# LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

## UPPER GRANDE RONDE RIVER - GRANDE RONDE SUBBASIN

## FINAL DESIGN DRAWINGS

UPPER GRANDE RONDE RIVER WATERSHED - HYDROLOGICAL UNIT CODE (HUC) 1706010401




LOCATION MAP

PARTNERS:
BONNEVILLE POWER ADMINISTRATION
GRANDE RONDE MODEL WATERSHED
WALLOWA–WHITMAN NATIONAL FOREST

PREPARED FOR:
CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION
ALLEN CHILDS
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PREPARED BY:
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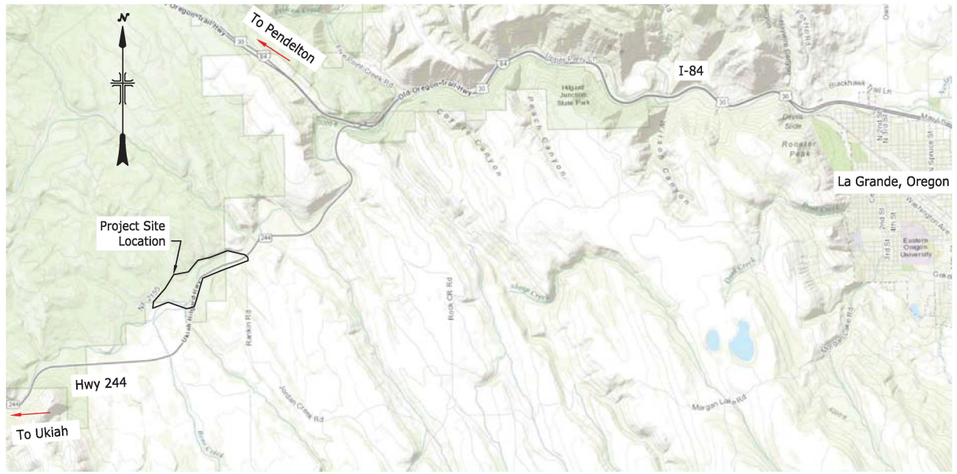


VICINITY MAP

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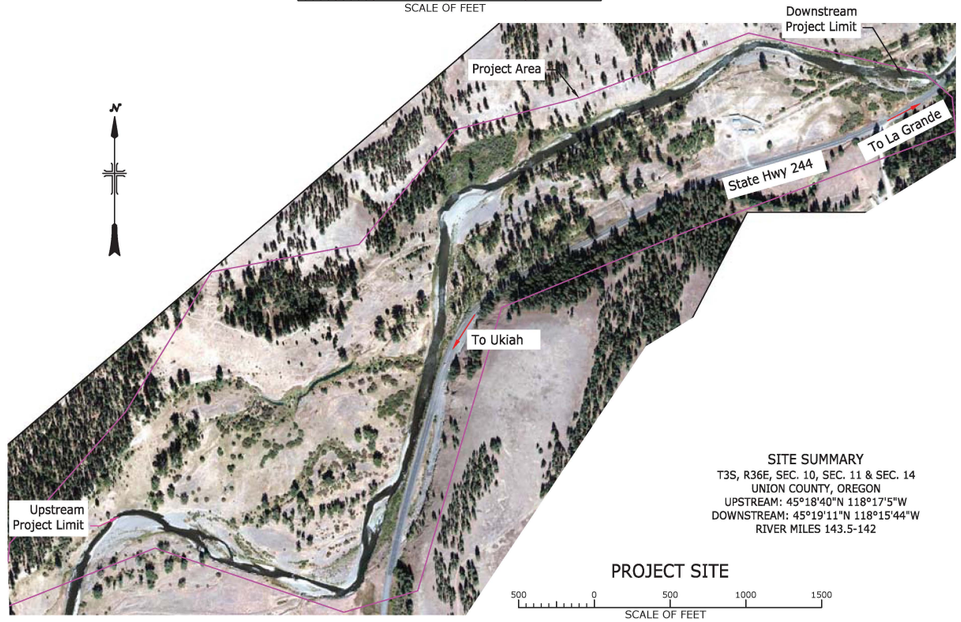
SCALE OF FEET




SITE SUMMARY
T3S, R36E, SEC. 10, SEC. 11 & SEC. 14
UNION COUNTY, OREGON
UPSTREAM: 45°18'40"N 118°17'5"W
DOWNSTREAM: 45°19'11"N 118°15'44"W
RIVER MILES 143.5-142

PROJECT SITE

500 0 500 1000 1500
SCALE OF FEET

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RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
R. Leija
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 09:41:04 -08'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

COVER SHEET

1678-100-61589
SHEET 1

DATE AND TIME PLOTTED
PLOTTED BY
CAD SYSTEM
CAD FILENAME

## GENERAL NOTES

1. Work shown in these contract documents will be performed for the Confederated Tribes of the Umatillla Indian Reservation (CTUIR), herein referred to as "Contracting Agency". Contracting Agency's representative assigned by Contracting Agency is herein referred to as the "Contracting Officer".
2. The drawings contained within should not be applied to any project except the one specified.
3. For those portions of full-size drawings (22x34 inches) showing scale bars, the major scale unit equals 1 inch. On comparable portions of half-size drawings (11x17 inches), the major scale unit equals 1/2 inch.
4. Elevations and distances shown are in feet and decimals with contour intervals at 1-foot and 5-foot increments.
5. Horizontal datum is State Plane Coordinate System, Oregon North Zone, NAD83 (2011), International Feet. The vertical datum is NAVD88.
6. Topographic mapping within stream banks was performed by Anderson Perry (La Grande, Oregon) in 2015. Geometry of the stream bed and banks at the time of construction may be different than shown on the Drawings. Topographic mapping outside the stream banks is based on 2013 LIDAR performed by Watershed Sciences (Corvallis, Oregon).
7. Engineer will not be responsible for, or liable for, unauthorized changes to, or use of, the Drawings and Specifications. All changes to the Drawings and Specifications must be approved in writing by the Engineer prior to construction.
8. The design may be adjusted in the field by the Contracting Officer during construction in order to meet site conditions and intended function as approved by the responsible engineer.
9. Funding for this project comes from the Bonneville Power Administration (BPA) and Oregon Watershed Enhancement Board (OWEB). The Contractor shall comply with all BPA and OWEB contract clauses that flow down to it, and to its subcontractors, as noted in the individual clauses and comply with applicable BPA and OWEB Contract construction clauses.
10. Portions of the project site are on public land administered by the Wallowa-Whitman National Forest. The Contractor shall comply with all applicable USFS regulations (C.O. will provide) pertaining to the use and construction on forest roads, trails, and lands.

## CONTRACTING AGENCY REQUIREMENTS

1. Contracting Agency will provide implementation monitoring to ensure compliance with the contract documents and the applicable biological opinion, including:
   a. General conservation measures are adequately followed; and
   b. Effects to ESA-listed species are not greater than predicted and incidental take limitations are not exceeded.
2. Contracting Agency will coordinate the receipt, and provide copies to the Contractor, of the Oregon DSL/ACOE Fill Permit, Oregon Department of Transportation Access Permit, and Cultural Resources Inadvertent Discovery Plan.
3. Contracting Agency will provide all live stakes, and seed required for use in construction.

## CONTRACTOR REQUIREMENTS

1. Contractor shall be responsible for obtaining, at Contractor's expense, all other permits as required by local, state, and Federal agencies including the EPA NPDES permit (SWPPP for Construction Activities).
2. Contractor shall pursue work in a diligent manner and provide all material, labor, and equipment required to ensure timely completion of the project excluding materials provided by Contracting Agency .
3. Contractor shall furnish all material and workmanship necessary for compliance with permit conditions, approving agency (Contracting Agency) requirements, and contract documents.
4. Contractor shall post on-site in a location visible to the public the following documentation:
   a. Contractor's contact name, phone number, and address for the person responsible for oversight;
   b. A description of the hazardous materials that will be used, including inventory, storage, and handling procedures;
   c. Procedures to contain and control a spill of any hazardous material generated, used, or stored on-site, including notification of proper authorities; and
   d. A standing order to cease work in the event of high flows (as defined in specifications) except as necessary to minimize resource damage (above those addressed in the design and implementation plans) or exceedance of take or water quality limitations.
5. Contractor shall construct the project in accordance with the contract documents provided by Contracting Agency. Work shall not be done without the current set of approved construction plans.
6. Contractor shall be solely and completely responsible for the conditions of the Project Site, including safety of all persons and property during performance of the work. The contractor shall ensure that all work conforms to pertinent safety regulations and codes including OSHA.
7. All work within the existing Ordinary High Water and/or the diverted actively flowing channel shall occur within the allowable Oregon Department of Fish and Wildlife in-water work window of July 1st through October 15th.
8. Contractor is responsible for construction surveying. Contracting agency and Engineer will provide field checks of construction staking, layout, and products. All topographic surface files and alignments will be provided to the Contractor in Autodesk Civil3D format.
9. Contractor shall coordinate with Contracting Officer to ensure fish salvage within the Project Site has been accomplished prior to construction activities. Fish salvage will be the responsibility of Contracting Agency.
10. Contractor will complete turbidity monitoring following permit requirements and will furnish data to the Contracting Agency on a weekly basis.
11. Contractor shall avoid, preserve, and protect existing sensitive areas as marked in the field by Contracting Officer.
12. Construction shall minimize disturbance to existing riparian vegetated areas and maximize reuse of existing riparian vegetation.
13. All native materials not used on-site shall be disposed of on-site by Contractor as directed by the Contracting Officer and all non-native materials shall be hauled offsite by Contractor and properly disposed of.

## UTILITY NOTES

1. The location of existing utilities shown on the drawings are approximate and have not been field verified. Utility location and protection is the responsibility of the contractor. The contractor shall be responsible for verifying the exact type, owner, location, and elevation of all buried and overhead utilities. It is the contractor's responsibility to perform the work in a safe manner and in accordance with any requirements set forth by the utility owner and applicable laws and regulations.
2. Contractor shall notify utility owners within the limits of construction a minimum of two weeks prior to excavation or other construction activity that may impact the utility. Contractor shall also contact the contracting officer prior to any construction activity in the area. Contractor shall provide access to utility owners for maintenance and work on their utilities during the course of the work.
3. Relocations and/or replacements of existing utilities shall be coordinated by the contractor with the utility owner. Contractor shall contact, schedule, and establish utility shut down times and determine the relocation and/or replacement requirements of existing utilities prior to the start of any work. The utility shall be relocated or replaced to the satisfaction of the utility owner.
4. The size, location and type of underground utilities exposed or modified by the contractor shall be accurately noted and placed on the contractor's as-built drawings.

## CARE OF WATER

1. The Contractor is responsible for work area isolation and performing work in compliance with all permits and ESA stipulations which are detailed in BPA's HIP III conservation measures on sheets 61591 and 61592. The Contractor may only work within Ordinary High Water (OHW) during the stipulated in-water work period of July 1st thru October 15th. Typical flow rates by month, during the construction period, are shown below for guidance only, the Contractor is solely responsible for managing water and project site safety.

## GRANDE RONDE RIVER FLOW STATISTICS AT PROJECT SITE

| MONTH | CHANCE OF EXCEEDANCE | | |
|---|---|---|---|
| | 95% | 50% | 5% |
| MAY | 190 cfs | 659 cfs | 1709 cfs |
| JUNE | 68 cfs | 230 cfs | 1125 cfs |
| JULY | 17 cfs | 56 cfs | 212 cfs |
| AUGUST | 9 cfs | 21 cfs | 51 cfs |
| SEPTEMBER | 12 cfs | 20 cfs | 42 cfs |
| OCTOBER | 19 cfs | 29 cfs | 64 cfs |
| NOVEMBER | 20 cfs | 38 cfs | 175 cfs |

## PROJECT SCOPE

The general scope of the project consists of approximately 3,380 feet of main channel construction; approximately 7,440 feet of side channel construction; approximately 450 feet of alcove construction; construction of approximately 149 large wood structures; 257 floodplain wood structures; 1,250 feet of floodplain fence live roughness structures; and approximately 4,300 ft of bank treatment. The project includes a large earthwork component with approximately 39,400 cubic yards of cut/fill material and sorting/screening of approximately 6,500 cubic yards of excavated material.

## ABBREVIATIONS

| | |
|---|---|
| AC | Acre |
| ACOE | Army Corp of Engineers |
| BMP | Best Management Practices |
| B.O. | Biological Opinion |
| BPA | Boneville Power Administration |
| CFS | Cubic Feet per Second |
| CO / C.O. | Contracting Officer |
| CP | Control Point |
| CSRO | Columbia-Snake Salmon Recovery Office |
| CTUIR | Confederated Tribe of the Umatillla Indian Reservation |
| CWA | Clean Water Act |
| CY | Cubic Yards |
| DBH | Diameter at Breast Height |
| DC | Direct Current |
| DEQ | Department Environmental Quality |
| DSL | Department of State Lands |
| E. | East |
| E | Electrical |
| El | Elevation |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| FCRPS | Federal Columbia River Power System |
| FT | Feet |
| F.G. | Finished Grade |
| HIP III | Habitat Improvement Program III - BPA's ESA Programatic |
| Hwy | Highway |
| I | Interstate |
| LWM | Large Woody Material |
| MC | Main Channel |
| MW | Monitoring Well |
| N. | North |
| NAD | North American Datum |
| NAVD | North American Vertical Datum |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollution Discharge Elimination System |
| ODFW | Oregon Department of Fish and Wildlife |
| ODOT | Oregon Department of Transportation |
| OG | Original Grade |
| OHW | Ordinary High Water |
| OR | Oregon |
| OSHA | Occupational Saftey and Health Administration |
| PDC | Pulsed Direct Current |
| PH | Phone |
| PLS/AC | Pure Live Seed per Acre |
| R | Range |
| RW | Rootwod |
| S. | South |
| SC | Side Channel |
| Sec. | Section |
| SHPO | State Historic Preservation Office |
| STA | Station |
| SWPPP | Storm Water Pollution Prevention Plan |
| SY | Square Yards |
| T | Township |
| TESC | Temporary Erosion & Sediment Control |
| TOB | Top of Bank |
| Typ | Typical |
| *U.S.* | United States |
| USACE | United States Army Corps of Engineers |
| USBR | United State Bureau of Reclamation |
| USFS | United States Forest Service |
| USFWS | United States Fish & Wildlife Service |
| v | Volts |
| W. | West |
| WET | Wetland |
| WSE | Water Surface Elevation |
| YR | Year |
| µs | Micro-Siemens |

RECLAMATION
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LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E. — DESIGNED
R. Leija — DRAWN
J. Bryant P.E. — CHECKED
JUSTIN NIELSEN 2020.03.13 10:03:35 -06'00' P.E. — TECH. APPR.
TED DAY — APPROVED ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

GENERAL NOTES

GENERAL NOTES AND ABBREVIATIONS

1678-100-61590

SHEET 1

LAST SAVED DATE
2020-03-10
LAST SAVED BY
JBRYANT

CAD SYSTEM
AutoCAD 23.0s
CAD FILENAME
02_LH_NOTES.DWG

HIP 3 GENERAL AQUATIC CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIP III ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-LISTED SPECIES. TO MINIMIZE THESE SHORT-TERM ADVERSE EFFECTS AND MAKE THEM PREDICTABLE FOR THE PURPOSES OF PROGRAMMATIC ANALYSIS, BPA WILL INCLUDE IN ALL PROJECTS IMPLEMENTED UNDER THIS HIP 111 PROPOSED ACTION THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS AND NMFS).

**PROJECT DESIGN AND SITE PREPARATION.**

1) STATE AND FEDERAL PERMITS. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, AND THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USAGE CLEAN WATER ACT (CWA) 404 PERMITS, AND CWA SECTION 401 WATER QUALITY CERTIFICATIONS.

2) TIMING OF IN-WATER WORK. 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.

A) BULL TROUT -WHILE UTILIZING THE APPROPRIATE STATE DESIGNATED IN-WATER WORK PERIOD WILL LESSEN THE RISK TO BULL TROUT, THIS ALONE MAY NOT BE SUFFICIENT TO ADEQUATELY PROTECT LOCAL BULL TROUT POPULATIONS. THIS IS ESPECIALLY TRUE IF WORK IS OCCURRING IN SPAWNING AND REARING AREAS BECAUSE EGGS, ALEVIN, AND FRY ARE IN THE SUBSTRATE OR CLOSELY ASSOCIATED HABITATS NEARLY YEAR ROUND. SOME AREAS MAY NOT HAVE DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR IF THEY DO THEY MAY CONFLICT WITH WORK WINDOWS FOR SALMON AND STEELHEAD. IF THIS IS THE CASE OR IF PROPOSED WORK IS TO OCCUR WITHIN BULL TROUT SPAWNING AND REARING HABITATS, 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.

B) LAMPREY - THE PROJECT SPONSOR AND/OR THEIR CONTRACTORS WILL AVOID WORKING IN STREAM 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 IN STREAM 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 DEWATERING AND SALVAGE PROCEDURES OUTLINED IN US FISH AND WILDLIFE SERVICE BEST MANAGEMENT PRACTICES TO MINIMIZE ADVERSE EFFECTS TO PACIFIC LAMPREY (2010).

C) EXCEPTIONS TO ODFW, WDFW, MFWP, OR IDFG IN-WATER WORK WINDOWS WILL BE REQUESTED THROUGH THE VARIANCE PROCESS (PAGE 2).

3) 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:

A) A REVIEW OF AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;

B) A SITE VISIT TO INSPECT THE AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES AND THE CONDITION OF THE PROPERTY;

C) INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, AND OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND

D) 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).

4) SITE LAYOUT AND FLAGGING. PRIOR TO CONSTRUCTION. THE ACTION AREA WILL BE CLEARLY FLAGGED TO IDENTIFY THE FOLLOWING:

A) SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;

B) EQUIPMENT ENTRY AND EXIT POINTS;

C) ROAD AND STREAM CROSSING ALIGNMENTS;

D) STAGING, STORAGE, AND STOCKPILE AREAS; AND

E) 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 TO LESSEN SOIL DISTURBANCE AND COMPACTION, AND IMPACTS TO VEGETATION.

B) 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.

C) 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).

D) 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.

E) TEMPORARY ROADS AND PATHS IN WET AREAS OR AREAS PRONE TO FLOODING WILL BE OBLITERATED BY THE END OF THE IN-WATER WORK WINDOW.

6) TEMPORARY STREAM CROSSINGS.

A) EXISTING STREAM CROSSINGS 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 OVER WATER.

C) EQUIPMENT AND VEHICLES WILL CROSS THE STREAM IN THE WET ONLY WHERE:

I. THE STREAMBED IS BEDROCK; OR

II. MATS OR OFF-SITE LOGS ARE PLACED IN THE STREAM AND USED AS A CROSSING.

D) VEHICLES AND MACHINERY WILL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHEREVER POSSIBLE.

E) THE LOCATION OF THE TEMPORARY CROSSING WILL AVOID AREAS THAT MAY INCREASE THE RISK OF CHANNEL RE-ROUTING OR AVULSION.

F) POTENTIAL SPAWNING HABITAT (I.E., POOL TAILOUTS) AND POOLS WILL BE AVOIDED TO THE MAXIMUM EXTENT POSSIBLE.

G) NO STREAM CROSSINGS WILL OCCUR AT ACTIVE SPAWNING SITES, WHEN HOLDING ADULT LISTED FISH ARE PRESENT, OR WHEN EGGS OR ALEVINS ARE IN THE GRAVEL. THE APPROPRIATE STATE FISH AND WILDLIFE AGENCY WILL BE CONTACTED FOR SPECIFIC TIMING INFORMATION.

H) AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND THE STREAM CHANNEL 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, OR ON AN ADJACENT, ESTABLISHED ROAD AREA IN A LOCATION AND MANNER THAT WILL PRECLUDE EROSION INTO OR CONTAMINATION OF THE STREAM OR FLOODPLAIN.

B) NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN THE 100-YEAR FLOODPLAIN.

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 REMOVED TO A LOCATION OUTSIDE OF THE 100-YEAR FLOODPLAIN FOR DISPOSAL.

8) 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:

A) STORED, FUELED, AND MAINTAINED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND OR ON AN ADJACENT, ESTABLISHED ROAD AREA;

B) REFUELED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM A NATURAL WATER BODY OR WETLAND, 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);

C) BIODEGRADABLE LUBRICANTS AND FLUIDS SHALL BE USED ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER.

D) INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND; AND

E) THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

9) EROSION CONTROL. EROSION CONTROL MEASURES WILL BE PREPARED AND CARRIED OUT, COMMENSURATE IN SCOPE WITH THE ACTION, THAT MAY INCLUDE THE FOLLOWING:

A)TEMPORARY EROSION CONTROLS.

I. 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.

II. 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.

III. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC.

IV. 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.

V. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL.

VI. 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:

I. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND

II. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10) 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:

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

B) 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 A 50:50 (LIGNINSULFONATE TO WATER) SOLUTION.

C) 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).

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

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

11) SPILL PREVENTION, CONTROL, AND COUNTER MEASURES. THE USE OF MECHANIZED MACHINERY INCREASES THE RISK FOR ACCIDENTAL SPILLS OF FUEL, LUBRICANTS, HYDRAULIC FLUID, OR OTHER CONTAMINANTS INTO THE RIPARIAN ZONE OR DIRECTLY INTO THE WATER. ADDITIONALLY, UNCURED CONCRETE AND FORM MATERIALS ADJACENT TO THE ACTIVE STREAM CHANNEL MAY RESULT IN ACCIDENTAL DISCHARGE INTO THE WATER. THESE CONTAMINANTS CAN DEGRADE HABITAT, AND INJURE OR KILL AQUATIC FOOD ORGANISMS AND ESA-LISTED SPECIES. THE PROJECT SPONSOR WILL ADHERE TO THE FOLLOWING 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.

12) INVASIVE SPECIES CONTROL. THE FOLLOWING MEASURES WILL BE FOLLOWED TO AVOID INTRODUCTION OF INVASIVE PLANTS AND NOXIOUS WEEDS INTO PROJECT AREAS:

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.

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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BOISE, ID 2020-03-13

HIP III GENERAL CONSERVATION MEASURES

1678-100-61591

SHEET 1

LAST SAVED DATE
2020-03-13
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JBRYANT

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**WORK AREA ISOLATION & FISH SALVAGE.**

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. WHEN WORK AREA ISOLATION IS REQUIRED, DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS, FISH RELEASE AREAS, AND, WHEN A PUMP IS USED TO DEWATER THE ISOLATION AREA AND FISH ARE PRESENT, A FISH SCREEN THAT MEETS NMFS'S FISH SCREEN CRITERIA (NMFS 2011, OR MOST CURRENT). 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.

- NATIONAL MARINE FISHERIES SERVICE. 2011. ANADROMOUS SALMONID PASSAGE FACILITY DESIGN. NORTHWEST REGION. AVAILABLE ONLINE AT:
HTTP://WWW.NWR.NOAA.GOV/SALMON-HYDROPOWER/FERC/UPLOAD/FISH-PASSAGE-DESIGN.PDF
- U.S. FISH AND WILDLIFE SERVICE. 2010. BEST MANAGEMENT PRACTICES TO MINIMIZE ADVERSE EFFECTS TO PACIFIC LAMPREY.
HTTP://WWW.FWS.GOV/PACIFIC/FISHERIES/SPHABCON/LAMPREY/PDF/BEST%20MANAGEMENT%20PRACTICES%20FOR%20PACIFIC%20LAMPREY%20APRIL%202010%20VERSION.PDF

FOR SALVAGE OPERATIONS IN KNOWN BULL TROUT SPAWNING AND REARING HABITAT,ELECTROFISHING SHALL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. BULL TROUT ARE VERY TEMPERATURE SENSITIVE AND GENERALLY SHOULD NOT BE ELECTROSHOCKED OR OTHERWISE HANDLED WHEN TEMPERATURES EXCEED 15DEGREES CELSIUS. 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.SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODOLOGIES, AND CONSERVATION MEASURES SPECIFIED BELOW IN STEPS 1 THROUGH 6. STEPS 1 AND 2WILL BE IMPLEMENTED FOR ALL PROJECTS WHERE WORK AREA ISOLATION IS NECESSARY ACCORDING TO CONDITIONS ABOVE. ELECTROFISHING (STEP 3) CAN BE IMPLEMENTED TO ENSURE ALL FISH HAVE BEEN REMOVED FOLLOWING STEPS 1 AND 2,OR WHEN OTHER MEANS OF FISH CAPTURE MAY NOT BE FEASIBLE OR EFFECTIVE.DEWATERING AND REWATERING (STEPS 4 AND 5) WILL BE IMPLEMENTED UNLESS WETTED IN-STREAM WORK IS DEEMED TO BE MINIMALLY HARMFUL TO FISH, AND IS BENEFICIAL TO OTHER AQUATIC SPECIES. DEWATERING WILL NOT BE CONDUCTED IN AREAS KNOWN TO BE OCCUPIED BY LAMPREY, UNLESS LAMPREYS ARE SALVAGED USING GUIDANCE SET FORTH IN US FISH AND WILDLIFE SERVICE (2010)3.

1) ISOLATE.
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 FOUR 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.

2) SALVAGE. AS DESCRIBED BELOW, FISH TRAPPED WITHIN THE ISOLATED WORK AREA WILL BE CAPTURED TO MINIMIZE THE RISK OF INJURY, THEN RELEASED AT A SAFE SITE:
A) REMOVE AS MANY FISH AS POSSIBLE PRIOR TO DEWATERING.
B) DURING DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
C) SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
D) MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
E) IF BUCKETS ARE USED TO TRANSPORT FISH:
I. THE TIME FISH ARE IN A TRANSPORT BUCKET WILL BE LIMITED, AND WILL BE RELEASED AS QUICKLY AS POSSIBLE;
II. THE NUMBER OF FISH WITHIN A BUCKET WILL BE LIMITED BASED ON SIZE, AND FISH WILL BE OF RELATIVELY COMPARABLE SIZE TO MINIMIZE PREDATION;
Ill. AERATORS FOR BUCKETS WILL BE USED OR THE BUCKET WATER WILL BE FREQUENTLY CHANGED WITH COLD CLEAR WATER AT 15 MINUTE OR MORE FREQUENT INTERVALS.
IV. BUCKETS WILL BE KEPT IN SHADED AREAS OR WILL BE COVERED BY A CANOPY IN EXPOSED AREAS.
V. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.
F) AS RAPIDLY AS POSSIBLE (ESPECIALLY FOR TEMPERATURE-SENSITIVE BULL TROUT), FISH WILL BE RELEASED IN AN AREA THAT PROVIDES ADEQUATE COVER AND FLOW REFUGE. UPSTREAM RELEASE IS GENERALLY PREFERRED, BUT FISH RELEASED DOWNSTREAM WILL BE SUFFICIENTLY OUTSIDE OF THE INFLUENCE OF CONSTRUCTION.
G) SALVAGE WILL BE SUPERVISED BY A QUALIFIED FISHERIES BIOLOGIST EXPERIENCED WITH WORK AREA ISOLATION AND COMPETENT TO ENSURE THE SAFE HANDLING OF ALL FISH.

3) ELECTROFISHING. ELECTROFISHING WILL BE USED ONLY AFTER OTHER SALVAGE METHODS HAVE BEEN EMPLOYED OR WHEN OTHER MEANS OF FISH CAPTURE ARE DETERMINED TO NOT BE FEASIBLE OR EFFECTIVE. IF ELECTROFISHING WILL BE USED TO CAPTURE FISH FOR SALVAGE, THE SALVAGE OPERATION WILL BE LED BY AN EXPERIENCED FISHERIES BIOLOGIST AND THE FOLLOWING GUIDELINES WILL BE FOLLOWED:

A) THE NMFS'S ELECTROFISHING GUIDELINES (NMFS 2000).
B) ONLY DIRECT CURRENT (DC) OR PULSED DIRECT CURRENT (PDC) WILL BE USED AND CONDUCTIVITY MUST BE TESTED.
I. IF CONDUCTIVITY IS LESS THAN 100 MS, VOLTAGE RANGES FROM 900 TO 1100WILL BE USED.
II. FOR CONDUCTIVITY RANGES BETWEEN 100 TO 300 MS, VOLTAGE RANGES WILL BE 500 TO 800.
Ill. FOR CONDUCTIVITY GREATER THAN 300 MS, VOLTAGE WILL BE LESS THAN 400.
C) ELECTROFISHING WILL BEGIN WITH A MINIMUM PULSE WIDTH AND RECOMMENDED VOLTAGE AND THEN GRADUALLY INCREASE TO THE POINT WHERE FISH ARE IMMOBILIZED.
D) THE ANODE WILL NOT INTENTIONALLY CONTACT FISH.
E) ELECTROFISHING SHALL NOT BE CONDUCTED WHEN THE WATER CONDITIONS ARE TURBID AND VISIBILITY IS POOR. THIS CONDITION MAY BE EXPERIENCED WHEN THE SAMPLER CANNOT SEE THE STREAM BOTTOM IN ONE FOOT OF WATER.
F) 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.

4) DEWATER. 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.

A) DIVERSION AROUND THE CONSTRUCTION SITE MAY BE ACCOMPLISHED WITH A COFFER DAM 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.
B) 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 20114, OR MOST RECENT VERSION). IF THE PUMPING RATE EXCEEDS 3 CUBIC FEET SECOND (CFS), A NMFS HYDRO FISH PASSAGE REVIEW WILL BE NECESSARY.
C) DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO RIPARIAN VEGETATION OR STREAM CHANNEL.
D) SAFE REENTRY OF FISH INTO THE STREAM CHANNEL WILL BE PROVIDED,PREFERABLY INTO POOL HABITAT WITH COVER, IF THE DIVERSION ALLOWS FOR DOWNSTREAM FISH PASSAGE.E) 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.
4 NATIONAL MARINE FISHERIES SERVICE. 2011. ANADROMOUS SALMONID PASSAGE FACILITY DESIGN. NORTHWEST REGION. AVAILABLE ONLINE AT:
HTTP://WWW.NWR.NOAA.GOV/SALMON-HYDROPOWER/FERC/UPLOAD/FISH-PASSAGE-DESIGN.PDF

5) SALVAGE NOTICE. MONITORING AND RECORDING OF FISH PRESENCE, HANDLING, AND MORTALITY MUST OCCUR DURING 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.

**CONSTRUCTION AND POST-CONSTRUCTION CONSERVATION MEASURES.**

1) FISH PASSAGE. FISH PASSAGE WILL BE PROVIDED FOR ANY ADULT OR JUVENILE FISH LIKELY TO BE PRESENT IN THE ACTION 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 AQUATIC SPECIES OF INTEREST OR THEIR HABITAT, A VARIANCE CAN BE REQUESTED FROM THE NMFS BRANCH CHIEF AND THE FWS 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.2) CONSTRUCTION AND DISCHARGE WATER.
A) SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS, BUT ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.
B) DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.
C) ALL CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED USING THE BEST AVAILABLE TECHNOLOGY APPLICABLE TO SITE CONDITIONS.
D) TREATMENTS TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS AND OTHER POLLUTANTS LIKELY TO BE PRESENT WILL BE PROVIDED.

