UmaBirch Instream Design and Construction Oversight Project

Project Area 4 Birch Creek Instream Enhancement and Floodplain Restoration

Implementation Plan

Issued for Construction

Prepared for:

Confederated Tribes of the Umatilla Indian Reservation
Fisheries Program-Umatilla River Basin
Department of Natural Resources
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July 2021

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1. Introduction

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have contracted Tetra Tech, Inc. (Tetra Tech) to provide engineering designs for the Instream Enhancement and Floodplain Restoration project, which includes Birch Creek from river mile (RM) 0.0 to RM 0.7 and RM 1.8 to RM 2.7, the Umatilla River from RM 47.8 to RM 49.9, the entire Birch Creek alluvial fan, and the associated floodplain areas on both sides of Birch Creek and the Umatilla River. To provide a phased construction approach the study area was separated into four distinct project areas (PAs). This Implementation Plan is specific to PA 4, formally named as the Project Area 4 Birch Creek Instream Enhancement and Floodplain Restoration Project (Project), which is located on Birch Creek from RM 1.8 to RM 2.7, from the Union Pacific Railroad (UPRR) Birch Creek Bridge upstream to the property boundary (Figure 1). This submittal includes the following items to support construction of PA 4:

- Implementation Plan (this document)
- Attachment 1: Design Drawings
- Attachment 2: Construction Specifications
- Attachment 3: Habitat Improvement Program (HIP) Conservation Measures

This section of the Implementation Plan briefly describes the Project. Section 2 provides an overview of the Project's construction implementation, including the Project schedule, materials, and actions. Section 3 provides an overview of important Project construction specifications, and Section 4 lists references cited.

1.1 PROJECT LOCATION

The Project is located on Birch Creek approximately 2 miles upstream of its confluence with the Umatilla River near the town of Rieth, approximately 3 miles west of Pendleton, Oregon (Figure 2).

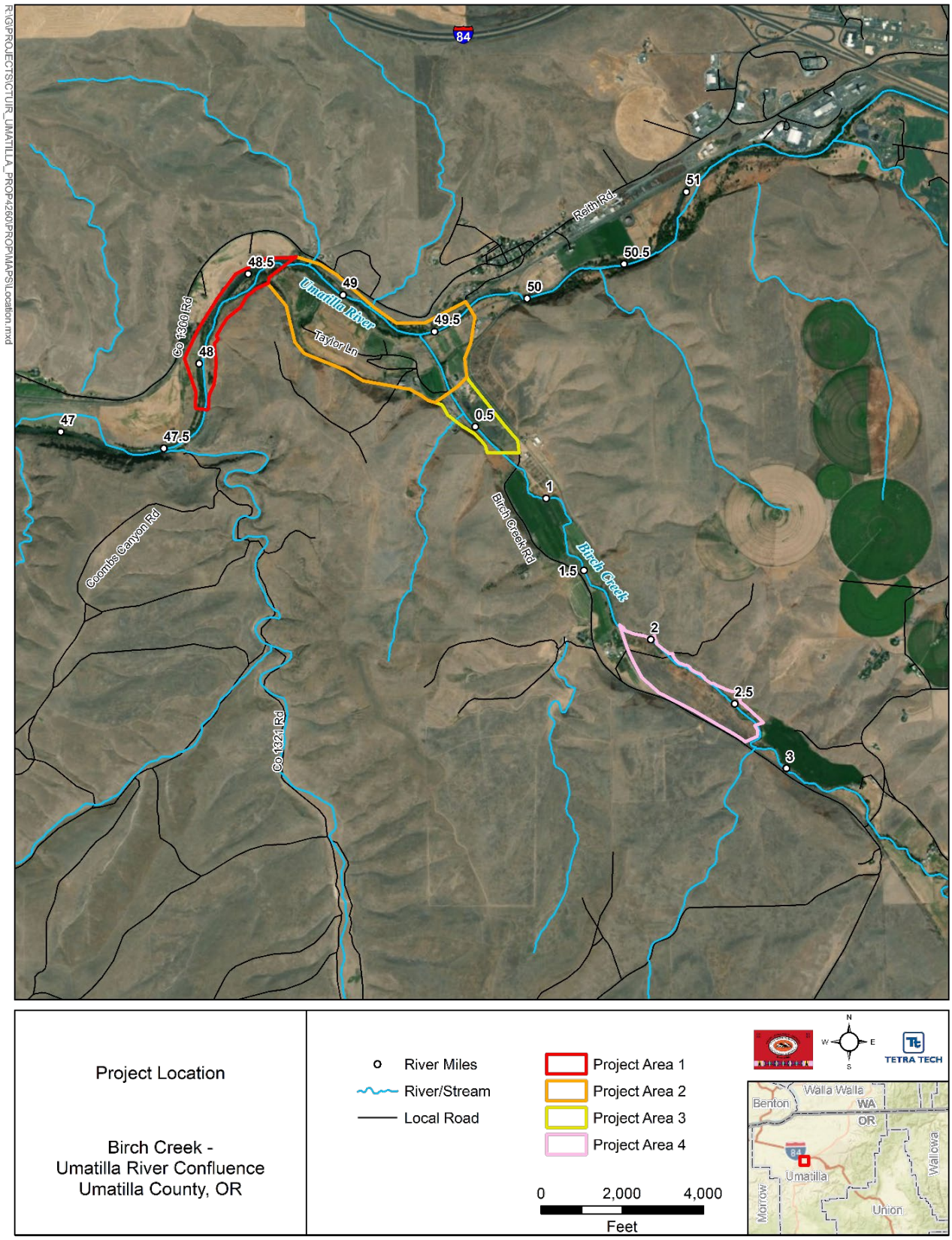


Figure 1. Study Area

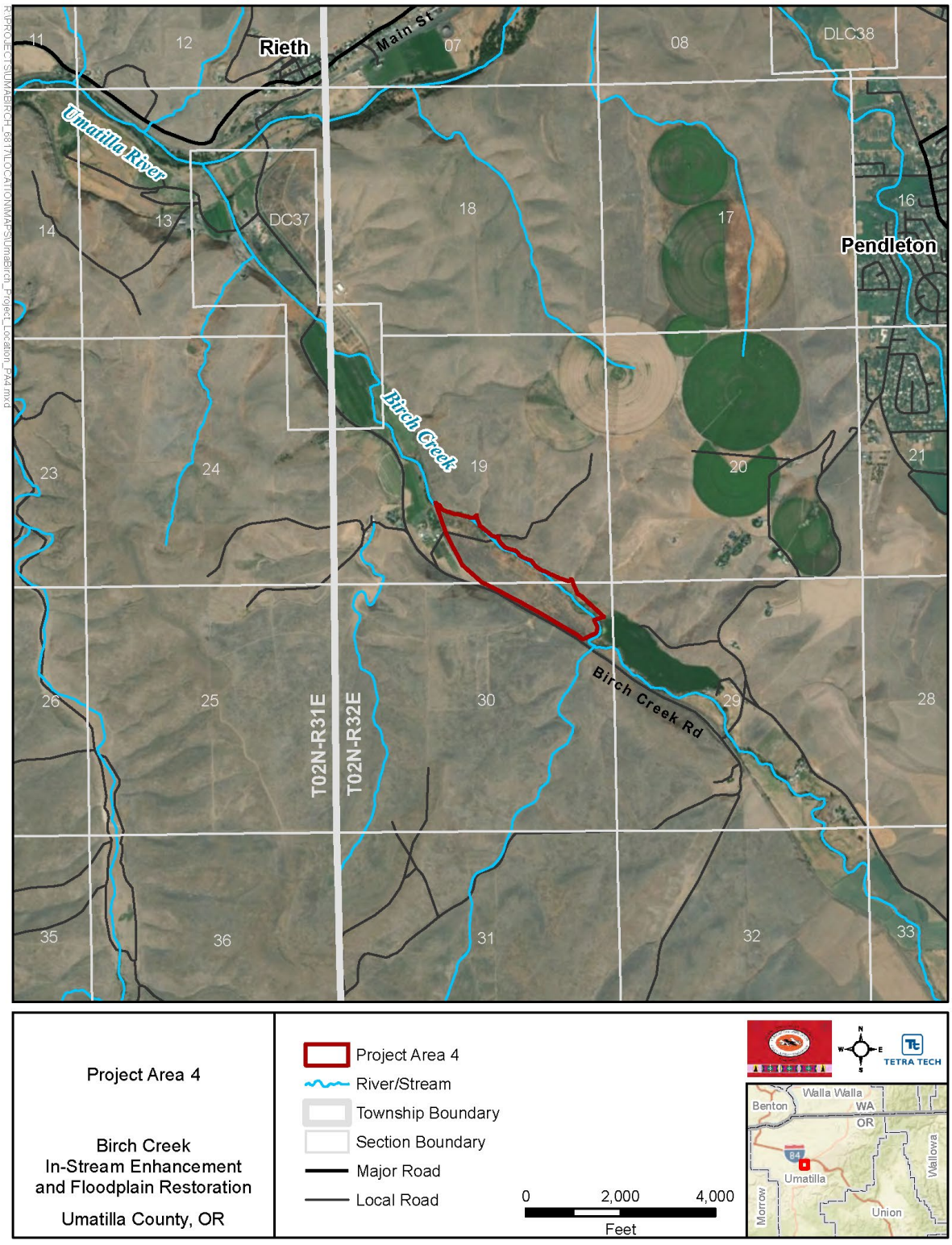


Figure 2. Project Area 4

1.2 PROJECT DESCRIPTION

The goal of the project is to improve instream habitat for Endangered Species Act (ESA)-listed and non-listed fish, benefit channel morphology and instream processes, and protect existing infrastructure along Birch Creek. This will be achieved by constructing a new main channel, grade stabilization measures, wetlands, modifications to the old channel, and terrace fill. Excavation and fill quantities have been designed to balance, such that no import or export of material shall be required other than large woody material (LWM), boulders, and grade stabilization material. LWM structures will be placed in the new and old channels and across the floodplain. An existing irrigation pipe and associated electrical utility will be relocated (to be completed by others). Finally, planting and seeding will be performed by CTUIR to initiate revegetation of the site.

The areal extent of disturbance is 35.9 acres. Construction is anticipated to be completed in 2021 or 2022. According to Oregon Department of Fish and Wildlife (ODFW) guidelines, the in-water work window is July 1 to October 31 for Birch Creek. A proposed construction sequence for construction is provided below. Potential impacts include noise and dust, temporary turbidity releases to the stream, minor impacts to resident fish populations from fish salvage activities, possible spills from construction equipment, colonization of disturbed ground by invasive vegetation, short-term disturbance issues for landowners, and damage to existing vegetation along designated access routes. Overall impacts to all work areas will be minimized through incorporation of HIP conservation measures and best management practices (BMPs), as well as site-specific actions described in Section 3.2.

2. Project Implementation Overview

The Project design includes excavation and fill of the channel and floodplain, installation of LWM, creation of meander bends and floodplain terraces, placement of fill within the existing channel with onsite excavated floodplain alluvium, and installation of riparian plantings. Relocation of an existing irrigation pipe and utilities is indicated on the designs, but the detailed designs, specifications, and implementation plan for that relocation will be completed by others, and the CTUIR will have this component constructed under a separate contract.

Specifically, these actions will result in:

- Excavation of 56,800 CY of floodplain alluvium material to create a new channel and wetlands.

- Fill of 56,800 CY of floodplain alluvium material for existing channel fill, floodplain topography, floodplain terraces, embankment fill, and LWM structure ballast.
- Installation of LWM, including 77 LWM structures (5 Type 1 Debris Jam structures, 21 Type 2 Debris Jam structures, 6 Channel Spanning structures, 16 Bank Habitat structures, 12 11-Log Habitat structures, and 17 10-Log Habitat structures) and 50 surface-placed logs to be placed as directed.
- Seeding and planting of native grasses, shrubs, and trees.

2.1 PROJECT SCHEDULE

This implementation plan assumes that the Project will be constructed continuously in a single year, with all work completed within the timeframe of May 1 and November 30, 2021 or 2022 or as directed in the Contract Documents. However, at the CTUIR's sole discretion, the CTUIR may elect to construct the Project in discrete phases. These phases may include, but are not limited to:

- Acquisition and staging of rock and woody materials.
- Site clearing, grubbing, and temporary access.
- Partial or full excavation of proposed channel, wetland, and floodplain features.
- Installation of LWM structures.
- Relocation of an existing irrigation pipe and utilities (to be completed by others).
- Placement of channel, embankment, terrace, and floodplain topography fill.
- Site stabilization.

2.1.1 Construction Sequence

A proposed construction sequence is provided below.

- Floodplain and Uplands Work: Before in-water work window (prior to July 1)
  - Construction staking, flagging of sensitive areas, contractor submittals, etc.
  - Mobilize to site and site preparation.
  - Clear and grub proposed temporary access roads.
  - Install temporary erosion and sediment controls (TESC).
  - Separate and stockpile in the staging area or areas directed by Owner's Representative or Engineer, earth, rock, and woody materials for future use.

  - Excavate new channel and wetlands, place fill for terraces, and construct grade stabilization measures leaving an earthen plug at each end of the new main channel before connecting to existing channel.
  - Construct floodplain LWM structures.

- Active Channel: July 1 – October 31
  - Install block nets and salvage fish (work to be completed by CTUIR).
  - Install temporary bridges or fish-excluded crossings of the wetted channel as directed by Owner's Representative or Engineer.
  - Install and monitor TESC.
  - Install work area isolation and dewater work areas. Pump turbid water to an approved location and monitor to ensure no turbid water returns to the stream.
  - Construct new main channel, and floodplains below ordinary high water (OHW).
  - Construct wetted channel LWM structures where temporary bridges or fish-excluded crossings in the wetted channel are required.
  - Install LWM structures and surface-placed logs.
  - Remove downstream earthen plug, isolate existing channel, conduct fish salvage, complete new main channel downstream confluence with existing channel.
  - Remove upstream earthen plug and re-route stream into new main channel. Slowly reintroduce flow to the work areas, monitoring for turbidity.
  - Remove temporary bridges or fish-excluded crossings in the wetted channel, final grading and shaping of terrace areas, and grade and subsoil compacted temporary access roads.
  - Remove work area isolation.
  - Remove block nets.
  - Remove TESC.
- After In-Water Work Window: After October 31
  - Complete any excavation and fill remaining above OHW.
  - Stabilize site (seeding and planting).
  - Site cleanup and demobilization.

- Revegetate decompacted floodplains and all disturbed areas.
- Plant trees and shrubs in the fall (to be completed by CTUIR).

2.2 CONSTRUCTION MATERIAL QUANTITIES

The implementation of the Project will require earthwork, including excavating and backfilling channel and floodplain areas and adding LWM to the stream. A summary of the Project earthwork quantities is shown in Table 2-1. The use of native fill and the balance of earthwork quantities is intended to avoid the need to import or export material LWM, boulders, and grade stabilization material. A summary of the Project rock materials is shown in Table 2-2. A summary of the Project LWM materials is shown in Table 2-3. Rock and wood materials will be imported from an off-site source.

Table 2-1. Project Earthwork Summary

Item	Unit	Quantity
Excavation – Proposed Birch Creek Alignment	CY	19,176
Excavation – Wetlands and Benching	CY	37,205
Fill – Terraces and Floodplain Topography	CY	16,624
Fill – Existing Birch Creek Channel	CY	24,520
Fill – Existing Birch Creek Embankments	CY	14,802

CY = cubic yard

Table 2-2. Project Rock Materials Summary

Item	Unit	Quantity
2-Foot Ballast Boulder	EA	520
3-Foot Ballast Boulder	EA	72
Grade Stabilization Material	CY	640

EA = each

Table 2-3. Project Large Wood Materials Summary

Large Wood Material	Size (Diameter)	Length	Rootwad (Diameter)	Unit	Quantity
Whole Tree w/ Rootwad	18″ min.	40′ min.	4′ min.	EA	828
Logs w/o Rootwads or Branches	18″ min.	40′ min.	–	EA	48
Slash/Racking	2-10″	6-16′	–	CY	3,016

min. = minimum
″ = inches
′ = feet

Project earthwork quantities are neatline quantities and represent direct measurements between existing and proposed grades. Contractor shall take into account the earthwork activities that involve existing grade excavation, loose volume in trucks and/or stockpiles, and compacted in-place proposed grades. Per Federal Highway Administration criteria, the typical range of combined shrink and swell factors for heavy excavation is approximately 15

percent shrink to 5 percent swell (FHWA 2021), which is within the expected variation in the bid items and actual work of 15 percent, as specified in Section 01 22 20 MEASUREMENT AND PAYMENT in Attachment 2. If additional fill is needed as a result of compaction (including compaction of soils under embankments and access routes) or other factors, the contractor may propose additional excavation within the wetland cells, beginning at the upstream end of the project.

2.3 PROJECT ACTIVITIES

To ensure integrity of the stream channel and to reduce impacts to water quality and aquatic organisms, all work below the OHW will be performed within the in-water work window. A detailed description of the major construction activities with reference to the corresponding drawings and specifications is presented below.

2.3.1 Mobilization and Construction Initiation

The Project will begin with mobilization and construction initiation activities. Mobilization includes procurement, field team selection and preparation, mobilization of equipment and materials, pre-construction meeting, and establishing protocols for construction support, construction quality control measures, and progress meetings.

Construction initiation activities will include:

- Installation of construction fencing where required;
- Installation and maintenance of construction area BMPs;
- Construction and maintenance of construction access and staging areas;
- Installation and maintenance of TESC; and
- Submission and approval of all required submittals and plans.

Pre-construction staking will be completed under separate contract. This staking effort will include the construction points shown on the design drawings and assumes that the construction contractor will have on-site survey capability and/or GPS-enabled equipment.

Required pre-construction submittals and plans are incidental pay items included within other bid items. They are described in the construction specifications (see Section 01 33 00 Submittal Procedures in Attachment 2) and are summarized in Table 2-4.

Table 2-4. Contractor Submittal Log

Log No.	Description of Submittal	Type of Submittal	Requirement found in Specification No.	Additional Specification References
1	Submittal Schedule	Schedule	Section 01 33 00 1.02	
2	Construction Schedule	Schedule	Section 01 33 00 3.01	Specifications Section 01 14 20 1.02 and1.05; Implementation Plan Section 2.1
3	Contract schedule of values	Schedule	Section 01 33 00 3.01	
4	Weed-free Material Source Certification	Material Certification	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Sections 01 35 43 2.03 and 3.04; Specifications Section 32 90 00 2.01
5	Spill Prevention Countermeasures and Control (SPCC) Plan	Plan	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Section 01 35 43 1.03; Implementation Plan Section 3.2
6	Oregon Department of Environmental Quality (ODEQ) 1200-C Permit	Permit	Section 01 33 00 3.01	Specifications Section 01 35 43 1.02
7	Stormwater Pollution Prevention Plan (SWPPP), with Oregon Department of State Lands 1200-C Permit and Supporting Materials	Plan; Permit	Section 01 33 00 3.01	Specifications Section 01 35 43 1.03
8	Erosion and Sediment Control (ESC) Plan	Plan	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Section 01 35 43 1.03; Implementation Plan Section 3.2
9	Storm Contingency Plan	Plan	Section 01 33 00 3.01	Specifications Section 01 35 43 1.02
10	Material Storage/Staging Plan	Plan	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Section 01 35 43 1.04 F.1; Implementation Plan Section 3.1
11	Dewatering and Work Area Isolation Plan	Plan	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Sections 01 35 43 1.05 H.1, 01 35 43 1.02, and 31 23 19 1.02
12	Excavation Plan	Plan	Section 01 33 00 3.01	Specifications Section 31 23 00
13	LWM, Boulder, Streambed, and Grade Stabilization Material	Material Compliance	Section 01 33 00 3.01	Specifications Section 35 49 50 Implementation Plan Section 2
14	Seed Certification	Material Certification	Section 01 33 00 3.01	Specifications Section 32 90 00 Implementation Plan Sections 2 and 3
15	Surveyor Credentials	Credential	Section 01 33 00 3.01	Specifications Section 01 71 23 1.02
16	Oregon Department of Forestry (ODF) Notification of Operation	Notice	Section 01 33 00 3.01	Specifications Section 01 35 43 1.03
17	Temporary Bridge Crossing Design	Plan	Section 01 33 00 3.01	HIP Terms and Conditions; Specifications Section 01 55 13 2.03
18	Final Record Drawings	Drawings	Section 01 33 00 3.01	Specifications Sections 01 71 23 and 01 78 39

2.3.2 Work in the Floodplain and Uplands

Work in the floodplain and uplands will include LWM acquisition, hauling, and staging; floodplain and channel excavation with no work below OHW; and the installation of LWM structures in upland locations outside of the OHW.

Work in the floodplain will begin by clearing and grubbing for temporary access routes, stockpile and staging areas, floodplain excavation areas, and the installation of temporary crossings. Suggested access routes are shown in the Design Drawings (Attachment 1 Sheet C-402), but the contractor will confirm all routes in the field with the CTUIR and the landowner before construction. All material excavated from the floodplain will be placed as designated in the Design Drawings. Concrete, metal, and other debris will be removed and hauled to an approved off-site disposal facility.

LWM structures will be constructed with no work below the OHW (Sheets C-402 and C-471 to C-476 in Attachment 1). Some LWM will be surface-placed, and other LWM will be excavated and backfilled with floodplain excavation spoils.

2.3.3 Work in the Wetted Channel

Work in the wetted channel (defined as the area below OHW) will only take place during the in-water work period of July 1st to October 31st. This will include channel and floodplain excavation and fill, installation of the remaining LWM structures, and replacement of the irrigation pipe (detailed designs, specifications, and implementation plan to be completed by others).

Work in the wetted channel must follow dewater, bypass, fish and freshwater mussel salvage sequences, and details in the Design Drawings, Attachment 1 (Sheet C-481), the Construction Specifications in Attachment 2, and the HIP Conservation Measures in the most current version of the HIP Handbook (currently BPA 2021) in Attachment 3. Any fish and mussel salvage will be done by the CTUIR, or other qualified fish biologists, by isolating the work area and/or blocking the upstream and downstream extents of the work area and capturing and releasing of mussels and fish from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury to animals. The contractor will provide at least three days advanced notice prior to dewatering or isolating any work area and coordinate placement of LWM structures with Owner's Representative in the immediate vicinity of fish and mussel bed salvage operations.

Construction of the LWM structures in the wetted channel will occur simultaneously with the channel and floodplain excavation. An excavator will be used to construct the LWM structures in the wetted channel as the materials are delivered by a front-end loader or off-

road haul truck. Installation of a typical structure will include surface placement or excavation of a trench in the floodplain or bank, installation of the log or rootwad, backfill of the trench with native fill, and bucket compaction. Each structure will have a unique installation procedure depending on the complexity of the structure and interaction with other logs, racking, rootwads, ballast (see Attachment 1, Design Drawing Sheets C-402, and C-471 to C-476, and Attachment 2, Section 35 01 60 Stream Restoration and Section 35 49 50 LWM and Channel Structures). All specifications for anchoring and securing large wood will follow the Oregon Department of Forestry (ODF) and ODFW manual for placing large wood in streams (ODFW and ODF 1999, 2010).

Rewatering steps will include pre-washing areas of channel excavation, pumping the turbid water to an approved floodplain location with no turbid water returns to the river, and incrementally increasing flow in the channel over a period of hours. Pump capacity and discharge hose length shall be sufficient to dewater work areas with no turbid water returns to the river. All pumps will be equipped with fish screens that meet National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) criteria (NMFS 2011). All pumps and generators used in or near streams will have appropriate spill containment structures in place at all times during use.

All material placed in the channel shall be placed and compacted in lifts. Fines shall be washed in for each lift until voids within the placed matrix are minimized such that ponding occurs with little to no percolation losses to keep the introduced water on the surface and avoid the river going subsurface.

2.3.4 Revegetation and Cleanup

To the extent practicable, existing vegetation will be maintained by the contractor on the floodplain and along the wetted channel. Whenever possible, disturbed vegetation will be transplanted by the contractor during construction. Natural vegetation will be removed by the contractor in clumps that preserve plant grouping, topsoil, and root systems. Vegetation clumps will be preserved, protected, and replanted to the greatest extent possible.

Following completion of all work activities, the contractor will decompact staging areas, access routes, and all compacted areas to a minimum depth of 18 inches and a clod size no larger than 8 inches. All disturbed areas will be permanently stabilized and seeded per Section 32 90 00 Seeding. Riparian planting with native plant species will be performed by the CTUIR.

3. Construction Specifications

3.1 STAGING AND STOCKPILE AREAS

Access to the site will be from Birch Creek Road. No new permanent access roads will be constructed, and all temporary access routes will be approved by the CTUIR. To minimize disturbance and associated environmental impacts, construction vehicles will avoid concentrations of thick vegetation and other sensitive areas. The construction staging will occur away from the wetted channel and only in designated areas. Construction staging and stockpile areas are indicated in the Design Drawings, Attachment 1 (Sheet C-402). All temporary staging, storing, or maintenance of equipment shall be more than 150 feet from any natural water body or wetland, and if fueling or maintenance must be performed near any natural water body or wetland, it shall be conducted using secondary containment to capture potential fuel spills as described in the Construction Specifications, Attachment 2 (Section 01 35 43 Environmental Protection).

3.2 TESC, BMP IMPLEMENTATION, AND PERMANENT SITE STABILIZATION

TESC measures are specified in the construction specifications in Attachment 2 (Section 01 35 43 Environmental Protection). The minimum measures that should be installed are indicated in the Design Drawings in Attachment 1 (Sheets G-003 to G-005, C-482). The specified controls represent the minimum. The contractor is responsible for installing additional controls to prevent any sediment and sediment-laden water leaving the construction site. Additionally, it is the contractor's responsibility to comply with all BPA HIP terms and conditions and conservation measures (Attachment 1, Sheets G-003 to G-005 and Attachment 3), including:

- General Aquatic Conservation Measures;
- Category 1c – Headcut and Grade Stabilization;
- Category 2a – Improve Secondary Channel and Floodplain Interactions;
- Category 2c – Protect Streambanks Using Bioengineering Methods;
- Category 2d – Install Habitat-Forming Natural Structures;
- Category 2e – Riparian Vegetation Planting; and
- Category 2f – Channel Reconstruction.

The general environmental protection measures and BMPs to be implemented are outlined below:

- All in-water work will be limited to the in-water work period (July 1 to October 31).
- Fish and freshwater mussel removal and relocation will be carried out by the CTUIR or other qualified fish biologists in accordance with NMFS and ODFW fish salvage guidelines.
- The contractor will secure the Project area at the end of every workday in an effort to stabilize the work area to minimize impacts in case a high-water event occurs. The contractor will be required to prepare and implement an Erosion and Sediment Control Plan to keep sediment from entering the wetted channel during rain events.
- The contractor will be required to prepare an emergency spill containment kit, to be located on the construction site at all times, and prepare a Spill Prevention, Control, and Countermeasures (SPCC) Plan addressing prevention and cleanup of accidental spills. The SPCC Plan will be in agreement with all conservation measures and BMPs included in this Implementation Plan.
- TESC measures, which may include fiber wattles, straw bales, silt fences, jute matting, wood fiber mulch and soil binder, or geotextiles and geosynthetic fabric, will be in place before any significant alteration of the Project site and appropriately installed downslope of Project activity until permanent site stabilization is complete.
    - If there is a potential for eroded sediment to enter the stream, sediment barriers will be installed and maintained for the duration of Project implementation.
    - Soil stabilization utilizing wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil if the materials are noxious weed-free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.
    - Sediment will be removed from erosion control BMPs once it has reached one-third of the exposed height of the BMP.
    - The work area will be well isolated from surface waters of the river using temporary cofferdams constructed with bulk bags filled with washed gravel, plastic sheeting and sandbags, or similar materials.
    - Once the site is stabilized following construction, TESC BMPs will be removed.
    - Materials for emergency erosion control will be available at the work site, including a supply of sediment control materials and an oil-absorbing floating boom whenever surface water is present.

- Machinery used in the Project area will be clean, well-maintained, in good operating condition, and inspected daily for leaks. All equipment used in and adjacent to the stream channel and live water will use biodegradable lubricants and fluids.
- Parking machinery, equipment, and vehicles in areas that are infested with noxious weeds will be avoided to the extent possible. Workers will check under vehicles and equipment before leaving the area and remove any plants or plant parts that may become lodged in the carriages. Workers will also check clothing and tools for weed seeds. If noxious weed plants or seeds are found during inspections, they will be incinerated at an approved location.
- The clearing limits associated with site access and construction will be marked with flagging in the field prior to vegetation removal and other construction activities to minimize disturbance to riparian vegetation and avoid disturbance to sensitive habitats.
- The contractor will minimize alteration or disturbance of streambanks and existing riparian vegetation. This will be done by revegetating banks that are disturbed during construction, covering all land areas that will be left undisturbed for more than seven days with an approved soil covering practice (e.g., seeding, mulching, plastic covering, crushed rock) whether at final grade or not, and marking in the field clearing limits associated with site access and construction.
- Contact water from work activities and water removed from within the work area will be routed to an area approved by the CTUIR to allow removal of fine sediment and other contaminants prior to being discharged to the stream.
- All construction staging and any machinery maintenance involving potential contaminants (e.g., fuel, oil, hydraulic fluid, etc.) will occur at an approved site at least 150 feet away from the wetted channel and only in designated areas. Hazardous spill clean-up materials and trained operators will be located on-site.
- Within the Project area, the necessary equipment will be maintained to pump out the work site if flows enter any construction area. The pump will be screened to prevent fish from entering the system. Pump screens will be designed in accordance with NMFS (2011) standards to avoid juvenile fish impingement or entrainment. Screen maintenance will be adequate to prevent injury or entrainment of juvenile fish. The screen will remain in place as long as the diversion or isolated work area is in place.
- Dewatering of isolated work areas will be done in a way that will not degrade water quality or cause fish or freshwater mussel stranding. Coordination with CTUIR will be necessary to ensure that fish and freshwater mussel salvage will be completed

prior to dewatering activities. If freshwater mussel bed locations are identified, three days advanced notice will be needed for any salvage and relocation effort. The contractor should anticipate that fish and freshwater mussel salvage and transfer may be necessary wherever these species are encountered during construction.

3.3 DEMOBILIZATION AND CLEAN-UP SCHEDULE

Demobilization will occur once work activities are completed and all work has been found to be acceptable by the CTUIR. Equipment will be transported off the site and returned to the vendors as applicable. Unused materials will be returned to the supplier or transported off-site to a location approved by CTUIR. Demobilization and final site cleanup is scheduled prior to December 1 in the year of construction.

4. References

BPA. 2021. FY 2021 HIP Handbook: Guidance of Programmatic Requirements and Process. Available online at: https://www.bpa.gov/efw/Analysis/NEPADocuments/esa/2021(HIP4)Handbook_20210309.pdf

BPA. 2018. HIP III General Project & Data Summary Requirements, Basis of Design Report Template. Version 2.0.

Federal Highway Administration (FHWA). 2021. Earthwork Design. Available online at: https://highways.dot.gov/federal-lands/pddm/dpg/earthwork-design

Tetra Tech. 2019a. Umatilla River and Birch Creek Instream and Floodplain Restoration 15 Percent Alternatives Analysis.

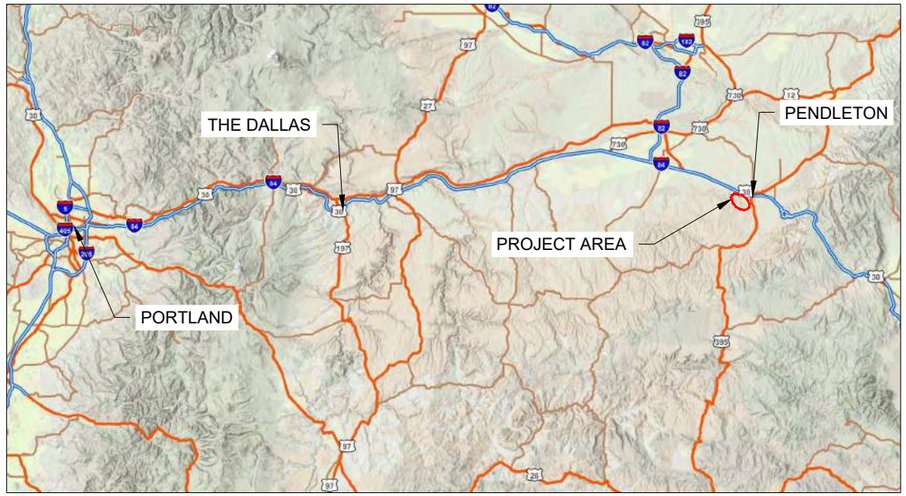
Tetra Tech. 2019b. Umatilla River and Birch Creek Instream and Floodplain Restoration 30 Percent Design Submittal.

Tetra Tech. 2021. Umatilla River and Birch Creek Instream and Floodplain Restoration 60 Percent Design Submittal.

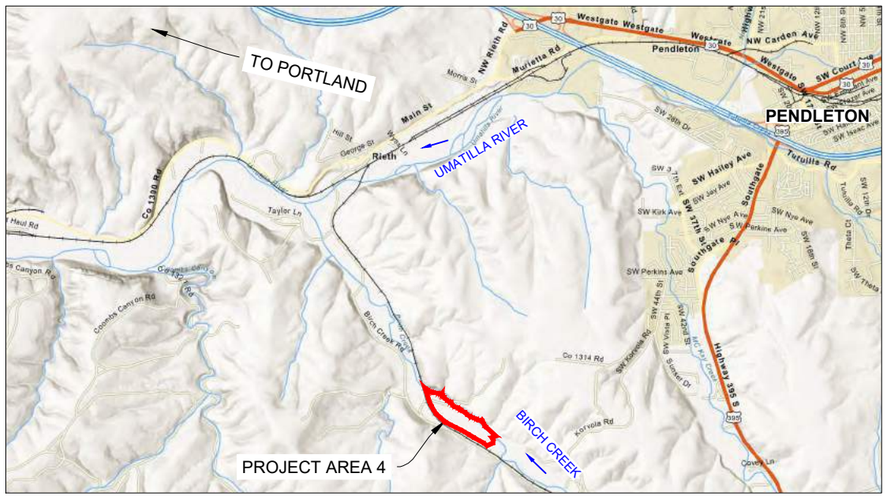
ATTACHMENT 1
DESIGN DRAWINGS

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

PROJECT AREA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION



LOCATION MAP
SCALE: NTS



VICINITY MAP
SCALE: NTS

SHEET LIST	
DWG #	**TITLE**
G-001	COVER SHEET
G-002	GENERAL NOTES
G-003 - G-005	GENERAL NOTES - HIP CONSERVATION MEASURES
C-401	EXISTING CONDITIONS OVERVIEW
C-402	PROPOSED CONDITIONS
C-411 - C-414	PROPOSED BIRCH CREEK ALIGNMENT PROFILES AND SECTIONS
C-421 - C-425	PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS
C-431 - C-433	PROPOSED TERRACE FILL PROFILES AND SECTIONS
C-434	PROPOSED FLOODPLAIN TOPOGRAPHY AND SECTIONS
C-441 - C-445	PROPOSED WETLAND PROFILES AND SECTIONS
C-451	PROPOSED TYPICAL SECTIONS
C-461 - C-464	CONSTRUCTION POINT DATA TABLES
C-471 - C-476	DETAILS LWM CONSTRUCTION
C-481	FISH SALVAGE, DEWATERING, AND REWATERING DETAILS
C-482	TESC DETAILS
L-401 - L-403	PLANTING PLAN

PROJECT AREA 4 CONSTRUCTION QUANTITY SUMMARY		
CONSTRUCTION ITEMS	UNITS	QUANTITY
BIRCH CREEK ALIGNMENT CUT*	CY	19,176
WETLANDS AND BENCHING CUT*	CY	37,205
TERRACE AND FLOODPLAIN TOPOGRAPHY FILL*	CY	16,624
EXISTING BIRCH CREEK CHANNEL FILL*	CY	24,520
EXISTING BIRCH CREEK EMBANKMENT FILL*	CY	14,802
WHOLE TREE (18"+ BDH, 40FT MIN., 4FT MIN. ROOTWAD)**	EA	828
LOG W/O ROOTWAD OR BRANCHES (18"+ DBH, 40 FT MIN.)	EA	48
SLASH/RACKING (2-10" DBH, 6-16FT)	CY	3,016
2FT BOULDER	EA	520
3FT BOULDER	EA	72
GRADE STABILIZATION MEASURE MATERIAL	CY	640
*QUANTITY BASED ON FINISHED GRADE NEATLINES, SEE GENERAL CONSTRUCTION NOTE 9 SHEET G-002		
**QUANTITY OF WHOLE TREES INCLUDES 50 ADDITIONAL TREES FOR AS DIRECTED SURFACE PLACEMENT, SEE SHEET C-402		

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Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JERMEY S. ANDREWS July 9, 2018
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	PLAN SHEET SIZE ANSI B (11" X 17") REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

COVER SHEET

DWG. NO.: G-001

CREATED: 7/1/21

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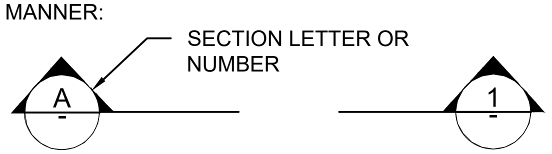
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 4:57 PM

ABBREVIATIONS

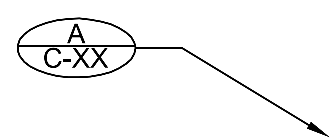
1H:1V	HORIZONTAL TO VERTICAL EXAGGERATION
µS	MICRO SECONDS
µS/CM	MICRO SECONDS PER CENTIMETER
°C	DEGREE CELSIUS
%	PERCENT
Ø	DIAMETER
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APP	APPROVED BY
APPROX	APPROXIMATE
BMP	BEST MANAGEMENT PRACTICE
BPA	BONNEVILLE POWER ADMINISTRATION
CHK	CHECKED BY
CO	COUNTY
CP	CONTROL POINT
CTUIR	CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
CWA	CLEAN WATER ACT
CY	CUBIC YARDS
D	DEPTH
DBH	DIAMETER AT BREAST HEIGHT
DC	DIRECT CURRENT
DIA	DIAMETER
DWG	DRAWING
DRW	DRAWN BY
EG	FOR EXAMPLE (LATIN: EXEMPLI GRATIA)
ENG	ENGINEERED BY
EQIV	EQUIVALENT
ESA	ENDANGERED SPECIES ACT
ETC	ET CETERA
EX	EXISTING
FT, '	FOOT
HARN	HIGH ACCURACY REFERENCE NETWORK
HEC-RAS	HYDRAULIC ENGINEERING CENTER RIVER ANALYSIS SYSTEM
HIP	HABITAT IMPROVEMENT PROGRAM
HUC	HYDROLOGIC UNIT CODE
HZ	HERTZ
ID	IDENTIFICATION
IDFG	IDAHO DEPARTMENT OF FISH AND GAME
IE	THAT IS (LATIN: ID EST)
IN, "	INCH
L	LENGTH
LBS	POUNDS
LiDAR	LIGHT DETECTION AND RANGING
LT	LEFT
LWM	LARGE WOODY MATERIAL
M	METER
MAX	MAXIMUM
MI	MILE
MIN	MINIMUM
MJR	MAJOR
MFWP	MONTANA FISH WILDLIFE AND PARKS
MNR	MINOR
MS	MILLISECONDS
N/A	NOT APPLICABLE
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
NEPA	NATIONAL ENVIRONMENTAL POLICY ACT
NMFS	NATIONAL MARINE FISHERIES SERVICE
NHPA	NATIONAL HISTORIC PRESERVATION ACT
NTS	NOT TO SCALE
PDC	PULSED DIRECT CURRENT
ODFW	OREGON DEPARTMENT OF FISH AND WILDLIFE
ODOT	OREGON DEPARTMENT OF TRANSPORTATION
OHW	ORDINARY HIGH WATER
OWRD	OREGON WATER RESOURCES DEPARTMENT
PREFAB	PREFABRICATED
PRO	PROPOSED
RT	RIGHT
STA	STATION
TEMP	TEMPORARY
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
TYP	TYPICAL
UPPR	UNION PACIFIC RAILROAD
USFS	UNITED STATES FOREST SERVICE
USFWS	UNITED STATES FISH AND WILDLIFE SERVICE
V	VOLTS
W/	WITH
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WSE	WATER SURFACE ELEVATION
XS	CROSS SECTION
YR	YEAR

SYMBOLS

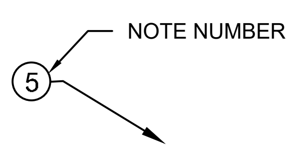
SECTIONS ARE REFERENCED IN THE FOLLOWING MANNER:



CONSTRUCTION DETAILS ARE REFERENCED IN THE FOLLOWING MANNER:



NOTES ARE REFERENCED IN THE FOLLOWING MANNER:



CONSTRUCTION SEQUENCING:

1. FLOODPLAIN WORK: OCTOBER 31 - JUNE 30
   - CLEAR AND GRUB PROPOSED TEMPORARY ACCESS ROADS.
   - SEPARATE AND STOCKPILE IN THE STAGING AREA OR AREAS DIRECTED BY OWNER'S REPRESENTATIVE OR ENGINEER, EARTH, ROCK, AND WOODY MATERIALS FOR FUTURE USE.
   - CONSTRUCT NEW MAIN CHANNEL, TERRACE FILL, WETLANDS, AND A PORTION OF THE DOWNSTREAM ROUGHENED RIFFLE LEAVING AN EARTHEN PLUG AT EACH END BEFORE CONNECTING TO EXISTING CHANNEL.
   - CONSTRUCT NEW MAIN CHANNEL AND FLOODPLAIN LWM STRUCTURES.
   - REVEGETATE DECOMPACTED FLOODPLAINS AND ALL DISTURBED AREAS.
2. ACTIVE CHANNEL: JULY 1 - OCTOBER 31
   - REMOVE DOWNSTREAM EARTHEN PLUG, ISOLATE REMAINING DOWNSTREAM ROUGHENED RIFFLE, CONDUCT FISH SALVAGE, AND COMPLETE ROUGHENED RIFFLE CONSTRUCTION.
   - REMOVE UPSTREAM EARTHEN PLUG AND RE-ROUTE STREAM INTO NEW MAIN CHANNEL.
   - ISOLATE EXISTING BIRCH CREEK AND CONDUCT FISH SALVAGE, IF NEEDED, TO REMOVE ANY STRANDED FISH WHERE NECESSARY AS DIRECTED BY OWNER'S REPRESENTATIVE OR ENGINEER.
   - DEWATER AND CONSTRUCT MODIFICATIONS TO EXISTING BIRCH CREEK, INCLUDING THE UPSTREAM ROUGHENED RIFFLE.
   - CONSTRUCT WETTED CHANNEL LWM STRUCTURES WHERE TEMPORARY BRIDGES OR FISH-EXCLUDED CROSSINGS IN THE WETTED CHANNEL ARE REQUIRED.
   - REMOVE TEMPORARY BRIDGES OR FISH-EXCLUDED CROSSINGS IN THE WETTED CHANNEL, FINAL GRADING AND SHAPING OF TERRACE AREAS, AND GRADE AND SUBSOIL COMPACTED TEMPORARY ACCESS ROADS.
3. AFTER IN-WATER WORK WINDOW (AFTER OCTOBER 31):
   - STABILIZE AND REVEGETATE SITE (SEEDING AND PLANTING).
   - SITE CLEANUP AND DEMOBILIZATION.

GENERAL NOTES:

1. HORIZONTAL PROJECTION: NAD83 OREGON STATE PLANES, NORTH ZONE, INTERNATIONAL FOOT.
2. VERTICAL PROJECTION: NAVD88.
3. PROJECT ALIGNMENT. ELEVATION, AND STATIONING BASED ON 2019 LiDAR TOPOGRAPHIC DATA BY QUANTUM SPATIAL, INC. AND SUPPLEMENTED BY BATHYMETRIC SURVEY CONDUCTED BY TETRA TECH IN JUNE 2019.
4. PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY LANDOWNER.
5. AERIAL IMAGERY PROVIDED BY GOOGLE EARTH, 2019 AND QUANTUM SPATIAL, INC., 2019.

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CONSTRUCT THE DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "ISSUED FOR CONSTRUCTION". THESE PLANS WILL BE PROVIDED TO THE CONTRACTOR BY THE CONTRACTING AGENCY PRIOR TO CONSTRUCTION. WORK SHALL NOT BE DONE WITHOUT THE CURRENT SET OF APPROVED CONSTRUCTION PLANS.
2. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE BPA HIP TERMS & CONDITIONS.
3. CONTRACTOR SHALL CONTACT THE OREGON UTILITY NOTIFICATION CENTER 1-800-332-2344 (OR 811) BEFORE ANY EXCAVATION WORK BEGINS.
4. THE CONTRACTOR SHALL PURSUE WORK IN A CONTINUOUS AND EFFICIENT MANNER TO ENSURE TIMELY COMPLETION OF THE PROJECT.
5. ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 1 - OCTOBER 31).
6. ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
7. THE CONTRACTOR SHALL PROTECT ALL CONTROL POINTS DURING CONSTRUCTION ACTIVITIES.
8. CONTRACTOR SHALL PROVIDE AN EROSION AND SEDIMENT CONTROL AND DEWATERING PLAN TO OWNER WITHIN TEN (10) DAYS OF NOTICE TO PROCEED.
9. ALL EARTHWORK QUANTITIES ASSUME FINAL CONSTRUCTED IN-PLACE NEATLINE OR NEAT VOLUMES AND ARE BASED ON THE FINISHED GRADE. QUANTITIES DO NOT COMPENSATE FOR ANY MATERIAL SHRINKAGE OR EXPANSION.

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Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91399 OREGON JUL 12 2010 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

PLAN SHEET SIZE ANSI B (11" X 17")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

GENERAL NOTES

DWG. NO.: G-002

CREATED: 7/1/21

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PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 4:57 PM

HIP GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIP ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-LISTED SPECIES. THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS AND NMFS) WILL BE APPLIED TO ALL ACTIONS OF THIS PROJECT.

PROJECT DESIGN AND SITE PREPARATION.

1. STATE AND FEDERAL PERMITS.

A. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION.

B. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USACE CLEAN WATER ACT (CWA) 404 PERMITS, CWA SECTION 401 WATER QUALITY CERTIFICATIONS, AND FEMA NO-RISE ANALYSES.

2. TIMING OF IN-WATER WORK.

A. APPROPRIATE STATE (OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW), WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW), IDAHO DEPARTMENT OF FISH AND GAME (IDFG), AND MONTANA FISH WILDLIFE AND PARKS (MFWP)) GUIDELINES FOR TIMING OF IN-WATER WORK WINDOWS (IWW) WILL BE FOLLOWED.

B. CHANGES TO ESTABLISHED WORK WINDOWS WILL BE APPROVED BY REGIONAL STATE BIOLOGISTS AND BPA'S EC LEAD.

C. BULL TROUT. FOR AREAS WITH DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR AREAS KNOWN TO HAVE BULL TROUT, PROJECT PROPONENTS WILL CONTACT THE APPROPRIATE USFWS FIELD OFFICE TO INSURE THAT ALL REASONABLE IMPLEMENTATION MEASURES ARE CONSIDERED AND AN APPROPRIATE IN-WATER WORK WINDOW IS BEING USED TO MINIMIZE PROJECT EFFECTS.

D. LAMPREY. WORKING IN STREAM OR RIVER CHANNELS THAT CONTAIN PACIFIC LAMPREY WILL BE AVOIDED FROM MARCH 1 TO JULY 1 FOR REACHES <5,000 FEET IN ELEVATION AND FROM MARCH 1 TO AUGUST 1 FOR REACHES >5,000 FEET. IF EITHER TIMEFRAME IS INCOMPATIBLE WITH OTHER OBJECTIVES, THE AREA WILL BE SURVEYED FOR NESTS AND LAMPREY PRESENCE, AND AVOIDED IF POSSIBLE. IF LAMPREYS ARE KNOWN TO EXIST, THE PROJECT SPONSOR WILL UTILIZE DEWATERING AND SALVAGE PROCEDURES (SEE FISH SALVAGE AND ELECTROFISHING SECTIONS) TO MINIMIZE ADVERSE EFFECTS.

E. THE IN-WATER WORK WINDOW WILL BE PROVIDED IN THE CONSTRUCTION PLANS.

3. CONTAMINANTS.

A. EXCAVATION OF MORE THAN 20 CUBIC YARDS WILL REQUIRE A SITE VISIT AND DOCUMENTED ASSESSMENT FOR POTENTIAL CONTAMINANT SOURCES. THE SITE ASSESSMENT WILL BE STORED WITH PROJECT FILES OR AS AN APPENDIX TO THE BASIS OF DESIGN REPORT.

B. THE SITE ASSESSMENT WILL SUMMARIZE:

1. THE SITE VISIT, CONDITION OF THE PROPERTY, AND IDENTIFICATION OF ANY AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES;
2. AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;
3. INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND
4. THE TYPE, QUANTITY, AND EXTENT OF ANY POTENTIAL CONTAMINATION SOURCES.

4. SITE LAYOUT AND FLAGGING.

A. CONSTRUCTION AREAS TO BE CLEARLY FLAGGED PRIOR TO CONSTRUCTION.

B. AREAS TO BE FLAGGED WILL INCLUDE:

1. SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;
2. EQUIPMENT ENTRY AND EXIT POINTS;
3. ROAD AND STREAM CROSSING ALIGNMENTS;
4. STAGING, STORAGE, AND STOCKPILE AREAS; AND
5. NO-SPRAY AREAS AND BUFFERS.

5. TEMPORARY ACCESS ROADS AND PATHS.

A. EXISTING ACCESS ROADS AND PATHS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER AND LENGTH OF TEMPORARY ACCESS ROADS AND PATHS THROUGH RIPARIAN AREAS AND FLOODPLAINS WILL BE MINIMIZED.

B. VEHICLE USE AND HUMAN ACTIVITIES, INCLUDING WALKING, IN AREAS OCCUPIED BY TERRESTRIAL ESA-LISTED SPECIES WILL BE MINIMIZED.

C. TEMPORARY ACCESS ROADS AND PATHS WILL NOT BE BUILT ON SLOPES WHERE GRADE, SOIL, OR OTHER FEATURES SUGGEST A LIKELIHOOD OF EXCESSIVE EROSION OR FAILURE. IF SLOPES ARE STEEPER THAN 30%, THEN THE ROAD WILL BE DESIGNED BY A CIVIL ENGINEER WITH EXPERIENCE IN STEEP ROAD DESIGN.

D. THE REMOVAL OF RIPARIAN VEGETATION DURING CONSTRUCTION OF TEMPORARY ACCESS ROADS WILL BE MINIMIZED. WHEN TEMPORARY VEGETATION REMOVAL IS REQUIRED, VEGETATION WILL BE CUT AT GROUND LEVEL (NOT GRUBBED).

E. AT PROJECT COMPLETION, ALL TEMPORARY ACCESS ROADS AND PATHS WILL BE OBLITERATED, AND THE SOIL WILL BE STABILIZED AND REVEGETATED. ROAD AND PATH OBLITERATION REFERS TO THE MOST COMPREHENSIVE DEGREE OF DECOMMISSIONING AND INVOLVES DECOMPACTING THE SURFACE AND DITCH, PULLING THE FILL MATERIAL ONTO THE RUNNING SURFACE, AND RESHAPING TO MATCH THE ORIGINAL CONTOUR.

F. HELICOPTER FLIGHT PATTERNS WILL BE ESTABLISHED IN ADVANCE AND LOCATED TO AVOID TERRESTRIAL ESA-LISTED SPECIES AND THEIR OCCUPIED HABITAT DURING SENSITIVE LIFE STAGES.

6. TEMPORARY STREAM CROSSINGS.

A. EXISTING STREAM CROSSINGS OR BEDROCK WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER OF TEMPORARY STREAM CROSSINGS WILL BE MINIMIZED.

B. TEMPORARY BRIDGES AND CULVERTS WILL BE INSTALLED TO ALLOW FOR EQUIPMENT AND VEHICLE CROSSING OVER PERENNIAL STREAMS DURING CONSTRUCTION. TREATED WOOD SHALL NOT BE USED ON TEMPORARY BRIDGE CROSSINGS OR IN LOCATIONS IN CONTACT WITH OR DIRECTLY OVER WATER.

C. FOR PROJECTS THAT REQUIRE EQUIPMENT AND VEHICLES TO CROSS IN THE WET:

1. THE LOCATION AND NUMBER OF ALL WET CROSSINGS SHALL BE APPROVED BY THE BPA EC LEAD AND DOCUMENTED IN THE CONSTRUCTION PLANS;
2. VEHICLES AND MACHINERY SHALL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHENEVER POSSIBLE;
3. NO STREAM CROSSINGS WILL OCCUR 300 FEET UPSTREAM OR 100 FEET DOWNSTREAM OF AN EXISTING REDD OR SPAWNING FISH; AND
4. AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND BANKS RESTORED.

7. STAGING, STORAGE, AND STOCKPILE AREAS.

A. STAGING AREAS (USED FOR CONSTRUCTION EQUIPMENT STORAGE, VEHICLE STORAGE, FUELING, SERVICING, AND HAZARDOUS MATERIAL STORAGE) WILL BE 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND. STAGING AREAS CLOSER THAN 150 FEET WILL BE APPROVED BY THE EC LEAD.

B. NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN 150 FEET IF CLEARLY INDICATED IN THE PLANS THAT AREA IS FOR NATURAL MATERIALS ONLY.

C. ANY LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL DISPLACED BY CONSTRUCTION WILL BE STOCKPILED FOR USE DURING SITE RESTORATION AT A SPECIFICALLY IDENTIFIED AND FLAGGED AREA.

D. ANY MATERIAL NOT USED IN RESTORATION, AND NOT NATIVE TO THE FLOODPLAIN, WILL BE DISPOSED OF OUTSIDE THE 100-YEAR FLOODPLAIN.

8. EQUIPMENT.

A. MECHANIZED EQUIPMENT AND VEHICLES WILL BE SELECTED, OPERATED, AND MAINTAINED IN A MANNER THAT MINIMIZES ADVERSE EFFECTS ON THE ENVIRONMENT (E.G., MINIMALLY-SIZED, LOW PRESSURE TIRES; MINIMAL HARD-TURN PATHS FOR TRACKED VEHICLES; TEMPORARY MATS OR PLATES WITHIN WET AREAS OR ON SENSITIVE SOILS).

B. EQUIPMENT WILL BE STORED, FUELED, AND MAINTAINED IN AN CLEARLY IDENTIFIED STAGING AREA THAT MEETS STAGING AREA CONSERVATION MEASURES.

C. EQUIPMENT WILL BE REFUELED IN A VEHICLE STAGING AREA OR IN AN ISOLATED HARD ZONE, SUCH AS A PAVED PARKING LOT OR ADJACENT, ESTABLISHED ROAD (THIS MEASURE APPLIES ONLY TO GAS-POWERED EQUIPMENT WITH TANKS LARGER THAN 5 GALLONS).

D. BIODEGRADABLE LUBRICANTS AND FLUIDS WILL BE USED ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER.

E. EQUIPMENT WILL BE INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND.

F. EQUIPMENT WILL BE THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

9. EROSION CONTROL.

A. TEMPORARY EROSION CONTROL MEASURES INCLUDE:

1. TEMPORARY EROSION CONTROLS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE;
2. IF THERE IS A POTENTIAL FOR ERODED SEDIMENT TO ENTER THE STREAM, SEDIMENT BARRIERS WILL BE INSTALLED AND MAINTAINED FOR THE DURATION OF PROJECT IMPLEMENTATION;
3. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE SEDGE MATS, FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC;
4. SOIL STABILIZATION UTILIZING WOOD FIBER MULCH AND TACKIFIER (HYDRO-APPLIED) MAY BE USED TO REDUCE EROSION OF BARE SOIL IF THE MATERIALS ARE NOXIOUS WEED FREE AND NONTOXIC TO AQUATIC AND TERRESTRIAL ANIMALS, SOIL MICROORGANISMS, AND VEGETATION;
5. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL; AND
6. ONCE THE SITE IS STABILIZED AFTER CONSTRUCTION, TEMPORARY EROSION CONTROL MEASURES WILL BE REMOVED.

B. EMERGENCY EROSION CONTROLS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:

1. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND
2. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10. DUST ABATEMENT.

A. THE PROJECT SPONSOR WILL DETERMINE THE APPROPRIATE DUST CONTROL MEASURES BY CONSIDERING SOIL TYPE, EQUIPMENT USAGE, PREVAILING WIND DIRECTION, AND THE EFFECTS CAUSED BY OTHER EROSION AND SEDIMENT CONTROL MEASURES.

B. WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.

C. DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS (TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET OF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING MIXED 50:50 WITH WATER.

D. APPLICATION OF DUST ABATEMENT CHEMICALS WILL BE AVOIDED DURING OR JUST BEFORE WET WEATHER, AND AT STREAM CROSSINGS OR OTHER AREAS THAT COULD RESULT IN UNFILTERED DELIVERY OF THE DUST ABATEMENT MATERIALS TO A WATERBODY (TYPICALLY THESE WOULD BE AREAS WITHIN 25 FEET OF A WATERBODY OR STREAM CHANNEL; DISTANCES MAY BE GREATER WHERE VEGETATION IS SPARSE OR SLOPES ARE STEEP).

E. SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION OF DUST ABATEMENT CHEMICALS.

F. PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

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REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
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CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

GENERAL NOTES
HIP CONSERVATION MEASURES

DWG. NO.: G-003
CREATED: 7/1/21
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PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 4:57 PM

PROJECT DESIGN AND SITE PREPARATION (CONTINUED).

11. SPILL PREVENTION, CONTROL, AND COUNTER MEASURES.

A. A DESCRIPTION OF HAZARDOUS MATERIALS THAT WILL BE USED, INCLUDING INVENTORY, STORAGE, AND HANDLING PROCEDURES WILL BE AVAILABLE ON-SITE.

B. WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.

C. SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIALS USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.

D. WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.

E. ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.

F. PUMPS USED ADJACENT TO WATER SHALL USE SPILL CONTAINMENT SYSTEMS.

12. INVASIVE SPECIES CONTROL.

A. PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.

B. WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES.

C. WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES UNLESS DECONTAMINATION PROCEDURES HAVE BEEN APPROVED BY THE EC LEAD.

WORK AREA ISOLATION AND FISH SALVAGE.

1. WORK AREA ISOLATION.

A. ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT, OR IF THE WORK AREA IS LESS THAN 300-FEET UPSTREAM FROM KNOWN SPAWNING HABITATS.

B. WORK AREA ISOLATION AND FISH SALVAGE ACTIVITIES WILL COMPLY WITH THE IN-WATER WORK WINDOW.

C. DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS AND AREAS (COFFER DAMS, PUMPS, DISCHARGE AREAS, FISH SCREENS, FISH RELEASE AREAS, ETC.).

D. WORK AREA ISOLATION AND FISH CAPTURE ACTIVITIES WILL OCCUR DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE, NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS AND DEATH OF SPECIES PRESENT.

2. FISH SALVAGE.

A. MONITORING AND RECORDING WILL TAKE PLACE FOR DURATION OF SALVAGE. THE SALVAGE REPORT WILL BE COMMUNICATED TO AGENCIES VIA THE PROJECT COMPLETION FORM (PCF).

B. SALVAGE ACTIVITIES SHOULD TAKE PLACE DURING CONDITIONS TO MINIMIZE STRESS TO FISH SPECIES, TYPICALLY PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES WHICH OCCUR IN THE MORNING VERSUS LATE IN THE DAY.

C. SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODS, AND CONSERVATION MEASURES SPECIFIED BELOW:

1. SLOWLY REDUCE WATER FROM THE WORK AREA TO ALLOW SOME FISH TO LEAVE VOLITIONALLY.
2. BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.
3. BLOCK NETS WILL BE SECURED TO THE STREAM CHANNEL BED AND BANKS UNTIL FISH CAPTURE AND TRANSPORT ACTIVITIES ARE COMPLETE. BLOCK NETS MAY BE LEFT IN PLACE FOR THE DURATION OF THE PROJECT TO EXCLUDE FISH AS LONG AS PASSAGE REQUIREMENTS ARE MET.
4. NETS WILL BE MONITORED HOURLY DURING IN-STREAM DISTURBANCE.
5. IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED AND FREE OF ORGANIC ACCUMULATION. IF BULL TROUT ARE PRESENT, NETS ARE TO BE CHECKED EVERY 4 HOURS FOR FISH IMPINGEMENT.
6. CAPTURE FISH THROUGH SEINING AND RELOCATE TO STREAMS.
7. WHILE DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
8. SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
9. MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
10. ELECTROFISH TO CAPTURE AND RELOCATED FISH NOT CAUGHT DURING SEINING PER ELECTROFISH CONSERVATION MEASURES.
11. CONTINUE TO SLOWLY DEWATER STREAM REACH.
12. COLLECT ANY REMAINING FISH IN COLD-WATER BUCKETS AND RELOCATED TO THE STREAM.
13. LIMIT THE TIME FISH ARE IN A TRANSPORT BUCKET.
14. MINIMIZE PREDATION BY TRANSPORTING COMPARABLE SIZES IN BUCKETS.
15. BUCKET WATER TO BE CHANGED EVERY 15 MINUTES OR AERATED.
16. BUCKETS WILL BE KEPT IN SHADED AREAS OR COVERED.
17. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.

D. SALVAGE GUIDELINES FOR BULL TROUT, LAMPREY, MUSSELS, AND NATIVE FISH.

1. CONDUCT SITE SURVEY TO ESTIMATE SALVAGE NUMBERS.
2. PRE-SELECT SITE(S) FOR RELEASE AND/OR MUSSEL BED RELOCATION.
3. SALVAGE OF BULL TROUT WILL NOT TAKE PLACE WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.
4. IF DRAWDOWN LESS THAN 48 HOURS, SALVAGE OF LAMPREY AND MUSSELS MAY NOT BE NECESSARY IF TEMPERATURES SUPPORT SURVIVAL IN SEDIMENTS.
5. SALVAGE MUSSELS BY HAND, LOCATING BY SNORKELING OR WADING.
6. SALVAGE LAMPREY BY ELECTROFISHING (SEE ELECTROFISHING FOR LARVAL LAMPREY SETTINGS AND LARVAL LAMPREY DRY SHOCKING SETTINGS).
7. SALVAGE BONY FISH AFTER LAMPREY WITH NETS OR ELECTROFISHING (SEE ELECTROFISHING FOR APPROPRIATE SETTINGS).
8. REGULARLY INSPECT DEWATERED SITE SINCE LAMPREY LIKELY TO EMERGE AFTER DEWATERING AND MUSSELS MAY BECOME VISIBLE.
9. MUSSELS MAY BE TRANSFERRED IN COOLERS.
10. MUSSELS WILL BE PLACED INDIVIDUALLY TO ENSURE ABILITY TO BURROW INTO NEW HABITAT.

3. ELECTROFISHING.

A. INITIAL SITE SURVEY AND INITIAL SETTINGS.

1. IDENTIFY SPAWNING ADULTS AND ACTIVE REDDS TO AVOID.
2. RECORD WATER TEMPERATURE. ELECTROFISHING WILL NOT OCCUR WHEN WATER TEMPERATURES ARE ABOVE 18 DEGREES CELSIUS.
3. IF POSSIBLE, A BLOCK NET WILL BE PLACED DOWNSTREAM AND CHECKED REGULARLY TO CAPTURE STUNNED FISH THAT DRIFT DOWNSTREAM.
4. INITIAL SETTINGS WILL BE 100 VOLTS, PULSE WIDTH OF 500 MICRO SECONDS, AND PULSE RATE OF 30 HERTZ.
5. RECORDS FOR CONDUCTIVITY, WATER TEMPERATURE, AIR TEMPERATURE, ELECTROFISHING SETTINGS, ELECTROFISHER MODEL, ELECTROFISHER CALIBRATION, FISH CONDITIONS, FISH MORTALITIES, AND TOTAL CAPTURE RATES WILL BE INCLUDED IN THE SALVAGE LOG BOOK.