LAST SAVED DATE 2020-03-10
LAST SAVED BY JBRYANT

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RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
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JAN. 14,2020
JUSTIN NIELSEN
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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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HIP III GENERAL CONSERVATION MEASURES

1678-100-61592

SHEET 1

## SUMMARY OF QUANTITIES

| Item | Description | Unit | Quantity |
|---|---|---|---|
| 1 | Mobilization and Demobilization | Lump Sum | 1 |
| 2 | Temporary Traffic Control | Lump Sum | 1 |
| 3 | Environmental Controls (SWPPP, ESC, Etc.) | Lump Sum | 1 |
| 4 | Temporary Access Routes and Staging | Lump Sum | 1 |
| 5 | Work Area Isolation, Channel Diversion, and Water Management | Lump Sum | 1 |
| 6 | Construction Surveying | Lump Sum | 1 |
| 7 | Provide Temporary Channel Crossings | Lump Sum | 1 |
| 8 | Transport Channel Materials Bird Track Springs | Lump Sum | 1 |
| 9 | General Site Clearing | AC | 13 |
| 10 | Sod Salvage, Store, Maintain, and Place | SQYD | 5080 |
| 11 | Salvage, Maintain, and Transplant Riparian Clumps | SQYD | 385 |
| 12 | Earthwork - Excavate, Haul, Segregate, Store, and Place | CY | 42050 |
| 13 | Channel Materials Mining/Replacement | CY | 1000 |
| 14 | Channel Materials Screening | CY | 17000 |
| 15 | Furnish Large Cobble | CY | 865 |
| 16 | Constructed Riffles Class 1 | CY | 5815 |
| 17 | Constructed Riffles Class 2 | CY | 4670 |
| 18 | Constructed Point Bars | CY | 5291 |
| 19 | Constructed Glides | CY | 900 |
| 20 | Furnish Boulders | Each | 305 |
| 21 | Boulder Placement | Each | 695 |
| 22 | Blind Channel | LF | 115 |
| 23 | Type A - Apex Jam Small | Each | 11 |
| 24 | Type B - Meander Jam - Mallet Jam | Each | 9 |
| 25 | Type C3 - 3 Log Angled Channel Margin Jam | Each | 13 |
| 26 | Type C6 - 6 Log Angled Channel Margin Jam | Each | 17 |
| 27 | Type C9 - 9 Log Angled Channel Margin Jam | Each | 16 |
| 28 | Type C12 - 12 Log Angled Channel Margin Jam | Each | 15 |
| 29 | Type D - Single Log Sweeper Jam | Each | 55 |
| 30 | Type E - Cover Logs | Each | 280 |

## SUMMARY OF QUANTITIES

| Item | Description | Unit | Quantity |
|---|---|---|---|
| 31 | Type F - Floodplain Roughness | Each | 299 |
| 32 | Type G - Reinforced Habitat Structure | Each | 2 |
| 33 | Short Roughened Edge Bank Treatment | LF | 3600 |
| 34 | Tall Roughened Edge Bank Treatment | LF | 800 |
| 35 | Flood Fence | LF | 270 |
| 36 | Live Brush Trench | LF | 3150 |
| 37 | Large Full Tree | Each | 55 |
| 38 | Large w/ RW | Each | 126 |
| 39 | Medium w/ RW | Each | 251 |
| 40 | Medium w/o RW | Each | 184 |
| 41 | Small Tree w/ RW | Each | 520 |
| 42 | Small Tree w/o RW | Each | 2634 |
| 43 | Tree Top | Each | 598 |
| 44 | Slash | CY | 6695 |
| 45 | Apply Seed to Disturbed Areas Outside of Channel Bank Limits | AC | 16 |
| 46 | Furnish and Place Straw Mulch | AC | 16 |
| 47 | Medium Track Hoe (i.e. CAT 330 or similar) | Hours | 80 |
| 48 | Small Track Hoe (i.e. CAT 318 or similar) | Hours | 80 |
| 49 | Off-Road Dump Truck (i.e. CAT 735 or similar) | Hours | 60 |
| 50 | Dozer (i.e. CAT D6 or similar) | Hours | 60 |

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 10:31:06 -06'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

SUMMARY OF PROJECT QUANTITIES

1678-100-61593

SHEET 1

LAST SAVED DATE
2020-03-13
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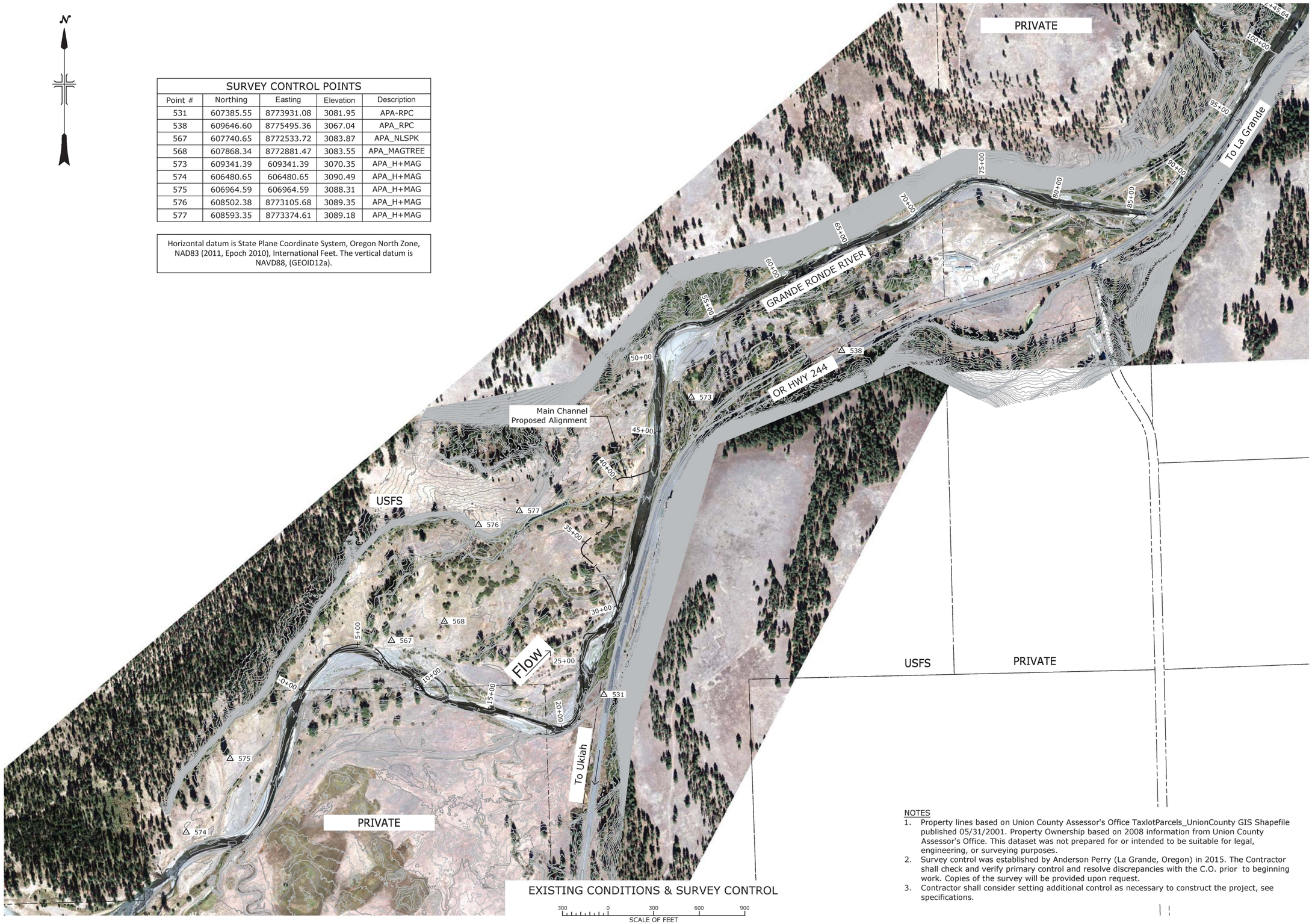
JBRYANT

CAD SYSTEM
AutoCAD 23.0s
CAD FILENAME
05_LH_QUANTITIES SUMMARY.DWG

| SURVEY CONTROL POINTS | | | | |
|---|---|---|---|---|
| Point # | Northing | Easting | Elevation | Description |
| 531 | 607385.55 | 8773931.08 | 3081.95 | APA-RPC |
| 538 | 609646.60 | 8775495.36 | 3067.04 | APA_RPC |
| 567 | 607740.65 | 8772533.72 | 3083.87 | APA_NLSPK |
| 568 | 607868.34 | 8772881.47 | 3083.55 | APA_MAGTREE |
| 573 | 609341.39 | 609341.39 | 3070.35 | APA_H+MAG |
| 574 | 606480.65 | 606480.65 | 3090.49 | APA_H+MAG |
| 575 | 606964.59 | 606964.59 | 3088.31 | APA_H+MAG |
| 576 | 608502.38 | 8773105.68 | 3089.35 | APA_H+MAG |
| 577 | 608593.35 | 8773374.61 | 3089.18 | APA_H+MAG |

Horizontal datum is State Plane Coordinate System, Oregon North Zone, NAD83 (2011, Epoch 2010), International Feet. The vertical datum is NAVD88, (GEOID12a).




EXISTING CONDITIONS & SURVEY CONTROL

300 0 300 600 900
SCALE OF FEET

NOTES
1. Property lines based on Union County Assessor's Office TaxlotParcels_UnionCounty GIS Shapefile published 05/31/2001. Property Ownership based on 2008 information from Union County Assessor's Office. This dataset was not prepared for or intended to be suitable for legal, engineering, or surveying purposes.
2. Survey control was established by Anderson Perry (La Grande, Oregon) in 2015. The Contractor shall check and verify primary control and resolve discrepancies with the C.O. prior to beginning work. Copies of the survey will be provided upon request.
3. Contractor shall consider setting additional control as necessary to construct the project, see specifications.

RECLAMATION
Managing Water in the West

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OREGON
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JUSTIN NIELSEN
EXPIRES: 12/31/2022

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
B. Leija
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 10:15:11 -08'00' P.E.
TECH. APPR.
JED DAY
X
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER

BOISE, ID 2020-03-13

EXISTING CONDITIONS & SURVEY CONTROL

1678-100-61594

SHEET 1

LAST SAVED DATE
2020-03-10
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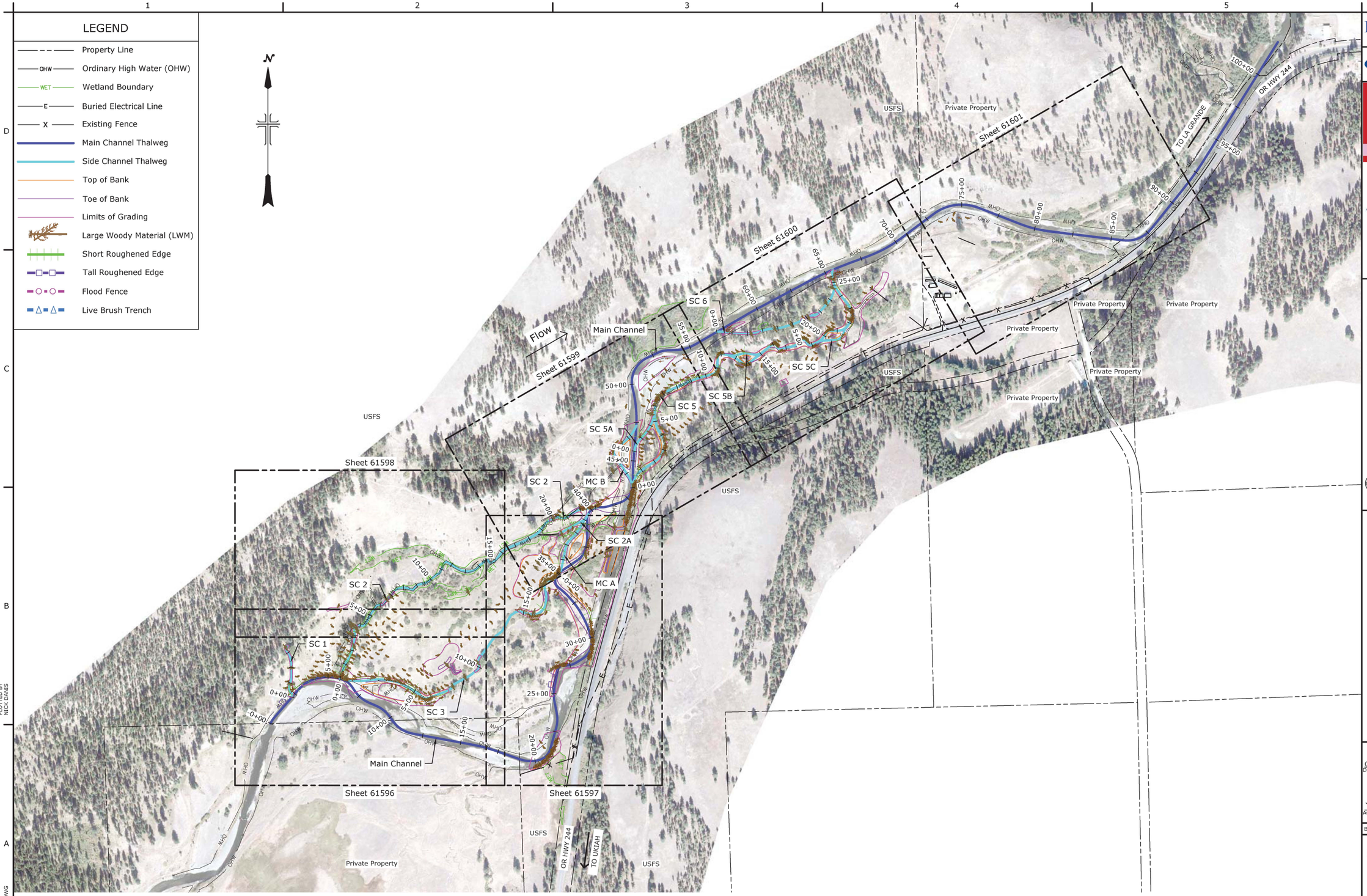
JBRYANT

CAD SYSTEM
AutoCAD 23.0s
ACAD FILE NAME
06_LM_EXIST_SURVEY.DWG

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench




PROPOSED CONDITIONS KEY MAP

300 0 300 600 900
SCALE OF FEET

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
19319PE
OREGON
NICHOLAS T. DANIS
03/13/2020
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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
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JUSTIN NIELSEN 2020.03.13 12:27:58 -06'00' P.E.
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PROPOSED CONDITIONS KEY MAP

1678-100-61595
SHEET 1

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CAD FILENAME
LONGLEY_OVERVIEW.DWG

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

Match Line - (Sheet 61598)

Match Line - (Sheet 61597)

Install Type E - Cover Logs
(Typ. See Sheet 61660)

Install Flood Fence
30 LF Per Fence Unless Noted Otherwise
(Typ. See Sheet 61663)

USFS

Side Channel 1

Side Channel 2

Side Channel 3

Flow

Limits of Grading

Bank Treatments
(Typ. See Sheet 61606
thru 61637 for placement)

Install Live Brush Trench
30 LF Per Trench Unless Noted Otherwise
(Typ. See Sheet 61666)

Large Woody Material Structure
(Typ. See Sheet 61606 thru
61637 for structure placement)

Install Type F - Floodplain Roughness
(Typ. See Sheet 61661)

50 LF

60 LF

35 LF

40 LF

Main Channel

Private Property not to be disturbed
including existing channel

Outlet Jordan Creek

Private Property

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | 60 EA | 61660 |
| F | Floodplain Roughness | 108 EA | 61661 |
| | Flood Fence | 270 LF | 61663 |
| | Live Brush Trench | 945 LF | 61666 |

PROPOSED CONDITIONS PLAN

60 0 60 120 180
SCALE OF FEET

RECLAMATION
Managing Water in the West

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79319PE
OREGON
EXPIRES: 12/31/21

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
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PROPOSED CONDITIONS PLAN

1678-100-61596

SHEET 1

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Match Line - (Sheet 61596)

Match Line - (Sheet 61598)

Match Line - (Sheet 61599)

Private Property

USFS

Limits of Grading

Main Channel

Bank Treatments
(Typ. See Sheet 61606
thru 61637 for placement)

Install Type E - Cover Logs
(Typ. See Sheet 61660)

Install Type F - Floodplain Roughness
(Typ. See Sheet 61661)

Flow

Install Boulder Nose/Necklace
Approx. 50 Boulders at the Direction of C.O.

Large Woody Material Structure
(Typ. See Sheet 61606 thru
61637 for structure placement)

Protect Highway by
Filling Existing Channel
See Sheets 61602 thru 61604

Side Channel 3

Side Channel 2

Install Live Brush Trench
30 LF Per Trench Unless Noted Otherwise
(Typ. See Sheet 61666)

Install Blind Channel
(See Sheet 61639)

Main Channel A

Side Channel 2A

OR HWY 244

50 LF

25 LF

35 LF

45 LF

40 LF

12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 25+00 30+00 35+00 0+00 1+00 2+00 3+00 4+00

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | 40 EA | 61660 |
| F | Floodplain Roughness | 57 EA | 61661 |
| | Flood Fence | - | 61663 |
| | Live Brush Trench | 1150 LF | 61666 |

PROPOSED CONDITIONS PLAN

60 0 60 120 180
SCALE OF FEET

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CAD FILENAME
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79319PE
OREGON
EXPIRES: 12/31/21

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
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ACCEPTED

BOISE, IDAHO 2020-03-13

PROPOSED CONDITIONS PLAN

1678-100-61597

SHEET 1

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | 25 EA | 61660 |
| F | Floodplain Roughness | 16 EA | 61661 |
| | Flood Fence | - | 61663 |
| | Live Brush Trench | 100 LF | 61666 |

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

USFS

Side Channel 2

Install Type E - Cover Logs
(Typ. See Sheet 61660)

Flow

Match Line - (Sheet 61596)

Match Line - (Sheet 61597)

Install Live Brush Trench
30 LF Per Trench Unless Noted Otherwise
(Typ. See Sheet 61666)

Install Type F - Floodplain Roughness
(Typ. See Sheet 61661)

50 LF

Side Channel 3

RECLAMATION
Managing Water in the West

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OREGON
NICHOLAS D. DANIS
EXPIRES: 12/31/21

03/13/2020

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

# GRANDE RONDE RIVER SUBBASIN

## LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
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BOISE, IDAHO 2020-03-13

PROPOSED CONDITIONS PLAN

1678-100-61598
SHEET 1

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CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_OVERVIEW.DWG

PROPOSED CONDITIONS PLAN

60 0 60 120 180
SCALE OF FEET

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | 105 EA | 61660 |
| F | Floodplain Roughness | 73 EA | 61661 |
| | Flood Fence | - | 61663 |
| | Live Brush Trench | 950 LF | 61666 |

Main Channel

Side Channel 5

Side Channel 5A

Side Channel 2

Side Channel 2A

Side Channel 3

Main Channel A

Main Channel B

Flow

USFS

OR HWY 244

Install Live Brush Trench
30 LF Per Trench Unless Noted Otherwise
(Typ. See Sheet 61666)

Bank Treatments
(Typ. See Sheet 61606
thru 61637 for placement)

Install Type F - Floodplain Roughness
(Typ. See Sheet 61661)

Install Type E - Cover Logs
(Typ. See Sheet 61660)

Large Woody Material Structure
(Typ. See Sheet 61606 thru
61637 for structure placement)

Protect Highway by
Filling Existing Channel
See Sheets 61602 thru 61604

Match Line - (Sheet 61597)

Match Line - (Sheet 61600)

PROPOSED CONDITIONS PLAN

SCALE OF FEET 60 0 60 120 180

RECLAMATION
Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
JUSTIN A. NIELSEN
03/13/2020
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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
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JUSTIN NIELSEN 2020.03.13 12:52:43 -06'00' P.E.
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PROPOSED CONDITIONS PLAN

1678-100-61599
SHEET 1

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NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_OVERVIEW.DWG

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | 50 EA | 61660 |
| F | Floodplain Roughness | 39 EA | 61661 |
| | Flood Fence | - | 61663 |
| | Live Brush Trench | - | 61666 |

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

USFS

Main Channel

Install Type E - Cover Logs
(Typ. See Sheet 61660)

Side Channel 5B

Flow

Side Channel 6

Bank Treatments
(Typ. See Sheet 61606
thru 61637 for placement)

Large Woody Material Structure
(Typ. See Sheet 61606 thru
61637 for structure placement)

Limits of Grading

Side Channel 5

Install Type F - Floodplain Roughness
(Typ. See Sheet 61661)

Side Channel 5C

Match Line - (Sheet 61599)

Match Line - (Sheet 61601)

OR HWY 244

Private Property

Private Property

USFS

PROPOSED CONDITIONS PLAN

60 0 60 120 180
SCALE OF FEET

RECLAMATION
Managing Water in the West

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79319PE
OREGON
NICHOLAS T. DANIS
03/13/2020
EXPIRES: 12/31/21

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LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
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JUSTIN NIELSEN 2020.03.13 12:34:02 -08'00' P.E.
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PROPOSED CONDITIONS PLAN

1678-100-61600
SHEET 1

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3/12/2020 10:48 AM
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AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_OVERVIEW.DWG

| Structure Type | Structure Description | Sheet Count | Detail Sheet |
|---|---|---|---|
| E | Cover Logs | - | 61660 |
| F | Floodplain Roughness | 6 EA | 61661 |
| | Flood Fence | - | 61663 |
| | Live Brush Trench | - | 61666 |

## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Buried Electrical Line
- Existing Fence
- Main Channel Thalweg
- Side Channel Thalweg
- Top of Bank
- Toe of Bank
- Limits of Grading
- Large Woody Material (LWM)
- Short Roughened Edge
- Tall Roughened Edge
- Flood Fence
- Live Brush Trench

USFS

Flow

Install Type F - Floodplain Roughness (Typ. See Sheet 61661)

Main Channel

Private Property

Private Property

Match Line - (Sheet 61600)

Existing Culvert

OR HWY 244

Private Property

75+00

80+00

85+00

90+00

OHW

MHO

PROPOSED CONDITIONS PLAN

60 0 60 120 180

SCALE OF FEET

RECLAMATION
Managing Water in the West

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79319PE
OREGON
JUSTIN A. NIELSEN
EXPIRES: 12/31/21

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
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PROPOSED CONDITIONS PLAN

1678-100-61601

SHEET 1

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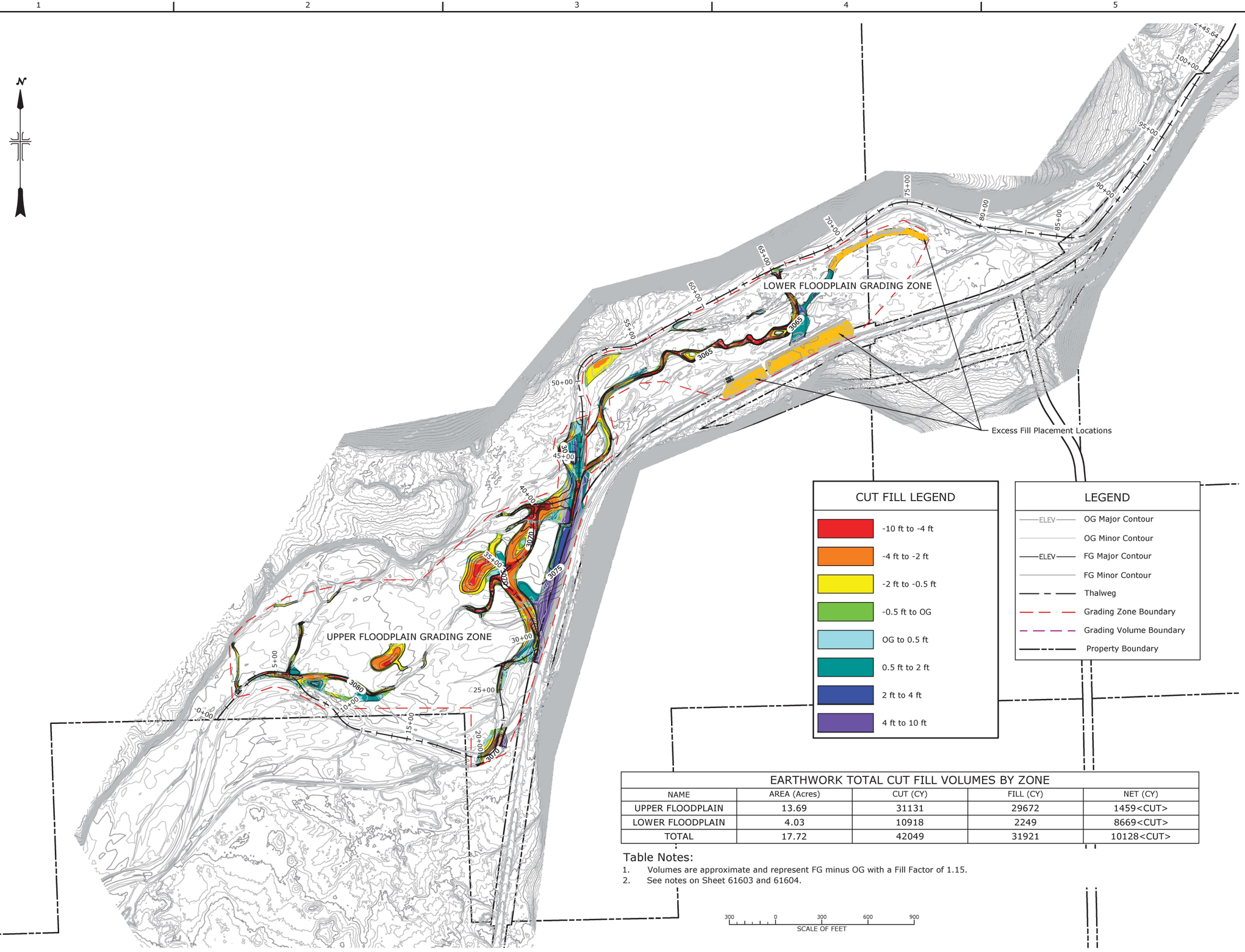


## CUT FILL LEGEND

- -10 ft to -4 ft
- -4 ft to -2 ft
- -2 ft to -0.5 ft
- -0.5 ft to OG
- OG to 0.5 ft
- 0.5 ft to 2 ft
- 2 ft to 4 ft
- 4 ft to 10 ft

## LEGEND

- ELEV — OG Major Contour
- OG Minor Contour
- ELEV — FG Major Contour
- FG Minor Contour
- Thalweg
- Grading Zone Boundary
- Grading Volume Boundary
- Property Boundary

## EARTHWORK TOTAL CUT FILL VOLUMES BY ZONE

| NAME | AREA (Acres) | CUT (CY) | FILL (CY) | NET (CY) |
|---|---|---|---|---|
| UPPER FLOODPLAIN | 13.69 | 31131 | 29672 | 1459<CUT> |
| LOWER FLOODPLAIN | 4.03 | 10918 | 2249 | 8669<CUT> |
| TOTAL | 17.72 | 42049 | 31921 | 10128<CUT> |

Table Notes:

1. Volumes are approximate and represent FG minus OG with a Fill Factor of 1.15.
2. See notes on Sheet 61603 and 61604.

300 0 300 600 900
SCALE OF FEET

RECLAMATION
Managing Water in the West

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95773PE
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OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Nielsen P.E.
DRAWN
J. Bryant P.E.
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JUSTIN NIELSEN 2020.03.13 10:32:23 -06'00' P.E.
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EARTHWORK CUT & FILL VOLUMES

PROJECT

1678-100-61602

SHEET 1

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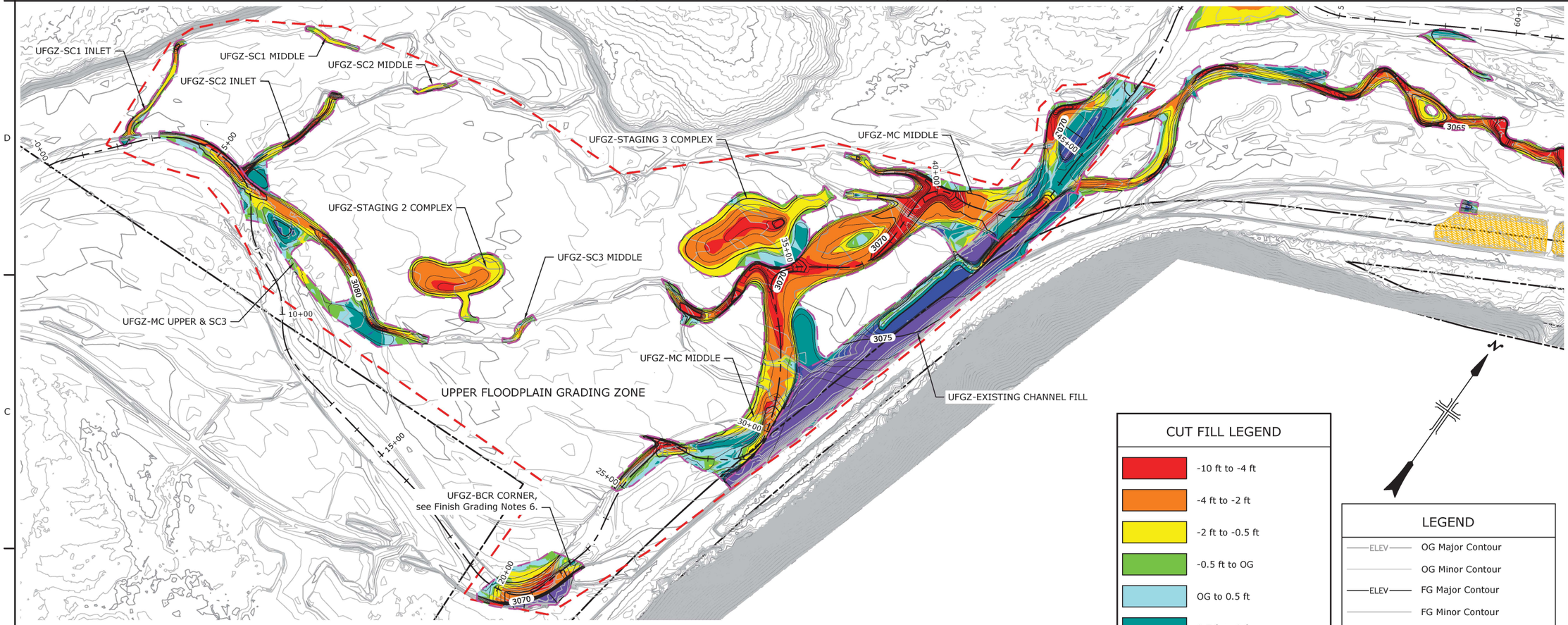
CAD FILENAME
LM-EARTHWORK-CUT-FILL-VOLUMES.DWG




EARTHWORK CUT AND FILL VOLUMES UPPER FLOODPLAIN

150 0 150 300 450
SCALE OF FEET

CUT FILL LEGEND

- -10 ft to -4 ft
- -4 ft to -2 ft
- -2 ft to -0.5 ft
- -0.5 ft to OG
- OG to 0.5 ft
- 0.5 ft to 2 ft
- 2 ft to 4 ft
- 4 ft to 10 ft

LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Thalweg
- Grading Zone Boundary
- Grading Volume Boundary
- Property Boundary

| UPPER FLOODPLAIN GRADING ZONE (UFGZ) | | | | |
|---|---|---|---|---|
| NAME | AREA (Acres) | CUT (CY) | FILL (CY) | NET (CY) |
| UFGZ-SC1 INLET | 0.17 | 227 | 10 | 217<CUT> |
| UFGZ-SC1 MIDDLE | 0.06 | 52 | 0 | 52<CUT> |
| UFGZ-SC2 INLET | 0.29 | 521 | 165 | 356<CUT> |
| UFGZ-SC2 MIDDLE | 0.04 | 41 | 1 | 40<CUT> |
| UFGZ-MC UPPER & SC3 | 1.50 | 2550 | 596 | 1954<CUT> |
| UFGZ-SC3 MIDDLE | 0.05 | 63 | 3 | 60<CUT> |
| UFGZ-STAGING 2 COMPLEX | 0.64 | 2143 | 0 | 2143<CUT> |
| UFGZ-STAGING 3 COMPLEX | 1.45 | 4530 | 137 | 4393<CUT> |
| UFGZ-BCR CORNER | 0.68 | 1521 | 1376 | 145<CUT> |
| UFGZ-MC MIDDLE | 6.19 | 19319 | 4021 | 15298<CUT> |
| UFGZ-EXISTING CHANNEL FILL | 2.62 | 164 | 23363 | 23199<FILL> |
| TOTAL | 13.69 | 31131 | 29672 | 1459<CUT> |

## Table Notes:

1. Volumes are approximate and represent FG minus OG using a Fill Factor of 1.15, see Note 3.
2. Volumes do not include additional over excavation required for placement of riffle, point bar, and glide materials or installation of LWM structures.
3. The cut and fill volumes of each feature were calculated using a comparison of the proposed surface of each feature surface to the existing ground surface using a Cut Factor of 1.0 and a Fill Factor of 1.15. The Fill Factor of 1.15 was used based on experience with a similar local project requiring a higher fill factor. See Sheet 61602 for entire estimated project quantities.
4. The Contractor shall place excess material in the areas shown on Sheet 61603 and 61604 according to details in Sheet 61643 under the direction of the C.O. to blend the excess material in the footprint shown with the existing grade. Excess Material Storage volumes shown on sheet 61604 are estimated to be greater than the excess materials generated from the project to ensure adequate space is available.

GENERAL FILL NOTE:
All fill within this project must meet material specifications and placement requirements detailed in Sheet 61643.

GENERAL EXCAVATION NOTES:
1. Excavation shall be completed to the lines and grades shown on the Drawings unless otherwise directed by the Engineer.
2. The quantity of material to be excavated or placed has been measured by surface subtraction in AutoCAD and is therefore assumed to be compacted in-place and not factored for any potential expansion.
3. Shape, trim, and finish cut slopes to conform with lines, grades, and cross-sections shown on the Drawings unless otherwise directed by the Engineer.
4. Stockpile excavated material and sort for use as fill or channel material until material is needed.
5. Dry excavated material may be stockpiled near each work site. Wet excavated material shall be hauled to a stockpile area where turbid water draining from the material cannot enter the waterway.
6. As boulders larger than 14 inches in diameter are discovered during excavation, remove and stock pile at locations to be used in riffle construction.

FINISH GRADING NOTES:
1. Finish grading shall be within ±0.50 feet Horizontal and ±0.10 feet Vertical of the locations and elevations shown on the Drawings.
2. Where 6 to 12 inches of topsoil is applied, the topsoil shall be compacted by a single pass with a tracked excavator or similar equipment to provide a uniform firm compaction, prior to measurement of finish grade, see Sheet 61643.
3. Finish grade shall be flush with adjacent surfaces unless otherwise indicated.
4. Finish Grade shall be inspected and approved by the C.O. prior to seeding or other activity that would hinder adjustments to the finish grading.
5. Compaction of finished surface is not required where the finished surface is achieved through only excavation, except in main channel excavation areas through riffles, glides, and point bars where specific construction is required, see detail sheets 61644 thru 61648.
6. Where fill materials are placed within the existing railroad grade prism utilize material that matches the appearance of the existing railroad materials in terms of gradations, color, and texture according to https://www.nps.gov/tps/standards/four-treatments/treatment-reconstruction.htm.

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Nielsen P.E.
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 10:35:22 -07'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

EARTHWORK CUT & FILL VOLUMES

UPPER FLOODPLAIN

1678-100-61603

SHEET 1

LAST SAVED DATE
2020-03-13
LAST SAVED BY
JBRYANT

CAD SYSTEM
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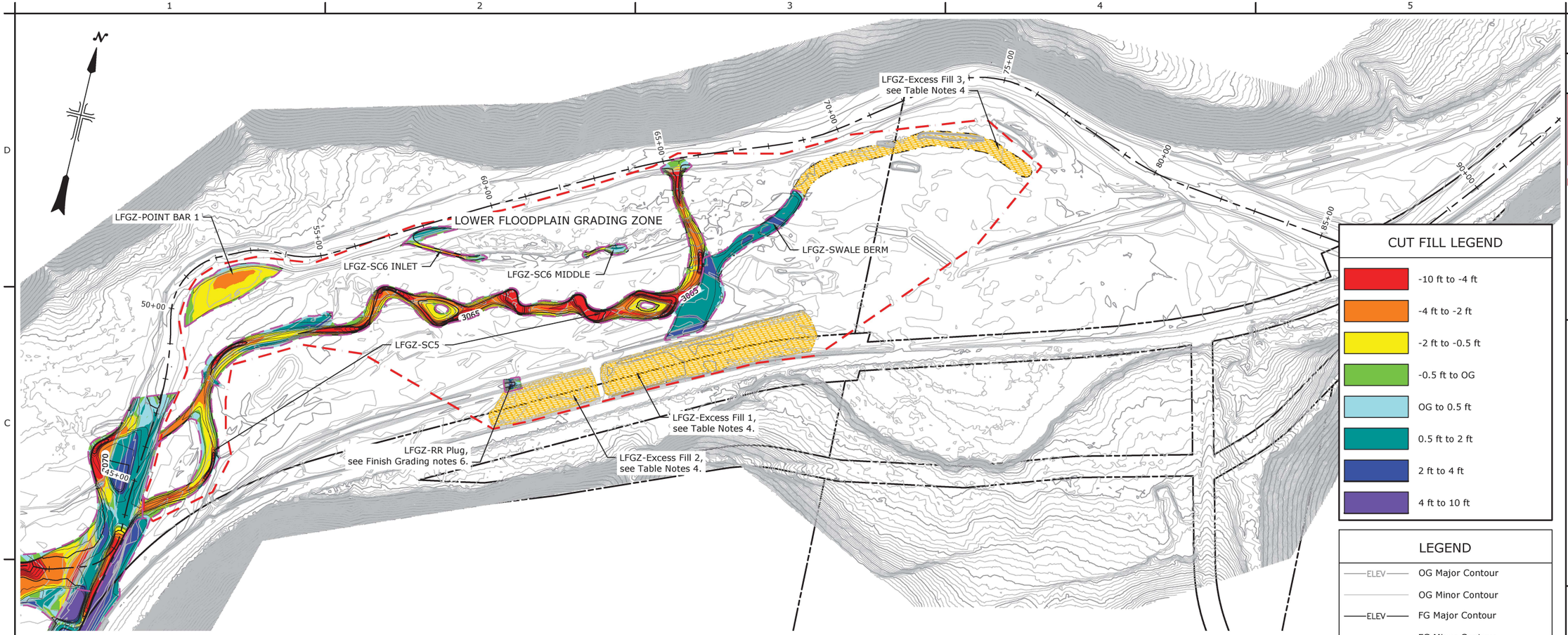
CAD FILENAME
LM-EARTHWORK-CUT-FILL-VOLUMES.DWG




EARTHWORK CUT AND FILL VOLUMES LOWER FLOODPLAIN

150 0 150 300 450
SCALE OF FEET

## CUT FILL LEGEND

- -10 ft to -4 ft
- -4 ft to -2 ft
- -2 ft to -0.5 ft
- -0.5 ft to OG
- OG to 0.5 ft
- 0.5 ft to 2 ft
- 2 ft to 4 ft
- 4 ft to 10 ft

## LEGEND

- ELEV — OG Major Contour
- OG Minor Contour
- ELEV — FG Major Contour
- FG Minor Contour
- Thalweg
- Grading Zone Boundary
- Grading Volume Boundary
- Property Boundary

| LOWER FLOODPLAIN GRADING ZONE (LFGZ) | | | | |
|---|---|---|---|---|
| NAME | AREA (Acres) | CUT (CY) | FILL (CY) | NET (CY) |
| LFGZ-SC5 | 2.61 | 9827 | 323 | 9504<CUT> |
| LFGZ-POINT BAR 1 | 0.49 | 938 | 2 | 936<CUT> |
| LFGZ-SC6 INLET | 0.14 | 117 | 97 | 20<CUT> |
| LFGZ-SC6 MIDDLE | 0.06 | 27 | 20 | 7<CUT> |
| LFGZ-RR PLUG | 0.04 | 3 | 71 | 68<FILL> |
| LFGZ-SWALE BERM | 0.69 | 6 | 1736 | 1730<FILL> |
| TOTAL | 4.03 | 10918 | 2249 | 8669<CUT> |

| EXCESS MATERIAL STORAGE | | | | |
|---|---|---|---|---|
| NAME | AREA (Acres) | CUT (CY) | FILL (CY) | NET (CY) |
| LFGZ-EXCESS FILL 1 | 1.45 | 0 | 5531 | 5531<FILL> |
| LFGZ-EXCESS FILL 2 | 0.65 | 42 | 744 | 702<FILL> |
| LFGZ-EXCESS FILL 3 | 0.63 | 8 | 5676 | 5668<FILL> |
| TOTAL | 2.73 | 50 | 11951 | 11901<FILL> |

## Table Notes:

1. Volumes are approximate and represent FG minus OG using a Fill Factor of 1.15, see Note 3.
2. Volumes do not include additional over excavation required for placement of riffle, point bar, and glide materials or installation of LWM structures.
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Managing Water in the West

Cardno

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JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E. — DESIGNED
J. Nielsen P.E. — DRAWN
J. Bryant P.E. — CHECKED
JUSTIN NIELSEN 2020.03.13 10:49:15 -06'00' P.E. — TECH. APPR.
TED DAY — APPROVED ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

EARTHWORK CUT & FILL VOLUMES

LOWER FLOODPLAIN

1678-100-61604

SHEET 1

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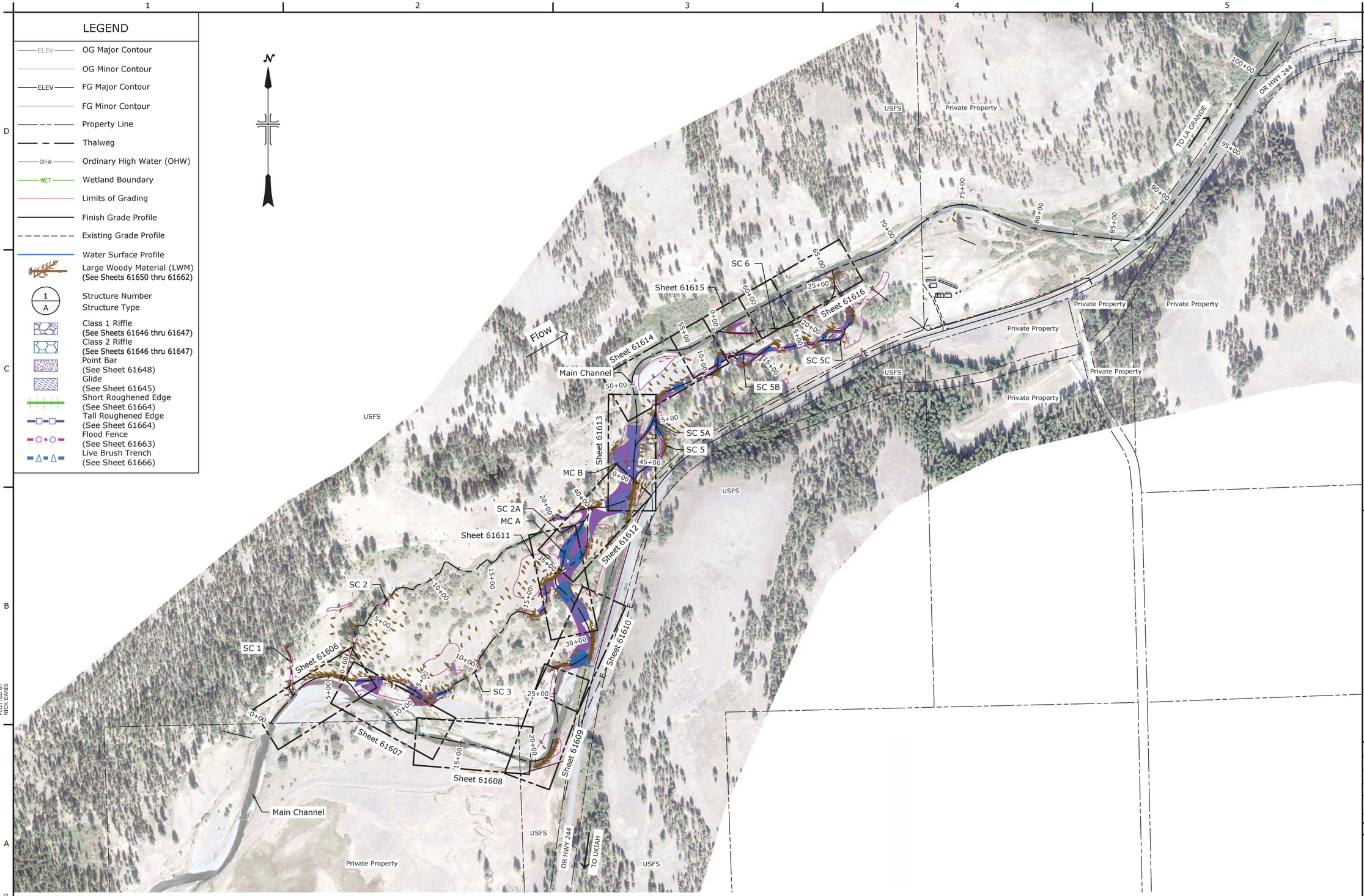
CAD SYSTEM
AutoCAD 23.0s
ACAD FILE NAME
LM-EARTHWORK-CUT-FILL-VOLUMES.DWG

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL PLAN AND PROFILE KEY MAP

300 0 300 600 900
SCALE OF FEET

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Managing Water in the West

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OREGON
JULY 15, 1997
MICHAEL TODD KNUTSON
EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

# GRANDE RONDE RIVER SUBBASIN

## LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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J. Bryant P.E.
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J. Nielsen P.E.
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MAIN CHANNEL PLAN AND PROFILE KEY MAP

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SHEET 1

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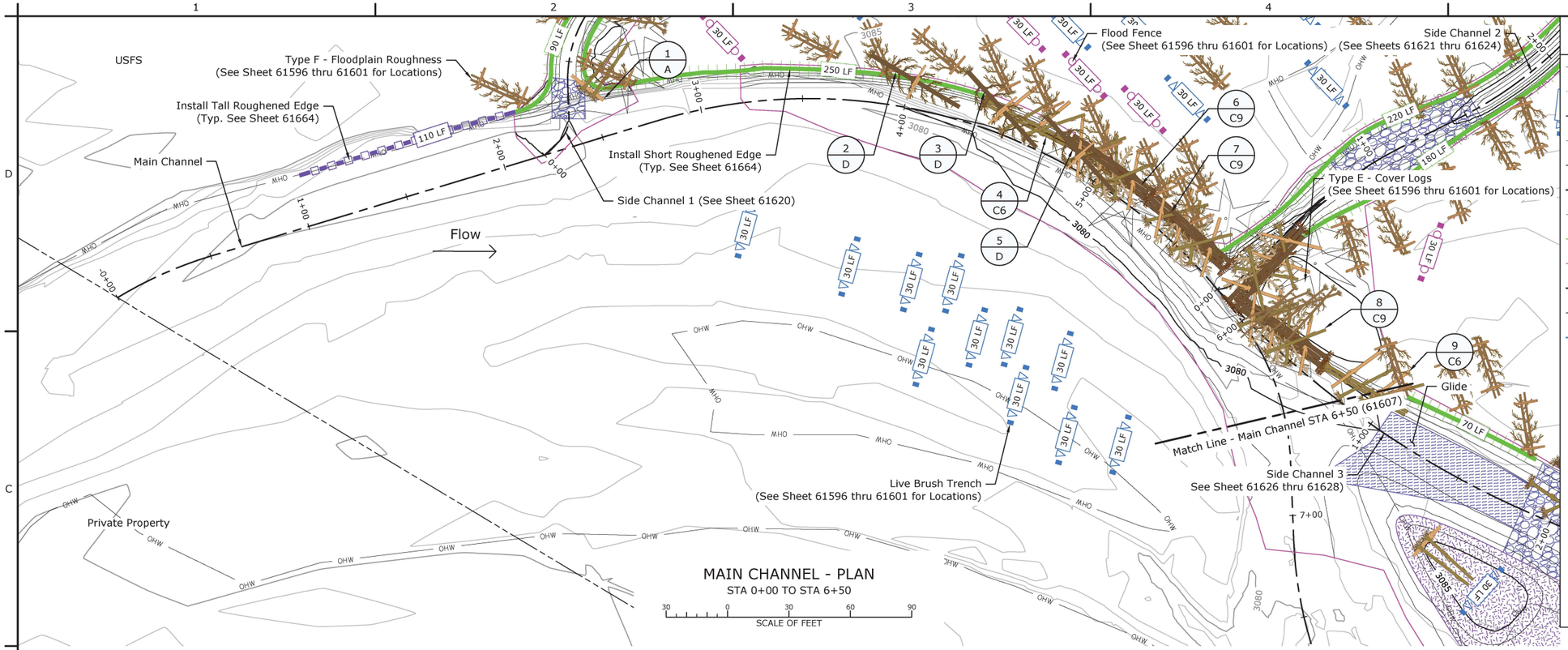



## MAIN CHANNEL - PLAN

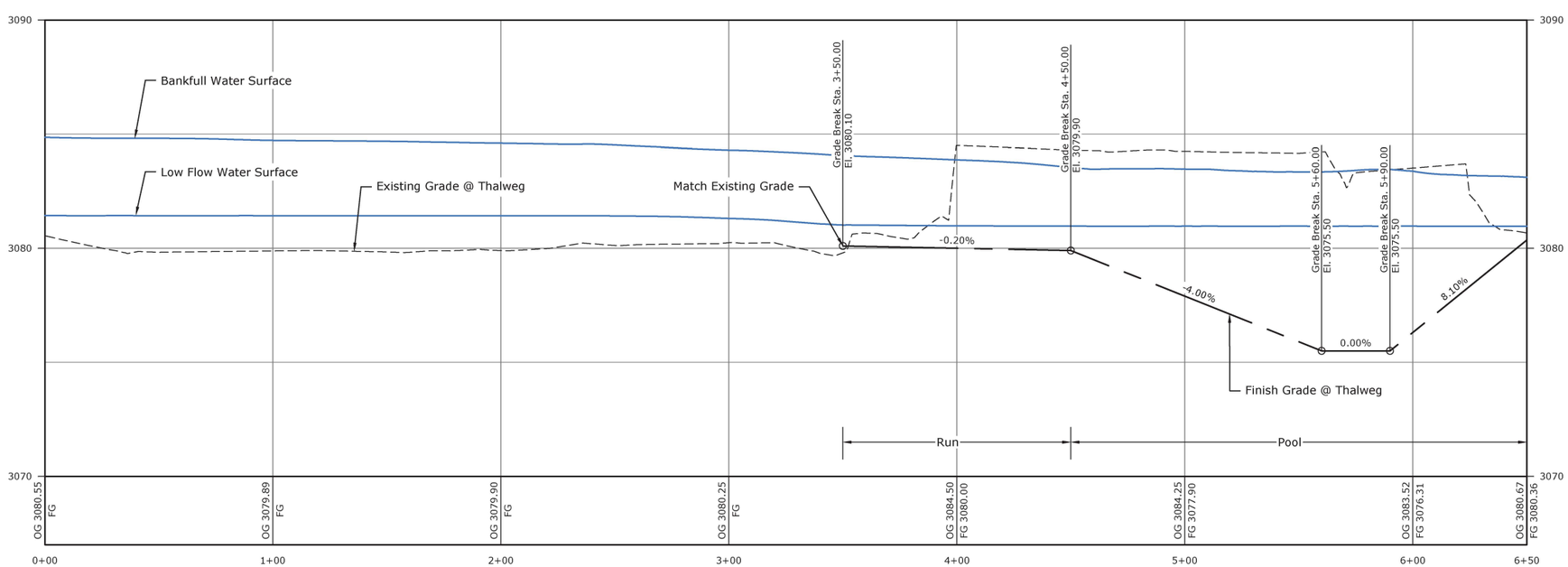
STA 0+00 TO STA 6+50

30 0 30 60 90

SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




## MAIN CHANNEL - THALWEG PROFILE

STA 0+00 TO STA 6+50

HORIZONTAL SCALE: 30 0 30 60 90 — SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 — SCALE OF FEET

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Managing Water in the West

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JULY 15, 2007
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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J. Bryant P.E.
DRAWN
J. Nielsen P.E.
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ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 0+00 TO STA 6+50

1678-100-61606

SHEET 1

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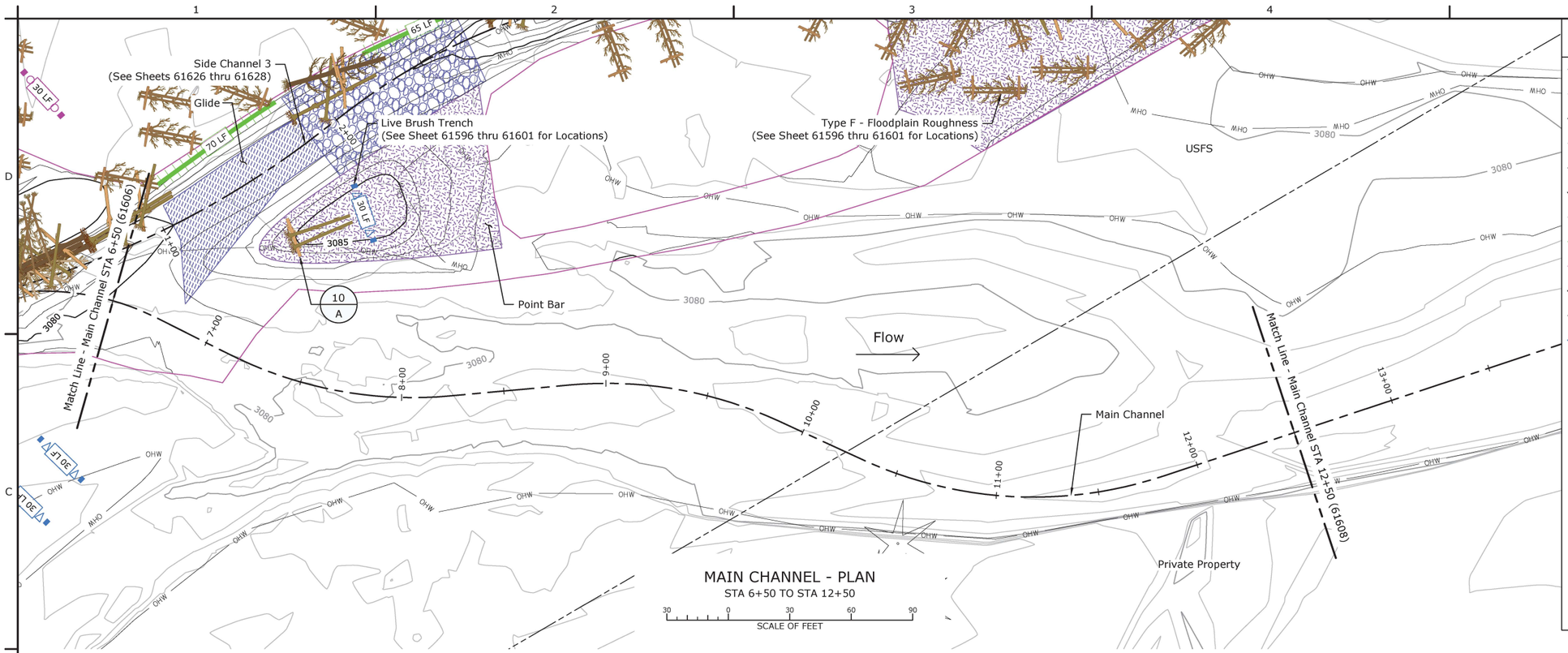


MAIN CHANNEL - PLAN
STA 6+50 TO STA 12+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
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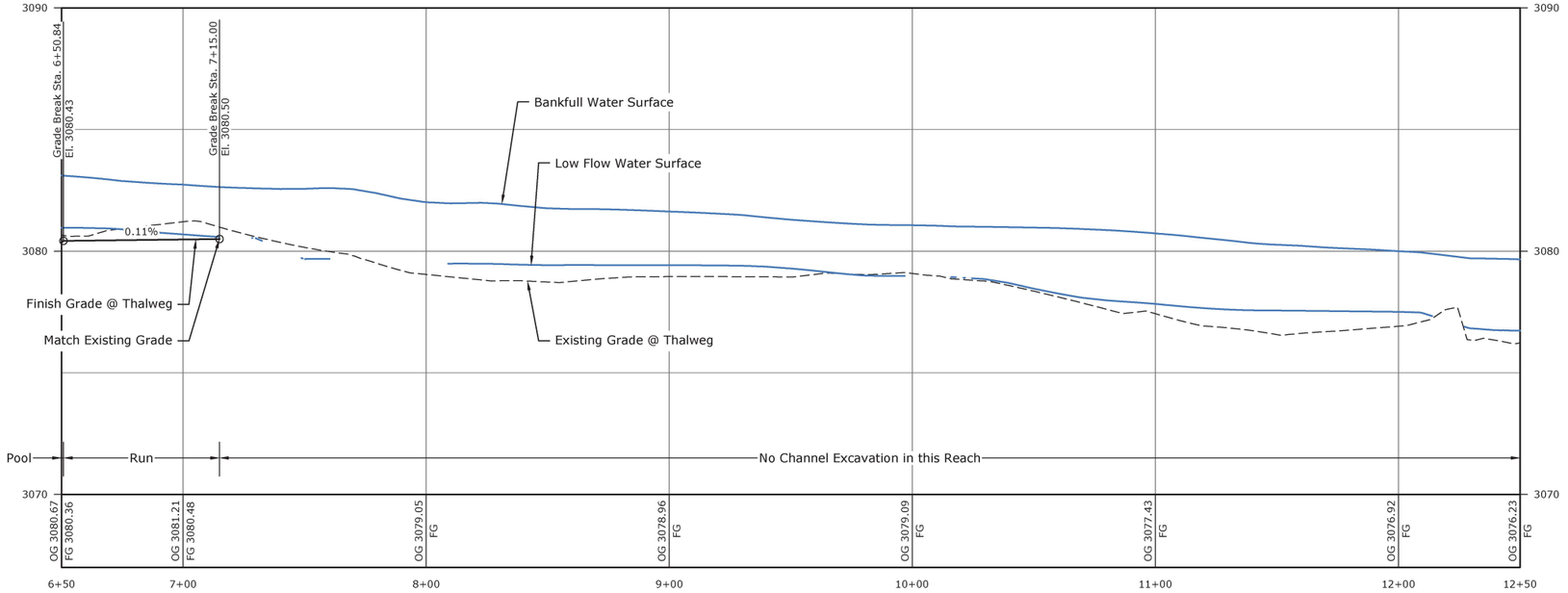
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL - THALWEG PROFILE
STA 6+50 TO STA 12+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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Managing Water in the West

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OREGON
JULY 15, 2007
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:06:03 -08'00' P.E.
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ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 6+50 TO STA 12+50

1678-100-61607

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CAD FILENAME
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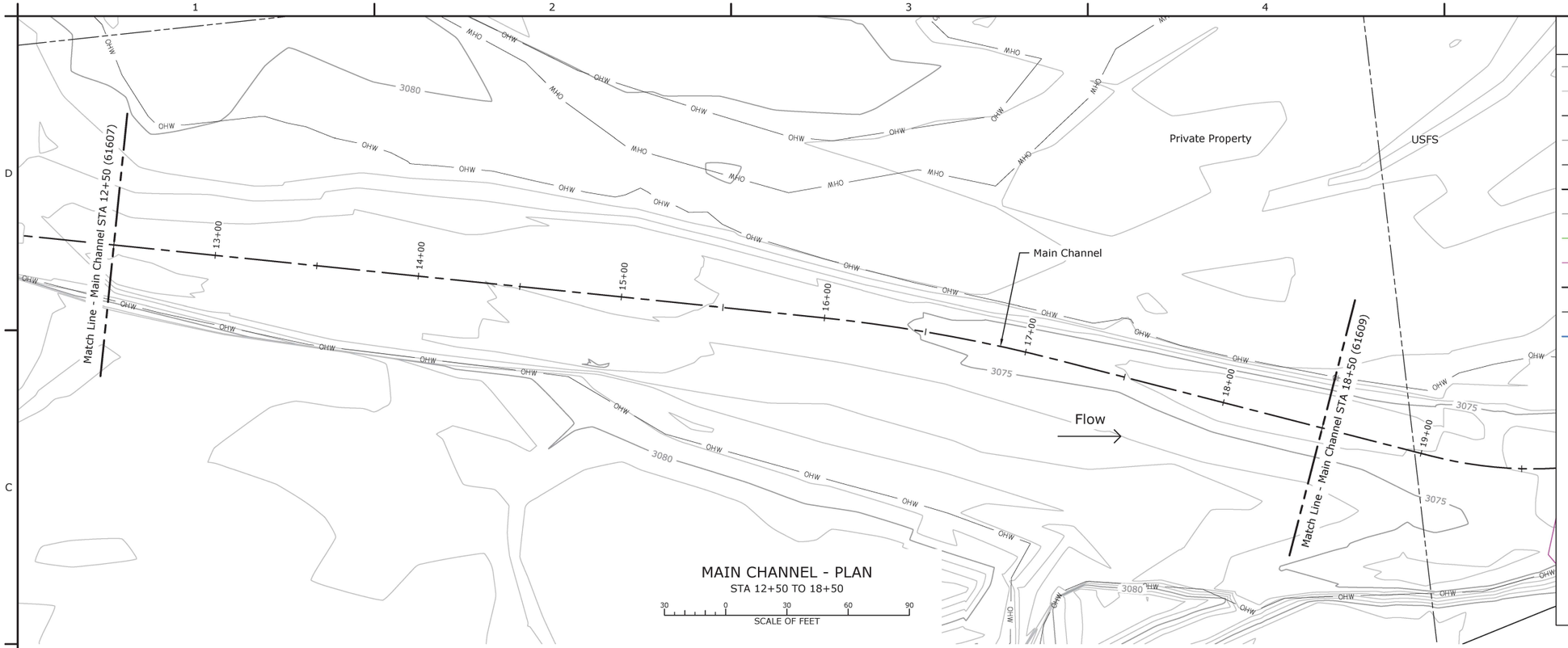


MAIN CHANNEL - PLAN
STA 12+50 TO 18+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
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- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
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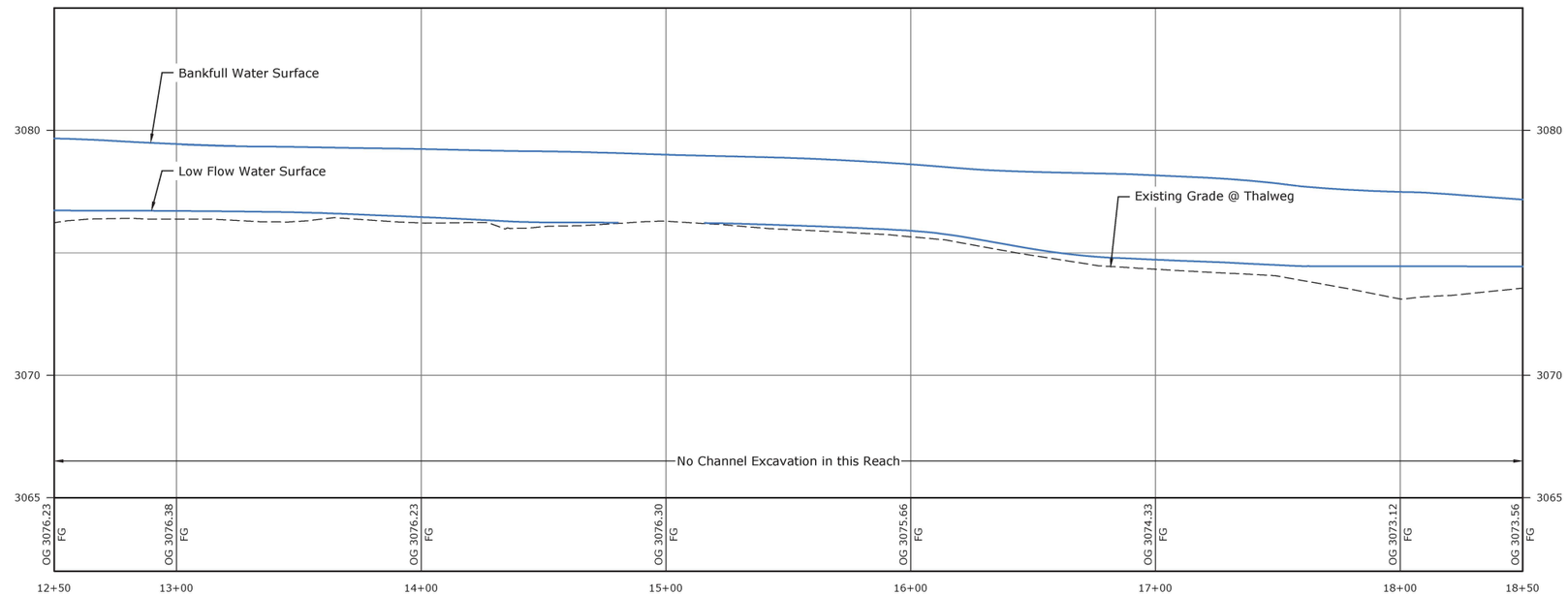
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL - THALWEG PROFILE
STA 12+50 TO 18+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

N

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Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 15, 1997
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:08:42 -08'00' P.E.
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TED DAY
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ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 12+50 TO 18+50

1678-100-61608

SHEET 1

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CAD FILENAME
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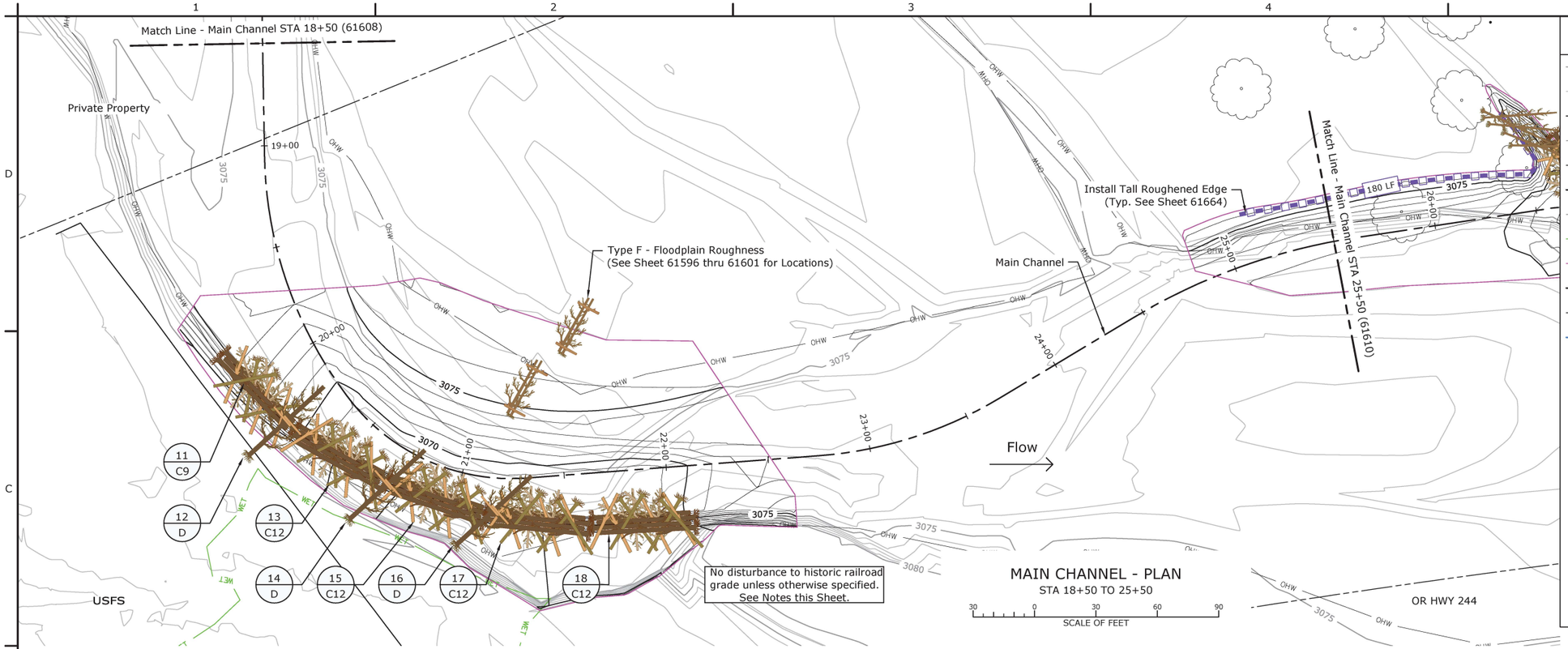


## MAIN CHANNEL - PLAN
STA 18+50 TO 25+50

SCALE OF FEET: 30 0 30 60 90

### LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
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- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
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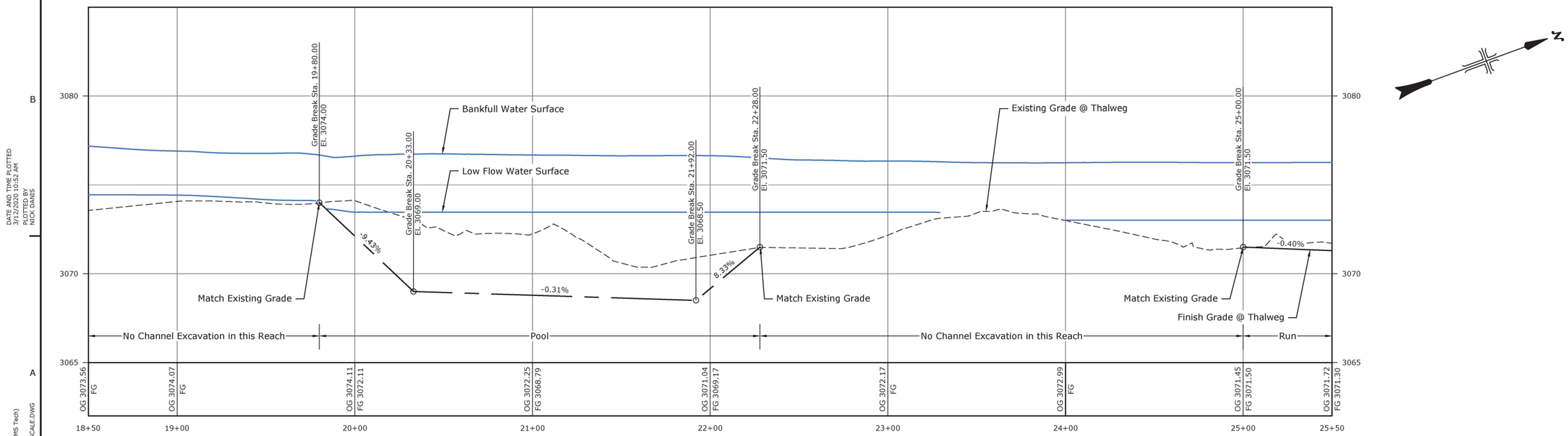


## MAIN CHANNEL - THALWEG PROFILE
STA 18+50 TO 25+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

### Construction Notes:

1. Where fill materials are placed within the existing railroad grade prism utilize material that matches the appearance of the existing railroad materials in terms of gradations, color, and texture according to https://www.nps.gov/tps/standards/four-treatments/treatment-reconstruction.htm.