B. ELECTROFISHING TECHNIQUE.

1. SAMPLING WILL BEGIN USING STRAIGHT DC. POWER WILL REMAIN ON UNTIL THE FISH IS NETTED WHEN USING STRAIGHT DC. GRADUALLY INCREASE VOLTAGE WHILE REMAINING BELOW MAXIMUM LEVELS.
2. MAXIMUM VOLTAGE WILL BE 1100 VOLTS WHEN CONDUCTIVITY IS <100 MILLISECONDS, 800 VOLTS WHEN CONDUCTIVITY IS BETWEEN 100 AND 300 MILLISECONDS, AND 400 VOLTS WHEN CONDUCTIVITY IS >300 MILLISECONDS.
3. IF FISH CAPTURE IS NOT SUCCESSFUL USING STRAIGHT DC, THE ELECTROFISHER WILL BE SET TO INITIAL VOLTAGE FOR PDC. VOLTAGE, PULSE WIDTH, AND PULSE FREQUENCY WILL BE GRADUALLY INCREASED WITHIN MAXIMUM VALUES UNTIL CAPTURE IS SUCCESSFUL.
4. MAXIMUM PULSE WIDTH IS 5 MILLISECONDS. MAXIMUM PULSE RATE IS 70 HERTZ
5. ELECTROFISHING WILL NOT OCCUR IN ONE AREA FOR AN EXTENDED PERIOD.
6. THE ANODE WILL NOT INTENTIONALLY COME INTO CONTACT WITH FISH. THE ZONE FOR POTENTIAL INJURY OF 0.5 M FROM THE ANODE WILL BE AVOIDED.
7. SETTINGS WILL BE LOWERED IN SHALLOWER WATER SINCE VOLTAGE GRADIENTS LIKELY TO INCREASE.
8. ELECTROFISHING WILL NOT OCCUR IN TURBID WATER WHERE VISIBILITY IS POOR (I.E. UNABLE TO SEE THE BED OF THE STREAM).
9. OPERATIONS WILL IMMEDIATELY STOP IF MORTALITY OR OBVIOUS FISH INJURY IS OBSERVED. ELECTROFISHING SETTINGS WILL BE REEVALUATED.

C. SAMPLE PROCESSING.

1. FISH SHALL BE SORTED BY SIZE TO AVOID PREDATION DURING CONTAINMENT.
2. SAMPLERS WILL REGULARLY CHECK CONDITIONS OF FISH HOLDING CONTAINERS, AIR PUMPS, WATER TRANSFERS, ETC.
3. FISH WILL BE OBSERVED FOR GENERAL CONDITIONS AND INJURIES
4. EACH FISH WILL BE COMPLETELY REVIVED BEFORE RELEASE. ESA-LISTED SPECIES WILL BE PRIORITIZED FOR SUCCESSFUL RELEASE.

D. BULL TROUT ELECTROFISHING.

1. ELECTROFISHING FOR BULL TROUT WILL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. IN FMO HABITATS ELECTROFISHING MAY OCCUR ANY TIME.
2. ELECTROFISHING OF BULL TROUT WILL NOT OCCUR WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.

E. LARVAL LAMPREY ELECTROFISHING.

1. PERMISSION FROM EC LEAD WILL BE OBTAINED IF LARVAL LAMPREY ELECTROFISHER IS NOT ONE OF FOLLOWING PRE-APPROVED MODELS: ABP-2 "WISCONSIN", SMITH-ROOT LR-24, OR SMITH-ROOT APEX BACKPACK.
2. LARVAL LAMPREY SAMPLING WILL INCORPORATE 2-STAGE METHOD: "TICKLE" AND "STUN".
3. FIRST STAGE: USE 125 VOLT DC WITH A 25 PERCENT DUTY CYCLE APPLIED AT A SLOW RATE OF 3 PULSES PER SECOND. IF TEMPERATURES ARE BELOW 10 DEGREES CELSIUS, VOLTAGE MAY BE INCREASED GRADUALLY (NOT TO EXCEED 200 VOLTS). BURSTED PULSES (THREE SLOW AND ONE SKIPPED) RECOMMENDED TO INCREASE EMERGENCE.
4. SECOND STAGE (OPTIONAL FOR EXPERIENCED NETTERS): IMMEDIATELY AFTER LAMPREY EMERGE, USE A FAST PULSE SETTING OF 30 PULSES PER SECOND.
5. USE DIP NETS FOR VISIBLE LAMPREY. SIENES AND FINE MESH NET SWEEPS MAY BE USED IN POOR VISIBILITY.
6. SAMPLING WILL OCCUR SLOWLY (>60 SECONDS PER METER) STARTING AT UPSTREAM AND WORKING DOWNSTREAM.
7. MULTIPLE SWEEPS TO OCCUR WITH 15 MINUTES BETWEEN SWEEPS.
8. POST-DRAWDOWN "DRY-SHOCKING" WILL BE APPLIED IF LARVAL LAMPREY CONTINUE TO EMERGE. ANODES TO BE PLACED ONE METER APART TO SAMPLE ONE SQUARE METER AT A TIME FOR AT LEAST 60 SECONDS. FOR TEMPERATURES LESS THAN 10 DEGREES CELSIUS, MAXIMUM VOLTAGE MAY BE GRADUALLY INCREASED TO 400 VOLTS (DRY-SHOCKING ONLY).

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REGISTERED PROFESSIONAL ENGINEER 91397 OREGON JUL. 9, 2018 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	PLAN SHEET SIZE ANSI B (11" X 17") REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

GENERAL NOTES
HIP CONSERVATION MEASURES

DWG. NO.: G-004
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\401_COVER PAGE AND NOTES.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 4:57 PM

WORK AREA ISOLATION AND FISH SALVAGE (CONTINUED).

4. DEWATERING.

A. DEWATERING WILL OCCUR AT A RATE SLOW ENOUGH TO ALLOW SPECIES TO NATURALLY MIGRATE OUT OF THE WORK AREA.

B. WHERE A GRAVITY FEED DIVERSION IS NOT POSSIBLE, A PUMP MAY BE USED. PUMPS WILL BE INSTALLED TO AVOID REPETIVE DEWATERING AND REWATERING.

C. WHEN FISH ARE PRESENT, PUMPS WILL BE SCREENED IN ACCORDANCE WITH NMFS FISH SCREEN CRITERIA. NMFS ENGINEERING REVIEW AND APPROVAL WILL BE OBTAINED FOR PUMPS EXCEEDING 3 CUBIC FEET PER SECOND.

D. DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO THE STREAM CHANNEL AND RIPARIAN VEGETATION.

E. SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE OF INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL AND VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

CONSTRUCTION AND POST CONSTRUCTION CONSERVATION MEASURES.

1. FISH PASSAGE.

A. FISH PASSAGE WILL BE PROVIDED FOR ADULT AND JUVENILE FISH LIKELY TO BE PRESENT DURING CONSTRUCTION UNLESS PASSAGE DID NOT EXIST BEFORE CONSTRUCTION, THE STREAM IS NATURALLY IMPASSABLE, OR PASSAGE WILL NEGATIVELY IMPACT ESA-LISTED SPECIES OR THEIR HABITAT.

B. FISH PASSAGE ALTERNATIVES WILL BE APPROVED BY THE BPA EC LEAD UNDER ADVISEMENT BY THE NMFS HABITAT BIOLOGIST.

2. CONSTRUCTION AND DISCHARGE WATER.

A. SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.

B. DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.

C. CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS, AND OTHER POLLUTANTS.

3. TIME AND EXTENT OF DISTURBANCE.

A. EARTHWORK REQUIRING IN-STREAM MECHANIZED EQUIPMENT (INCLUDING DRILLING, EXCAVATION, DREDGING, FILLING, AND COMPACTING) WILL BE COMPLETED AS QUICKLY AS POSSIBLE.

B. MECHANIZED EQUIPMENT WILL WORK FROM TOP OF BANK UNLESS WORK FROM ANOTHER LOCATION WILL RESULT IN LESS HABITAT DISTURBANCE (TURBIDITY, VEGETATION DISTURBANCE, ETC.).

4. CESSATION OF WORK.

A. PROJECT OPERATIONS WILL CEASE WHEN HIGH FLOW CONDITIONS MAY RESULT IN INUNDATION OF THE PROJECT AREA (FLOOD EFFORTS TO DECREASE DAMAGES TO NATURAL RESOURCES PERMITTED).

B. WATER QUALITY LEVELS EXCEEDED. SEE CWA SECTION 401 WATER QUALITY CERTIFICATION AND TURBIDITY MEASURES.

5. SITE RESTORATION.

A. DISTURBED AREAS, STREAM BANKS, SOILS, AND VEGETATION WILL BE CLEANED UP AND RESTORED TO IMPROVED OR PRE-PROJECT CONDITIONS.

B. PROJECT-RELATED WASTE WILL BE REMOVED.

C. TEMPORARY ACCESS ROADS AND STAGING WILL BE DECOMPACTED AND RESTORED. SOILS WILL BE LOOSENED IF NEEDED FOR REVEGETATION OR WATER INFILTRATION.

D. THE PROJECT SPONSOR WILL RETAIN THE RIGHT OF REASONABLE ACCESS TO THE SITE TO MONITOR AND MAINTAIN THE SITE OVER THE LIFE OF THE PROJECT.

6. REVEGETATION.

A. PLANTING AND SEEDING WILL OCCUR PRIOR TO OR AT THE BEGINNING OF THE FIRST GROWING SEASON AFTER CONSTRUCTION.

B. A MIX OF NATIVE SPECIES (INVASIVE SPECIES NOT ALLOWED) APPROPRIATE TO THE SITE WILL BE USED TO REESTABLISH VEGETATION, PROVIDE SHADE, AND REDUCE EROSION. REESTABLISHED VEGETATION SHOULD BE AT LEAST 70% OF PRE-PROJECT CONDITIONS WITHIN THREE YEARS.

C. VEGETATION SUCH AS WILLOWS, SEDGES, OR RUSH MATS WILL BE SALVAGED FROM DISTURBED OR ABANDONED AREAS TO BE REPLANTED.

D. SHORT-TERM STABILIZATION MEASURE MAY INCLUDE THE USE OF NON-NATIVE STERILE SEED MIX (WHEN NATIVE NOT AVAILABLE), WEED-FREE CERTIFIED STRAW, OR OTHER SIMILAR TECHNIQUES.

E. SURFACE FERTILIZER WILL NOT BE APPLIED WITHIN 50 FEET OF ANY STREAM, WATE BODY, OR WETLAND.

F. FENCING WILL BE INSTALLED AS NECESSARY TO PREVENT ACCESS TO REVEGETATED SITES BY LIVESTOCK OR UNAUTHORIZED PERSONS.

G. INVASIVE PLANTS WILL BE REMOVED OR CONTROLLED UNTIL NATIVE PLANT SPECIES ARE WELL ESTABLISHED (TYPICALLY THREE YEARS POST-CONSTRUCTION).

7. SITE ACCESS AND IMPLEMENTATION MONITORING.

A. THE PROJECT SPONSOR WILL PROVIDE CONSTRUCTION MONITORING DURING IMPLEMENTATION TO ENSURE ALL CONSERVATION MEASURES ARE ADEQUATELY FOLLOWED, EFFECTS TO LISTED SPECIES ARE NOT GREATER THAN PREDICTED, AND INCIDENTAL TAKE LIMITATIONS ARE NOT EXCEEDED.

B. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL SUBMIT THE PROJECT COMPLETION FORM (PCF) WITHIN 30 DAYS OF PROJECT COMPLETION.

8. CWA SECTION 401 WATER QUALITY CERTIFICATION.

A. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL COMPLETE AND RECORD WATER QUALITY OBSERVATIONS (SEE TURBIDITY MONITORING) TO ENSURE IN-WATER WORK IS NOT DEGRADING WATER QUALITY.

B. DURING CONSTRUCTION, WATER QUALITY PROVISIONS PROVIDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WASHINGTON DEPARTMENT OF ECOLOGY, IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY WILL BE FOLLOWED.

STAGED REWATERING PLAN.

A. WHEN REINTRODUCING WATER TO DEWATERED AREAS AND NEWLY CONSTRUCTED CHANNELS, A STAGED REWATERING PLAN WILL BE APPLIED.

B. THE FOLLOWING WILL BE APPLIED TO ALL REWATERING EFFORTS. COMPLEX REWATERING EFFORTS MAY REQUIRE ADDITIONAL NOTES OR A DEDICATED SHEET IN THE CONSTRUCTION DETAILS.

1. TURBIDITY MONITORING PROTOCOL WILL BE APPLIED TO REWATERING EFFORTS.
2. PRE-WASH THE AREA BEFORE REWATERING. TURBID WASH WATER WILL BE DETAINED AND PUMPED TO THE FLOODPLAIN OR SEDIMENT CAPTURE AREAS RATHER THAN DISCHARGING TO FISH-BEARING STREAMS.
3. INSTALL SEINE NETS AT UPSTREAM END TO PREVENT FISH FROM MOVING DOWNSTREAM UNTIL 2/3 OF TOTAL FLOW IS RESTORED TO THE CHANNEL.
4. STARTING IN EARLY MORNING INTRODUCE 1/3 OF NEW CHANNEL FLOW OVER PERIOD OF 1-2 HOURS.
5. INTRODUCE SECOND THIRD OF FLOW OVER NEXT 1 TO 2 HOURS AND BEGIN FISH SALVAGE OF BYPASS CHANNEL IF FISH ARE PRESENT.
6. REMOVE UPSTREAM SEINE NETS ONCE 2/3 FLOW IN REWATERED CHANNEL AND DOWNSTREAM TURBIDITY IS WITHIN ACCEPTABLE RANGE (LESS THAN 40 NTU OR LESS THAN 10% BACKGROUND).
7. INTRODUCE FINAL THIRD OF FLOW ONCE FISH SALVAGE EFFORTS ARE COMPLETE AND DOWNSTREAM TURBIDITY VERIFIED TO BE WITHIN ACCEPTABLE RANGE.
8. INSTALL PLUG TO BLOCK FLOW INTO OLD CHANNEL OR BYPASS. REMOVE ANY REMAINING SEINE NETS.
9. IN LAMPREY SYSTEMS, LAMPREY SALVAGE AND DRY SHOCKING MAY BE NECESSARY.

TURBIDITY MONITORING.

A. RECORD THE READING, LOCATION, AND TIME FOR THE BACKGROUND READING APPROXIMATELY 100 FEET UPSTREAM OF THE PROJECT AREA USING A RECENTLY CALIBRATED TURBIDIMETER OR VIA VISUAL OBSERVATION (SEE THE HIP HANDBOOK TURBIDITY MONITORING SECTION FOR A VISUAL OBSERVATION KEY).

B. RECORD THE TURBIDITY READING, LOCATION, AND TIME AT THE MEASUREMENT COMPLIANCE LOCATION POINT.

1. 50 FEET DOWNSTREAM FOR STREAMS LESS THAN 30 FEET WIDE.
2. 100 FEET DOWNSTREAM FOR STREAMS BETWEEN 30 AND 100 FEET WIDE.
3. 200 FEET DOWNSTREAM FOR STREAMS GREATER THAN 100 FEET WIDE.
4. 300 FEET FROM THE DISCHARGE POINT OR NONPOINT SOURCE FOR LOCATIONS SUBJECT TO TIDAL OR COASTAL SCOUR.

C. TURBIDITY SHALL BE MEASURED (BACKGROUND LOCATION AND COMPLIANCE POINTS) EVERY 4 HOURS WHILE WORK IS BEING IMPLEMENTED.

D. IF THERE IS A VISIBLE DIFFERENCE BETWEEN A COMPLIANCE POINT AND THE BACKGROUND, THE EXCEEDANCE WILL BE NOTED IN THE PROJECT COMPLETION FORM (PCF). ADJUSTMENTS OR CORRECTIVE MEASURES WILL BE TAKEN IN ORDER TO REDUCE TURBIDITY.

E. IF EXCEEDANCES OCCUR FOR MORE THAN TWO CONSECUTIVE MONITORING INTERVALS (AFTER 8 HOURS), THE ACTIVITY WILL STOP UNTIL THE TURBIDITY LEVEL RETURNS TO BACKGROUND. THE BPA EC LEAD WILL BE NOTIFIED OF ALL EXCEEDANCES AND CORRECTIVE ACTIONS AT PROJECT COMPLETION.

F. IF TURBIDITY CONTROLS (COFFER DAMS, WADDLES, FENCING, ETC.) ARE DETERMINED INEFFECTIVE, CREWS WILL BE MOBILIZED TO MODIFY AS NECESSARY. OCCURRENCES WILL BE DOCUMENTED IN THE PROJECT COMPLETION FORM (PCF).

G. FINAL TURBIDITY READINGS, EXCEEDANCES, AND CONTROL FAILURES WILL BE SUBMITTED TO THE BPA EC LEAD USING THE PROJECT COMPLETION FORM (PCF).

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REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JUL. 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

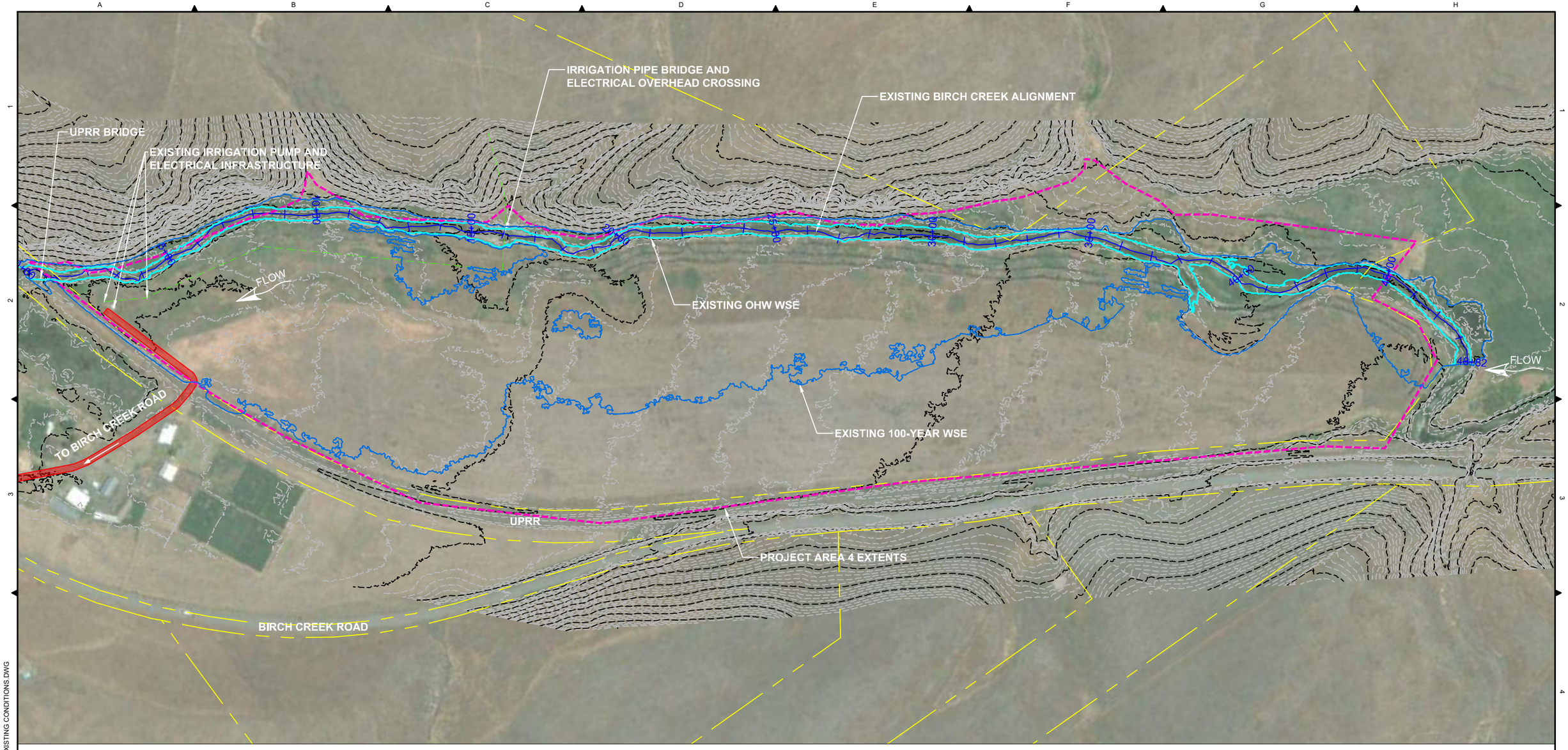
PLAN SHEET SIZE ANSI B (11" X 17")

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

GENERAL NOTES
HIP CONSERVATION MEASURES

DWG. NO.: G-005
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\401_COVER PAGE AND NOTES.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 4:57 PM



0 150' 300' 600'

LEGEND
- EXISTING 2-FOOT CONTOUR
- EXISTING 10-FOOT CONTOUR
- EXISTING CHANNEL ALIGNMENT
- PROPERTY BOUNDARY
- EXISTING OHW
- EXISTING 100-YEAR WSE
- PROJECT AREA 4
- EXISTING ACCESS ROAD

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REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL. 9, 2019
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	PLAN SHEET SIZE ANSI B (11" X 17") REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

EXISTING CONDITIONS OVERVIEW

DWG. NO.: C-401

CREATED: 7/1/21

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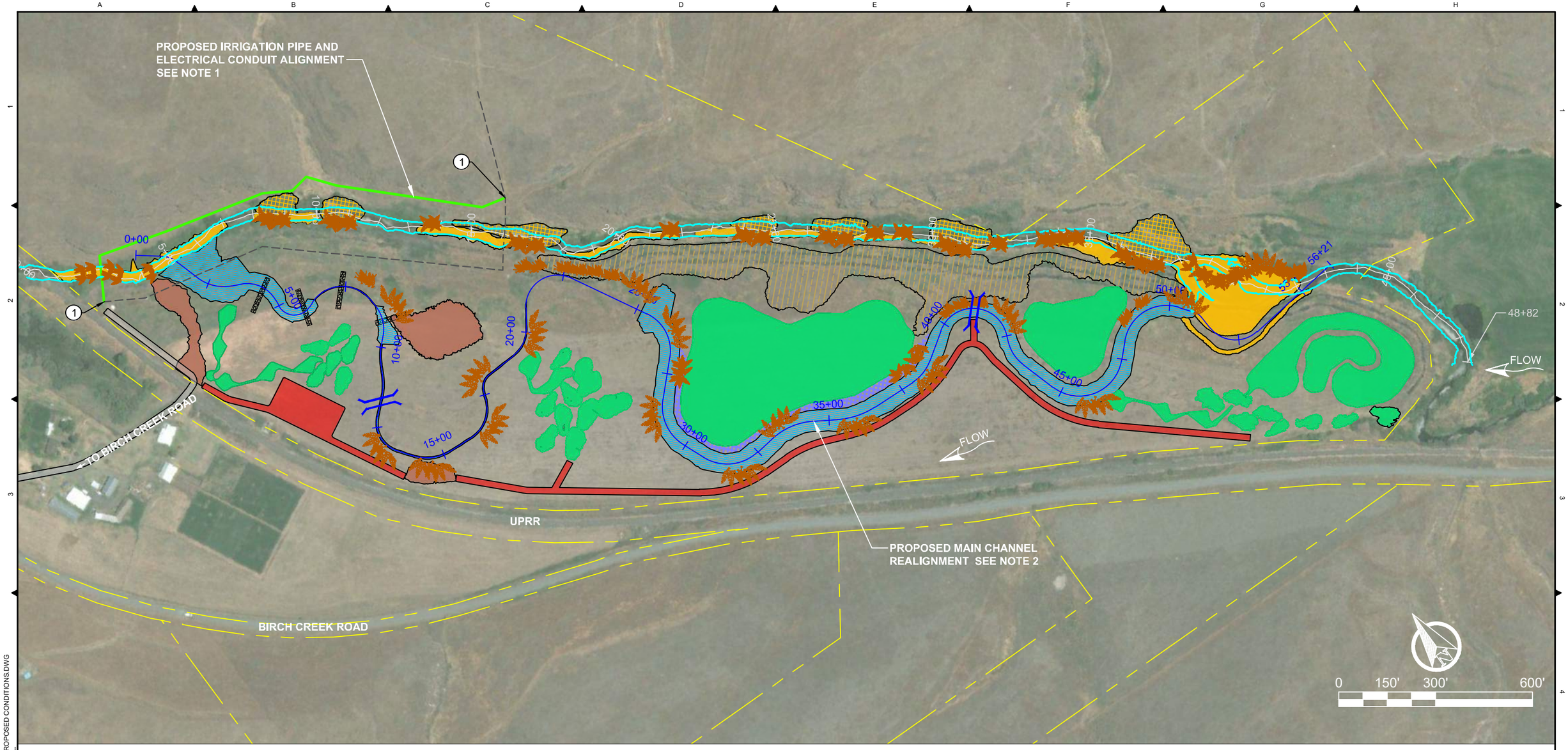
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 5:04 PM



NOTES:

1. CONNECT PROPOSED IRRIGATION PIPE AND ELECTRICAL CONDUIT WITH EXISTING INFRASTRUCTURE (BY OTHERS).
2. 50 ADDITIONAL TREES TO BE SURFACE PLACED AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.

LEGEND

- EXISTING IRRIGATION PIPE
- EXISTING BIRCH CREEK ALIGNMENT
- PROPERTY BOUNDARY
- EXISTING OHW
- PROPOSED BIRCH CREEK ALIGNMENT
- PROPOSED IRRIGATION PIPE ALIGNMENT
- PROPOSED FLOODPLAIN TOPOGRAPHY
- PROPOSED GRADE STABILIZATION MEASURE
- PROPOSED CHANNEL CUT
- PROPOSED CHANNEL FILL
- PROPOSED TERRACE
- PROPOSED WETLAND AREAS
- PROPOSED STAGING AREA AND ACCESS ROUTES
- PROPOSED LWM
- PROPOSED TEMPORARY CROSSING

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REGISTERED PROFESSIONAL ENGINEER 91397 OREGON JULY 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

PLAN SHEET SIZE ANSI B (11" X 17")						
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED CONDITIONS

DWG. NO.: C-402

CREATED: 7/1/21

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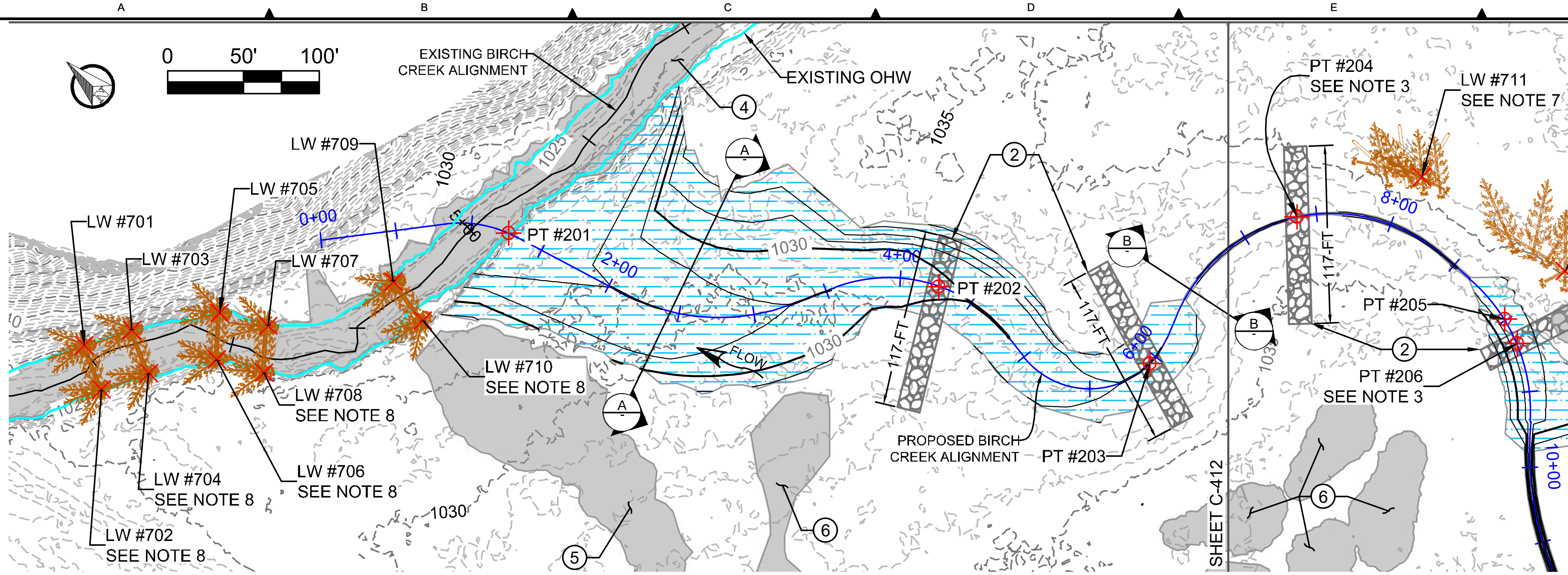
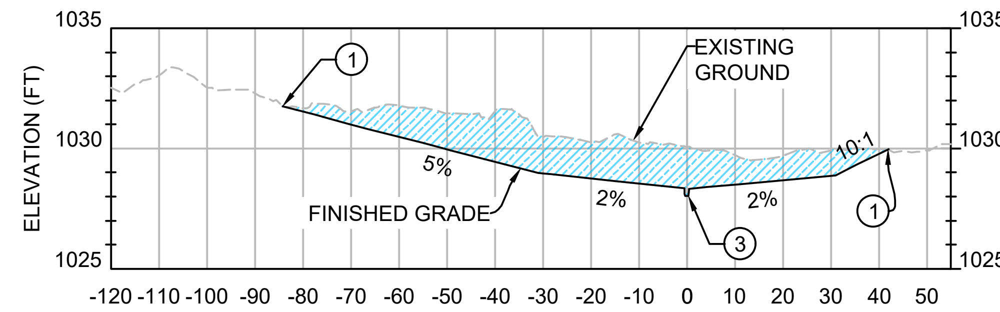
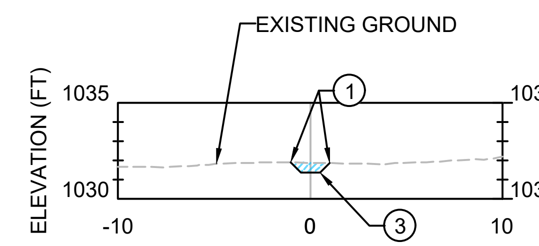


NOTES:

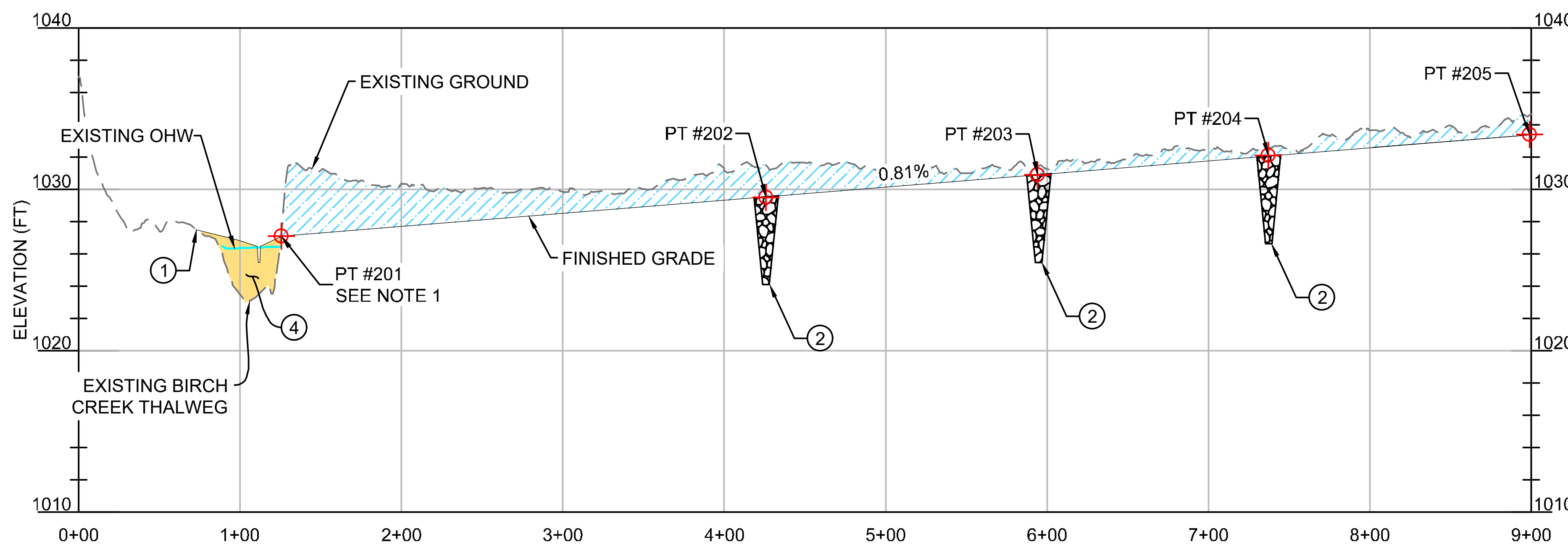
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED GRADE STABILIZATION MATERIAL PER DETAIL ON SHEET C-451.
3. SEE PROPOSED TYPICAL PILOT CHANNEL SECTION F ON SHEET C-451 FOR CHANNEL GEOMETRY.
4. PROPOSED CHANNEL FILL. SEE SHEETS C-421 TO C-425.
5. PROPOSED TERRACE. SEE SHEETS C-431 TO C-433.
6. PROPOSED WETLAND. SEE SHEETS C-441 TO C-445.
7. INSTALL 11-LOG BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-472.
8. INSTALL CHANNEL SPANNING STRUCTURE PER DETAIL ON SHEET C-474.



PROPOSED CHANNEL SECTION VIEW A
SCALE 1" = 40', 1H:5V



PROPOSED CHANNEL SECTION VIEW B
SCALE 1" = 40', 1H:5V



CHANNEL REALIGNMENT PROFILE VIEW (FT)
(SCALE 1" = 100', 1H:10V)

LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL CUT
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CHANNEL FILL
- PROPOSED GRADE STABILIZATION MEASURE
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)

KEYMAP
NTS

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REGISTERED PROFESSIONAL ENGINEER 91393 OREGON JEREMY S. ANDREWS EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

PLAN SHEET SIZE ANSI B (11" X 17")

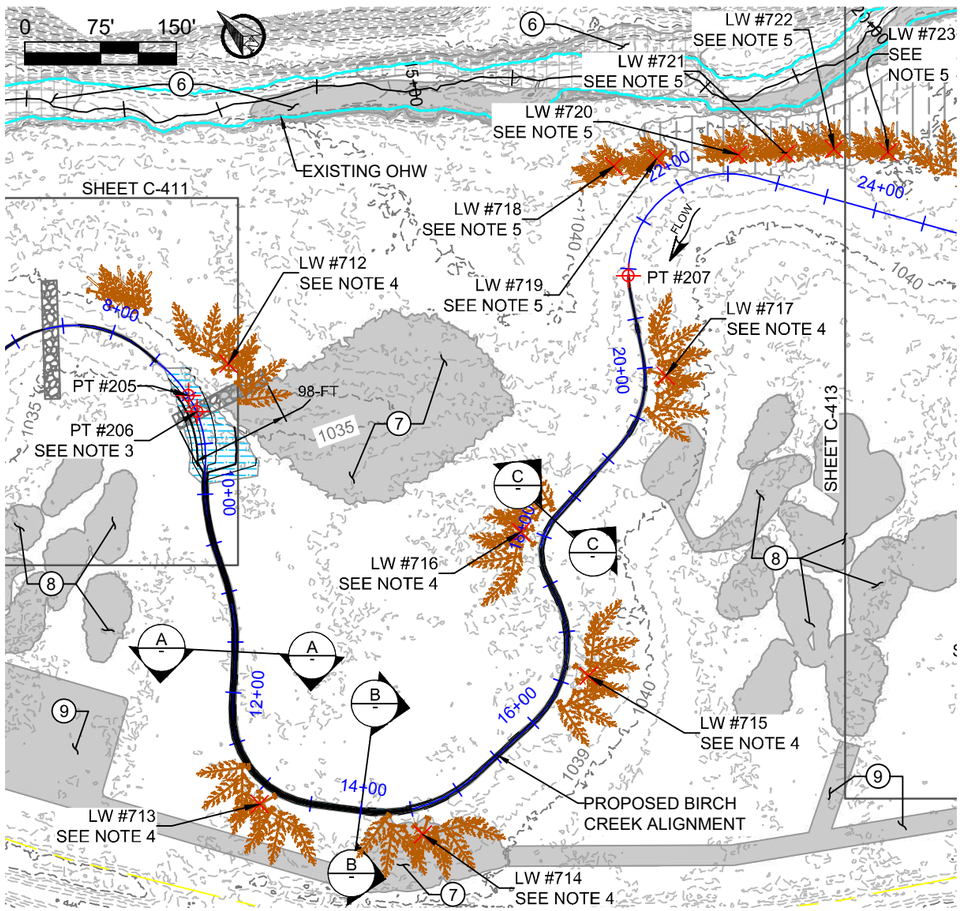
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED BIRCH CREEK ALIGNMENT PROFILES AND SECTIONS

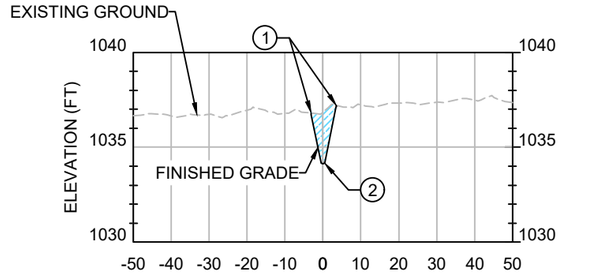
DWG. NO.: C-411
CREATED: 7/1/21
8 of 41

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\405_PROFILE AND SECTIONS-NEW CHANNEL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 5:45 PM

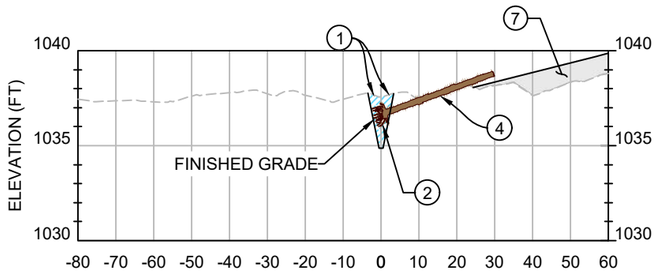


LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL CUT
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED GRADE STABILIZATION MEASURE
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



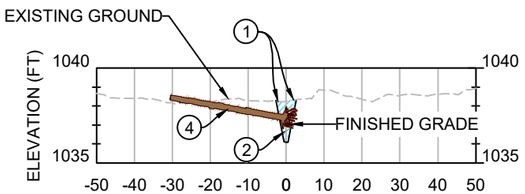
A / - PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



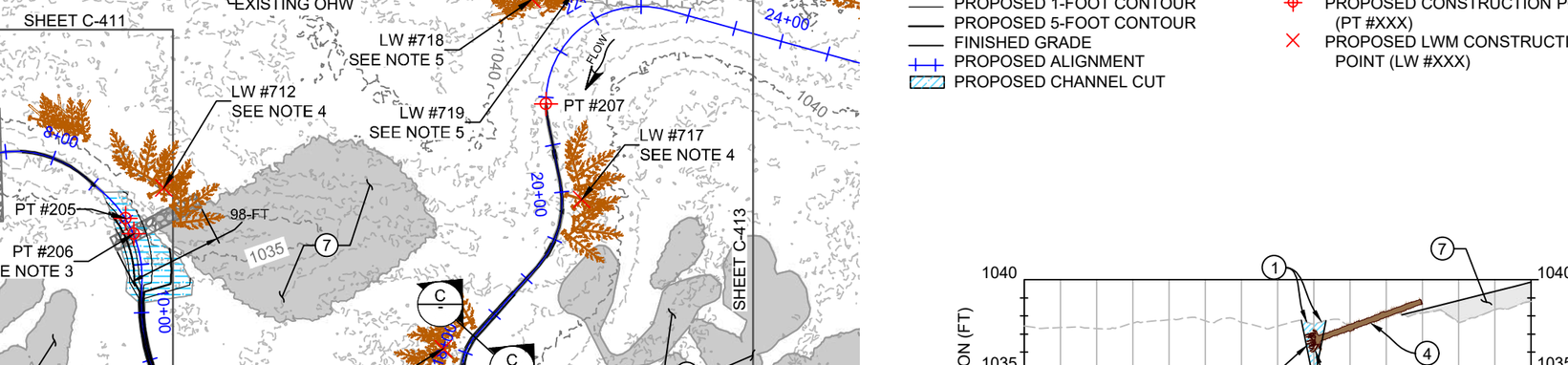
B / - PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V

NOTES:

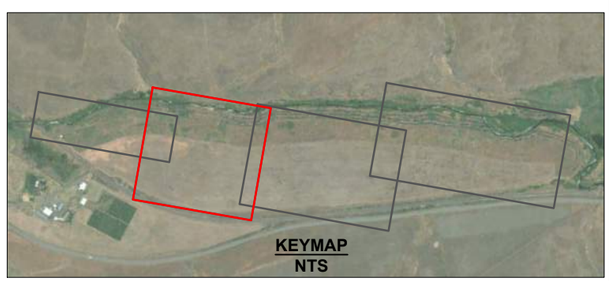
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. SEE PROPOSED TYPICAL PILOT CHANNEL SECTION F ON SHEET C-451 FOR CHANNEL GEOMETRY.
3. PROPOSED GRADE STABILIZATION MEASURES PER DETAIL SECTION C ON SHEET C-451.
4. INSTALL 10-LOG HABITAT STRUCTURE PER DETAIL ON SHEET C-471.
5. INSTALL 11-LOG BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-472.
6. PROPOSED CHANNEL FILL. SEE SHEETS C-421 TO C-425.
7. PROPOSED TERRACE. SEE SHEETS C-431 TO C-433.
8. PROPOSED WETLAND. SEE SHEETS C-441 TO C-445.
9. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.



C / - PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



NEW CHANNEL ALIGNMENT PROFILE VIEW (FT)
(SCALE 1" = 150', 1H:10V)



TETRA TECH
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Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL 12 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

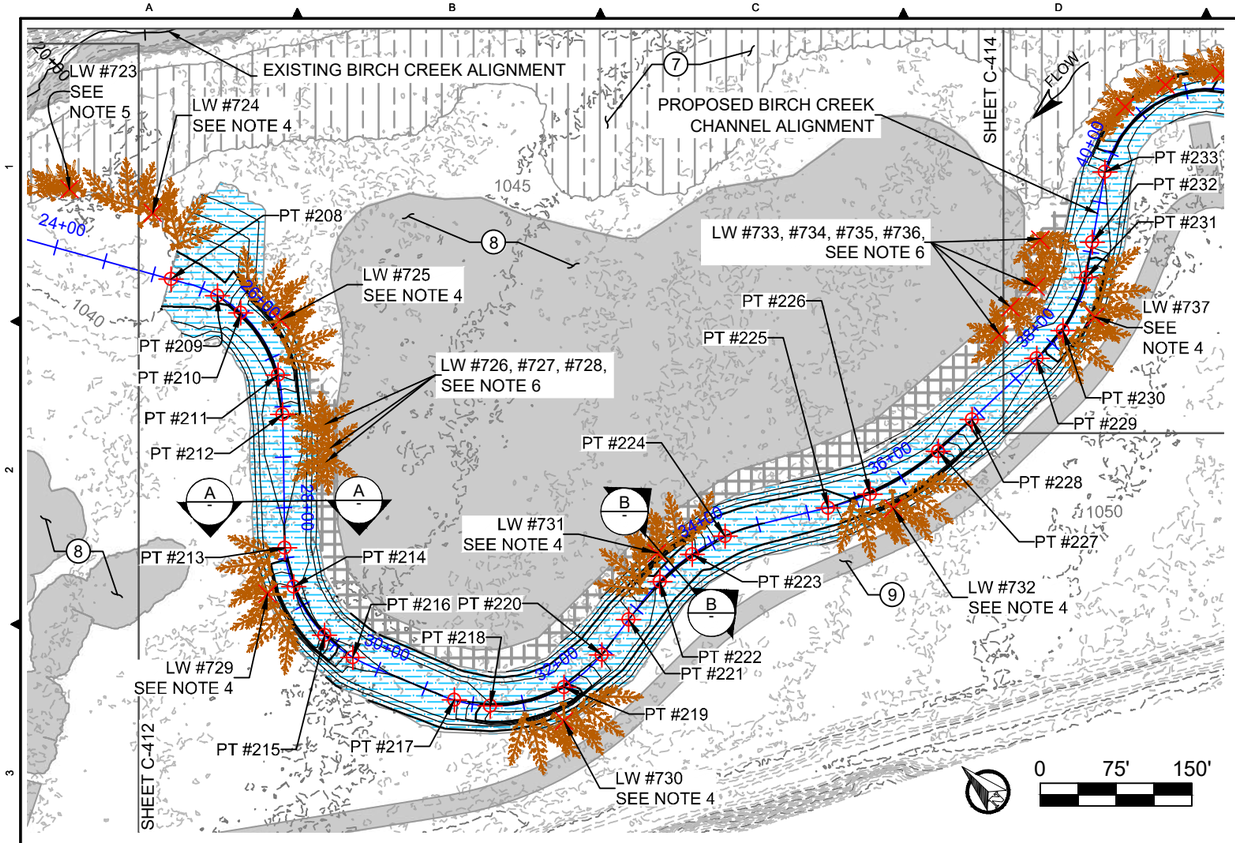
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED BIRCH CREEK ALIGNMENT PROFILES AND SECTIONS

DWG. NO.: C-412

CREATED: 7/1/21

Z:\PROJECTS\194-6817.UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\405_PROFILE AND SECTIONS-NEW CHANNEL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 5:45 PM

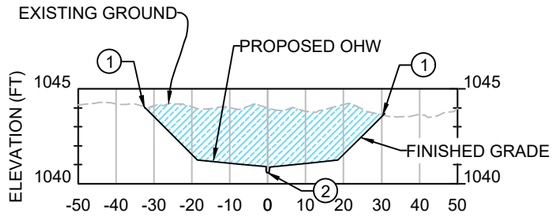


NOTES:

1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. SEE PROPOSED TYPICAL CHANNEL RIFFLE SECTION B ON SHEET C-451 FOR CHANNEL GEOMETRY.
3. SEE PROPOSED TYPICAL CHANNEL POOL SECTIONS D AND G ON SHEET C-451 FOR CHANNEL GEOMETRY.
4. INSTALL 10-LOG HABITAT STRUCTURE PER DETAIL ON SHEET C-471.
5. INSTALL 11-LOG BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-472.
6. INSTALL BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-473.
7. PROPOSED FLOODPLAIN TOPOGRAPHY. SEE SHEET C-434.
8. PROPOSED WETLAND. SEE SHEETS C-441 TO C-445.
9. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.

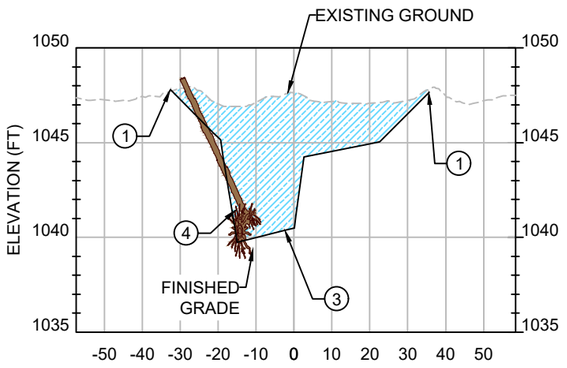
LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED NEW MAIN CHANNEL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)

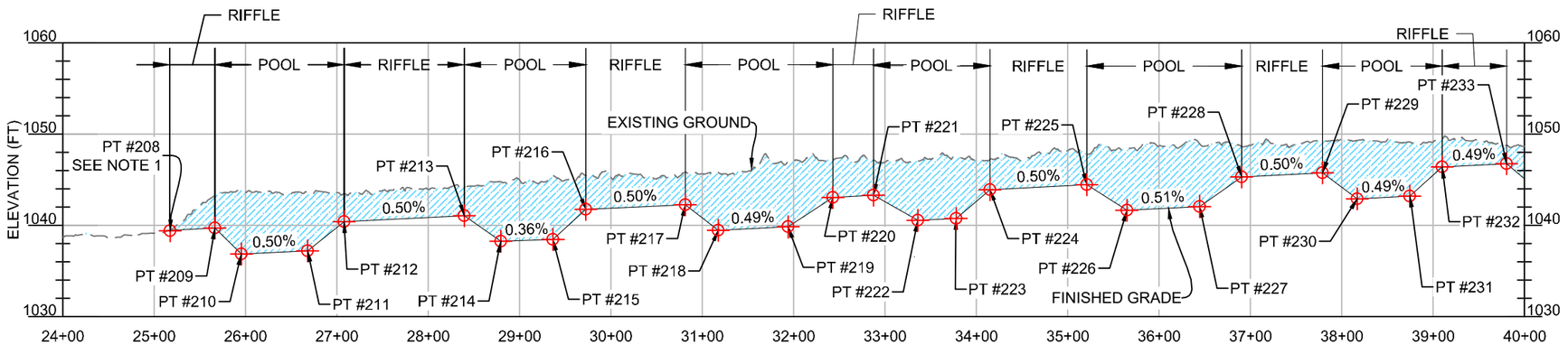


OFFSET (FT)
(SCALE 1" = 30', 1H:5V)

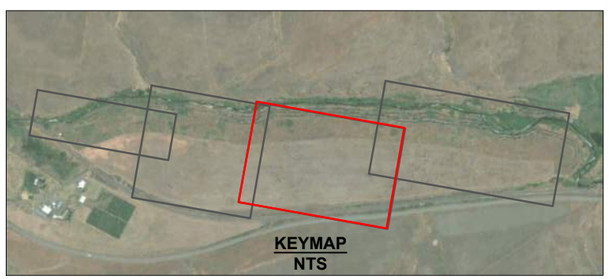
A / - PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



B / - PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



NEW CHANNEL ALIGNMENT PROFILE VIEW (FT)
(SCALE 1" = 150', 1H:10V)



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91397PE
OREGON
JUL 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

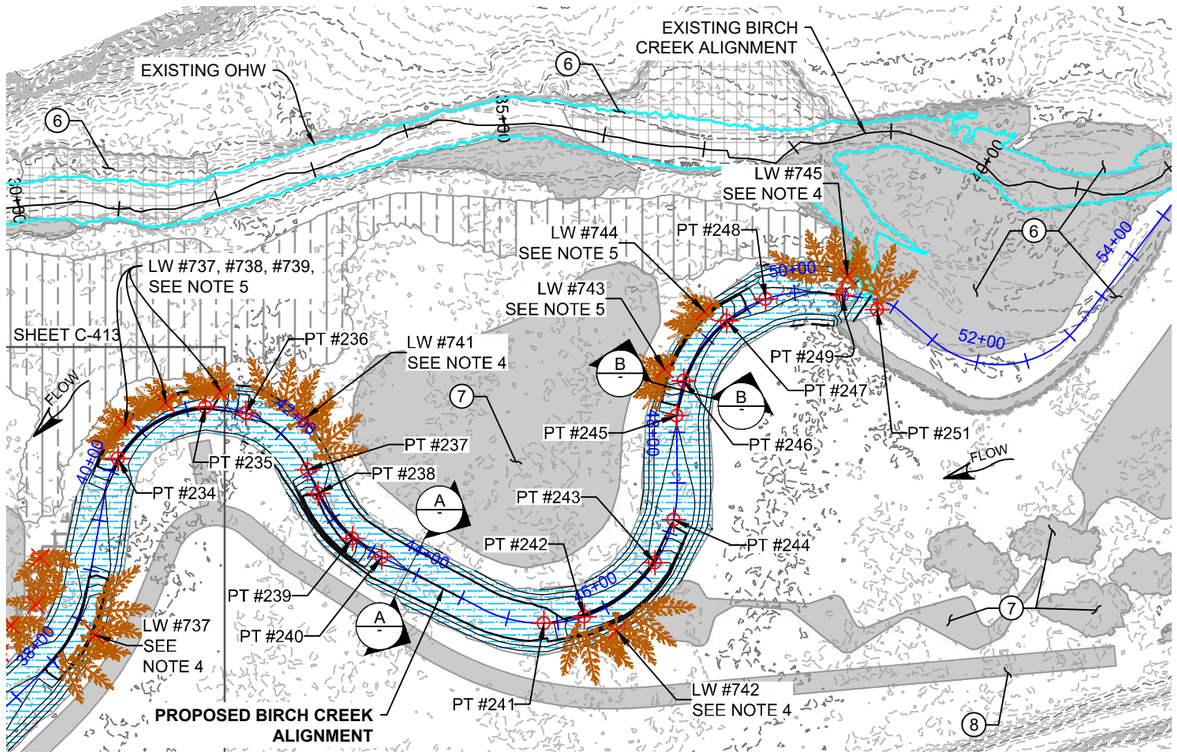
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED BIRCH CREEK ALIGNMENT PROFILES AND SECTIONS

DWG. NO.: C-413

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMA\BIRCH IN-STREAM DESIGN\100%\SHEET FILES\405_PROFILE AND SECTIONS-NEW CHANNEL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 5:46 PM



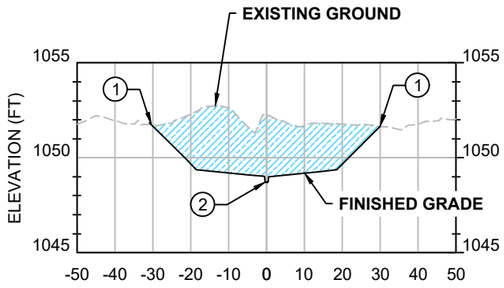
0 75' 150'

NOTES:

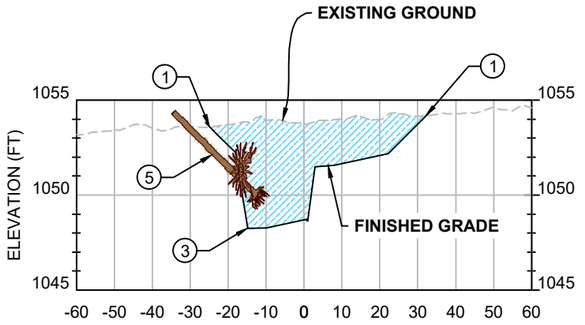
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. SEE PROPOSED TYPICAL CHANNEL RIFFLE SECTION B ON SHEET C-451 FOR CHANNEL GEOMETRY.
3. SEE PROPOSED TYPICAL CHANNEL POOL SECTIONS D AND G ON SHEET C-451 FOR CHANNEL GEOMETRY.
4. INSTALL 10-LOG STRUCTURE PER DETAIL ON SHEET C-471.
5. INSTALL 11-LOG STRUCTURE PER DETAIL ON SHEET C-472.
6. PROPOSED CHANNEL FILL. SEE SHEETS C-421 TO C-425.
7. PROPOSED WETLAND. SEE SHEETS C-441 TO C-445.
8. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.

LEGEND

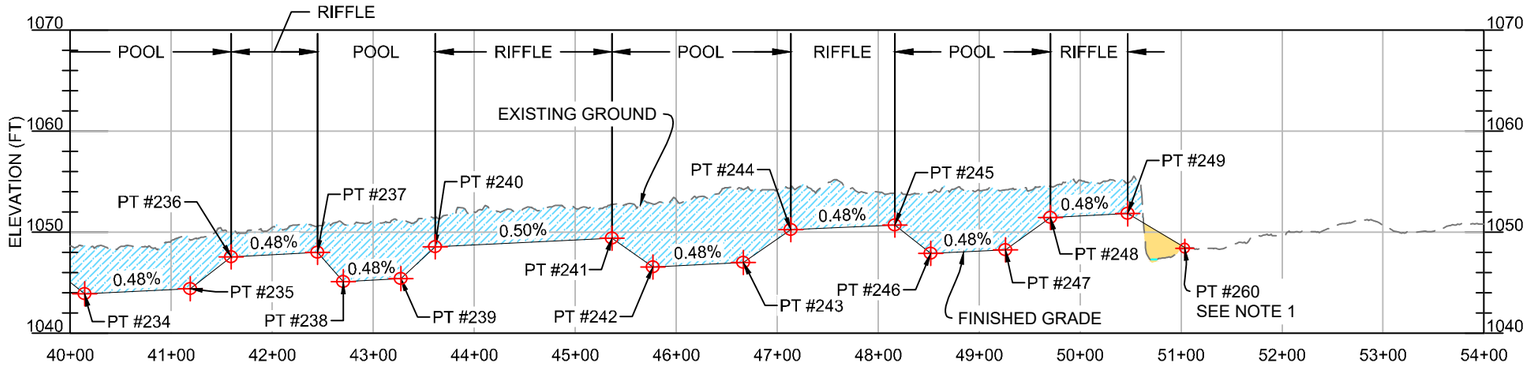
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL CUT
- PROPOSED CHANNEL FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



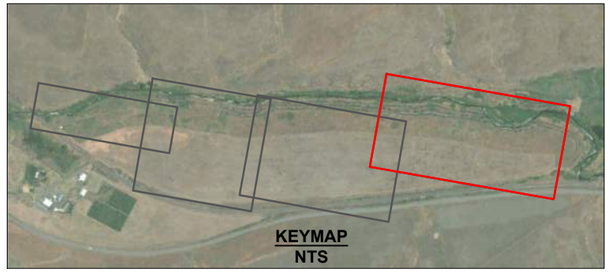
A
-
PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



B
-
PROPOSED CHANNEL SECTION VIEW
SCALE 1" = 40', 1H:5V



NEW CHANNEL ALIGNMENT PROFILE VIEW (FT)
(SCALE 1" = 150', 1H:10V)



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91397
OREGON
JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

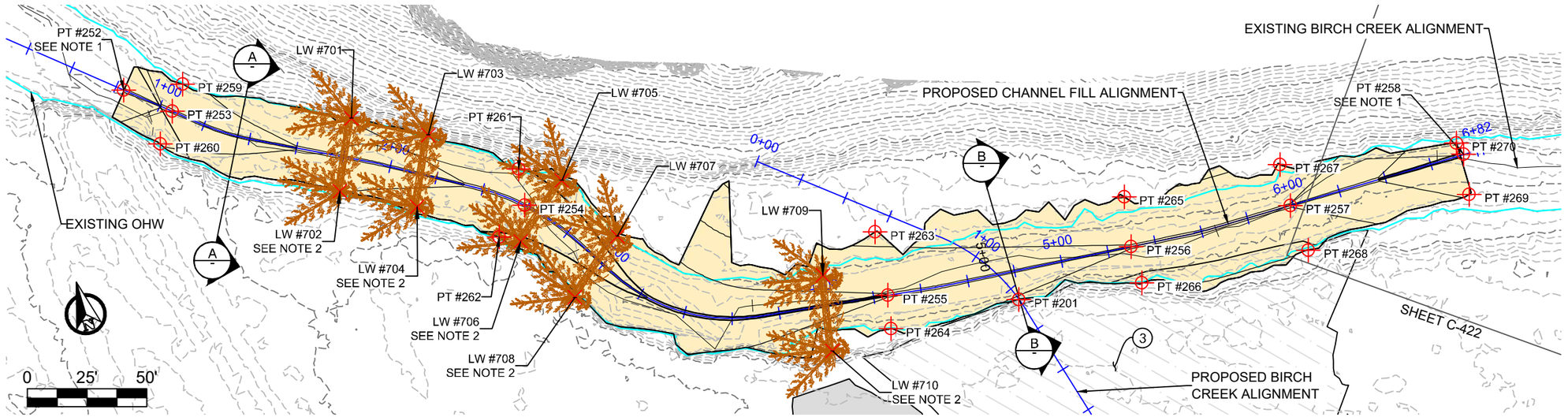
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED BIRCH CREEK ALIGNMENT PROFILES AND SECTIONS

DWG. NO.: C-414

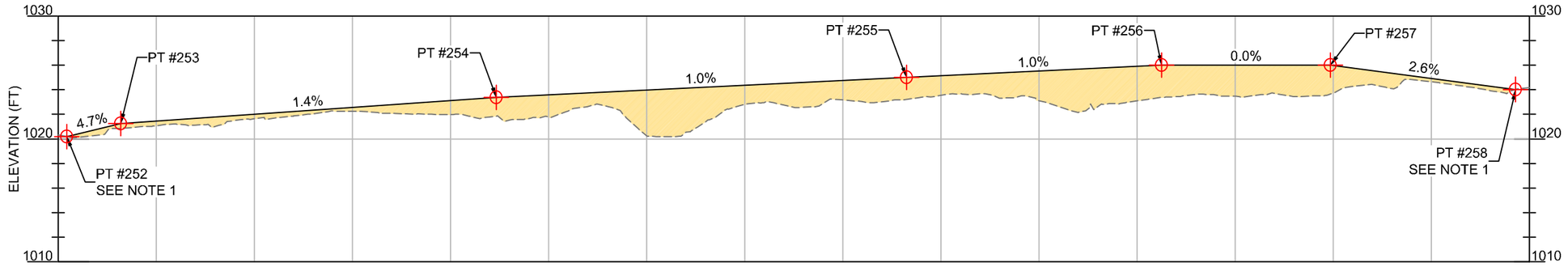
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\405_PROFILE AND SECTIONS-NEW CHANNEL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 5:48 PM



LEGEND

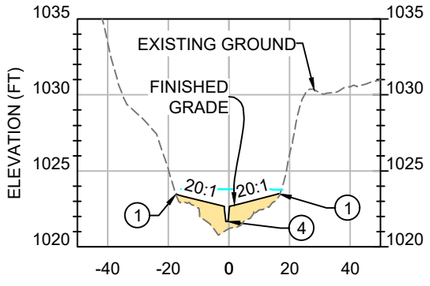
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED NEW MAIN CHANNEL
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



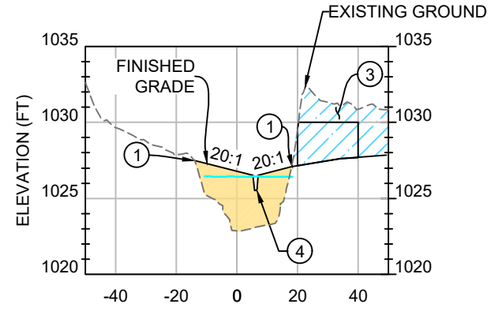
CHANNEL FILL PROFILE VIEW (FT)
(SCALE 1" = 50', 1H:5V)

NOTES:

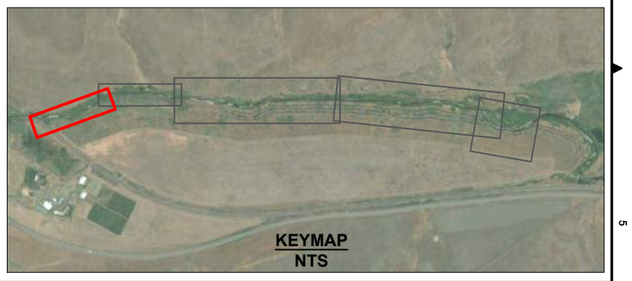
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. INSTALL CHANNEL SPANNING STRUCTURE PER DETAIL ON SHEET C-474.
3. PROPOSED CHANNEL CUT. SEE SHEETS C-421 TO C-425.
4. SEE PROPOSED TYPICAL PILOT CHANNEL SECTION F ON SHEET C-451.