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 15, 2007
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:07:22 -06'00' P.E.
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ADMIN APPROVAL - PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 18+50 TO 25+50

1678-100-61609

SHEET 1

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NICK DANIS

CAD SYSTEM
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CAD FILENAME
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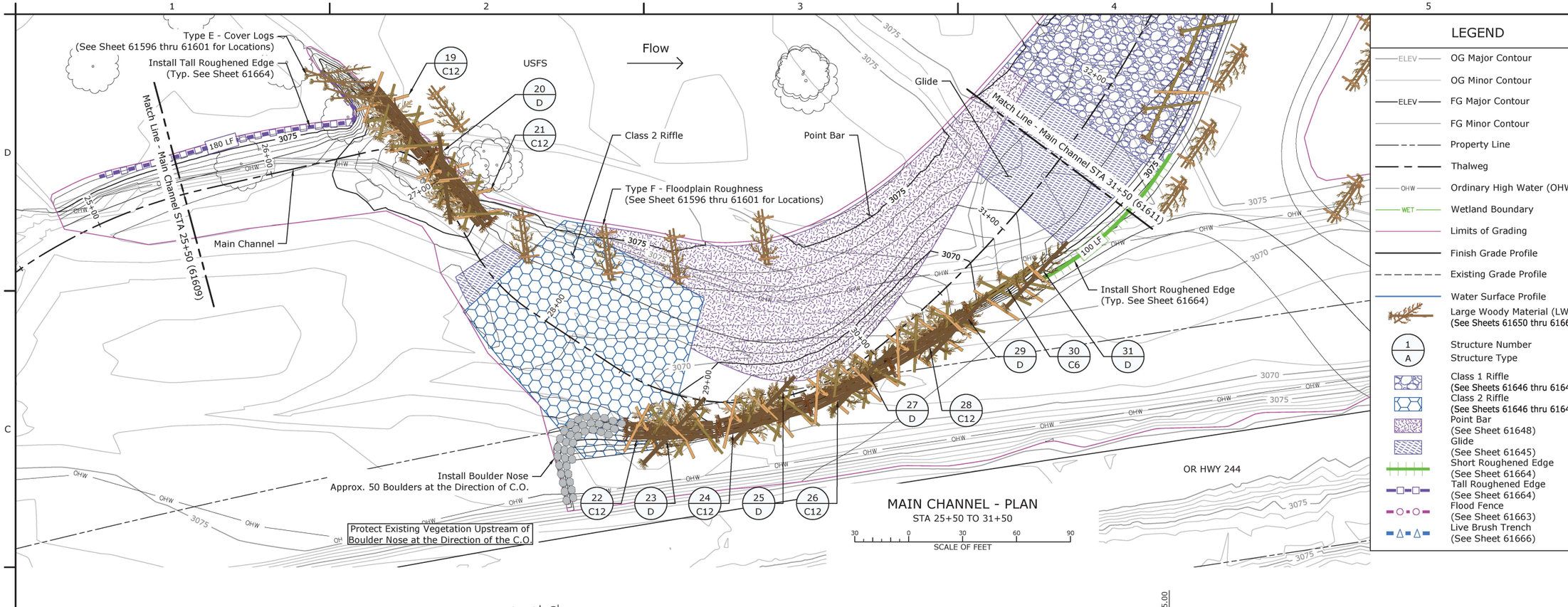
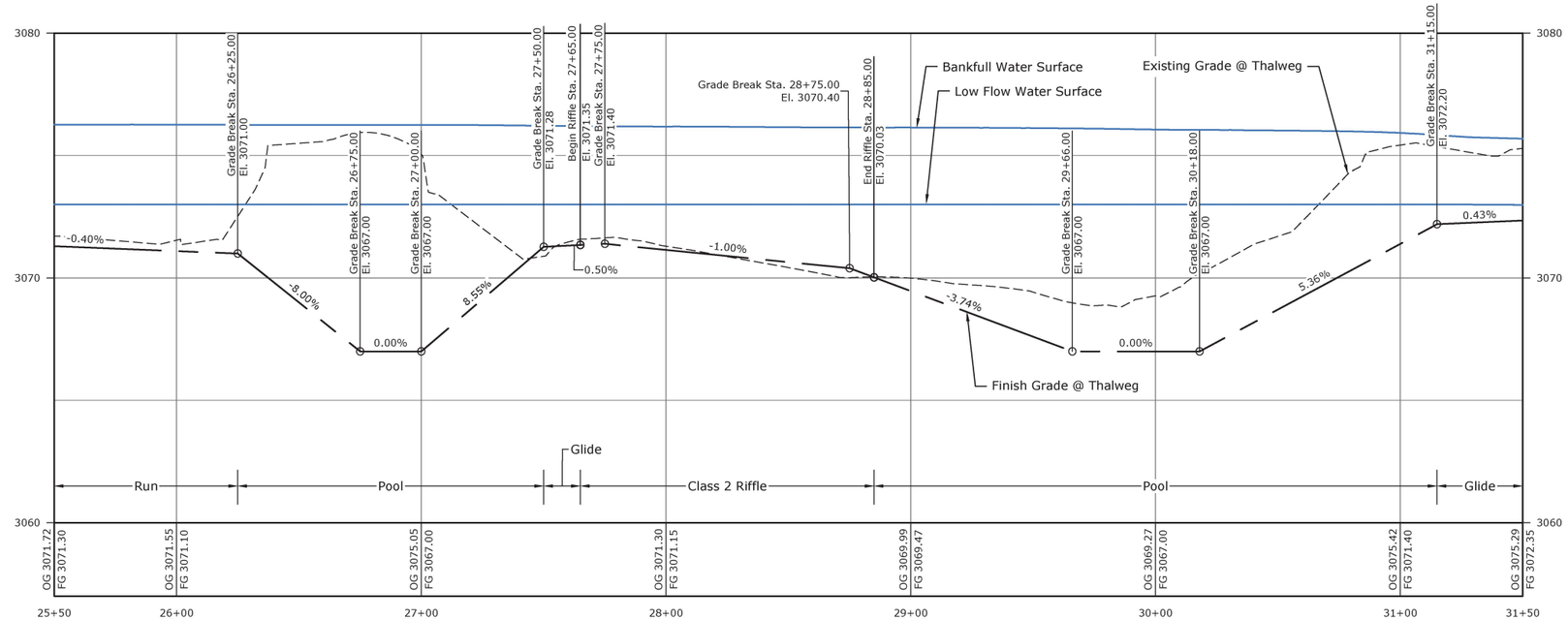



## MAIN CHANNEL - PLAN
STA 25+50 TO 31+50

SCALE OF FEET: 30 0 30 60 90




## MAIN CHANNEL - THALWEG PROFILE
STA 25+50 TO 31+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
19223PE
DIGITALLY SIGNED
OREGON
JULY 15, 2007
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:08:57 -08'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 25+50 TO 31+50

1678-100-61610

SHEET 1

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NICK DANIS

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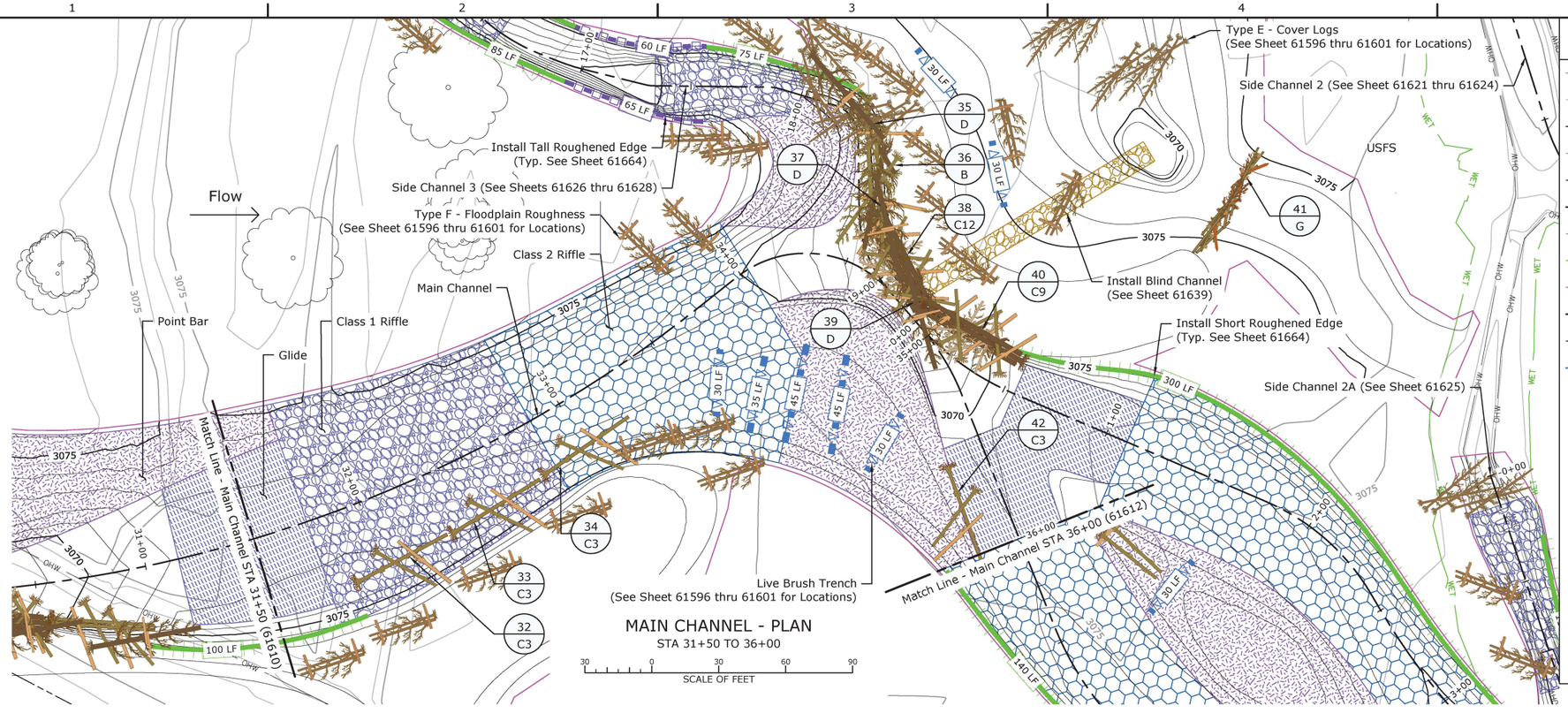
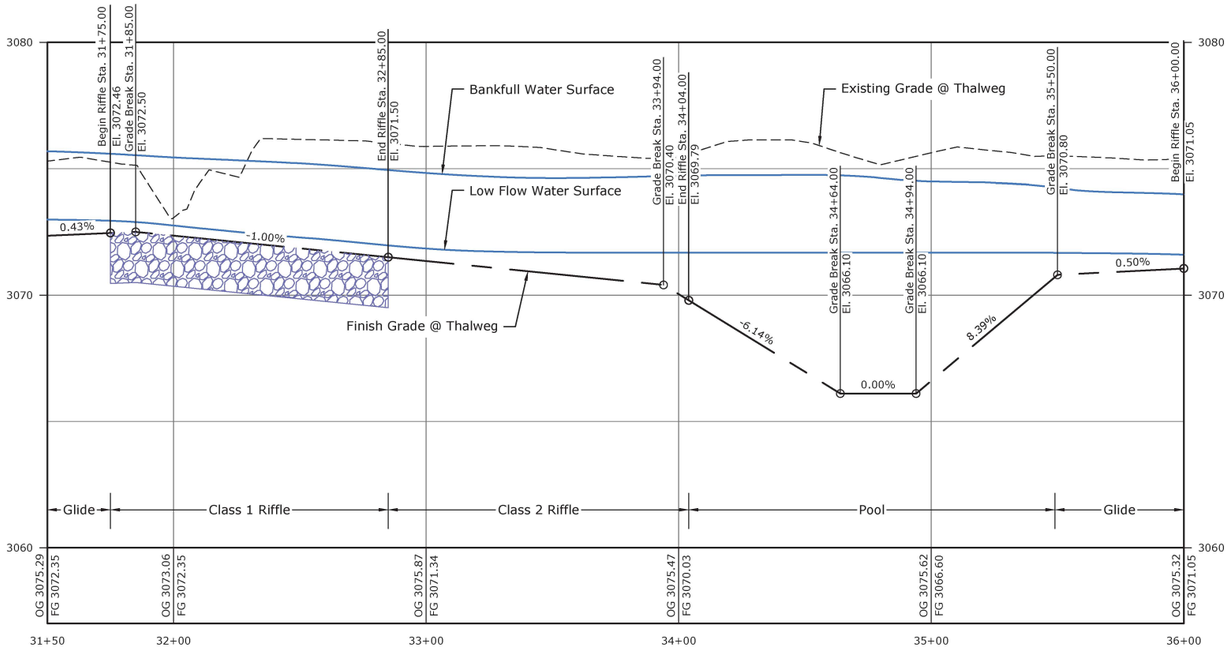



MAIN CHANNEL - PLAN
STA 31+50 TO 36+00
SCALE OF FEET




MAIN CHANNEL - THALWEG PROFILE
STA 31+50 TO 36+00
HORIZONTAL SCALE
SCALE OF FEET
VERTICAL SCALE
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
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- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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# GRANDE RONDE RIVER SUBBASIN

## LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Nielsen P.E. |
| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:10:00 -08'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL – PROGRAM MANAGER |
| BOISE, IDAHO | 2020-03-13 |

MAIN CHANNEL PLAN AND PROFILE

STA 31+50 TO 36+00

1678-100-61611

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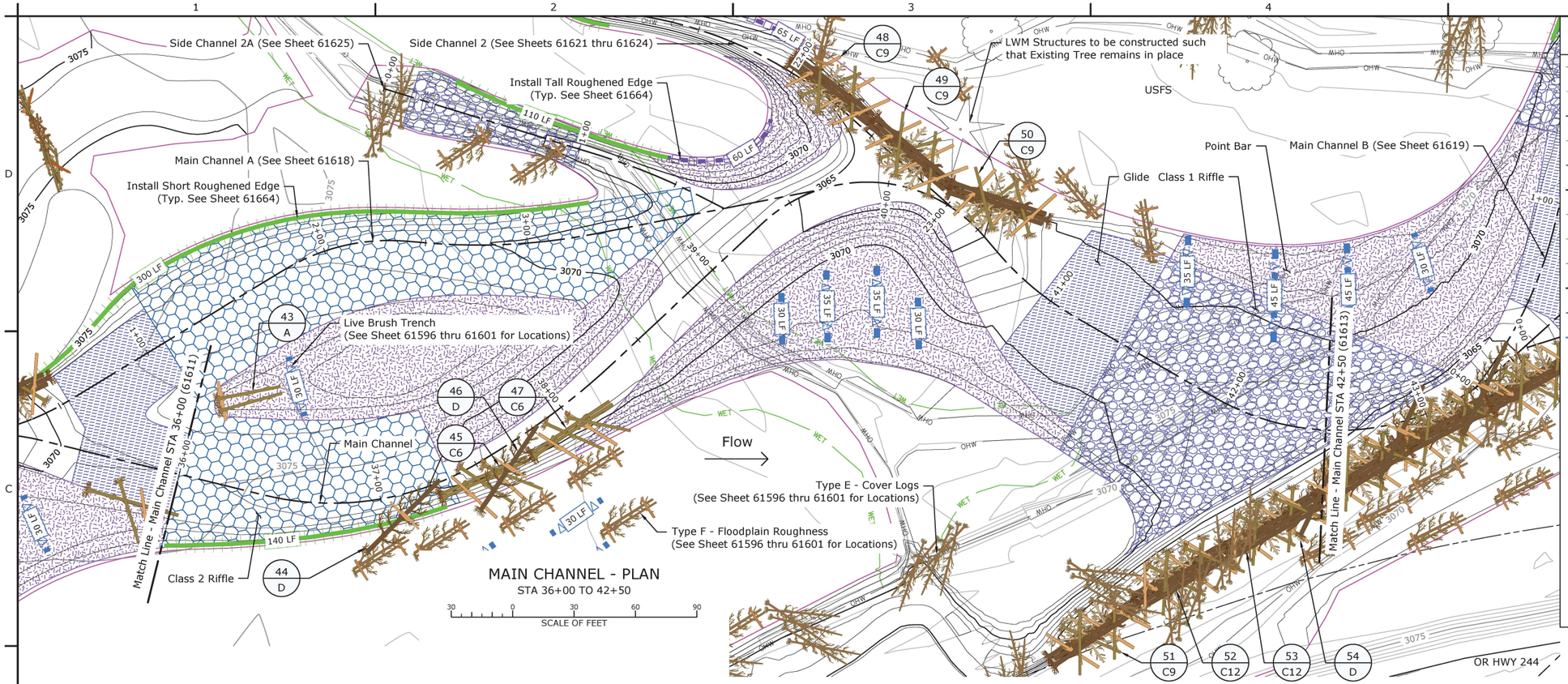


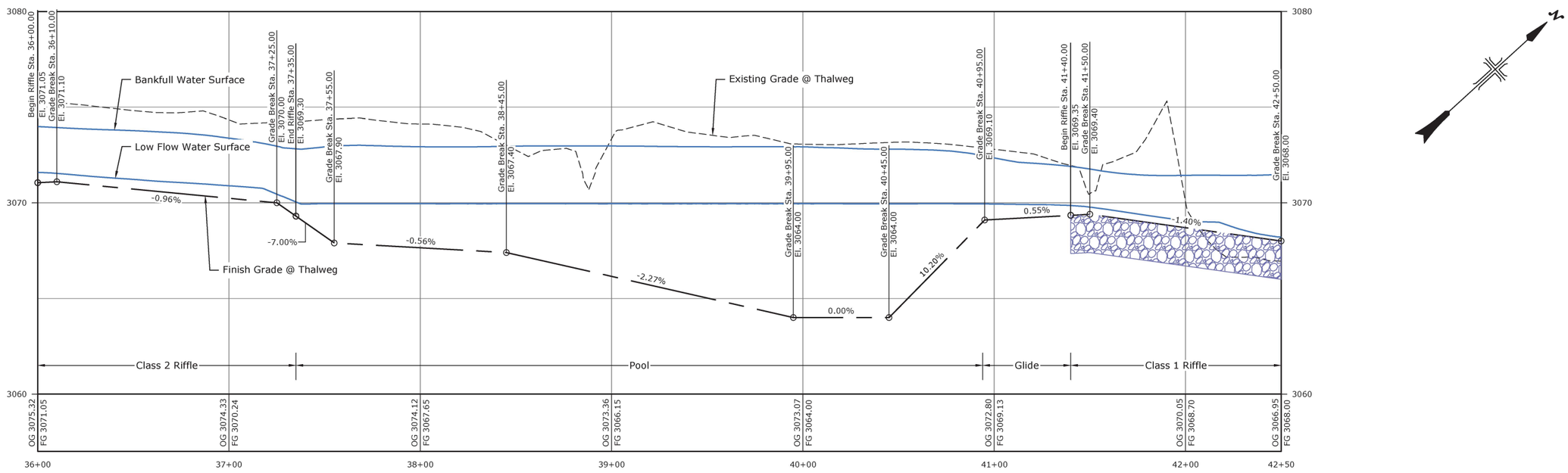


## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
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- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
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- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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J. Bryant P.E.
DRAWN
J. Nielsen P.E.
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MICHAEL KNUTSON 2020.03.13 11:10:48 -06'00' P.E.
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MAIN CHANNEL PLAN AND PROFILE

STA 36+00 TO 42+50

1678-100-61612

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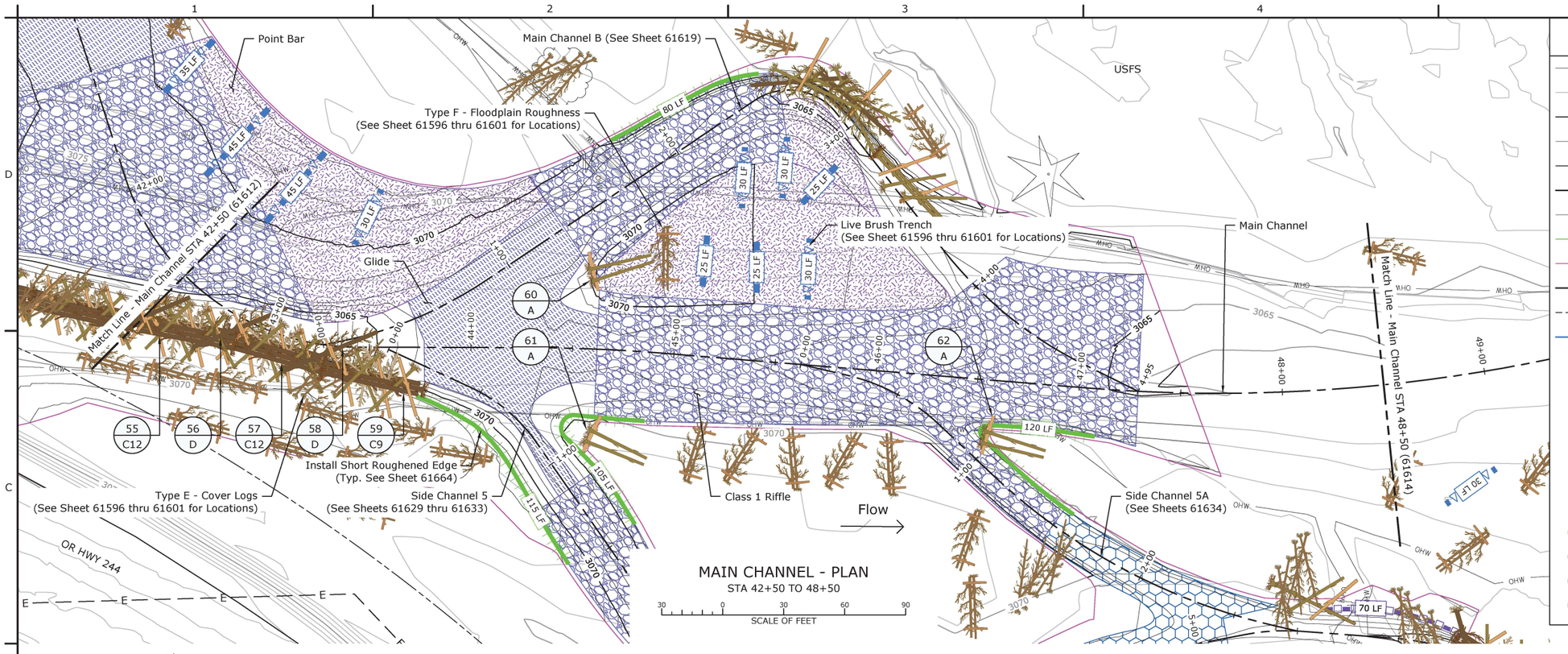


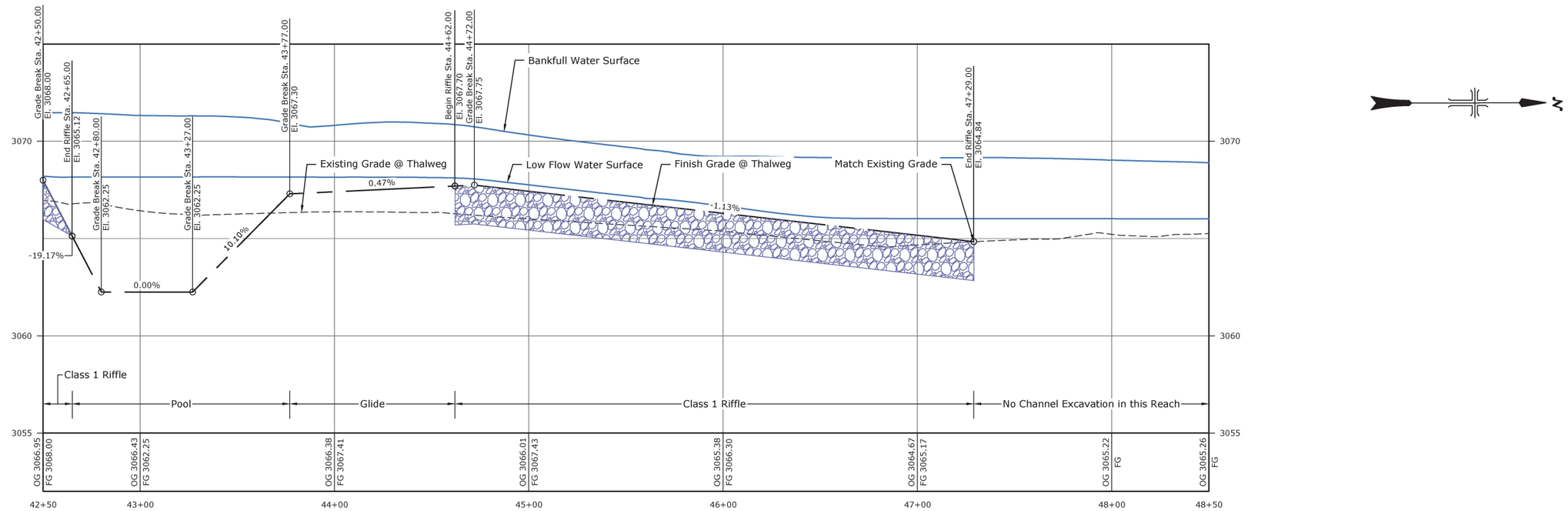


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# GRANDE RONDE RIVER SUBBASIN

## LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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J. Nielsen P.E.
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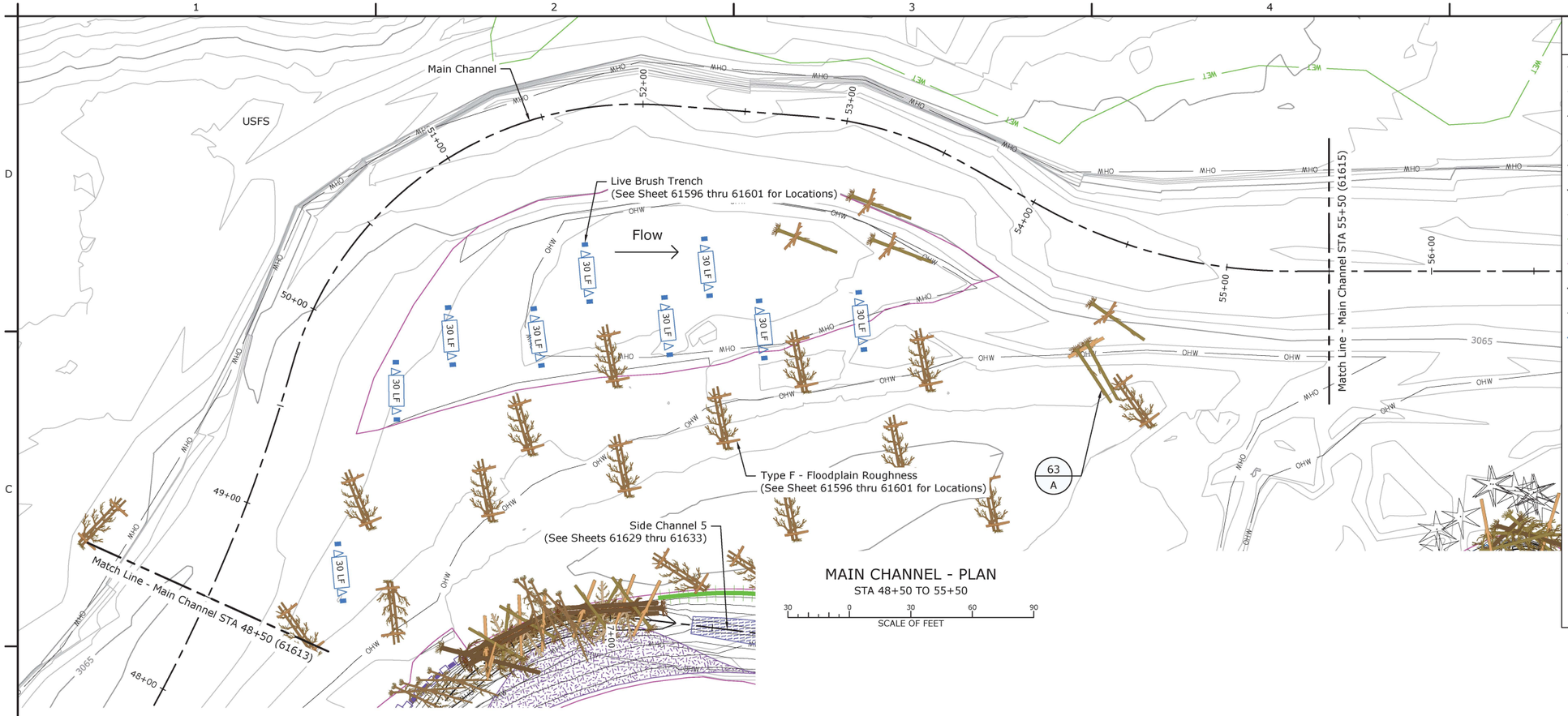
MAIN CHANNEL PLAN AND PROFILE

STA 42+50 TO 48+50

1678-100-61613

SHEET 1

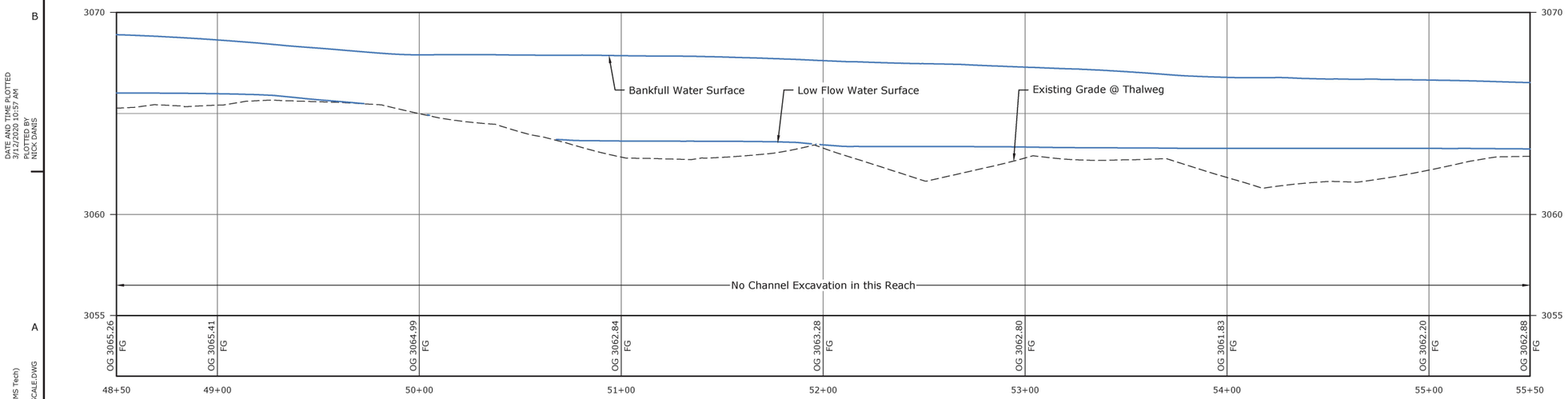



MAIN CHANNEL - PLAN
STA 48+50 TO 55+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type (1 / A)
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL - THALWEG PROFILE
STA 48+50 TO 55+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET
VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E. — DESIGNED
J. Bryant P.E. — DRAWN
J. Nielsen P.E. — CHECKED
MICHAEL KNUTSON 2020.03.13 11:13:06 -06'00' P.E. — TECH. APPR.
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BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 48+50 TO 55+50

1678-100-61614
SHEET 1

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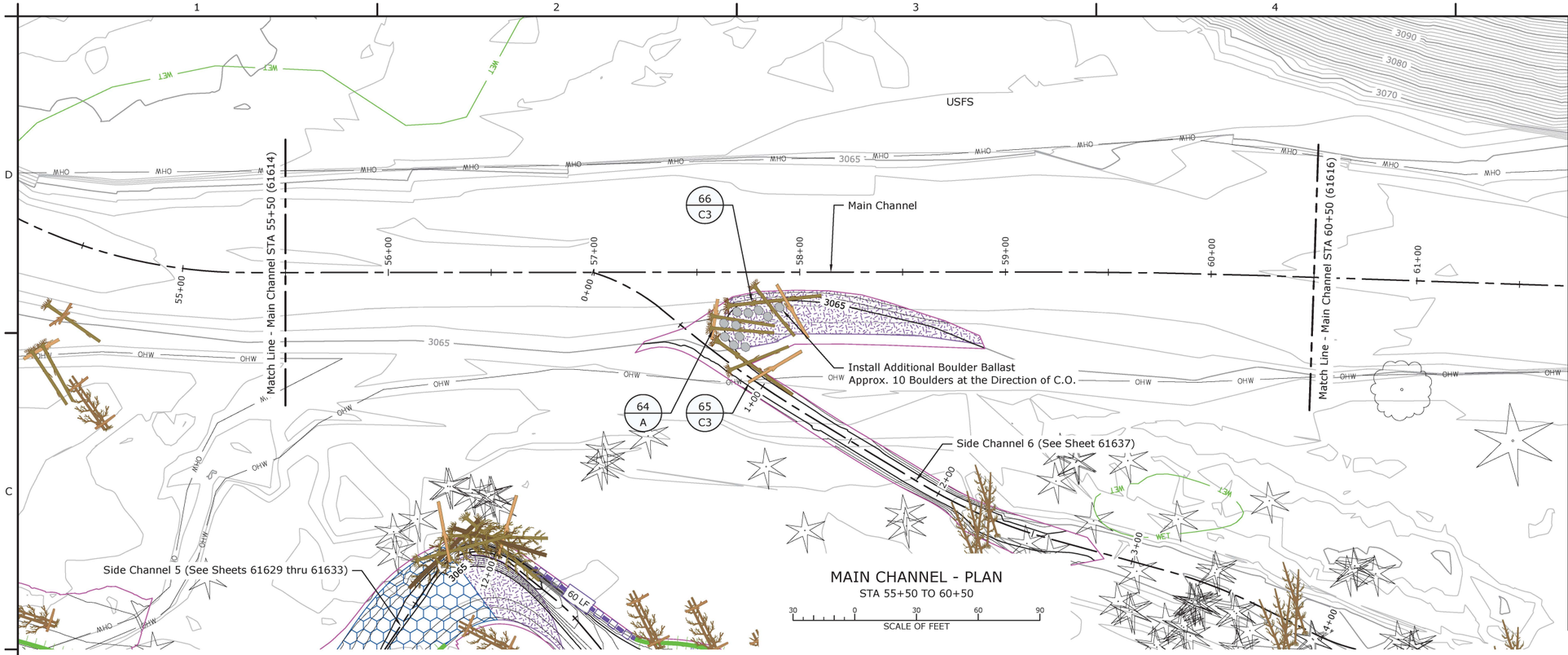


MAIN CHANNEL - PLAN
STA 55+50 TO 60+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
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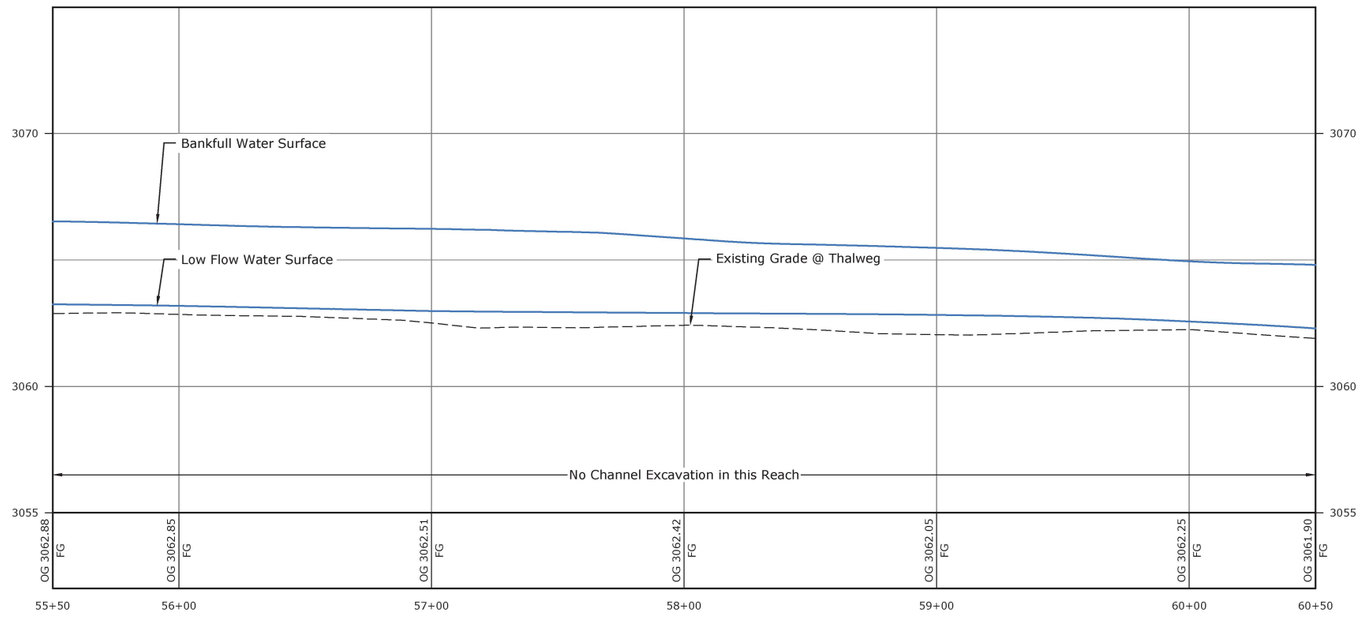
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL - THALWEG PROFILE
STA 55+50 TO 60+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET
VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

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Managing Water in the West

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MICHAEL TODD KNUTSON
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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Nielsen P.E. |
| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:14:00 -08'00' P.E. |
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| APPROVED | ADMIN APPROVAL – PROGRAM MANAGER |
| BOISE, IDAHO | 2020-03-13 |