A
-
CHANNEL FILL SECTION
1"=50' (1H:5V)



B
-
CHANNEL FILL SECTION
1"=50' (1H:5V)



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JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

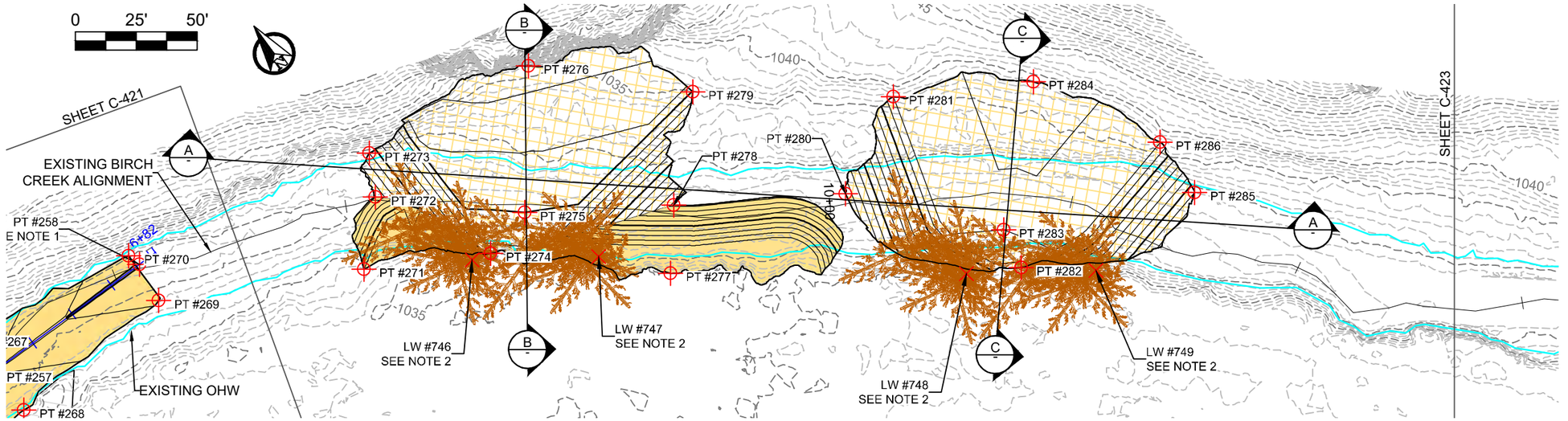
PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS

DWG. NO.: C-421

CREATED: 7/1/21

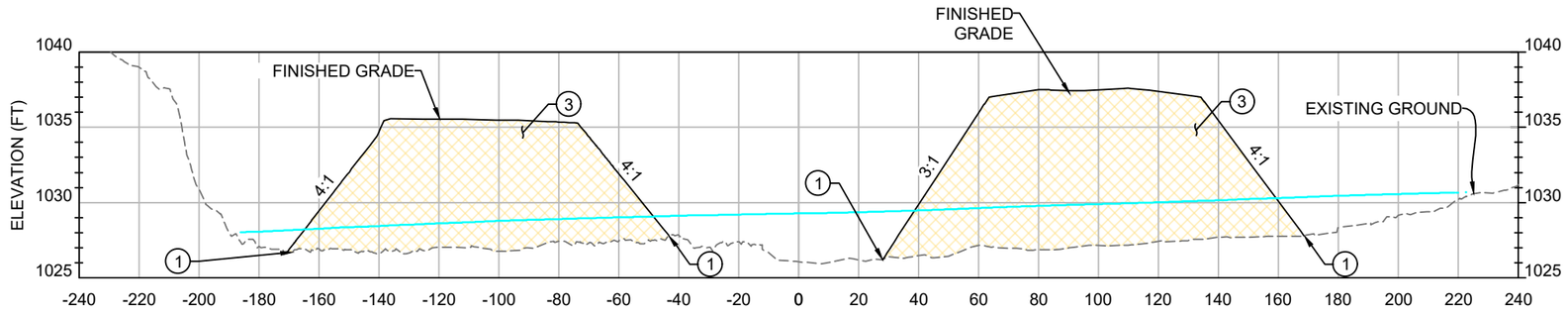
12 of 41

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\407_PROFILE AND SECTIONS-FILL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 4:27 PM

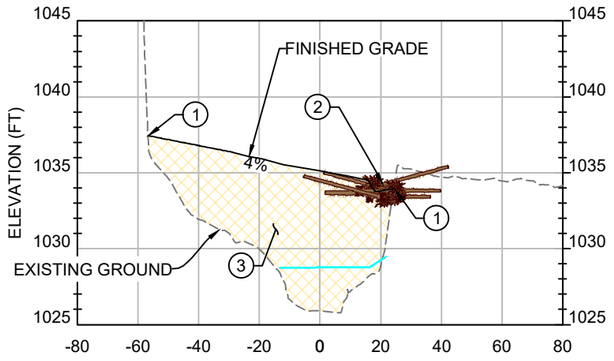


LEGEND

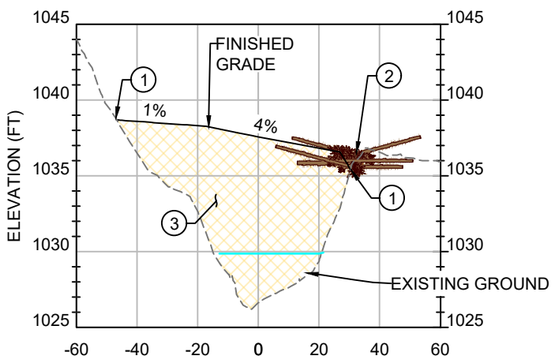
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL FILL
- PROPOSED CHANNEL EMBANKMENT FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



A — CHANNEL FILL SECTION
1"=50' (1H:5V)

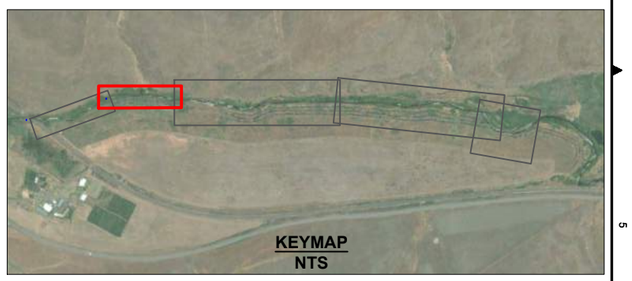


B — CHANNEL FILL SECTION
1"=50' (1H:5V)



C — CHANNEL FILL SECTION
1"=50' (1H:5V)

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. INSTALL DEBRIS JAM TYPE-2 STRUCTURE PER DETAIL ON SHEET C-476.
3. COMPACT EMBANKMENT FILL PER SPECIFICATION SECTION 31 23 00.



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REGISTERED PROFESSIONAL ENGINEER 91397 OREGON JULY 9, 2018 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

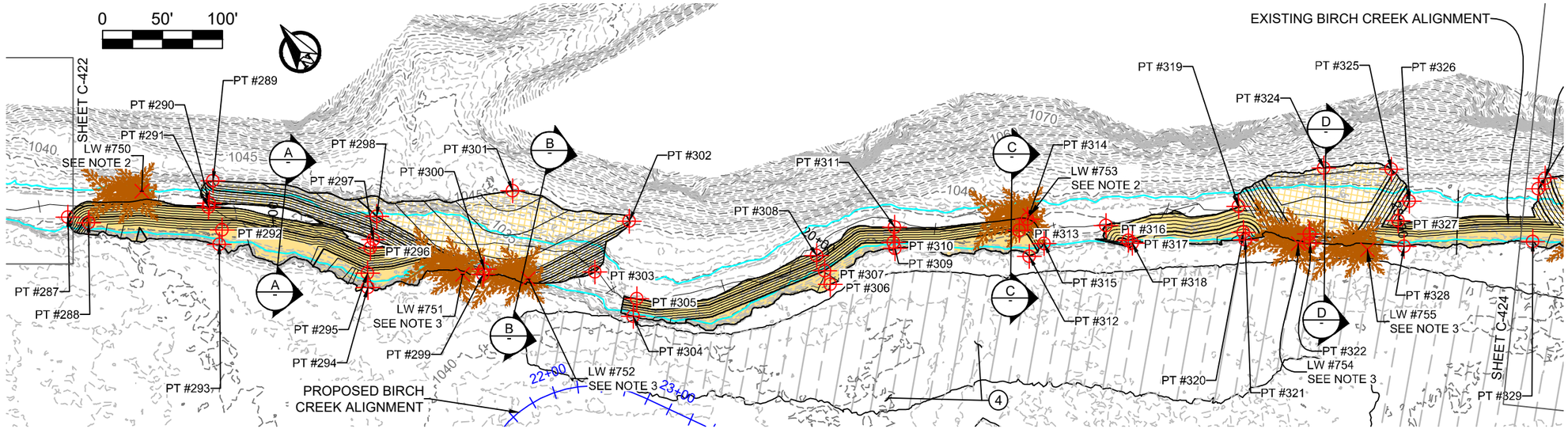
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS

DWG. NO.: C-422

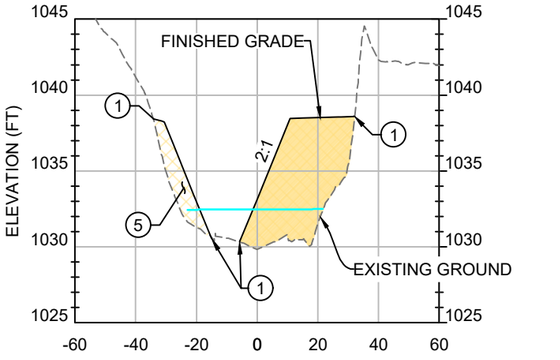
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\407_PROFILE AND SECTIONS-FILL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 4:27 PM

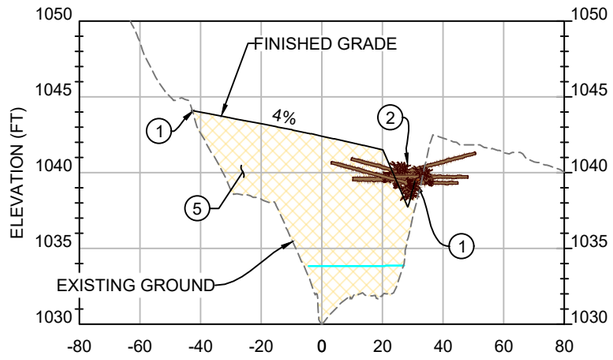


LEGEND

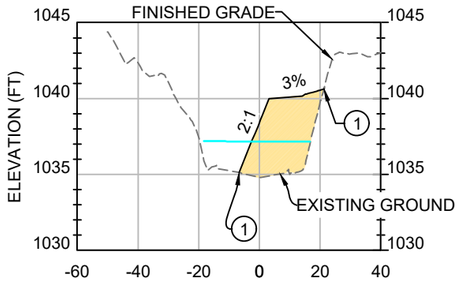
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL FILL
- PROPOSED CHANNEL EMBANKMENT FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



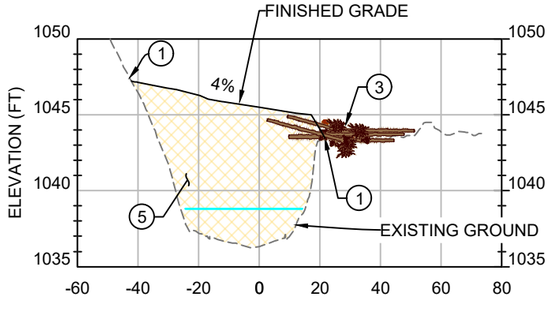
A CHANNEL FILL SECTION
1"=50' (1H:5V)



B CHANNEL FILL SECTION
1"=50' (1H:5V)

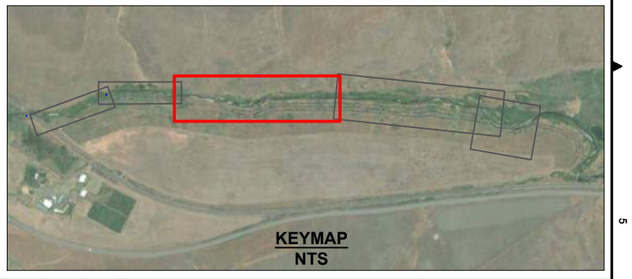


C CHANNEL FILL SECTION
1"=50' (1H:5V)



D CHANNEL FILL SECTION
1"=50' (1H:5V)

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. INSTALL DEBRIS JAM STRUCTURE TYPE 1 PER DETAIL ON SHEET C-475.
3. INSTALL DEBRIS JAM STRUCTURE TYPE 2 PER DETAIL ON SHEET C-476.
4. PROPOSED FLOODPLAIN TOPOGRAPHY. SEE SHEET C-434.
5. COMPACT EMBANKMENT FILL PER SPECIFICATION SECTION 31 23 00.



KEYMAP
NTS

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JULY. 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

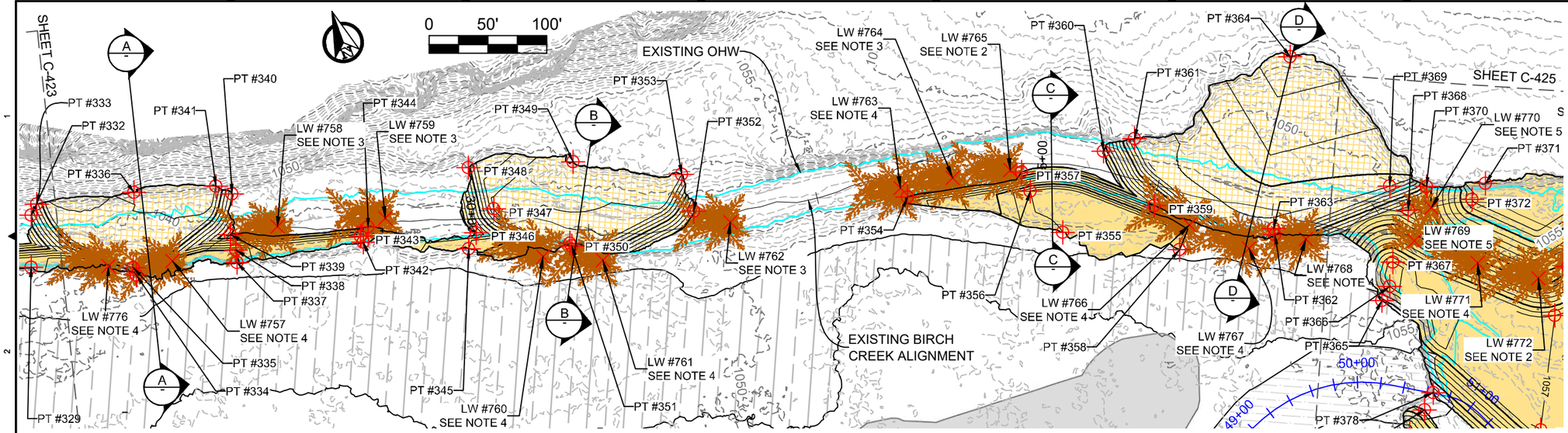
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS

DWG. NO.: C-423

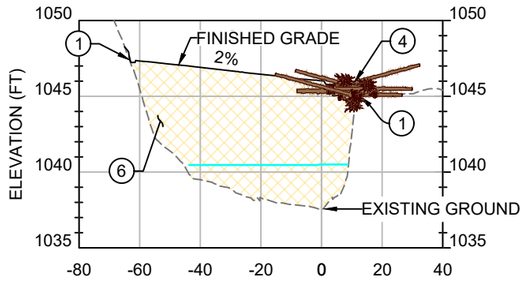
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\407_PROFILE AND SECTIONS-FILL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 4:28 PM

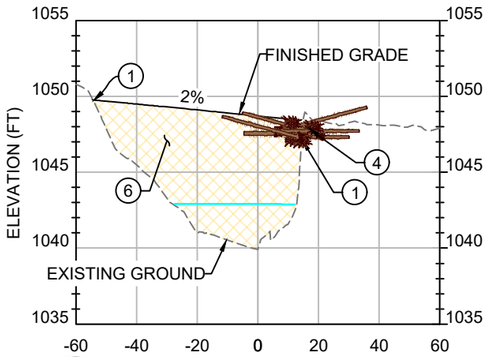


LEGEND

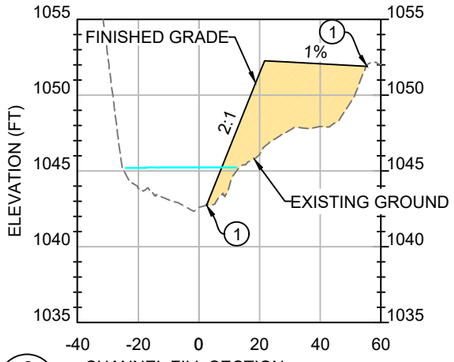
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL FILL
- PROPOSED CHANNEL EMBANKMENT FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)



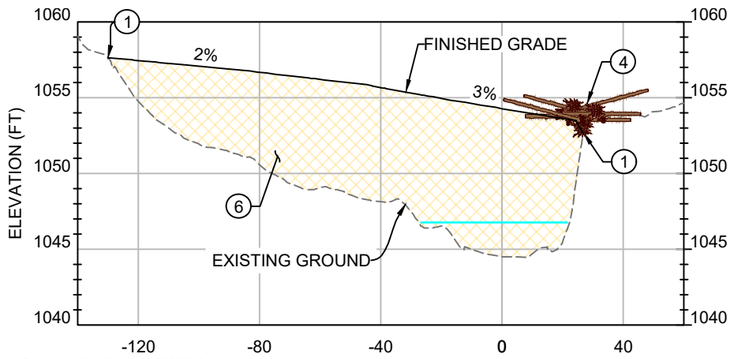
A — CHANNEL FILL SECTION
1"=50' (1H:5V)



B — CHANNEL FILL SECTION
1"=50' (1H:5V)

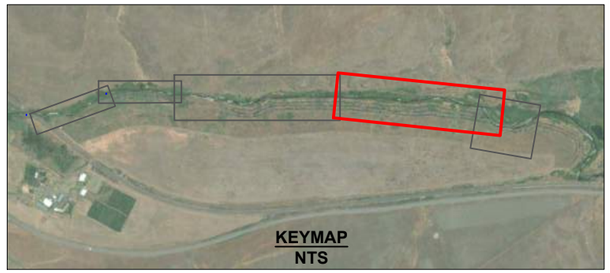


C — CHANNEL FILL SECTION
1"=50' (1H:5V)



D — CHANNEL FILL SECTION
1"=50' (1H:5V)

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. INSTALL BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-473.
3. INSTALL DEBRIS JAM STRUCTURE TYPE 1 PER DETAIL ON SHEET C-475.
4. INSTALL DEBRIS JAM STRUCTURE TYPE 2 PER DETAIL ON SHEET C-476.
5. INSTALL CHANNEL SPANNING STRUCTURE PER DETAIL ON SHEET C-474.
6. COMPACT EMBANKMENT FILL PER SPECIFICATION SECTION 31 23 00.



TETRA TECH
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Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91393 OREGON JULY 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

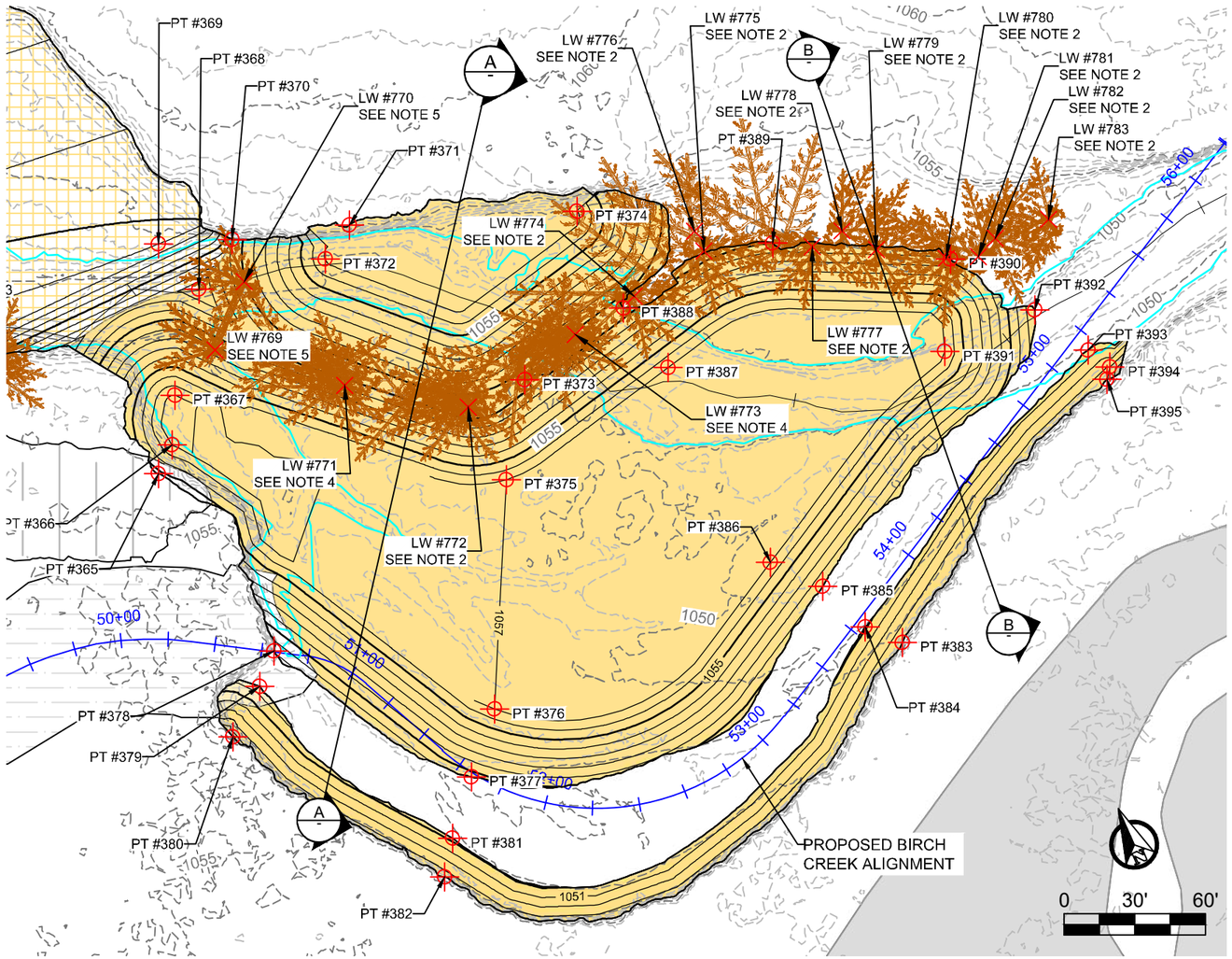
PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS

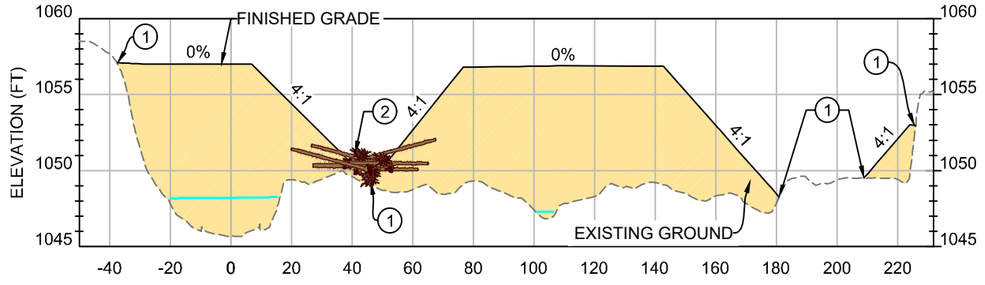
DWG. NO.: C-424

CREATED: 7/1/21

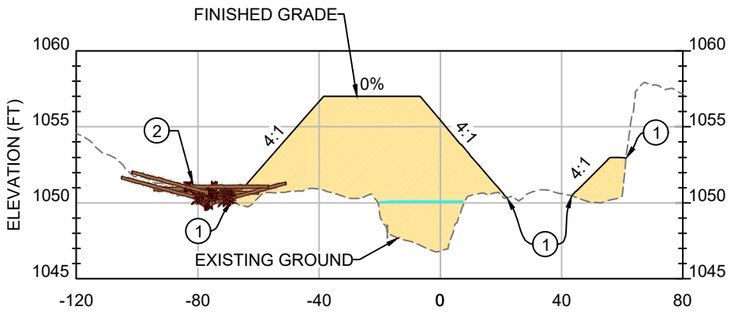
15 of 41

Z:\PROJECTS\194-68817 UMA\BIRCH IN-STREAM DESIGN\100%\SHEET FILES\407_PROFILE AND SECTIONS-FILL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 4:28 PM





A — CHANNEL FILL SECTION
1"=50' (1H:5V)



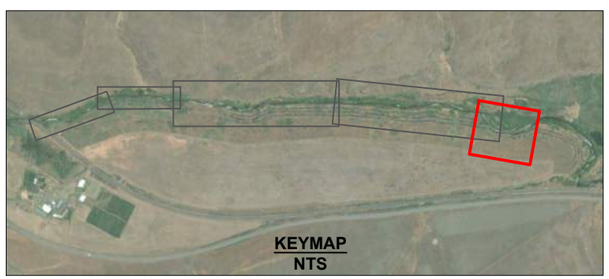
B — CHANNEL FILL SECTION
1"=50' (1H:5V)

LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED CHANNEL FILL
- PROPOSED CHANNEL EMBANKMENT FILL
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED LWM
- PROPOSED CONSTRUCTION POINT (PT #XXX)
- PROPOSED LWM CONSTRUCTION POINT (LW #XXX)

NOTES:

1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. INSTALL BANK HABITAT STRUCTURE PER DETAIL ON SHEET C-473.
3. INSTALL DEBRIS JAM STRUCTURE TYPE 1 PER DETAIL ON SHEET C-475.
4. INSTALL DEBRIS JAM STRUCTURE TYPE 2 PER DETAIL ON SHEET C-476.
5. INSTALL CHANNEL SPANNING STRUCTURE PER DETAILS ON SHEET C-474.



TETRA TECH
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19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91394 OREGON JEREMY S. ANDREWS JUL. 12 2018 EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

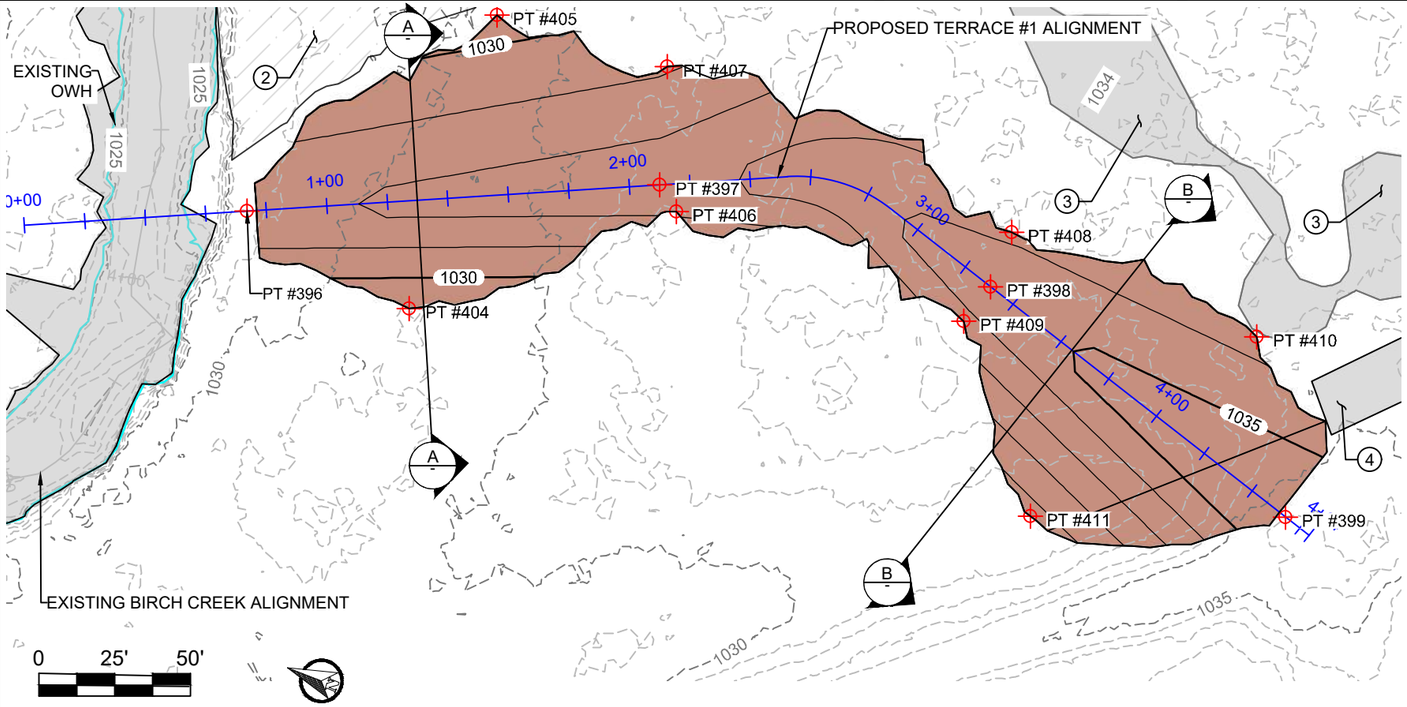
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED EXISTING CHANNEL FILL PLANS AND SECTIONS

DWG. NO.: C-425

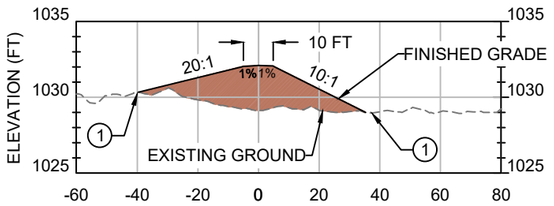
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\407_PROFILE AND SECTIONS-FILL.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 4:30 PM

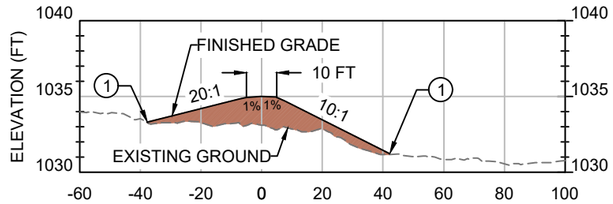


NOTES:

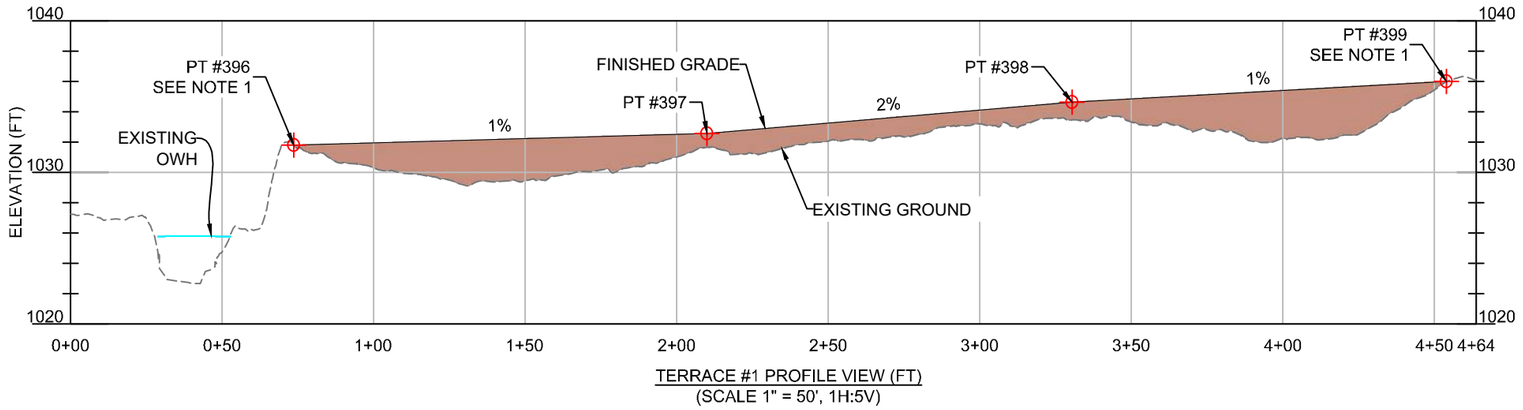
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED NEW MAIN CHANNEL. SEE SHEETS C-411 TO C-414.
3. PROPOSED WETLANDS. SEE SHEETS C-441 TO C-445.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.



A / - TERRACE #1 SECTION VIEW
SCALE 1" = 50', 1H:5V



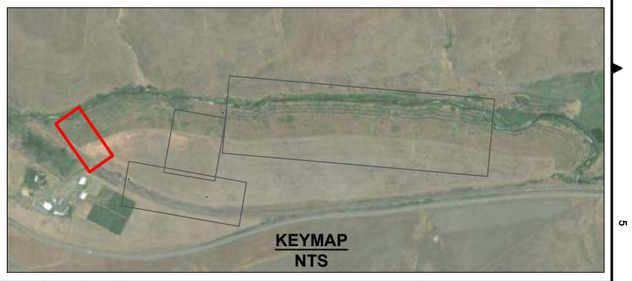
B / - TERRACE #1 SECTION VIEW
SCALE 1" = 50', 1H:5V



TERRACE #1 PROFILE VIEW (FT)
(SCALE 1" = 50', 1H:5V)

LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED TERRACE
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED CONSTRUCTION POINT (PT #XXX)



KEYMAP
NTS

TETRA TECH
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Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

		PLAN SHEET SIZE ANSI B (11" X 17")				
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

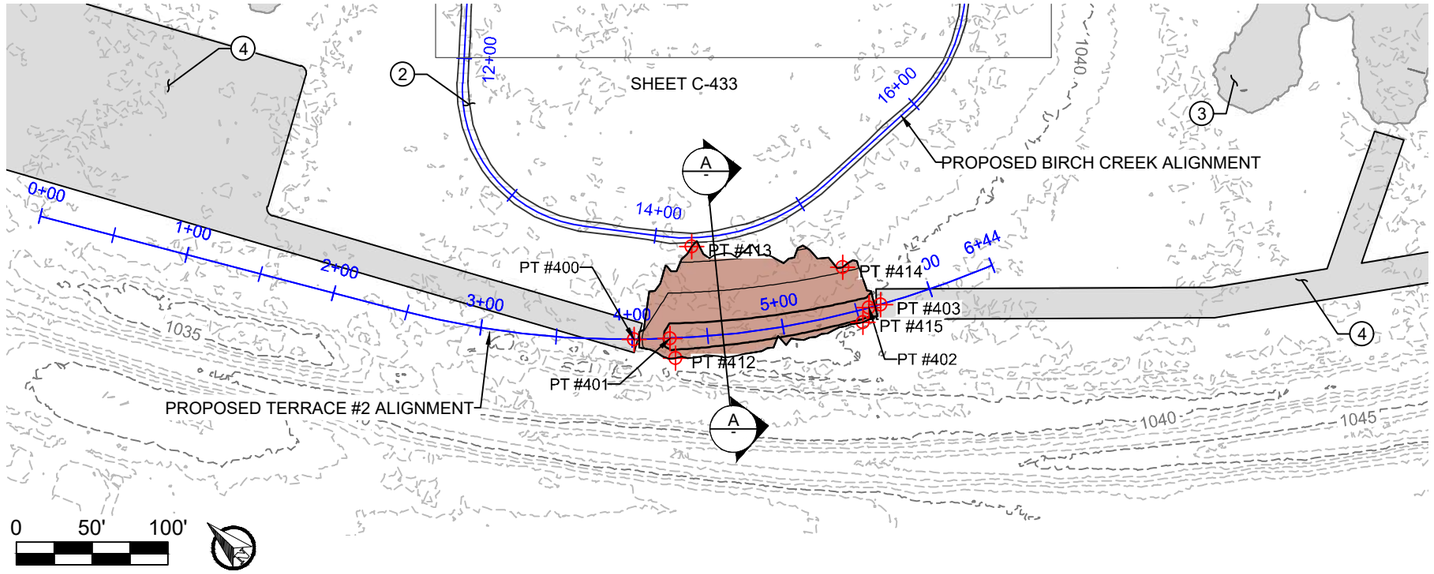
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

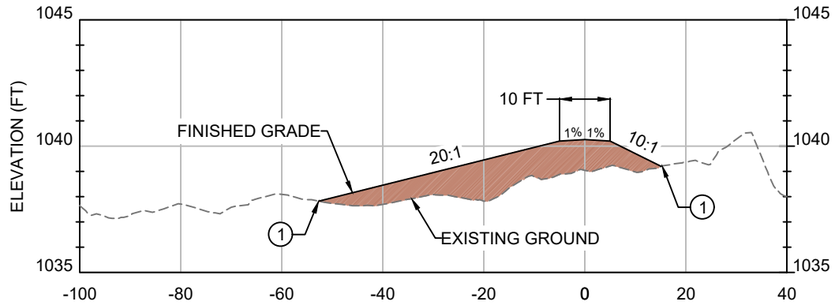
PROPOSED TERRACE FILL PROFILES AND SECTIONS

DWG. NO.: C-431

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\408_PROFILE AND SECTIONS-TERR.DWG
PLOT DETAILS: ANDREWS, JEREMY 6:00 PM June 29, 2021



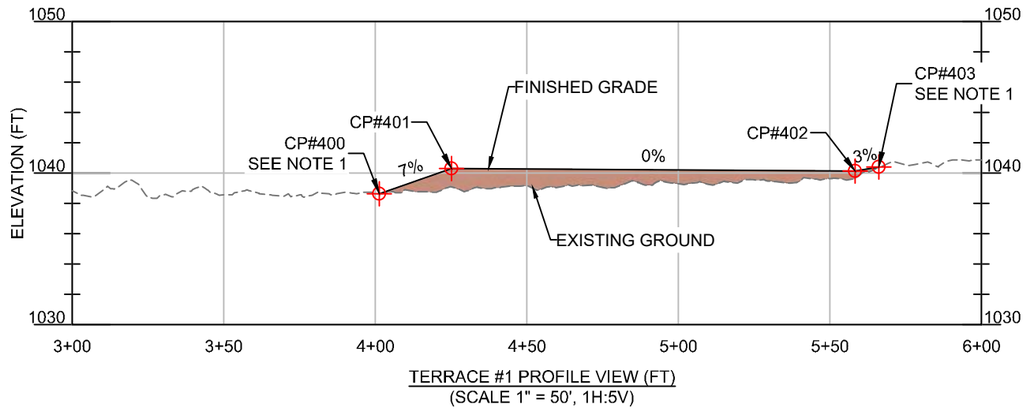


A
-

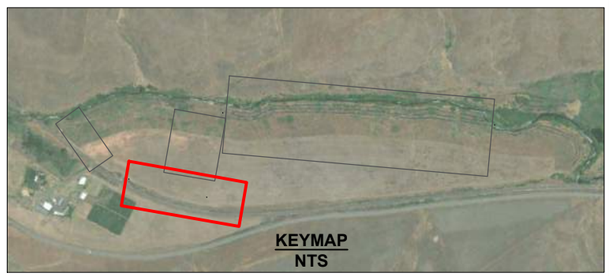
TERRACE #2 SECTION VIEW
SCALE 1" = 30', 1H:5V

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.
3. PROPOSED WETLAND AND CONNECTED HABITAT. SEE SHEETS C-441 TO C-445.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.

LEGEND
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED TERRACE
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED CONSTRUCTION POINT (PT #XXX)



TERRACE #1 PROFILE VIEW (FT)
(SCALE 1" = 50', 1H:5V)



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REGISTERED PROFESSIONAL ENGINEER
91391
OREGON
JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

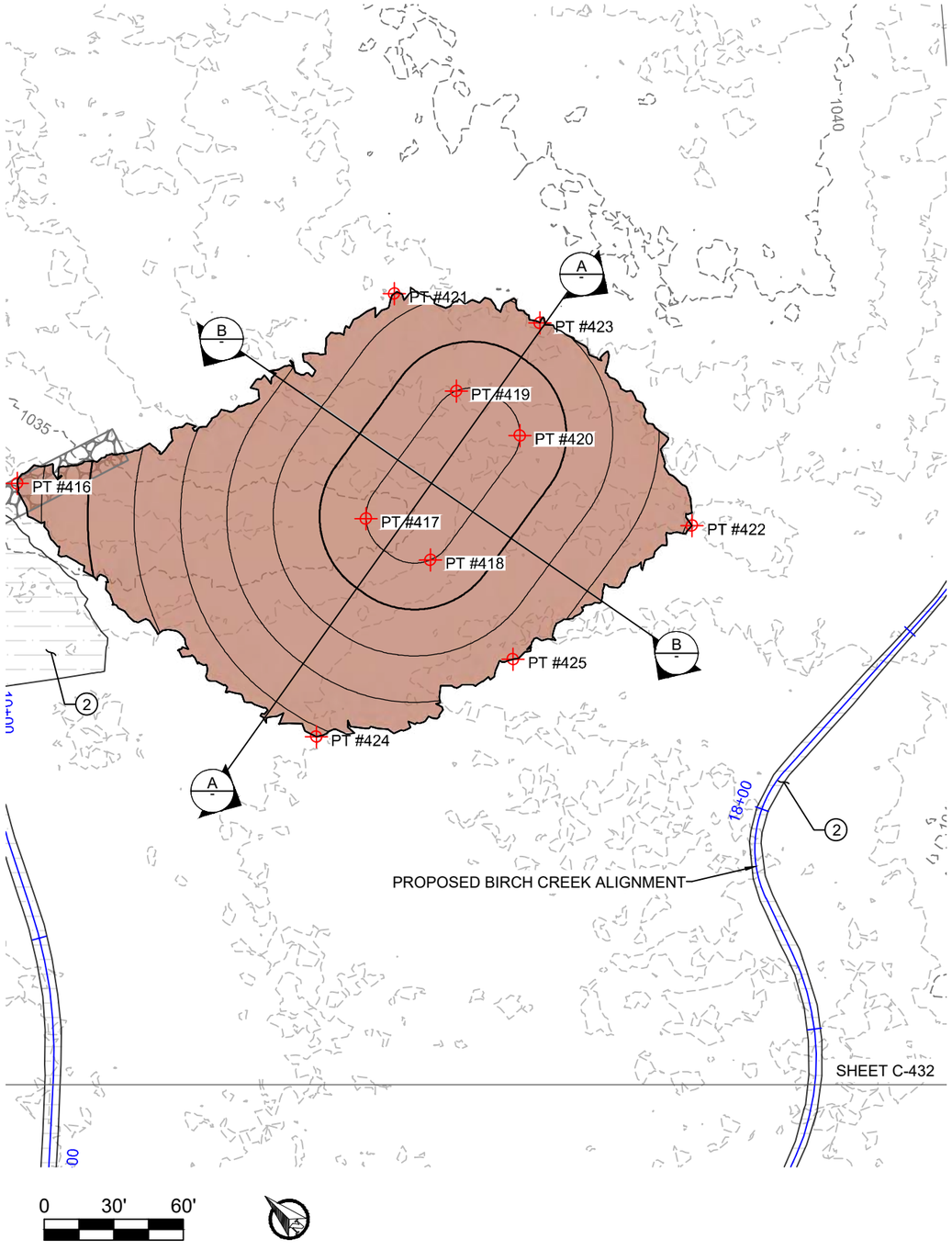
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

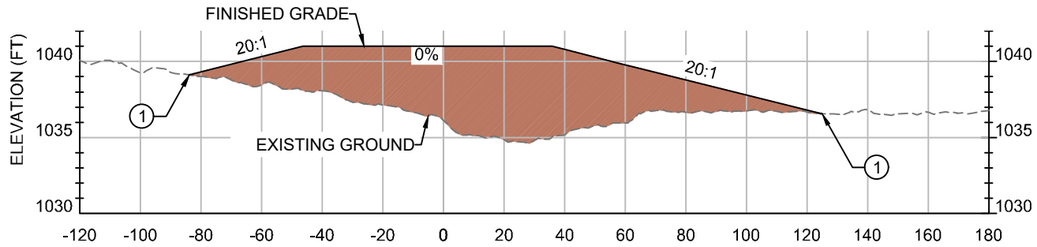
PROPOSED TERRACE FILL PROFILES AND SECTIONS

DWG. NO.: C-432

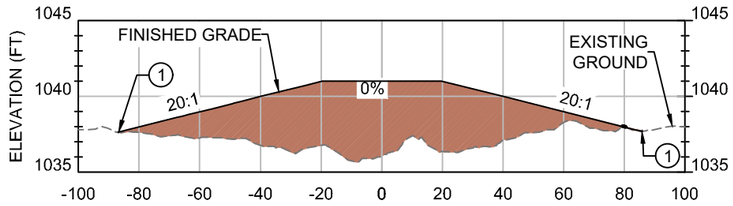
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMA\BIRCH IN-STREAM DESIGN\100%\SHEET FILES\408_PROFILE AND SECTIONS-TERR.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 6:00 PM





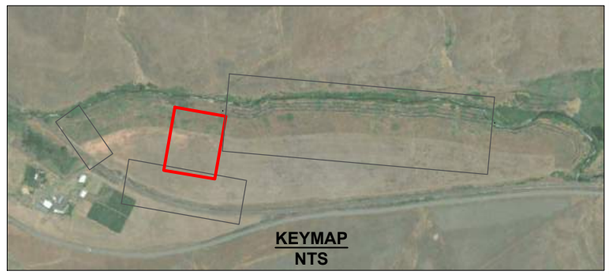
A
-
TERRACE #3 SECTION VIEW
SCALE 1" = 50', 1H:5V



B
-
TERRACE #3 SECTION VIEW
SCALE 1" = 50', 1H:5V

LEGEND
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED TERRACE
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE
- PROPOSED CONSTRUCTION POINT (PT #XXX)

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED MAIN CHANNEL. SEE SHEETS C-411 TO C-414.



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Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91397 OREGON JULY 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

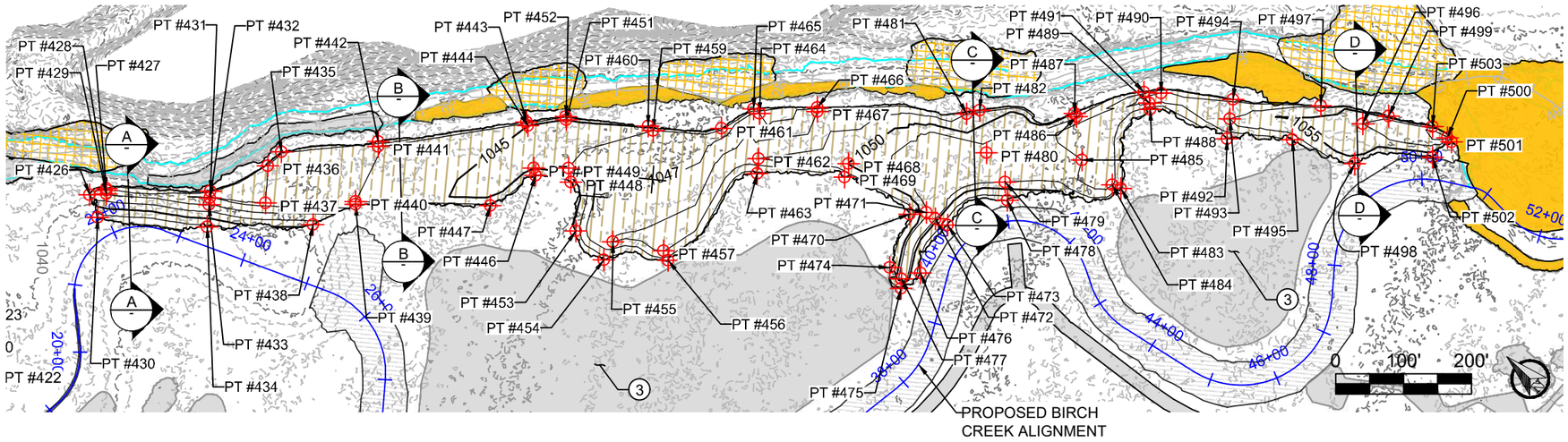
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED TERRACE FILL PROFILES AND SECTIONS

DWG. NO.: C-433

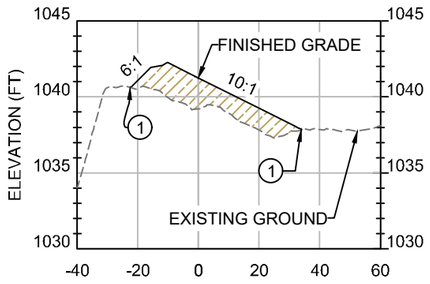
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\408_PROFILE AND SECTIONS-TERR.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 6:00 PM

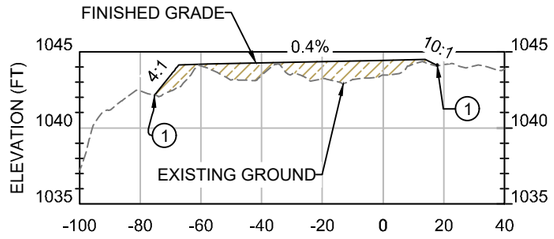


NOTES:

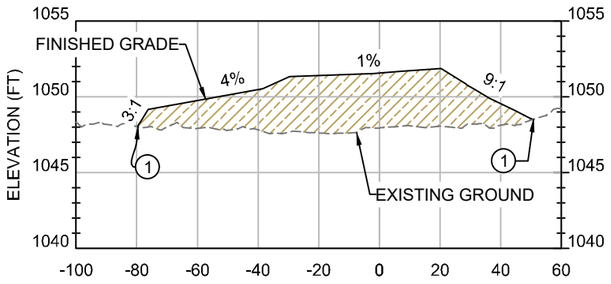
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.
3. PROPOSED WETLAND AND CONNECTED HABITAT. SEE SHEETS C-441 TO C-445.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.



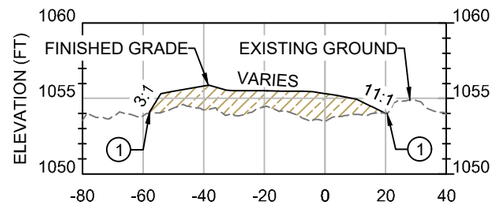
A FLOODPLAIN TOPOGRAPHY SECTION VIEW
SCALE 1" = 30', 1H:5V



B FLOODPLAIN TOPOGRAPHY SECTION VIEW
SCALE 1" = 30', 1H:5V



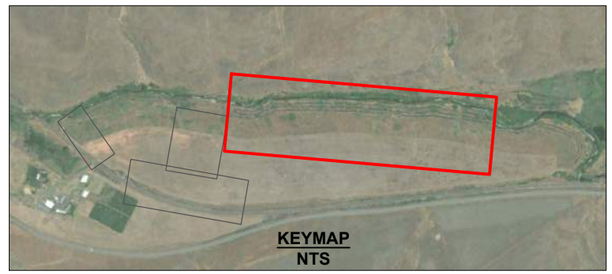
C FLOODPLAIN TOPOGRAPHY SECTION VIEW
SCALE 1" = 30', 1H:5V



D FLOODPLAIN TOPOGRAPHY SECTION VIEW
SCALE 1" = 30', 1H:5V

LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED FLOODPLAIN
- TOPOGRAPHY
- SEE NOTE FOR PROJECT ELEMENT
- SHEET REFERENCE
- PROPOSED CONSTRUCTION POINT
- (PT #XXX)



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REGISTERED PROFESSIONAL ENGINEER
91392
OREGON
JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

PLAN SHEET SIZE ANSI B (11" X 17")						
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

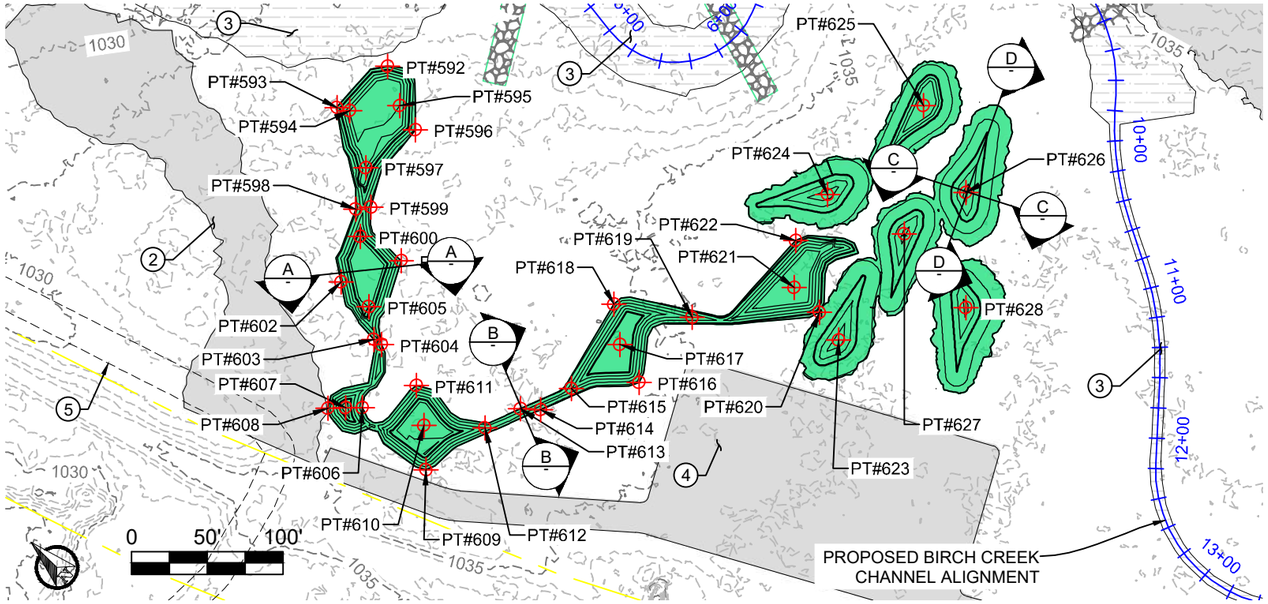
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED FLOODPLAIN TOPOGRAPHY SECTIONS

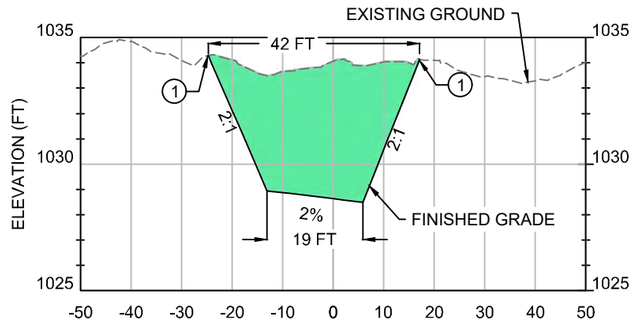
DWG. NO.: C-434

CREATED: 7/1/21

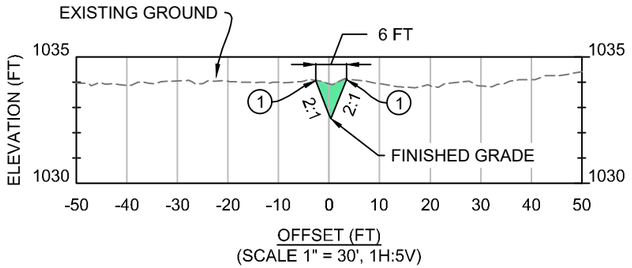
Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\408_PROFILE AND SECTIONS-TERR.DWG
PLOT DETAILS: ANDREWS, JEREMY June 29, 2021 6:00 PM



NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED TERRACE. SEE SHEETS C-431 TO C-433.
3. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.
5. EXISTING ACCESS ROAD.

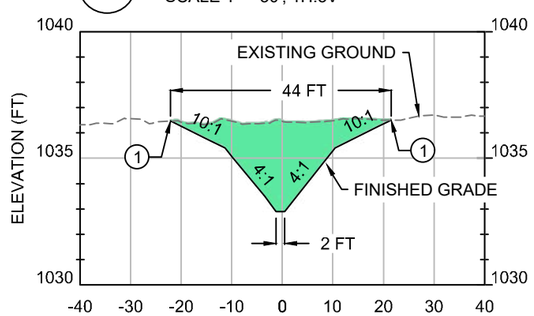


A — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V

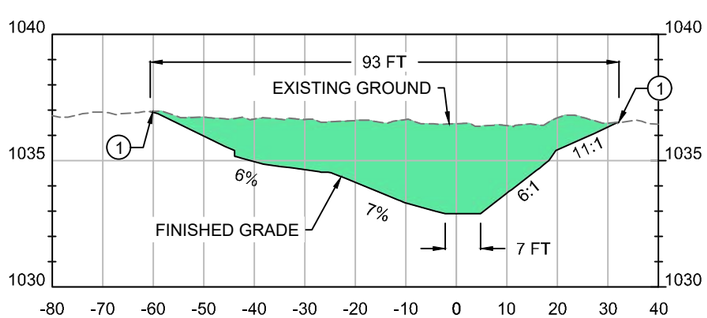


(SCALE 1" = 30', 1H:5V)

B — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V

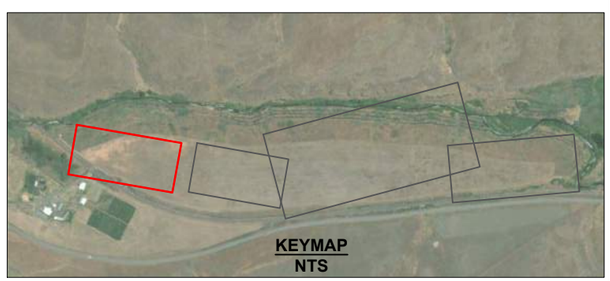


C — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V



D — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V

LEGEND
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- PROPERTY BOUNDARY
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED WETLAND
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE



TETRA TECH
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REGISTERED PROFESSIONAL ENGINEER
91394
OREGON
JUL. 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

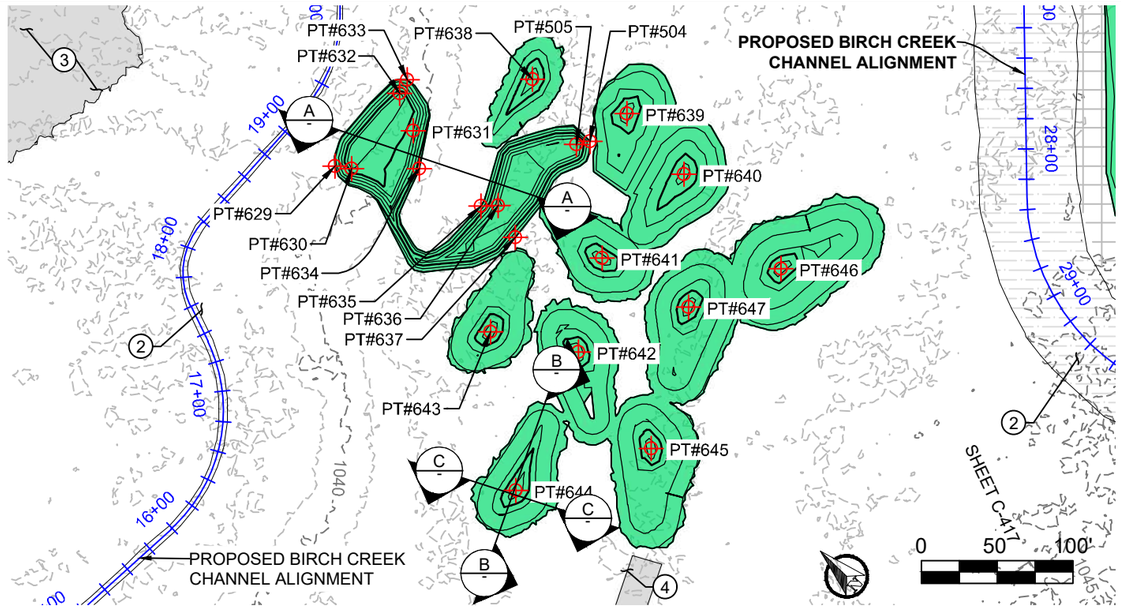
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED WETLAND PROFILES AND SECTIONS

DWG. NO.: C-441

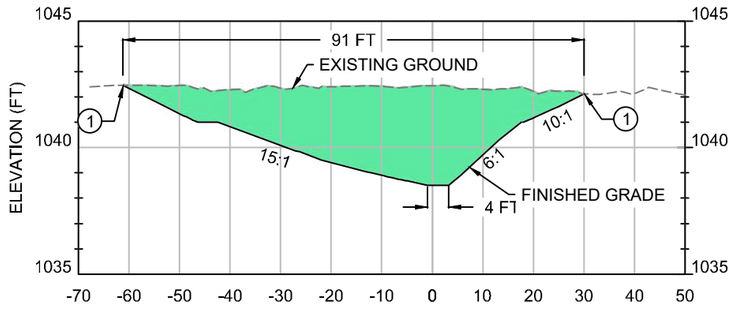
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\409_PROFILE AND SECTIONS-WETLAND.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:28 AM

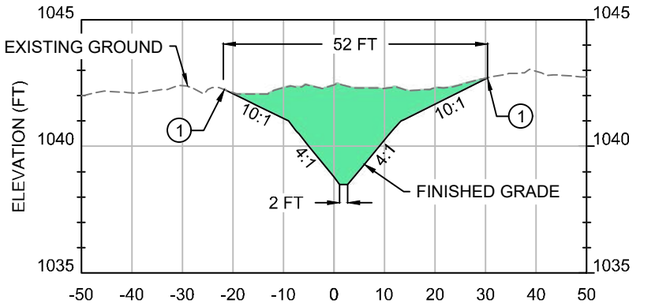


LEGEND

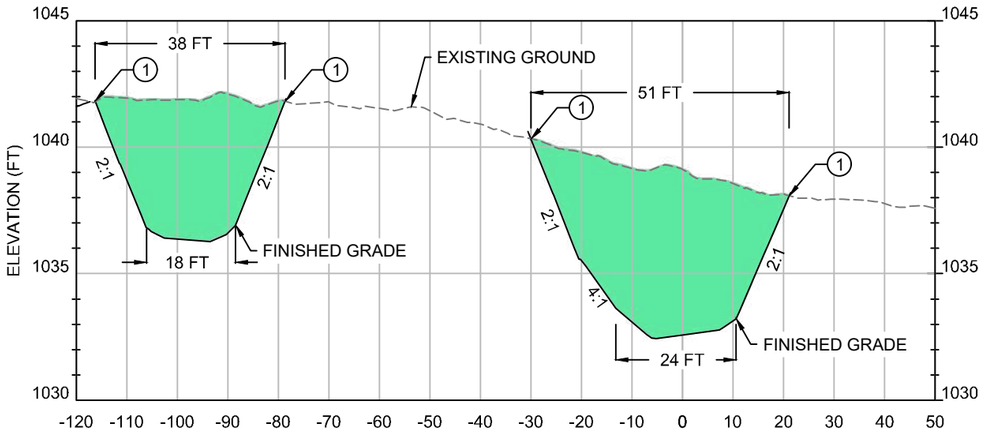
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED WETLAND
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE



B — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V

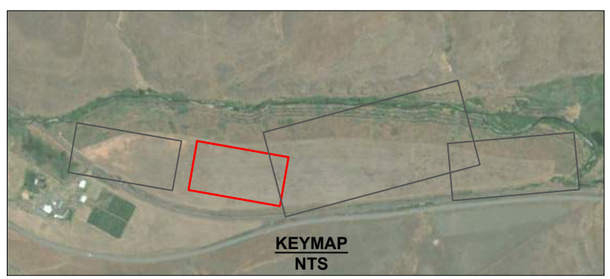


C — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V



A — PROPOSED WETLAND SECTION
SCALE 1" = 30', 1H:5V

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.
3. PROPOSED TERRACE. SEE SHEETS C-431 TO C-433.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.



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REGISTERED PROFESSIONAL ENGINEER
91394
OREGON
JEREMY S. ANDREWS
JUL 12 2016
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

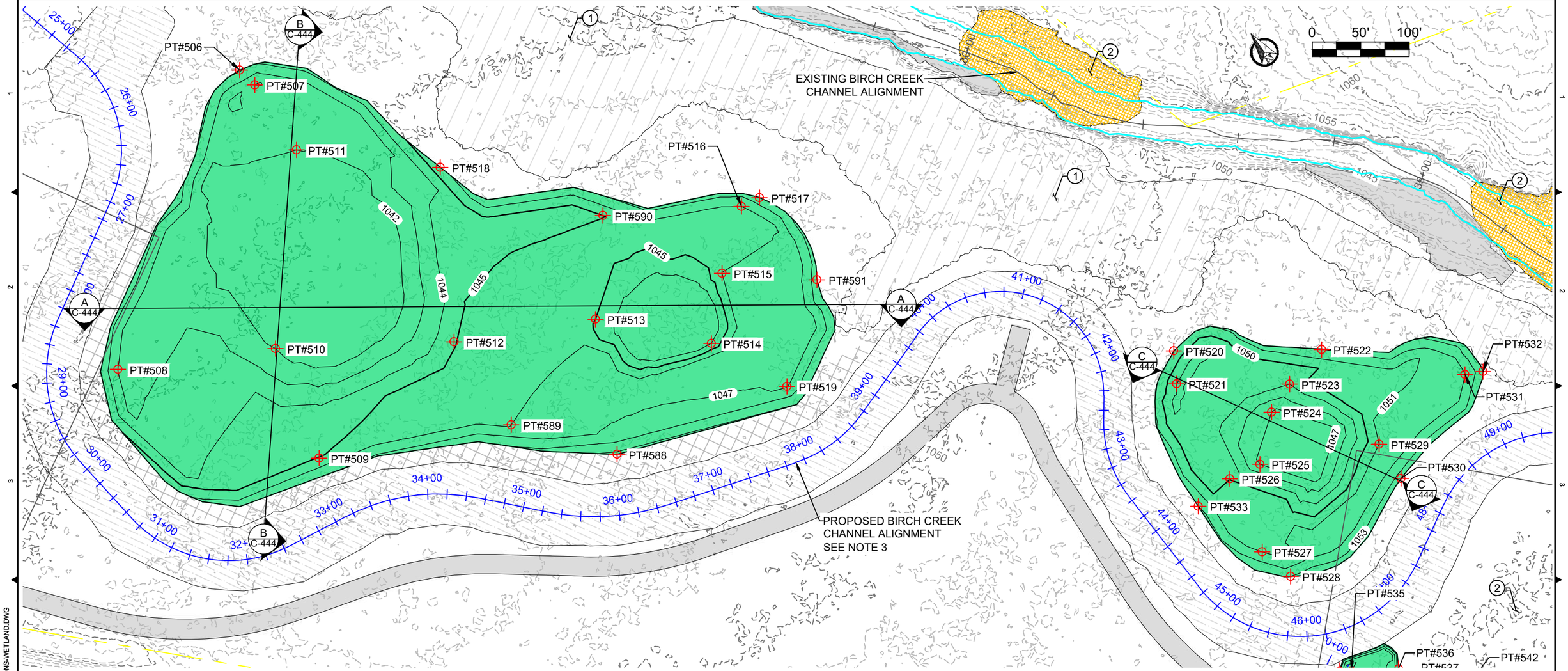
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED WETLAND PROFILES AND SECTIONS

DWG. NO.: C-442

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMA\BIRCH IN-STREAM DESIGN\100%\SHEET FILES\409_PROFILE AND SECTIONS-WETLAND.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:29 AM

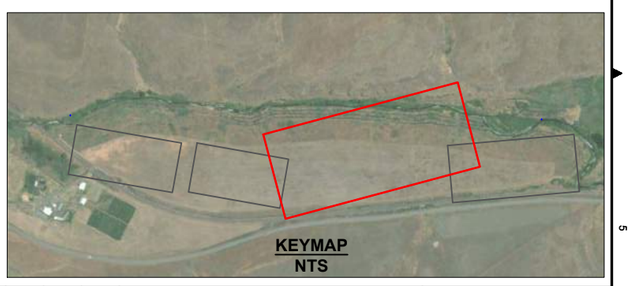


LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- EXISTING OHW
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED WETLAND
- PROPOSED FLOODPLAIN BENCHING
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE

NOTES:

1. PROPOSED FLOODPLAIN TOPOGRAPHY. SEE SHEET C-434.
2. PROPOSED CHANNEL FILL. SEE SHEETS C-421 TO C-425.
3. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.