MAIN CHANNEL PLAN AND PROFILE

STA 55+50 TO 60+50

1678-100-61615

SHEET 1

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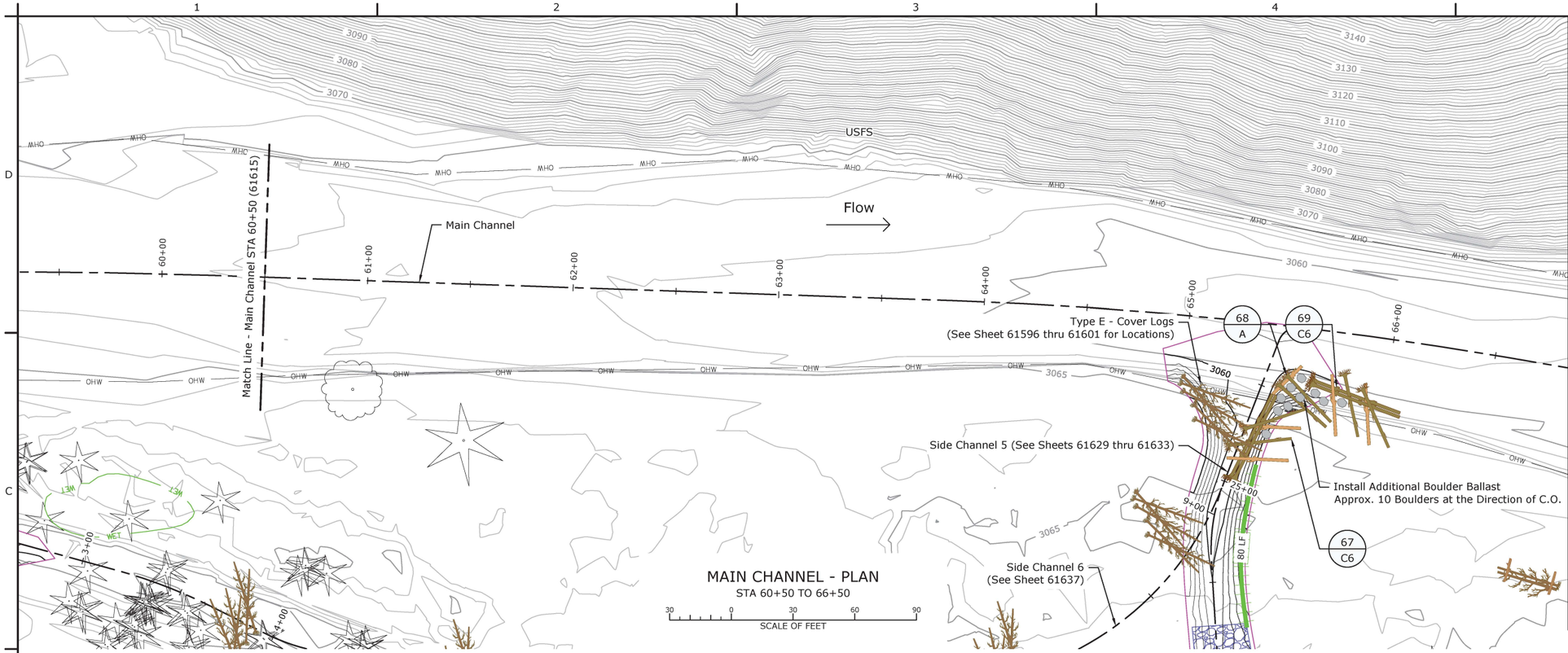


MAIN CHANNEL - PLAN
STA 60+50 TO 66+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
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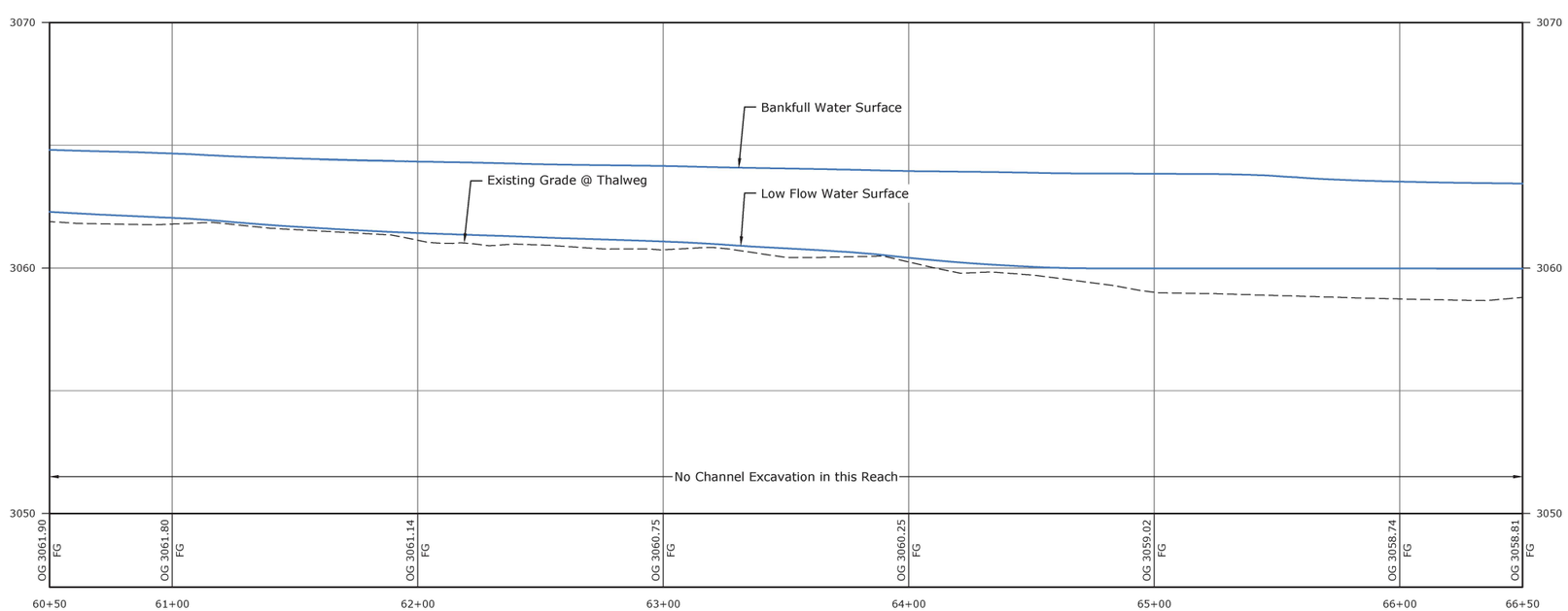
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL - THALWEG PROFILE
STA 60+50 TO 66+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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OREGON
MAY 15, 1987
MICHAEL TODD KNUTSON
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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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J. Bryant P.E.
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J. Nielsen P.E.
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MICHAEL KNUTSON 2020.03.13 11:14:42 -08'00' P.E.
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BOISE, IDAHO 2020-03-13

MAIN CHANNEL PLAN AND PROFILE

STA 60+50 TO 66+50

1678-100-61616
SHEET 1

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CAD FILENAME
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## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
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- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

N

Flow

Main Channel

SC 1, SC 2, SC 2A, SC 3, SC 5, SC 5A, SC 5B, SC 5C, SC 6, MC A, MC B

Sheet 61620, Sheet 61621, Sheet 61622, Sheet 61623, Sheet 61624 & 61625, Sheet 61626, Sheet 61627, Sheet 61628, Sheet 61629, Sheet 61630, Sheet 61631, Sheet 61632 and 61636, Sheet 61633, Sheet 61634, Sheet 61635, Sheet 61637, Sheet 61618, Sheet 61619

USFS, Private Property

OR HWY 244, TO LA GRANDE, TO UKIAH

SIDE CHANNEL PLAN AND PROFILE KEY MAP

300 0 300 600 900
SCALE OF FEET

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# GRANDE RONDE RIVER SUBBASIN

## LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:17:20 -06'00' P.E.
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SIDE CHANNEL PLAN AND PROFILE KEY MAP

1678-100-61617

SHEET 1

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CAD FILENAME
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Install Blind Channel
(Typ. See Sheet 61639)

Side Channel 3
(See Sheets 61626 thru 61628)

Flow

Install Short Roughened Edge
(Typ. See Sheet 61664)

Main Channel A

Class 2 Riffle

Side Channel 2
(See Sheets 61621 thru 61624)

Side Channel 2A
(See Sheet 61625)

Glide

Live Brush Trench
(See Sheet 61596 thru 61601 for Locations)

USFS

Point Bar

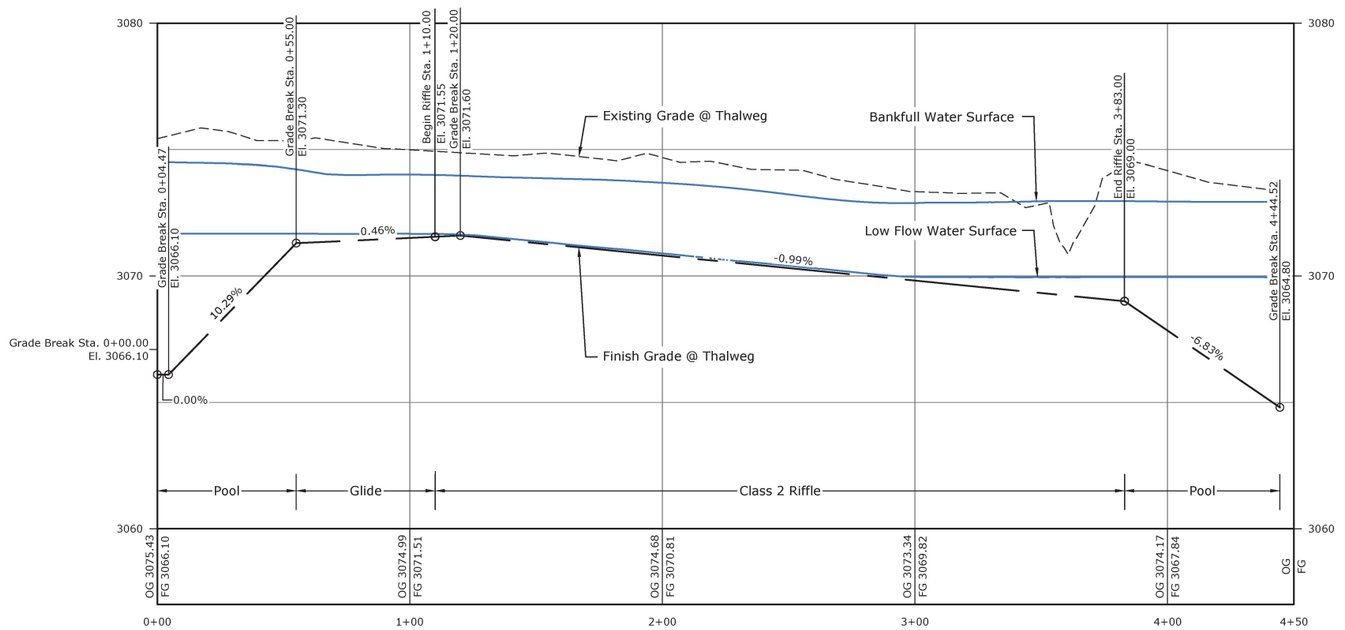
Main Channel
(See Sheets 61606 thru 61616)

Type F - Floodplain Roughness
(See Sheet 61596 thru 61601 for Locations)

## MAIN CHANNEL A - PLAN

STA 0+00 TO STA 4+50

SCALE OF FEET




## MAIN CHANNEL A - THALWEG PROFILE

STA 0+00 TO STA 4+50

HORIZONTAL SCALE
SCALE OF FEET

VERTICAL SCALE
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
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- Point Bar (See Sheet 61648)
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- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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MICHAEL TODD KNUTSON

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:18:47 -08'00' P.E.
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TED DAY
APPROVED
ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

MAIN CHANNEL A PLAN AND PROFILE

STA 0+00 TO STA 4+50

1678-100-61618

SHEET 1

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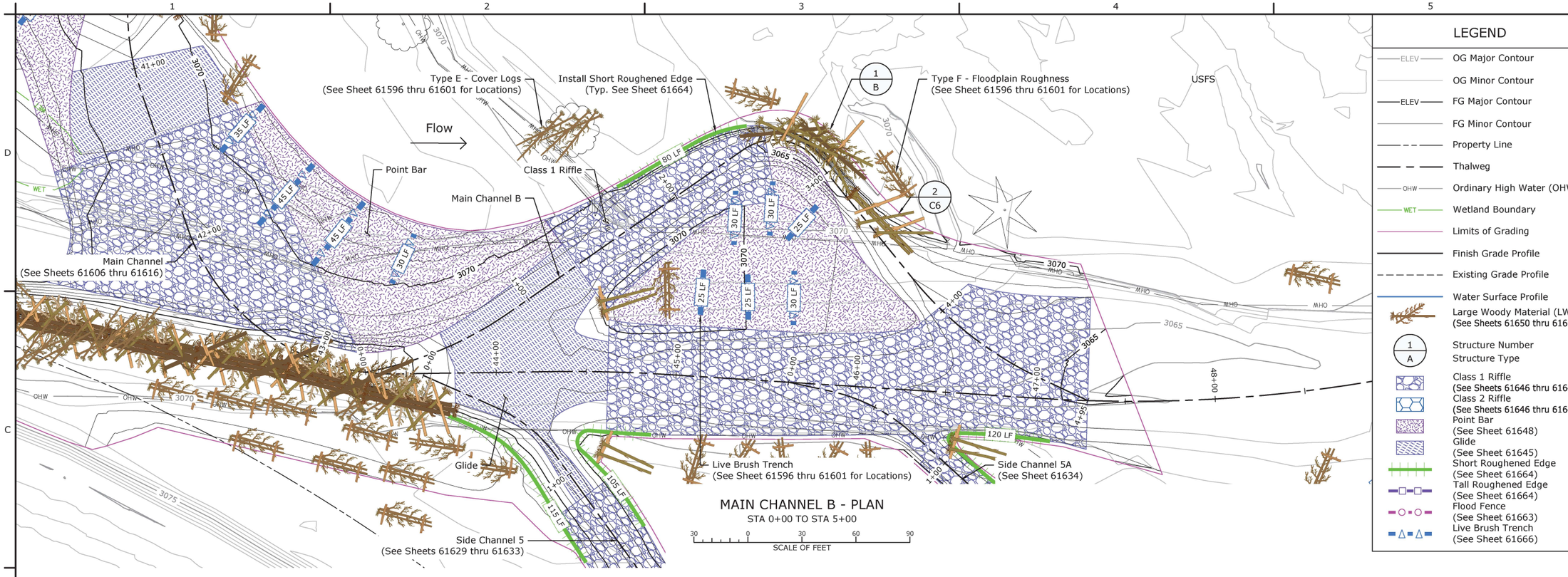
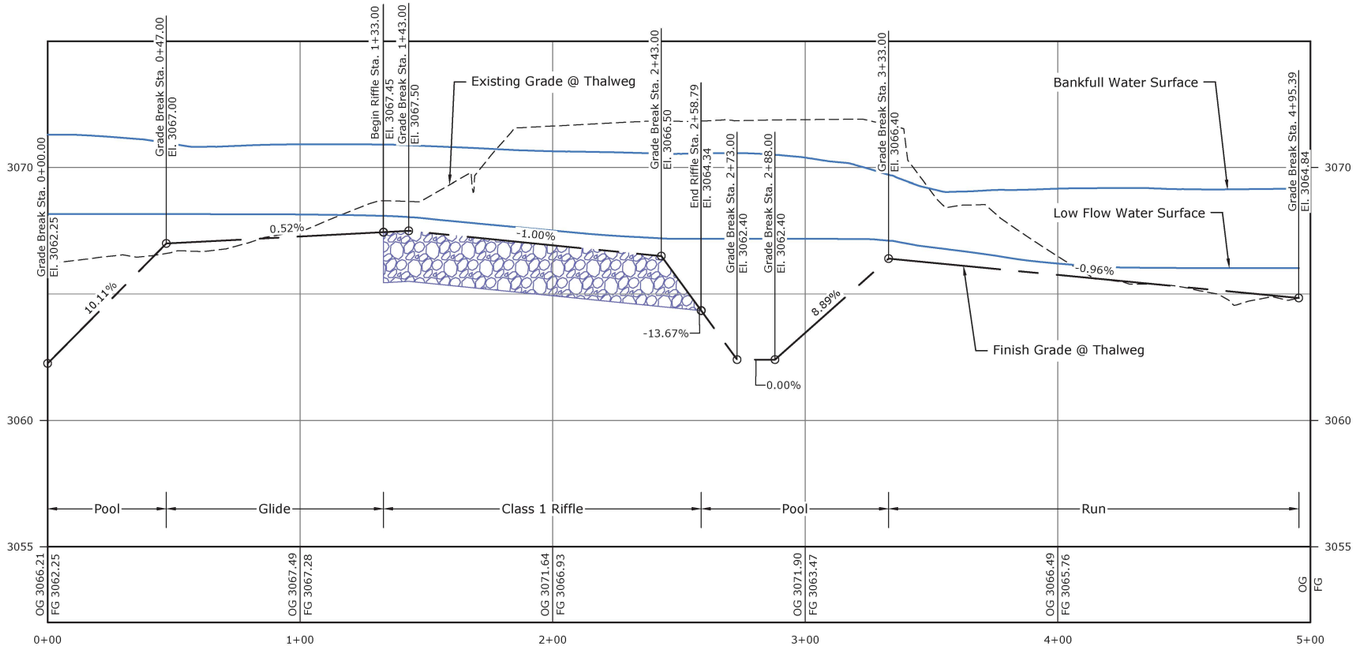



## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




MAIN CHANNEL B - THALWEG PROFILE
STA 0+00 TO STA 5+00
HORIZONTAL SCALE
SCALE OF FEET
VERTICAL SCALE
SCALE OF FEET

RECLAMATION
Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
19223PE
DIGITALLY SIGNED
OREGON
JULY 15, 1997
MICHAEL TODD KNUTSON
EXPIRES: 6/30/2021

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Nielsen P.E. |
| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:19:39 -08'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL – PROGRAM MANAGER |
| BOISE, IDAHO | 2020-03-13 |

MAIN CHANNEL B PLAN AND PROFILE

STA 0+00 TO STA 5+00

1678-100-61619

SHEET 1

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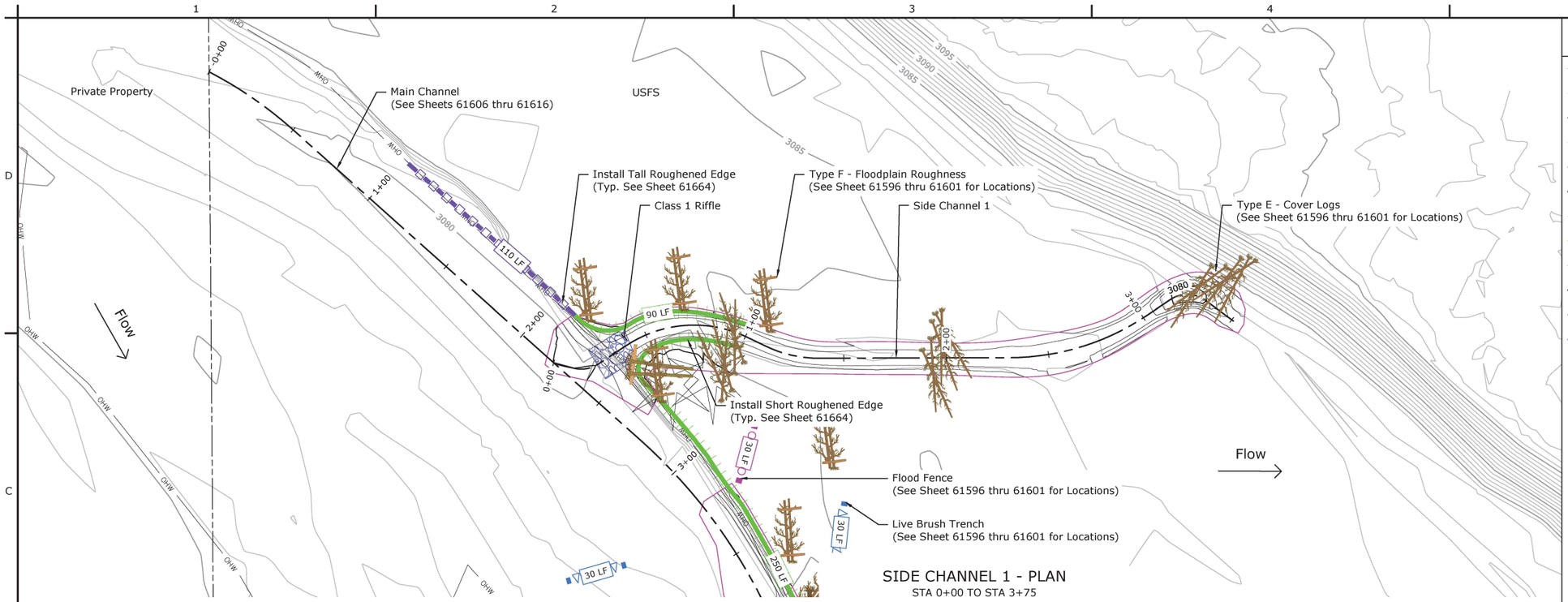
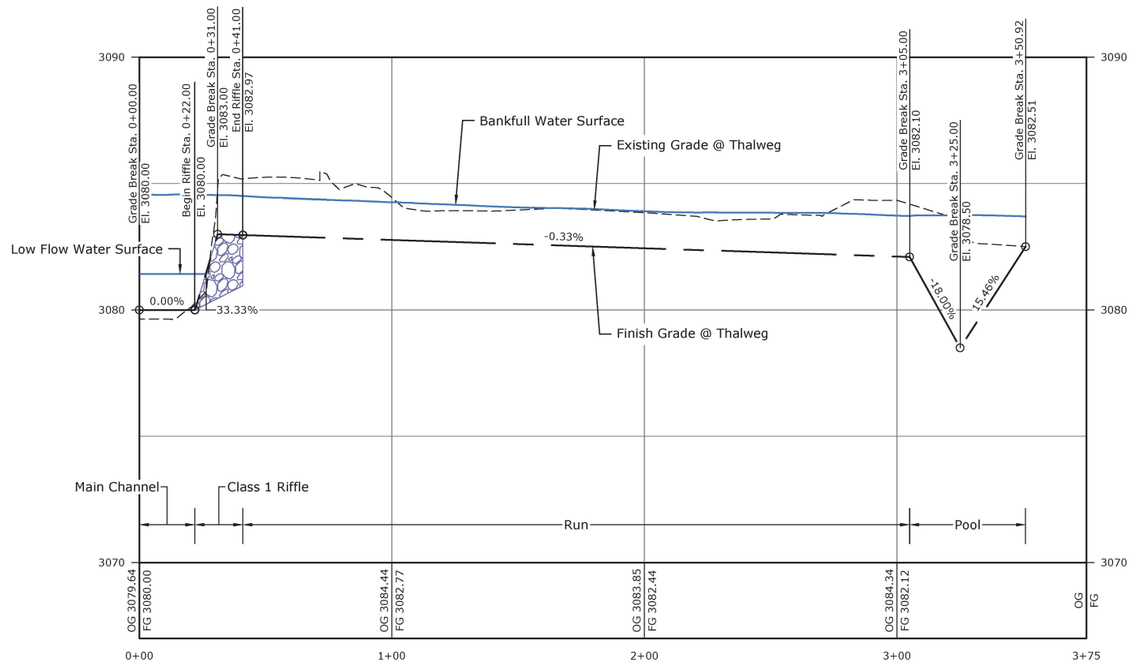



## SIDE CHANNEL 1 - PLAN
STA 0+00 TO STA 3+75

SCALE OF FEET: 30 0 30 60 90




## SIDE CHANNEL 1 - THALWEG PROFILE
STA 0+00 TO STA 3+75

HORIZONTAL SCALE: 30 0 30 60 90 — SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 — SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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MICHAEL TODD KNUTSON

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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DRAWN J. Bryant P.E.
CHECKED J. Nielsen P.E.
TECH. APPR. MICHAEL KNUTSON 2020.03.13 11:20:20 -08'00' P.E.
APPROVED TED DAY
ADMIN APPROVAL – PROGRAM MANAGER

BOISE, IDAHO 2020-03-13

SIDE CHANNEL 1 PLAN AND PROFILE

STA 0+00 TO STA 3+75

1678-100-61620

SHEET 1

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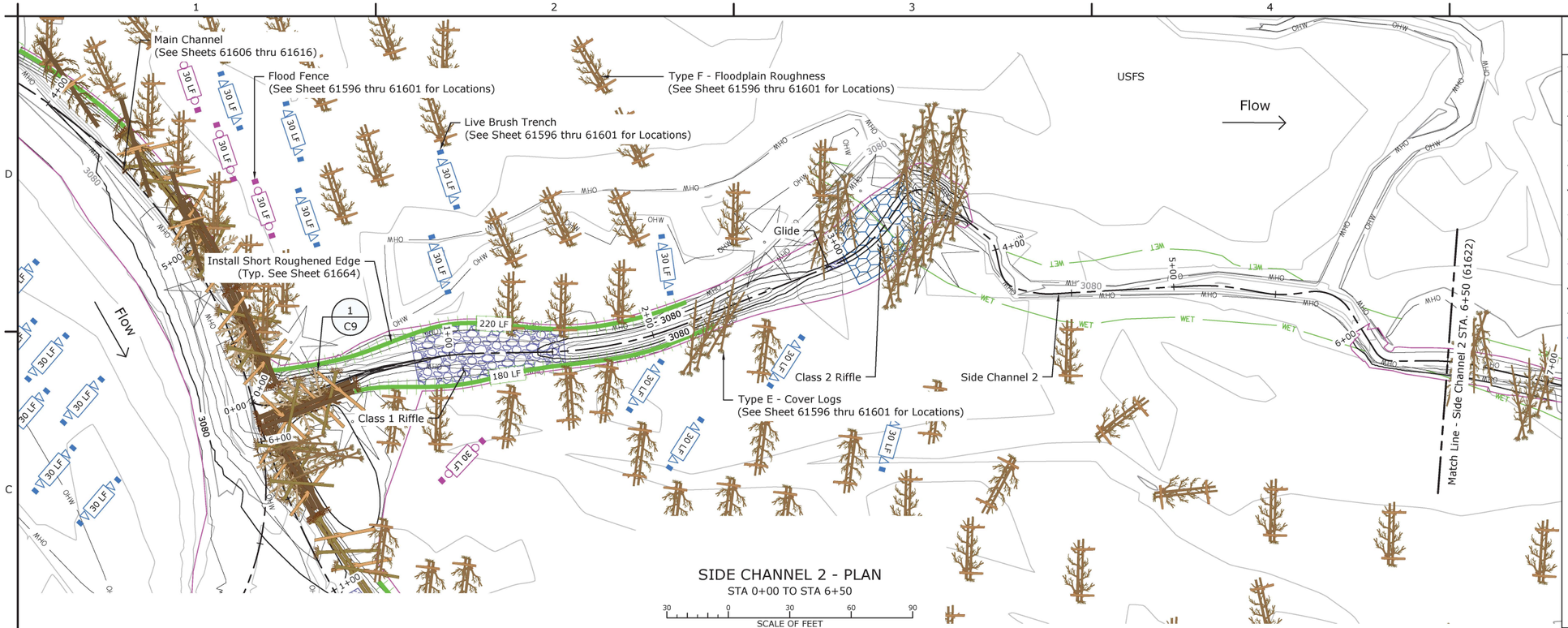
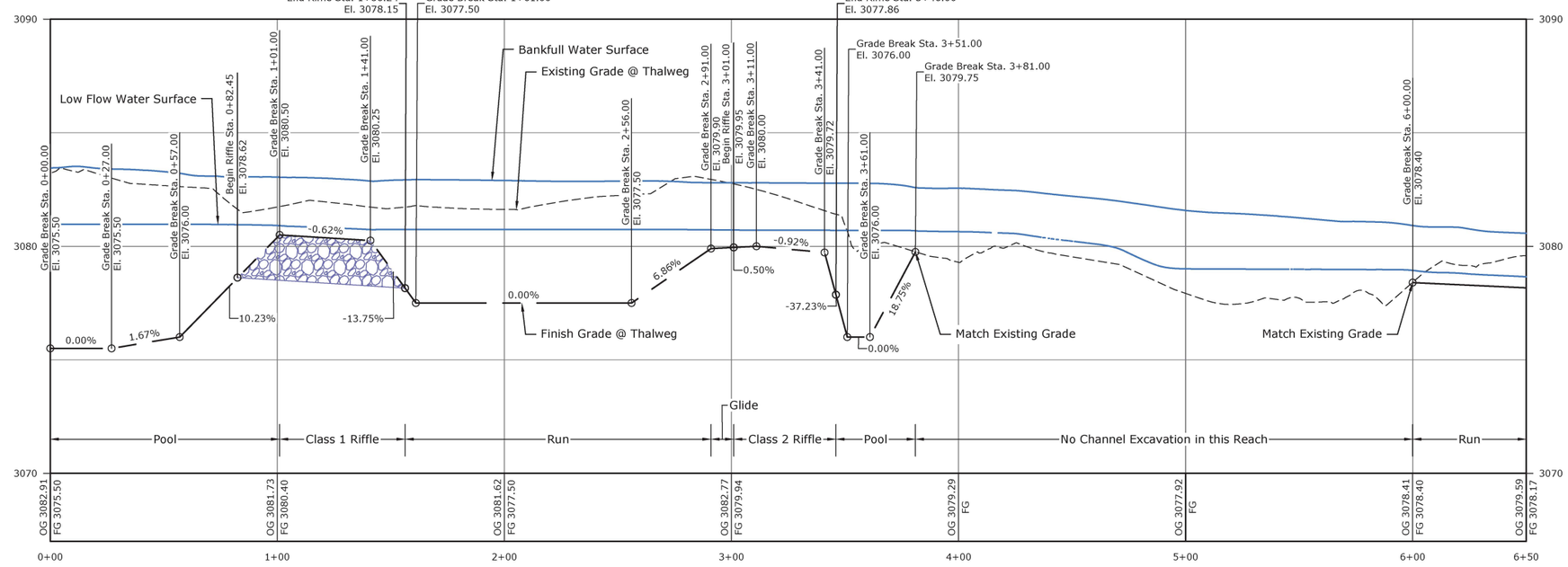



SIDE CHANNEL 2 - PLAN
STA 0+00 TO STA 6+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




SIDE CHANNEL 2 - THALWEG PROFILE
STA 0+00 TO STA 6+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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MICHAEL TODD KNUTSON
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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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| J. Bryant P.E. | DRAWN |
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| TED DAY | APPROVED |
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| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 2 PLAN AND PROFILE

STA 0+00 TO STA 6+50

1678-100-61621

SHEET 1

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CAD FILENAME
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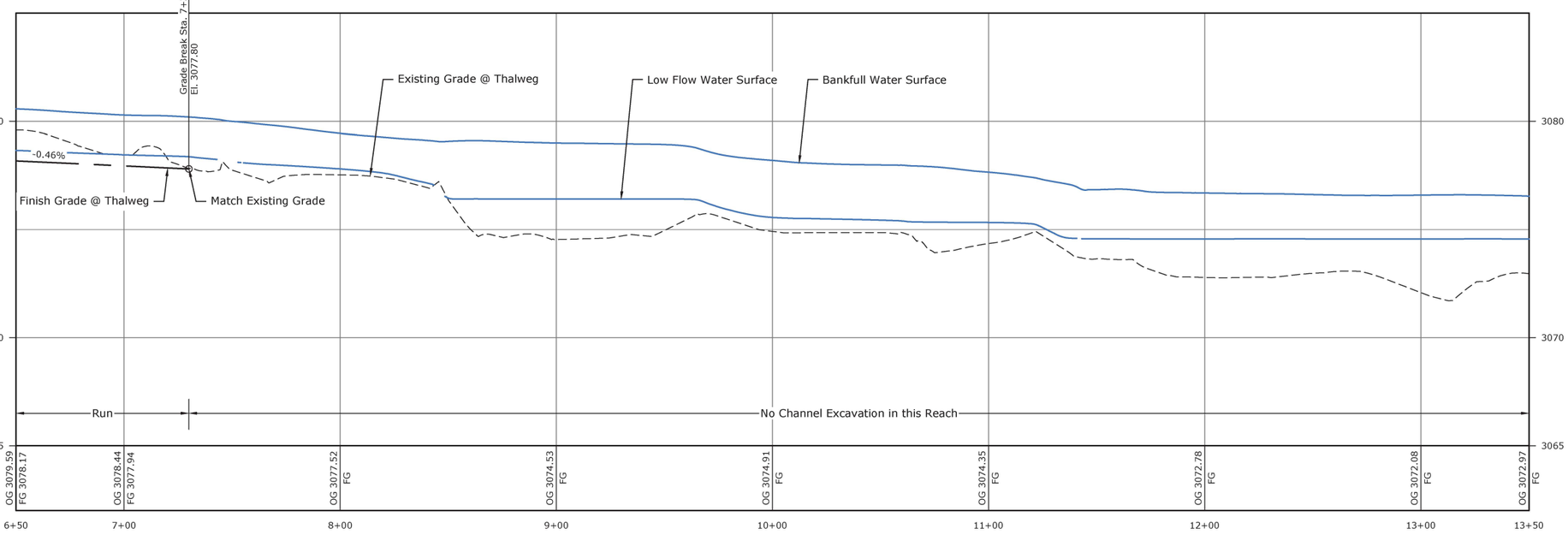
## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type (1 / A)
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

## SIDE CHANNEL 2- PLAN

STA 6+50 TO STA 13+50

30 0 30 60 90
SCALE OF FEET




## SIDE CHANNEL 2 - THALWEG PROFILE

STA 6+50 TO STA 13+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

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SIDE CHANNEL 2 PLAN AND PROFILE