KEYMAP
NTS

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REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JEREMY S. ANDREWS JUL 12 2016
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

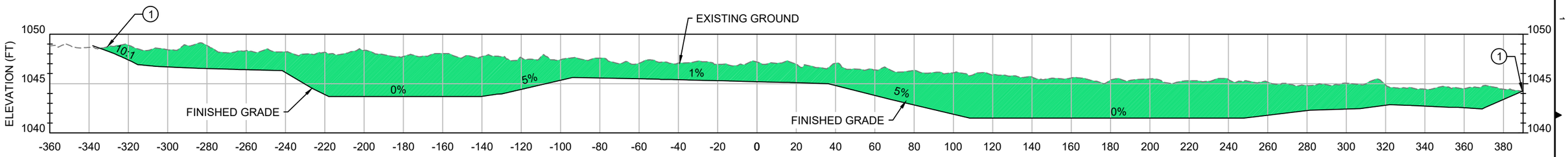
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED WETLAND PROFILES AND SECTIONS

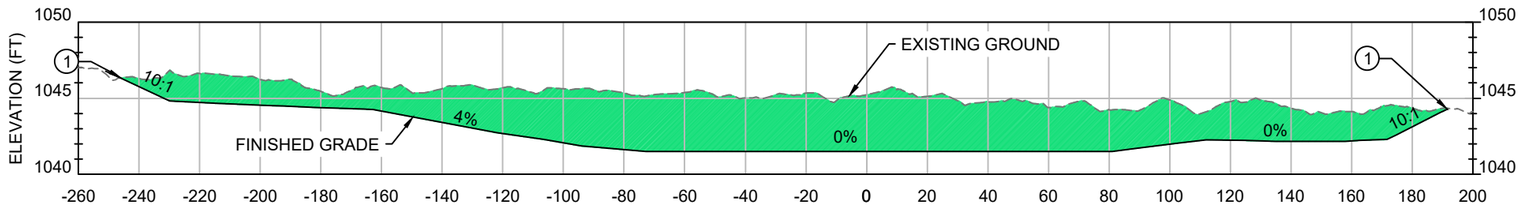
DWG. NO.: C-443

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\409_PROFILE AND SECTIONS-WETLAND.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:29 AM



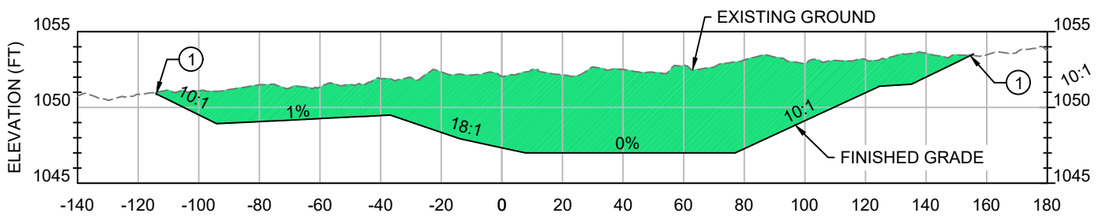
A / C-443 PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



B / C-443 PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V

LEGEND
- EXISTING GROUND
- FINISHED GRADE
- PROPOSED WETLAND

NOTES:
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.



C / C-443 PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V

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OREGON
JUL. 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

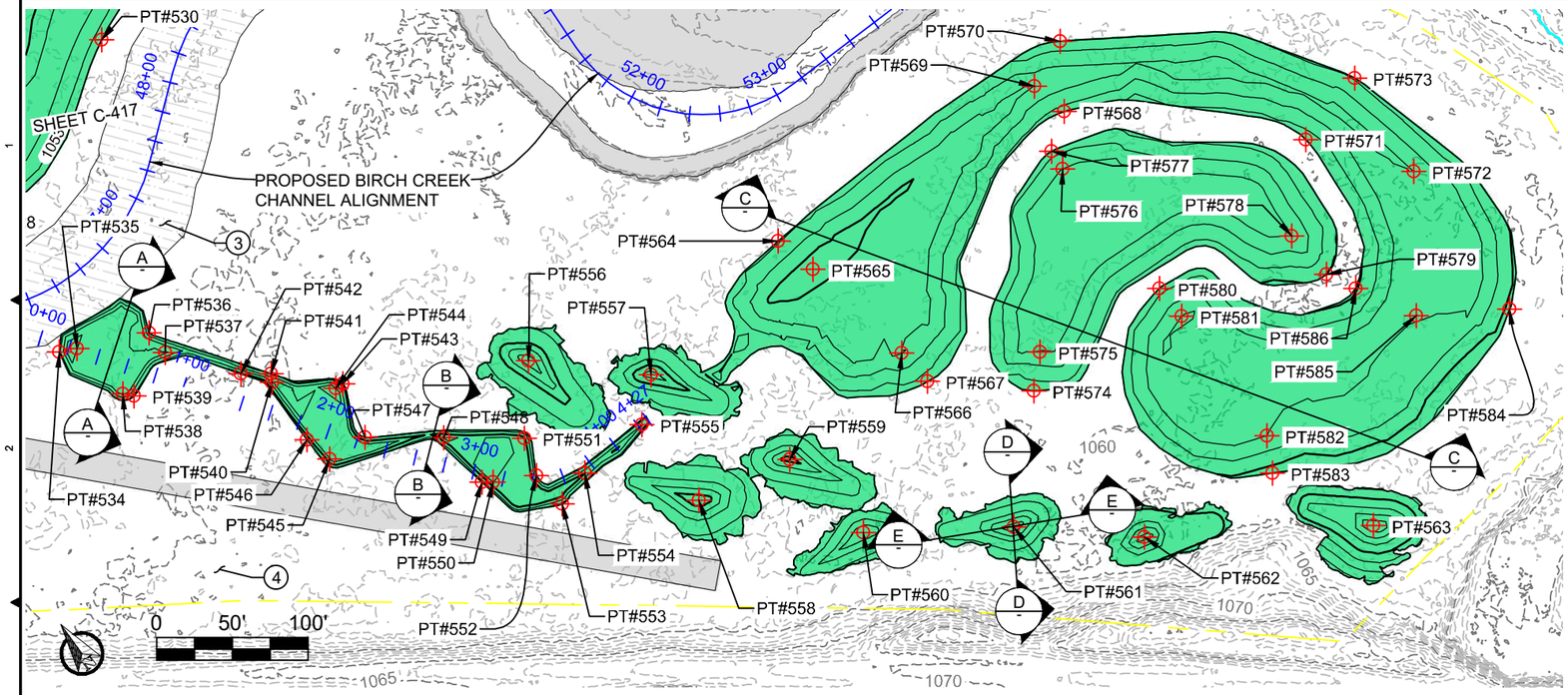
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED WETLAND PROFILES AND SECTIONS

DWG. NO.: C-444

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UM\ABIRCH IN-STREAM DESIGN\100%\SHEET FILES\409_PROFILE AND SECTIONS-WETLAND.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:29 AM

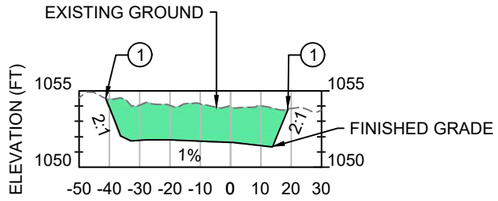


NOTES:

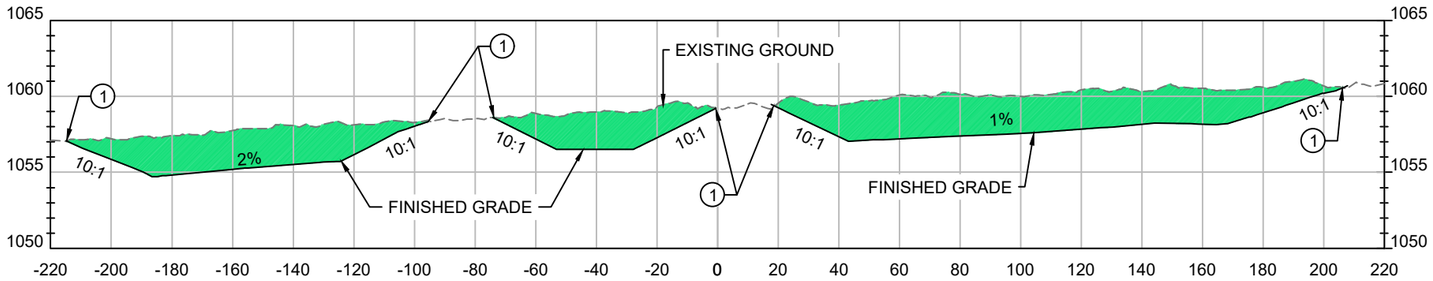
1. DAYLIGHT PROPOSED FINISHED GRADE TO MATCH EXISTING GROUND.
2. PROPOSED CHANNEL FILL. SEE SHEETS C-421 TO C-425.
3. PROPOSED BIRCH CREEK ALIGNMENT. SEE SHEETS C-411 TO C-414.
4. TEMPORARY STAGING AND ACCESS ROUTES. SEE SHEET C-402.

LEGEND

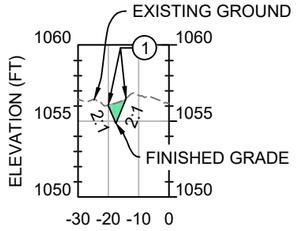
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING GROUND
- EXISTING ALIGNMENT
- PROPERTY BOUNDARY
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- FINISHED GRADE
- PROPOSED ALIGNMENT
- PROPOSED WETLAND
- SEE NOTE FOR PROJECT ELEMENT SHEET REFERENCE



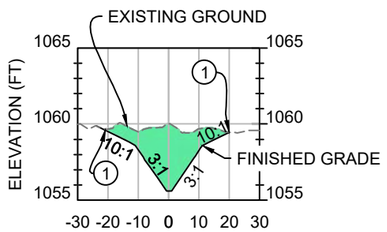
A / - PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



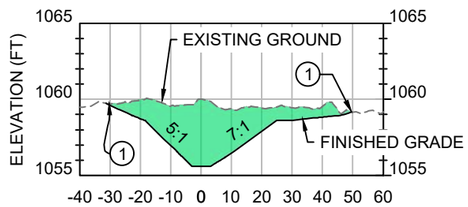
C / C-418 PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



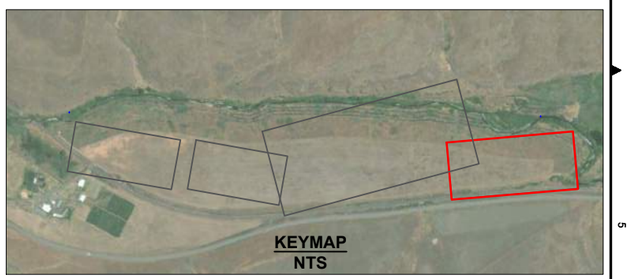
B / - PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



D / - PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



E / - PROPOSED WETLAND SECTION
SCALE 1" = 50', 1H:5V



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REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL. 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

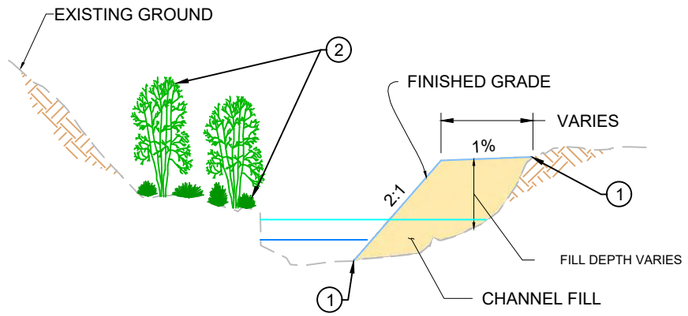
PROPOSED WETLAND PROFILES AND SECTIONS

DWG. NO.: C-445

CREATED: 7/1/21

25 of 41

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\409_PROFILE AND SECTIONS-WETLAND.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:29 AM

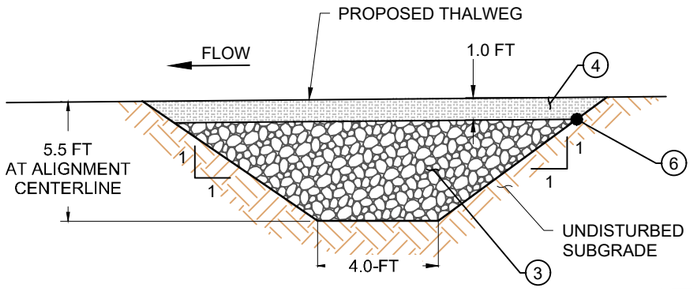


A - PROPOSED FILL TYPICAL SECTION

NTS

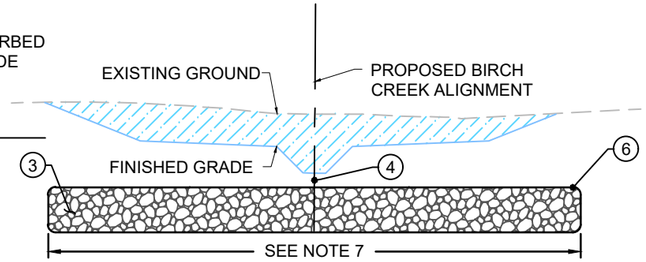
NOTES:

1. DAYLIGHT PROPOSED FINISH GRADE TO MATCH EXISTING GROUND.
2. PROTECT EXISTING MATURE VEGETATION.
3. PROPOSED GRADE STABILIZATION MATERIAL. SEE SECTION 35 49 50 IN THE SPECIFICATIONS FOR MATERIAL SIZE AND GRADATION.
4. TOP 1-FT OF THE PROPOSED GRADE STABILIZATION MEASURE SHALL MEET THE STREAMBED COBBLE AND SEDIMENT GRADATION REQUIREMENTS IN SECTION 35 49 50 OF THE CONSTRUCTION SPECIFICATIONS.
5. TYPICAL DEPTH FROM OHW TO THALWEG VARIES BETWEEN 3-FT TO 5-FT IN PROPOSED RIFFLES AND 4 -FT TO 8-FT IN POOLS.
6. GRADE STABILIZATION MEASURES DEPTH IS BASED ON PROPOSED PROFILE ELEVATIONS AT THE PROPOSED BIRCH CREEK ALIGNMENT CENTERLINE. THE ELEVATION OF THE STABILIZATION MEASURES SHALL BE CONSTANT ACROSS THE ENTIRE WIDTH OF GRADE STABILIZATION MEASURE.
7. SEE SHEETS C-411 TO C-412 FOR LENGTH OF GRADE STABILIZATION MEASURES.



GRADE STABILIZATION TYPICAL DETAIL - PROFILE VIEW

NTS

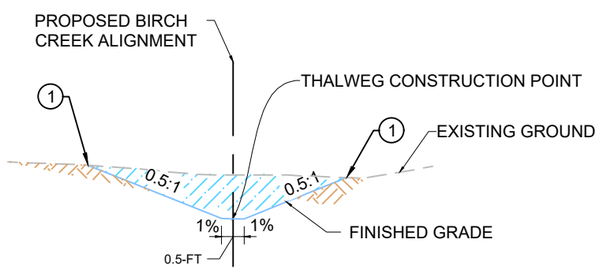


GRADE STABILIZATION TYPICAL DETAIL - CROSS SECTION VIEW

NTS

C - PROPOSED CHANNEL GRADE STABILIZATION MEASURES

NTS

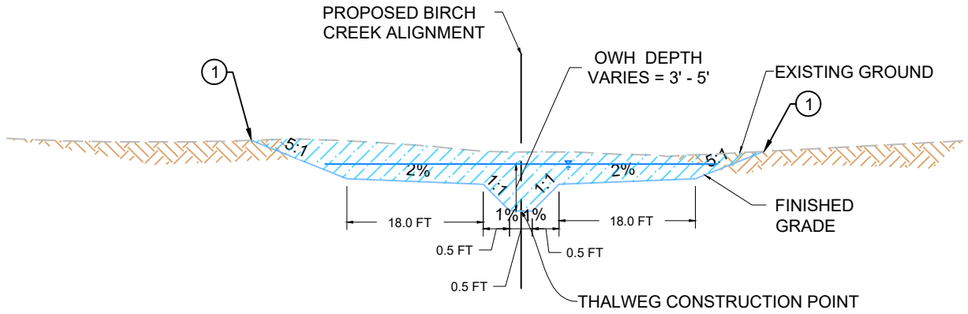


F - PROPOSED CHANNEL REALIGNMENT TYPICAL PILOT CHANNEL SECTION

NTS

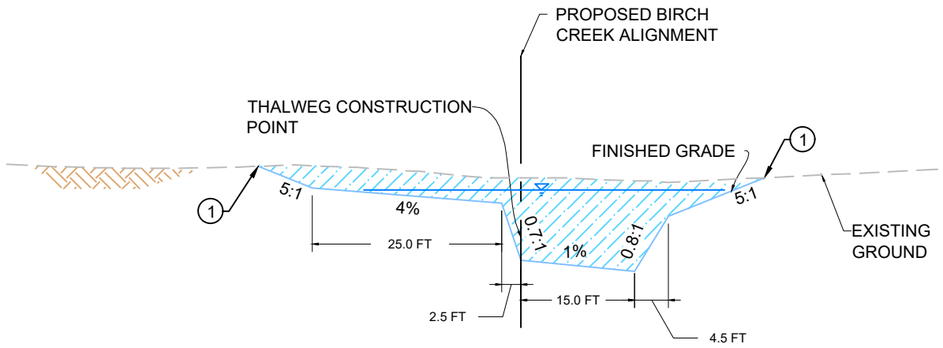
LEGEND

- EXISTING GROUND
- EXISTING OHW
- FINISHED GRADE
- PROPOSED OHW
- EXISTING UNDISTURBED SOIL
- PROPOSED CHANNEL FILL
- PROPOSE NEW CHANNEL EXCAVATION
- GRADE STABILIZATION MATERIAL
- PROPOSED STREAMBED



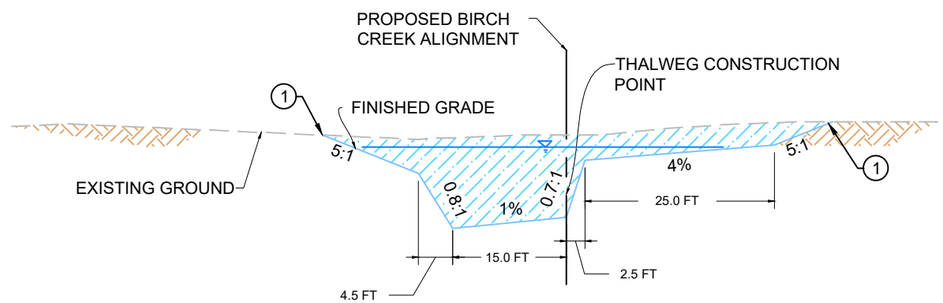
B - PROPOSED NEW CHANNEL TYPICAL RIFFLE SECTION

SCALE 1"= 20', 1H:2V



D - PROPOSED NEW CHANNEL TYPICAL POOL RIGHT SECTION

SCALE 1"= 20', 1H:2V



G - PROPOSED NEW CHANNEL TYPICAL POOL LEFT SECTION

SCALE 1"= 20', 1H:2V

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REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JUL. 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PROPOSED TYPICAL SECTIONS

DWG. NO.: C-451

CREATED: 7/1/21

26 of 41

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\410_TYPICAL_SECTIONS.DWG
PLOT DETAILS: ANDREWS, JEREMY
June 30, 2021
8:38 AM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
201	721914.0FT	8621182.1FT	1027.1FT	THALWEG
202	721688.5FT	8621357.6FT	1029.5FT	THALWEG
203	721554.2FT	8621420.2FT	1030.9FT	THALWEG
204	721554.0FT	8621557.1FT	1032.1FT	THALWEG
205	721409.4FT	8621606.4FT	1033.4FT	THALWEG
206	721392.3FT	8621601.0FT	1033.4FT	THALWEG
207	721185.4FT	8621998.3FT	1037.2FT	THALWEG
208	720956.7FT	8622274.7FT	1039.4FT	THALWEG
209	720912.4FT	8622295.6FT	1039.7FT	THALWEG
210	720884.3FT	8622300.1FT	1036.9FT	THALWEG
211	720814.5FT	8622282.9FT	1037.2FT	THALWEG
212	720783.7FT	8622258.1FT	1040.4FT	THALWEG
213	720688.9FT	8622166.5FT	1041.1FT	THALWEG
214	720655.6FT	8622145.3FT	1038.3FT	THALWEG
215	720599.9FT	8622133.1FT	1038.5FT	THALWEG
216	720564.4FT	8622137.4FT	1041.7FT	THALWEG
217	720463.9FT	8622178.5FT	1042.3FT	THALWEG
218	720434.5FT	8622199.7FT	1039.5FT	THALWEG
219	720396.1FT	8622264.3FT	1039.8FT	THALWEG
220	720392.3FT	8622313.1FT	1043.1FT	THALWEG

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
221	720398.1FT	8622357.0FT	1043.3FT	THALWEG
222	720403.1FT	8622405.2FT	1040.5FT	THALWEG
223	720399.4FT	8622446.8FT	1040.7FT	THALWEG
224	720389.2FT	8622482.7FT	1043.9FT	THALWEG
225	720337.0FT	8622574.4FT	1044.4FT	THALWEG
226	720316.9FT	8622613.4FT	1041.7FT	THALWEG
227	720299.3FT	8622690.9FT	1042.1FT	THALWEG
228	720297.8FT	8622736.9FT	1045.3FT	THALWEG
229	720295.1FT	8622825.1FT	1045.7FT	THALWEG
230	720296.5FT	8622863.2FT	1042.9FT	THALWEG
231	720317.5FT	8622916.3FT	1043.2FT	THALWEG
232	720337.7FT	8622945.2FT	1046.4FT	THALWEG
233	720378.1FT	8623003.4FT	1046.7FT	THALWEG
234	720391.2FT	8623034.2FT	1043.9FT	THALWEG
235	720366.5FT	8623131.6FT	1044.4FT	THALWEG
236	720334.0FT	8623155.6FT	1047.6FT	THALWEG
237	720251.0FT	8623159.3FT	1048.0FT	THALWEG
238	720227.0FT	8623150.3FT	1045.1FT	THALWEG
239	720171.2FT	8623142.5FT	1045.4FT	THALWEG
240	720138.0FT	8623150.0FT	1048.6FT	THALWEG

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
241	719978.3FT	8623217.2FT	1049.4FT	THALWEG
242	719954.7FT	8623250.0FT	1046.6FT	THALWEG
243	719942.7FT	8623337.2FT	1047.0FT	THALWEG
244	719959.8FT	8623380.3FT	1050.2FT	THALWEG
245	720030.2FT	8623455.4FT	1050.7FT	THALWEG
246	720049.9FT	8623484.9FT	1047.9FT	THALWEG
247	720062.1FT	8623556.9FT	1048.3FT	THALWEG
248	720049.6FT	8623599.2FT	1051.5FT	THALWEG
249	719998.7FT	8623655.5FT	1051.8FT	THALWEG
251	719964.1FT	8623670.1FT	1048.3FT	THALWEG
252	722095.6FT	8620842.9FT	1020.2FT	THALWEG
253	722081.8FT	8620860.3FT	1021.2FT	THALWEG
254	722005.6FT	8620992.5FT	1023.4FT	THALWEG
255	721929.9FT	8621129.6FT	1025.0FT	THALWEG
256	721923.2FT	8621233.3FT	1026.0FT	THALWEG
257	721922.6FT	8621302.2FT	1026.0FT	THALWEG
258	721924.4FT	8621377.7FT	1024.0FT	THALWEG
259	722091.7FT	8620867.4FT	1022.8FT	DAYLIGHT
260	722069.8FT	8620851.9FT	1022.9FT	DAYLIGHT
261	722021.0FT	8620994.0FT	1024.9FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
262	721995.5FT	8620978.9FT	1025.1FT	DAYLIGHT
263	721956.8FT	8621131.3FT	1027.3FT	DAYLIGHT
264	721916.0FT	8621127.2FT	1026.7FT	DAYLIGHT
265	721944.0FT	8621235.9FT	1028.0FT	DAYLIGHT
266	721907.3FT	8621233.7FT	1027.8FT	DAYLIGHT
267	721940.3FT	8621302.3FT	1027.8FT	DAYLIGHT
268	721902.6FT	8621304.6FT	1027.9FT	DAYLIGHT
269	721907.7FT	8621375.6FT	1025.9FT	DAYLIGHT
270	721929.8FT	8621376.0FT	1025.3FT	DAYLIGHT
271	721869.9FT	8621452.0FT	1031.0FT	DAYLIGHT
272	721891.4FT	8621472.9FT	1026.0FT	THALWEG
273	721907.6FT	8621481.0FT	1029.0FT	DAYLIGHT
274	721845.4FT	8621498.3FT	1033.0FT	DAYLIGHT
275	721851.1FT	8621519.4FT	1035.0FT	TOP
276	721899.5FT	8621555.1FT	1037.4FT	DAYLIGHT
277	721796.4FT	8621554.2FT	1034.1FT	DAYLIGHT
278	721818.6FT	8621571.3FT	1025.7FT	THALWEG
279	721852.1FT	8621604.4FT	1034.9FT	DAYLIGHT
280	721781.9FT	8621631.7FT	1026.2FT	DAYLIGHT
281	721803.2FT	8621670.7FT	1037.0FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
282	721715.7FT	8621673.4FT	1035.2FT	DAYLIGHT
283	721732.5FT	8621676.4FT	1037.0FT	TOP
284	721775.3FT	8621721.2FT	1038.9FT	DAYLIGHT
285	721700.1FT	8621749.4FT	1029.0FT	DAYLIGHT
286	721725.1FT	8621749.7FT	1037.0FT	DAYLIGHT
287	721564.7FT	8621848.1FT	1028.6FT	DAYLIGHT
288	721550.9FT	8621859.4FT	1037.0FT	TOP
289	721520.0FT	8621964.5FT	1037.0FT	DAYLIGHT
290	721506.8FT	8621951.3FT	1029.2FT	DAYLIGHT
291	721504.4FT	8621948.9FT	1029.6FT	DAYLIGHT
292	721482.2FT	8621947.5FT	1039.0FT	TOP
293	721473.7FT	8621938.3FT	1039.3FT	DAYLIGHT
294	721373.1FT	8622019.3FT	1042.1FT	DAYLIGHT
295	721383.2FT	8622026.0FT	1042.0FT	TOP
296	721399.1FT	8622039.9FT	1031.7FT	DAYLIGHT
297	721403.2FT	8622046.0FT	1030.7FT	DAYLIGHT
298	721417.4FT	8622059.3FT	1040.0FT	TOP
299	721327.0FT	8622104.5FT	1041.0FT	DAYLIGHT
300	721330.0FT	8622107.6FT	1041.0FT	TOP
301	721369.9FT	8622164.7FT	1044.8FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
302	721293.4FT	8622229.8FT	1041.0FT	DAYLIGHT
303	721275.1FT	8622181.8FT	1028.7FT	DAYLIGHT
304	721226.6FT	8622186.9FT	1037.8FT	DAYLIGHT
305	721236.9FT	8622197.7FT	1031.7FT	DAYLIGHT
306	721154.1FT	8622336.9FT	1041.1FT	DAYLIGHT
307	721166.1FT	8622339.4FT	1040.0FT	TOP
308	721180.3FT	8622341.2FT	1032.9FT	DAYLIGHT
309	721147.6FT	8622398.1FT	1040.1FT	DAYLIGHT
310	721152.5FT	8622400.1FT	1040.0FT	TOP
311	721162.3FT	8622408.3FT	1033.6FT	DAYLIGHT
312	721078.1FT	8622486.1FT	1041.1FT	DAYLIGHT
313	721100.6FT	8622491.8FT	1040.0FT	TOP
314	721104.0FT	8622503.0FT	1035.1FT	DAYLIGHT
315	721079.5FT	8622502.5FT	1036.0FT	DAYLIGHT
316	721062.4FT	8622553.4FT	1034.9FT	DAYLIGHT
317	721041.3FT	8622561.6FT	1040.0FT	TOP
318	721037.7FT	8622562.9FT	1040.2FT	DAYLIGHT
319	721011.7FT	8622653.2FT	1035.7FT	THALWEG
320	720991.7FT	8622643.9FT	1043.0FT	TOP
321	720985.9FT	8622641.7FT	1044.0FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
322	720952.6FT	8622684.5FT	1043.3FT	DAYLIGHT
323	720959.1FT	8622688.2FT	1045.1FT	TOP
324	720997.2FT	8622729.7FT	1047.2FT	DAYLIGHT
325	720964.2FT	8622775.1FT	1046.0FT	DAYLIGHT
326	720933.8FT	8622772.3FT	1037.1FT	DAYLIGHT
327	720925.9FT	8622755.3FT	1037.0FT	DAYLIGHT
328	720905.6FT	8622747.1FT	1044.0FT	DAYLIGHT
329	720847.1FT	8622837.3FT	1043.4FT	DAYLIGHT
332	720880.3FT	8622866.3FT	1041.1FT	DAYLIGHT
333	720884.4FT	8622876.2FT	1043.6FT	DAYLIGHT
334	720783.3FT	8622900.3FT	1045.0FT	DAYLIGHT
335	720790.1FT	8622902.6FT	1046.0FT	TOP
336	720837.8FT	8622945.0FT	1047.2FT	DAYLIGHT
337	720735.4FT	8622971.9FT	1045.1FT	DAYLIGHT
338	720744.1FT	8622978.3FT	1045.0FT	TOP
339	720757.0FT	8622983.3FT	1038.4FT	THALWEG
340	720782.1FT	8623007.1FT	1042.0FT	DAYLIGHT
341	720796.2FT	8623001.1FT	1047.0FT	DAYLIGHT
342	720678.0FT	8623064.2FT	1042.1FT	DAYLIGHT
343	720683.2FT	8623065.8FT	1042.0FT	TOP

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
344	720685.1FT	8623076.1FT	1038.2FT	DAYLIGHT
345	720614.9FT	8623128.5FT	1044.0FT	DAYLIGHT
346	720621.2FT	8623142.1FT	1040.9FT	THALWEG
347	720626.4FT	8623166.6FT	1049.0FT	TOP
348	720667.0FT	8623173.4FT	1044.6FT	DAYLIGHT
349	720612.5FT	8623243.7FT	1049.9FT	DAYLIGHT
350	720562.0FT	8623196.4FT	1048.0FT	DAYLIGHT
351	720559.3FT	8623195.9FT	1047.2FT	DAYLIGHT
352	720513.3FT	8623293.6FT	1041.0FT	DAYLIGHT
353	720543.8FT	8623306.5FT	1049.0FT	DAYLIGHT
354	720403.3FT	8623438.5FT	1045.0FT	DAYLIGHT
355	720294.2FT	8623518.7FT	1052.0FT	DAYLIGHT
356	720338.7FT	8623520.8FT	1052.0FT	TOP
357	720355.8FT	8623525.7FT	1043.2FT	DAYLIGHT
358	720217.8FT	8623584.0FT	1052.8FT	DAYLIGHT
359	720260.4FT	8623592.1FT	1046.0FT	THALWEG
360	720323.2FT	8623590.0FT	1044.0FT	DAYLIGHT
361	720314.0FT	8623616.9FT	1053.0FT	DAYLIGHT
362	720174.4FT	8623653.5FT	1054.0FT	DAYLIGHT
363	720179.1FT	8623656.0FT	1053.6FT	TOP

TETRA TECH
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19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL 12 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

CONSTRUCTION POINT DATA TABLES

DWG. NO.: C-461

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\410.1_POINT TABLES.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:29 AM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
364	720279.7FT	8623762.4FT	1057.7FT	DAYLIGHT
365	720072.4FT	8623685.3FT	1054.7FT	DAYLIGHT
366	720077.0FT	8623698.1FT	1058.0FT	TOP
367	720091.0FT	8623713.8FT	1058.0FT	TOP
368	720115.7FT	8623752.8FT	1046.0FT	THALWEG
369	720141.4FT	8623754.1FT	1054.0FT	TOP
370	720120.6FT	8623777.6FT	1049.1FT	DAYLIGHT
371	720089.7FT	8623817.2FT	1057.1FT	DAYLIGHT
372	720086.8FT	8623799.7FT	1057.0FT	TOP
373	719990.8FT	8623823.4FT	1050.0FT	THALWEG
374	720025.6FT	8623889.6FT	1057.0FT	TOP
375	719966.4FT	8623787.9FT	1057.0FT	TOP
376	719901.1FT	8623715.5FT	1057.0FT	TOP
377	719887.7FT	8623688.3FT	1049.4FT	DAYLIGHT
378	719984.7FT	8623666.9FT	1048.1FT	DAYLIGHT
379	719978.3FT	8623651.9FT	1048.3FT	DAYLIGHT
380	719971.3FT	8623628.8FT	1054.7FT	DAYLIGHT
381	719874.9FT	8623664.2FT	1049.7FT	DAYLIGHT
382	719865.7FT	8623650.2FT	1053.0FT	DAYLIGHT
383	719798.8FT	8623857.9FT	1053.0FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
384	719814.5FT	8623851.4FT	1049.9FT	DAYLIGHT
385	719839.5FT	8623850.9FT	1051.0FT	DAYLIGHT
386	719862.3FT	8623842.4FT	1057.0FT	TOP
387	719951.5FT	8623870.0FT	1057.0FT	TOP
388	719982.8FT	8623874.4FT	1049.1FT	THALWEG
389	719957.5FT	8623938.7FT	1050.0FT	DAYLIGHT
390	719899.2FT	8623987.3FT	1051.0FT	DAYLIGHT
391	719873.1FT	8623957.9FT	1057.0FT	TOP
392	719858.6FT	8623997.3FT	1047.1FT	DAYLIGHT
393	719830.7FT	8624001.3FT	1050.3FT	DAYLIGHT
394	719819.1FT	8624002.7FT	1053.0FT	TOP
395	719816.3FT	8623998.2FT	1053.0FT	DAYLIGHT
396	721902.7FT	8621095.8FT	1031.8FT	TOE
397	721766.7FT	8621104.5FT	1032.6FT	TOP
398	721657.5FT	8621070.9FT	1034.6FT	TOP
399	721560.1FT	8620994.9FT	1036.0FT	TOP
400	720959.9FT	8621378.2FT	1038.6FT	TOE
401	720943.5FT	8621395.4FT	1040.3FT	TOP
402	720865.0FT	8621502.7FT	1040.1FT	TOP
403	720861.2FT	8621509.5FT	1040.4FT	TOP

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
404	721849.3FT	8621063.7FT	1029.0FT	TOE
405	721820.4FT	8621160.5FT	1029.5FT	TOE
406	721761.1FT	8621095.7FT	1032.2FT	TOE
407	721764.2FT	8621143.4FT	1030.9FT	TOE
408	721650.5FT	8621088.9FT	1033.8FT	TOE
409	721666.3FT	8621059.6FT	1033.6FT	TOE
410	721569.6FT	8621054.4FT	1033.6FT	TOE
411	721644.3FT	8620995.2FT	1030.5FT	TOE
412	720931.9FT	8621388.7FT	1039.4FT	TOE
413	720976.3FT	8621448.5FT	1037.5FT	TOE
414	720896.1FT	8621509.2FT	1038.9FT	TOE
415	720861.2FT	8621493.1FT	1039.8FT	TOE
416	721388.8FT	8621629.4FT	1033.5FT	TOE
417	721271.8FT	8621724.9FT	1041.0FT	TOP
418	721239.5FT	8621732.1FT	1041.0FT	TOP
419	721283.2FT	8621791.4FT	1041.0FT	TOP
420	721250.2FT	8621797.2FT	1041.0FT	TOP
421	721331.7FT	8621802.2FT	1038.5FT	TOE
422	721170.1FT	8621822.2FT	1036.9FT	TOE
423	721278.3FT	8621837.6FT	1039.2FT	TOE

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
424	721220.4FT	8621643.2FT	1036.8FT	TOE
425	721184.1FT	8621726.9FT	1038.2FT	TOE
426	721278.1FT	8622105.2FT	1040.9FT	TOE
427	721268.8FT	8622130.0FT	1041.6FT	TOE
428	721267.3FT	8622127.9FT	1042.1FT	TOP
429	721263.0FT	8622124.5FT	1042.2FT	TOP
430	721244.4FT	8622092.6FT	1038.6FT	TOE
431	721167.4FT	8622244.9FT	1041.6FT	TOE
432	721160.1FT	8622237.7FT	1043.0FT	TOP
433	721153.4FT	8622230.2FT	1042.0FT	TOP
434	721130.3FT	8622207.7FT	1038.8FT	TOE
435	721144.6FT	8622362.0FT	1042.1FT	TOE
436	721141.8FT	8622333.7FT	1043.0FT	TOP
437	721102.1FT	8622296.0FT	1043.0FT	TOP
438	721032.6FT	8622328.7FT	1040.4FT	TOE
439	721015.3FT	8622395.9FT	1043.6FT	TOE
440	721018.4FT	8622399.1FT	1044.0FT	TOPE
441	721059.0FT	8622476.8FT	1044.0FT	TOP
442	721064.9FT	8622481.5FT	1042.1FT	TOE
443	720945.7FT	8622667.2FT	1043.6FT	TOE

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
444	720940.5FT	8622665.1FT	1045.0FT	TOP
445	720887.1FT	8622631.9FT	1045.0FT	TOP
446	720877.5FT	8622627.1FT	1044.0FT	TOE
447	720885.8FT	8622547.0FT	1043.7FT	TOE
448	720836.3FT	8622660.6FT	1044.5FT	TOE
449	720854.1FT	8622670.7FT	1046.0FT	TOP
450	720798.2FT	8622672.6FT	1047.0FT	TOP
451	720910.7FT	8622714.4FT	1045.0FT	TOP
452	720915.1FT	8622717.1FT	1043.7FT	TOE
453	720776.5FT	8622619.5FT	1045.4FT	TOE
454	720717.3FT	8622623.8FT	1045.4FT	TOE
455	720729.0FT	8622651.4FT	1048.0FT	TOP
456	720655.9FT	8622695.6FT	1046.5FT	TOE
457	720671.0FT	8622700.2FT	1048.0FT	TOP
458	720762.1FT	8622755.0FT	1047.0FT	GS
459	720816.9FT	8622801.9FT	1046.0FT	TOP
460	720826.3FT	8622800.5FT	1044.6FT	TOE
461	720753.9FT	8622881.2FT	1045.6FT	TOE
462	720685.0FT	8622894.8FT	1049.0FT	TOP
463	720669.5FT	8622879.0FT	1046.8FT	TOE

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
464	720735.1FT	8622938.5FT	1047.0FT	TOP
465	720745.8FT	8622935.7FT	1045.2FT	TOE
466	720686.9FT	8623009.6FT	1046.5FT	TOE
467	720682.3FT	8623005.7FT	1048.0FT	TOP
468	720593.9FT	8622991.5FT	1050.0FT	TOP
469	720582.8FT	8622974.1FT	1048.2FT	TOE
470	720479.1FT	8623012.6FT	1048.4FT	TOE
471	720465.2FT	8623032.6FT	1051.0FT	TOP
472	720449.3FT	8623037.0FT	1051.0FT	TOP
473	720431.1FT	8623044.8FT	1048.3FT	TOE
474	720437.8FT	8622939.2FT	1048.7FT	TOE
475	720403.5FT	8622931.9FT	1048.8FT	TOE
476	720402.9FT	8622968.9FT	1048.5FT	TOE
477	720413.9FT	8622941.9FT	1051.0FT	TOP
478	720402.1FT	8623135.9FT	1048.3FT	TOE
479	720425.0FT	8623150.8FT	1051.0FT	TOP
480	720475.6FT	8623156.9FT	1051.4FT	TOP
481	720538.3FT	8623171.8FT	1049.0FT	TOP
482	720530.0FT	8623189.8FT	1048.1FT	TOE
483	720307.7FT	8623275.2FT	1050.7FT	TOE

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
484	720320.3FT	8623268.7FT	1052.0FT	TOP
485	720377.3FT	8623258.2FT	1052.0FT	TOP
486	720431.1FT	8623293.3FT	1051.0FT	TOP
487	720436.4FT	8623293.9FT	1050.3FT	TOE
488	720369.4FT	8623383.2FT	1051.6FT	TOE
489	720377.2FT	8623388.2FT	1053.0FT	TOP
490	720377.7FT	8623410.7FT	1053.0FT	TOP
491	720395.2FT	8623392.5FT	1051.4FT	TOE
492	720263.7FT	8623442.3FT	1052.0FT	TOE
493	720283.5FT	8623463.8FT	1054.0FT	TOP
494	720302.3FT	8623486.2FT	1052.0FT	TOE
495	720200.8FT	8623515.2FT	1053.3FT	TOE
496	720152.1FT	8623609.5FT	1056.0FT	TOP
497	720212.0FT	8623579.4FT	1053.1FT	TOE
498	720114.3FT	8623562.6FT	1053.9FT	TOE
499	720136.0FT	8623645.8FT	1054.3FT	TOE
500	720056.1FT	8623691.9FT	1057.0FT	TOP
501	720047.5FT	8623692.9FT	1054.9FT	TOE
502	720048.3FT	8623656.8FT	1054.3FT	TOE
503	720083.0FT	8623685.8FT	1055.4FT	TOE

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
504	720924.6FT	8621994.2FT	1042.0FT	DAYLIGHT
505	720929.4FT	8621986.2FT	1037.8FT	TOE
506	720871.6FT	8622435.6FT	1044.1FT	DAYLIGHT
507	720851.9FT	8622445.3FT	1042.0FT	TOE
508	720624.5FT	8622211.9FT	1043.0FT	TOE
509	720467.5FT	8622375.7FT	1045.1FT	TOE
510	720589.1FT	8622372.2FT	1042.0FT	BOTTOM
511	720774.1FT	8622462.5FT	1042.0FT	BOTTOM
512	720532.6FT	8622547.7FT	1044.9FT	BOTTOM
513	720504.6FT	8622693.0FT	1045.0FT	BOTTOM
514	720440.2FT	8622797.0FT	1044.0FT	BOTTOM
515	720504.4FT	8622832.0FT	1046.0FT	BOTTOM
516	720562.4FT	8622874.2FT	1046.0FT	TOE
517	720564.4FT	8622895.0FT	1047.7FT	DAYLIGHT
518	720706.6FT	8622595.9FT	1045.8FT	DAYLIGHT
519	720371.7FT	8622855.2FT	1047.0FT	TOE
520	720269.6FT	8623242.9FT	1050.9FT	DAYLIGHT
521	720236.5FT	8623234.1FT	1049.0FT	TOE
522	720218.9FT	8623386.6FT	1052.0FT	DAYLIGHT
523	720196.3FT	8623343.6FT	1049.0FT	TOE

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Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	PLAN SHEET SIZE ANSI B (11" X 17") REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

CONSTRUCTION POINT DATA TABLES

DWG. NO.: C-462

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\410.1_POINT TABLES.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:30 AM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
524	720175.7FT	8623315.9FT	1047.0FT	BOTTOM
525	720129.4FT	8623286.4FT	1047.0FT	BOTTOM
526	720125.9FT	8623252.1FT	1050.0FT	TOE
527	720043.6FT	8623257.6FT	1051.0FT	TOE
528	720009.7FT	8623276.6FT	1053.0FT	DAYLIGHT
529	720106.6FT	8623409.1FT	1051.0FT	TOE
530	720065.7FT	8623418.4FT	1053.5FT	DAYLIGHT
531	720144.0FT	8623516.9FT	1051.9FT	TOE
532	720140.4FT	8623535.5FT	1053.8FT	DAYLIGHT
533	720110.5FT	8623211.7FT	1052.0FT	DAYLIGHT
534	719901.1FT	8623291.1FT	1053.2FT	DAYLIGHT
535	719897.1FT	8623302.4FT	1051.0FT	BOTTOM
536	719882.4FT	8623348.8FT	1054.8FT	DAYLIGHT
537	719865.9FT	8623351.6FT	1052.0FT	BOTTOM
538	719856.0FT	8623313.7FT	1052.0FT	TOE
539	719851.2FT	8623319.4FT	1054.4FT	DAYLIGHT
540	719813.6FT	8623402.9FT	1053.0FT	TOE
541	719818.6FT	8623405.2FT	1054.9FT	DAYLIGHT
542	719828.7FT	8623387.9FT	1055.2FT	DAYLIGHT
543	719789.4FT	8623442.8FT	1055.6FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
544	719789.0FT	8623437.3FT	1053.0FT	TOE
545	719750.7FT	8623410.5FT	1054.0FT	DAYLIGHT
546	719768.9FT	8623404.0FT	1055.8FT	DAYLIGHT
547	719751.3FT	8623437.8FT	1056.0FT	DAYLIGHT
548	719725.1FT	8623482.7FT	1054.0FT	BOTTOM
549	719687.1FT	8623489.9FT	1056.5FT	DAYLIGHT
550	719683.2FT	8623496.4FT	1054.0FT	TOE
551	719698.2FT	8623528.8FT	1055.0FT	TOE
552	719672.7FT	8623523.5FT	1056.6FT	DAYLIGHT
553	719648.0FT	8623528.7FT	1057.3FT	DAYLIGHT
554	719658.0FT	8623551.9FT	1055.0FT	TOE
555	719666.9FT	8623600.4FT	1056.0FT	TOE
556	719741.0FT	8623556.8FT	1052.5FT	BOTTOM
557	719692.7FT	8623622.3FT	1053.7FT	BOTTOM
558	719604.8FT	8623608.0FT	1054.3FT	BOTTOM
559	719598.4FT	8623673.5FT	1054.8FT	BOTTOM
560	719532.0FT	8623691.5FT	1056.1FT	BOTTOM
561	719485.5FT	8623779.3FT	1055.6FT	BOTTOM
562	719436.6FT	8623851.0FT	1056.8FT	BOTTOM
563	719367.4FT	8623985.8FT	1056.3FT	BOTTOM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
564	719726.9FT	8623739.1FT	1057.1FT	DAYLIGHT
565	719699.4FT	8623749.7FT	1054.7FT	BOTTOM
566	719622.0FT	8623772.9FT	1056.0FT	TOE
567	719597.5FT	8623778.1FT	1058.5FT	DAYLIGHT
568	719706.7FT	8623945.5FT	1058.4FT	DAYLIGHT
569	719731.2FT	8623936.8FT	1056.0FT	BOTTOM
570	719748.4FT	8623966.4FT	1058.7FT	DAYLIGHT
571	719610.9FT	8624074.6FT	1059.6FT	DAYLIGHT
572	719556.9FT	8624125.9FT	1057.0FT	BOTTOM
573	719629.9FT	8624123.0FT	1059.1FT	DAYLIGHT
574	719556.7FT	8623836.1FT	1059.7FT	DAYLIGHT
575	719577.1FT	8623852.3FT	1057.1FT	TOE
576	719674.3FT	8623925.9FT	1057.0FT	TOE
577	719688.2FT	8623925.1FT	1058.4FT	DAYLIGHT
578	719560.5FT	8624034.6FT	1057.0FT	BOTTOM
579	719526.9FT	8624041.8FT	1060.0FT	DAYLIGHT
580	719574.0FT	8623941.6FT	1059.4FT	DAYLIGHT
581	719550.7FT	8623945.3FT	1057.0FT	BOTTOM
582	719454.2FT	8623954.5FT	1058.0FT	TOE
583	719431.0FT	8623945.2FT	1060.5FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
584	719446.4FT	8624135.2FT	1060.3FT	DAYLIGHT
585	719473.6FT	8624079.6FT	1057.9FT	DAYLIGHT
586	719509.1FT	8624053.9FT	1060.1FT	DAYLIGHT
588	720365.8FT	8622666.2FT	1049.3FT	DAYLIGHT
589	720431.9FT	8622574.0FT	1046.0FT	TOE
590	720602.3FT	8622736.7FT	1045.0FT	TOE
591	720464.6FT	8622921.8FT	1048.6FT	DAYLIGHT
592	721703.1FT	8621244.5FT	1031.2FT	DAYLIGHT
593	721707.2FT	8621201.8FT	1030.7FT	DAYLIGHT
594	721699.9FT	8621206.0FT	1027.0FT	TOE
595	721678.9FT	8621231.9FT	1027.0FT	TOE
596	721660.4FT	8621227.9FT	1032.2FT	DAYLIGHT
597	721665.6FT	8621187.1FT	1028.0FT	TOE
598	721651.0FT	8621163.0FT	1033.4FT	DAYLIGHT
599	721645.1FT	8621171.0FT	1033.7FT	DAYLIGHT
600	721636.3FT	8621152.4FT	1029.0FT	TOE
601	721605.9FT	8621160.2FT	1034.0FT	DAYLIGHT
602	721624.1FT	8621122.2FT	1033.6FT	DAYLIGHT
603	721581.7FT	8621110.7FT	1034.0FT	DAYLIGHT
604	721576.0FT	8621111.8FT	1033.8FT	DAYLIGHT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
605	721599.5FT	8621123.8FT	1029.0FT	TOE
606	721555.5FT	8621073.5FT	1033.8FT	DAYLIGHT
607	721563.3FT	8621065.6FT	1028.7FT	TOE
608	721571.2FT	8621057.1FT	1033.7FT	DAYLIGHT
609	721496.8FT	8621074.2FT	1034.0FT	DAYLIGHT
610	721518.5FT	8621093.9FT	1028.9FT	TOE
611	721540.7FT	8621109.0FT	1033.9FT	DAYLIGHT
612	721488.6FT	8621121.5FT	1032.0FT	TOE
613	721481.1FT	8621146.8FT	1033.9FT	DAYLIGHT
614	721471.3FT	8621155.7FT	1034.2FT	DAYLIGHT
615	721466.8FT	8621179.9FT	1032.0FT	TOE
616	721438.2FT	8621214.5FT	1034.7FT	DAYLIGHT
617	721464.6FT	8621223.2FT	1029.7FT	BOTTOM
618	721486.2FT	8621239.2FT	1034.7FT	DAYLIGHT
619	721443.8FT	8621269.5FT	1033.0FT	TOE
620	721386.5FT	8621331.3FT	1036.0FT	DAYLIGHT
621	721410.0FT	8621331.3FT	1030.8FT	TOE
622	721431.4FT	8621353.7FT	1035.9FT	DAYLIGHT
623	721364.7FT	8621327.5FT	1032.5FT	BOTTOM
624	721437.8FT	8621389.9FT	1032.5FT	BOTTOM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
625	721434.5FT	8621476.4FT	1032.9FT	BOTTOM
626	721374.1FT	8621455.6FT	1032.9FT	BOTTOM
627	721383.7FT	8621407.4FT	1032.9FT	BOTTOM
628	721320.4FT	8621401.7FT	1032.9FT	BOTTOM
629	721032.1FT	8621863.5FT	1038.6FT	DAYLIGHT
630	721023.1FT	8621870.4FT	1034.0FT	TOE
631	721012.0FT	8621916.7FT	1036.0FT	TOE
632	721035.6FT	8621927.7FT	1034.0FT	TOE
633	721038.4FT	8621937.5FT	1039.2FT	DAYLIGHT
634	720991.7FT	8621901.8FT	1040.7FT	DAYLIGHT
635	720945.3FT	8621912.9FT	1041.8FT	DAYLIGHT
636	720937.5FT	8621921.3FT	1037.0FT	TOE
637	720914.7FT	8621914.4FT	1042.0FT	DAYLIGHT
638	720980.2FT	8621996.2FT	1038.5FT	BOTTOM
639	720920.3FT	8622024.3FT	1038.5FT	BOTTOM
640	720865.3FT	8622022.7FT	1038.5FT	BOTTOM
641	720864.6FT	8621945.3FT	1038.5FT	BOTTOM
642	720831.7FT	8621890.4FT	1038.5FT	BOTTOM
643	720882.2FT	8621859.0FT	1038.5FT	BOTTOM
644	720796.3FT	8621796.5FT	1038.5FT	BOTTOM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
645	720752.9FT	8621879.4FT	1038.5FT	BOTTOM
646	720776.2FT	8622023.7FT	1038.5FT	BOTTOM
647	720801.4FT	8621962.7FT	1038.5FT	BOTTOM

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REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL. 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

CONSTRUCTION POINT DATA TABLES

DWG. NO.: C-463

CREATED: 7/1/21

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PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:30 AM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
701	722059.5FT	8620931.9FT	-	CHANNEL SPANNER
702	722031.2FT	8620919.4FT	-	CHANNEL SPANNER
703	722044.5FT	8620961.1FT	-	CHANNEL SPANNER
704	722016.6FT	8620949.0FT	-	CHANNEL SPANNER
705	722011.6FT	8621010.2FT	-	CHANNEL SPANNER
706	721991.4FT	8620987.1FT	-	CHANNEL SPANNI
707	721983.0FT	8621026.6FT	-	CHANNEL SPANNER
708	721963.0FT	8621002.9FT	-	CHANNEL SPANNER
709	721945.0FT	8621105.6FT	-	CHANNEL SPANNER
710	721913.4FT	8621101.2FT	-	CHANNEL SPANNER
711	721514.3FT	8621633.9FT	-	11-LOG
712	721403.8FT	8621656.9FT	-	10-LOG
713	721073.8FT	8621370.3FT	-	10-LOG
714	720938.2FT	8621463.5FT	-	10-LOG
715	720933.1FT	8621690.4FT	-	10-LOG
716	721081.5FT	8621743.4FT	-	10-LOG
717	721089.3FT	8621954.6FT	-	10-LOG
718	721272.5FT	8622064.5FT	-	11-LOG
719	721247.6FT	8622100.0FT	-	11-LOG
720	721193.7FT	8622159.9FT	-	11-LOG

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
721	721160.7FT	8622194.1FT	-	11-LOG
722	721130.1FT	8622231.0FT	-	11-LOG
723	721090.4FT	8622266.9FT	-	11-LOG
724	721015.7FT	8622308.4FT	-	10-LOG
725	720851.2FT	8622323.1FT	-	10-LOG
726	720746.5FT	8622281.7FT	-	BANK HABITAT
727	720726.6FT	8622268.1FT	-	BANK HABITAT
728	720720.1FT	8622255.8FT	-	BANK HABITAT
729	720668.6FT	8622122.1FT	-	10-LOG
730	720372.3FT	8622240.3FT	-	10-LOG
731	720424.9FT	8622423.1FT	-	10-LOG
732	720290.6FT	8622619.7FT	-	10-LOG
733	720338.1FT	8622815.7FT	-	BANK HABITAT
734	720349.5FT	8622842.7FT	-	BANK HABITAT
735	720346.5FT	8622874.7FT	-	BANK HABITAT
736	720376.2FT	8622910.7FT	-	BANK HABITAT
737	720283.8FT	8622895.0FT	-	10-LOG
738	720409.9FT	8623063.0FT	-	11-LOG
739	720396.8FT	8623106.6FT	-	11-LOG
740	720366.3FT	8623153.0FT	-	11-LOG

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
741	720288.7FT	8623193.1FT	-	10-LOG
742	719921.7FT	8623262.8FT	-	10-LOG
743	720071.4FT	8623479.7FT	-	11-LOG
744	720083.7FT	8623547.8FT	-	11-LOG
745	720008.6FT	8623672.8FT	-	10-LOG
746	721847.5FT	8621490.6FT	-	DEBRIS JAM
747	721818.9FT	8621533.9FT	-	DEBRIS JAM
748	721726.5FT	8621653.6FT	-	DEBRIS JAM
749	721697.1FT	8621697.8FT	-	DEBRIS JAM
750	721546.9FT	8621911.0FT	-	DEBRIS JAM
751	721336.7FT	8622090.6FT	-	DEBRIS JAM
752	721302.4FT	8622133.3FT	-	DEBRIS JAM
753	721105.5FT	8622506.0FT	-	DEBRIS JAM
754	720958.2FT	8622676.1FT	-	DEBRIS JAM
755	720920.8FT	8622720.4FT	-	DEBRIS JAM
756	720804.7FT	8622887.6FT	-	DEBRIS JAM
757	720772.4FT	8622931.5FT	-	DEBRIS JAM
758	720735.9FT	8623017.9FT	-	DEBRIS JAM
759	720681.1FT	8623091.8FT	-	DEBRIS JAM
760	720568.4FT	8623171.6FT	-	DEBRIS JAM

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
761	720532.8FT	8623207.9FT	-	DEBRIS JAM
762	720485.9FT	8623311.0FT	-	DEBRIS JAM
763	720413.1FT	8623439.3FT	-	DEBRIS JAM
764	720390.6FT	8623478.4FT	-	DEBRIS JAM
765	720363.5FT	8623519.6FT	-	DEBRIS JAM
766	720228.1FT	8623603.9FT	-	DEBRIS JAM
767	720180.0FT	8623629.2FT	-	DEBRIS JAM
768	720154.2FT	8623670.8FT	-	DEBRIS JAM
769	720092.6FT	8623739.4FT	-	CHANNEL SPANNER
770	720104.4FT	8623768.7FT	-	CHANNEL SPANNER
771	720043.2FT	8623767.7FT	-	DEBRIS JAM
772	719999.5FT	8623798.2FT	-	DEBRIS JAM
773	719989.3FT	8623852.2FT	-	DEBRIS JAM
774	719983.1FT	8623881.2FT	-	HABITAT
775	719975.7FT	8623915.7FT	-	HABITAT
776	719984.4FT	8623918.8FT	-	10-LOG
777	719944.4FT	8623949.5FT	-	HABITAT
778	719940.2FT	8623963.2FT	-	HABITAT
779	719924.3FT	8623967.8FT	-	HABITAT
780	719900.8FT	8623986.2FT	-	HABITAT

CONSTRUCTION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
781	719891.7FT	8623996.4FT	-	HABITAT
782	719892.0FT	8624007.0FT	-	HABITAT
783	719881.8FT	8624028.7FT	-	HABITAT

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REGISTERED PROFESSIONAL ENGINEER
91391
OREGON
JULY 12, 2006
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

CONSTRUCTION POINT DATA TABLES

DWG. NO.: C-464

CREATED: 7/1/21

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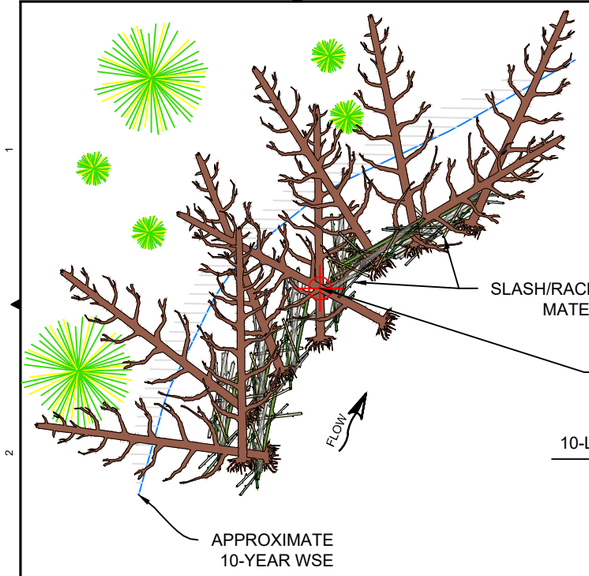
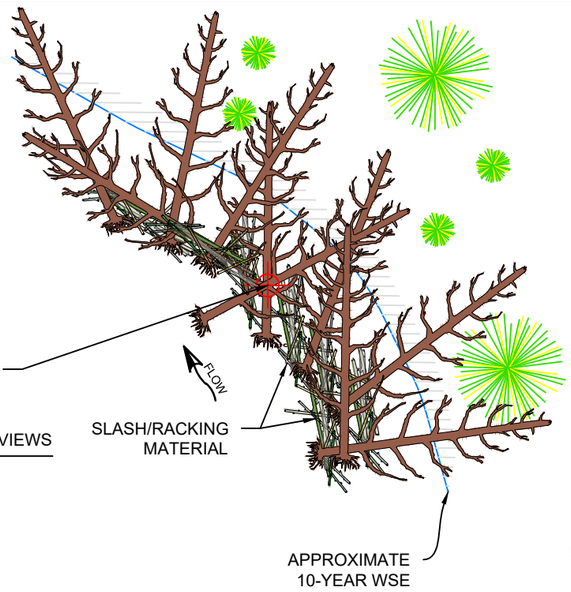
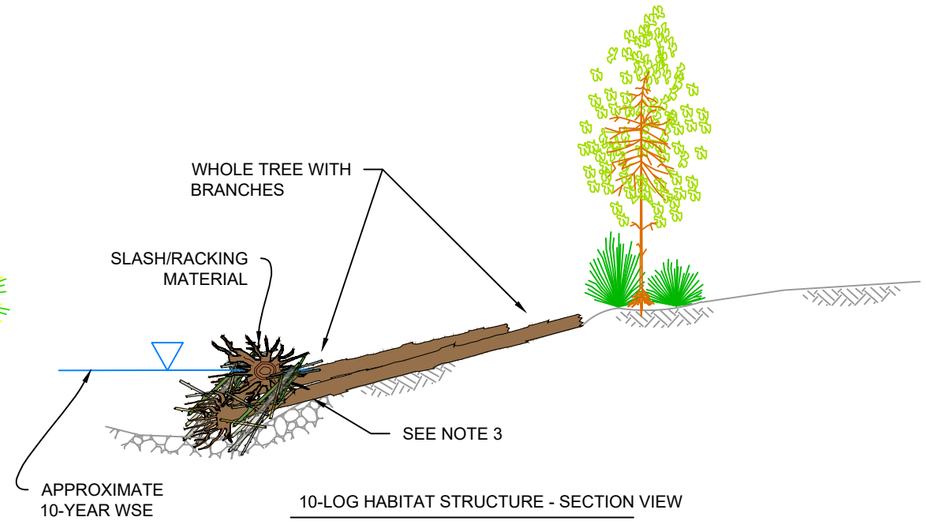
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:31 AM



10-LOG HABITAT STRUCTURE - PLAN VIEWS





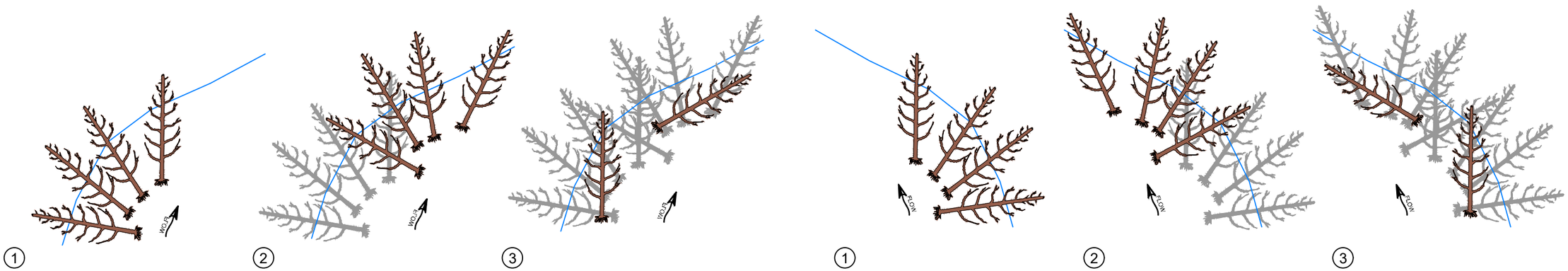
10-LOG HABITAT STRUCTURE - SECTION VIEW

10-LOG HABITAT STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. TO PLACE ROOTWAD IN WETTED CHANNEL, MINIMAL TRENCHING OUTSIDE THE WETTED CHANNEL MAY BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.
4. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES OR PLACED AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
5. APPROXIMATE 10-YEAR WSE WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
6. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	10
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6-16')	44 CY



10-LOG HABITAT STRUCTURE - LOG PLACEMENT SEQUENCING

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www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JUL. 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

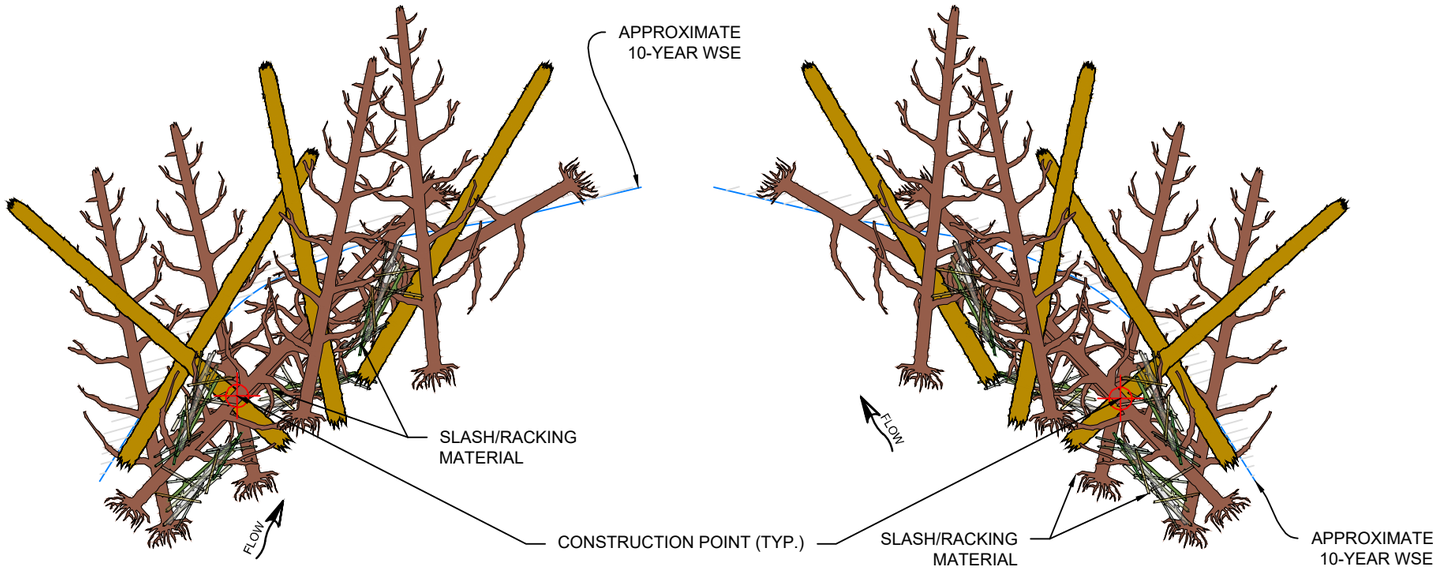
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

DETAILS
10-LOG HABITAT STRUCTURE

DWG. NO.: C-471

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



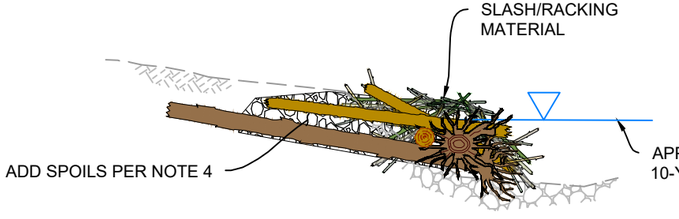
11-LOG BANK HABITAT STRUCTURE - PLAN VIEWS

11-LOG BANK HABITAT STRUCTURE NOTES:

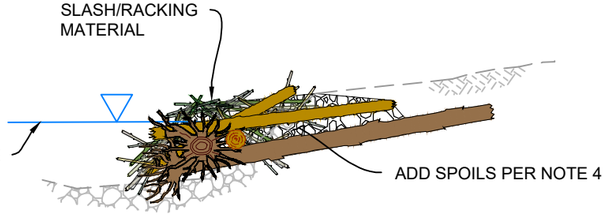
1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. PARTIAL BURIAL OF TREES WILL BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.
4. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES OR AS DIRECTED IN THE FIELD BY ENGINNER OR OWNER'S REPRESENTATIVE. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
5. APPROXIMATE 10-YEAR WSE WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
6. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.