STA 6+50 TO STA 13+50

1678-100-61622

SHEET 1

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CAD FILENAME
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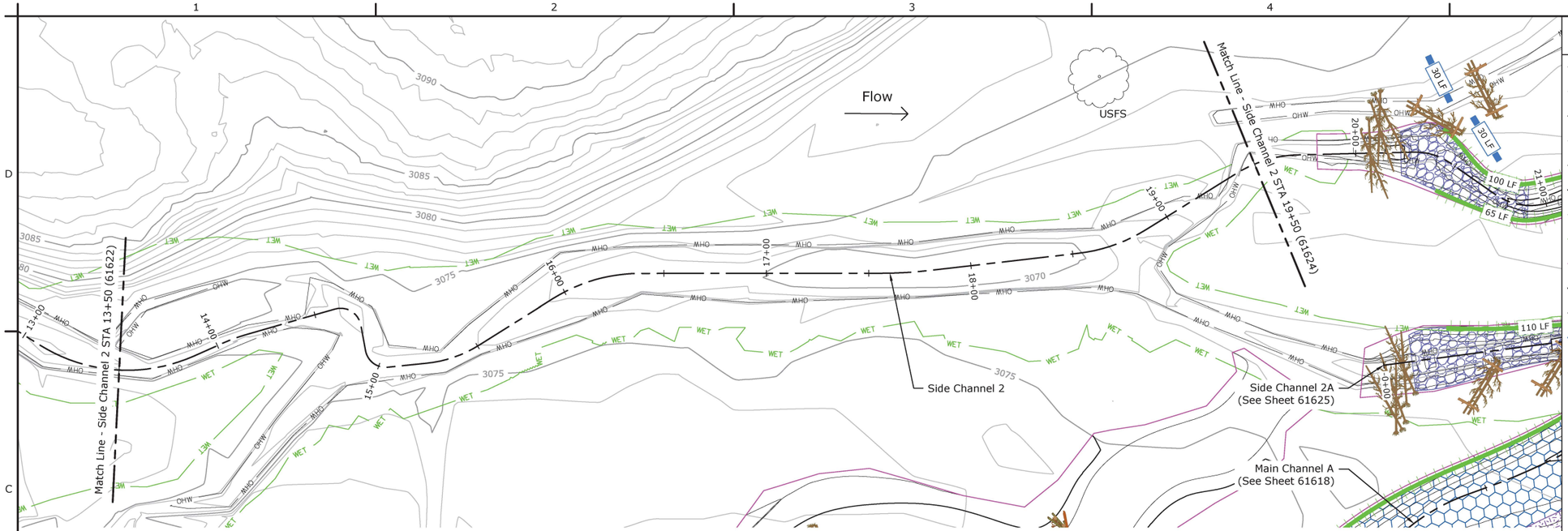
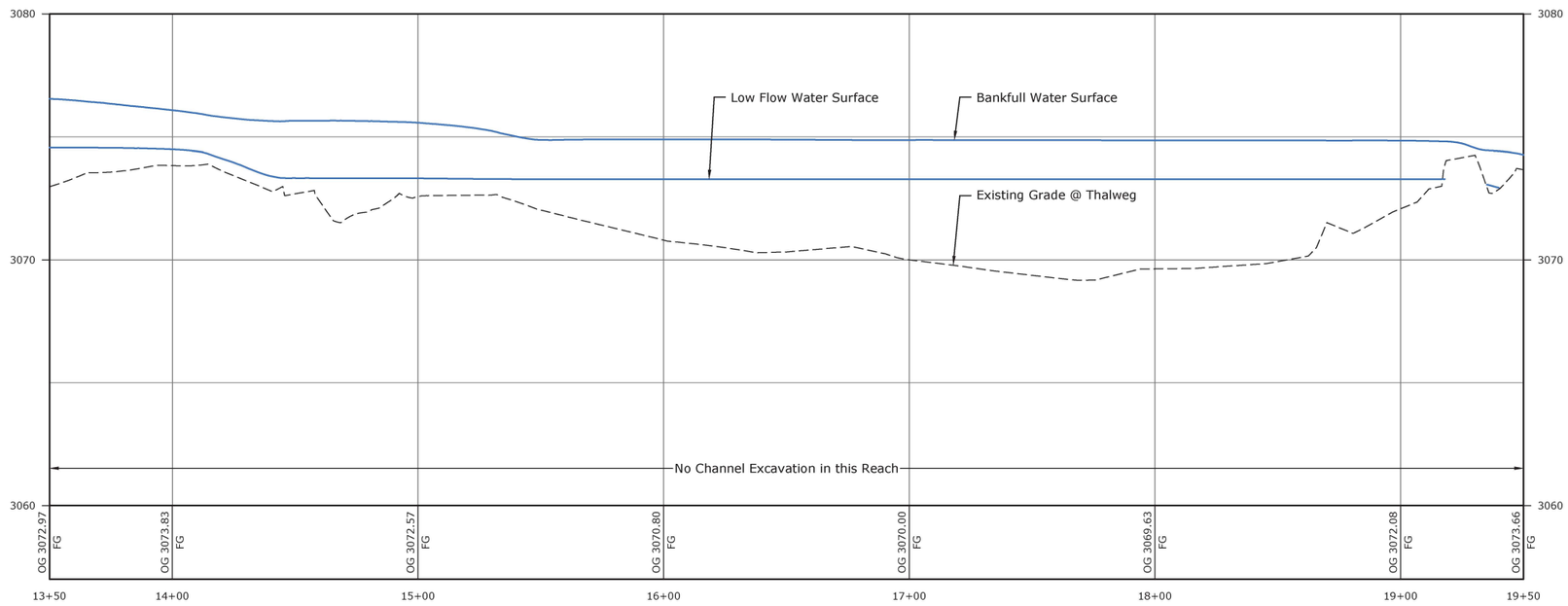



## SIDE CHANNEL 2 - PLAN

STA 13+50 TO STA 19+50

30 0 30 60 90

SCALE OF FEET




## SIDE CHANNEL 2 - THALWEG PROFILE

STA 13+50 TO STA 19+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number (1) / Structure Type (A)
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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J. Nielsen P.E.
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SIDE CHANNEL 2 PLAN AND PROFILE

STA 13+50 TO STA 19+50

1678-100-61623

SHEET 1

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CAD FILENAME
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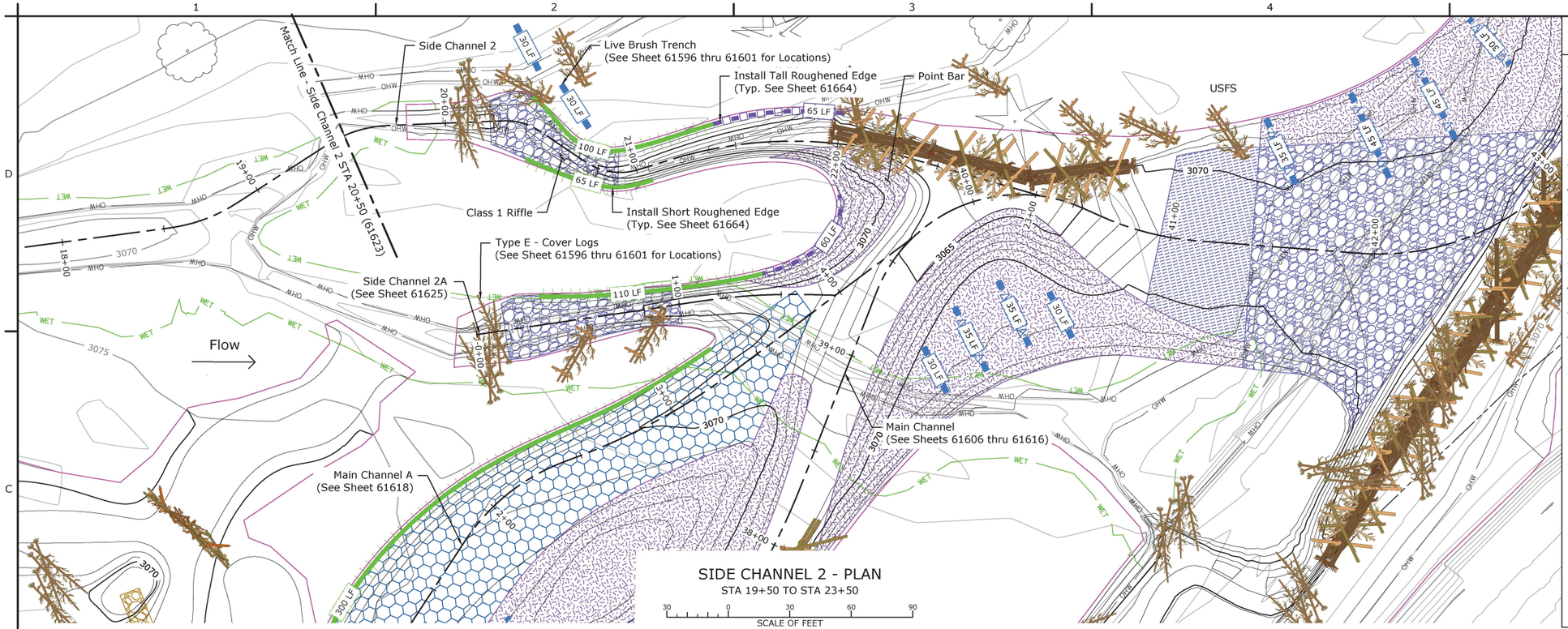
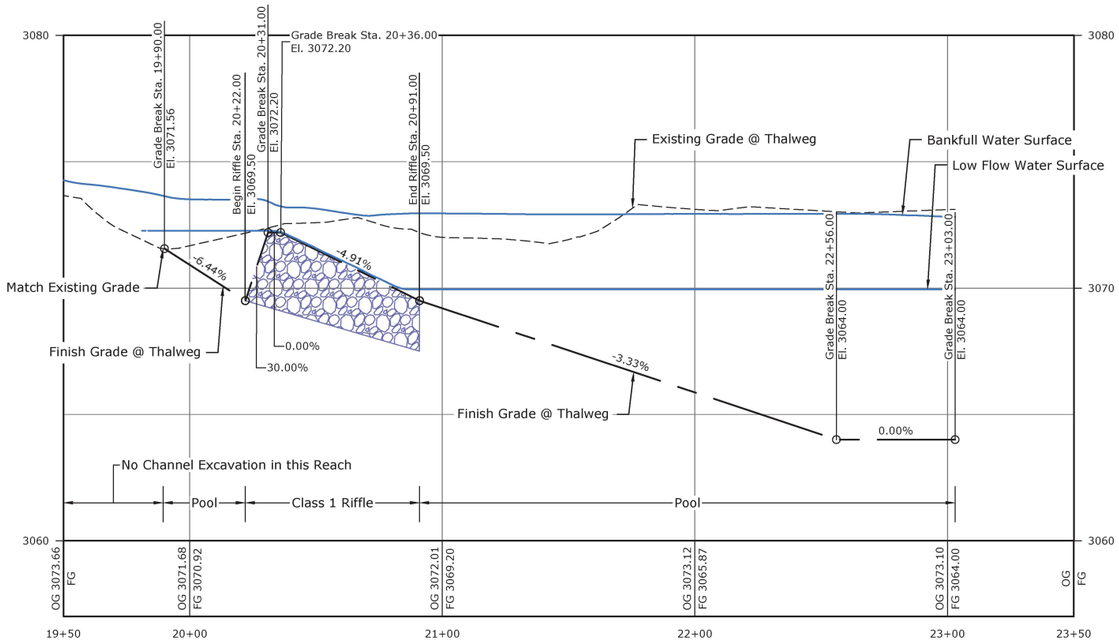



## SIDE CHANNEL 2 - PLAN
STA 19+50 TO STA 23+50

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




## SIDE CHANNEL 2 - THALWEG PROFILE
STA 19+50 TO STA 23+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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MICHAEL TODD KNUTSON
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CAD FILENAME
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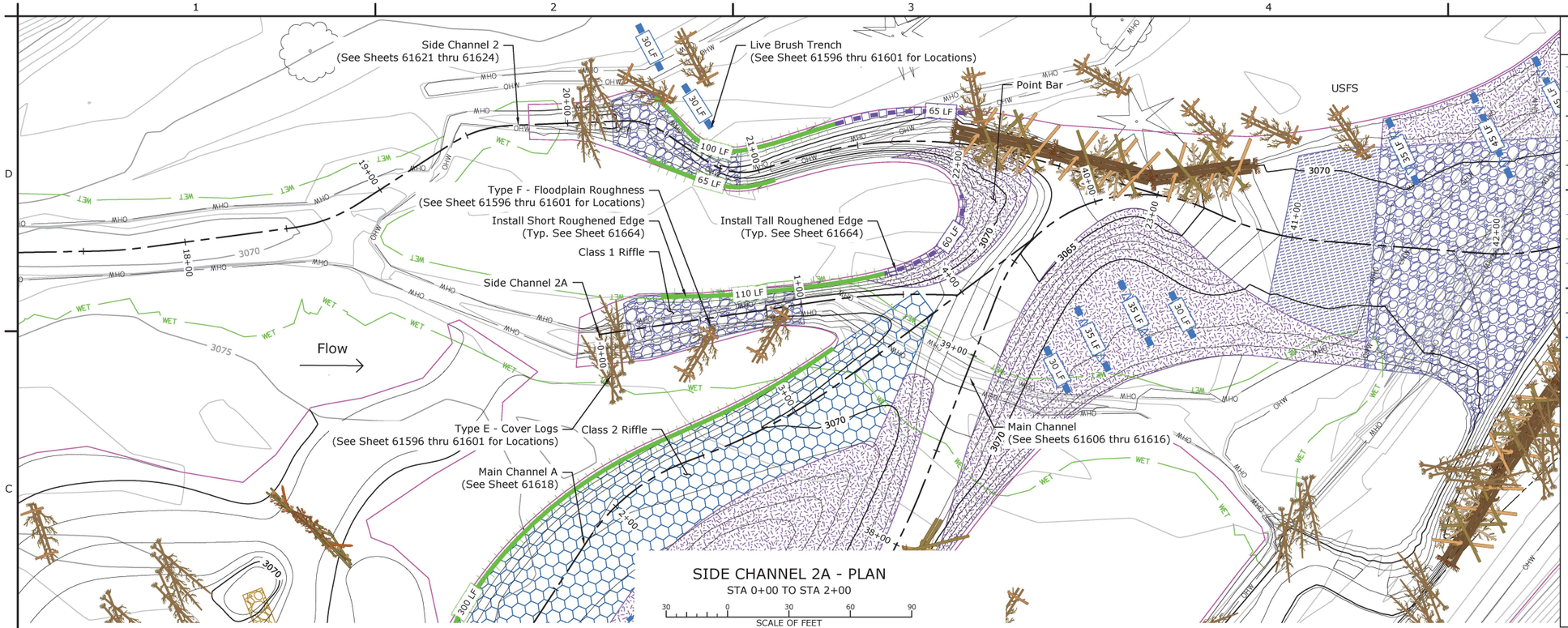
BOISE, IDAHO 2020-03-13

SIDE CHANNEL 2 PLAN AND PROFILE

STA 19+50 TO STA 23+50

1678-100-61624

SHEET 1

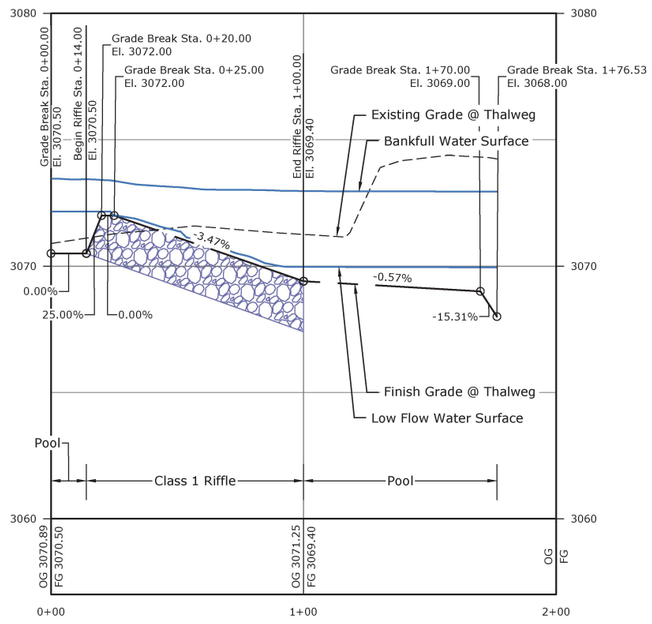



SIDE CHANNEL 2A - PLAN
STA 0+00 TO STA 2+00

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- 1 / A — Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




SIDE CHANNEL 2A - THALWEG PROFILE
STA 0+00 TO STA 2+00

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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MICHAEL TODD KNUTSON
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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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J. Bryant P.E.
DRAWN
J. Nielsen P.E.
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MICHAEL KNUTSON 2020.03.13 11:25:07 -06'00' P.E.
TECH APPD
TED DAY
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BOISE, IDAHO 2020-03-13

SIDE CHANNEL 2A PLAN AND PROFILE

STA 0+00 TO STA 2+00

1678-100-61625
SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:08 AM
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NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY-SC-P&P-30SCALE.DWG

Side Channel 2
(See Sheets 61621 thru 61624)
Glide
Side Channel 3
Install Short Roughened Edge
(Typ. See Sheet 61664)
Live Brush Trench
(See Sheet 61596 thru 61601 for Locations)
Flood Fence
(See Sheet 61596 thru 61601 for Locations)
LWM Called out on Sheet 61606
Point Bar
Type F - Floodplain Roughness
(See Sheet 61596 thru 61601 for Locations)
Class 1 Riffle
Flow
USFS
Match Line - Side Channel 3 STA 6+50 (61627)
Main Channel
(See Sheets 61606 thru 61616)

## SIDE CHANNEL 3 - PLAN
STA 0+00 TO STA 6+50

SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

Bankfull Water Surface
Low Flow Water Surface
Existing Grade @ Thalweg
Finish Grade @ Thalweg

Grade Break Sta. 0+00.00 El. 3075.50
Grade Break Sta. 0+10.00 El. 3075.50
Grade Break Sta. 1+05.00 El. 3080.00
Begin Riffle Sta. 1+85.00 El. 3080.44
Grade Break Sta. 1+95.00 El. 3080.50
Grade Break Sta. 2+65.00 El. 3079.80
End Riffle Sta. 2+75.00 El. 3079.14
Grade Break Sta. 3+15.00 El. 3076.50
Grade Break Sta. 3+90.00 El. 3076.50
Grade Break Sta. 4+40.00 El. 3079.30
Begin Riffle Sta. 4+55.00 El. 3079.36
Grade Break Sta. 4+65.00 El. 3079.40
Grade Break Sta. 5+55.00 El. 3078.50
End Riffle Sta. 5+71.87 El. 3076.33
Grade Break Sta. 5+90.00 El. 3074.00
Grade Break Sta. 6+10.00 El. 3074.00
Grade Break Sta. 6+35.00 El. 3078.48
Begin Riffle Sta. 6+50.00 El. 3078.55

0.00% 4.74% 0.56% -1.00% -6.60% 0.00% 5.60% 0.40% -1.00% -12.86% 0.00% 17.90% 0.50%

Pool | Glide | Class 1 Riffle | Pool | Glide | Class 1 Riffle | Pool | Glide

| | 0+00 | 1+00 | 2+00 | 3+00 | 4+00 | 5+00 | 6+00 | 6+50 |
|---|---|---|---|---|---|---|---|---|
| OG | 3082.91 | 3082.48 | 3082.99 | 3082.03 | 3081.78 | 3080.15 | 3080.14 | 3081.69 |
| FG | 3075.50 | 3079.76 | 3080.45 | 3077.49 | 3077.06 | 3079.05 | 3074.00 | 3078.55 |

## SIDE CHANNEL 3 - THALWEG PROFILE
STA 0+00 TO STA 6+50

HORIZONTAL SCALE
SCALE OF FEET

VERTICAL SCALE
SCALE OF FEET

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OREGON
JULY 15, 1997
MICHAEL TODD KNUTSON
EXPIRES: 6/30/2021

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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
CHECKED
MICHAEL KNUTSON 2020.03.13 11:26:10 -08'00' P.E.
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TED DAY
APPROVED
ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

SIDE CHANNEL 3 PLAN AND PROFILE

STA 0+00 TO STA 6+50

1678-100-61626

SHEET 1

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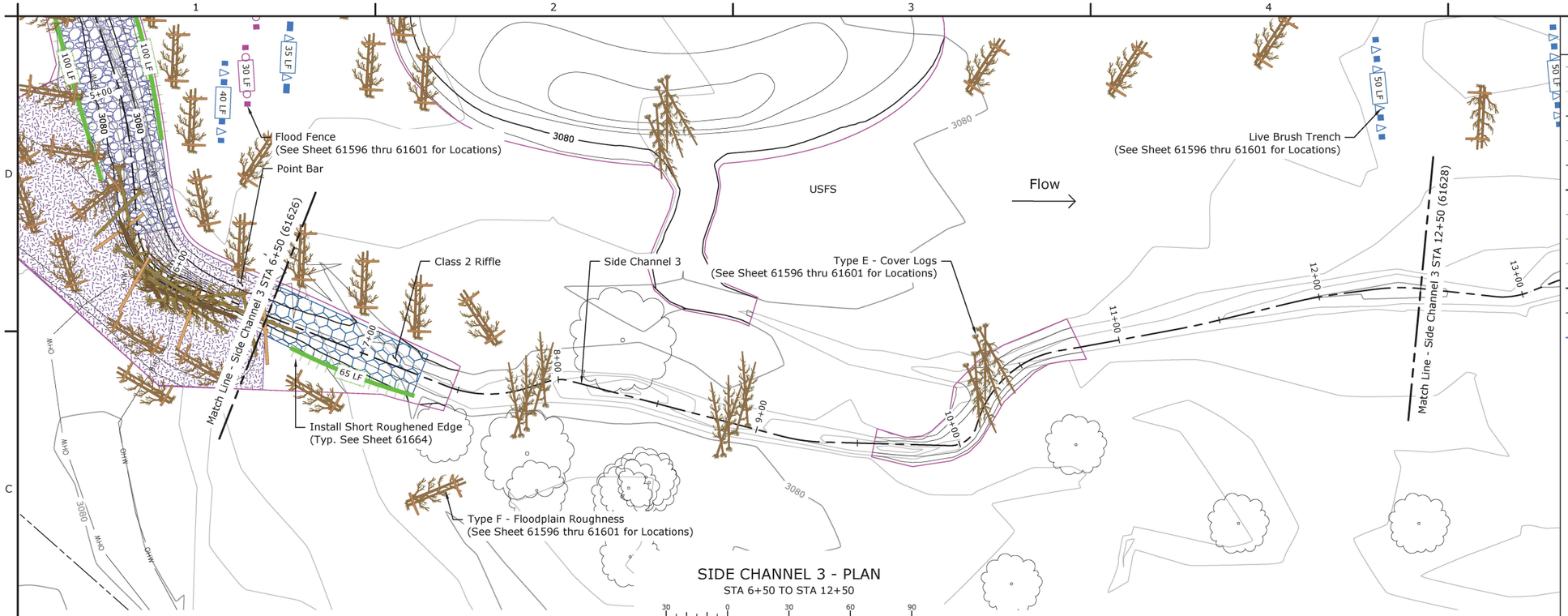
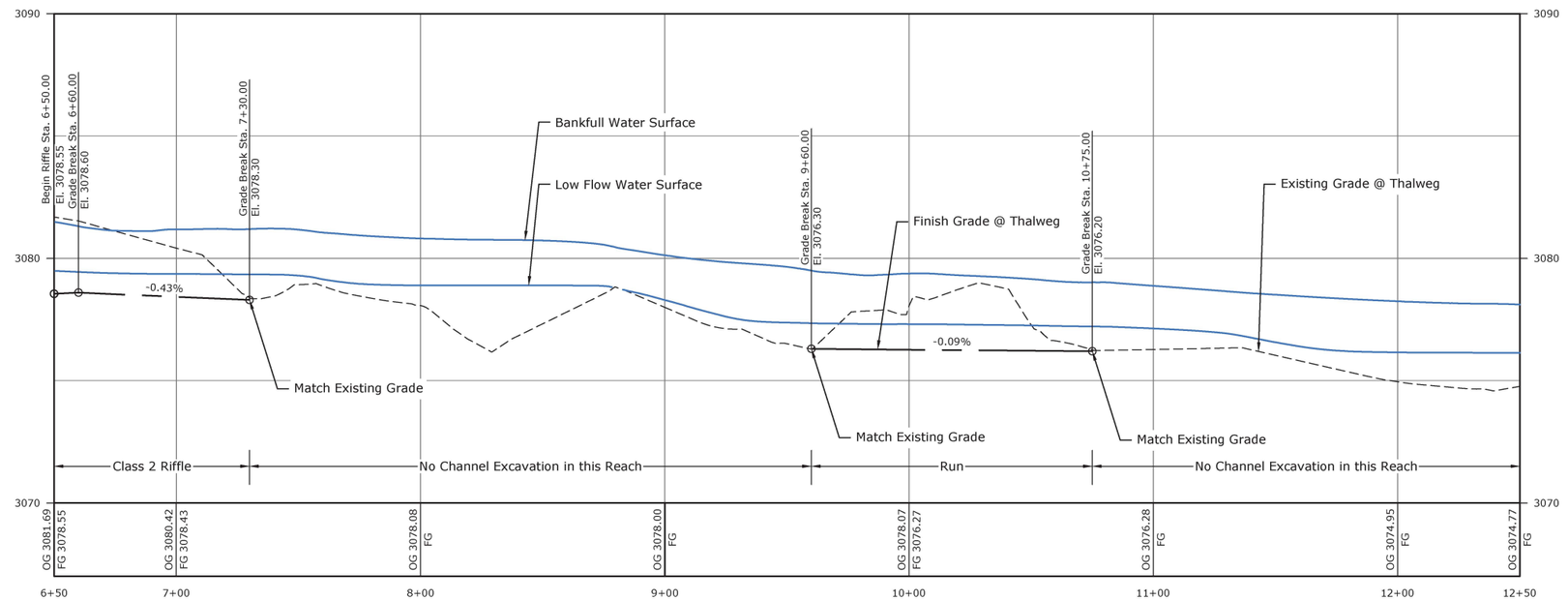



SIDE CHANNEL 3 - PLAN
STA 6+50 TO STA 12+50
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




SIDE CHANNEL 3 - THALWEG PROFILE
STA 6+50 TO STA 12+50
HORIZONTAL SCALE
SCALE OF FEET
VERTICAL SCALE
SCALE OF FEET

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Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
19223PE
DIGITALLY SIGNED
OREGON
JULY 15, 1997
MICHAEL TODD KNUTSON
EXPIRES: 6/30/2021

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
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| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:26:49 -08'00' P.E. |
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| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 3 PLAN AND PROFILE

STA 6+50 TO STA 12+50

1678-100-61627

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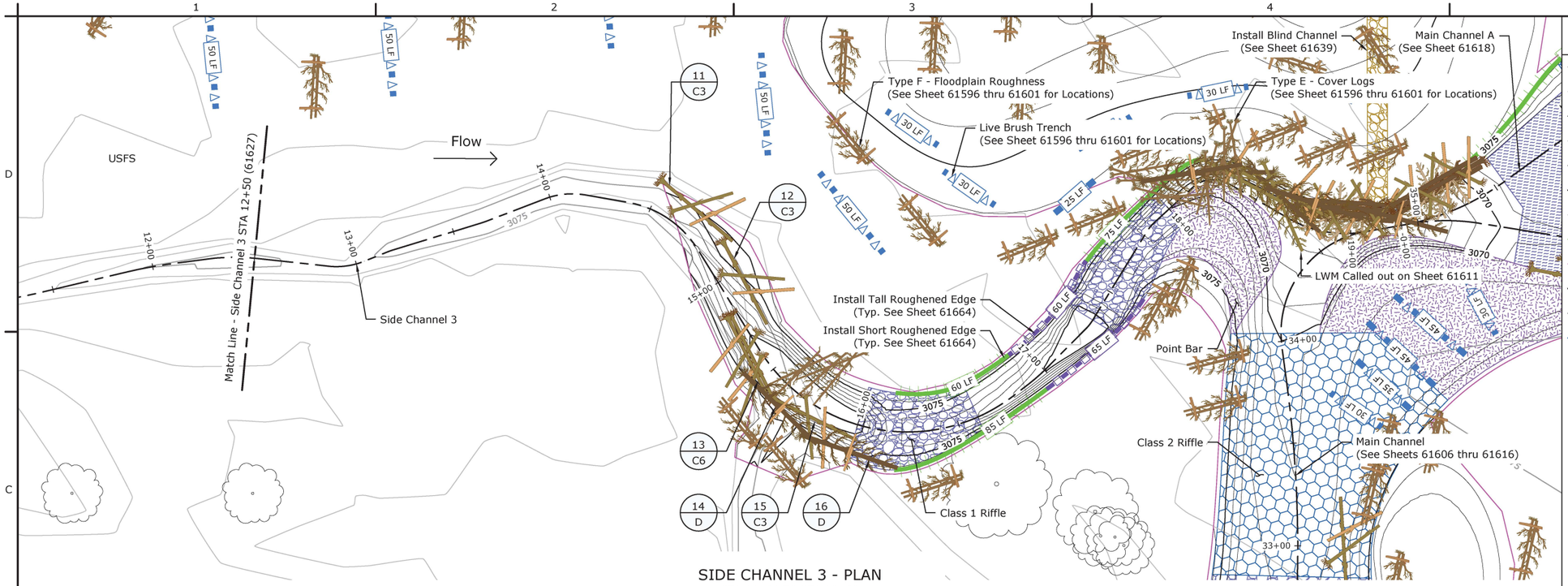
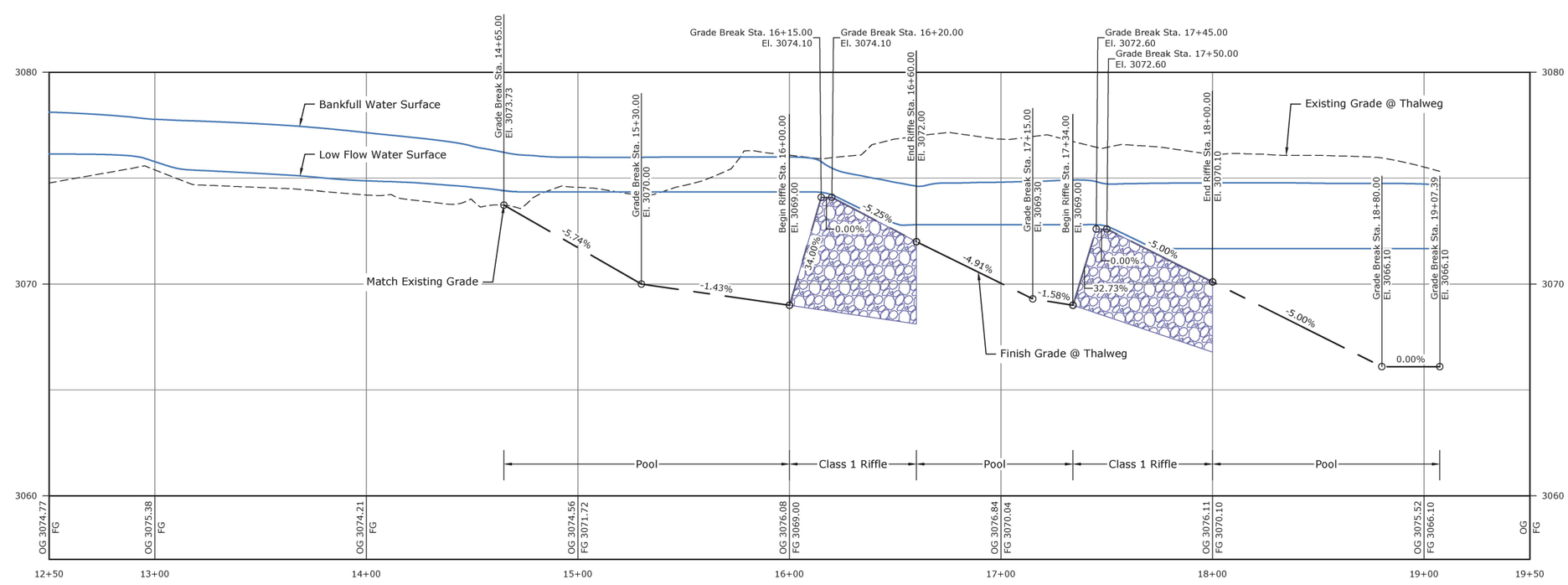



## SIDE CHANNEL 3 - PLAN
STA 12+50 TO STA 19+50

30 0 30 60 90
SCALE OF FEET




## SIDE CHANNEL 3 - THALWEG PROFILE
STA 12+50 TO STA 19+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
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- Live Brush Trench (See Sheet 61666)

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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SIDE CHANNEL 3 PLAN AND PROFILE

STA 12+50 TO STA 19+50

1678-100-61628

SHEET 1

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Main Channel B
(See Sheet 61619)

LWM Called out on Sheet 61613

Main Channel
(See Sheets 61606 thru 61616)

Side Channel 5A
(See Sheet 61634)

Match Line - Side Channel 5 STA 5+50 (61630)

Flow

Glide

Install Short Roughened Edge
(Typ. See Sheet 61664)

Side Channel 5

Class 1 Riffle

Point Bar

Class 2 Riffle

Type E - Cover Logs
(See Sheet 61596 thru 61601 for Locations)

Type F - Floodplain Roughness
(See Sheet 61596 thru 61601 for Locations)

Live Brush Trench
(See Sheet 61596 thru 61601 for Locations)

USFS

OR HWY 244

1 C6 | 2 C9 | 3 C6

## SIDE CHANNEL 5 - PLAN

STA 0+00 TO STA 5+50

SCALE OF FEET: 30 0 30 60 90

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
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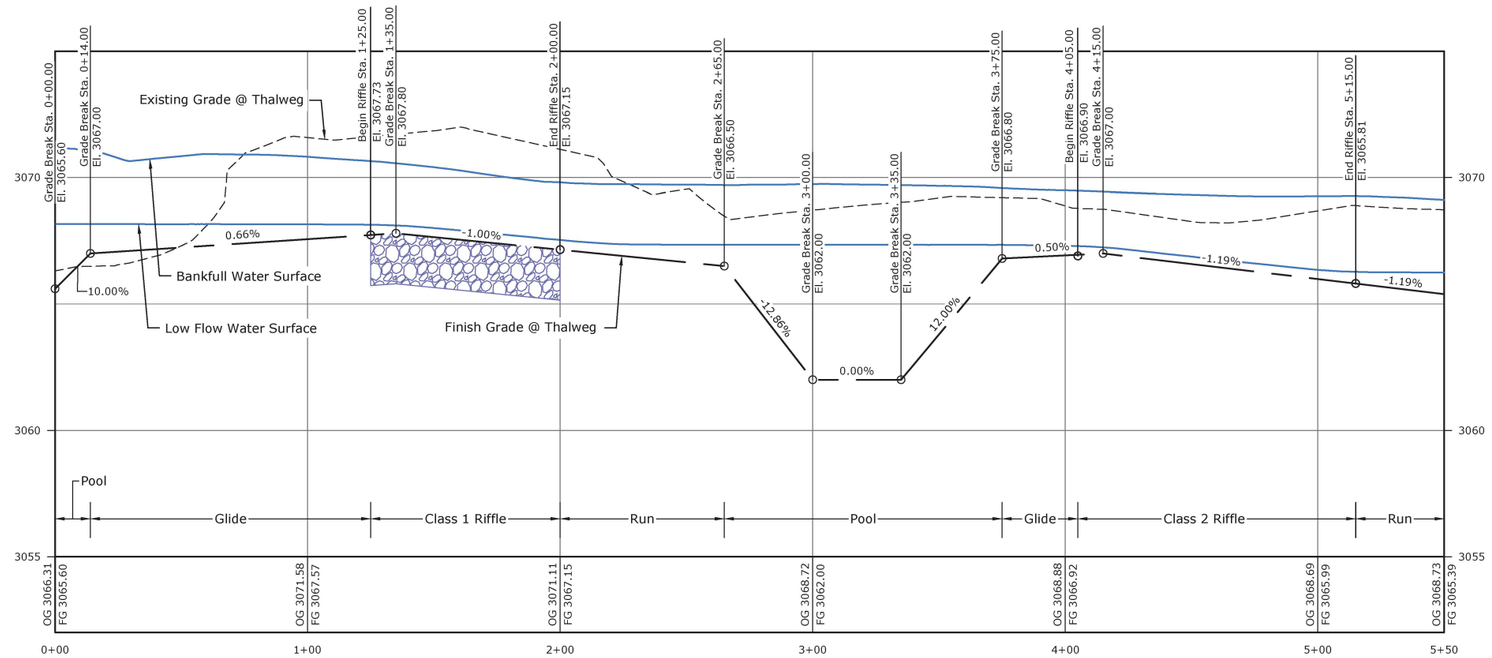
- Live Brush Trench (See Sheet 61666)




## SIDE CHANNEL 5 - THALWEG PROFILE

STA 0+00 TO STA 5+50

HORIZONTAL SCALE: 30 0 30 60 90 SCALE OF FEET

VERTICAL SCALE: 3 0 3 6 9 SCALE OF FEET

N

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Bryant P.E.
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J. Bryant P.E.
DRAWN
J. Nielsen P.E.
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MICHAEL KNUTSON 2020.03.13 11:28:33 -08'00' P.E.
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BOISE, IDAHO 2020-03-13

SIDE CHANNEL 5 PLAN AND PROFILE

STA 0+00 TO STA 5+50

1678-100-61629

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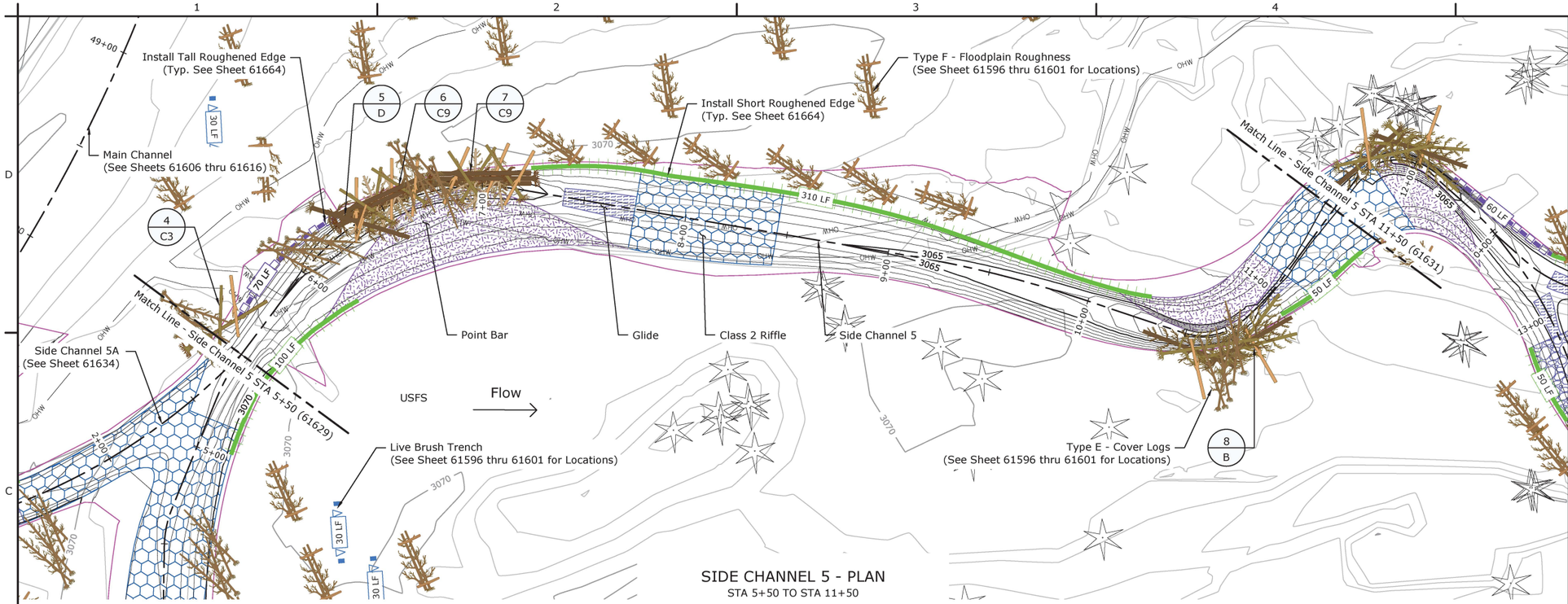


SIDE CHANNEL 5 - PLAN
STA 5+50 TO STA 11+50
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
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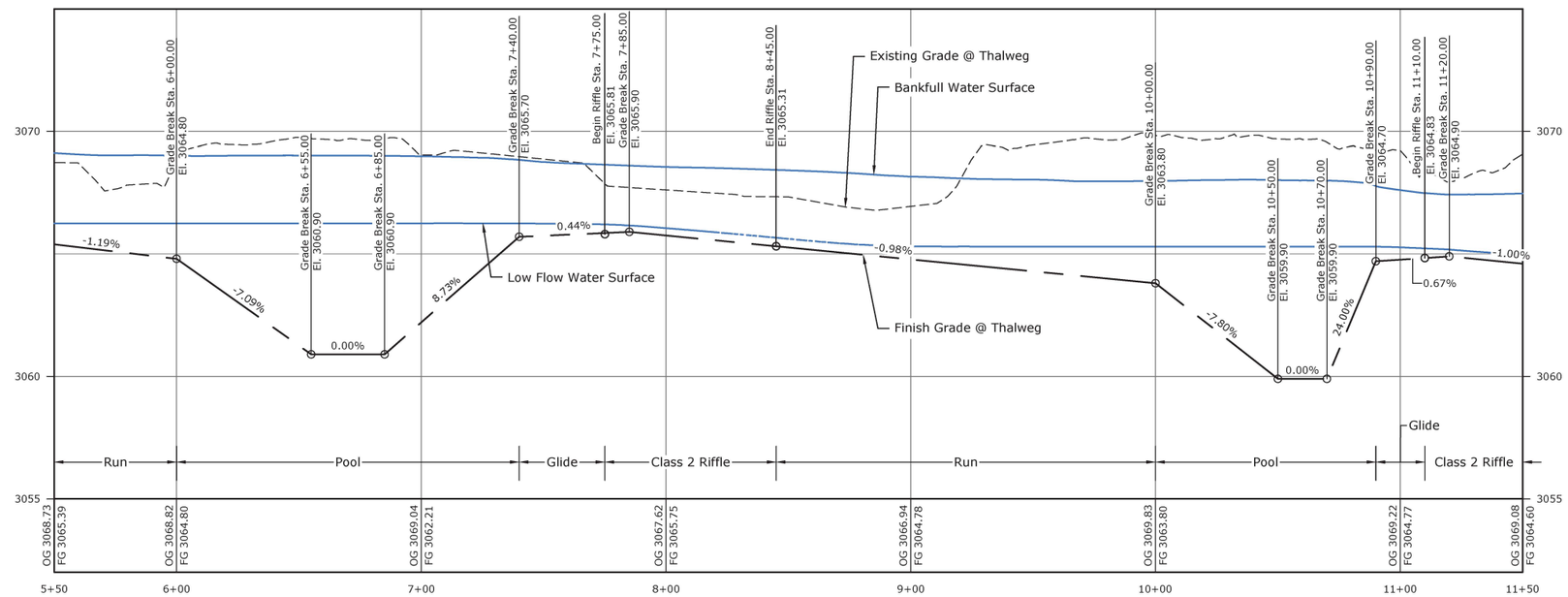
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




SIDE CHANNEL 5 - THALWEG PROFILE
STA 5+50 TO STA 11+50
HORIZONTAL SCALE
SCALE OF FEET
VERTICAL SCALE
SCALE OF FEET

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JULY 15, 1997
MICHAEL TODD KNUTSON
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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Bryant P.E. |
| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:29:14 -08'00' P.E. |
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| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 5 PLAN AND PROFILE

STA 5+50 TO STA 11+50

1678-100-61630

SHEET 1

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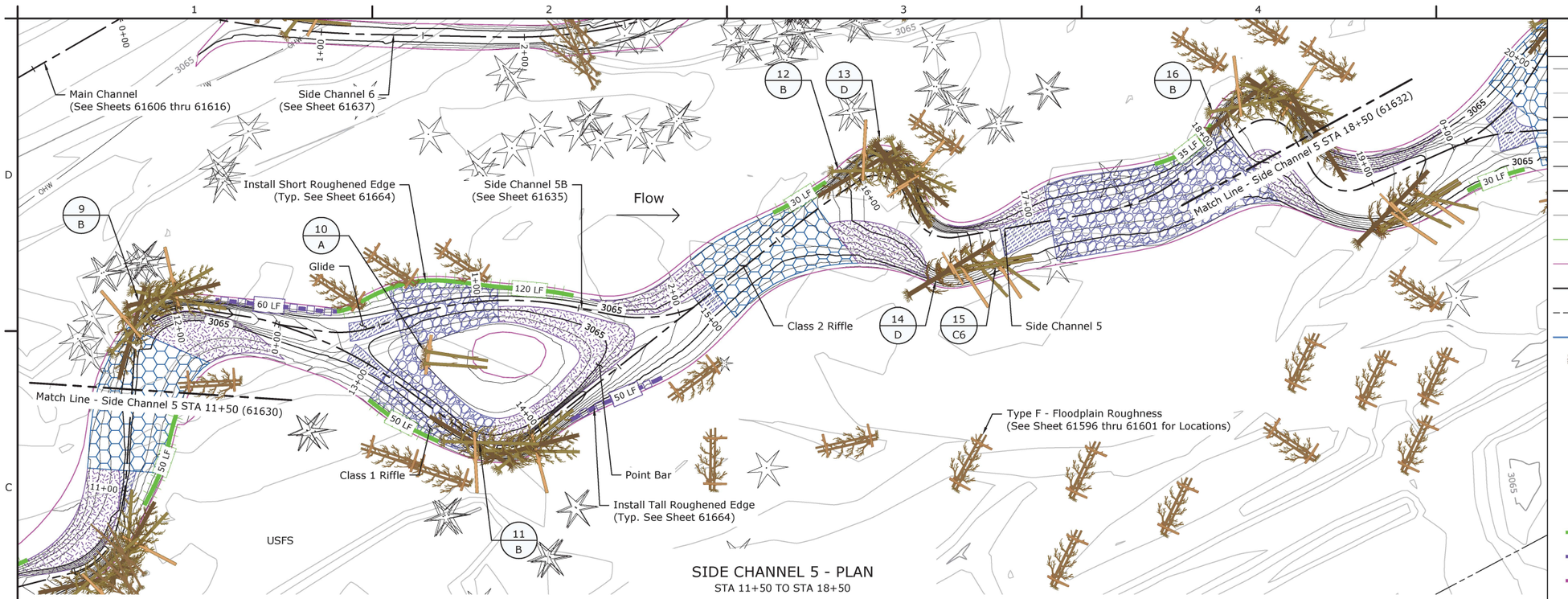


## SIDE CHANNEL 5 - PLAN

STA 11+50 TO STA 18+50

SCALE OF FEET

### LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
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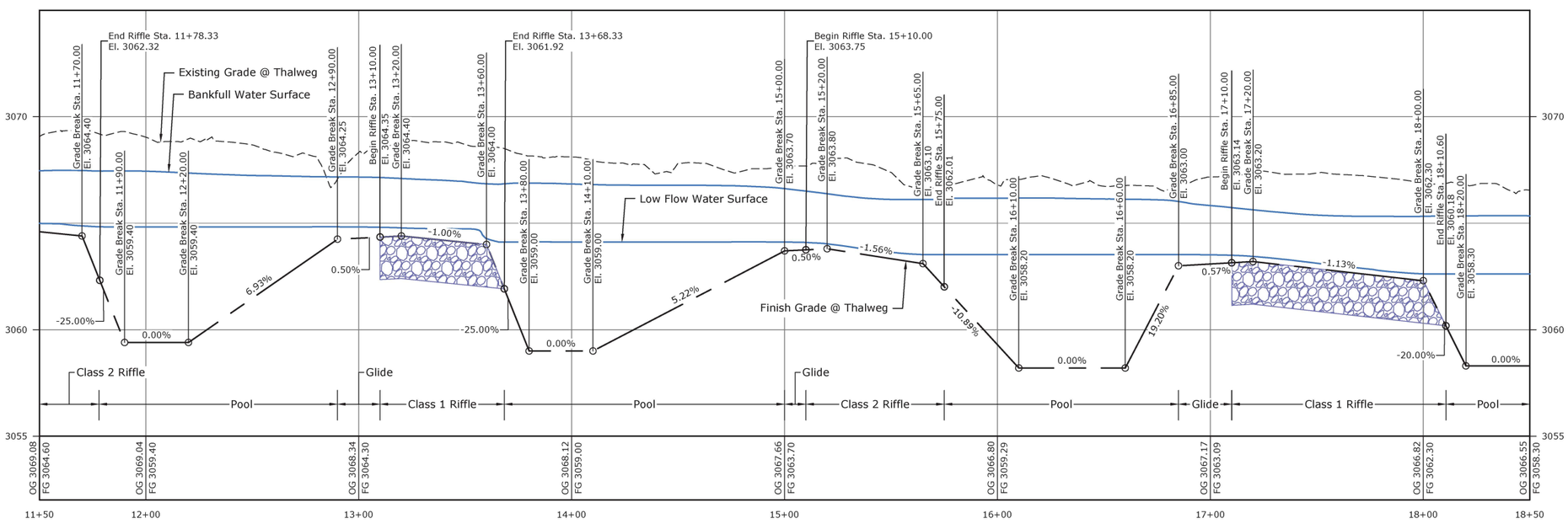


## SIDE CHANNEL 5 - THALWEG PROFILE

STA 11+50 TO STA 18+50

HORIZONTAL SCALE — SCALE OF FEET

VERTICAL SCALE — SCALE OF FEET

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MICHAEL TODD KNUTSON

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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
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| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:29:56 -08'00' P.E. |
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| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 5 PLAN AND PROFILE

STA 11+50 TO STA 18+50

1678-100-61631

SHEET 1

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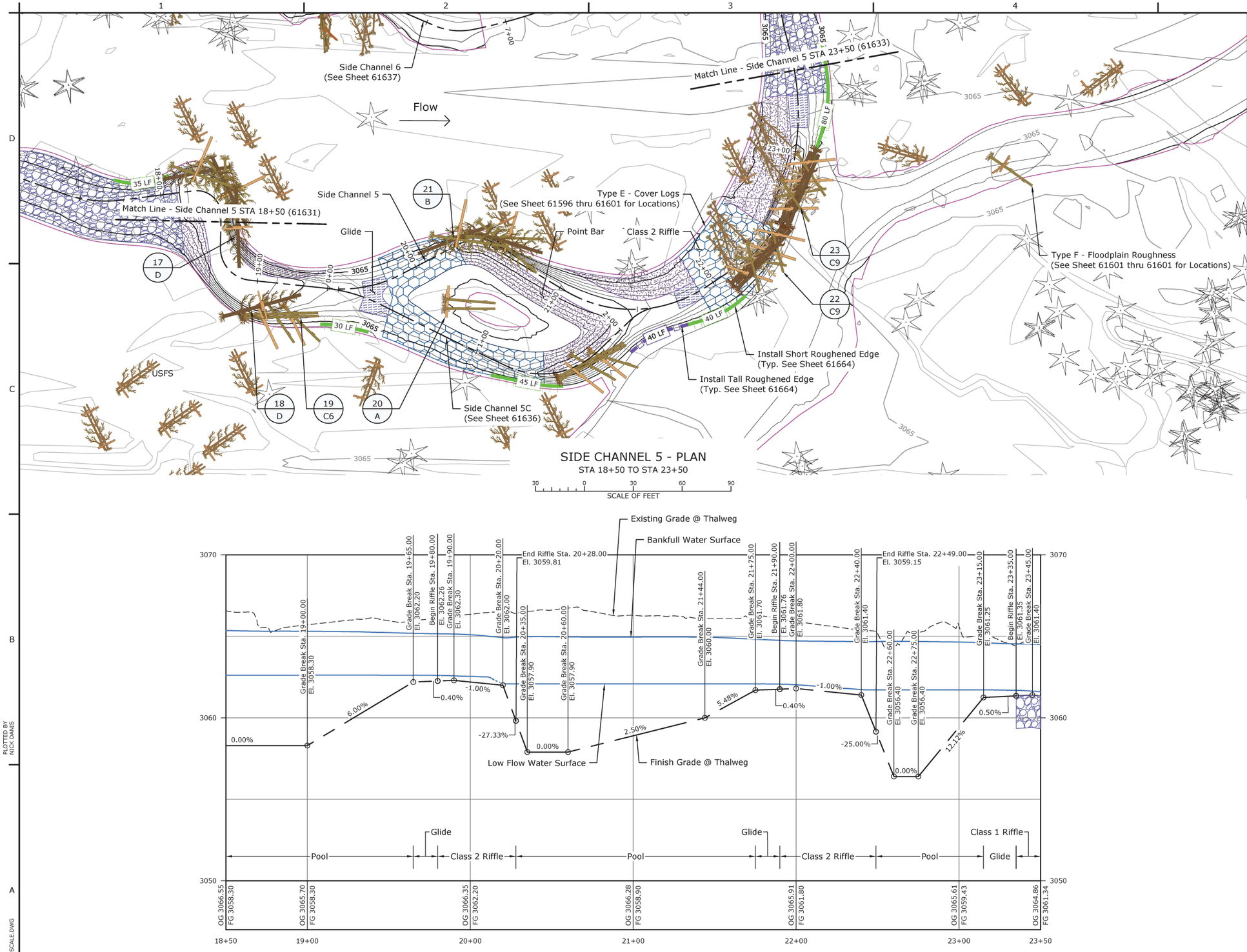


## SIDE CHANNEL 5 - PLAN
STA 18+50 TO STA 23+50

30 0 30 60 90
SCALE OF FEET




## SIDE CHANNEL 5 - THALWEG PROFILE
STA 18+50 TO STA 23+50

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

### LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
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J. Nielsen P.E.
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BOISE, IDAHO 2020-03-13

# SIDE CHANNEL 5 PLAN AND PROFILE

STA 18+50 TO STA 23+50

1678-100-61632

SHEET 1

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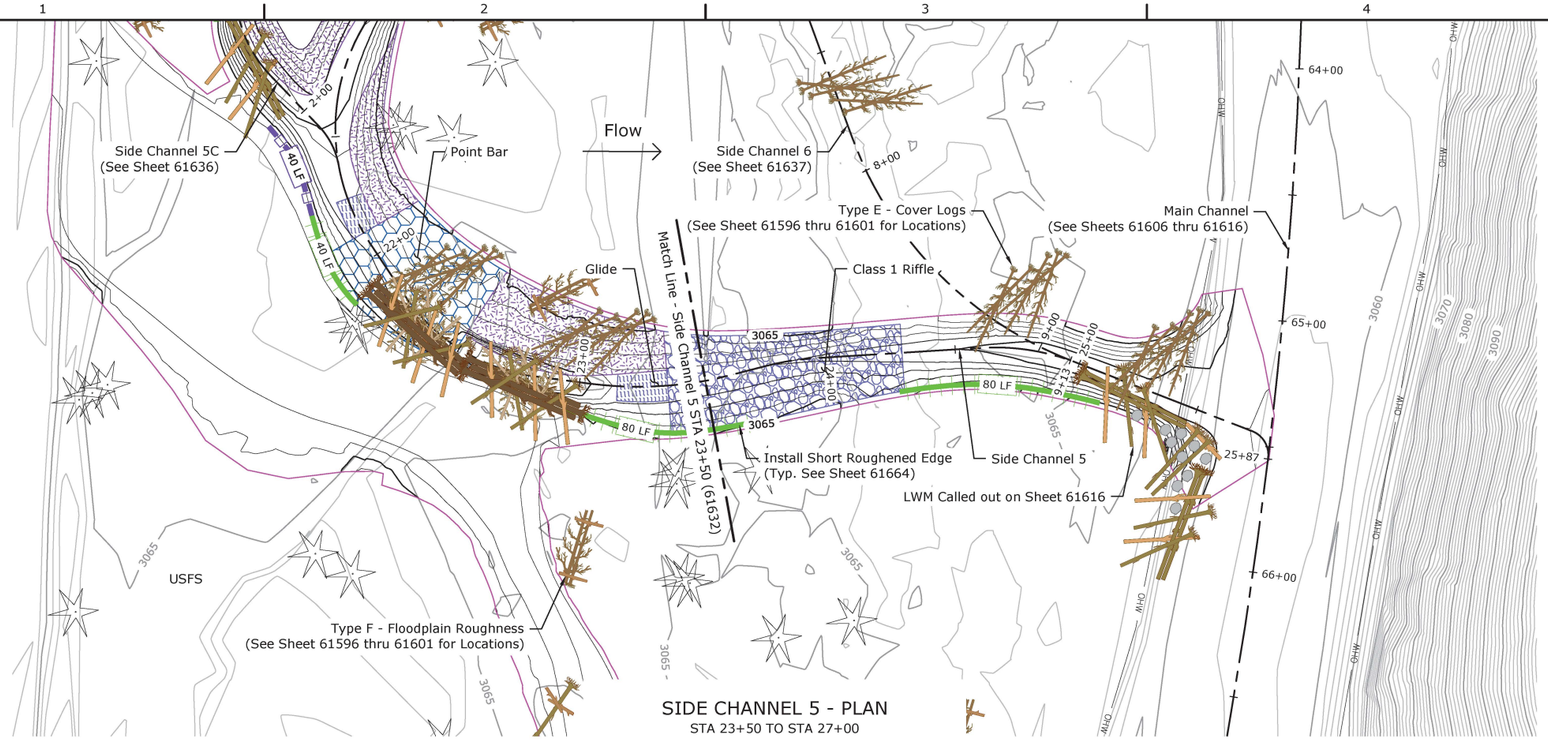
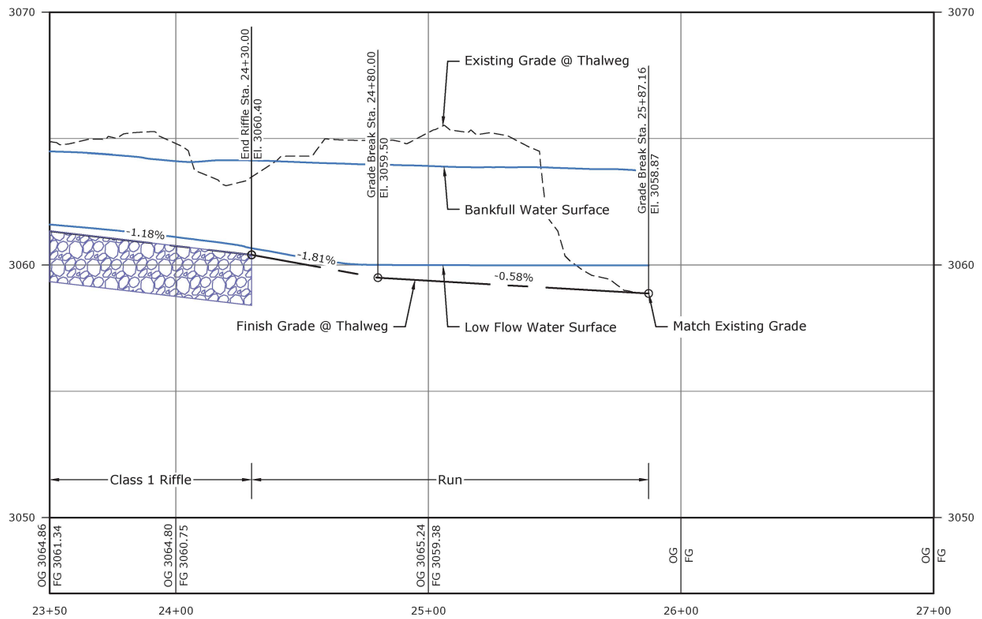



SIDE CHANNEL 5 - PLAN
STA 23+50 TO STA 27+00

30 0 30 60 90
SCALE OF FEET




SIDE CHANNEL 5 - THALWEG PROFILE
STA 23+50 TO STA 27+00

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
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- Existing Grade Profile
- Water Surface Profile
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| TECH. APPR. | MICHAEL KNUTSON 2020.03.13 11:32:04 -08'00' P.E. |
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| ADMIN APPROVAL – PROGRAM MANAGER | |
| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 5 PLAN AND PROFILE

STA 23+50 TO STA 27+00

1678-100-61633

SHEET 1

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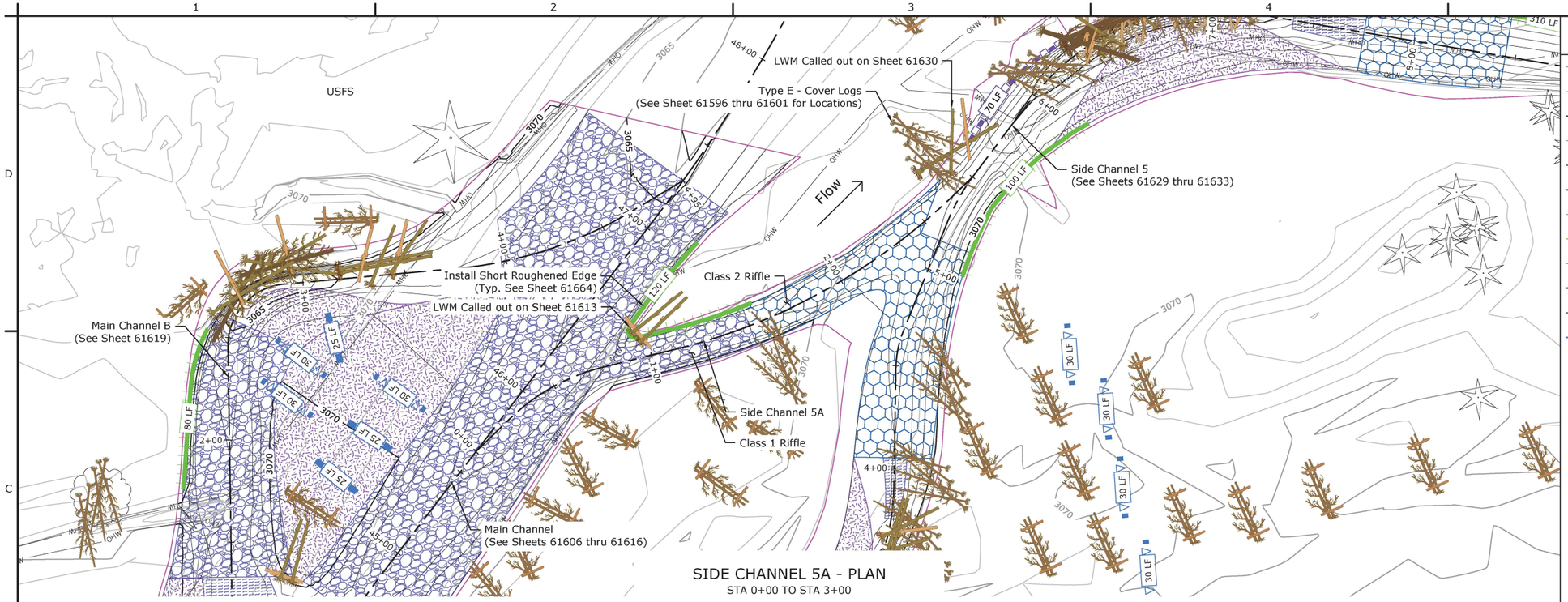


SIDE CHANNEL 5A - PLAN
STA 0+00 TO STA 3+00

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
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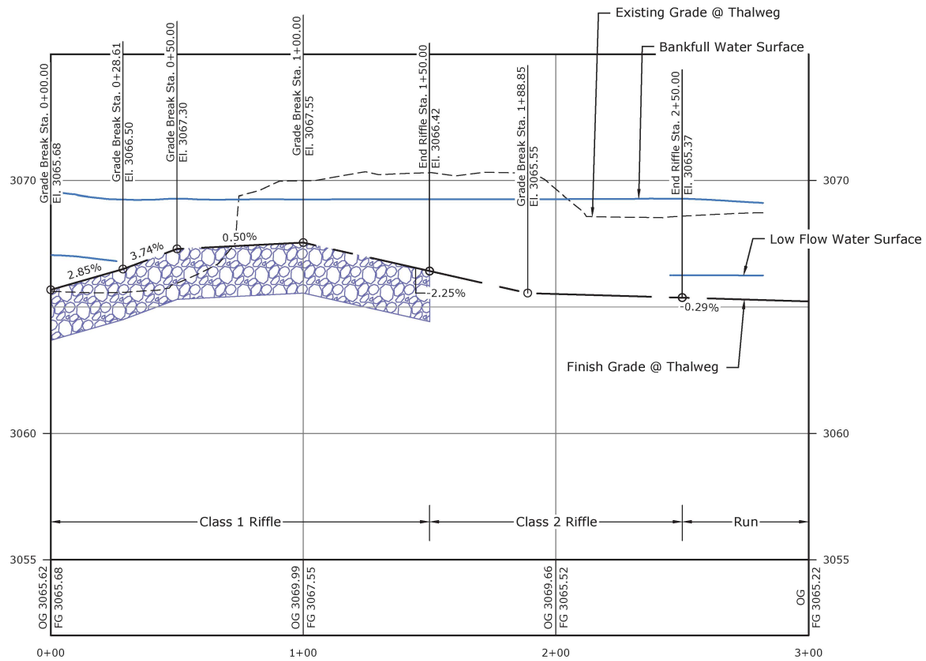


SIDE CHANNEL 5A - THALWEG PROFILE
STA 0+00 TO STA 3+00

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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DRAWN
J. Nielsen P.E.
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ADMIN APPROVAL – PROGRAM MANAGER
BOISE, IDAHO 2020-03-13

SIDE CHANNEL 5A PLAN AND PROFILE

STA 0+00 TO STA 3+00

1678-100-61634
SHEET 1

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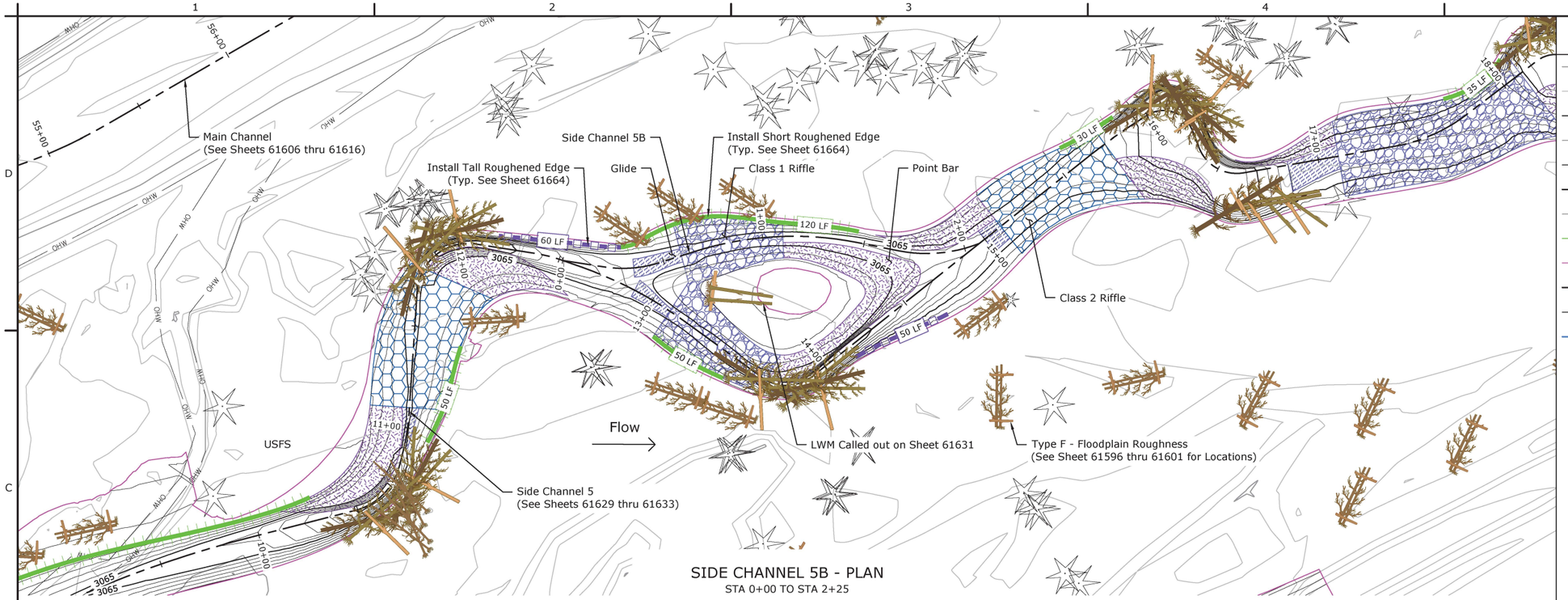
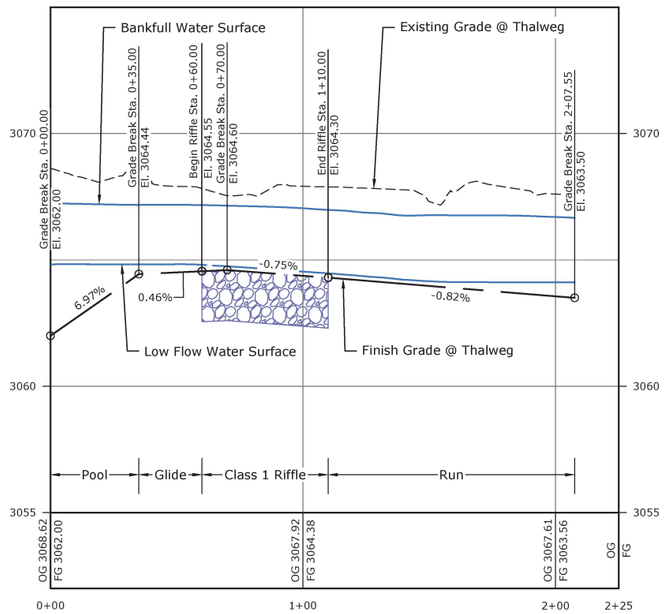



## SIDE CHANNEL 5B - PLAN

STA 0+00 TO STA 2+25

30 0 30 60 90

SCALE OF FEET




## SIDE CHANNEL 5B - THALWEG PROFILE

STA 0+00 TO STA 2+25

HORIZONTAL SCALE

30 0 30 60 90

SCALE OF FEET

VERTICAL SCALE

3 0 3 6 9

SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number (1) / Structure Type (A)
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
19223PE
DIGITALLY SIGNED
OREGON
JULY 15, 2007
MICHAEL TODD KNUTSON

EXPIRES: 6/30/2021

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

DESIGNED J. Bryant P.E.
DRAWN J. Bryant P.E.
CHECKED J. Nielsen P.E.
TECH. APPR. MICHAEL KNUTSON 2020.03.13 11:33:28 -08'00' P.E.
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SIDE CHANNEL 5B PLAN AND PROFILE