CONSTRUCTION QUANTITIES:

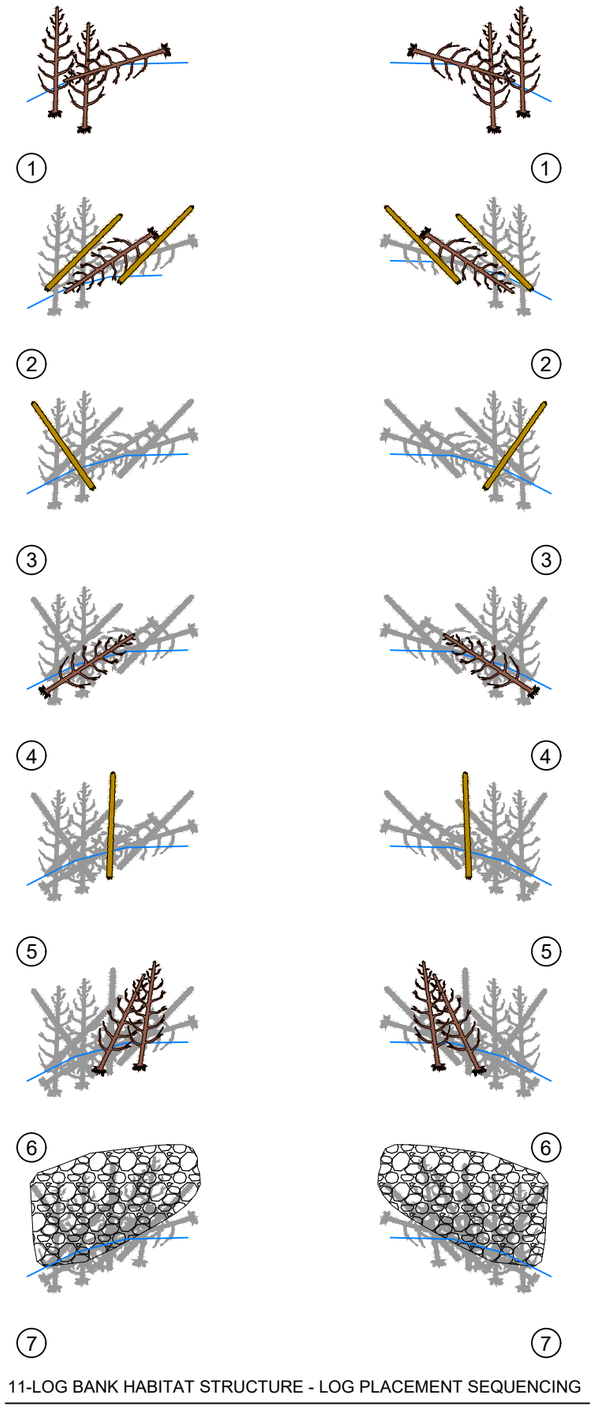
COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	7
LOG W/O ROOTWAD OR BRANCHES	18" MIN. DBH, 40' MIN	4
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6-16')	44 CY
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	65 CY



11-LOG BANK HABITAT STRUCTURE - SECTION VIEW



11-LOG BANK HABITAT STRUCTURE - SECTION VIEW



11-LOG BANK HABITAT STRUCTURE - LOG PLACEMENT SEQUENCING

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
JEREMY S. ANDREWS
91394
OREGON
JUL. 12, 2018
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

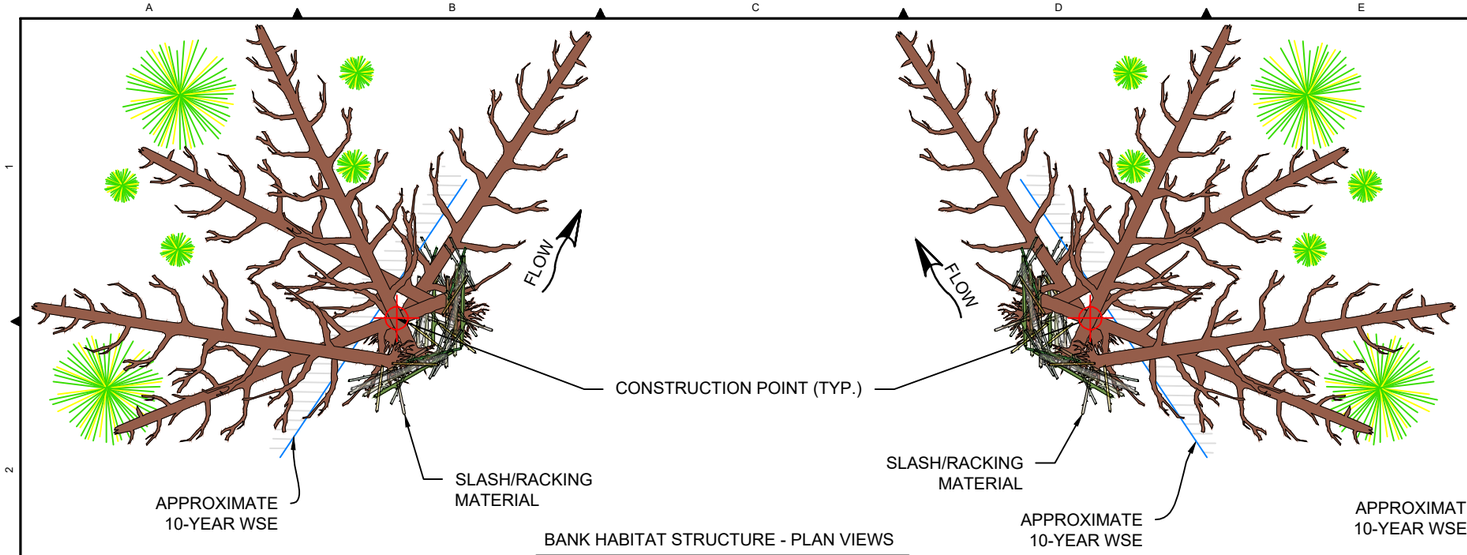
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

DETAILS
11-LOG BANK HABITAT STRUCTURE

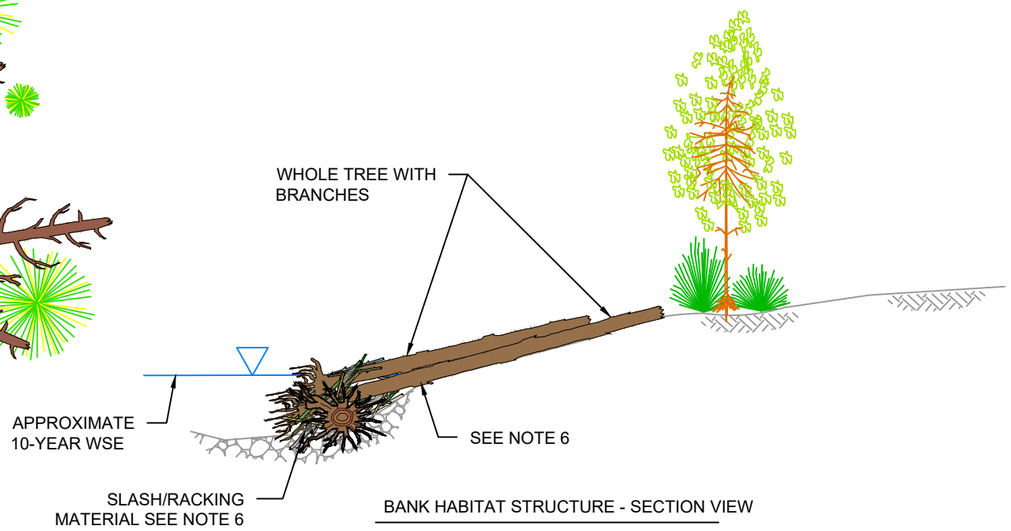
DWG. NO.: C-472

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



BANK HABITAT STRUCTURE - PLAN VIEWS



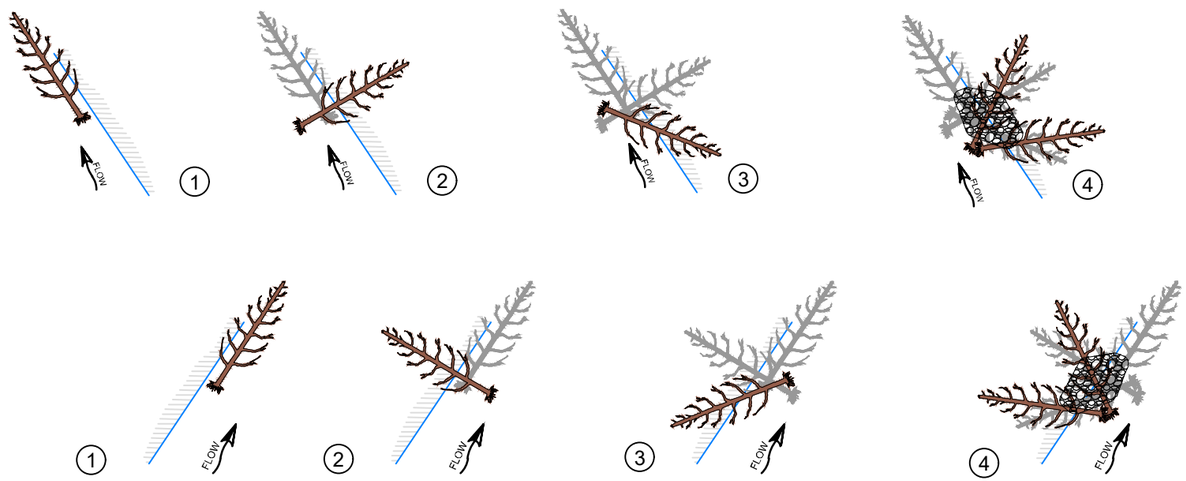
BANK HABITAT STRUCTURE - SECTION VIEW

BANK HABITAT STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES OR PLACED AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
4. APPROXIMATE 10-YEAR WSE WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
5. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.
6. TO PLACE ROOTWAD IN WETTED CHANNEL, MINIMAL TRENCHING OUTSIDE THE WETTED CHANNEL MAY BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	5
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6-16')	20 CY



BANK HABITAT STRUCTURE - LOG PLACEMENT SEQUENCING

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JEREMY S. ANDREWS JUL. 9, 2018 EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

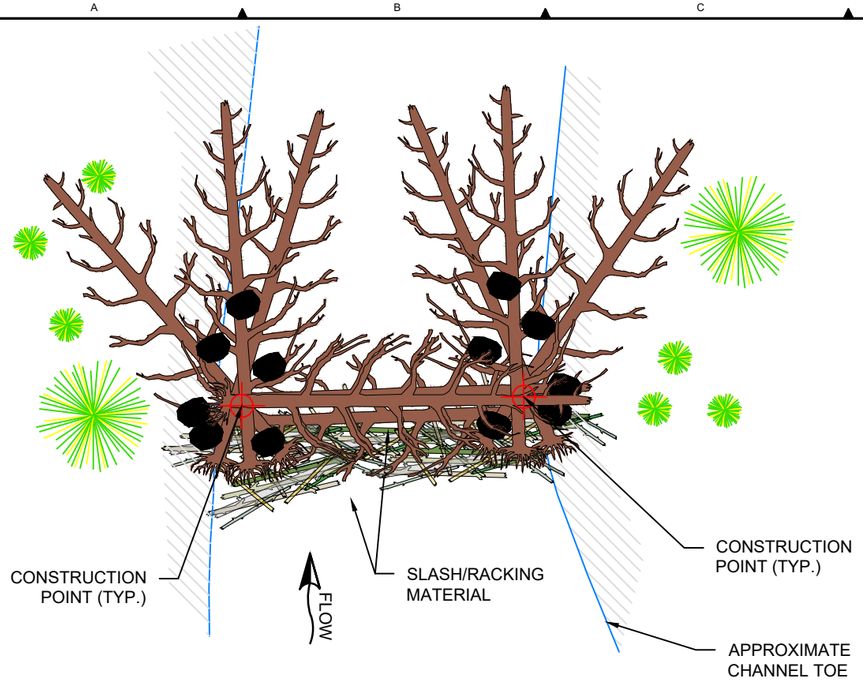
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

DETAILS
BANK HABITAT STRUCTURE

DWG. NO.: C-473

CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



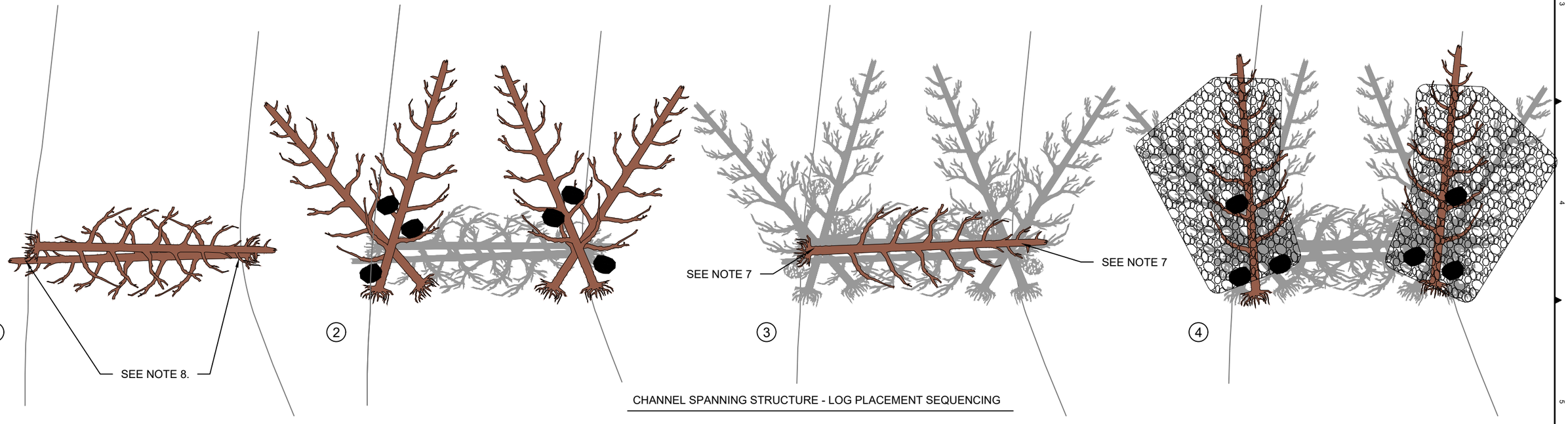
CHANNEL SPANNING STRUCTURE - PLAN VIEW

LWM NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.
4. PARTIAL BURIAL OF TREES WIL BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.
5. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
6. APPROXIMATE 10-YEAR WSE RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
7. FIELD ADJUST LOG OVERLAP LENGTH TO ALLOW FOR LOGS TO BE PLACED IN CHANNEL BOTTOM.

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	9
BOULDER	3' DIA MIN.	12
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6'-16')	20 CY
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	85 CY



CHANNEL SPANNING STRUCTURE - LOG PLACEMENT SEQUENCING

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 9139 OREGON JULY 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

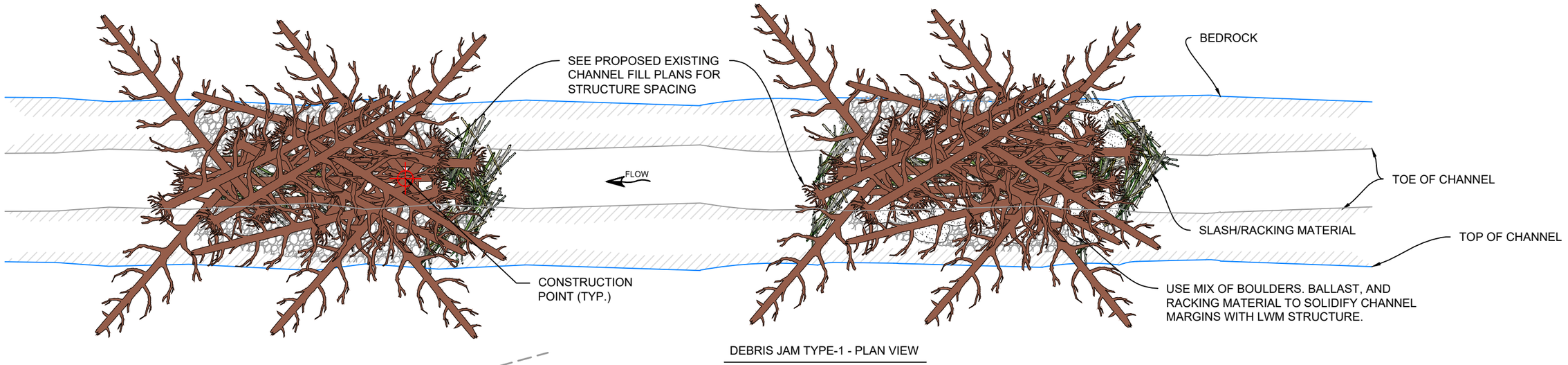
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

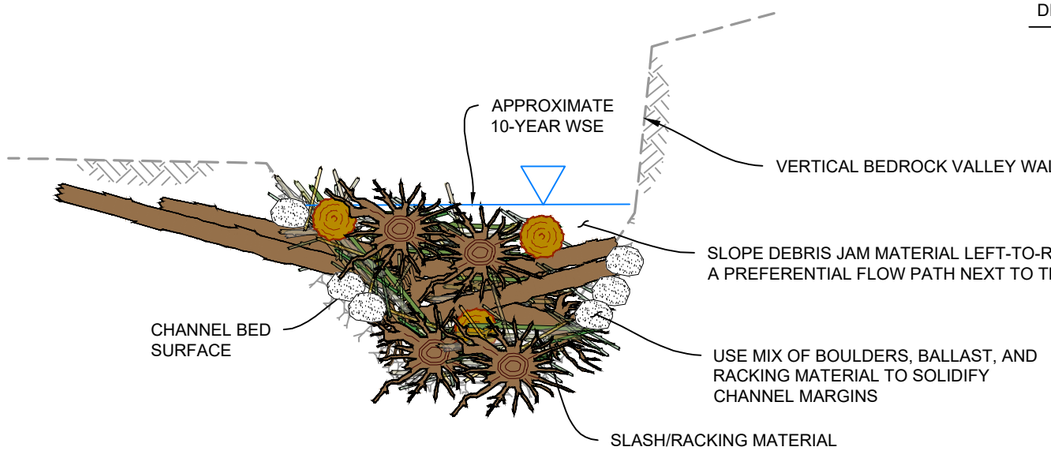
DETAILS
CHANNEL SPANNING STRUCTURE

DWG. NO.: C-474
CREATED: 7/1/21

Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



DEBRIS JAM TYPE-1 - PLAN VIEW



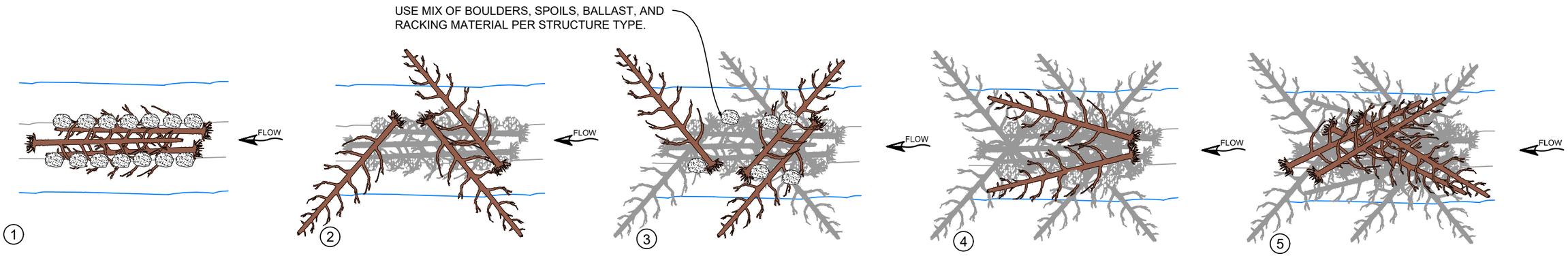
DEBRIS JAM - TYPE 1 (POROUS) - SECTION VIEW

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	15
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6-16')	50 CY
BOULDER	2' DIA.	20
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	90 CY

DEBRIS JAM - TYPE 1 STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. PARTIAL BURIAL OF TREES MAY BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.
4. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
5. WATER SURFACE ELEVATIONS SHOWN WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
6. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES, CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.



TETRA TECH
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REGISTERED PROFESSIONAL ENGINEER 91393 OREGON JULY 12, 2016 JEREMY S. ANDREWS EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

PLAN SHEET SIZE ANSI B (11" X 17")

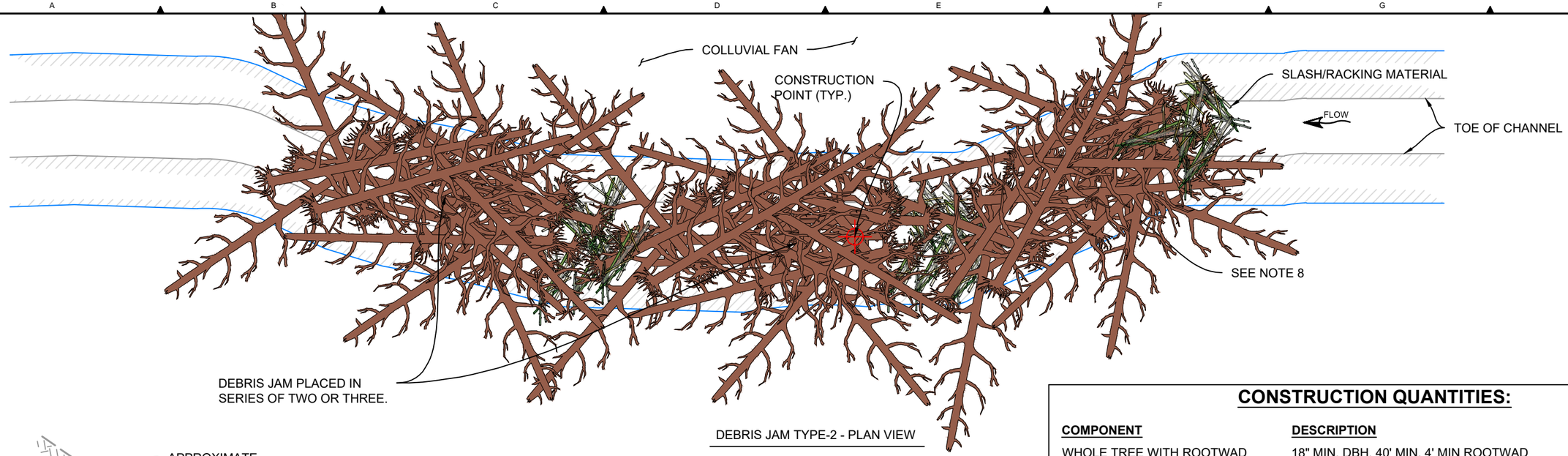
CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

DETAILS
DEBRIS JAM - TYPE 1 STRUCTURE

DWG. NO.: C-475

CREATED: 7/1/21

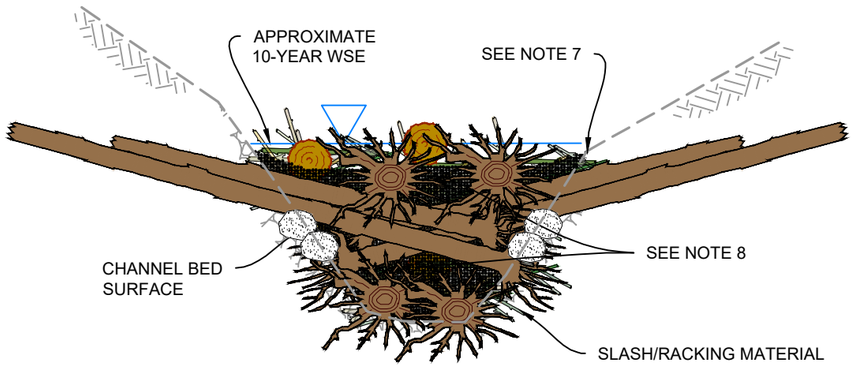
Z:\PROJECTS\194-6817 UMA\BIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



DEBRIS JAM TYPE-2 - PLAN VIEW

CONSTRUCTION QUANTITIES:

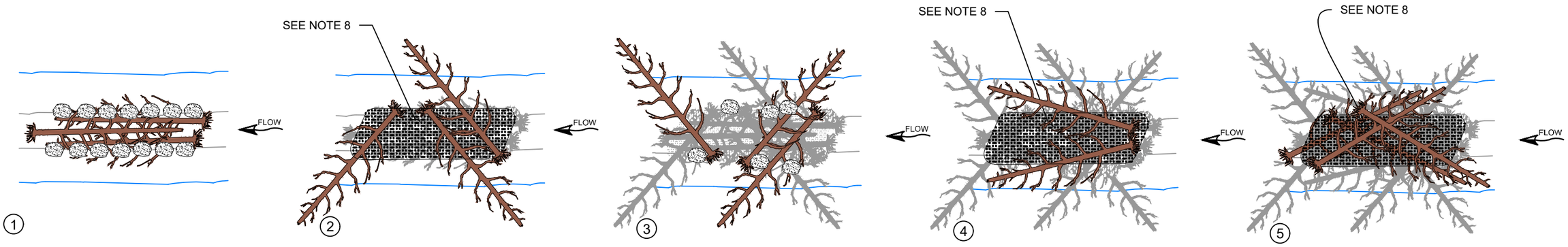
COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	15
SLASH/RACKING MATERIAL	MISC. (4-10" DBH, 8-16')	50 CY
BOULDER	2' DIA.	20
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	100 CY



DEBRIS JAM - TYPE 2 (SOLID) - SECTION VIEW

DEBRIS JAM - TYPE 2 STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. PARTIAL BURIAL OF TREES WILL BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.
4. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
5. WATER SURFACE ELEVATIONS SHOWN WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.
6. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES, CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.
7. STRUCTURE CREST ELEVATIONS TO MATCH EARTHWORK CONSTRUCTION POINTS (E.G. PT #XXX) AND ELEVATIONS SHOWN ON THE PLANS. COORDINATE FINAL STRUCTURE ELEVATION IN THE FIELD WITH OWNER'S REPRESENTATIVE.
8. USE MIX OF BOULDERS, SPOILS, BALLAST, AND SLASH/RACKING MATERIAL TO SOLIDIFY ALL INTERSTITIAL SPACE WITHIN THE LWD STRUCTURE.



TETRA TECH
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REGISTERED PROFESSIONAL ENGINEER 91391 OREGON JUL 12 2005 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

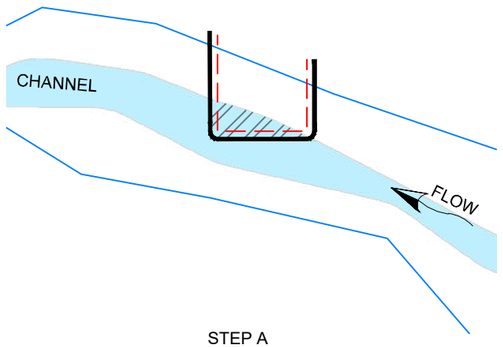
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

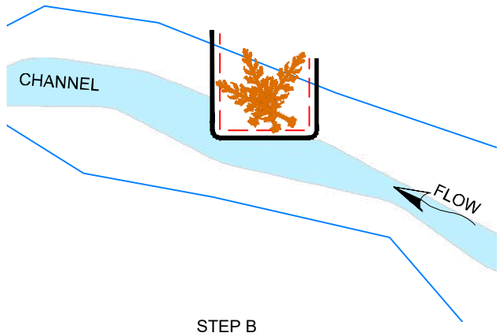
DETAILS
DEBRIS JAM - TYPE 2 STRUCTURE

DWG. NO.: C-476
CREATED: 7/1/21

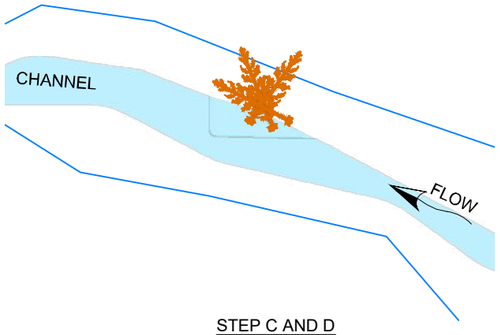
Z:\PROJECTS\194-6817 UMABIRCH IN-STREAM DESIGN\100%\SHEET FILES\411_LWD DETAIL SHEETS.DWG
PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 8:41 AM



STEP A

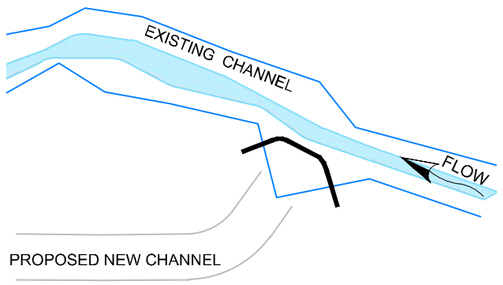


STEP B

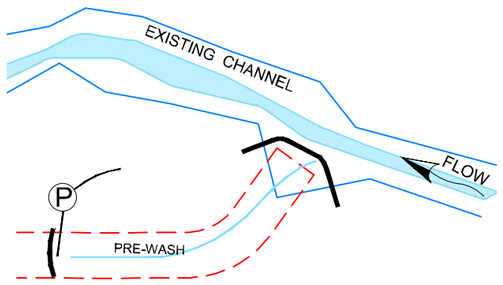


STEP C AND D

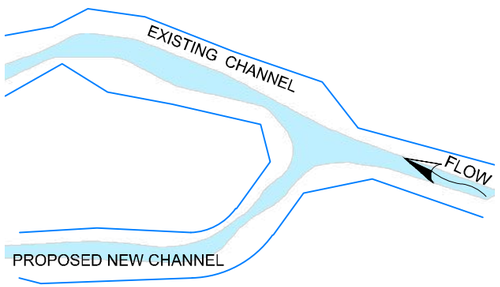
LWM INSTALLATION WITH LOCAL ISOLATION (TYP.)
(NOT TO SCALE)



STEP A



STEP B AND C



STEP D

PROPOSED NEW CHANNEL (TYP.)
(NTS)

GENERAL FISH SALVAGE AND DEWATERING STEPS

CONSTRUCTION SHALL OCCUR IN THE FOLLOWING GENERAL STEPS, WHICH CORRESPOND TO THE STEPS SHOWN ON THIS PLAN SHEET AND IN ACCORDANCE WITH HIP GUIDELINES.

A) ISOLATION AND SALVAGE:
ESTABLISH LIMITS OF EXCAVATION, STAGING AREAS AND ACCESS ROADS. INSTALL AND MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES. ESTABLISH WORK AREA ISOLATION AS SHOWN ON THIS SHEET.

B) DEWATERING AND INSTALLATION:
INSTALL COFFERDAM AND DEWATER ISOLATED WORK AREA. ALL ISOLATION WORK AND DEWATERING ACTIVITIES SHALL BE IN ACCORDANCE WITH HIP GUIDELINES. EXCAVATE AND INSTALL LWM STRUCTURES AS SHOWN ON THE THE CONSTRUCTION PLAN SHEETS AND IN ACCORDANCE WITH PROJECT SPECIFICATIONS.

C) REWATERING:
WHEN NECESSARY PERFORM STAGED REWATERING PROCESS WITH THE RECENTLY EXCAVATED CHANNEL. PREWASH EXCAVATED CHANNEL AND DETAIN AND RELEASE TURBID WATER TO THE FLOODPLAIN RATHER THAN FISH BEARING WATER.

D) SITE RESTORATION:
STREAMBANKS AND DISTURB AREA SHALL BE RESTORED AS NECESSARY USING ONSITE NATIVE MATERIAL AND ALL PROJECT WASTE MATERIAL REMOVED.

GENERAL FISH SALVAGE NOTES:

1. PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY OWNER.
2. CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROL PLAN PER PROJECT PLAN AND SPECIFICATIONS.
3. CONTRACTOR TO PROVIDE DEWATERING PLAN PER PROJECT PLANS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL CONSTRUCT THE RESTORATION DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "ISSUED FOR CONSTRUCTION" AS PROVIDED TO THE CONTRACTOR BY THE OWNER PRIOR TO CONSTRUCTION.
5. ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR DURING THE APPROVED WORK WINDOW. ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
6. ALL TEMPORARY ACCESS ROUTES SHALL BE LAID OUT TO MINIMIZE DISTURBANCE TO EXISTING VEGETATION AND FINAL LOCATION WILL BE VERIFIED BY OWNER.
7. ALL EROSION CONTROL MEASURES ARE TO INDICATE WHAT IS EXPECTED IN SIMILAR GEOMORPHIC CONDITIONS. CHANNEL CONDITIONS MAY DIFFER DURING CONSTRUCTION AND FIELD ADJUSTMENT SHALL BE COORDINATED WITH PROJECT OWNER AND SHALL CONFORM TO HIP GUIDELINES.
8. OWNER SHALL BE RESPONSIBLE FOR FISH SALVAGE EFFORTS.
9. CONSTRUCTION WORK IN THE IMMEDIATE VICINITY OF FISH SALVAGE EFFORTS SHALL BE DELAYED (TYPICALLY 2 TO 24 HOURS) DURING SALVAGE. DELAYS MAY BE LONGER IN SOME CASES.

LEGEND:
- TOP OF BANK
- LOW FLOW LINE
- FISH BLOCK NET
- EXCAVATION LIMITS
- FISH SALVAGE AREA
- COFFER DAM
- LWM

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REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JULY 12, 2016
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

FISH SALVAGE, DEWATERING, AND REWATERING DETAILS

DWG. NO.: C-481

CREATED: 7/1/21

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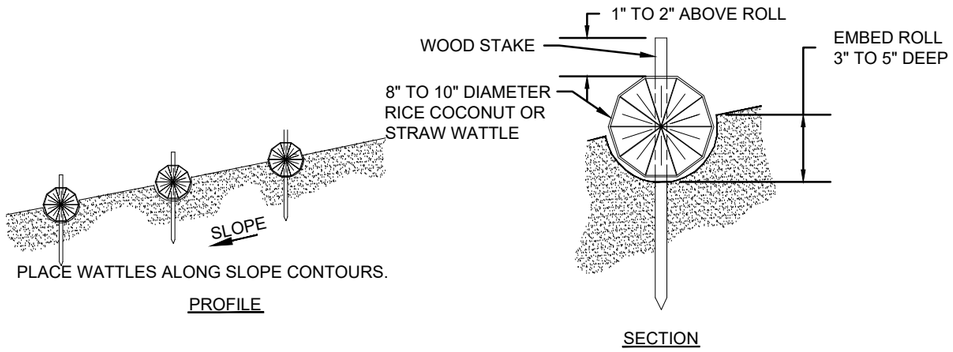
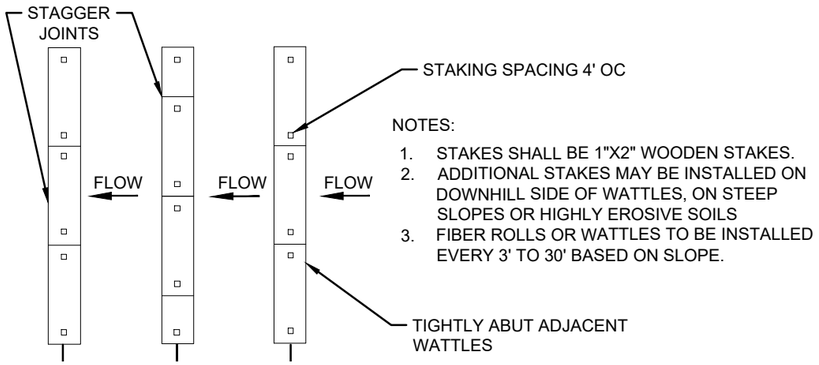
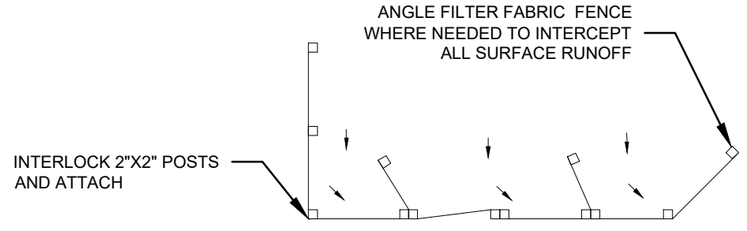




NOTES:
1. STAKES SHALL BE 1"X2" WOODEN STAKES.
2. ADDITIONAL STAKES MAY BE INSTALLED ON DOWNHILL SIDE OF WATTLES, ON STEEP SLOPES OR HIGHLY EROSIVE SOILS
3. FIBER ROLLS OR WATTLES TO BE INSTALLED EVERY 3' TO 30' BASED ON SLOPE.

FIBER ROLLS/WATTLES - TYPICAL DETAIL
NTS



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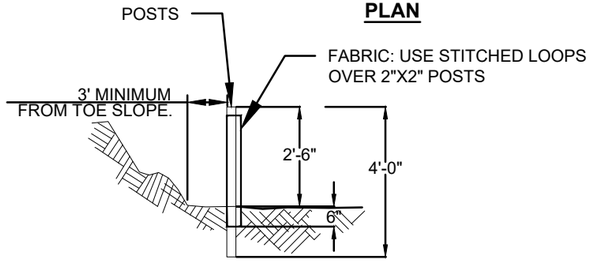

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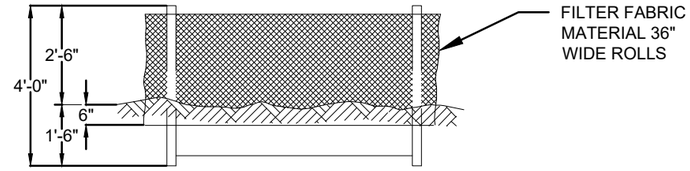
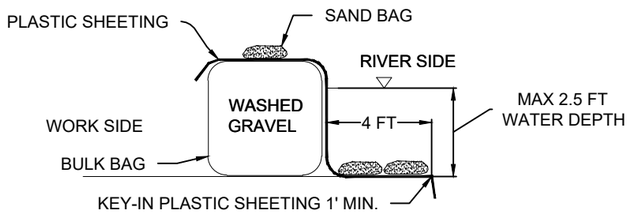


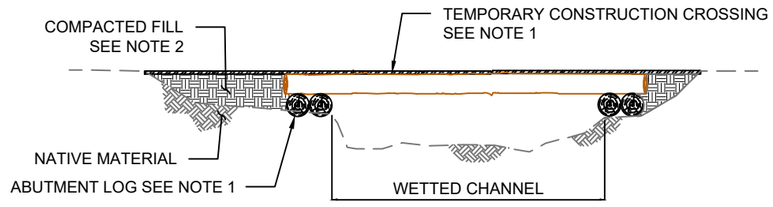
SEDIMENT FENCE NOTES:
1. SEDIMENT FENCE SHALL BE INSTALLED ON A LINE OF EQUAL ELEVATION.
2. BOTTOM EDGE OF SEDIMENT FENCE SHALL BE BURIED MIN 6".
3. POSTS MAY BE 2"X2" FIR, PINE OR STEEL.
4. POSTS TO BE INSTALLED ON UPHILL SIDE OF SLOPE.
5. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
6. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION REACHES 1/3 OF THE MEASURE HEIGHT. SEDIMENT SHALL BE DISPOSED OF TO AN AREA THAT CAN BE PERMANENTLY STABILIZED.

TEMPORARY SILT FENCE TYPICAL DETAIL
NTS



TEMPORARY COFFERDAM SECTION TYPICAL DETAIL
NTS

COFFERDAM NOTES:
1. ALL WORK IN CHANNEL SHALL ONLY OCCUR DURING THE APPLICABLE IN-WATER WORK WINDOWS.
2. IN-WATER WORK AREAS SHALL BE ISOLATED BY COFFERDAMS.
3. ISOLATED AREAS REQUIRE FISH SALVAGE ACTIVITIES PRIOR TO THE INITIATION OF CONSTRUCTION.
4. FISH SALVAGE TO BE PERFORMED BY QUALIFIED FISH BIOLOGIST.
5. FILL BULK BAG WITH WASHED GRAVEL.
6. SAND BAGS, ECO-BLOCKS, OR SIMILAR MAY BE SUBSTITUTED FOR WASHED GRAVEL BULK BAGS.



TEMPORARY CONSTRUCTION CROSSING TYPICAL DETAIL
NTS

TEMPORARY CONSTRUCTION CROSSING NOTES:
1. PLACE TEMPORARY CONSTRUCTION CROSSING. CONTRACTOR TO COORDINATE TEMPORARY CROSSING DIMENSIONS, MATERIAL SIZE, AND LOCATION WITH OWNER'S REPRESENTATIVE.
2. CROSSING MATERIALS AND INSTALLATION SHALL BE COMPLIANT WITH HIP III TERMS AND CONDITIONS
3. COMPACTED FILL MAY BE REQUIRED OUTSIDE OF TEMPORARY CONSTRUCTION CROSSING TO PROVIDE SMOOTH TRANSITION FROM BRIDGE TO EXISTING GROUND. (SHOWN IN SECTION DETAIL)
4. AFTER COMPLETION OF WORK AND REMOVAL OF CROSSING, SUBSOIL SHALL BE RIPPED TO PROVIDE SUITABLE SURFACE FOR PLANTING.

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER 91397 OREGON JULY 12, 2005 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
		PLAN SHEET SIZE ANSI B (11" X 17")				
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

TESC DETAILS

DWG. NO.: C-482

CREATED: 7/1/21

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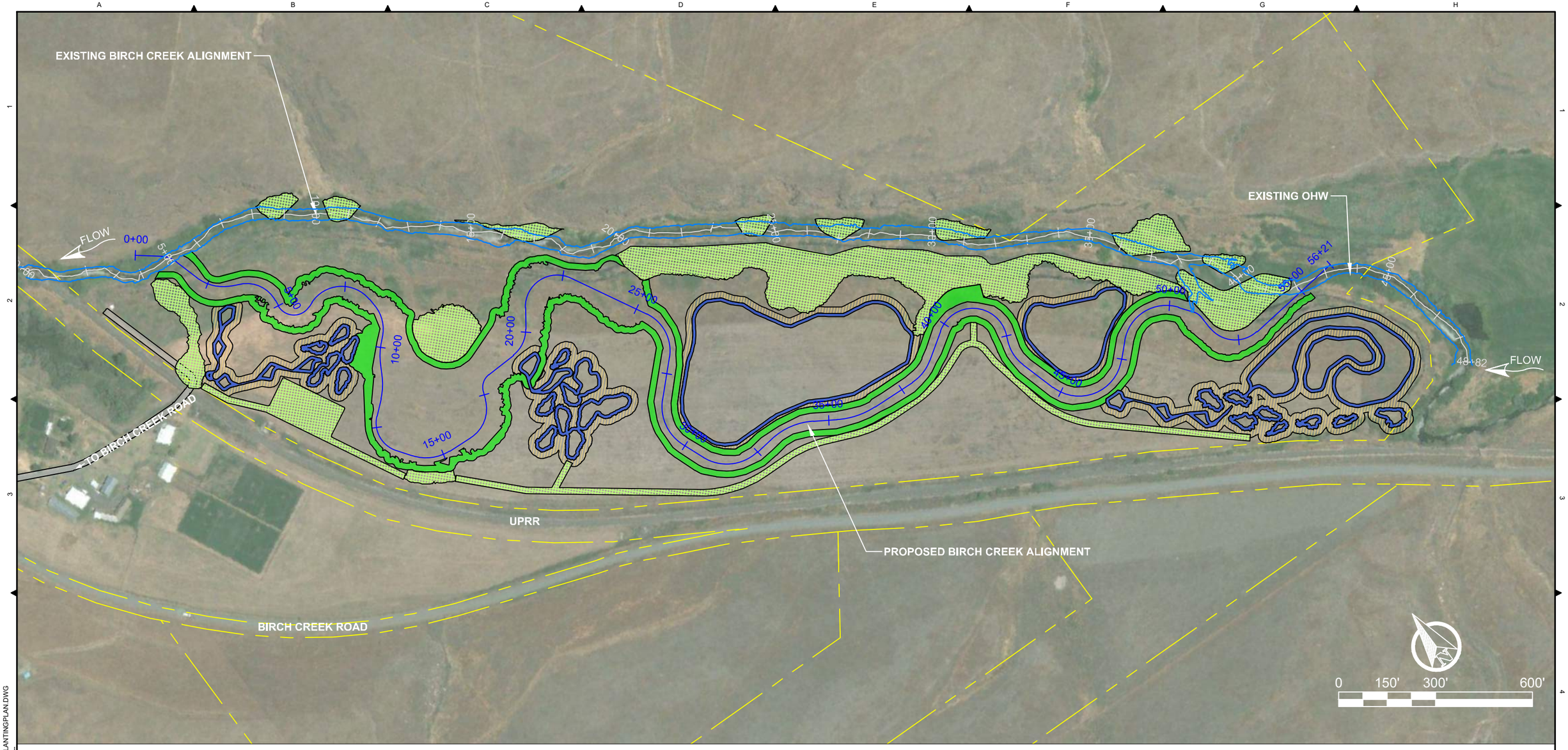

LEGEND

- EXISTING CHANNEL ALIGNMENT
- EXISTING OHW
- PROPERTY BOUNDARY
- PROPOSED CHANNEL ALIGNMENT
- PROPOSED FLOODPLAIN SHRUB PLANTINGS
- PROPOSED UPLAND GRASS PLANTINGS
- PROPOSED RIPARIAN SHRUBS AND GRASS PLANTINGS
- PROPOSED WETLAND PLANTINGS

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REGISTERED PROFESSIONAL ENGINEER
91397
OREGON
JULY 12, 2018
JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

REV.	DATE	PLAN SHEET SIZE ANSI B (11" X 17") REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PLANTING PLAN

DWG. NO.: L-401

CREATED: 7/1/21

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PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 11:15 AM

CRITERIA FOR PLANTING PLAN

1. LOCAL STOCK OF NATIVE SPECIES SHOULD BE USED TO THE EXTENT POSSIBLE BECAUSE THESE STOCKS WOULD BE BEST SUITED TO AND ADAPTED TO LOCAL CONDITIONS.
2. FINAL PLANTING PLANS WILL BE BASED ON THE FINAL CONSTRUCTION DESIGN. FACTORS SUCH AS TOPOGRAPHY DISTANCE TO STREAM CHANNEL AND SIDE CHANNEL SHALL BE TAKEN INTO ACCOUNT. THE FINAL PLANTING PLAN WILL BE INTENDED TO FACILITATE PLANT SURVIVAL AND TO FACILITATE PROJECT GOAL OF IMPROVING AQUATIC AND RIPARIAN HABITAT.
3. TO AUGMENT SURVIVAL OF RIPARIAN PLANTINGS:
   a. FINAL PLACEMENT OF PLANTS SHALL BE CHOSEN BASED ON MICROSITE CONDITIONS, BECAUSE SOIL PROPERTIES AND WATER TABLE DEPTH CAN VARY OVER SHORT DISTANCES, SUCH THAT SPECIES ARE BEST MATCHED TO THEIR SITE CONDITIONS.
   b. SITE PREPARATION, SUCH AS REMOVAL OF WEEDS OR OTHER SPECIES THAT WILL COMPETE WITH SEEDLINGS AND TILLING OF THE SOIL SHALL OCCUR PRIOR TO PLANTING.
   c. IF NECESSARY, SOIL AMENDMENT, SUCH AS FERTILIZER, SHALL BE INCORPORATED PRIOR TO OR DURING PLANTING.
   d. IF NECESSARY, MEASURES SUCH AS TUBING, OR OTHER ANIMAL CONTROL TECHNIQUES, CAN BE UTILIZED TO PROTECT WOODY PLANTS FROM GRAZING/HERBIVORY.
   e. IF POSSIBLE, PLANTS SHALL BE INSTALLED IN THE LATE FALL THROUGH EARLY SPRING TO MINIMIZE THE NEED FOR SUPPLEMENTAL WATER AND TO ALLOW FOR THE OPTION OF USING BARE ROOT PLANT STOCK IF AVAILABLE.

GENERAL PLANTING NOTES

1. IF APPLICABLE, SUPPLEMENTAL FERTILIZER MAY BE ADDED TO THE BOTTOM OF EACH TREE AN SHRUB PLANTING HOLE PRIOR TO PLANTING AND BACKFILLING. IF USED,FERTILIZERS SHALL BE SLOW RELEASE PRODUCTS THAT WILL NOT RESULT IN NUTRIENT RUNOFF INTO AQUATIC SYSTEMS.
2. IF APPLICABLE, ADDITION OF MULCH THREE INCHES DEEP MAY BE PLACED IN AN 18 INCH DIAMETER RING AROUND EACH TREE AND SHRUB TO PREVENT COMPETITION WITH INVASIVE SPECIES.

RIPARIAN PLANTING ZONE EXAMPLE SEQUENCE:

1. SEED BARE SOIL AT APPROXIMATELY 30 LBS/ACRE IN SELECTED AREAS AS NEEDED/DESIRED FOR EROSION CONTROL.
2. INSTALL PLANTS BASED ON MICROSITE VARIATIONS WITHIN RIPARIAN PLANTING ZONE.
3. DEPENDING ON DESIRED DENSITY: TREES SHOULD BE PLANTED 10 TO 18 FEET ON CENTER, SHRUBS SHOULD BE PLANTED AT APPROXIMATELY 4 TO 8 FEET ON CENTER. HOWEVER, FINAL PLANT SPACING WILL DEPEND ON SPECIFIC SITE CONDITIONS AND DESIRED OUTCOMES AND SHOULD BE DESIGNED DURING FINAL PLAN DESIGN.

NOTES:

1. CHOICE OF SPECIES AND PLACEMENT WITHIN PLANTING ZONE WILL DEPEND ON SITE CONDITIONS AND SPECIES; SPECIES HAVE DIFFERENT MOISTURE REQUIREMENTS AND TOLERANCES

LIVE STAKES DESCRIPTION:

IF USED, LIVE STAKES SHOULD BE INSTALLED ALONG BANKS OF STREAM AND SIDE CHANNEL, WHERE APPLICABLE. THE WIDTH OF THE ZONE FOR PLANTING LIVE STAKES WILL DEPEND ON SITE CONDITIONS AND DESIGN CHARACTERISTICS INCLUDING FINAL GRADE OF BANK AND MOISTURE AVAILABILITY.

EXAMPLE SEQUENCE:

1. SEED BARE SOIL AT APPROXIMATELY 30 LBS/ACRE IN SELECTED AREAS AS NEEDED/DESIRED FOR EROSION CONTROL.
2. INSTALL STAKES BASED ON MICROSITE VARIATIONS WITHIN RIPARIAN PLANTING ZONE.
3. DEPENDING ON DESIRED DENSITY, STAKES MAY BE PLANTED AT APPROXIMATELY 1 TO 10 FEET ON CENTER.

SELECTION AND INSTALLATION NOTES:

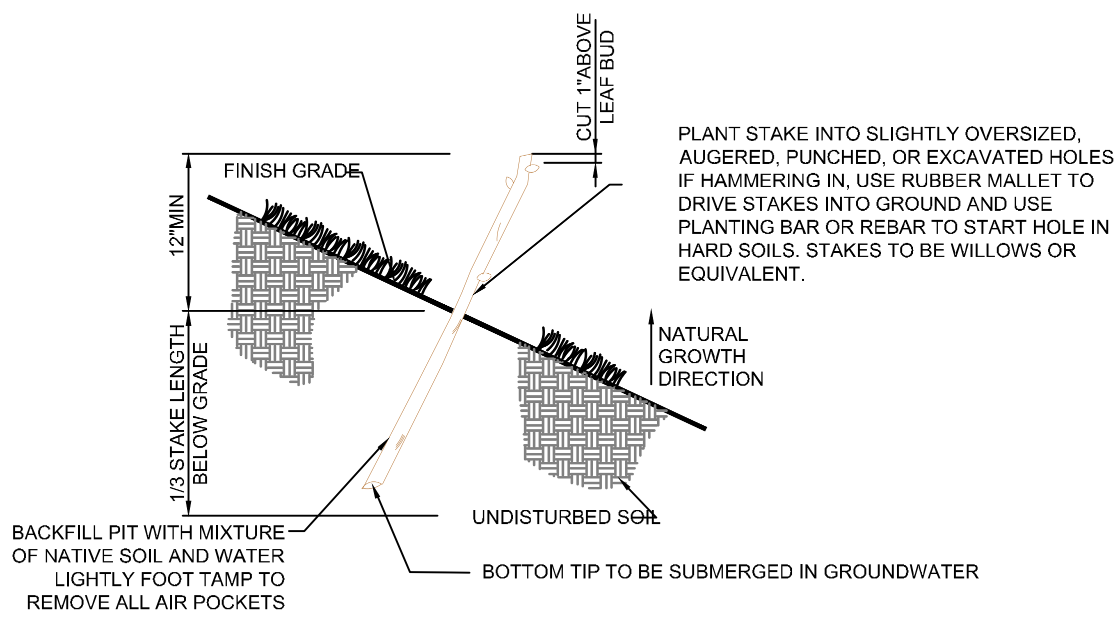
1. LIVE STAKES SHOULD BE BETWEEN 18-48 INCHES LONG AND AT LEAST 1/2" IN DIAMETER.
2. STAKES SHOULD BE CUT STRAIGHT AT THE TIP OF THE BRANCH AND AT AN ANGLE AT THE BASE OF CUTTING TO ENSURE THE CORRECT END IS DRIVEN INTO THE GROUND.
3. KEEP STAKES MOIST AND IN A DARK PLACE UNTIL INSTALLED; DO NOT LET STAKES DRY OUT.
4. SOAKING STAKES BEFORE INSTALLATION INCREASES SURVIVAL AND GROWTH WEIGHT.
5. DRIVE STAKES INTO THE SOIL SO AT LEAST 2/3 OF ITS LENGTH IS UNDERGROUND; LEAVE AT LEAST 12 INCHES ABOVE GROUND.
6. USE THICKER DIAMETER STAKES WHEN PLANTING IN RIPRAP; THICKER DIAMETER STAKES WILL RESIST HEAT AND DRYING BETTER THAN SMALLER CUTTINGS.
7. PLANT STAKES DURING THE DORMANT SEASON.

SEED MIX DESCRIPTION:

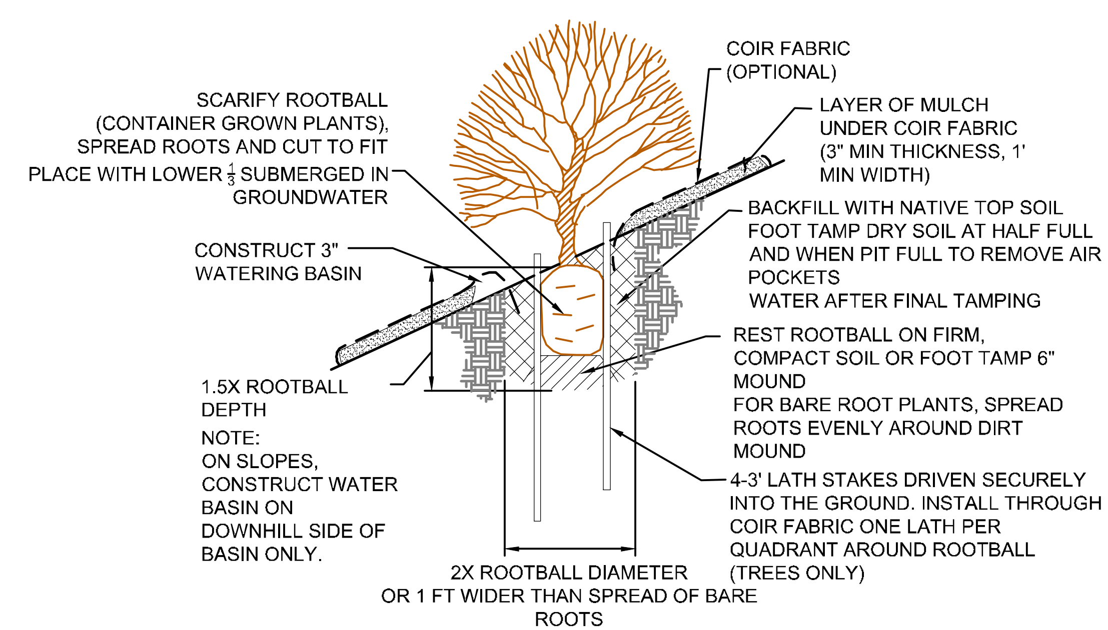
SEED MIX, COMPOSED OF NATIVE SPECIES, SHALL BE USED ON BARE SOIL IN SELECTED AREAS OF THE RIPARIAN PLANTING ZONES AS NEEDED/DESIRED FOR EROSION CONTROL.

NOTES:

1. SEED AT APPROXIMATELY 30 LBS/ACRE; FINAL QUANTITY OF SEED MIX PER ACRE WILL DEPEND ON SPECIES COMPOSITION AND SITE CONDITIONS.
2. SPECIES TO BE USED FOR SEED MIX(ES) AND FINAL COMPOSITION SHOULD BE CHOSEN BASED ON SITE SPECIFIC DESIGN AND CONDITIONS (E.G. SLOPE, WIDTH OF PLANTING ZONE, MOISTURE AVAILABILITY)
3. ALL SEED MIXES SHOULD BE CERTIFIED WEED-FREE.



LIVE STAKE PLANTING DETAIL



SHRUB AND TREE PLANTING DETAIL

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PLOT DETAILS: ANDREWS, JEREMY June 30, 2021 11:15 AM

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REGISTERED PROFESSIONAL ENGINEER 91399PE OREGON JUL. 12, 2016 JEREMY S. ANDREWS
EXPIRES: 12/31/2021

ISSUED FOR CONSTRUCTION

PLAN SHEET SIZE ANSI B (11" X 17")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
0	7/1/21	ISSUED FOR CONSTRUCTION	JA	JA	CM	CJ

CTUIR - PA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

PLANTING PLAN

DWG. NO.: L-402

CREATED: 7/1/21

WETLANDS								
Acres: 2.9								
Growth Habit	Scientific Name	Common Name	Indicator Status*	Percent Composition	Propagation Method	Spacing (feet o.c.)	Density per Acre	Quantity
Herbaceous	SCIRPUS MICROCARPUS (See Note 1)	SMALL-FRUITED BULRUSH	OBL	40	PLUG	3	1936	5614
	ELEOCHARIS PALUSTRIS (See Note 2)	COMMON SPIKERUSH	OBL	30	PLUG	3	1452	4211
	CAREX NEBRASCENSIS (See Note 3)	NEBRASKA SEDGE	OBL	10	PLUG	3	484	1404
	CAREX UTRICULATA (C. ROSTRATA) (See Note 3)	NORTHWEST TERRITORY SEDGE	OBL	10	PLUG	3	484	1404
	CAREX PELLITA (See Note 3)	WOOLLY SEDGE	OBL	10	PLUG	3	484	1404

*Indicator status based on the USACE 2016 National Wetland Plant List (Lichvar et al. 2016); indicator status for the Arid West Region.

WETLAND NOTES:
1. Plant in clumps furthest down toe of slope
2. Plant above Scirpus microcarpus in the deeper portions of the wetland planting zone
3. Intermix these three species at the middle to upper edge of wetland planting zone.

RIPARIAN								
Acres: 5.0								
Growth Habit	Scientific Name	Common Name	Indicator Status*	Percent Composition	Propagation Method	Spacing (feet o.c.)	Density per Acre	Quantity
Shrub	SALIX EXIGUA VAR. EXIGUA	COYOTE WILLOW	FACW	50	LIVE STAKES	5	871	4356
	SALIX BOOTHII	BOOTH'S WILLOW	FACW	20	LIVE STAKES	5	348	1742
	SALIX PROLIXA	MACKENZIE'S WILLOW	OBL	20	LIVE STAKES	5	348	1742
	CORNUS SERICEA	RED-OSIER DOGWOOD	FACW	10	LIVE STAKES**	5	174	871
Herbaceous	CAREX NEBRASCENSIS (See Note 2)	NEBRASKA SEDGE	OBL	20	PLUG	3	620	3098
	CAREX UTRICULATA (C. ROSTRATA)	NORTHWEST TERRITORY SEDGE	OBL	20	PLUG	3	620	3098
	JUNCUS BALTICUS	BALTIC RUSH	FACW	20	PLUG	3	620	3098
	JUNCUS ENSIFOLIUS	DAGGER-LEAF RUSH	FACW	20	PLUG	3	620	3098
	GLYCERIA GRANDIS (See Note 1)	AMERICAN MANNAGRASS	OBL	20	PLUG	3	620	3098

* Indicator status based on the USACE 2016 National Wetland Plant List (Lichvar et al. 2016); indicator status for the Arid West Region.
** Use live stakes if available; if not available substitute with container grown plants

RIPARIAN NOTES:
1. Plant obligate species (Salix prolixa, Carex nebrascensis, C. utriculata, and Glyceria grandis) closest to channel; intermix the rest of the species throughout riparian planting zone.

FLOODPLAIN SHRUBS								
Acres: 4.8								
Growth Habit	Scientific Name	Common Name	Indicator Status*	Percent Composition	Propagation Method	Spacing (feet o.c.)	Density per Acre	Quantity
Tree	*ALNUS*	BLUE ELDERBERRY	FACU	60	CONTAINER	18	81	387
	POPULUS TRICHOCARPA	BLACK COTTONWOOD	FAC	40	CONTAINER	18	54	258
Shrub	*SAMBUCUS NIGRA SSP. CERULEA*	BLUE ELDERBERRY	FACU	40	CONTAINER	8	272	1307
	SALIX BOOTHII	BOOTH'S WILLOW	FACW	25	CONTAINER	8	170	817
	CORNUS SERICEA	RED-OSIER DOGWOOD	FACW	25	CONTAINER	8	170	817
	ROSA WOODSII	WOOD'S ROSE	FACU	10	CONTAINER	8	68	327

* Indicator status based on the USACE 2016 National Wetland Plant List (Lichvar et al. 2016); indicator status for the Arid West Region.

FLOODPLAIN SHRUBS NOTES:
1. Species placement within zone will be finalized in field; in general FACW species will be planted closer to the Riparian Zone than other species

UPLAND ZONE SEED MIX		
Acres: 9.6		
Quantity: 288 lbs*		
Scientific Name	Common Name	Percent Composition
LEYMUS CINEREUS	GREAT BASIN WILDRYE	25
PSEUDOROEGNERIA SPICATA	BLUEBUNCH WHEATGRASS	25
ELYMUS ELYMOIDES	SQUIRRELTAIL	10
FESTUCA IDAHOENSIS	IDAHO FESCUE	10
KOELERIA MACRANTHA	PRAIRIE JUNEGRASS	10
ACHILLEA MILLEFOLIUM	YARROW	10
LUPINUS POLYPHYLLUS	BIGLEAF LUPINE	10

* Quantity based on 30 lbs seed per acre

RIPARIAN SEED MIX		
Acres: 5.0		
Quantity: 150 lbs*		
Scientific Name	Common Name	Percent Composition
PSEUDOROEGNERIA SPICATA VAR SECAR	BLUEBUNCH WHEATGRASS	20
POA SECUNDA	BIG BLUEGRASS	20
LEYMUS CINEREUS VAR MAGNAR	GREAT BASIN WILDRYE	30
ELYMUS LANCEOLATUS	STREAMBANK WHEATGRASS	20
FESTUCA IDAHOENSIS	IDAHO FESCUE	10

* Quantity based on 30 lbs seed per acre

SEEDING NOTES:
1. Seeds shall be applied to bare soil and may be applied by drill or broadcast .
2. After seeding, drag with harrow or other suitable implement to cover seed to a depth of 1/4 to 1/2 inch
3. Upland zone will be mulched following application of seed.
4. All seed mixes should be certified weed-free

ATTACHMENT 2
CONSTRUCTION SPECIFICATIONS

UmaBirch Instream Design and Construction Oversight Project

Project Area 4 Birch Creek Instream Enhancement and Floodplain Restoration

Attachment 2

Construction Specifications

Issued for Construction

Prepared for:

Confederated Tribes of the Umatilla Indian Reservation
Fisheries Program-Umatilla River Basin
Department of Natural Resources
46411 Timíne Way
Pendleton, OR 97801

Prepared by:

19803 North Creek Parkway
Bothell, WA 98011
Tel 425-482-7600 Fax 425-482-7652

July 2021

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

UMABIRCH INSTREAM DESIGN AND CONSTRUCTION OVERSIGHT PROJECT

PROJECT AREA 4 BIRCH CREEK INSTREAM ENHANCEMENT AND FLOODPLAIN RESTORATION

CONSTRUCTION SPECIFICATIONS

ISSUED FOR CONSTRUCTION

Submittal To:

Confederated Tribes of the Umatilla Indian Reservation
Department of Natural Resources
46411 Timíne Way
Pendleton, Oregon 97801

Prepared By:

Tetra Tech, Inc.
19803 North Creek Parkway
Bothell, WA 98011

July 2021

TABLE OF CONTENTS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 DESCRIPTION

A. This section provides a brief narrative summary of the contract work. The project is located on Birch Creek approximately 2 miles upstream of its confluence with the Umatilla River. This contract work consists of constructing a new main channel, grade stabilization measures, wetlands, modifications to the old main channel, and terrace fill. Large woody material (LWM) structures will be placed in the new main channel, old main channel, and floodplain grading. Excavation and fill quantities have been designed to equilibrate; no material shall be hauled offsite. Addition of LWM and channel and floodplain grading will potentially require isolation of work areas from water and fish.

The Contractor shall provide all labor, equipment, supervision, transportation, operating supplies and incidentals to perform all work necessary on the areas specified herein. All aspects of the work shall be performed in an organized and systematic manner to assure that services are performed in a timely matter and comply with the technical specifications.

This summary does not provide the technical detail of the work activities, but describes the work as a whole, providing overall perspective to the separate tasks. This section shall be used in conjunction with all the other sections and the Drawings to establish the total work requirements.

B. The project was designed in accordance with the Bonneville Power Administration (BPA) Habitat Improvement Program (HIP) Programmatic Biological Opinion. Refer to the HIP Conservation Notes in the Drawings and the HIP handbook.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The Contractor is advised that the contract work will consist of the following:

Clearing and Grubbing within Project Area
Installation of Temporary Construction Access Routes
Installation of Temporary Construction Bridges
Installation and Maintenance of Construction Area BMPs
Construction and Maintenance of Material Storage Areas
Channel Excavation
Grade Stabilization Measure Construction
Terrace and Wetland Grading
Installation of Floodplain and Instream Structures
Finish Grading of Floodplain and Decompaction of Compacted Access Routes and Staging Areas
Installation of Revegetation Materials by CTUIR
Complete Project Area Cleanup and Repairs

Additionally, erosion control measures must be executed to the highest construction industry standards – great care must be taken to prevent excavated soil material from

entering the stream system. To ensure integrity of the stream channel and to reduce impacts to water quality and aquatic organisms, floodplain activities will be completed separately from activities in the wetted channel. Activities in the floodplain will occur between May and November, whereas work in the wetted channel, or that requires crossing the wetted channel, will occur between July 1 and October 31, during the Oregon Department of Fish and Wildlife (ODFW) in-water work period. No instream work will be conducted between May and June 30 or between August 16 and November. The Contractor shall notify the CTUIR in writing 10 days before beginning any work activities.

B. For all construction activities, including those within the above listed instream work window, the Contractor shall be responsible for potential turbidity and sediment transport within and downstream of the physical limits of the project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SUMMARY OF WORK

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section provides general Work Restrictions that shall be observed by the Contractor during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Restricted Work Periods

1. Completion of the instream components of the project shall be restricted to the period of July 1 to October 31 during the construction period.

B. Restricted Work Areas

1. Completion of work adjacent to or on private property will require coordination with the affected landowners.

2. The Contractor and CTUIR will coordinate the project work schedule in order to notify landowners and stakeholders of when the work activities adjacent to or on the private property will occur.

3. The Contractor and CTUIR will coordinate the project work schedule in order to notify the UPRR of when work will occur adjacent to the existing UPRR line that runs along the south perimeter of the project area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF WORK RESTRICTIONS

SECTION 01 14 13
ACCESS TO SITE

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the location of the project site and the access routes the Contractor will use during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Location of Project Work Site

1. Overall location of the project site is shown on the Drawings.

B. Directions to Project Work Site

1. From Interstate 84 (I-84), take exit 207 toward US-30/Airport/Pendleton City Center. Head southwest on County 1300 Rd/McKennon Rd and continue on County 1300 Rd for 1.5 miles. Turn left onto Birch Creek Rd and continue for 2.3 miles. Turn left to stay on Birch Creek Rd for 0.1 miles and cross the UPRR tracks to access the site.

C. Restricted Access Areas

1. Permission to access is granted by the private landowner to the CTUIR. The Contractor shall make arrangements with the CTUIR to access the project site through private land.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF ACCESS TO SITE

SECTION 01 14 20
SITE-SPECIFIC REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section provides general Site-Specific Requirements that shall be observed by the Contractor during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Coordination

1. Coordination with agencies, other on-site Contractors, and Owner shall generally be made by Contractor through the Owner's Representative or Engineer as expressed in the Contract Documents to assist Contractor with performance of the work with a minimum of interference and inconvenience. Contractor will access the project site at locations identified on the Drawings and by direct coordination with Owner's Representative management staff.

2. The project site is located on private lands. All activities shall be coordinated with ongoing activities and not interfere with these activities except with written approval of the Owner's Representative or Engineer.

B. Work Hours

1. The Contractor shall propose work hours based on the Contractor's construction schedule to ensure completion of all instream work no later than October 31. The Contractor shall propose extended workdays and/or weekend work if necessary, to meet the time constraints of the appropriate year in-water work period of time. The Contractor's proposed work schedule shall be subject to Owner's Representative or Engineer's approval. Proposed work schedule may not be approved if the Owner's Representative or Engineer is not available to be on site during the proposed work hours.

1.03 GENERAL ACCESS REQUIREMENTS

A. The project site area is closely monitored by Owner's personnel. Contractor's personnel working at the site may be asked for appropriate identification. A list of all employees for the Contractor, suppliers, and vendor Representatives will be provided to the Owner's Representative or Engineer.

B. Irregular or Non-Routine Access

1. Access on an irregular basis and during other than established working hours will require prior approval by Owner's Representative or Engineer.

C. Maintenance of Access

1. Contractor shall not obstruct or interfere with access by others to existing facilities adjacent to the project site during the work under this Contract.

D. Vehicle Parking

1. Contractor's vehicles shall only park in approved areas as described by Owner's staff.

1.04 COORDINATION AND COOPERATION WITH OTHER CONTRACTORS

A. Work by others may be performed in the vicinity of or adjacent to the project site in concurrence with the scheduled performance of the Work under these Contract Documents. Contractor shall coordinate construction work with Owner's Representative or Engineer.

1.05 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Workflow

1. The Work shall be planned, scheduled, and performed to complete the Work within the requirements of these Contract Documents and the requirements of appropriate Federal, State, and local agencies. Contractor shall prepare and maintain a construction schedule. Work shall be completed within the timeframe of May 1 and November 30, expected to be 2021, or as directed in the Contract Documents.

B. Construction Sequence

1. Floodplain Work: May – November
   - Clear and grub proposed temporary access roads.
   - Separate and stockpile in the staging area or areas directed by Owner's Representative or Engineer, earth, rock, and woody materials for future use.
   - Construct new main channel, grade stabilization measures, terrace fill, and wetlands.
   - Install isolation measures such as earthen plugs at each end of the new main channel before connecting to existing channel.
   - Construct new main channel and floodplain LWM structures.
2. Active Channel: July 1 – October 31
   - Install temporary bridges or fish-excluded crossings of the wetted channel as directed by Owner's Representative or Engineer.
   - Remove downstream and upstream isolation measures from new channel and re-route stream into new main channel.
   - Install isolation measures at upstream and downstream confluences to isolate inflow from entering old main channel.
   - Conduct fish salvage, if needed, to remove any stranded fish where necessary as directed by Owner's Representative or Engineer.
   - Dewater and construct modifications to old main channel.

- Construct wetted channel LWM structures where temporary bridges or fish-excluded crossings in the wetted channel are required.
- Remove temporary bridges or fish-excluded crossings in the wetted channel, final grading and shaping of terrace areas, and grade and subsoil compacted temporary access roads.
- Revegetate decompacted floodplains and all disturbed areas.

1.06 PROTECTION OF PROPERTY

A. Contractor shall protect all property within or in the vicinity of the work site. Contractor shall ensure that property is not removed, damaged, destroyed, or prevented from its normal use unless so designated in the Contract Documents. All property adjacent to the work shall be protected including, but not be limited to, protection from construction-generated dust, debris, water, and vibration. Property includes land, utilities, trees, shrubs, landscaping, markers and monuments, natural features, monitoring wells, buildings, structures, site and drainage improvements, and other improvements, whether shown on the Drawings or not. No work shall be conducted in any wetlands or vegetation protection areas shown on the Drawings and restricted areas unless coordinated with and approved by the Owner's Representative or Engineer.

B. Contractor shall confine operations to within the clearing limits or other areas designated in the contract documents, and prevent the depositing of rocks, excavated materials, stumps, or other debris outside of these limits. Contractor shall retrieve material which falls outside of these limits and dispose of, or incorporate in the work, as directed by the Owner. Contractor shall preserve the scenic and natural environment along this construction project.

C. Contractor shall not allow objectionable material to enter any stream, river, lake, or other body of water. Contractor shall retrieve material which falls in these areas and dispose of, or incorporate in the work, and repair damage to vegetation or structures outside the project limits.

D. Contractor shall not operate equipment or otherwise disturb the natural vegetation and soil beyond the construction limits.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SITE-SPECIFIC REQUIREMENTS

SECTION 01 22 20
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. The Bid Items described in this Section correspond with those listed on the Bid Form. Additional bid items requiring no further description may also be included on the form.

B. Payment will be made only for those items listed on the Bid Form. All other items of work shown on the Contract Drawings or required by Specifications shall be considered incidental to the items listed.

1.02 SCHEDULE OF VALUES

A. Contractor shall prepare and submit a schedule of values corresponding to the project specification sections and any other major work items to be used as a basis for monthly pay requests.

B. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Specification table of contents. Provide multiple line items for subcontract amounts, where appropriate.

C. The quantity to be paid is the quantity shown in the Schedule of Items. The contract quantity will be adjusted for authorized changes that affect the quantity or for errors made in computing this quantity. If there is evidence that a quantity specified as a contract quantity is incorrect, the Contractor shall submit calculations, drawings, or other evidence indicating why the quantity is in error and request, in writing, that the quantity be adjusted. The CTUIR reserves the right to review all Contractor submitted actual quantity measurements for review and payment.

D. Submit copies of the schedule of values to Owner’s Representative at earliest possible date, but no later than 15 days before the date scheduled for submittal of initial pay request.

1.03 PAY REQUESTS

A. Each pay request shall be consistent with previous applications and payments as certified by Owner’s Representative and paid for by Owner.

B. It will be the Contractor's responsibility to prepare a monthly estimate of the percentage of work accomplished on each line item of the approved schedule of values. This estimate shall be submitted to the Owner’s Representative each month as part of the pay request for review not later than the date established at pre-construction conference. Owner’s Representative will verify all measurements and monthly estimate and provide for approval to the owner within 30 days of receiving monthly estimate.

1.04 DESCRIPTION OF BID ITEMS

A. This is a lump sum bid; therefore, the price submitted on the bid form shall include all Contractor costs, overhead, and profit needed to complete the project.

B. Contract quantities will be adjusted only when the variation in the bid items and actual work is of 15 percent or more.

C. Contractor shall give a price per hour for unforeseen work that is encountered during the contract performance and not included in the other sub-items. Hourly work must be authorized in advance by the CTUIR. The CTUIR does not guarantee that any hourly work shall be ordered and reserves the right to reduce or eliminate entirely the work under these items with no adjustment in contract unit price.

D. Mobilization: Payment will be made for mobilization in a lump sum. When 10 percent of the original contract amount is earned from other bid items, 100 percent of the mobilization item may be paid.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF MEASUREMENT AND PAYMENT

SECTION 01 25 10
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the process and procedures to be followed by the Contractor and Owner in the event a contract modification is required during project implementation.

B. A contract modification is defined as a change order or amendment to the original contract to add costs to the construction contract for expanding the scope of work or to subtract costs to the construction contract for reducing the scope of work.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall keep a copy of the construction contract and bid sheet at the construction site during the entire implementation period.

B. During each weekly progress meeting, the Contractor shall provide a summary of work completed to date, a summary of work to be completed in the next week, and a summary of work to be completed within the next month.

C. During the discussion of work to be completed in the next week and next month provided by the Contractor during the weekly progress meeting, any work activities not included in the current contract shall be identified by the Contractor.

D. After the activities not included in the current construction contract have been identified by the Contractor, the Contractor shall prepare a description of the additional work required and an itemized cost to complete the additional work.

E. The Contractor shall submit the description of work and itemized costs to the Owner's Representative for review.

1.03 OWNER'S REPRESENTATIVE REVIEW

A. Upon receipt of the description of additional work and itemized costs, the Owner's Representative will complete a review of the materials.

B. Review of the submitted materials will be completed by the Owner's Representative within 7 days from the date of submittal.

C. If, during the review of the submitted materials, the Owner's Representative has questions or requires additional information to complete his/her review, they will contact the Contractor within 7 days from the date of the submittal.

D. A response to the Contractor's submittal by the Owner's Representative will be required within 7 days from the date of the submittal.

1.04 OWNER'S REPRESENTATIVE APPROVAL

A. After the Owner's Representative has reviewed the Contractor's submittal and verifies that the work included in the submittal is not included in the current scope of work, the Owner's Representative shall approve the submittal.

B. After the submittal has been approved, the Owner's Representative shall complete a change order or contract amendment to cover the work items in the submittal.

C. Any change order or contract amendment shall be completed by the Owner and ready for signature within 21 days from the date of the submittal.

D. Adhering to the time schedule described above is necessary to keep the project implementation on schedule and prevent the Contractor from completing a critical component of the project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CONTRACT MODIFICATION PROCEDURES

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the process and procedures to be followed by the Contractor and Owner for the preparation, submittal, and payment of monthly invoices for completed construction work.

B. During the pre-construction meeting, the Owner's Representative will identify the monthly submittal date for invoices to be submitted by the Contractor. This date will account for submittal, review, approval, and payment processing time to expedite payments to the Contractor.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall keep a copy of the construction implementation spreadsheet at the construction site during the entire implementation period. This spreadsheet will show daily progress on schedule of value line items.

B. During each weekly progress meeting, the Contractor shall provide a summary of work completed during the prior week and a total since the last invoice period.

C. At the weekly progress meeting immediately before the monthly submittal date, the Contractor will present a draft invoice to the Owner's Representative. This draft invoice will show the percentage complete of schedule of value items included in the payment request.

D. The total percent complete shown on the draft invoice will be supported by the construction implementation spreadsheet submitted with the draft invoice.

1.03 OWNER'S REPRESENTATIVE'S REVIEW

A. During the weekly progress meetings, the total percentage of work completed recorded by the Owner's Representative and Contractor will be reconciled and approved.

B. Upon verification of the total percent complete, Owner's Representative will sign an invoice approval form and forward the invoice to the CTUIR Accounts Payable Section.

E. The CTUIR Accounts Payable Section will have 2 working days to review and approve or reject the invoice.

1.04 OWNER'S REPRESENTATIVE APPROVAL

A. The Owner's Representative will be expected to attend and participate in the Weekly Progress Meetings and keep current on the project implementation activities.

B. Upon receipt of the approved invoice from the Owner's Representative, the CTUIR Accounts Payable Section shall review the submitted invoice and construction implementation spreadsheet.

C. The CTUIR Accounts Payable Section will have 2 working days to review and approve or reject the invoice after receipt from the Owner's Representative.

D. After approval, the Owner's Representative will prepare all necessary administrative forms to initiate payment processing within the CTUIR Accounts Payable Section.

E. The Owner's Representative will have 3 working days to prepare the necessary administrative forms and secure signatures to initiate the payment process.

1.05 PAYMENT PROCESSING

A. Upon submittal of the administrative forms and Contractor invoice, payment processing will follow the standard operating procedures of the CTUIR Accounts Payable Section.

B. If payment has not been received by the Contractor within 4 working days of the estimated payment date defined in Section 1.01 B., the Owner's Representative will contact the CTUIR Accounts Payable Section to determine the reason for the delay.

C. The Owner's Representative will make every effort possible to resolve any issues that are holding up payment to the Contractor as quickly as possible.

D. In the event that payment is not received by the Contractor within 30 days of the estimated payment date, the Contractor will be allowed to charge interest on the outstanding balance. This interest charge will not be part of the overall construction cost included in the construction contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PAYMENT PROCEDURES

SECTION 01 31 19.13
PRE-CONSTRUCTION MEETING

PART 1 GENERAL

1.01 DESCRIPTION

A. Not more than 5 days after a Notice to Proceed has been issued to the Contractor, but earlier if practicable, a mandatory pre-construction meeting will be scheduled by the Owner's Representative or Engineer. This meeting will occur not less than 10 days prior to work commencing.

B. The Owner's Representative or Engineer will preside at the pre-construction meeting.

C. Present to represent the Contractor shall be at least the project Superintendent, a representative with full contract authority to speak for each of his principle subcontractors, and other representatives as he/she may deem appropriate.

D. The Owner's Representative and other invited parties shall be present as required.

E. Proceedings of the meeting will be recorded and distributed to interested parties.

1.02 AGENDA

A. Both Owner's Representative and Contractor shall be prepared to speak to the following:

1. Name and Field Address of Job Superintendent
2. Emergency Phone and/or operator
3. Date of Construction Start
4. Date of Notice to Proceed
5. Notification of Utilities, Concerned Fire, Police, Schools, etc.
6. Coordination with other Contractors
7. Permits: County, City, all Government Agencies as required
8. Inspector: name, authority
9. Field office (location)
10. Submittals
11. Responsibility for lines and grades
12. Periodic progress payments including date for submittal
13. Construction Progress Schedule (bar graph or C.P.M.)

14. Safety Requirements and Special Hazards

15. Insurance and Bonds

16. Traffic Control

17. Construction Signs

18. Drawings revised to conform to construction records

19. Beneficial Occupancy

20. Retention of Contract Records

21. Guarantees and Warranties

22. Testing

23. Progress Meetings

24. Complaint Procedure

25. Job Photos

26. Other Matters Concerning Construction

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PRE-CONSTRUCTION MEETING

SECTION 01 31 19.23
PROGRESS MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Weekly Progress Meetings will be held at the job site during construction.

B. The Owner's Representative or Engineer will preside at Progress Meetings.

C. Proceedings of meeting will be recorded and distributed to interested parties.

1.02 MEETINGS

A. Meetings other than Weekly Progress Meetings (if required) will be scheduled each week at mutually agreed time.

B. Location of meetings: As designated during preconstruction conference.

C. Attendance:

1. Owner's Representative

2. Engineer

3. Contractor

4. Other Contractors (if any)

5. Subcontractors as pertinent to agenda

6. Safety Representative (Optional)

7. Representatives of Governmental or other Regulatory Agencies (Optional)

1.03 MINIMUM MEETING AGENDA

A. Review and approve minutes of previous meeting.

B. Review work progress since last meeting.

C. Note field observations, problems and decisions.

D. Identify problems which impede planned progress.

E. Identify potential ways to increase construction efficiencies.

F. Develop corrective measures and procedures to regain planned schedule.

G. Revise Construction Schedule as indicated.

H. Plan progress during next work period.

I. Coordinate projected progress with other Contractors.

J. Review submittal schedules, expedite as required to maintain schedule.

K. Maintaining of quality and work standards.

L. Review proposed changes for:

1. Effect on Construction Schedule

2. Effect on Completion Date

M. Complete other current business.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PROGRESS MEETINGS

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes specifications for the general requirements and procedures for preparing and submitting construction information and data for information and review. Other requirements for submittals are specified under applicable Sections of the Specifications.

B. Submittals are as specified throughout the Contract Documents and may not be included in this specification.

1.02 SUBMITTAL REQUIREMENTS

A. Schedule of Submittals: Within 10 calendar days after the effective date of Notice to Proceed, Contractor shall submit a completed submittal schedule and list of products for all items requiring Owner's Representative's or Engineer's review, as follows:

1. Work Plan, Shop Drawing, or other Submittal identification including description of the item. Include name of manufacturer, trade name, and model number, if applicable.

2. Specification section references.

3. Intended submission/resubmission date(s).

4. Order release date.

5. Lead time to delivery/anticipated delivery date(s).

6. Highlight items that require expedited review to meet the project schedule and are on the critical path.

B. These schedules shall be presented in a form that is readily reproducible and shall be updated and sent to Owner's Representative or Engineer on a bi-weekly basis (twice per month). Identify all submittals that are required by the Contract Documents and determine the date on which each submittal will be submitted.

C. Professional Seal Required: Submittals involving engineering expertise, such as excavation support structures, and load calculations, shall be sealed and signed by a Professional Engineer, currently registered in the State of Oregon, for the discipline involved.

D. Review Stamp and Action Block Space: Include a 5-inch square blank space, in the lower right corner, just above the title block, in which Engineer may indicate the action taken.

E. Review Period:

1. Prepare submittals sufficiently in advance so that review may be given before commencement of related work.

2. Allow 10 calendar days after receipt by Owner's Representative or Engineer for review of each submittal.

3. Contractor shall be responsible for determining whether or not certain submittals require longer review periods. Where longer review periods are required, Contractor shall schedule the Work accordingly, so that the Work and construction schedules are not adversely impacted.

F. Submittal Delivery: Ship submittals prepaid or deliver by hand directly to Owner's Representative or Engineer.

G. Transmittal Form: Accompany submittals with the transmittal forms provided by Owner's Representative or Engineer.

H. Changes in Reviewed Submittals: Changes in reviewed submittals will not be permitted unless those approved submittals with changes have been resubmitted and reviewed, in the same manner as the original submittal.

I. Supplemental Submittals: Supplemental submittals initiated by Contractor for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals.

J. Incomplete submittal packages will be returned without review.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Contractor's Review:

1. Each submittal shall be reviewed, stamped, and signed as reviewed and approved by Contractor prior to submission.

2. If the submittal is designated to be sent to Owner's Representative or Engineer for information, approval by the designated approval authority shall take place before submission to Owner's Representative or Engineer.

3. Contractor shall coordinate each submittal with the requirements of the Work, placing particular emphasis upon ensuring that each submittal of one trade is compatible with other submittals of that trade and with the submittals of other trades. Ensure submittal is complete with all relevant data required for review.

4. Review of drawings and associated calculations by Engineer shall not relieve Contractor from the responsibility for errors or omissions in the drawings and associated calculations, or from deviations from the Contract Documents, unless submittals containing such deviations were submitted to Engineer and the deviations were specifically called to the attention of Engineer in the letter of transmittal, and approved by Engineer as a Contract change.

5. Contractor's liability in case of deviations in the submittals from the requirements of the Contract Documents is not relieved by Engineer's review of submittals

containing deviations, unless Engineer expressly approves the deviations by issuing a Change Order.

6. Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by the use of such drawings.

B. Submittal Quantities: Unless noted otherwise, Contractor shall submit three copies of all submittals. Where permits and licenses and other such documents are obtained in Owner's name, submit the original and five copies.

C. Distribution of Submittals after Review: Distribute prints or copies of reviewed submittals, bearing Engineer's or designated approval authority's stamp and signature, to affected and concerned subcontractors, suppliers, and fabricators; and to affected and concerned members of Contractor's workforce.

D. Maintain at the site of the work a complete, up-to-date, organized file of all past and current submittals including an index and locating system which identifies the status of each submittal:

1. Assign a sequential number to each submittal.

2. Assign a revision number, using an alphanumeric sequence (e.g., 15, 15A, 15B, etc.) to all resubmittals.

1.04 ENGINEER'S REVIEW

A. Submittals will be reviewed for conformance with requirements of the Contract Documents. Review of a separate item will not constitute review of an assembly in which the item functions. Review will not relieve Contractor from Contractor's responsibility for accuracy of submittals, for conformity of submittals to requirements of Contract Documents, for compatibility of described product with contiguous products and the rest of the system, or for prosecution and completion of the Contract in accordance with the Contract Documents.

B. Engineer will indicate its reviews of submittals and the action taken by means of its review stamp. The review stamp will be affixed by Engineer, the action block will be marked, and the stamp will be signed and dated.

C. The review-stamp action-block marks will have the following meanings:

1. The mark NO EXCEPTIONS TAKEN means that every illustration and description appears to conform to the respective requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed; and that the submittal need not be resubmitted.

2. The mark EXCEPTIONS AS NOTED - RESUBMISSION NOT REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed. Submittals so

marked need not be resubmitted unless Contractor challenges the reviewer's exception.

3. The mark EXCEPTIONS AS NOTED - RESUBMISSION REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed after incorporation of the reviewer's corrections and verification by Engineer that the reviewer's corrections have been properly incorporated in the submittal. Resubmission is also required if Contractor challenges the reviewer's corrections.

4. The mark REJECTED means that the submittal is deficient to the degree that the reviewer cannot correct the submittal with a reasonable degree of effort, has not made a thorough review of the submittal, and that the submittal needs revision and is to be corrected and resubmitted.

D. Contractor shall attend meetings as requested by Owner's Representative or Engineer to address issues related to the review of submittals.

E. Owner's Representative or Engineer will return submittals to Contractor within 10 calendar days after submittals have been received.

F. Contractor shall include 10 calendar days in its schedule for Owner and other parties to review submittals and re-submittals.

G. No schedule extensions will be permitted for poorly prepared, incomplete, or inaccurate submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL PROCEDURES

A. Contractor's submittal schedule shall include the following submittals.

1. Submittal schedule
2. Construction schedule
3. Contract schedule of values
4. Weed-free material source certification
5. Spill Prevention Countermeasures and Control (SPCC) Plan
6. Oregon Department of Environmental Quality (ODEQ) 1200-C Permit
7. Stormwater Pollution Prevention Plan (SWPPP)
8. Erosion and Sediment Control (ESC) Plan
9. Storm Contingency Plan
10. Material Storage/Staging Plan
11. Dewatering and Work Area Isolation Plan
12. Excavation Plan
13. LWM, Boulder, Streambed and Grade Stabilization Material (Per Section 35 49 50 1.02)
14. Seed Certification

15. Surveyor credentials
16. Oregon Department of Forestry (ODF) Notification of Operation
17. Temporary Bridge Crossing Design
18. Final Record Drawings

END OF SUBMITTAL PROCEDURES

SECTION 01 35 43
ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes Environmental Protection work required to minimize environmental pollution and damage resulting from Contractor's operations during construction.

1.02 GENERAL REQUIREMENTS

A. Contractor shall perform the work, minimizing environmental pollution and damage as the result of construction operations, in accordance with these Drawings and Specifications and applicable local, state, and federal laws. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to all life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. Contractor shall ensure compliance with this section by Subcontractors.

B. Permits

1. The Owner will obtain permits for Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act, Sections 401 and 404 of the Clean Water Act, and Oregon Department of State Lands Removal-Fill.

2. Contractor shall be responsible for complying with all permit requirements including HIP Terms and Conditions. Contractor shall be responsible for obtaining all other permits as may be required including Oregon Department of Environmental Quality (ODEQ) 1200-C Permit and the Oregon Department of Forestry (ODF) Permit to Use Fire or Power-Driven Machinery. Contractor shall obtain all needed certifications and licenses as required by state and local jurisdictions.

C. Notification

1. Owner’s Representative or Engineer will notify Contractor in writing of any observed noncompliance with the previously mentioned federal, state, or local laws or regulations, permits, and other elements of the environmental protection specifications. Contractor shall, after receipt of such notice, inform Owner’s Representative or Engineer of proposed corrective action and take such action when approved. If Contractor fails to comply promptly, Owner’s Representative or Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to Contractor for any such suspensions. Failure of Owner’s Representative or Engineer to notify Contractor of noncompliance does not relieve

Contractor of full responsibility of maintaining compliance conditions and work methods.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. SWPPP and ESC Plan

a. The Contractor will secure the project area at the end of every workday in an effort to stabilize the project area to minimize impacts in case a high water storm event occurs. The Contractor will be required to prepare and implement the SWPPP to keep sediment from entering the channel during rain events.

b. Contractor shall submit a SWPPP and all ESC Plans within 10 calendar days of Notice to Proceed. All erosion control plans shall be approved before work can begin. Plan shall be consistent with the requirements and meet the satisfaction of Owner.

c. ESC Plans shall include all measures necessary to protect resources and improvements. This shall include:

(1) The construction activities and sequence of implementation relating to specific erosion control measures.

(2) The location and type of permanent controls to be implemented during construction.

(3) The location and type of temporary controls to be implemented during construction.

(4) Detailed dewatering plan.

(5) Description of monitoring plan.

2. SPCC Plan

a. Contractor shall submit an SPCC Plan within 10 calendar days of Notice to Proceed. The SPCC Plan shall meet all applicable U.S. Environmental Protection Agency (EPA) requirements, must be certified by a registered professional engineer, and will include safe mobile fueling of equipment procedures, including inventory, storage, and handling. The Plan shall describe secondary containment procedures to be used during mobile fueling to protect nearby wetlands and other surface water bodies. Plan shall be consistent with the requirements and meet the satisfaction of Owner

b. The Contractor will be required to prepare an emergency spill containment kit, to be located on the construction site at all times, and prepare a SPCC Plan, addressing prevention and cleanup of accidental spills. If a spill of petroleum product should occur in water, Contractor shall immediately notify the Owner's Representative and appropriate state agencies.

3. ODF Notification of operation

    a. The Contractor shall file a Notification of Operation or Permit to Use Fire or Power Driven Machinery with the ODF before starting the work.

1.04 LAND RESOURCES

A. Contractor shall confine all activities to areas defined by the Drawings and Specifications. Prior to the beginning of any construction, Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the Drawings or specified to be cleared, Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, wetlands, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized by the Owner's Representative or Engineer. Where such emergency use is permitted, Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth, or other material displaced into uncleared areas shall be carefully removed and properly disposed of by Contractor at no additional cost to the Owner.

B. Work Area Limits

1. Prior to construction, Contractor shall mark the areas that are not to be disturbed under this contract, as identified on the Drawings and by Owner's Representative or Engineer during the pre-construction meeting. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers not scheduled for abandonment on the Drawings and Specifications shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

C. Landscape

1. Trees, shrubs, vines, grasses, land forms, wetlands, and other landscape features indicated and defined on the Drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

D. Unprotected Erodible Soils

1. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by Owner's Representative or Engineer.

E. Disturbed Areas

1. Contractor shall effectively prevent erosion and control sedimentation through approved methods, which shall be included in the ESC Plan, including, but not limited to, the following:

a. Retardation of runoff and prevention of runoff channelization. Runoff from the construction site or from storms shall be retarded by means of site perimeter silt fencing, straw wattles, fiber rolls, straw bales, and the preservation of a vegetated buffer area around the site, and by any measures required by area-wide Drawings under the Clean Water Act. Straw mulch, wood chips, plastic sheeting, rolled erosion control products (i.e., erosion control blankets or mats), mid-slope sediment fences, fiber rolls, or wattles shall also be employed for temporary soil stabilization if an area is to remain unworked for longer than 1 week.

b. Erosion and sedimentation control devices. Contractor shall install temporary erosion and sedimentation control features as indicated on the Drawings or directed by the Owner's Representative or Engineer. Erosion and sedimentation control devices shall be checked daily and maintained throughout the duration of the project to prevent sediments from entering the stream channel.

c. Cleanup of roadways. Contractor shall maintain roads and parking areas traveled by construction equipment free of debris, tracked mud, and spillage. Cleanup of roadways shall be performed daily at a minimum. Any damage to public roadways caused by Contractor's equipment shall be restored at Contractor's expense.

F. Contractor Facilities and Work Areas

1. Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the Drawings or as directed by the Owner's Representative. Temporary movement or relocation of Contractors facilities shall be made only when approved by the Owner's Representative. Borrow areas, if required, shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the Drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall only be developed with written approval of Owner's Representative or Engineer. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.05 WATER RESOURCES

A. Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Monitoring of active streams, wetlands, and tributaries affected by construction shall be Contractor's responsibility.

B. If at any time as a result of project activities fish are observed in distress, a fish kill occurs, or water quality problems develop (including equipment leaks or spills), operations shall cease, and the Owner's Representative and Engineer shall be notified immediately and the following agency shall be contacted:

Oregon Department of Fish and Wildlife; Contact: 503-947-6002 and 800-452-0311.

C. The discharge or release of oil or petroleum hydrocarbons into or on the surface of waters of the state is prohibited. If visible oil sheen is observed beyond the limits of

the construction activity then all appropriate actions to stop, contain, and cleanup the oil shall be taken.

D. Mobile Equipment Fueling

1. Contractor shall service all equipment only in the areas approved by the Owner's Representative. No mobile equipment fueling shall take place over or within 150 feet of the Birch Creek stream channel. All equipment fueling shall be conducted using secondary containment to capture potential fuel spills. All mobile equipment fueling locations shall be pre-approved by the Owner's Representative.

2. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and all other equipment, etc., shall be checked daily for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters.

3. All vehicles carrying fuel will have specific equipment and materials needed to contain or clean up any incidental spills at the project site.

4. All pumps and generators used in or near streams will have appropriate spill containment structures and/or absorbent pads in place at all times during use.

E. Equipment used for this project shall be well maintained and, to the maximum extent possible, prevented from leaking petroleum-based products that could result in environmental contamination.

1. All equipment used for instream work will be cleaned of external oil, grease, dirt and mud, prior to arriving at the project site. All equipment will be inspected by the Owner's Representative before unloading at the site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly into waterways.

2. All equipment will be fueled outside of stream-adjacent riparian areas and wetland areas. Specific fueling areas may be approved and designated by the CO. When not in use, vehicles and fueling equipment will be stored in a designated staging area. The staging area should be in an area that will not deliver fuel, oil, etc. to streams.

3. Oil-absorbing floating booms, and other equipment such as pads and absorbent "peanuts" appropriate for the size of the stream, will be available on-site during all phases of construction. For small streams with few pools or slack water, booms may not be effective. Use pads and straw bales to anchor booms if necessary. Booms will be placed in a location that facilitates an immediate response to potential petroleum leakage.

F. The Contractor is solely responsible for all spills or leaks that occur during the performance of this contract. The Contractor must clean up spills or leaks in a manner that complies with Federal, state, and local laws and regulations and to the satisfaction of the Owner's Representative. Any spills resulting in a detectable sheen on water shall be reported to the EPA National Response Center (1-800-424-8802). Any spills over 25 gallons will be reported to the ODEQ and cleanup will be initiated within 24

hours of the spill. When available provide copies of all spill related clean up and closure documentation and correspondence from regulatory agencies.

G. Washing Water

1. Contractor shall ensure that wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall be contained for proper disposal or treatment and shall not be directly discharged into state waters, storm drains, or any part of the project site.

H. Diversion Operations

1. Construction operations for dewatering and rewatering shall be controlled at all times. Contractor will be responsible for limiting the impacts of water turbidity and contaminants known to be present at the site on habitat for wildlife and on water quality for discharge and downstream use.

2. Contractor shall construct and maintain cofferdams as necessary and as shown on the Drawings to divert and de-water fish isolation areas for all work activities within the wetted channel. Water removed from within the isolated work area shall be routed to an area to an area approved by the Owner's Representative to allow removal of fine sediment and other contaminants. The existing flow downstream from the project area shall be maintained throughout construction. The diversion and dewatering shall remain in place until instream restoration work is complete and Owner's Representative or Engineer approves removal of the system. .

3. Rewatering of the isolated work area shall occur slowly and under the direct supervision/approval of the Owner's Representative. This process shall occur over sufficient time as to prevent excessive turbidity downstream of the work area.

I. Fish and Wildlife

1. Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. Both resident and anadromous fish are present in the project reach on Birch Creek.

2. Oregon Administrative Rules (OAR) Chapter 340, Division 41 for additional water quality standards and related regulations (OAR 340-041-0036) states that limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied. Based on this OAR, the Owner shall get clearance to exceed State's water quality standards through a permit or certification authorized under terms of section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 14l-085-0100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

J. No excavated material shall be placed in the channel bottom that would divert the stream and cause erosion.

1.06 AIR RESOURCES

A. Equipment operation and activities or processes performed by Contractor in accomplishing the specified construction shall be in accordance with the State of Oregon air quality rules and all Federal emission and performance laws and standards. Ambient air quality standards set by the EPA shall be maintained. Monitoring of air quality shall be Contractor's responsibility. All air areas affected by the construction activities shall be monitored by Contractor.

B. Particulates

1. Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from airborne particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type or other methods will be permitted to control particulates in the work area if approved by the Owner's Representative. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

C. Hydrocarbons and Carbon Monoxide

1. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

D. Sound Intrusions

1. Contractor shall keep construction activities under surveillance and controlled to minimize environment damage by noise, in accordance with all applicable Federal, State, and local regulations.

1.07 WASTE DISPOSAL

A. Solid Wastes

1. Solid wastes shall be placed in containers that are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste shall become co-mingled with solid waste. Contractor shall transport solid waste, including clearing debris, off Owner-controlled property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

B. Hazardous Materials Used by Contractor

1. Contractor shall take sufficient measures to prevent spillage of any materials of construction containing hazardous and toxic materials during operations (i.e. hydraulic fluid, ethylene glycol, etc.) and shall collect any such spilled materials in

suitable containers, observing compatibility. Contractor shall inform Owner's Representative of any hazardous waste generated during construction and request direction from Owner regarding proper transport and disposal. Spills of hazardous or toxic materials shall be immediately reported to Owner and Engineer. Cleanup and cleanup costs due to spills shall be Contractor's responsibility.

C. Burning

1. Burning will not be permitted.

1.08 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

A. No archeological sites within Contractor's work area have been identified. If identified during the course of the work, Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the contract. If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, Contractor shall immediately notify Engineer and Owner's Representative. While waiting for instructions Contractor shall record, report, and preserve the finds in accordance with the National Historic Preservation Act and 43 Code of Federal Regulations Subtitle A Part 7, Protection of Archeological Resources.

1.09 FIRE CONTROL

A. The Contractor shall immediately extinguish, without expense to the CTUIR, all fires on or in the vicinity of the project which are caused by Contractor's employees, whether set directly or indirectly as a result of Contractor operations. The Contractor may be held liable for all damages and costs of additional labor, subsistence, equipment, supplies, and transportation resulting from fires set or caused by the Contractor's employees or resulting from contract operations.

B. At all times during closed fire season period, as specified by State law, the Contractor shall comply with each of the following provisions to the extent applicable to his operation under the contract.

1. Fire Tools. The Contractor will provide for each employee in the contract area at least one approved handtool of a type appropriate in the contract area, such as shovel, pulaski, or axe. Tools required and furnished under (2) and (4) below, shall count toward fulfillment of the above requirement.

2. Fire Extinguishers and Tools on Mobile or Stationary Equipment. Each unit of powered equipment used in connection with this contract, including automobiles, trucks, tractors, etc., shall be equipped with serviceable tools and fire extinguishers as follows:

One - fire extinguisher, dry chemical type of not less than 2-1/2 pound capacity with a 4 BC or higher rating.

One - shovel, round point #0 lady or equal.

One - axe, 2 pounds or over, 26-inch minimum length, or one pulaski.

One - water container (at least 1-gallon capacity), not required with stationary equipment.

3. Spark Arresters. Each internal combustion engine shall be provided with a spark arrester or spark-arresting device.

4. Power saws. For each power saw used in connection with this contract, the following will be provided:

   One - shovel, round point #0 lady or equal. Shovel must be immediately available for use.

   One - Fire extinguisher, containing not less than 8 ounces of extinguisher fluid, or a dry chemical powder-type of not less than 1-pound capacity. The extinguisher must be immediately accessible to the saw operator at all times.

5. Smoking. Smoking shall not be permitted within the contract area except on surfaced or dirt roads, at staging areas, within closed vehicles, or at other posted places, and shall never be allowed while working or traveling on foot.

6. Welding. Welding or use of cutting torches will be permitted only in areas that have been cleared or are free of all material capable of carrying fire. Flammable debris and vegetation must be removed from within a minimum of 10 feet radius of all welding and cutting torch operations. A shovel and a 5-gallon standard backpack water container (filled) with handpump attached shall be immediately available for use in the event of a fire start.

1.10 POST-CONSTRUCTION CLEANUP

A. Contractor shall clean up all areas used for construction.

1.11 RESTORATION OF LANDSCAPE DAMAGE

A. Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.12 TRAINING OF CONTRACTOR PERSONNEL

A. Contractor shall advise his personnel regarding all pertinent phases of environmental protection required in the Contract Documents. The training shall include methods of detecting and avoiding pollution, proper fueling techniques at this site, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

PART 2 PRODUCTS

2.01 FILTER FABRIC FENCE

A. Geotextile

1. Manufacturer's fabric specifications must be submitted for approval and must be available on-site.

2. Geotextile shall be a woven monofilament or non-woven fabric. Slit-film fabric shall not be used.

3. Apparent opening size (AOS), American Society for Testing and Materials [ASTM] D-4751): 100

4. Water permittivity (ASTM D-4491): 0.02 sec-1 minimum

5. Grab tensile strength (ASTM D-4632): 100 pounds minimum

6. Grab tensile elongation (ASTM D-4632): 30 percent maximum

7. Ultraviolet resistance (ASTM D-4355): 70 percent minimum

B. Posts: 2- by 4-inch wood or steel fence posts

C. Wire Mesh Backing: 14 gauge with 2-inch by 2-inch square openings

2.02 SAND BAGS

A. Sand bags shall be burlap or polypropylene and filled to a minimum weight of 30 pounds.

2.03 EROSION CONTROL BALES, WATTLES, LOGS, AND ROLLS

A. Furnish straw bales tied with either commercial quality baling wire or string. Conform to the following:

1. Furnish certified weed free (native grass seed) straw that is free from mold or other objectionable material. Furnish straw in an air-dry condition suitable for placing with mulch blower equipment.

2. Approximate length 3.5 feet; Shape rectangular; approximate mass 70 pounds

B. Furnish fiber wattles, logs, or rolls of curled excelsior fiber rolled into a cylindrical shape and encased in seamless photodegradable tubular netting. Conform to the following:

1. Diameter 12 inches min.; Mass 3 pounds per foot min.

C. Furnish straw wattles that are manufactured from weed free straw and wrapped in tubular photodegradable plastic netting made from 85% high density polyethylene,

14% ethyl vinyl acetate and 1% color for ultraviolet (UV) inhibition. Conform to the following:

1. Diameter 9 inches minimum; Netting strand thickness 0.030 inches; Netting knot thickness 0.055 inches; Mass of netting 0.315 to 0.385 ounces per foot

D. Mulch shall be air-dried, well-seasoned, and free of undesirable seeds, noxious weeds, and all other material detrimental to plant life.

PART 3 EXECUTION

3.01 PERIMETER FILTER FABRIC FENCES

A. Construction

1. Install prior to other land-disturbing activities.

2. Silt fence trench: minimum 8 inches wide by 6 inches deep; backfill trench with compacted native soil.

3. Fence posts: Maximum separation, 6 feet.

4. Posts: Drive minimum 18 inches into ground.

5. Fabric: Staple to posts per manufacturer's recommendations.

6. Fence: Wire mesh backing.

7. Alignment: As described on Drawings.

8. Fence ends: Extend upslope perpendicular to the contour for a distance of at least 6-feet to inhibit flow around the end of the fence.

9. Fence sections: Overlap at least 10 feet.

B. Maintenance

1. Inspection: Daily. Repair damage immediately.

2. Sediment removal: If sediment is evident, remove the trapped sediment. Remove accumulated sediment at least daily.

3. Photo-degraded or damaged fabric: Replace.

4. Final site stabilization: Remove fence.

3.02 EROSION CONTROL BALES, WATTLES, LOGS, AND ROLLS

A. Erosion Control Plan

B. Application

1. Prepare the slope before the installation procedure is started.

2. Shallow gullies should be smoothed as work progresses.

3. Dig small trenches across the slope on contour, to place rolls in. The trench should be deep enough to accommodate half the thickness of the roll. When the soil is loose and uncompacted, the trench should be deep enough to bury the roll 1/3 of its thickness because the ground will settle.

4. It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.

5. Start building trenches and installing rolls from the bottom of the slope and work up.

6. Construct trenches at contour intervals 25-30 feet (8-10 meters) apart depending on the steepness of the slope. The steeper the slope, the closer together the trenches should be.

7. Lay the roll along the trenches fitting it snugly against the soil. Make sure no gaps exist between the soil and the straw wattle.

8. Use a straight bar to drive holes through the roll and into the soil for the willow or wooden stakes.

9. Drive the stake through the prepared hole, and into the soil. Leave only 1 or 2 inches (25 or 51 millimeters) of the stake exposed above roll.

10. Install stakes at least every 4 feet (1.2 meters) apart along the length of the wattle. Additional stakes may be driven on the downslope side of the trenches on highly erosive or very steep slopes.

B. Maintenance

1. Inspect the rolls and the slopes after rain events and at the frequencies as established in the SWPPP. Make sure the rolls are in contact with the soil.

2. Repair any rills or gullies promptly.

3. Reseed or replant vegetation if necessary, until the slope is stabilized.

3.03 STRAW MULCH

A. Application

1. Disturbed areas that will remain unworked for longer than one week

2. Rate: 3 tons per acre (3 bales per 1,000 square foot, or 3 inches thick)

3. Secure mulch to soil: “Crimp” straw into soil by operating tracked vehicle (or straw crimping equipment) parallel to slope (up and down slope)

B. Maintenance

1. Stockpiled straw: have available on-site sufficient straw to replace 10 percent of covered area.

2. Inspect straw mulch: after each rainfall event, repair by replacing straw and re-crimping.

3.04 NOXIOUS WEED CONTROL

A. In order to prevent the potential spread of noxious weeds into work areas, Contractor shall be required to use weed-free equipment. The following is considered proof of weed-free equipment:

1. The Contractor will be required to clean all equipment prior to entry onto CTUIR lands. This cleaning shall remove all dirt, animal and plant parts and material that could carry invasive species seeds or parts into the work area. Only clean equipment inspected by the CTUIR will be allowed to operate within the work area. The inspection shall be pre-arranged by the Contractor and will occur prior to entering the work area. All subsequent move-ins of equipment shall be treated in the same manner as initial move-in.

2. For the purpose of item (1) above, equipment includes: hand tools, power tools, vehicles, all-terrain vehicle (ATV)/utility task vehicle (UTV), dump trucks, excavators, and all other heavy equipment.

B. Straw/hay bales shall be certified as “weed free”. The source field shall be inspected and certified by the county extension agent from the county that the straw/hay is grown. Each shipment into the work area shall be accompanied by a certification tag stating that it is weed free. The Contractor shall furnish the CTUIR with a statement of certification prior to unloading the bales.

END OF ENVIRONMENTAL PROTECTION

SECTION 01 35 43.20
CARE AND DIVERSION OF WATER

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the dewatering, treatment, discharge, and/or diversion of any water that might be required for performance of contract work. The work includes care and any necessary diversion of water in the vicinity of excavated banks, seepage into excavations, and water potentially generated by Contractor's project construction methods.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. Construction Dewatering Water Storage, Treatment, and Discharge System

a. Contractor shall submit a Dewatering Plan with shop drawings showing design details and layout for the Construction Dewatering, Treatment, and Discharge System, and procedures for operation. These shop drawings shall be submitted within 10 calendar days following Notice to Proceed.

2. Storm Contingency Plan

a. Contractor shall submit, within 10 calendar days of Notice to Proceed, a Storm Contingency Plan. The Storm Contingency Plan shall detail actions to be taken in the event of an unexpected storm that could cause stormwater to collect and leave the work area.

B. Fish Passage

1. Both resident and anadromous fish utilize the project reach of Birch Creek. Due to the instream work period restrictions, no provisions for fish passage are required beyond those discussed throughout this document and on the Drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CARE AND DIVERSION OF WATER

SECTION 01 52 00
TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Construction Equipment Parking

1. Contractor shall identify a location within the project work area as an equipment parking area for daily parking and receive approval by the Owner's Representative. This area shall also be used for equipment fueling and daily maintenance and shall meet all criteria listed in Section 01 35 43 ENVIRONMENTAL PROTECTION Subsection 1.06 D, Mobile Equipment Fueling. No daily fueling or maintenance shall be completed outside this designated area.

B. Employee Parking

1. Contractor employees shall park privately owned vehicles in an area designated by the Owner's Representative. This area shall be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements.

1.02 SUBMITTALS

A. None.

1.03 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Water and Electricity

1. No municipal water or electricity will be available at the project site. Contractor shall arrange for drinking water, potable water, and power at the project site as needed and coordinate these needs with the Owner's Representative at the pre-construction meeting.

B. Sanitation

1. Contractor shall provide and maintain within the construction area field-type sanitary facilities. The number of sanitary facilities shall be matched to the maximum number of personnel working at the site as required by Federal, State, and local codes and regulations. Sanitary facilities shall be equipped with a hand-washing station.

1.04 PROTECTION AND MAINTENANCE OF TRAFFIC

A. Contractor shall maintain and protect traffic and parked vehicles on all affected roads and parking lots during the construction period, except as otherwise specifically directed by the Owner's Representative. Measures for notification, any required hauling permits, the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities

having jurisdiction. The traveling public and Owner personnel shall be protected from damage to person and property. Contractor's traffic on roads selected for hauling material to and from the Site shall interfere as little as possible with public traffic. Contractor shall investigate the adequacy of existing roads and parking lots and the allowable load limit on these roads and parking lots. Contractor shall be responsible for the repair of any damage to roads and parking lots caused by construction operations.

B. Barricades

1. Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to areas such as roads or parking areas is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible, and with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.05 CONTRACTOR'S TEMPORARY FACILITIES

A. Administrative Field Offices

1. Contractor shall provide and maintain administrative field office facilities within the construction area as directed by the Owner's Representative.

2. The Contractor shall provide a clean, watertight field office with heat, electric lighting, equipped with drawing rack and drawing display table, all weather automobile access, and parking in a central location on the job site for the use of the Owner's Representative or Engineer if so directed. The field office will provide space for project meetings, with table and chairs to accommodate the appropriate number of persons. The Contractor shall provide access to the field office during normal working hours and other times to be specified by the Owner's Representative or Engineer. The Contractor shall pay all costs to set up the office, supply materials, supply electricity, provide weekly janitorial service, and maintenance for the duration of the project. The Contractor shall not use the field office for the storage of any material, equipment, tools, or supplies.

B. Appearance of Trailers

1. Trailers used by Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair.

C. Security Provisions

1. Adequate outside security lighting shall be provided at Contractor's temporary facilities as needed. Contractor shall be responsible for the security of its own equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF TEMPORARY CONSTRUCTION FACILITIES

SECTION 01 55 13
TEMPORARY ACCESS ROADS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work in this section consists of the installation and removal of temporary access roads into the project work areas. Location of temporary access roads shall be field-fit as directed to protect existing vegetation to the extent practical.

1.02 SUBMITTALS

A. Contractor shall submit a plan showing the proposed location and construction techniques to install the access road based on the Drawings. This plan shall be developed using the equipment weights and proposed usage to ensure the location and construction will support the equipment and anticipated loads over the proposed usage period of the road.

PART 2 PRODUCTS

2.01 FILTER FABRIC

A. Installation of a filter fabric between the native soil and rock road surface may be required in places to keep the materials separate and ease the removal of the rock. If used, filter fabric shall be Mirafi 140NL or approved equal.

2.02 ROCK FOR ACCESS ROADS

A. Rock used for the access roads shall be free of soil and other extraneous materials. Materials used for the road construction shall be either quarry spalls or larger crushed rock.

2.03 TEMPORARY BRIDGES

A. Temporary construction bridges are required at locations as shown on Drawings.

B. Contractor shall submit proposed bridge configuration to Owner's Representative or Engineer for approval at least a week in advance of installation.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Site clearing and fence removal shall be completed within Section 31 10 00 SITE CLEARING and Section 01 56 23 TEMPORARY FENCING.

3.02 PRELIMINARY GRADING

A. Once the temporary road alignments have been approved by the Owner's Representative or Engineer, preliminary grading can be completed. All materials removed during the preliminary grading shall be placed to the side of the temporary roads for use during site restoration upon completion of the project.

3.03 ROAD INSTALLATION

A. Upon completion of the preliminary grading, filter fabric may need to be installed on the temporary roads to ease removal of access road rock. Quarry spalls or large crushed rock will then be placed on the filter fabric to complete the access pad.

B. Compaction of the temporary roads will be completed using a dozer to spread the rock material, dump trucks delivering additional material, or an excavator after the rock is installed.

C. Estimated total length of temporary construction access roads will be approximately 3,360 feet. Length of the individual construction access roads will vary depending on the site conditions.

3.04 TEMPORARY BRIDGE INSTALLATION

A. Bridges to be installed at the locations shown on the Drawings.

B. Bridges to be installed over active flowing water in the stream channel.

C. Bridges to be installed on temporary concrete abutments or on a firm substrate.

3.04 ROAD MAINTENANCE

A. During the use of the temporary access roads, if additional materials are needed to maintain the roads, these materials shall be of the same type that were used to originally construct the roads and pads.

3.05 ROAD REMOVAL

A. Upon completion of the construction, the temporary access roads shall be removed.

B. The Contractor shall remove the quarry spalls or larger crushed rock and haul this material to an off-site location. In addition, all filter fabric used shall be removed and hauled to an off-site location. It is the Contractors responsibility to remove all of the filter fabric and rock from the temporary roads.

C. All compacted access roads shall be subsoiled/scarified during Closeout.

3.06 SITE DECOMPACTION AND REGRADING

A. After the filter blanket and rock have been removed from the temporary road alignment, these sites shall be evaluated for the degree of compaction by the Owner's Representative to make sure the disturbed areas will be restored to original conditions to the greatest extent practical for re-establishment of native vegetation.

B. Subsoiling/decompaction to a minimum depth of 18 inches will be required to restore heavily compacted subgrade. Subsoiling shall be performed with a dozer ripper, subsoiling grabble rake (SGR) or subsoiling excavator bucket (SEB) and will leave no clumps larger than 8 inches in diameter when finished. Subsoiling during Closeout shall be approved by the Owner's Representative or Engineer.

C. After the filter blanket and rock have been removed from the temporary road alignment, these sites shall be regraded using the materials set aside during the

preliminary grading. Finished grade along the road shall be as close to the original grade as possible.

3.07 SITE REVEGETATION

A. Revegetation along the regraded road alignments shall be completed by the Owner and in Section 32 90 00 SEEDING.

END OF TEMPORARY ACCESS ROADS

SECTION 01 71 23
FIELD SURVEYING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work described herein for Field Surveying may be selected for contract separately from the remainder of the specifications. Owner to determine Contractor for described work.

B. Contractor shall provide all materials, items, operations, or methods specified, listed, or scheduled on the Drawings or in the Specifications, including all materials, labor, equipment, and incidentals necessary and required to conduct proper surveys required to stake and layout the work, based on the Drawings and CAD files provided by the Owner's Representative or Engineer.

C. Contractor shall perform surveys for layout of the work and to document final construction for "Record" Drawings.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. Survey Data for Record Drawings

a. Within 14 calendar days of final acceptance, Contractor shall furnish Owner's Representative or Engineer field survey data documenting the completed construction.

1.03 QUALITY CONTROL

A. All survey, layout, and related work shall be performed to the satisfaction of Owner's Representative or Engineer.

1.04 PROJECT RECORD DOCUMENTS

A. Upon completion of the work, Contractor shall submit Field Record Documents to Owner's Representative or Engineer under the provisions of Section 01 78 39 RECORD DRAWINGS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall exercise care during the execution of the work to minimize any disturbance to the landscape in the areas surrounding the work site.

B. Contractor shall have onsite survey and grade control capacity such as total station, GPS, and/or GPS enabled construction equipment.

3.02 INSPECTION

A. Contractor shall verify locations of existing site reference and survey control points prior to starting work. Contractor shall promptly notify Owner's Representative or Engineer of any discrepancies discovered. Contractor shall also verify layouts periodically during construction.

3.03 SURVEY REFERENCE POINTS

A. Survey reference points have been established by prior contract at the site. Contractor shall locate and verify the accuracy of three of these reference points for coordinate location and elevations prior to using them for work performed at the site. If any discrepancies exist in the location of the existing benchmarks, Contractor shall notify Owner's Representative or Engineer prior to performing any site layout activities. Contractor may install additional reference points for his/her convenience at locations approved by Owner's Representative or Engineer. No payment will be made for any additional permanent site control installed by Contractor beyond that specified and permitted herein. Contractor shall protect survey control points prior to starting site work and preserve permanent reference points during construction. Contractor shall not relocate site reference points without prior written approval from Owner's Representative or Engineer.

B. Contractor shall promptly report to Owner's Representative or Engineer the loss, damage, or destruction of any reference point or relocation required because of changes in grades or other reasons. Contractor shall replace dislocated survey control points based on original survey control at no additional cost to Owner. Replacement of dislocated survey control points shall be done by a licensed land surveyor in the State of Oregon. Survey accuracy used to relocate disturbed control points shall be equal to or better than that used to set the original control.

C. Contractor shall be responsible for the accuracy of all surveys performed with his forces, including those of his subcontractors. Any work performed not conforming to the lines, grades, elevations, and locations indicated on the Contract Drawings due to survey error shall be the responsibility of Contractor, and Contractor shall repair or relocate such work to its proper location at no additional cost to Owner.

3.04 SURVEY REQUIREMENTS

A. Contractor shall reference survey and site reference points to the provided control monuments and record locations of survey control points, with horizontal and vertical data, on project Record Documents. Record Drawings shall include the bare earth of all grading activities and location of all installed structures to the tolerances described herein.

B. Contractor shall with its own forces obtain working or construction lines or grades as needed.

C. All control surveys for elevation shall be +0.1 foot and, for horizontal, control angles shall be to the nearest 20 seconds +10 seconds, and measured distances shall be to +0.1 foot. All measurement surveys for elevation shall be to the nearest 0.1 foot +0.05 foot and for horizontal distances shall be to + 0.1 foot.

D. Contractor shall provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required. All material shall be of good professional quality and in first-class condition.

E. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work. A copy of the recent calibration of all instruments will be required and available to the Engineer and Owner.

F. Contractor shall furnish all materials and accessories (i.e., grade markers, stakes, pins, spikes, etc.) required for the proper location of grade points and line.

G. All marks given shall be carefully preserved and, if destroyed or removed without Engineer's or Owner's Representative's approval, they shall be reset, if necessary, at Contractor's expense.

H. Upon completion of surveys for control points, channel location, structure location, fencing location, access roads and embankment, the Contractor's Surveyor will notify the Owner's Representative or Engineer for review of the survey. Upon review and approval of the survey by the Owner's Representative or Engineer, the Contractor will be notified to proceed with implementation.

3.05 SURVEY OF COMPLETED EXCAVATION

A. At the completion of excavation and fill in all areas, Contractor shall survey the extents, elevations, grade breaks, and daylight points of all excavation and fill areas using a grid at a minimum of 25-foot centers plus key grade breaks, to document the final configuration.

3.06 SURVEY OF COMPLETED CONSTRUCTION

A. At the completion of restoration in all areas, Contractor shall survey the floodplain, backfill, creek bed and banks, using a grid at a minimum of 25-foot centers plus key grade breaks, to document the final configuration, access road to remain in place, and all major structures (such as boulders and/or large woody debris) in the creek or floodplain.

3.07 PAYMENT AS AN INCIDENTAL

A. The cost to Contractor of all work and delays occasioned by giving lines and grades, or making other necessary measurements, will be considered as having been included in the lump sum price for the work.

END OF FIELD SURVEYING

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the process and procedures to be followed by the Contractor, Engineer, and Owner for the review and acceptance of work during implementation.

B. Review and acceptance of work will be completed when needed during and at the end of construction, including for as-directed and hourly work.

C. Review and acceptance of work will be completed for the completion of earthwork, LWM structures, and channel features as shown on the Drawings.

D. A Record of Review and Acceptance of work will be kept by both the Contractor and Owner's Representative or Engineer at the project site.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. During the weekly construction meetings, the Contractor will provide a summary of work completed and work under way at each of the work sites, including as-directed and hourly work.

B. The Contractor will communicate with the Owner's Representative or Engineer on the status of work completion at each of the work sites.

C. As work approaches completion at each work site, the Contractor will request the Owner's Representative or Engineer to review the work and prepare a punch-list of tasks to be completed at each site.

D. Upon receipt of the punch-list, the Contractor will complete each of the tasks identified by the Owner's Representative or Engineer.

E. Work on the tasks will continue until the Owner's Representative or Engineer accepts the completed work.

1.03 ENGINEER'S REVIEW AND APPROVAL

A. Upon receiving a request from the Contractor, the Owner's Representative will prepare a punch-list of tasks to complete work at each of the work sites.

B. The Owner's Representative will update the completion punch-list regularly to assist the Contractor in completing the work in an efficient manner. This will occur at a minimum of twice per week, more frequently if the task dictates more immediate action.

C. Upon completion of the tasks included on the punch-list, the Owner's Representative or Engineer will approve the work and sign the Record of Review and Acceptance.

D. As work approaches completion of individual components, the Engineer will notify the Owner's Representative on project activities and request an on-site review of the work.

1.04 OWNER'S REPRESENTATIVE APPROVAL

A. The Owner's Representative will be expected to attend and participate in the Weekly Progress Meetings and keep current on the project implementation activities.

B. Upon receipt of the request from the Engineer for an on-site review of the completed work, the Owner's Representative will schedule a time to be on-site to complete the review.

C. After the completion of the review, the Owner's Representative will have the option to approve, approve with conditions, or reject the work completed.

D. When the Owner's Representative approves with conditions or rejects the completed work, the Owner's Representative will have two (2) working days to prepare a punch-list of items to be completed prior to approval. This punch-list will be submitted to the Contractor and the Engineer.

1.05 PROJECT APPROVALS

A. Project approvals will be completed at the end of construction.

B. Upon project approval by the Engineer and Owner's Representative, the construction work will be accepted by the Owner's Representative.

1.06 PROJECT CLEANUP AND REPAIRS

A. Cleanup and repair of work area will be completed when needed during and at the end of construction.

B. The Contractor is expected to keep the project work area clean and prevent the accumulation of trash and debris. Placement of a dumpster at the project trailer with regularly scheduled pickups shall be arranged by the Contractor.

C. Additional cleanup and repair activities shall include but are not limited to road and fence repairs, general maintenance, staging area cleanup and maintenance and construction trailer maintenance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CLOSEOUT PROCEDURES

SECTION 01 78 39
RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Field Record Drawings.

1. Field Record Drawings shall be completed and submitted to Owner's Representative or Engineer, within 14 calendar days of final acceptance. All Drawings from the original Contract Drawings set shall be included, including the drawings where no changes were made. Owner's Representative or Engineer will review all field record drawings for accuracy and clarity. The Field Record Drawings will be returned to Contractor if corrections are necessary. Contractor shall make all corrections and shall return the Field Record Drawings within 7 calendar days of receipt.

1.02 SUBMITTALS

A. Field Record Drawings shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FIELD RECORD DRAWINGS

A. Contractor shall keep at the construction site two complete sets of full-size prints of the Contract Drawings, reproduced at Contractor expense, one for Contractor's use, one for Owner's Representative or Engineer. During construction, both sets of prints shall be marked to show all deviations in actual construction from the Contract Drawings. The color green shall be used to indicate all additions and red to indicate all deletions. The drawings shall show the following information but not be limited thereto:

1. The locations and description of any structures, pipelines, utility lines and other installations of any kind or description known to exist within the construction area and not previously shown on the Contract Drawings. The location includes dimensions and/or survey coordinates for permanent features.

2. The location, orientation, topography and grade of all stream restoration features installed or affected as part of the project construction.

3. All changes or modifications from the original design and from the last inspection.

B. Where Contract Drawings or Specifications allow options, only the option actually used in the construction shall be shown on the record drawings. The option not used shall be deleted.

C. These deviations shall be shown in the same general detail utilized in the Contract Drawings. Marking of the prints shall be pursued continuously during construction to keep them up to date. The resulting field-marked prints and data shall be referred to

and marked as “Field Record Drawings,” and shall be used for no other purpose. They shall be made available for inspection by Owner’s Representative or Engineer whenever requested during construction and shall be jointly inspected for accuracy and completeness by Owner’s Representative or Engineer and a responsible Representative of Contractor prior to submission of each monthly pay estimate. Failure to keep the Field Record Drawings current shall be sufficient justification to withhold 10 percent of the final payment until satisfactory drawings are received.

3.02 PAYMENT

A. All costs incurred by Contractor in the preparation and furnishing of Field Record Drawings shall be included in the contract price and no separate measurement or payment will be made for this work. Approval and acceptance of the Field Record Drawings shall be accomplished before final payment is made to Contractor.

END OF RECORD DRAWINGS

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work specified in this Section includes, but is not necessarily limited to, the following:

1. Removing materials from the site and delivering salvaged items to the CTUIR.

2. Removing designated trees and protecting from harm any trees or other objects selected to remain by Owner's Representative.

1.02 HISTORICAL ITEMS

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value that may be encountered during site preparation shall remain the CTUIR's property. Upon such discovery or find, Contractor shall immediately notify Engineer and Owner's Representative. While waiting for instructions Contractor shall record, report, and preserve the finds in accordance with the National Historic Preservation Act and 43 Code of Federal Regulations Subtitle A Part 7, Protection of Archeological Resources.

B. Items designated for attention of CTUIR if discovered shall be handled as described in Section 01 35 43 ENVIRONMENTAL PROTECTION.

1.03 SUBMITTALS

A. Submit:

1. Procedures and operational sequence for review and acceptance by the Owner's Representative or Engineer include:

a. Permits for transport and disposal of debris as required.

2. As-built drawings and records in accordance with Section 01 78 39 RECORD DRAWINGS.

1.04 DIMENSIONS AND LAYOUT

A. The Contractor shall be responsible for installing construction fence around the construction area and resetting fencing to accommodate changes in the construction area.

B. All work, materials, methods, and personnel shall be subject to approval by the Owner's Representative or Engineer prior to commencing construction and on a continuous basis throughout construction.

C. The Contractor is responsible for preserving all benchmarks and stakes and replacing any that are displaced or missing as a result of the Contractor's operations.

D. The Contractor shall be responsible for locating all underground utilities prior to beginning any excavation or underground demolition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. This section describes the requirements for site clearing and grubbing. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

3.02 EROSION/POLLUTION CONTROL

A. Required erosion/pollution control facilities in accordance with Sections 01 35 43.20 CARE AND DIVERSION OF WATER and Section 01 35 43 ENVIRONMENTAL PROTECTION shall be in place prior to beginning the work of this Section.

3.03 EXISTING CONDITIONS

A. Protection of Facilities

1. Provide, erect, and maintain temporary construction fencing around the construction area as shown on the Drawings.

2. Control construction traffic entering and leaving construction access gates to protect property.

B. Protection of Existing Improvements:

1. Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing trees, fences, structures or buildings. Restore any improvements damaged by this work to their original condition, as acceptable to the Owner's Representative or Engineer.

3.04 TREE AND SHRUB PROTECTION

A. General:

1. Include barricades and/or fencing and other protection for trees indicated on the Drawings or directed by the Owner's Representative or Engineer to be saved and protected.

2. Maintain existing grade within root protection zone of trees to the edge of the dripline unless otherwise indicated.

3. Grubbing will be performed by cutting the vegetation at ground level while keeping the roots to the extent possible.

3.05 SITE WORK

A. Sprinkle debris with water as necessary to limit dust to lowest practicable level. Do not use excessive water which may cause flooding, contaminated runoff, or icing.

B. Existing utility lines within the project area shall remain in operation throughout the duration of the construction period. Protect and support all lines and meters from damage and movement.

C. Existing utility lines, structures, and meters serving other properties shall remain in operation throughout the duration of the construction period. Protect and support all lines and meters from damage and movement.

D. In the event the Contractor encounters utility lines not shown on the Drawings or otherwise indicated to be saved, removed, or abandoned, the location of such lines shall be marked in the field and the Owner's Representative or Engineer notified.

3.06 CLEARING LIMITS

A. Construction fences and clearing limits for the construction activities are shown on the Drawings.

B. Construction fences and temporary erosion control shall be installed prior to the beginning of site clearing for each construction period.

C. All trees removed within the clearing limits shall be sorted and stockpiled into the following size categories:

1. Diameter 18 inches or greater.

2. Diameter 4 to 10 inches.

3. Diameter less than 4 inches.

D. All shrubs and other wood material shall be collected and stockpiled for use later in the project.

3.07 DEMOLITION

A. Temporary erosion and sedimentation control features shall be in place before demolition.

B. Demolished material shall be treated as salvaged item.

3.08 SALVAGED ITEMS

A. Carefully dismantle and remove salvaged items.

1. The Contractor shall deliver any salvaged items to an approved location designated by the Owner's Representative.

3.09 STOCKPILING OF MATERIALS

A. The Contractor should have sufficient area on-site to stockpile large wood material for later use in the project.

B. If additional stockpile areas are required to complete the project on schedule, the Contractor will arrange off-site stockpile areas. No additional payments will be made for stockpiling excavated materials off-site.

C. Reusable materials shall be carefully segregated into material sizes defined in Section 3.06.

3.10 DISPOSAL OF MATERIALS

A. Refuse and non-organic trash resulting from site clearing and grubbing shall be disposed of by the Contractor in a manner consistent with all government regulations.

1. No burning permitted.

2. Do not leave refuse material on the project site, shoved onto abutting private properties, or buried in embankments or trenches on the project site.

3. Do not deposit debris in streams, bodies of water, roads, or upon private property except by written consent of the private property Owner.

4. Maintain haul routes clean and free of debris resulting from work of this Section.

5. All small trees, limbs, branches, bark and needles shall be buried during backfilling activities.

3.11 CLEAN-UP

A. Upon completion of the work of this Section, remove all rubbish, trash, and debris resulting from operations.

B. Remove equipment and tools; leave the site in a neat and orderly condition acceptable to the Owner's Representative or Engineer.

END OF SITE CLEARING

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers earthwork for new main channel, old main channel, new wetlands, and terrace fill and compaction.

1.02 JOB CONDITIONS

A. Environmental requirements: Construction shall progress only when weather conditions will not detrimentally affect the quality of the finished earthwork. If the atmospheric temperature falls below 35 degrees Fahrenheit in the shade, protect from freezing earthwork or soils-in-cut which require compaction to a specified degree.

B. Protection of adjacent work and existing facilities is the responsibility of the Contractor and must be accomplished. Where open cuts are used in lieu of shoring, the excavation slopes should be made to the angle judged safe by the Contractor's designated competent person responsible for excavations and trenches. Regardless, temporary cuts shall be no steeper than 1 vertical to 1 horizontal and meet all applicable OSHA regulations. Permanent slopes shall be as shown on the Drawings and in no case be steeper than 1 vertical to 2 horizontal. Cover exposed slopes if erosion or riling threatens.

C. Allowable instream work period will be July 1 to October 31. All in-channel work activities must be completed within this period due to spawning and incubation periods of lamprey, steelhead, and Chinook Salmon in Birch Creek. Extensions of the in-channel work period may be granted under certain conditions by the ODFW District Office but the Contractor shall not expect an extension due to scheduling conflicts.

1.03 DEFINITIONS

A. Excavation: Area or material removed to provide a suitable base for improvement.

B. Channel Fill: Fill material shall be from channel and wetland excavation and free of organic and other unsuitable material. Channel fill relates to the proposed existing channel fill locations indicated on the Drawings

C. Terrace Fill: Fill material shall be from channel and wetland excavation and free of organic and other unsuitable material. Terrace fill relates to the proposed floodplain terrace fill locations indicated on the Drawings

D. Embankment Fill: Fill material shall be from channel and wetland excavation and free of organic and other unsuitable material. Embankment fill relates to the proposed colluvial fan locations indicated on the Drawings

E. Compaction: Placement of channel fill materials shall be compacted to a density similar to the in-situ or excavated adjacent floodplain conditions. See Section 3.12 for Embankment Fill Compaction requirements.

F. Unsuitable excavated material: excavated soil heavy laden with fines and organic material such as peat, decomposing vegetation, soft organic clay, and silts and are completely devoid of sands, gravel, and cobble.

1.04 REFERENCES

A. Oregon Department of Transportation (ODOT) Standard Specifications for Construction 2021 or most current.

1. Section 00330 – Earthwork

2. Section 00330.12 – Borrow Material

3. Section 00330.42 – Embankment, Fills, and Backfills

4. Section 00330.43(C) – Earthwork Compaction Requirements

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. This section describes the requirements for excavation and backfilling. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

B. Refer to Section 31 23 19 CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING for specifications on work area isolation, fish and freshwater mussel salvage, dewatering, and rewatering.

3.02 PROTECTION OF ADJACENT WORK

A. Protection of adjacent work, utilities and other improvements must be accomplished. Properly slope cuts to provide stability. Temporary cuts should be no steeper than one vertical to one horizontal. Permanent slopes should be no steeper than one vertical to two horizontal. Cover exposed slopes if erosion or raveling threatens.

3.03 EQUIPMENT

A. Construction of the LWM structures, channel and wetland excavation, loading and hauling material to stockpiles, and backfilling the old channel fill and terraces will require numerous types of heavy equipment. This equipment will include but is not limited to medium to large excavators with bucket thumb, front end loaders, off-road dump trucks, and dozers with 6-way blade.

B. Construction of the LWM structures, channel and wetland excavation, loading and hauling material to stockpiles, and backfilling the old channel fill and terraces will require the Contractor to have onsite survey and grade control capacity such as total station, GPS, and/or GPS enabled construction equipment.

3.04 EXCAVATION BELOW EXISTING GRADE

A. Unless otherwise specified, any appropriate method of excavation within the work limits shown may be employed which, in the opinion of the Contractor, is considered best, and meets applicable safety standards. The Contractor shall take whatever precautions are necessary to maintain the undisturbed state of the natural soils at and below the bottom of the excavation.

B. Should the excavation be carried below the lines and grades indicated on the drawings or specified herein because of the Contractor's operations, the Contractor shall refill such excavated space to the proper elevation as directed by the Owner's Representative or Engineer. Should foundation materials be disturbed or loosened because of the Contractor's operations, they shall be removed and the space refilled as directed at no additional cost to the Owner.

C. Rock Excavation is defined as the removal of all material which by actual demonstration, cannot, in the Engineer or Owner's Representative's judgment, be reasonably excavated with equipment used for common earthwork and equipped with rippers or similar approved equipment. If bedrock is encountered that cannot be removed using the common earthwork equipment or equipment with minimum 125 Horsepower, the grading plan shall be adjusted as approved by the Engineer or Owner's Representative at no additional cost. The term Rock Excavation shall be understood to indicate a method of removal and not a geological formation.

3.05 CONTROL OF WATER

A. The Contractor shall follow guidelines contained in Sections 01 35 43 ENVIRONMENTAL PROTECTION 01 35 43.20 CARE AND DIVERSION OF WATER during all excavation and backfill operations.

B. The Contractor is responsible for complying with all permits conditions related to water in the stream, stormwater, and dust control during the excavation and backfill operations.

3.06 DUST CONTROL

A. The Contractor shall be responsible for providing control of airborne dust and particulates from the work areas. Visible dust shall be limited by water, dust palliative or other approved methods.

B. If water is used for dust abatement, it must be brought in by the Contractor from an outside source. Water may not be used directly from Birch Creek without prior, written consent of the Owner's Representative.

3.07 EXCAVATION OF NEW MAIN CHANNEL

A. A new main channel will be excavated as shown on the Drawings.

B. Excavation will begin at the downstream end of the new main channel to prevent working in accumulated seepage flow from the old channel upstream.

C. Dimensions of the new side channel are shown on the Drawings.

3.08 EXCAVATED MATERIAL STOCKPILES

A. Excavated material stockpile areas are identified in the Drawings as staging areas.

B. Additional location of the excavated material stockpile sites are to be determined by Owner's Representative or Engineer.

C. Contractor will be responsible for managing the volume, shape, and weather protection for each of the stockpile sites.

D. The Contractor is responsible for keeping the stockpiled material protected to prevent any major erosion off the piles.

E. In the event that sufficient room to store the anticipated excavated volume of material is not available in the identified stockpile sites, the Contractor can propose additional stockpile sites within the project area. Any new stockpile site must be approved by the Owner's Representative or Engineer prior to use by the Contractor.

3.09 EXCAVATION OF WETLANDS

A. New wetlands will be excavated as shown on the Drawings.

B. Excavation will begin at the downstream end of the wetland cluster to prevent working in accumulated seepage flow from the upstream excavated wetlands.

C. Dimensions of the new wetlands are shown on the Drawings.

3.10 CHANNEL FILL

A. Placement of suitable material as channel fill shall begin at the most upstream end and move downstream to the locations and dimensions as shown on the Drawings.

B. Channel fill shall be compacted with mechanical effort to a firm and unyielding surface using excavator bucket or other means approved by the Owner's Representative or Engineer. Fill should be placed in maximum 6-inch lifts. Channel backfill density should meet or exceed the density of the in-situ floodplain material.

C. Fill construction for channel backfill will begin once temporary isolation measures are in place to prevent working in accumulated seepage flow in the channel.

D. The channel fill area shall be dewatered and stripped of topsoil, vegetation, organic material, and unsuitable material.

E. Riparian plant species and sod clumps should be salvaged and replanted once fill is complete, to the extent practical.

3.11 TERRACE FILL

A. Placement of suitable material as terrace fill shall begin at the most upstream end and move downstream to the locations and dimensions as shown on the Drawings.

B. Terrace fill shall be compacted with mechanical effort to a firm and unyielding surface using excavator bucket or other means approved by the Owner's Representative or

Engineer. Fill should be placed in maximum 6-inch lifts. Terrace fill density should meet or exceed the density of the in-situ floodplain material.

C. The terrace fill area shall be dewatered and stripped of topsoil, vegetation, organic material, and unsuitable material.

D. Riparian plant species and sod clumps should be salvaged and replanted once fill is complete, to the extent practical.

3.12 EMBANKMENT FILL

A. Placement of suitable material as embankment fill shall begin at the most upstream end and move downstream to the locations and dimensions as shown on the Drawings.

B. Embankment fill shall be placed and compacted following the ODOT standard specification 00330.43(C) Earthwork Compaction Requirements, and method C for Non-Moisture-Density Testable Materials.

C. Embankment fill testing method shall follow ODOT TM 158 In-Place Density of Embankment and Base Using Deflection Requirements to the extent possible, or approved equivalent.

D. The embankment fill area shall be dewatered and stripped of topsoil, vegetation, organic material, and unsuitable material.

E. Riparian plant species and sod clumps should be salvaged and replanted once fill is complete, to the extent practical.

3.13 GRADE STABILIZATION MEASURES

A. Grade stabilization measure locations and dimensions to be constructed are shown on the Drawings.

B. Surfacing material and rock material shall meet the requirements shown on the Drawings and provided in Section 35 49 50 LWM AND CHANNEL STRUCTURES.

C. Fill construction for channel backfill will begin once flow diversion methods are in place to prevent working in accumulated seepage flow in the channel.

D. The grade stabilization measure areas shall be dewatered and stripped of topsoil, vegetation, organic material, and unsuitable material.

3.14 TEMPORARY ACCESS ROAD DECOMISSIONING/FLOODPLAIN DECOMPACTION

A. Demolish and decompact the temporary access road sections identified in the Drawings by restoring to approximate original ground contours. Remove any piping or structures, if found, and all associated fill material, down to “natural ground”. Finish slopes to provide gradual transitions in slope adjustments without noticeable breaks.

B. Any hardened road segment or surface area identified on the Drawings, or as directed in the field, shall be decompacted to promote water infiltration and establish vegetation.

This work shall consist of loosening all of the soil in the existing roadbed or staging area to a depth of 18 inches (minimum) and a clod size no larger than 8 inches or as shown on the plans. All roadway materials shall be removed from the downhill side of the road and placed on the uphill or cut side of the road. The roadway fill material shall be excavated down to the natural hillslope material. The sides of the road prism shall be blended to match the natural ground elevation to avoid trapping water. The excavation shall match the existing slope and contours of the local existing grade.

C. Place available slash and wood material on the recontoured area, arranged to facilitate later clump planting of vegetation during revegetation as directed by the Owner's Representative.

D. Refer to HIP Conservation Notes for additional requirements.

3.15 FINAL GRADING AND CLEAN-UP

A. All irregularities shall be made smooth except for natural surface roughness, washouts shall be filled, slopes made uniform, slightly rounded at top and bottom, and the entire area of the fill compacted and completed to the required lines, grades and cross-sections within 1/10th-foot above or below the established grade.

B. When final surfaces have been established, the Contractor shall protect the surfaces from erosion, raveling or any type of degradation, especially on surfaces that will be lined.

C. Temporary access roads shall be subsoiled/scarified during closeout.

D. Place available slash and wood material on the recontoured area, arranged to facilitate later clump planting of vegetation during revegetation as directed by the Owner's Representative.

E. Refer to HIP Conservation Notes for additional requirements.

F. When work is completed, the Contractor shall place all surplus material including stumps, trees, and brush, in the floodplain. The Contractor shall leave the premises in condition acceptable to the Owner's Representative or Engineer.

3.16 TESTING

A. Testing for compaction is required for EMBANKMENT FILL, See PART 3 EXECUTION, 3.12 EMBANKMENT FILL, C.

END OF EXCAVATION AND FILL

SECTION 31 23 19
CHANNEL DEWATERING, FISH TRANSFER AND CHANNEL REWATERING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work in this section consists of the installation and removal of a streamflow diversion systems to isolate the stream channel during the installation of temporary crossings and construction of channel LWM structures.

1.02 SUBMITTALS

A. The Contractor shall provide a list of materials and equipment proposed for use during this component of the work. In addition, the Contractor shall submit the Manufacturer's data on a bypass pipe, if deemed necessary, for use during the project.

B. The Contractor shall submit a dewatering and work area isolation plan for pre-approval to CTUIR at least 10 days prior to beginning work.

PART 2 PRODUCTS

2.01 DIVERSION STRUCTURE

A. The Contractor shall use a sandbag/stone streamflow diversion structure or a side-channel to re-route or dewater the portion of stream for in-water construction, with fish isolated from the installation of the diversion structure, as shown in the Drawings and as expressed in the HIP Terms and Conditions.

B. The Contractor shall provide material for instream temporary diversion measures such as block nets, silt fencing, floating booms, sandbags, and/or other suitable means. Instream temporary diversion shall be implemented at locations and at a duration only if approved by Engineer or Owner's Representative. The structure should include plastic liner or fine mesh silt fence to reduce the amount of fines entering the free flowing portion of the river. Block net mesh sizes and other diversion materials shall be in accordance with the National Marine Fisheries Service standards and as expressed in the HIP Terms and Conditions.

PART 3 EXECUTION

3.01 GENERAL

A. All channel dewatering system shall be approved by the owner, installed, and operational before any work in the channel can begin.

B. All instream activities must be completed after the channel has been diverted and all fish can pass through the diverted stream channel.

C. Refer to the HIP Conservation Notes in the Drawings if any fish salvage operation is required. Construction work in the immediate vicinity of fish salvage will be delayed, typically for 2 to 24 hours but longer in some cases.

D. Turbid water or sediment must not be released into the channel downstream.

E. If any bypass pumping is approved by Engineer or Owner's Representative, the Contractor shall also provide pumps with adequate pump capacity, hoses, and personnel as backup to the temporary stream flow bypass system in the event the system becomes non-operational, as may be required during construction when flow rates in the existing channel exceed the design capacity of the gravity bypass, or to maintain a dry work area when installing LWM structures. Pumps and hoses may also be used to pump seepage flow through the cofferdam into the bypass pipeline to keep water out of the work area. Turbid water shall be discharged to an approved area with sufficient capacity to allow for slow infiltration and remain disconnected from active flow channel. The Contractor shall monitor pumping operation at all times.

   Any pumping operation shall use a fish screen that is in accordance with the National Marine Fisheries Service standards. Pump intake screens shall be sized to prevent fish from being entrained into the pump intake or from being impinged on the intake screen. The screen face should be oriented parallel to flow for best screening performance. The screen shall be designed and used such that it can be submerged with at least one-screen-height-clearance above and below the screen.

F. Upon removal of the temporary stream diversion, the disturbed area shall be re-graded to match surrounding topography and reseeded, if needed, as specified in Section 32 90 00 SEEDING.

3.02 FISH TRANSFER

A. Refer to the HIP Conservation Notes in the Drawings if fish transfer is deemed necessary.

B. Fish salvage operations will be conducted by CTUIR staff and their partners, not the Contractor. Contractor shall provide at least three (3) days advance notice before dewatering or isolating any work area. Dewatering and rewatering shall be done in carefully controlled stages as expressed in the Drawings and the HIP Terms and Conditions for the purpose of inducing volitional movement out of the work area and of salvaging fish. Close coordination will be necessary with the Owner's Representative during this operation. Dewatering will take place as early in the morning as possible. No work will occur within the surrounding area until the fish salvage effort is complete. Construction work in the immediate vicinity of fish salvage will be delayed, typically for 2 to 24 hours but longer in some cases.

3.03 CHANNEL REWATERING

A. Upon activating the new main channel, the new main channel will be slowly re-watered, including pre-washing and pumping the turbid water to an approved floodplain location with no turbid water returns to the creek, and incrementally increasing flow in the new main channel over a period of hours to prevent loss of surface flow downstream and to prevent a sudden increase in stream turbidity. During re-watering, the site will be monitored to prevent stranding of aquatic organisms below the construction site. Rewatering will be completed under the direct supervision of the Owner's Representative. Refer to the HIP Conservation Notes in the Drawings.

END OF CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING

SECTION 32 90 00
SEEDING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work in this section consists of furnishing all labor, equipment, and materials to establish ground cover and grass as noted on the Drawings. Any substantive variance to this specification due to unforeseen conditions encountered on the site, weather conditions, seed availability, other construction activities, etc. must be approved by the Owner's Representative.

B. Areas outside the limit of disturbance shall be protected from damage by Contractor. Any disturbance of trees, shrubs, grass, ground cover, or wetland areas outside the limit of disturbance shown on the Drawings shall be restored by the Contractor.

1.02 SUBMITTALS

A. Prior to use on the site, Contractor shall submit to Owner's Representative or Engineer certification of the seed mix as outlined by the State of Oregon Department of Agriculture "Rules for Seed Certification."

B. Prior to use on the site, Contractor shall furnish to Owner's Representative or Engineer a statement signed by the Manufacturer certifying that each lot of seed has been tested by a recognized seed testing laboratory within six months of the date of delivery to the site.

PART 2 PRODUCTS

2.01 SEED

A. Seed mix shall conform to the standards for "Certified" grade seed or better as outlined by the State of Oregon Department of Agriculture "Rules for Seed Certification." Mulch and seed mix must be certified as weed-free. The county extension agent or soils scientist will be consulted for approval of seed mixes and sources of certified weed-free mulch.

B. Seed mix shall be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.

C. The seed mix and rate of application shall be as indicated in Table 2.01-1 and Table 2.01-2.

D. The rate of application shall be 30 pounds pure live seed per acre.

E. Seed that has become wet, moldy, or otherwise damaged in transit or storage shall not be accepted.

F. Seeding shall occur in Riparian Areas, Upland Areas and Wetland Areas shown on the Drawings.

TABLE 2.01-1 RIPARIAN SEED MIX AND COMPOSITION		
COMMON NAME	**SCIENTIFIC NAME**	**COMPOSITION (% OF MIX)**
Bluebunch Wheatgrass	*Pseudoroegneria Spicata Var Secar*	20
Big Bluegrass	*Poa Secunda*	20
Great Basin Wildrye	*Leymus Cinereus Var Magnar*	30
Streambank Wheatgrass	*Elymus Lanceolatus*	20
Idaho Fescue	*Festuca Idahoensis*	10

TABLE 2.01-2 UPLAND SEED MIX AND COMPOSITION		
COMMON NAME	**SCIENTIFIC NAME**	**COMPOSITION (% OF MIX)**
Great Basin Wildrye	*Leymus Cinereus*	25
Bluebunch Wheatgrass	*Pseudoroegneria Picata*	25
Squirreltail	*Elymus Elymoides*	10
Idaho Fescue	*Festuca Idahoensis*	10
Prairie Junegrass	*Koeleria Macrantha*	10
Yarrow	*Achillea Millefolium*	10
Bigleaf Lupine	*Lupinus Polyphyllus*	10

2.02 TACKIFIER

A. Tackifier shall be used as a tie-down for the seed mixture.

B. Tackifier shall be derived from natural organic plant sources containing no growth or germination inhibiting materials. Tackifier shall hydrate in water and readily blend with other slurry materials. Tackifier shall be noxious weed free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.

C. Apply tackifier at the Manufacturer's recommended rate.

2.03 FERTILIZER

A. Fertilizer shall not be used on this project.

2.04 WATER

A. Water shall be the responsibility of Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.05 HYDROSEEDING APPARATUS

A. Use of a hydroseeding device for spreading seed and tackifier shall be capable of uniformly distributing the material at the Manufacturer's specified rate for that product.

2.06 EROSION CONTROL MATTING

A. Use of any Rolled Erosion Control Product to control erosion or protect young plants shall conform to Section 01 35 43 ENVIRONMENTAL PROTECTION.

B. Grade areas to be seeded to achieve the finished grades and grading drainage patterns indicated on the Drawings. Grading shall be accomplished in accordance with the requirements of Section 35 01 60 STREAM RESTORATION and Section 01 52 00 TEMPORARY CONSTRUCTION FACILITIES. Blend new surfaces to existing areas.

C. The ground to be seeded shall be free of large clods or rocks, roots and other material that may interfere with the work and subsequent maintenance operations. Hand picking may be required.

D. The Rolled Erosion Control Product shall be installed in accordance with the requirements of Section 01 35 43 ENVIRONMENTAL PROTECTION.

E. Seeding shall not commence until Owner's Representative or Engineer has accepted the condition of the prepared areas.

3.02 APPLICATION

A. Weather Limitations:

1. Seeding operations shall not be permitted when wind velocities exceed 15 miles per hour;

2. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is unduly wet, or otherwise not in a tillable condition; and

3. Seeding shall only be completed from August 15 until December 1, preferably between October and November or as directed by Owner's Representative. Seeding at other times of the year shall only be completed with written permission from Owner's Representative or Engineer.

B. Hydroseeding

1. Seed shall be added to water and thoroughly mixed at the rates specified.

2. The seed and water shall be thoroughly mixed to produce a homogeneous slurry.

3. While the soil is still loose and moist, the seed and water slurry shall be uniformly broadcast under pressure over the nominated area at a rate of 30 pounds per acre using a hydroseeding apparatus.

4. Carefully regulate the flow rate and go over the area twice, applying half the seed with each application. The first application shall be from east to west and the second from north to south to ensure uniformity.

C. Watering:

1. Newly seeded areas shall not be watered to force seed germination, but only to sustain growth.

2. Vegetated areas shall be watered so as to provide optimum growth conditions for the establishment of the seed mix species.

3. Start watering within 5 working days after completing the seeded area, or once the seeds have germinated.

4. Run-off and puddling shall be prevented.

D. Maintenance

1. Maintain the seeded areas in a satisfactory condition until final acceptance by Owner's Representative or Engineer.

2. Maintenance shall include:

a. Watering vegetated areas where the establishment of the seed mix does not appear to be developing satisfactorily; and

b. Filling and leveling where erosion has washed an area away.

3. If in the opinion of the Owner's Representative or Engineer, repeat hydroseeding or repair is necessary due to Contractor's negligence, carelessness or failure to provide maintenance, then the work shall be at Contractor's sole expense.

4. Repeat hydroseeding or repair required due to factors determined by Owner's Representative or Engineer to be beyond the control of Contractor shall be paid for under the appropriate contract pay items.

3.03 APPLICATION

A. Contractor retains all ownership and responsibility for seeding until written acceptance by Owner's Representative or Engineer.

B. Owner's Representative or Engineer will accept the seeding when:

1. The application or installation is complete;

2. Documentation is complete;

3. Verification of the adequacy of all repairs, including associated vegetation, is complete; and

4. The required written seed certification documents have been received by Owner's Representative or Engineer.

END OF SEEDING

SECTION 32 93 00
PLANTING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work described herein for Planting may be selected for contract separately from the remainder of the specifications or the Owner may elect to self-perform this task. The Owner to determine the Contractor for the described work.

B. Work in this section consists of furnishing all labor, equipment, and materials to establish trees, shrubs, and hardwood cuttings as noted on the Drawings and in the plant list. Any substantive variance to this specification due to unforeseen conditions encountered on the site, weather conditions, plant availability, other construction activities, etc. must be approved by the Owner's Representative.

C. Areas outside the limit of disturbance shall be protected from damage by the Contractor. Any disturbance of trees, shrubs, or wetland areas outside the limit of disturbance shown on the Drawings shall be restored by the Contractor.

1.02 SUBMITTALS

The following submittals are required if the Contractor is to perform planting.

A. Proposed Plant Sources

1. Within 10 days after award of the contract, submit a complete list of plant materials proposed to be provided demonstrating conformance with the requirements specified. Include the names and address of all nurseries.

B. Product Certificates

1. Plant Materials List – Submit documentation at least 10 days prior to start of work under this section that plant materials have been ordered. Arrange procedure for inspection of plant material at time of submission.

2. Have copies of vendor's invoices or packing slips for all plants on site during installation. Invoice or packing slip should list species by scientific name, quantity, and date delivered. Submit invoices or packing slips at time of planting.

C. Maintenance Record

1. Submit record of maintenance work performed, quantity of plant losses, and replacements, and diagnosis of unhealthy plant material.

1.03 DELIVERY, INSPECTION, STORAGE, AND HANDLING

A. Notification

1. The Contractor must notify the Owner's Representative 48 hours or more in advance of deliveries to arrange for inspection.

B. Plant Materials

1. Transportation: During shipping, plants shall be packed to provide protection against climate extreme, breakage and drying. Proper ventilation and prevention of damage to bark, branches, and root systems, must be ensured.

2. Scheduling and Storage: Plants shall be delivered as close to planting as possible. If there is unavoidable delay, the Contractor will be provided compensation of the added expense of storing plants, either on or off-site, unless the Contractor is the cause of delay. Plants in storage must be protected against any condition that is detrimental to their continued health and vigor.

3. Handling: Plant materials shall not be handled by the trunk, limbs, or foliage but only by the container, ball, box or other protective structure.

4. Labels: Plants shall have durable, legible labels stating correct scientific name and size. Ten percent of container grown plants in individual pots shall be labeled. Plants supplied in flats, rack, boxes, bags, or bundles shall have one label per group.

C. Inspection

1. Plants shall be subject to inspection and approval for conformance to specifications at time of delivery on-site. Approval of plant materials at any time shall not impair the subsequent right to inspection and rejection during progress of the work.

2. Plants inspected on site and rejected for not meeting specification must be removed immediately from site or red-tagged and removed as soon as possible.

1.04 WARRANTY

A. Installed plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12-month period after initial planting. A minimum 12-month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with Section 3.07 PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

PART 2 PRODUCTS

2.01 PLANT MATERIAL

A. Plant Material Classification

1. Plants shall be nursery grown in accordance with good horticultural practices under climatic conditions similar to or more severe than those of the project site within northeast Oregon.

2. Plants shall be true to species and variety or subspecies. No cultivars or named varieties shall be used.

B. Plant List:

1. The plant materials Wetland, Riparian, and Floodplain Shrubs shall be as shown on the Drawings.

C. Growing Conditions

1. Plant material shall be native to the region and well suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site within northeast Oregon.

a. Container-Grown Plant Material

1) Containers shall include plastic pots, trays, or tubes. Plant material shall be grown in a container over time sufficient for new fibrous roots to have developed throughout the container and for the root mass to retain its shape and hold together when removed from the container. Plants must be true to container size and shall be grown in the specified container size for a period of no less than one growing season prior to delivery. Plants shall not be excessively root-bound.

b. Live Stakes

1) Cutting stock shall be gathered during the dormant period and installed within 7 calendar days of harvest. Cuttings shall not be gathered if temperatures are below 32°F (0°C). Cuttings shall be protected from sun, wind, freezing, drying or injury before and during planting. Cuttings shall be stored upright in water immediately after harvesting up until they are installed. Stored material shall be examined frequently for signs of disease and planted before dormant bud development.

2) Cuttings shall be 24 inches long (as specified in the plant lists) making the bottom cut slanted and below a dormant bud, and the top cut straight, 1/2 to 1 inch above a dormant bud. The diameter of pieces reserved for planting shall not be less than 1/2 inch thick.

c. Deciduous Trees

1) Plants shall be of typical form for the specified species. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be “poled” or the leader removed.

2) Single stem: The trunk shall have a persistent main leader.

d. Deciduous Shrubs

1) Plants shall be of typical form for the specified species. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

e. Coniferous Trees

1) Plants shall be of typical form for the specified species. Coniferous trees shall not be “poled” or the leader removed.

f. Plugs

1) Plug materials shall follow the recommendations provided by the nursery for each type of plug.

D. Plant Material Size

1. Plant material shall be furnished in sizes indicated by the Drawings.

2.02 WATER

A. Unless otherwise directed, water used for watering plants shall be the responsibility of Contractor. Water shall not contain elements toxic to plant life.

PART 3 EXECUTION

3.01 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

A. Deciduous Plant Material Time

1. Deciduous plant material shall be installed from October 15 to November 30.

B. Evergreen Plant Material Time

1. Evergreen plant material shall be installed from October 15 to November 30.

C. Cutting Plant Material Time

1. Cutting plant material shall be gathered and installed from November 15 to November 30.

D. Plant Material Conditions

1. When drought, excessive moisture, frozen ground, expected freezing air temperatures or other unsatisfactory conditions prevail, planting installation shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval by Owner’s Representative.

3.02 SITE PREPARATION

A. Planting shall not occur until after rolled erosion control fabric has been placed per Section 01 35 43 ENVIRONMENTAL PROTECTION.

1. Layout

a. Planting boundaries shall be staked on the project site by the Contractor at the locations shown on the Drawings before any excavation for planting is made. Planting boundaries shall be reviewed with the Owner’s Representative

following staking. Planting shall not commence until approval from the Owner's Representative is received indicating agreement with the staked planting boundaries.

B. Protecting Existing Vegetation

1. Existing trees, shrubs, and other plants that are to be preserved shall be fenced off or otherwise barricaded along the dripline to protect them during planting operations.

3.03 EXCAVATION

A. Obstructions Below Ground

1. When obstructions below ground affect the work, adjustments to plant material location, type of plant, and planting method shall be done by the Owner's Representative.

B. Plant Pits

1. Plant pits for container plant material shall be dug to a depth equal to the height of the root mass as measured from the base of the root mass to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. All plant pits shall be dug at least twice as wide as the root mass or root system to allow for root expansion. The sides of planting pits shall be roughened to encourage root spread.

3.04 INSTALLATION

A. Setting Plant Material

1. All plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. The base of the plant shall be level with the surrounding ground.

2. Containerized plants shall be removed from their containers and the root mass gently loosened to prevent root-bound conditions. The base of containerized plants shall be set at the same grade as the surrounding soil; no roots should be exposed after planting. The base of containerized plants shall not be buried deeper than final grade. Prior to setting the plant in the pit, a maximum one-fourth depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. Do not compact soil around plant. Water each plant thoroughly after installed, ensuring the roots become saturated. Contractor shall add soil as necessary to replace any fill that settles below final grading during watering.

B. Cuttings

1. Prepare a pilot hole into the soil with rebar (slightly smaller diameter than cutting) if cutting cannot be easily installed into the ground. Cuttings shall be inserted, angled end down 18 inches below ground leaving 6 inches above ground, or a minimum of one to two dormant buds above ground.

C. Watering

1. All plantings shall be watered immediately after backfilling, until saturated.

3.05 MAINTENANCE DURING PLANTING OPERATION

A. Plant material installed in the initial phase of planting shall be maintained in a healthy growing condition during installation. Installed plants shall be maintained to foster establishment and growth. The maintenance includes watering and adjusting plant position to counteract settling.

3.06 RESTORATION AND CLEANUP

A. Restoration

1. Turf areas, access roads, and facilities that have been damaged from the planting operation shall be restored to original condition.

B. Cleanup

1. Excess and waste material generated from within the lateral limits of sediment removal shown on the drawings shall be managed as contaminated material in accordance with Section 31 10 00 SITE CLEARING. Excess waste material generated from outside these limits shall be managed and disposed of by Contractor as uncontaminated construction debris.

3.07 PLANT ESTABLISHMENT PERIOD

A. Commencement

1. Upon completion of the last day of the planting operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for a minimum of 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period due to plantings that occur at separate times, the boundaries of the planted area covered by each period shall be recorded and provided to the Owner's Representative. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for different areas.

B. Maintenance During Establishment Period

1. The site shall be maintained for 12 months after planting is finished. Maintenance of plant material shall include straightening plant material, pruning dead or broken branch tips; watering; eradicating weeds, insects and disease; documenting and control of invasive species: control of planted grasses to prevent competition with planted trees; and removing and replacing installed plants that are unhealthy and/or have been physically damaged beyond full recovery. Maintenance shall also include removal of litter or other coarse material that inhibits growth and establishment of installed plants.

2. At least one site visit should occur within two weeks of planting to make any adjustments to plant material. Additional visits may be required for watering and plant replacement.

    a. Watering Plant Material

        1) The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone, until the end of November. An adequate supply of moisture is estimated to be the equivalent of 0.5 inch absorbed water per week, delivered in the form of rain or augmented by watering. Runoff, puddling and wilting from the watering operations shall be prevented. Watering of other adjacent areas or existing plant material shall be prevented.

    b. Weeding

        1) Noxious weeds and persistent non-native plants that inhibit growth and establishment of installed vegetation shall be removed by hand or other method approved by the Owner's Representative. Invasive species in the restored areas shall be controlled as directed by the Owner. Spring and fall inventories for invasive species shall be taken for the 12-month period following restoration. Planted grasses shall be controlled such that they do not compete with the planted trees.

    c. Plant Pit Settling

        1) When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with Section 3.04 - INSTALLATION.

    d. Maintenance Record

        1) Contractor shall report site status and maintenance actions to the Owner's Representative after each site visit for the duration of the establishment period. A record shall be furnished describing the maintenance work performed, the quantity of plant losses, and the quantity of replacements made on each site visit.

C. Unhealthy Plant Material

1. A tree will be considered unhealthy or dead when the main leader has died back or 25 percent or more of the branches have died. A shrub will be considered unhealthy or dead when 25 percent or more of the plant has died. Herbaceous plants shall be considered unhealthy or dead when the crown has not produced leaves or shoots during the growing season, or when the crown appears dried or decayed. Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be replaced prior to the following growing season.

D. Replacement Plant Material

1. Unless otherwise directed, plant material shall be provided for replacement in accordance with Section 3.01 - PLANT MATERIAL. Replacement plant material shall be installed in accordance with Section 3.04 - INSTALLATION, and recommendations in Section 3.07 - PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with Section 3.04 - WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

END OF PLANTING

SECTION 35 01 60
STREAM RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section consists of the improvements included in the restoration of the Birch Creek stream channel and descriptions of the stream structures and ancillary materials required to complete the restoration.

B. Stream restoration components include additions of LWM (Section 35 49 50 LOG AND CHANNEL STRUCTURES) in the floodplain and new and existing main stream channels, excavation of a new main channel, excavation of wetlands, and old channel fill (Section 31 22 00 EXCAVATION AND FILL).

PART 2 PRODUCTS

2.01 LARGE WOOD MATERIAL

A. The Contractor shall utilize the large wood material logs of the type shown on the Drawings and as specified herein. See Section 35 49 50 LOG AND CHANNEL STRUCTURES for specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Refer to Section 31 22 00 EXCAVATION AND FILL for specifications on excavation and fill of channels and floodplain areas. Refer to Section 35 49 50 LOG AND CHANNEL STRUCTURES for specifications of large wood material structures. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

B. Refer to Section 31 23 19 CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING for specifications on work area isolation, fish salvage, dewatering, and rewatering.

END OF STREAM RESTORATION

SECTION 35 49 50
LWM AND CHANNEL STRUCTURES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section consists of the rock and log habitat structures included in the new channel and old channel fill. This section includes descriptions of the stream structures and ancillary materials required to complete the improvements.

1.02 SUBMITTALS

A. For the following materials, documentation demonstrating compliance with specifications shall be submitted at least 10 calendar days prior to delivery to the site:

1. Whole tree with rootwad

2. Log without rootwad or branches

3. Streambed Sediment

4. Streambed Cobble

4. Grade Stabilization Material

5. Boulders

1.03 REFERENCES

A. ODOT Standard Specifications for Construction 2021 or most current.

PART 2 PRODUCTS

2.01 LARGE WOOD MATERIAL

A. The CTUIR requires whole trees for use in this restoration project for promoting fish habitat. This includes limbs, treetops, and rootwads. Harvested trees are to be pushed over after loosening the soils around the tree roots to maximize root wad size and minimize handling damage to the tree roots and bole. Whole trees should be excavated to retain the entire rootwad, with rootwad diameters meeting the specifications shown in Table 2.01-1 (see below). Soil lodged around the roots shall be displaced to the extent practical without destroying the integrity of the roots. Trees must be handled with care to remain as intact as possible and contractors shall avoid excess handling of the rootwads to minimize breakage. Trees branches shall be retained intact with minimal breakage during transport and placement. These are critical details to the contract, and contractors should include details of the methods used to achieve the desired results.

B. All treetops, limbs, and other woody material created from the harvest and loading of the trees are also to be delivered to the project. These materials may be used for slash/racking as may be called for in the large wood structure drawings or

specifications. Racking and slash material must be fresh (green) and flexible, not dry and brittle.

C. Contractor must obtain their own sources for trees. Whole trees should be conifers and must be of high quality, green, sound, and free of checks and defects that would affect structural integrity or accelerate decay. Trees shall not be comprised of rotten or punk wood. The following species, in order of preference, are acceptable: Spruce, Grand or White fir, Douglas fir, Lodgepole pine, Ponderosa pine, and juniper. Juniper trees must be from a dense stand that promoted height instead of limb development. Juniper trees need to have a minimum stem diameter of six inches at the top and still meet minimum length requirements. Junipers must not have excessive thick limbs, but rather should only have smaller limbs from being grown in a shaded forest stand environment. Western larch (tamarack) may also be used for large wood structures that do not required trees with limbs (e.g., for buried footer logs or revetment trees). Bidders must identify the species on the bid form, and if mixed species are to be provided then the percentage of each species shall be identified.

D. In some cases, whole trees may be harvested near the project site, such as those that must be removed for site access. In those cases, trees must be obtained from outside of the immediate work area and must not be removed from areas within 100 feet of a stream channel.

E. All trees must be alive when harvested with the following exception. Signs of light scorching are acceptable on large trees if confined only to the outer bark. Dead, dried out, or brittle trees are not acceptable.

F. Acceptable trees may have defects such as crooks, multiple forks, bends, etc., if the tree is alive (green) when harvested and as long as minimum stem and top diameters and lengths are still met. These defects shall not affect the structural integrity of the tree, and trees that end up broken during transportation or handling as a result of these defects may be rejected by Owner's Representative or Engineer. The maximum percentage of trees with these types of irregularities shall be no more than 30 percent in any size class.

G. Whole tree and log specifications are as follows:

TABLE 2.01-1 TREE SIZE REQUIREMENTS			
Tree Type	**Minimum DBH[1/] (inches)**	**Minimum Length (feet)**	**Minimum Rootwad Diameter (feet)**
Whole tree with rootwad	18+	40	4
Log without rootwad or branches	18+	40	n/a
Slash/Racking material	4-10	6-16	na

[1/] DBH = Diameter at Breast Height, measured at 4.5 feet above the ground and with bark intact. If the tree splits into multiple trunks below that point the trunk is measured at its narrowest point beneath the split.

Note: Stem diameters at the top end for whole trees is a minimum of 8 inches (6 inches for Juniper) for all size classes.

H. Any trees that naturally exceed the required minimum length may be shortened so long as they meet the minimum length for each size class. Leaving trees longer than the minimum length is also acceptable. Trees requiring shortening must be snapped or broken off rather than cut with a chainsaw for a more natural appearance. Breaking trees in this manner must not result in splintering or weakening of the treetop.

I. Trees shall be marked in a manner that specifies length. Markings shall be visible around the whole tree at any one point, and can be accomplished using tree marking paint, chalk, or similar.

J. Trees must be handled to avoid damage to rootwads, stems, and limbs at all stages of the harvest and delivery process. Limbs that are broken off the trees are required for delivery to the staging site but may be hauled separately. Limbs on juniper trees may require cutting to allow transportation but leaving limb stabs of at least 18 inches is preferable.

K. Contractor shall not cut limbs flush to the bole, except where needed to allow for legal and safe transport.

L. All harvested trees and logs are subject to inspection by Owner's Representative or Engineer.

M. Upon delivery, Owner's Representative reserves the right to reject any trees or logs failing to meet the specifications and requirements herein.

2.02 STREAMBED SEDIMENT

A. The excavated channel bed material shall consist of native alluvium consisting of finer material to seal the bed. If the native floodplain alluvium does not contain sufficient sediment to seal the newly excavated channel, the Contractor shall furnish streambed sediment with the following gradation:

1. Streambed sediment shall be clean, naturally occurring, water-rounded gravel material. Streambed sediment shall have a well-graded distribution of aggregate sizes and conform to the grading in Table 2.03-1:

TABLE 2.02-1 STREAMBED SEDIMENT	
Approximate Size	**Percent Passing**
2½"	99-100
2"	65-95
1"	50-85
No. 4	26-44
No. 40	16 max.
No. 200	5.0-9.0

2. The grading of the material shall be determined by the Owner's Representative or Engineer through visual inspection of the load before it is dumped into place, or, if so ordered by the Owner's Representative, dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.

3. The excavated channel and floodplain areas consist of native alluvium. Following excavation to proposed grade the existing bed material will be inspected by the owner's representative or Engineer to ensure that materials meet minimum size requirements. If finer material is encountered and not suitable for the channel bed material, in the areas designated by the owner's representative or Engineer, the Contractor shall furnish and install streambed sediment.

B. Place streambed sediment in one or more layers with a layer depth less than 1½ times the maximum dimension of the streambed sediment, but no greater than 1 foot. Placement shall be by methods that do not cause segregation or damage to the prepared surface. Place or rearrange individual cobbles to obtain a uniformly dense, compact, low permeability mass. Fill voids by machine or hand tamping before placing the next lift. Compact bed materials by mechanical means such as plate compactors, loaders, etc.

D. Fill all voids left during placement of streambed sediment as shown on the Drawings. Use water pressure, metal tamping rods, and similar hand-operated equipment to force material into all surfaces and subsurface voids between the structure and rocks, and between individual rocks.

E. All streambed sediment shall consist of screened material free from adherent coatings. The materials shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances.

2.03 STREAMBED COBBLE

A. The excavated channel bed material shall consist of native alluvium similar to Birch Creek. If finer material is encountered and not suitable for the channel bed material Contractor shall furnish streambed cobbles with the following gradation:

1. Streambed cobbles shall be clean, naturally occurring, water-rounded gravel material. Streambed cobbles shall have a well-graded distribution of cobble sizes and conform to the grading in Table 2.03-1:

TABLE 2.03-1 STREAMBED COBBLE	
Approximate Size	**Percent Passing**
4”	99-100
3”	70-90
1 ½”	20-50
¾”	10 max

2. The grading of the cobbles shall be determined by the Owner’s Representative or Engineer through visual inspection of the load before it is dumped into place, or, if so ordered by the Owner’s Representative, dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.

2.04 GRADE STABILIZATION MATERIAL

A. Grade stabilization material shall be rock to rock contact of material conforming to the gradation in Table 2.04-1 and shall be with voids filled with streambed sediment after placement of grade stabilization material. Place grade stabilization material in one or more layers with a layer depth no greater than 1 foot. Placement shall be by methods that do not cause segregation or damage to the prepared surface. Place or rearrange individual cobbles to obtain a uniformly dense, compact, low permeability mass. Fill voids by machine or hand tamping before placing the next lift. Compact bed materials by mechanical means such as plate compactors, loaders, etc. Grade stabilization material shall be placed at the locations and the dimensions indicated on the Drawings or as directed by the Engineer.

TABLE 2.04-1 GRADE STABILIZATION MATERIAL	
Approximate Size	**Percent Passing**
8”	99-100
6”	70-90
3.5”	30-60
¾”	10 max

C. Fill all voids left during placement of grade stabilization material as shown on the Drawings. Use water pressure, metal tamping rods, and similar hand-operated equipment to force material into all surfaces and subsurface voids between the structure and rocks, and between individual rocks.

D. All grade stabilization material shall consist of screened material free from adherent coatings. The materials shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances.

2.05 BOULDERS

A. Boulders include large rocks (i.e., riffle rocks, ballast rocks) placed in the LWM structures to create habitat features, and to provide ballast for LWM structures. See Drawings for number required and approximate location.

B. Boulders shall be hard, sound, and durable. They shall be free from segregation, seams, cracks, and other defects tending to destroy resistance to weather. All Boulders shall be sub-angular or round in shape and come from a rock quarry close to the project site or from an alluvial source. Imported boulders shall conform to the soundness requirements specified in Table 2.05-1 and size requirements in Table 2.05-2. Nominal diameters refer to the intermediate axis of the boulder. Use of on-site boulders to be determined by the Owner's Representative or Engineer

C. Excavated and cleaned riprap from onsite may be used in place of any boulders where size and weight requirements are satisfied.

TABLE 2.05-1
BOULDER SOUNDNESS REQUIREMENTS

Test	Standard	Value
Specific Gravity	ASTM C-127	Min. 2.65
Soundness	AASHTO T104 (5.2.2)	Not greater than 5% loss
Accelerated Expansion	CRD-C-148	Not greater than 15% breakdown
Absorption	ASTM C-127	Not greater than 2%
L.A. Abrasion	ASTM C-131	Max. 20% loss @ 500 rev.

TABLE 2.05-2
BOULDER SIZE REQUIREMENTS

Boulder Type	Nominal Diameter (feet)	Average Weight (lbs)
LWM Ballast Boulders	2.0 -3.0	700 -2,300

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. The materials used for construction shall be as specified in PART 2 PRODUCTS. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

B. Refer to Section 31 23 19 CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING for specifications on work area isolation, fish salvage, dewatering, and rewatering

3.02 FLOODPLAIN AND CHANNEL LWM STRUCTURES

A. Floodplain and instream LWM structures include 10-Log Habitat, 11-Log Habitat, Bank Habitat, Channel Spanning, Surface-placed logs, and Debris Jam Type 1 and Type 2 structures.

B. Installation of LWM structures will occur at locations shown on the Drawings.

C. Installation of surface-placed log shall be as directed in the field by Engineer or Owner's Representative.

C. Refer to the Drawings for sequence and specified dimensions of whole trees with rootwads and branches and logs without rootwads or branches to be installed.

D. Orientation and placement of the LWM will be adjusted depending on the type of structure being installed.

E. Excavated material from installation trenches will be used as backfill and compacted around the structure to provide required ballast volume. Compaction will be completed using the excavator bucket to a firm and unyielding surface. Finish grade will be blended into the surrounding floodplain.

3.03 STREAMBED SEDIMENT

A. Streambed sediment shall be placed at locations along the new main channel that do not meet the requirements of Table 2-03-1 during channel excavation.

B. Once all the streambed sediment materials have been placed and before the stream bed is open to stream flows, the Contractor shall wash in fines from selected on site materials approved by the Owner's Representative to seal the gravels to keep the introduced water on the surface and avoid having the creek go underground through the new stream bed. Fines shall be washed in until ponding occurs on the surface of each lift prior to placing next lift.

C. Water that flows off the stream bed during the wash-in process shall be properly disposed of in accordance with the approved Temporary Erosion and Sediment Control Plan.

D. Once fines have been washed in, the surface shall be flushed so flows coming off the new stream bed do not increase the turbidity over existing levels in the upstream creek, as approved by the Owner's Representative.

3.04 STREAMBED COBBLE

A. Streambed cobble shall be placed at the locations and the dimensions indicated on the Drawings if native alluvium is not suitable for channel bed material.

B. Once all the streambed cobble materials have been placed and before the stream bed is open to stream flows, the Contractor shall wash in fines from selected on site materials approved by the Owner's Representative to seal the gravels to keep the introduced water on the surface and avoid having the creek go underground through the new stream bed. Fines shall be washed in until ponding occurs on the surface of each lift prior to placing next lift.

C. Water that flows off the stream bed during the wash-in process shall be properly disposed of in accordance with the approved Temporary Erosion and Sediment Control Plan.

D. Once fines have been washed in, the surface shall be flushed so flows coming off the new stream bed do not increase the turbidity over existing levels in the upstream creek, as approved by the Owner's Representative.

3.05 GRADE STABILIZATION MATERIAL

A. Grade stabilization material will be used to construct the grade stabilization measures.

B. The overall plan form of all grade stabilization measures shall be constructed at the locations and the dimensions shown on the Drawings.

C. Finish grade daylight will be blended into the surrounding channel bed and floodplain.

3.06 LWM STRUCTURE BOULDERS

A. The overall plan form of all boulders will be constructed as shown on the Drawings and as directed by Owner's representative or Engineer.

B. Installation of the boulders will occur at locations shown on the Drawings.

C. Excavated material backfilled and compacted around the boulders if necessary. Compaction will be completed using the excavator bucket to a firm and unyielding surface.

D. Refer to the Drawings for LWM structure sequencing and placement of boulders.

END OF LOG AND CHANNEL STRUCTURES

ATTACHMENT 3
HIP CONSERVATION MEASURES

UmaBirch Instream Design and Construction Oversight Project

Project Area 4 Birch Creek Instream Enhancement and Floodplain Restoration

Attachment 3

Habitat Improvement Program (HIP) Conservation Measures

Issued for Construction

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July 2021

Chapter 3 General Conservation Measures

3.1 General Conservation Measures Applicable to all Actions

These measures will be implemented on all projects covered under the HIP.

3.1.1 Project Design and Site Preparation

3.1.1.1 Timing of in-water work

Formal recommendations published by state agencies such as the Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Idaho Department of Fish and Game (IDFG), and Montana Fish Wildlife and Parks (MFWP), or informal recommendations from the appropriate state Fishery Biologist in regard to the timing of in-water work, will be followed.

1) **Bull trout** - In Bull Trout spawning and rearing areas, eggs, alevin, and fry are present nearly year round. In Bull Trout habitats designated as foraging, migration, and overwintering (FMO) habitats, juvenile and adult bull trout may be present seasonally. Some project locations may not have designated in-water work windows for bull trout, or if they do, they may differ from the in-water work windows for salmon and steelhead. If this is the case, the project sponsor will contact the appropriate USFWS field office to ensure that all reasonable implementation measures are considered and an appropriate in-water work window is used to minimize project effects.
2) **Lamprey** – To minimize disturbance to migrant adults, the project sponsor and/or their contractors will avoid working instream or river channels that contain Pacific lamprey from March 1 to July 1 in low- to mid-elevation reaches (<5,000 feet). In high-elevation reaches (>5,000 feet), the project sponsor will avoid working instream or river channels from March 1 to August 1. If either timeframe is incompatible with other objectives, the area will be surveyed for nests and lamprey presence, and avoided if possible. If lampreys are known to exist, the project sponsor will utilize best management practices (BMPs) for dewatering and salvage as outlined in USFWS 2010[1], or most recent guiddance. Salvage should include salvage of larval lamprey from sediments. (See section "Conservation Measures for Salvage of Native Fish, Lamprey, and Mussels").
3) A **maximum of 1 week** past the recommended in-water work window shall be considered and approved by the EC lead, any other deviation from the IWWW shall considered and reviewed by the Services through the Variance Process.

[1] USFWS. 2010. Best management practices to minimize adverse effects to Pacific lamprey. Available online at: http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/pdf/Best%20Management%20Practices%20for%20Pacific%20Lamprey%20April%202010%20Version.pdf

3.1.1.2 Contaminants

The project sponsor will complete a site assessment with the following elements to identify the type, quantity, and extent of any potential contamination for any action that involves excavation of more than 20 cubic yards of material:

1) A review of available records, such as former site use, building plans, and records of any prior contamination events;
2) A site visit to inspect the areas used for various industrial processes and the condition of the property;
3) Interviews with knowledgeable people, such as site owners, operators, and occupants, neighbors, or local government officials; and
4) A summary, stored with the project file that includes an assessment of the likelihood that contaminants are present at the site, based on items 4(a) through 4(c).

3.1.1.3 Site layout and flagging

1) Prior to construction, the project area will be clearly flagged to identify the following:
2) Sensitive resource areas, such as areas below ordinary high water (OHW), spawning areas, springs, and wetlands;
3) Equipment entry and exit points;
4) Road and stream crossing alignments;
5) Staging, storage, and stockpile areas; and
6) No-herbicide-application areas and buffers.

3.1.1.4 Temporary access roads and paths

1) Existing access roads and paths will be preferentially used whenever possible, and the number and length of temporary access roads and paths through riparian areas and floodplains will be minimized to lessen soil disturbance, soil compaction, and impacts to vegetation.
2) Vehicle use and human activities, including walking in areas occupied by terrestrial ESA-listed species, will be minimized.
3) Temporary access roads and paths will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. If slopes are steeper than 30%, the road will be designed by a civil engineer with experience in steep road design.
4) The removal of riparian vegetation during construction of temporary access roads will be minimized. When temporary vegetation removal is required, vegetation will be cut at ground level (not grubbed).
5) At project completion, all temporary access roads and paths will be decompacted and reshaped to match the original contour; and the soil will be stabilized and revegetated.

1) Helicopter flight patterns will be established in advance, and located to avoid terrestrial ESA- listed species, including their occupied habitat and appropriate buffers, during sensitive life stages (i.e. nesting and critical breeding periods). See species-specific

conservation measures for each listed species that may occur within the project area for more information.

3.1.1.5 Temporary stream crossings

1) Existing stream crossings, fords, or bedrock will be used whenever possible.
2) If an existing stream crossing is not accessible, temporary crossings will be installed. Treated wood shall not be used on temporary bridge crossings or in locations in contact with or over water.
3) For projects that require equipment and vehicles to cross in the wet:
    a) The location and number of all wet crossings must be approved by BPA and clearly indicated on design drawings.
    b) Vehicles and machinery will cross streams at right angles to the main channel wherever possible.
    c) No stream crossings will occur 300 feet upstream or 100-feet downstream of an existing redd or spawning fish.
    d) After project completion, temporary stream crossings will be obliterated, and the banks restored.

3.1.1.6 Staging, storage, and stockpile areas

1) Staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, and hazardous material storage) will be 150 feet or more from any natural waterbody or wetland, or on an adjacent established road area in a location and manner that will preclude erosion into, or contamination of, the stream or floodplain. Staging areas may be closer than 150 feet if the area is above (elevation) the 100-yr floodplain and spill prevention measures are approved by the EC Lead.
2) Natural materials used for implementation of aquatic restoration, such as large wood, gravel, and boulders, may be staged within 150 feet if clearly indicated in plans. Recommend referring to area as “Natural Material Stockpile Area” with a note that states vehicle storage, equipment storage, hazardous materials, fueling, and servicing not permitted in this area.
3) Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration at a specifically identified and flagged area.
4) Any material not used in restoration, and not native to the floodplain, will be removed to a location outside of the 100-year floodplain for disposal.

3.1.1.7 Equipment

Mechanized equipment and vehicles will be selected, operated, and maintained in a manner that minimizes adverse effects on the environment (e.g., minimally-sized, low pressure tires; minimal hard-turn paths for tracked vehicles; temporary mats or plates within wet areas or on sensitive soils). All vehicles and other mechanized equipment will be:

1) Stored, fueled, and maintained in a vehicle staging area located 150 feet or more from any natural water body or wetland, or on an adjacent, established road area;
2) Refueled in a vehicle staging area located 150 feet or more from a natural waterbody or wetland, or in an isolated hard zone, such as a paved parking lot or adjacent, established road (this measure applies only to gas or diesel-powered equipment with tanks larger than 5 gallons);
3) Biodegradable lubricants and fluids[2] shall be used on equipment operating in the stream channel and live water.
4) Inspected daily for fluid leaks before leaving the vehicle staging area for operation within 150 feet of any natural water body or wetland; and
5) Thoroughly cleaned before operation below ordinary high water (OHW), and as often as necessary during operation, to remain free of grease.

3.1.1.8 Erosion control

Erosion control best management practices (BMPs) will be prepared and carried out, commensurate with the scope of the action that may include the following:

1) Temporary erosion control BMPs.
    a) Temporary erosion control BMPs shall be in place before any significant alteration of the action site, and shall be appropriately installed downslope of project activity within the riparian buffer area until site rehabilitation is complete.
    b) If there is a potential for eroded sediment to enter the stream, sediment barriers will be installed and maintained for the duration of project implementation.
    c) Temporary erosion control measures may include sedge mats, fiber wattles, silt fences, jute matting, wood fiber mulch with soil binder, or geotextiles and geosynthetic fabric. Biodegradable netting may be used so that they can decompose on site.
    d) Soil stabilization utilizing wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil if the materials are noxious-weed-free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.
    e) Sediment will be removed from erosion control BMP once it has reached 1/3 of the exposed height of the BMP.
    f) Once the site is stabilized following construction, temporary erosion control BMPs will be removed.

[2] For additional information and suppliers of biodegradable hydraulic fluids, motor oil, lubricant, or grease. See, Environmentally Acceptable Lubricants by the U.S. EPA (2011); e.g., mineral oil, polyglycol, vegetable oil, synthetic ester; Mobil® biodegradable hydraulic oils, Total® hydraulic fluid, Terresolve Technologies Ltd.® biobased biodegradable lubricants, Cougar Lubrication® 2XT Bio engine oil, Series 4300 Synthetic Bio-degradable Hydraulic Oil, 8060-2 Synthetic Bio-Degradable Grease No. 2, etc.

2) Emergency erosion control BMPs. The following materials for emergency erosion control will be available at the work site:
    a) A supply of sediment control materials; and
    b) An oil-absorbing floating boom whenever surface water is present.

3.1.1.9 Dust abatement

The project sponsor will determine the appropriate dust control measures by considering soil type, equipment usage, prevailing wind direction, and the effects caused by other erosion and sediment control measures. In addition, the following criteria will be followed:

1) Work will be sequenced and scheduled to reduce exposed bare soil subject to wind erosion.
2) Dust-abatement additives and stabilization chemicals (typically magnesium chloride, calcium chloride salts, or lignin sulfonate) will not be applied within 25 feet of a natural waterbody or wetland and will be applied so as to minimize the likelihood that they will enter streams. Applications of lignin sulfonate will be limited to a maximum rate of 0.5 gallons per square yard of road surface, assuming a 50:50 (lignin sulfonate to water) solution.
3) Application of dust abatement chemicals will be avoided during or just before wet weather and at stream crossings or other areas that could result in unfiltered delivery of the dust abatement chemicals to a waterbody (typically these would be areas within 25 feet of a natural waterbody or wetland; distances may be greater where vegetation is sparse or slopes are steep).
4) Spill containment equipment will be available during application of dust abatement chemicals.
5) Petroleum-based products will not be used for dust abatement.

3.1.1.10 Spill prevention, control, and counter measures

The following measures will be used to prevent accidental spills of fuel, lubricants, hydraulic fluid[3], or other contaminants into the riparian zone or directly into the water:

1) A description of hazardous materials that will be used, including inventory, storage, and handling procedures, will be available on-site.
2) Written procedures for notifying environmental response agencies will be posted at the work site.

[3] For additional information and suppliers of biodegradable hydraulic fluids, motor oil, lubricant, or grease. See, Environmentally Acceptable Lubricants by the U.S. EPA (2011); e.g., mineral oil, polyglycol, vegetable oil, synthetic ester; Mobil® biodegradable hydraulic oils, Total® hydraulic fluid, Terresolve Technologies Ltd.® biobased biodegradable lubricants, Cougar Lubrication® 2XT Bio engine oil, Series 4300 Synthetic Bio-degradable Hydraulic Oil, 8060-2 Synthetic Bio-Degradable Grease No. 2, etc.

3) Spill containment kits (including instructions for cleanup and disposal) adequate for the types and quantity of hazardous materials used at the site will be available at the work site.

4) Workers will be trained in spill containment procedures and will be informed of the location of spill containment kits.

5) Any waste liquids generated at the staging areas will be temporarily stored under an impervious cover, such as a tarpaulin, until they can be properly transported to, and disposed of, at a facility that is approved for receipt of hazardous materials.

6) Pumps used adjacent to water shall use spill containment systems.

3.1.1.11 Invasive species control

The following measures will be followed to avoid introduction of invasive plants and noxious weeds into project areas:

1) Prior to entering the site, all vehicles and equipment will be power-washed, allowed to dry fully, and inspected to make sure no plants, soil, or other organic material adheres to the surface.

2) Watercraft, waders, boots, and any other gear to be used in or near water will be inspected for aquatic invasive species. Wading boots with felt soles are not to be used due to their propensity for aiding in the transfer of invasive species unless decontamination procedures are used.

3.1.2 Work Area Isolation & Fish Salvage

3.1.2.1 Work Area Isolation

Any work area requiring excavation or mobilization of sediment within the wetted channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is less than 300-feet upstream from known ESA-listed fish spawning habitats. If the work area isolation practices would cause greater impacts than it would prevent, is located in deep or swiftly flowing water, or if fish can be effectively excluded by nets or screens, then a variance to not isolate the work area may be pursued.

Work area isolation & fish salvage activities are considered incidental to construction-related activities and shall occur during the state-recommended in-water work windows.

When work area isolation is required, design plans will include all isolation elements, fish release areas, a pump to be used to dewater the isolation area, and, when fish are present, a fish screen that meets NMFS's fish screen criteria (NMFS 2011[4], or most current). Wider mesh screens may be used after all fish have been removed from the isolated area. Work area isolation and fish capture activities take place during periods of the coolest air and water temperatures

[4] NMFS. 2011. Anadromous salmonid passage facility design. Northwest Region. Available online at: http://www.habitat.noaa.gov/pdf/salmon_passage_facility_design.pdf

possible, normally early in the morning versus late in the day, and during conditions appropriate to minimize stress to fish species present.

A fish biologist will determine how to remove ESA-listed fish, with least harm to the fish, before in-water work begins. This will involve either passive movement of fish out of the project reach through slow dewatering, or actively removing the fish from the project reach. Should active removal be warranted, a fish biologist will clear the area of fish before the site is dewatered using one or more of a variety of methods including seining, dipping, or electrofishing, depending on specific site conditions. In areas occupied by larval lamprey, to the extent possible, salvage using guidance set forth in USFWS 2010 or most recent guidance.

Dependent upon site conditions, a fish biologist will conduct or supervise the following:

1) Slowly reduce water from the work area to allow some fish to leave the work area volitionally;
    a) If dewatered area contains large fine/ sandy sediment deposits, larval lamprey could be present, and potentially in large numbers. If so, consider electrofishing using lamprey electrofishing settings (which do not affect bony fish) prior to or during drawdown. See section further down on Lamprey Conservation Measures and Electrofishing guidelines.
2) Install block nets;
    a) Block nets will be installed at upstream and downstream locations and maintained in a secured position to exclude fish from entering the project area.
    b) Block nets will be secured to the stream channel bed and banks until fish capture and transport activities are complete. Block nets may be left in place for the duration of the project to exclude fish.
    c) If block nets remain in place more than one day, the nets will be monitored at least daily to ensure they are secured to the banks and free of organic accumulation. If the project is within bull trout spawning and rearing habitat, the block nets must be checked every 4 hours for fish impingement on the net. Less frequent intervals must be approved through a variance request.
    d) Nets will be monitored hourly anytime there is instream disturbance.
3) Capture fish through seining, and relocate to streams;
    a) While dewatering, any remaining fish will be collected by hand or dip nets.
    b) Seines with a mesh size to ensure capture of the residing ESA-listed fish will be used.
    c) Minnow traps may be left in place overnight and used in conjunction with seining.
4) Electrofish to capture and relocate fish not caught during seining, NMFS electrofishing guidelines shall be used. This step is to be used as a last resort; after all passive techniques have been exhausted.
5) Continue to slowly dewater the stream reach;

6) Collect any remaining fish in cold-water buckets and relocate to the stream;

   a) Limit the time fish would be in a transport bucket , and release them as quickly as possible;

   b) The number of fish within a bucket will be limited, and fish will be of relatively comparable size to minimize predation;

   c) Aerators for buckets will be used, or the bucket's water will be frequently changed with cold, clear, water at 15 minute, or more-frequent, intervals.

   d) Buckets will be kept in shaded areas; or if in exposed areas, covered by a canopy.

   e) Dead fish will not be stored in transport buckets but will be left on the streambank to avoid mortality counting errors.

3.1.2.2 NMFS's Electrofishing Guidelines (NMFS 2000[5])

1) Initial Site Surveys and Equipment Settings

   a) In order to avoid contact with spawning adults or active redds, researchers must conduct a careful visual survey of the area to be sampled before beginning electrofishing.

   b) Prior to the start of sampling at a new location, water temperature and conductivity measurements shall be taken to evaluate electrofisher settings and adjustments.

[5] http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf

c) No electrofishing should occur when water temperatures are above 18°C or are expected to rise above this temperature prior to concluding the electrofishing survey.

d) Whenever possible, a block net should be placed below the area being sampled to capture stunned fish that may drift downstream.

e) Equipment must be in good working condition and operators should go through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a logbook.

f) Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish (Table 1). These settings should be gradually increased only to the point where fish are immobilized and captured, and generally not allowed to exceed conductivity-based maxima.

Table 1 Guidelines for initial and maximum settings for backpack electrofishing for salmonids.

	Initial Settings	Maximum Settings	
Voltage		Conductivity	Max Voltage
	100V	<100	1100 V
		100-300	800 V
		>300	400 V
Pulse Width	500 µS	5 mS	
Pulse Rate	30 Hz	70 Hz	

2) Electrofishing Technique

a) Sampling should begin using straight DC. The power needs to remain on until the fish is netted when using straight DC. If fish capture is unsuccessful with initial low voltage, gradually increase voltage settings with straight DC.

b) If fish capture is not successful with the use of straight DC, then set the electrofisher to lower voltages with PDC. If fish capture is unsuccessful with low voltages, increase pulse width, voltage, and pulse frequency (duration, amplitude, and frequency).

c) Electrofishing should be performed in a manner that minimizes harm to the fish. Stream segments should be sampled systematically, moving the anode continuously in a herringbone pattern (where feasible) through the water. Care should be taken when fishing in areas with high fish concentrations, structure (e.g., wood, undercut banks) and in shallow waters where most backpack electrofishing for juvenile salmonids occurs. Voltage gradients may be high when electrodes are in shallow water where boundary layers (water surface and substrate) tend to intensify the electrical field.

d) Do not electrofish in one location for an extended period (e.g., undercut banks) and regularly check block nets for immobilized fish.

e) Fish should not make contact with the anode. The zone of potential injury for fish is 0.5 m from the anode.

f) Electrofishing crews should be generally observant of the condition of the fish and change or terminate sampling when experiencing problems with fish recovery time, banding, injury, mortality, or other indications of fish stress.

g) Netters should not allow the fish to remain in the electrical field any longer than necessary by removing stunned fish from the water immediately after netting.

3) Sample Processing and Recordkeeping

a) Fish should be processed as soon as possible after capture to minimize stress. This may require a larger crew size.

b) All sampling procedures must have a protocol for protecting held fish. Samplers must be aware of the conditions in the containers holding fish; air pumps, water transfers, etc., should be used as necessary to maintain safe conditions. Also, large fish should be kept separate from smaller prey-sized fish to avoid predation during containment.

c) Fish should be observed for general condition and injuries (e.g., increased recovery time, dark bands, and visually observable spinal injuries). Each fish should be completely revived before releasing at the location of capture. A plan for achieving efficient return to appropriate habitat should be developed before each sampling session. Also, every attempt should be made to process and release ESA-listed specimens first.

d) Pertinent water quality (e.g., conductivity and temperature) and sampling notes (e.g., shocker settings, fish condition/injuries/mortalities) should be recorded in a logbook to improve technique and help train new operators. It is important to note that records of injuries or mortalities pertain to the entire electrofishing survey, including the fish sample work-up.

e) The anode will not intentionally contact fish.

f) Electrofishing should not be conducted when the water conditions are turbid and visibility is poor. For example, when the sampler cannot see the stream bottom in one foot of water.

g) If mortality or obvious injury (defined as dark bands on the body, spinal deformations, de-scaling of 25% or more of body, and torpidity or inability to maintain upright attitude after sufficient recovery time) occurs during electrofishing, operations will be immediately discontinued, machine settings, water temperature, and conductivity checked, and procedures adjusted or electrofishing postponed to reduce mortality.

3.1.2.3 Dewatering

Dewatering, when necessary, will be conducted over a sufficient period of time to allow species to naturally migrate out of the work area and will be limited to the shortest linear extent practicable.

1) Diversion around the construction site may be accomplished with a cofferdam and a by-pass culvert or pipe, or a lined, non-erodible diversion ditch. Where gravity feed is not possible, a pump may be used, but must be operated in such a way as to avoid repetitive dewatering and rewatering of the site. Impoundment behind the cofferdam must occur slowly through the transition, while constant flow is delivered to the downstream reaches.
2) All pumps will have fish screens to avoid juvenile fish impingement or entrainment, and will be operated in accordance with NMFS's current fish screen criteria (NMFS 2011, or most recent version). If the pumping rate exceeds 3 cubic feet per second (cfs), a NMFS Engineering review will be necessary. If the screen is in an isolated area with no fish (salmonids or larval lamprey), a larger mesh screen may be used.
3) Dissipation of flow energy at the bypass outflow will be provided to prevent damage to riparian vegetation and/or stream channel.
4) Seepage water will be pumped to a temporary storage and treatment site or into upland areas to allow water to percolate through soil or to filter through vegetation prior to reentering the stream channel.
5) In areas occupied by larval lamprey, to the extent possible, salvage using guidance described in above section "Conservation Measures for Salvage of Native Fish, Lamprey and Mussels" (which is based on USFWS 2010) or most recent guidance.
6) In areas occupied by native freshwater mussels, to the extent possible, salvage using guidance developed by the Xerces Society (Blevins et al. 2018, 2019).

3.1.2.4 Bull Trout Electrofishing Conservation Measures

1) For salvage operations in known bull trout spawning and rearing habitat[6], electrofishing shall only occur from May 1 to July 31. In FMO habitats, electrofishing may occur any time of year.
2) Bull trout are very temperature sensitive and generally should not be electrofished or otherwise handled when temperatures exceed 15°C in spawning and rearing habitats.
3) Salvage activities should take place during periods of the coolest air and water temperatures possible, normally early in the morning versus late in the day, and during conditions appropriate to minimize stress to fish species present.

3.1.2.5 Salvage of Native Fish, Lamprey[7] and Mussels[8]

[6] Bull Trout Spawning and Rearing habitat is not foraging, migrating, and overwintering (FMO) habitats.

[7] For lamprey, see USFWS. 2010. Best management practices to minimize adverse effects to Pacific lamprey or the latest revision: Available online at:

In addition to Conservation Recommendations for salmonids, additional efforts will be employed to salvage other native species. The following guidelines are draft from the U.S. Fish and Wildlife Service, with assistance from the Xerces Society, and will be used as appropriate and to the extent possible.

1) Conduct native mussel and lamprey presence/ absence; approximate numbers for salvage to aid in planning for salvage. Pre-select site where salvaged mussels will be relocated.
2) Suggested drawdown: this order should be adjusted for site-specific conditions and numbers of species and individuals- for example, if you only have a small number of mussels or very limited larval lamprey habitat, it may be most efficient to salvage only during drawdown. If drawdown occurs during cool, wet weather, and the area will be rewatered within 24-48 hours, mussels and larval lamprey may survive in the sediments, and not require salvage. Conversely, if conditions are warm or hot, lamprey can expire within a couple of hours. Depending on your site and circumstances, other adjustments may also be necessary. A generalized order prior to drawdown is:
    a) Salvage FW mussels by hand, locating by snorkeling or wading. If mussels are numerous (or staff is limited), it may be necessary to do this step in the days before drawdown, as relocation/placement can be time consuming.
    b) Salvage larval lamprey by e-fisher under watered conditions with lamprey-specific settings.
    c) Salvage bony fish after lamprey with nets or by e-fisher with appropriate settings.
    d) If there are sufficient numbers of people and equipment, some people can be dry-shocking dewatered areas, while others are removing remaining mussels, and others are salvaging salmon.
3) Continue salvage larval lamprey and FW mussels by hand during and after drawdown, as water recedes and lamprey continue to emerge from sediments and overlooked mussels become visible. Larval lamprey may emerge hours after dewatering occurs.
4) To encourage larval lamprey emergence, “Dry shock” in areas of fine/sandy deposits that are likely to have high larval lamprey densities.
5) Hold all fish in buckets, fine mesh baskets or tanks with adequate temperatures, space and oxygen. Release all fish throughout the salvage process in appropriate habitats to minimize stress, thermal shock and predation risk. Hold mussels in coolers as described below and relocate mussels in a pre-selected appropriate habitat; placement of each individual is needed to allow mussels to re-establish/burrow into the new habitat.

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http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/pdf/Best%20Management%20Practices%20for%20Pacific%20Lamprey%20April%202010%20Version.pdf

[8] For mussels, see Blevins et al. 2018. Conserving the Gems of Our Waters: Best Management Practices for Protecting Native Western Freshwater Mussels, and Blevins et al. 2019. Mussel-Friendly Restoration. Both available on line at https://xerces.org/western-freshwater-mussels/

Electrofishing settings for larval Lamprey

1) Electrofishing should be performed in a manner that minimizes harm to fishes. Handling techniques as described in NMFS Electrofishing Guidelines are protective of lamprey. If there is a conflict between conservation measures for ESA-listed salmonids and lamprey/mussels notify EC Lead and prioritize protections towards the ESA-listed fish.
2) Generally three types of electrofishers are suitable for larval lamprey sampling9:
    a) AbP-2 "Wisconsin" electrofisher (ETS Electrofishing, Verona, WI)
    b) Smith-Root LR-24 model electrofisher with lamprey settings;
    c) Smith Root Apex Backpack electrofisher with lamprey settings.
3) Electrofishers used for larval lamprey sampling should be set with two wave forms, a lower frequency "tickle" wave form to coax larval lampreys out of the substrate and a higher frequency "stun" wave form to immobilize larval lampreys for netting.
4) Effective sampling involves this 2-stage method (Table 2):
    a) First stage: use 125V direct current with a 25 percent duty cycle applied at a slow rate of 3 pulses per second, to induce larval lampreys to emerge from the sediment. At low water temperature (<10C˚), voltage may need to be raised (150-200V) to maintain its effectiveness (gradually increase voltage to find the appropriate setting to avoid the risk of electronarcosis).
    b) Use a pattern of 3 slow pulses followed by a skipped pulse (bursted pulse) helps larval lampreys to emerge.
    c) Second stage: immediately after larval lampreys emerge, use a fast pulse setting of 30 pulses per second to immobilize and net them. It is not necessary to stun lamprey for netting for experienced netters.

Table 2: Electrofishing Guidelines for Larval Lampreys.

	"Tickle" Bursted Slow Pulse Primary Way Form	"Stun" Standard Fast Pulse Secondary Wave Form
Voltage	125 v	125 v
Pulse Frequency	3 Hz	30 Hz
Duty Cycle	25%	25%
Burst Pulse Train	3:1	X
Maximum duration/set	60-90seconds	

NOTE: Settings are too low to effect salmonid species and other bony fishes.

[9] Information on set up can be found at https://www.smith-root.com/support/kb/setting-up-a-backpack-electrofisher-to-capture-larval-lamprey/

5) Avoid exposing larval lampreys to extended periods of electrofishing as it has also been linked to electronarcosis. Recovery from electronarcosis takes about 15 minutes.

6) Use dip nets to capture larval lampreys where they are readily visible. Where not visible, seines may be effective. Using fine mesh nets to "sweep" the water ("blind-netting") may increase the number of small larvae collected.

7) Within each reach, electrofishing should be conducted in a downstream to upstream direction (for the purpose of reducing turbidity/maintaining visibility) with one person operating the electrofisher and at least one person netting larval lampreys. Each reach should be thoroughly and slowly sampled (60-90 sec/m), with more effort directed at suitable lamprey rearing habitat and less effort in areas with hard substrates or high water velocity.

8) Using the 2-stage method described above, the electrofisher should mainly be operated in the lower frequency output mode to irritate larval lampreys out of the substrate. When necessary, the higher frequency mode should be activated for capturing emergent larval lampreys.

9) Multiple electrofishing passes should be made to ensure a more complete removal of larval lampreys. A fifteen minute break between passes should be taken to reduce the chance of electronarcosis. Some research indicated on average, only 30% lamprey emerge per pass, thus the need for multiple passes.

10) Post-Drawdown: Larval lamprey may continue to emerge from sediments after drawdown. The following "Dry- Shocking" Guidelines can be used to encourage larvae to emerge from the sediments so they can be salvaged.

    a) During and after dewatering, dewatered areas where lamprey may be burrowed should be shocked, aka "dry-shocking." Dry shock in depositional areas of fine and sandy sediment for larval lamprey. Juveniles (eyed migrants) and adults are sometimes found buried in rockier areas, and those areas should also be shocked if other these life stages may be present.

    b) Dry-shock a square meter at a time. Place the anodes about 1 meter apart and tickle-pulse for 60 to 90 seconds. Remove emerged lamprey once the shocking has stopped. Move to next square meter and continue. Adjust to local conditions – in some instances, 60 seconds of shocking will be sufficient; in other areas 90 seconds is needed. In cold temperatures, it can be beneficial to raise the voltage to increase efficiency. A general guideline is at temperatures less than 100C, the voltage can be increased to 150-175 V. If emergence is really slow (or on the last salvage pass prior to complete dewatering), the voltage can be increased to 200 V initially, and up to 400 V if lower voltage is not effective (dry shocking only).

3.1.2.6 Fish Salvage Notice

Monitoring and recording of fish presence, handling, and mortality must occur for the duration of the isolation, salvage, electrofishing, dewatering, and rewatering operations. Once operations are completed, a salvage report will document procedures used, any fish injuries or deaths (including numbers of fish affected), and causes of any deaths.

3.1.3 Construction and Post-Construction Conservation Measures

3.1.3.1 Fish passage

Fish passage will be provided for any adult or juvenile fish likely to be present in the project area during construction, unless passage did not exist before construction, or the stream is naturally impassable at the time of construction. If the provision of temporary fish passage during construction will increase negative effects on ESA-listed species or their habitat, a variance can be requested from the NMFS Branch Chief and the USFWS Field Office Supervisor. Pertinent information, such as the species affected, length of stream reach affected, proposed time for the passage barrier, and alternatives considered will be included in the variance request.

3.1.3.2 Construction and discharge water

1) Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate.
2) Diversions will not exceed 10% of the available flow.
3) All construction discharge water will be collected and treated using the best available technology suitable for site conditions.
4) Treatments to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present will be provided.

3.1.3.3 Minimize time and extent of disturbance

Earthwork (including drilling, excavation, dredging, filling and compacting) in which mechanized equipment is used in stream channels, riparian areas, and wetlands will be completed as quickly as possible. Mechanized equipment will be used in streams only when project specialists believe that such actions are the only reasonable alternative for implementation, or would result in less sediment in the stream channel or damage (short- or long-term) to the overall aquatic and riparian ecosystem relative to other alternatives. To the extent feasible, mechanized equipment will work from the top of the bank, unless work from another location would result in less habitat disturbance.

3.1.3.4 Cessation of work

Project operations will cease under the following conditions:

1) High flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage

2) When allowable water quality impacts, as defined by the state CWA section 401 water quality certification or HIP Turbidity Monitoring Protocol, have been exceeded

3.1.3.5 Site restoration

When construction is complete:

1) All streambanks, soils, and vegetation will be cleaned up and restored as necessary using stockpiled large wood, topsoil, and native channel material.
2) All project-related waste will be removed.
3) All temporary access roads, crossings, and staging areas will be decompacted and re-contoured. When necessary for revegetation and infiltration of water, compacted areas of soil will be loosened.
4) All disturbed areas will be rehabilitated in a manner that results in similar or improved conditions relative to pre-project conditions. This will be achieved through redistribution of stockpiled materials, seeding, and/or planting with local native seed mixes or plants.

3.1.3.6 Revegetation

Long-term soil stabilization of disturbed sites will be accomplished with reestablishment of native vegetation using the following criteria:

1) Planting and seeding will occur prior to or at the beginning of the first growing season after construction.
2) Use a mix of species, appropriate to the site that will achieve establishment, shade, and erosion control objectives. These would, preferably be forb, grass, shrub, or tree species native to the project area or region.
3) Vegetation, such as willow, sedge and rush mats, will be salvaged from disturbed or abandoned floodplains, stream channels, or wetlands, and replanted at the site in appropriate locations.
4) Invasive species will not be used.
5) Short-term stabilization measures may include the use of non-native sterile seed mix (when native seeds are not available), weed-free certified straw, jute matting, and other similar techniques.
6) Surface fertilizer will not be applied within 50 feet of any stream channel, waterbody, or wetland.
7) Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
8) Re-establishment of vegetation in disturbed areas will achieve at least 70% of pre-project conditions within 3 years.
9) Invasive plants will be removed or controlled until native plant species are well-established (typically 3 years post-construction).

3.1.3.7 Site access

The project sponsor will retain the right of reasonable access to the site in order to monitor the success of the project over its life.

3.1.3.8 Implementation monitoring

Project sponsor staff or their designated representative will provide implementation monitoring by filling out the Project Completion Form (PCF) to ensure compliance with the applicable BiOp, demonstrating that:

1) General conservation measures are adequately followed.
2) Effects to listed species are not greater than predicted and incidental take limitations are not exceeded.
3) Turbidity monitoring is being conducted in accordance with the HIP turbidity monitoring protocol (Section 3.3, pg. 44) and recorded in the PCF.

3.1.3.9 CWA section 401 water quality certification

The project sponsor or designated representative will complete and record water quality observations to ensure that in-water work is not degrading water quality. During construction, CWA section 401 water quality certification provisions provided by the Oregon Department of Environmental Quality, Washington Department of Ecology, or Idaho Department of Environmental Quality will be followed.

3.2 Staged Rewatering Plan

When appropriate, the project sponsor shall implement a staged rewatering plan for projects that involve introducing streamflow into recently excavated channels under the 2a) Improve Secondary Channel and Wetland Habitat Activity category or 2f) Channel Reconstruction categories. This plan may be altered according to site specific conditions with coordination and feedback from BPA and the Services.

1) Pre-wash the newly-excavated channel before rewatering[10]. Turbid wash water will be detained and pumped to the floodplain or into a reach with sediment capture devices, rather than discharging into fish-bearing waters.
2) Prepare new channel for water by installing seine nets at the upstream end to prevent fish from moving downstream into the new channel until 2/3 of total streamflow is available in that channel. Starting in the early morning, introduce 1/3 of the flow into the new channel over a period of 1-2 hours.
3) When reintroducing streamflow into a dewatered stream reach, monitor for turbidity:
    a) A sample must be taken to establish background turbidity levels prior to anticipated turbidity pulses. Take the sample at an undisturbed area approximately 100 feet upstream from the newly excavated channel.
    b) Take a second sample or observation, immediately downstream of the newly excavated channel, approximately:
    c) 50 feet downstream for streams that are less than 30 feet wide;
    d) 100 feet downstream for streams between 30 and 100 feet wide;
    e) 200 feet downstream for streams greater than 100 feet wide; and
    f) 300 feet from the discharge point or nonpoint source for locations subject to tidal or coastal scour.
    g) A sample must then be taken every **2 hours** during rewatering and be compared against the background measurement.
    h) An exceedance occurs whenever **both** of the following conditions are exceeded:
    i) Downstream turbidity exceeds 40 NTU (Figure 1).
    j) Downstream turbidity exceeds 10% above background.
    k) In an exceedance occurs for two consecutive readings (4 hours), stop work immediately and take measures to reduce turbidity before continuing to reintroduce streamflow.
4) Prepare to introduce the second 1/3 of the flow (up to a total of 2/3) to the new channel by installing seine nets at the upstream end of the old channel in order to prevent fish, larval lamprey and freshwater mussels from moving into a partially-dewatered channel. Introduce the second 1/3 of the flow over the next 1-2 hours. Salvage fish from the old

[10] The contractor may find it useful to have prewashed gravel bags available onsite to control the flow of water.

channel at this time, so that the old channel is fish-free before dropping below 1/3 of the flow.

Note: the fish will be temporarily blocked from moving downstream into either channel until 2/3 of the flow has been transitioned to the new channel. This blockage to downstream fish passage is expected to persist for roughly 12 to 14 hours, but fish will still be able to volitionally move out of the channel in the downstream direction. Perform monitoring as in #3 above.

5) After the second 1/3 of flow is introduced over 2 hours, and turbidity is within 10% of the background level, remove seine nets from the new channel, and allow fish to move downstream back into the channel.

   Introduce the final 1/3 of flow. Once 100% of the flow is in the new channel, install plug to block flow into the old channel and remove seine nets from the old channel. Additional efforts to salvage larval lamprey emerging from fine sediment deposits should be conducted after the flow is gone and possibly for a few hours after flow is gone, as the larvae will continue to emerge.

3.3 HIP Turbidity Monitoring Protocol

The Project Sponsor shall complete and record the following water quality observations on the HIP 4 Project Completion Form (PCF). If the geomorphology of the project area (e.g., silty or claylike materials) or the nature of the action (e.g., large amounts of bare earth exposure) shall preclude the successful compliance with these triggers, notify your EC Lead & the Services in advance of the likelihood of an exceedance and seek additional recommendations.

1) Take a background turbidity measurement approximately 100 feet upstream from the project area using a recently-calibrated turbidimeter. Record the observation, location, and time of the background measurement before monitoring at the downstream point, known as the **measurement compliance point**. If the background turbidity is less than 20 NTU, then use visual observations (Figure 1).

2) Take a second measurement or observation at the **measurement compliance point**, immediately downstream of the disturbance area, approximately:

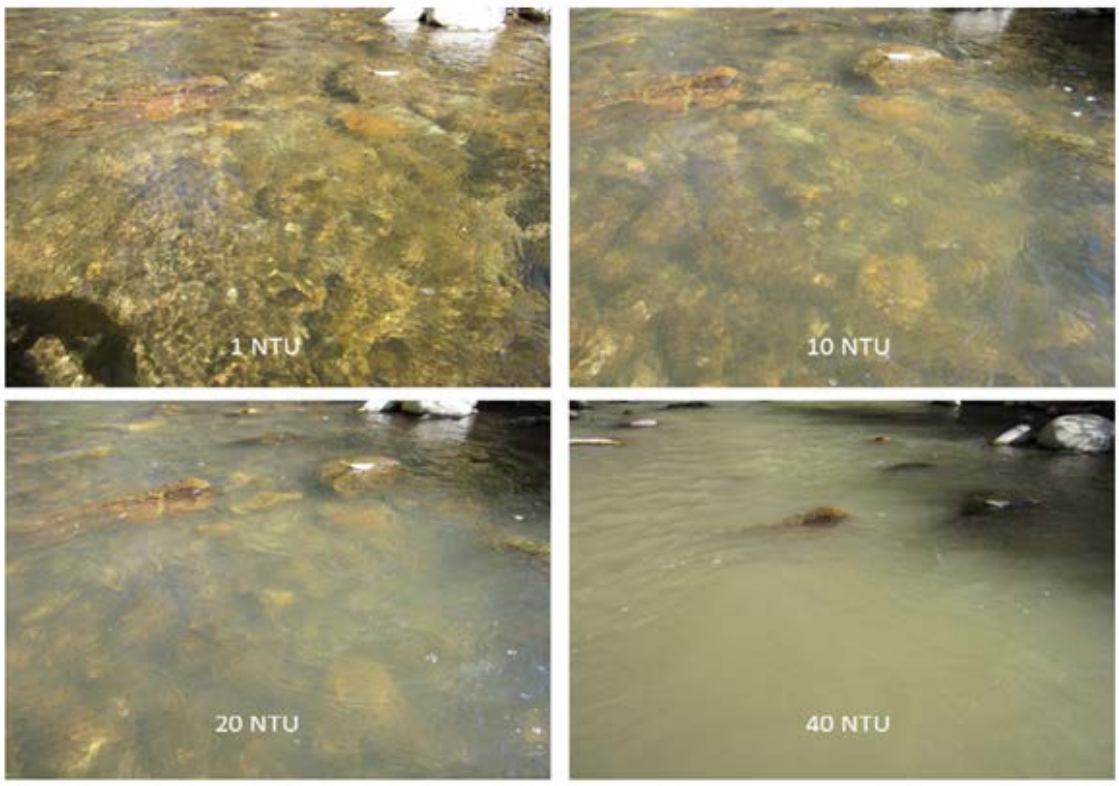
   a) 50 feet downstream for streams that are less than 30 feet wide;
   b) 100 feet downstream for streams between 30 and 100 feet wide;
   c) 200 feet downstream for streams greater than 100 feet wide; and
   d) 300 feet from the discharge point or nonpoint source for locations subject to tidal or coastal scour.
   e) Record the downstream observation, location, and time.

3) Turbidity shall be measured (steps 1-2) every **2 hours** [11] while work is being implemented.

[11] The monitoring interval of 4 hours has been proposed but not approved.

4) An exceedance occurs whenever both of the following conditions are exceeded:
   a) Downstream turbidity exceeds 40 NTU**,**
   b) Downstream turbidity exceeds 10% above background

Figure 1 Suggested Visual Observational Differences in Turbidity



NOTE: For any stream with a background turbidity of 20 NTU or less, if you cannot see the bottom in 2 feet of water at each 2 hour interval, then turbidity has likely surpassed 40 NTUs and you must adjust your procedures. This would allow work to continue with a turbidity of under about 30-40 NTU. Turbidity over 40 NTU should be avoided.

1) If an exceedance occurs then adjustments or corrective measures must be taken in order to reduce turbidity. The NMFS staff biologists of the area can provide technical assistance.
2) If exceedances occur for more than **two consecutive monitoring intervals** (after 4 hours), the activity must stop until the turbidity level returns to background, and the EC lead must be notified after the project is concluded. The EC lead shall document the reasons for the exceedances and the **corrective measures** taken. This is very important as BPA is required to report to the Services upon all exceedances.

3) If at any time, monitoring, inspections, or observations/samples show that the turbidity controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary. Document those occurrences in the Project Completion Form(PCF).

7) Diversions will be designed to incorporate Point of Diversion (POD) flow restrictions to limit the diverted flow to satisfy the irrigator's water right at the 95% exceedance stream flow stage. Diversion flow restriction may be accomplished by any practical means available but must be supported by hydraulic calculations and a stage rating curve. POD flow restriction may be accomplished by:

8) Incorporation of a restricted orifice plate or screen at the POD that provides at a maximum, the required area to pass the irrigators water right;

9) Mechanically restricting the opening of a variable head gate to the maximum area required to pass the irrigator's water right; or

10) Any other method that will satisfy the intent of the diversion flow governance requirement that can be justified by the design documents.

11) Treated wood and copper- or zinc-plated hardware shall not be used in the construction of irrigation diversions. Concrete must be sufficiently cured or dried (48-72 hours depending on temperature) before coming into contact with stream flow.

12) Irrigation diversion intake and return points will be designed or replaced to prevent fish and other aquatic organisms of all life stages from swimming or being entrained in the irrigation system. Fish screens for surface water that is diverted by gravity or by pumping at a rate that exceeds 3 cfs will be submitted to NMFS for review and approval.

13) Diversions equipped with a fish screen that utilizes an automated cleaning device will have a minimum effective surface area of 2.5 square feet per cfs, and a nominal maximum approach velocity of 0.4 feet per second (fps).

14) Diversions with no automated cleaning device shall have a minimum effective surface area of 5 square foot per cfs, and a nominal maximum approach rate of 0.2 fps; and a round or square screen mesh that is no larger than 2.38 mm (0.094 inch) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inch) in the narrow dimension.

4.1.4 Category 1c) Headcut and Grade Stabilization

Description

BPA proposes to review and fund the restoration of fish passage and grade control (i.e., headcut stabilization) with geomorphically-appropriate structures constructed from rock or large wood (LW). Boulder weirs and roughened channels may be installed for grade control at culverts to mitigate headcuts, and to provide passage at small dams or other channel obstructions that cannot otherwise be removed. For wood-dominated systems, grade control engineered log jams (ELJs) should be considered as an alternative.

Grade control ELJs are designed to arrest channel downcutting or incision, retain sediment, lower stream energy, and increase water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Grade control ELJs also serve to protect infrastructure that is exposed

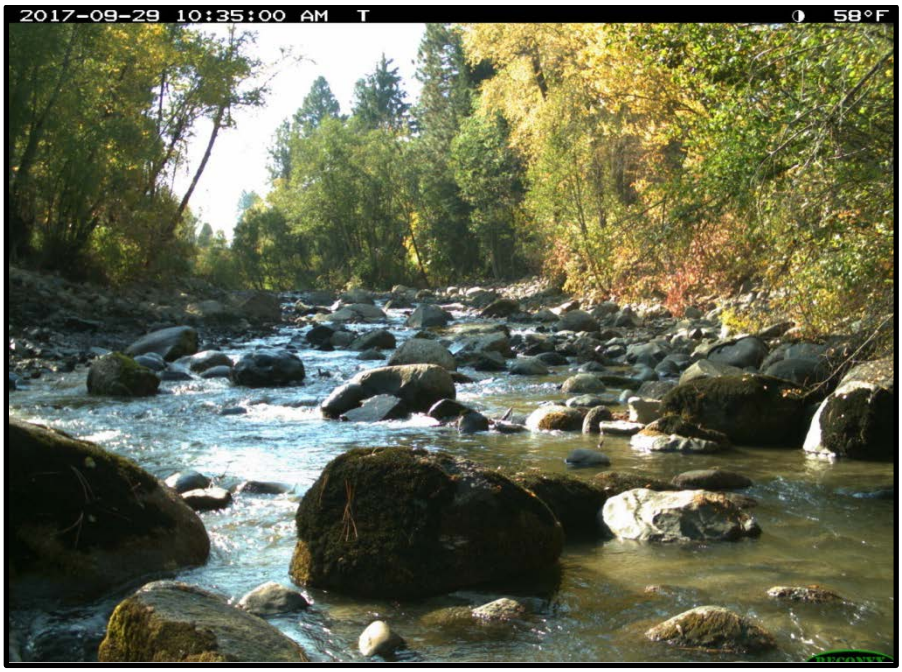
by channel incision and to stabilize over-steepened banks. Unlike hard weirs or rock grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually.

If geomorphic conditions are appropriate, consideration should be given towards use of a roughened channel or constructed riffle to minimize the potential for future development of a passage (jump height) barrier.

Guidelines for Review

- ***Low Risk:*** Boulder weirs and other grade control structures that address headcuts less than 18 inches in height (18 inches refers to height of the headcut, rather that the height of individual weirs or other grade-control structures intended to address the headcut) with drawings that demonstrate the incorporation of applicable conservation measures.
- ***Medium Risk*:** Boulder weirs and other grade control structures that are constructed to address headcuts greater than 18 inches in height (elevation differential across headcut from streambed) will require both BPA and NMFS Engineering Review. Roughened channels or constructed riffles are considered medium-risk.

All medium to high risk projects shall address Section 2.5 **Basis of Design** Report (BDR) Requirements on page 16.



Conservation Measures

1) For boulder weirs and other grade control structures that are greater than 18 inches in height (elevation differential across headcut from streambed), the profile of the stream

channel thalweg in the design plan shall provide enough information to clearly demonstrate project impacts to the stream channel and the potential for channel degradation, for a minimum for (10) upstream and (10) downstream channel widths of the downstream and upstream boundaries of the project.

2) All structures will be designed to the design benchmarks set forth in NMFS 2011[17] (or most recent version).

3) **Boulder weirs** shall incorporate the following design features:

   a) Install boulder weirs low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).

   b) Boulder weirs are to be placed diagonally across the channel or in upstream pointing "V" or "U" configurations (with the apex oriented upstream). The apex should be lower in elevation than the structure wings to support low flow consolidation.

   c) Boulder weirs are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. This can be accomplished by providing plunges no greater than 6 inches in height, allowing for juvenile fish passage at all flows.

   d) Key the weirs into the streambed (preferably at least 2.5 times their exposure height)) to minimize structure undermining due to scour. The weir should also be keyed into both banks in a manner that prevents water from cutting around the structure.

   e) Include fine material in the weir material mix to help seal the weir/channel bed, thereby preventing subsurface flow. Geotextile material can be used as an alternative approach to prevent subsurface flow.

   f) Rock for boulder weirs shall be durable and of suitable quality to ensure permanence in the climate in which it is to be used.

   g) Full spanning boulder weir placement shall be coupled with measures to improve habitat complexity (e.g., LW placement, etc.) and protection of riparian areas.

   h) The use of gabions, cable, or other means to prevent the movement of individual boulders in a boulder weir is not allowed.

4) **Headcut stabilization** shall incorporate the following design features:

   a) Armor the head-cut with sufficiently-sized and amounts of material to prevent continued up-stream movement. Materials can include both rock and organic materials which are native to the area.

[17] NMFS. 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon. Available at: http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fish_passage_design_criteria.pdf

b) Focus stabilization efforts in the plunge pool, the head cut, as well as in a short distance of stream above the headcut.

c) Minimize lateral migration of the channel around the head cut ("flanking") by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.

d) Provide fish passage over a stabilized head-cut through a series of log or rock weir structures or a roughened channel.

e) Headcut stabilization structures will be constructed utilizing stream simulation bed material, which will be pressure-washed into place until surface flow is apparent and minimal subsurface material to ensure fish passage immediately following construction (if natural flows are sufficient). Successful washing will be determined by minimizing voids within placed matrix such that ponding occurs with little to no percolation losses.

4.1.5 Category 1d) Low Flow Consolidation

Description

BPA proposes to fund and review projects that: (a) modify diffused or braided flow conditions that impede fish passage; (b) modify dam aprons with shallow depth (less than 10 inches); or (c) utilize temporary placement of sandbags, straw bales, and ecology blocks to provide depths and velocities passable to upstream migrants.

Guidelines for Review

- ***Medium or High Risk*:** All of the sub-activities under the Low Flow Consolidation activity category will require both BPA and NMFS Engineering Review.

All medium to high risk projects shall address Section 2.5 **Basis of Design** Report (BDR) Requirements on page 16.

Conservation Measures

1) Fish Passage will be designed to the design benchmarks set forth in NMFS 2011 (or most recent version) and, where appropriate, guidelines set forth in Pacific Lamprey Technical Workgroup 2017[18].

[18] *Practical guidelines for incorporating adult Pacific lamprey passage at fishways* (Pacific Lamprey Technical Workgroup 2017) (https://www.fws.gov/pacificlamprey/mainpage.cfm)

4.2 Category 2: River, Stream, Floodplain, and Wetland Restoration

BPA proposes to review and fund river, stream, floodplain, and wetland restoration actions with the objective of providing appropriate habitat conditions required for foraging, rearing, and migrating ESA-listed fish.

Projects utilizing habitat restoration actions outlined within this activity category shall be related to limiting factors identified within the applicable sub-basin plan for the watershed, a recovery plan for ESA-listed species, or shall be prioritized by recommended restoration activities identified within a localized region by a technical oversight and steering committee (e.g., the Columbia River Estuary). Individual projects may utilize a combination of the activities listed in the **River, Stream, Floodplain, and Wetland Restoration** activity category.

BPA proposes the following activities to improve fish habitat: (a) improve secondary channel and wetland habitats; (b) set-back or removal of existing berms, dikes, and levees; (c) protect streambanks using bioengineering methods; (d) install habitat-forming natural material instream structures (e.g., large wood, boulders, and spawning gravel); (e) riparian vegetation planting; and (f) channel reconstruction.

4.2.1 Category 2a) Improve Secondary Channel and Floodplain Interactions

Description

BPA proposes to review and fund projects that reconnect historical stream channels within floodplains; restore or modify hydrologic and other essential habitat features of historical river floodplain swales, abandoned side channels, spring-flow channels, wetlands, and historical floodplain channels; and create new self-sustaining side channel habitats, which are maintained through natural processes.

Guidelines for Review

- ***Medium or High Risk:*** All of the sub-activities under the **Improve Secondary Channel and Wetland Habitats** projects subcategory will require BPA review.

All medium to high risk projects shall address Section 2.5 **Basis of Design** Report (BDR) Requirements on page 16.

Conservation Measures

1) Designs must demonstrate that the project will be self-sustaining over time or promote the recovery of natural habitat-forming processes. Self-sustaining means the restored or created habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain. Promotion of natural habitat-forming processes means an early step in the restoration of a process that may take decades or multiple steps to restore.

2) Proposed new side channel construction must be within the historic floodplain (e.g. 5-year recurrence interval), current channel meander migration zone, and require limited excavation for construction. Reconnection of historical fragmented habitats is preferred.

3) Perennial side channels will be constructed to prevent fish stranding by providing a continual positive **overall** grade, or, if the gradient is lower than the main channel then by providing a year-round water connection.

4) Intermittent side channels activated only at flood stage should be designed with sufficient roughness and gradient to create shallow, slow-moving water that will not attract fish.

5) Excavated material removed from off- or side-channel habitat shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity. Hydric soils may be salvaged to provide appropriate substrate and/or seed source for hydrophytic plant community development. Hydric soils will only be obtained from wetland salvage sites.

6) Excavation depth will never exceed the maximum thalweg depth of the main channel.

7) All side channel and pool habitat work will occur in isolation from waters occupied by ESA-listed salmonid species until project completion. During project completion, a reconnection may be made by either excavation to waters occupied by ESA-listed salmonids or re-watering of these channel units.

8) Adequate precautions will be taken to prevent the creation of fish passage issues or stranding of juvenile or adult fish. Stranding must be avoided by incorporating floodplain or channel features that create shallow, slow-moving, water during flood stage that will not attract fish.

9) **Re-watering stream channels**. For stream channels which have been isolated and dewatered during project construction:

    a. Reconstructed stream channels will be “pre-washed” into a reach equipped with sediment capture devices, prior to reintroduction of stream flow.

    b. Stream channels will be re-watered slowly to minimize a sudden increase in turbidity (use **Staged Rewatering Plan** in Section 3.2 when appropriate).

11) Riparian buffer strips associated with streambank protection shall extend from the bankfull elevation towards the floodplain a minimum distance of 35 feet.

4.2.4 Category 2d) Install Habitat-Forming Instream Structures (Large Wood, Small Wood and Boulders) [25]

Description

BPA proposes to review and fund projects that include placement of in stream structures comprised of natural habitat-forming materials to provide instream complexity and to support spawning, rearing, and resting habitat for salmonids and other aquatic species. Anthropogenic activities that have altered riparian habitats, such as splash damming and the removal of large wood, logjams, and boulders have reduced instream habitat complexity in many rivers and have eliminated or reduced features like pools, cover, and bed complexity that Salmonids need for rearing, feeding, and migrating. To offset these impacts, in-stream structures consisting of large wood, small wood and boulders will be placed in stream channels either individually or in combination.

Projects utilizing structures shall increase instream structural complexity and diversity, shall mimic the processes and functions of natural input of large wood (e.g., whole conifer and hardwood trees, logs, root wads, etc.); boulders and complex bedforms, create rearing habitat and pool formation; promote spawning gravel deposition; reduce siltation in pools; reduce the

[25] descriptions of each technique refer to the WDFW Stream Habitat Restoration Guidelines: http://wdfw.wa.gov/publications/00046/,the USACE's EMRRP Technical Notes, Stream Restoration: http://el.erdc.usace.army.mil/publications.cfm?Topic=technote&Code=emrrp, or the NRCS National Engineering Handbook Part 654, Stream Restoration: http://policy.nrcs.usda.gov/viewerFS.aspx?id=3491

width/depth ratio of the stream; decrease flow velocities; deflect flows into adjoining floodplain areas to increase channel and floodplain function, promote natural vegetation composition and diversity on the floodplain and provide high-flow refugia.

The term “structure” refers to any intentionally placed object in the stream or floodplain. Structures that come in contact with water obstruct streamflow and force it to run over, around, and/or under the structure. This redirection, concentration, or expansion of flow influences the form, structure, hydraulics, and consequently, the function of the stream. As a result, instream structures are prone to having unintended consequences; caution must be exercised when using this approach.

All structures placed in a channel have the potential to affect channel hydraulics, sediment scour and deposition patterns, and the processes of wood and sediment transport. The degree to which these effects achieve the desired results or place nearby habitat, infrastructure, property, and public safety at risk depends on a number of important variables that affect the way in which a structure functions in the stream. The following parameters should be considered in structure design.

- Channel constriction caused by the structure
- Location of the structure within the channel cross-section and its height relative to the depth of flow
- Structure spacing
- Structure configuration and position in the channel
- Sediment supply and substrate composition
- Wood loading, transport and supply
- Channel confinement
- Channel slope
- Hydrology
- Fisheries life histories and limiting factors
- Time

Large Wood Placements

Large wood placements are defined herein as projects or structures that use trees that are greater 1 foot in diameter as measured at diameter at breast height, (DBH), (measured 4.5 feet from the end of the rootwad or cut end) and 15 feet or greater in length as the primary pieces within the placement or structure. This criterion does not preclude the use of materials with dimensions less than this size class for racking, woven, or slash that may be incorporated into the structure.

Placement of large woody debris (wood) and other structures in streams is one of the most widespread and common techniques to improve riverine fish habitat. Techniques for wood placement range from simply falling, pushing, or hauling trees from the riparian zone into the active stream channel to construction of highly engineered structures such as log weirs or engineered logjams (Roni et al. 2014).

Large wood will be placed to increase coarse sediment storage, increase habitat diversity and complexity, retain gravel for spawning habitat, improve flow heterogeneity, provide long-term nutrient storage and substrate for aquatic macroinvertebrates, moderate flow disturbances, increase retention of leaf litter, and provide refugia for fish during high flows. Structure design criteria should be focused on balancing biological benefit, structural resiliency, and enhancing - complementing watershed driven and reach scale processes. Increasing the system-wide placement and longitudinal extent of process forming friction elements may be more effective in many reaches than individual, large scale structures. This process allows for longitudinal moderation of applied energy along a longer reach of the river system vs. a few large structures that must with stand the applied forces of the simplified watershed and stream network. The placement of large wood should be viewed as an interim solution - a short-term improvement providing habitat as natural rates of woody debris recruitment are restored through riparian forest regeneration.

Habitat created by structures may be critical at specific times of year or ranges of discharge. Therefore, it may be appropriate to establish design discharges that relate to specific fish and wildlife benefits, in addition to those that dictate structural failure. For instance, the limiting factor for fish may be cover during summer low flow or shelter during high flow events. Under these circumstances structures will need to be designed to function during this critical time, at a minimum, in order to optimize their effects. Timing and discharge requirements may be specific to the stream and target species and age class (e.g., fish passage requirements for adult chum salmon will differ from that for juvenile coho salmon).

Small Wood Placements

Small wood placements are defined herein as projects or structures that use trees that are less than 1 foot in diameter as measured at diameter at breast height, (DBH), (measured 4.5 feet from the end of the rootwad or cut end) and 15 feet or less in length.

This activity includes the installation of small wood in-channel structures that mimic the processes and functions of beaver dams including flattening of local stream gradients, increasing interactions between the stream and floodplain, increasing bank storage, capturing of relatively fine sediment in the channel, pool formation, and hyporheic exchange. Structures consist of porous channel-spanning or partial spanning structures comprised of small diameter woody debris (including whole trees) riparian cuttings and other inert materials that are structurally reinforced with small diameter driven posts. Structures include spaces between posts that allow water, sediment, fish, and other aquatic organisms to move through the structure.

Variation of this restoration treatment may include small, whole tree placement, beaver dam analogues, post assisted log structures, post lines only, post lines with wicker weaves, construction of starter dams, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams as described by Pollock et al. (2012). The structure (either alone or in combination with debris that it traps) causes a significant reduction in channel cross-sectional area or in series will collectively increase the hydraulic roughness of the channel, thereby reducing velocities, increasing flow depth and creating backwater. The effects of large-scale backwatering can include increased flood levels and frequency of floodplain inundation, potential change in riparian species composition and distribution in response to changing inundation patterns and water table elevations, and reduced reach transport of sediment and woody debris.

Boulder Placements

Boulder placements may be used to restore habitat diversity to plane bed streams from which boulders have been removed, as an enhancement technique to increase habitat diversity in new channels, naturally plane bed stream reaches, and altered plane bed channels that were historically dominated by wood. Boulder placements increase habitat diversity and complexity, improve flow heterogeneity, provide substrate for aquatic vertebrates, moderate flow disturbances, and provide refuge for fish during high flows.

The placement of individual large boulders and boulder clusters to increase structural diversity is important to provide holding and rearing habitat for ESA-listed salmonids and create a diversity of water depth, substrate, and velocity, thereby increasing habitat diversity of an otherwise plane bed stream. Increased diversity is evident immediately after boulder placement and improves over time as substrate is scoured and sorted during high flow events. Boulder clusters should only be applied where a biologic or geomorphic need has been identified.

Guidelines for Review:

Both Large Wood and Small Wood projects shall address the **Basis of Design Requirements** in Section 2.5 **Basis of Design** Report (BDR) Requirements on page 16 and require initial **BPA Engineering Review**.

- ***Low Risk:*** Installation of habitat forming structures with drawings that demonstrate the incorporation of all conservation measures and require no ballast,

boulders, excavation or structural connections and include no risk to downstream infrastructure or property.

- ***Medium or High Risk:*** Installation of habitat forming structures that require ballast, excavation, or structural connections. Risk level of habitat forming structures also depends on scope and scale of proposal.

Conservation Measures (Large Wood):

1) Large wood placements must be designed to mimic the process and function of natural accumulations of large wood in the channel, estuary, or marine environment and address defined limiting factors.
2) Large wood placements for other purposes than habitat restoration or enhancement are excluded from this consultation.
3) Large wood must be intact, hard, and undecayed to partly decaying and should preferably include untrimmed root wads when available to provide functional refugia habitat for fish. Large wood includes whole trees with rootwad and limbs attached, pieces of trees with or without rootwads and limbs, and cut logs. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable for key pieces but may be incorporated to add habitat complexity.
4) Large wood anchoring will not utilize cable or chain. Manila, sisal or other biodegradable ropes may be used for lashing connections. If hydraulic conditions warrant use of structural connections then rebar pinning[26] or bolting may be used. The utilization of structural connections should be used minimally and only to ensure structural longevity in highly energetic systems (high gradient systems with lateral confinement and limited floodplain). Rationale for structural anchorage shall be justified and demonstrated in the Basis of Design Report and will be evaluated as a component of the HIP Technical Review.
5) If 100 year flood design criteria is applied to specific structures then stability requirements must be considered for the primary LWD elements including base, key and anchorage members (logs larger than 15 feet long and greater than one foot in diameter). These pieces are assumed to comprise ~ 50% of the overall structure. Woven, racking, matrix, and recruited material are expected to be transient and dynamically interact with the fluvial system. If specific stability evaluation of a structure result in criteria more conservative than that presented above, then a risk – benefit analyses is expected to ascertain the appropriateness of the subject structure. This assessment will be used to determine the benefits to fish habitat and may result in forgoing or modification of the project element.
6) Rock may be used for ballast but should be limited to what is needed to anchor the large wood.

[26] If rebar is to be used, the protruding ends should be cut flush with the log or bent in order to prevent impaling fish, people or wildlife.

7) Piling shall consist of wood piles; steel piles are not to be used under any circumstance. Drive each piling as follows to minimize the use of force and resulting sound pressure
    a) Use a vibratory head to drive the piles; an impact hammer shall not be used
    b) Select areas with soft substrate rather than rocky hard substrate; avoid bedrock
    c) Isolate the work area if possible to minimize acoustic disturbance

Conservation Measures (Small Wood):

1) Small wood placements shall be constructed for floodplain reconnection in stream systems less than 4% stream gradient.
2) Structures that are overtopped shall have crest elevations that extend no more than 3 feet above the stream bed. Vertical posts (if utilized) shall be cut flush and not extend above the proposed crest elevation.
3) For incised channels, an adaptive management approach using lower elevation structures that trap sediment and aggrade the channel, with future and subsequent project phases is preferred over tall structures with excessive drop and increased risk of failure.
4) Vertical posts (if utilized) must be driven to a depth at least 1.5 times the expected scour depth of the waterway or a ratio of 1:2 for exposed – embedded length whichever is more conservative. A minimum 1.5 foot clear space is required between posts.
5) All in-stream construction associated with small wood structures shall be completed by hand or small machinery not to exceed 15,000lbs operating weight.
6) All primary materials used in small wood placements must consist of non- treated wood (e.g. fence posts) and must be constructed from a materials source collected outside the riparian area.
7) Structures cannot unreasonably interfere with use of the waterway for navigation, fishing or recreation.
8) Placement of inorganic material is limited to the minimum quantity necessary to prevent under-scour of structure and manage pore flow sufficient to ensure adequate over-topping flow and side flow to facilitate fish passage where required.
9) In addition to any other design parameters necessary to meet fish passage requirements, structures must be porous, must provide for a water surface differential of no more than one-foot at low flows, or otherwise provide a clear path for fish passage over, through or around the structure during low flows.
10) No cabling, wire, mortar or other materials that serve to affix the structure to the bed, banks or upland is allowed.
11) Additional potential effects of these structures may include channel aggradation and associated channel widening, bank erosion, increased channel meandering, and decreased channel depth. The Basis of Design Report must demonstrate how these potential impacts have been addressed.
12) At project completion, all disturbed areas, including staging and access areas, will need to be graded smooth, seeded, and planted to repair damage and restore the riparian zone.

Conservation Measures (Boulder Placement):

1) Boulder placements for purposes other than habitat restoration or enhancement are not covered under this activity of HIP 4.
2) Boulder placements will be limited to reaches with a streambed that consists predominantly of coarse gravel or larger sediments and will address identified limiting factors.
3) The cross-sectional area of boulder placements may not exceed 25% of the cross-sectional area of the low-flow channel.
4) Boulder placements may not be installed with the purpose of shifting the stream flow to a single flow pattern in the middle or to the side of the stream.
5) Boulders will be machine-placed (no end dumping allowed) and will rely on the size of boulder, rather than anchoring, for stability.
6) Boulders will be installed in a low position in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 2-year flow event).
7) At project completion, all disturbed areas, including staging and access areas, will need to be graded smooth, seeded, and planted to repair damage and restore the riparian zone.

4.2.5 Category 2e) Riparian and Wetland Vegetation Planting

Description

BPA proposes to fund vegetation planting to recover watershed processes and functions associated with native plant communities and that will help restore natural plant species composition and structure. Under this activity category, the project sponsors would plant trees, shrubs, herbaceous plants, and aquatic macrophytes to help stabilize soils or restore riparian plant communities. Large trees such as cottonwoods and conifers will be planted in areas where they historically occurred but are currently either scarce or absent. Native plant species and seeds will be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.

Vegetation management strategies will be utilized that are consistent with local native succession and disturbance regimes and specify seed/plant source, seed/plant mixes, and soil preparation. Planting will address the abiotic factors contributing to the sites' succession (i.e., weather and disturbance patterns, nutrient cycling, and hydrologic condition). Only certified noxious weed-free seed (99.9%), straw, mulch or other vegetation material for site stability and revegetation projects will be utilized.

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2) Boulder placements will be limited to reaches with a streambed that consists predominantly of coarse gravel or larger sediments and will address identified limiting factors.
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Guidelines for Review

- ***Low Risk:*** Riparian vegetation planting is considered low-risk and requires no BPA review.

Conservation Measures

1) An experienced silviculturist, botanist, ecologist, or associated technician shall be involved in designing vegetation treatments.
2) Species to be planted must be of the same species that naturally occur in the project area.
3) Tree and shrub species as well as sedge and rush mats to be used as transplant material shall come from outside the bankfull width, typically in abandoned floodplains, and where such plants are abundant, or be salvaged from areas where excavation is planned.
4) Sedge and rush mats should be sized and anchored to prevent their movement during high flow events.
5) Species distribution shall mimic natural distribution in the riparian and floodplain areas.

4.2.6 Category 2f) Channel Reconstruction

Description

BPA proposes to review and fund channel reconstruction projects to improve aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, reduce bed and bank erosion, increase hyporheic exchange, provide long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic material, and provide refuge for fish and other aquatic species. All this will be accomplished by reconstructing stream channels and floodplains that are compatible within the appropriate watershed context and geomorphic setting.

The reconstructed stream system shall be composed of a naturally sustainable and dynamic planform, cross-section, and longitudinal profile which incorporates unimpeded passage and temporary storage of water, sediment, organic material, and species. Stream channel adjustment over time is to be expected in naturally dynamic systems and is a necessary component to restore a wide array of stream functions. It is expected that for most projects there will be a primary channel with secondary channels that are activated at various flow levels to increase floodplain connectivity and to improve aquatic habitat through a range of flows. This proposed action is not intended to artificially stabilize streams into a single location or into a single channel for the purposes of protecting infrastructure or property.

Channel reconstruction consists of re-meandering or movement of the primary active channel and may include structural elements such as streambed simulation materials, streambank restoration, and hydraulic roughness elements. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder weirs shall be preferentially used in step-pool and cascade stream types. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.

Guidelines for Review

- ***Medium Risk:*** Channel Reconstruction that restores historical alignment with minimal excavation shall require BPA HIP Review.
- ***High Risk:*** Channel Reconstruction that creates entirely new channel meanders through significant excavation shall require BPA Engineering and Interagency Review.

All medium to high risk projects shall address Section 2.5 **Basis of Design** Report (BDR) Requirements on page 16.

Channel Reconstruction also requires a **Staged Rewatering Plan** (Section 3.2) and a **Monitoring and Adaptive Management Plan**

Conservation Measures

1) Detailed construction drawings must be provided.
2) Designs must demonstrate that channel reconstruction will identify, correct (to the extent possible), and account for (in the project development process), the conditions that lead to the degraded condition.
3) Designs must demonstrate that the proposed action will mimic natural conditions for gradient, width, sinuosity and other hydraulic parameters.
4) Designs must demonstrate that structural elements shall fit within the geomorphic context of the stream system.
5) Designs must demonstrate sufficient hydrology and that the project will be self-sustaining over time. Self-sustaining means the restored or created habitat would not require major or periodic maintenance but function naturally within the processes of the floodplain.
6) Designs must demonstrate that the proposed action will not result in the creation of fish passage issues or post-construction stranding of juvenile or adult fish.

and seeds will be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.

Planting sites will be prepared by cutting, digging, grubbing roots, scalping sod, de-compacting soil as needed, and removing existing vegetation. The ground will be scarified as necessary to promote seed germination. Woody debris, wood chips, or soil may be placed at select locations to alter microsites.

Plants will be fertilized, mulched, and stems wrapped to protect from rodent girdling. Buds will be capped to protect plants from herbivores. Work may entail use of heavy equipment, power tools, and/or hand tools.

Because noxious weeds, nonnative invasive plants, and aggressive weedy species can take over disturbed lands and degrade range values, vegetation will be controlled through the use of herbicide application, mechanical removal, and hand pulling.

Conservation Measures

1) Plantings will be in areas where such plants have historically occurred but at present are either scarce or absent.
2) A vegetation plan will be developed that is responsive to the biological and physical factors at the site.
3) Planting plans shall require the use of native species and specify seed/plant source, seed/plant mixes, soil preparation, etc.
4) Planting Plans shall include vegetation management strategies that are consistent with local native succession and disturbance regime.
5) Vegetation Plans shall address the abiotic factors contributing to the sites' succession, i.e., weather and disturbance patterns, nutrient cycling, and hydrologic condition.

4.9.4 Category 9d: Tree Removal for Large Wood Projects

Description

This activity involves manipulation, harvest, placement, or removal and stockpiling of large wood for restoration projects. For this activity live conifers and other trees can be felled or pulled/pushed over for in-channel large wood placement. These trees will come from areas fully stocked by conifers and other trees. Danger trees and trees killed through fire, insects, disease, blow-down, and other means can be felled and used for in-channel placement regardless of live-tree stocking levels. Trees may be removed by cable, ground-based equipment, or helicopter. Trees may be felled or pushed/pulled directly into a stream or floodplain. Trees may be stockpiled for future instream restoration projects.

Conservation Measures

1) The project manager for an aquatic restoration action will coordinate with BPA's Environmental Compliance Lead and/or an action-agency wildlife biologist in tree-removal planning efforts.
2) Tree felling shall not create excessive streambank erosion or increase the likelihood of channel avulsion during high flows.
3) If these actions fall within the range of specific listed terrestrial species such as the northern spotted owl (NSO) and/ or the marbled murrelet (MAMU), timing and or equipment/distance restrictions will be applied as necessary.