STA 0+00 TO STA 2+25

1678-100-61635

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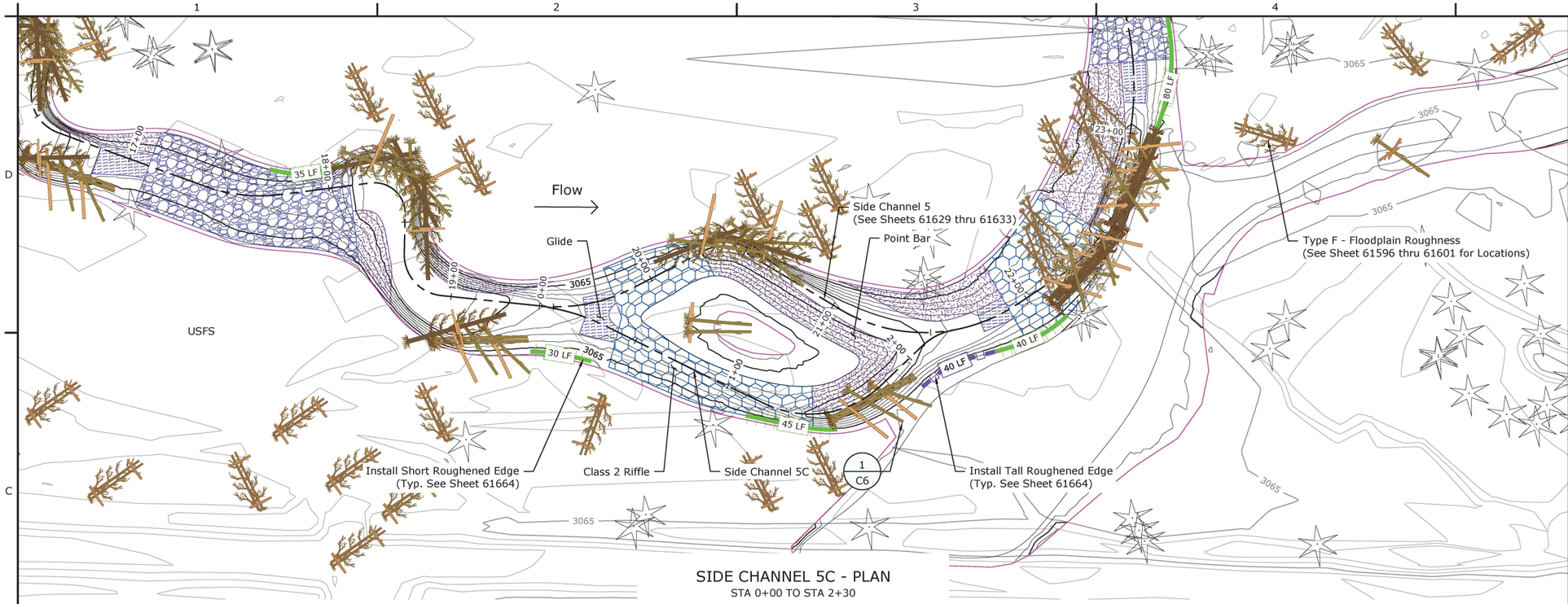


SIDE CHANNEL 5C - PLAN
STA 0+00 TO STA 2+30

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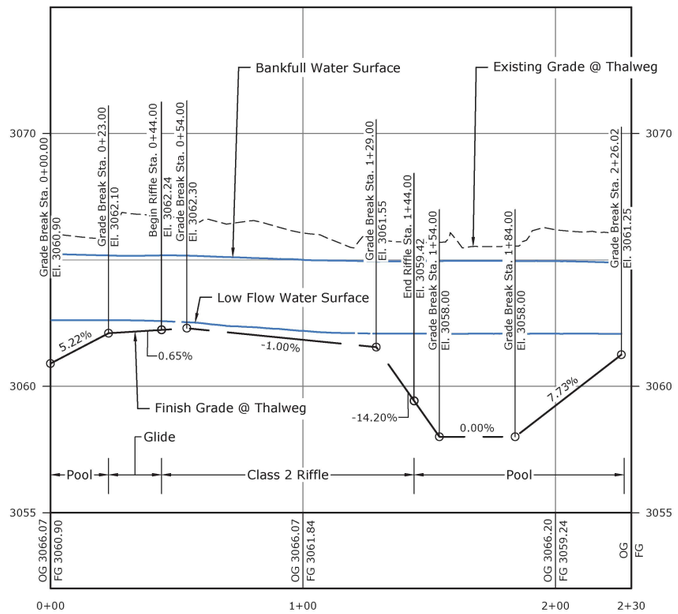
SCALE OF FEET




SIDE CHANNEL 5C - THALWEG PROFILE
STA 0+00 TO STA 2+30

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

## LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour (ELEV)
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary (WET)
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 61662)
- Structure Number / Structure Type (1 / A)
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)

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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Bryant P.E.
DESIGNED
J. Bryant P.E.
DRAWN
J. Nielsen P.E.
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BOISE, IDAHO 2020-03-13

SIDE CHANNEL 5C PLAN AND PROFILE

STA 0+00 to STA 2+30

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SHEET 1

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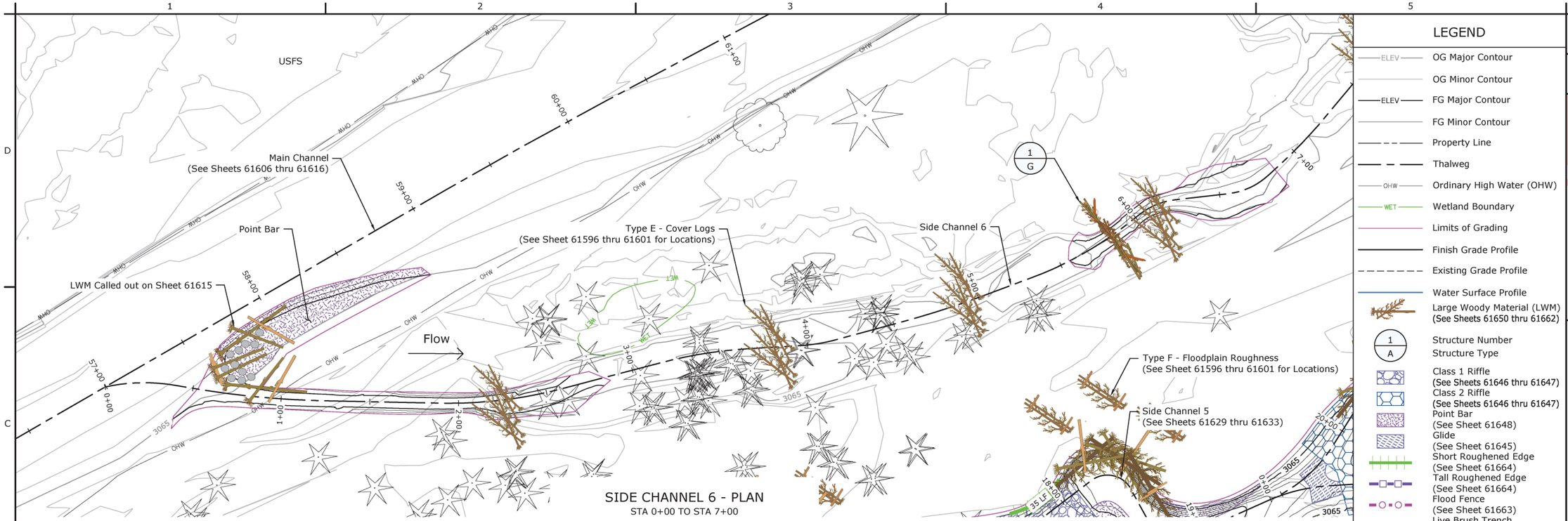
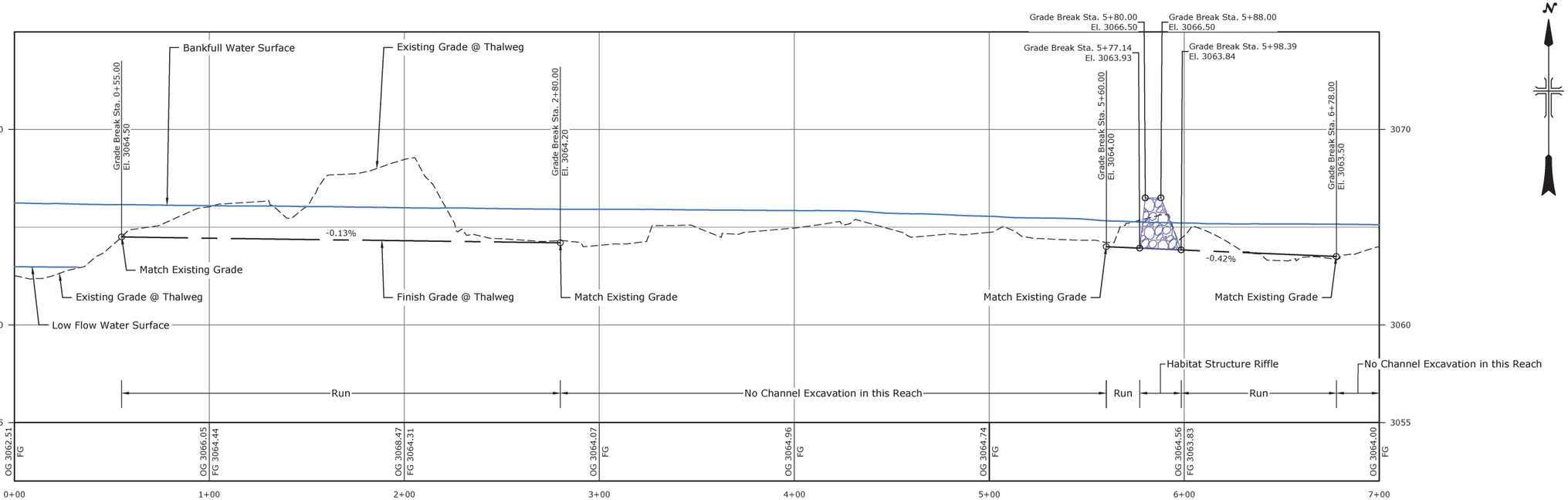



SIDE CHANNEL 6 - PLAN
STA 0+00 TO STA 7+00

30 0 30 60 90
SCALE OF FEET

## LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Thalweg
- Ordinary High Water (OHW)
- Wetland Boundary
- Limits of Grading
- Finish Grade Profile
- Existing Grade Profile
- Water Surface Profile
- Large Woody Material (LWM) (See Sheets 61650 thru 1662)
- Structure Number / Structure Type
- Class 1 Riffle (See Sheets 61646 thru 61647)
- Class 2 Riffle (See Sheets 61646 thru 61647)
- Point Bar (See Sheet 61648)
- Glide (See Sheet 61645)
- Short Roughened Edge (See Sheet 61664)
- Tall Roughened Edge (See Sheet 61664)
- Flood Fence (See Sheet 61663)
- Live Brush Trench (See Sheet 61666)




SIDE CHANNEL 6 - THALWEG PROFILE
STA 0+00 TO STA 7+00

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Nielsen P.E. |
| DRAWN | J. Bryant P.E. |
| CHECKED | J. Nielsen P.E. |
| | MICHAEL KNUTSON 2020.03.13 11:43:34 -08'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL – PROGRAM MANAGER |
| BOISE, IDAHO | 2020-03-13 |

SIDE CHANNEL 6 PLAN AND PROFILE

STA 0+00 TO STA 7+00

1678-100-61637

SHEET 1

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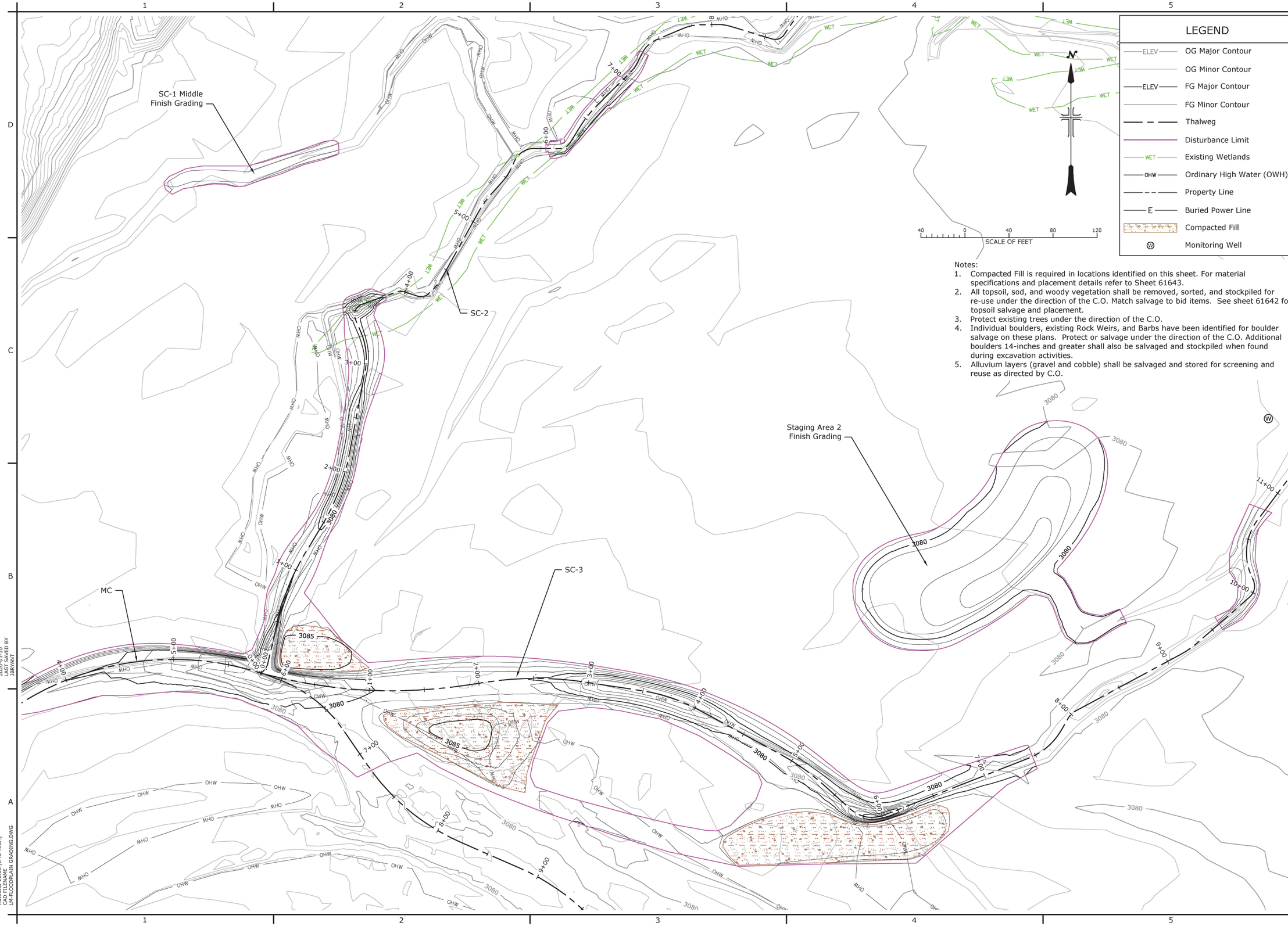


## LEGEND

| | |
|---|---|
| ELEV | OG Major Contour |
| | OG Minor Contour |
| ELEV | FG Major Contour |
| | FG Minor Contour |
| | Thalweg |
| | Disturbance Limit |
| WET | Existing Wetlands |
| OHW | Ordinary High Water (OWH) |
| | Property Line |
| E | Buried Power Line |
| | Compacted Fill |
| W | Monitoring Well |

40 0 40 80 120
SCALE OF FEET

Notes:

1. Compacted Fill is required in locations identified on this sheet. For material specifications and placement details refer to Sheet 61643.
2. All topsoil, sod, and woody vegetation shall be removed, sorted, and stockpiled for re-use under the direction of the C.O. Match salvage to bid items. See sheet 61642 for topsoil salvage and placement.
3. Protect existing trees under the direction of the C.O.
4. Individual boulders, existing Rock Weirs, and Barbs have been identified for boulder salvage on these plans. Protect or salvage under the direction of the C.O. Additional boulders 14-inches and greater shall also be salvaged and stockpiled when found during excavation activities.
5. Alluvium layers (gravel and cobble) shall be salvaged and stored for screening and reuse as directed by C.O.

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OREGON
JAN. 14, 2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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J. Nielsen P.E.
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J. Bryant P.E.
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FLOODPLAIN GRADING
PLAN 1

1678-100-61638
SHEET 1

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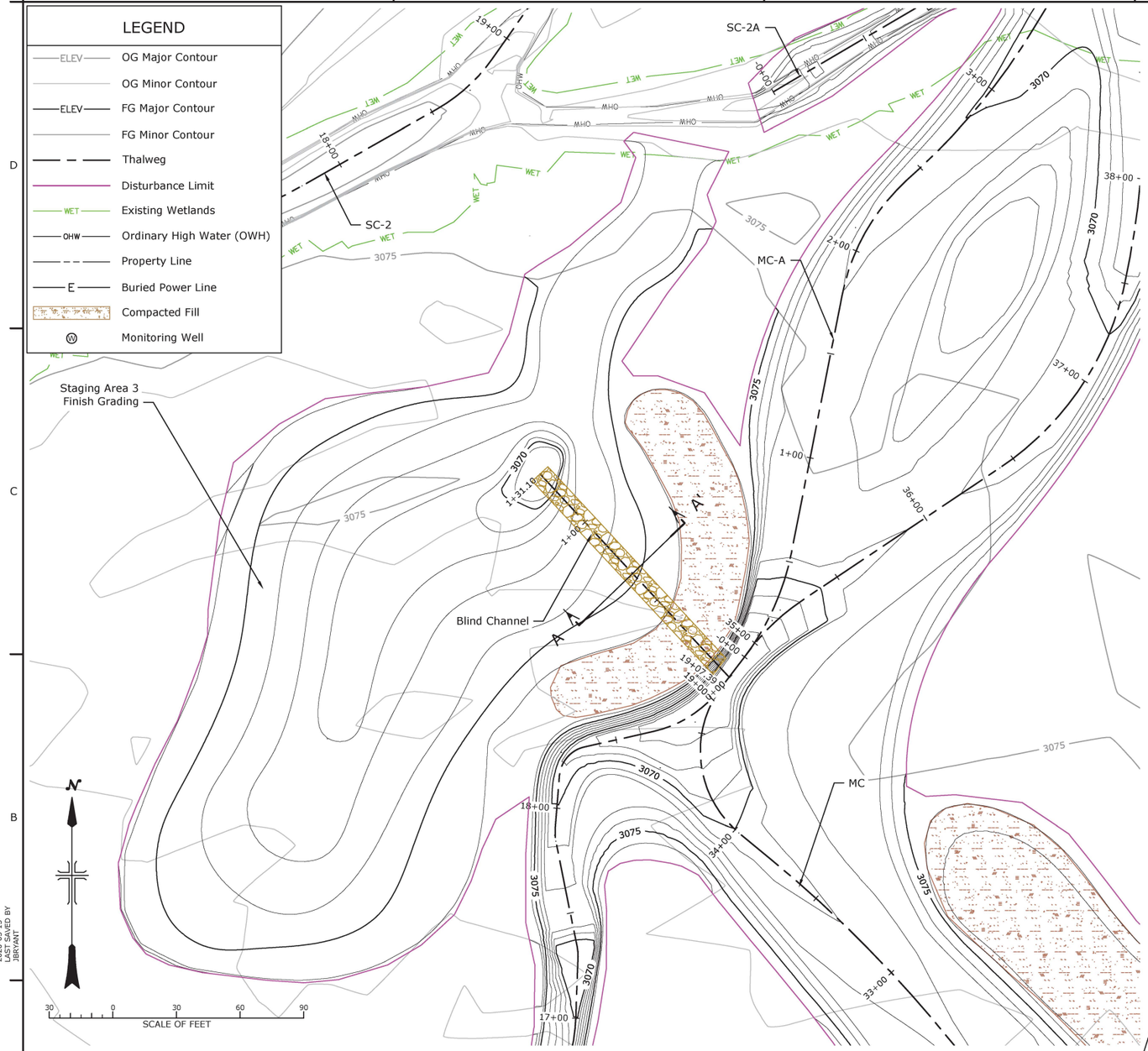
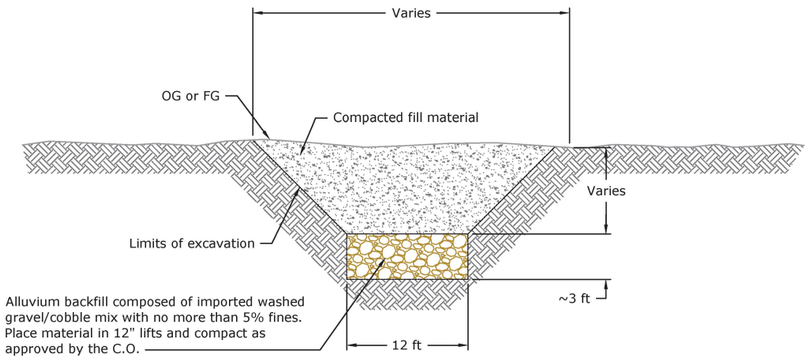



BLIND CHANNEL MATERIALS OVERVIEW

These plans contain blind channels. The intent of a blind channel is to facilitate subsurface flow from in-stream pools to off channel ponds and/or ephemeral channels through a preferential flow path of a course mix of alluvium. Blind channels shall be built from imported materials to achieve a mixture relatively free (washed) from fine sediment material that facilitates subsurface flow.

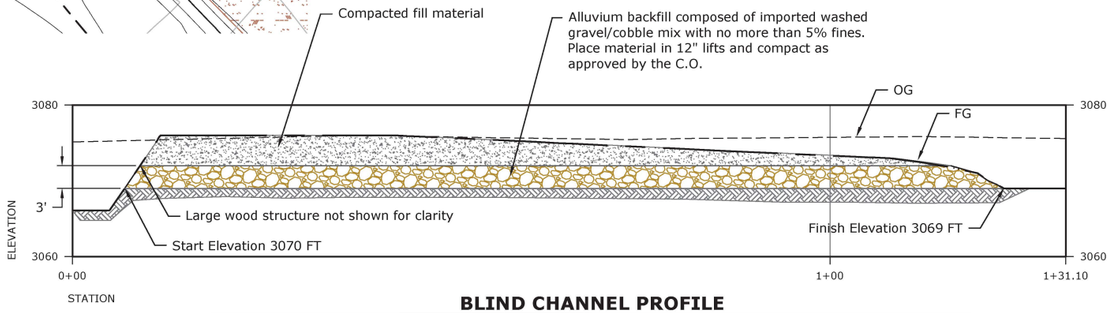



**TYPICAL BLIND CHANNEL SECTION A - A'**

NOT TO SCALE

| LONGLEY MEADOWS BLIND CHANNEL | | |
|---|---|---|
| LOCATION | LENGTH (ft) | VOLUME OF ALLUVIUM (CY) |
| Blind Channel | 115 | ~150 |

| BLIND CHANNEL ALLUVIUM BACKFILL | |
|---|---|
| Percent Passing | Size Class |
| 80–100 | 4.0–inches |
| 40–80 | 3.0–inches |
| 10–40 | 2.0–inches |
| 0–10 | 1.0–inches |
| <5 | No 200 Sieve |




**BLIND CHANNEL PROFILE**

NOT TO SCALE

Notes:
1. Compacted Fill is required in locations identified on this sheet. For material specifications and placement details refer to Sheet 61643.
2. All topsoil, sod, and woody vegetation shall be removed, sorted, and stockpiled for re-use under the direction of the C.O. Match salvage to bid items. See sheet 61642 for topsoil salvage and placement.
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5. Alluvium layers (gravel and cobble) shall be salvaged and stored for screening and reuse as directed by C.O.

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

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FLOODPLAIN GRADING PLAN 2

BLIND CHANNEL DETAILS

1678-100-61639

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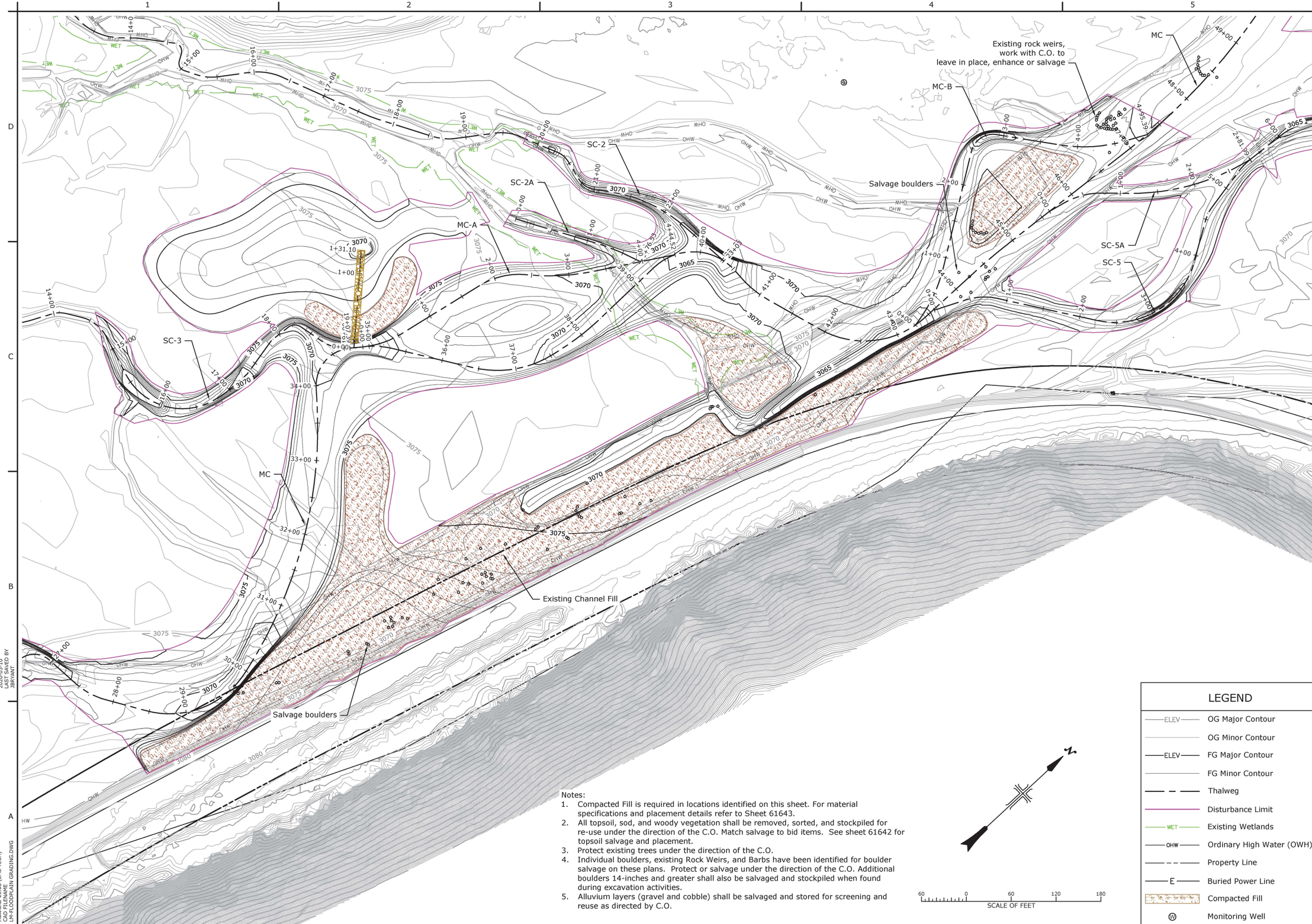


Notes:

1. Compacted Fill is required in locations identified on this sheet. For material specifications and placement details refer to Sheet 61643.
2. All topsoil, sod, and woody vegetation shall be removed, sorted, and stockpiled for re-use under the direction of the C.O. Match salvage to bid items. See sheet 61642 for topsoil salvage and placement.
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5. Alluvium layers (gravel and cobble) shall be salvaged and stored for screening and reuse as directed by C.O.

60 0 60 120 180
SCALE OF FEET

## LEGEND

| | |
|---|---|
| ELEV | OG Major Contour |
| | OG Minor Contour |
| ELEV | FG Major Contour |
| | FG Minor Contour |
| | Thalweg |
| | Disturbance Limit |
| WET | Existing Wetlands |
| OHW | Ordinary High Water (OWH) |
| | Property Line |
| E | Buried Power Line |
| | Compacted Fill |
| W | Monitoring Well |

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Nielsen P.E.
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DRAWN
J. Bryant P.E.
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FLOODPLAIN GRADING PLAN 3

1678-100-61640

SHEET 1

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## LEGEND

- ELEV — OG Major Contour
- OG Minor Contour
- ELEV — FG Major Contour
- FG Minor Contour
- Thalweg
- Disturbance Limit
- WET — Existing Wetlands
- OHW — Ordinary High Water (OWH)
- Property Line
- E — Buried Power Line
- Compacted Fill
- (W) Monitoring Well

Notes:
1. Compacted Fill is required in locations identified on this sheet. For material specifications and placement details refer to Sheet 61643.
2. All topsoil, sod, and woody vegetation shall be removed, sorted, and stockpiled for re-use under the direction of the C.O. Match salvage to bid items. See sheet 61642 for topsoil salvage and placement.
3. Protect existing trees under the direction of the C.O.
4. Individual boulders, existing Rock Weirs, and Barbs have been identified for boulder salvage on these plans. Protect or salvage under the direction of the C.O. Additional boulders 14-inches and greater shall also be salvaged and stockpiled when found during excavation activities.
5. Alluvium layers (gravel and cobble) shall be salvaged and stored for screening and reuse as directed by C.O.

MC

Existing rock weirs, work with C.O. to leave in place, enhance, or salvage

SC-6

SC-5C

SC-5

SC-5B

Existing Fence

Fill within the existing railroad prism, see Finish Grading Notes 6 on Sheet 61604.

SCALE OF FEET
30 0 30 60 90

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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

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FLOODPLAIN GRADING PLAN 4

1678-100-61641
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CAD FILENAME
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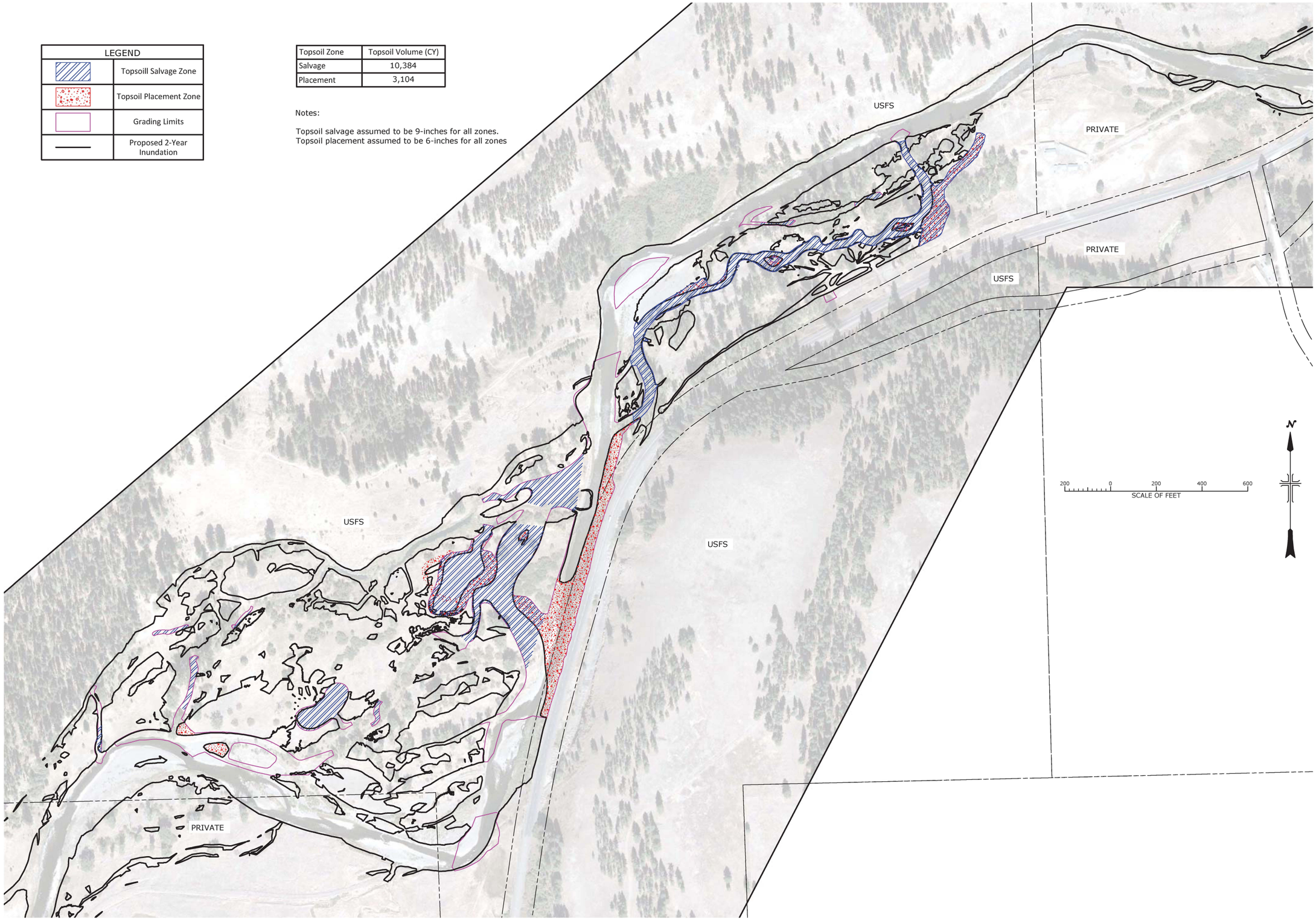
| LEGEND | |
|---|---|
| | Topsoill Salvage Zone |
| | Topsoil Placement Zone |
| | Grading Limits |
| | Proposed 2-Year Inundation |

| Topsoil Zone | Topsoil Volume (CY) |
|---|---|
| Salvage | 10,384 |
| Placement | 3,104 |

Notes:

Topsoil salvage assumed to be 9-inches for all zones.
Topsoil placement assumed to be 6-inches for all zones

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GRAND RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

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TOPSOIL SLAVAGE & PLACEMENT PLAN

1678-100-61642
SHEET 1

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# FILL MATERIAL OVERVIEW

Fill material and placement requirements for this project, with the exception of channel materials, are detailed on this sheet. For this project, fill has been delineated into three types: compacted fill, general fill, and channel materials with specific material and compaction requirements for each type. This sheet provides material and placement details for general and compacted fill types, details for channel materials can be found on sheets 61644 thru 61648.

## COMPACTED FILL MATERIAL

Critical locations within the project require compacted fill. Excavated materials that are uniform in size and type will require mixing to create a well-graded and compactable fill that meets the following requirements:

| COMPACTED FILL MATERIAL | | |
|---|---|---|
| Material Class (approximate size range) | "Idealized" Percent Passing* | **Range of Acceptable Compacted Fill as Class Percentage**** |
| Boulders (10-inches to 12-inches) | 100% | 0% to 20% |
| Cobble (3-inches to 10-inches) | 80% | 0% to 60% |
| Gravel (0.08-inches to 3-inches) | 50% | 20% to 80% |
| Sands (0.0025 to 0.08 inches) | 30% | 10% to 30% |
| Fines (<No. 200 Sieve) | 10% | 5% to 40% |
| Moisture Content | 10% | 5% to 10% |

*Note - Idealized Percent Passing is intended to show a well-graded alluvial mix that contains all size classes along with optimum fine material and water content for compaction and support of vegetative plants. This example is for illustration only.

**Note -The C.O. will utilize this range for approval of acceptable materials for Compacted Fill. The C.O. and Engineer will work with the Contractor to develop a fill mixture that will meet requirements given materials readily found and accessible on site.

## COMPACTED FILL PLACEMENT NOTES:

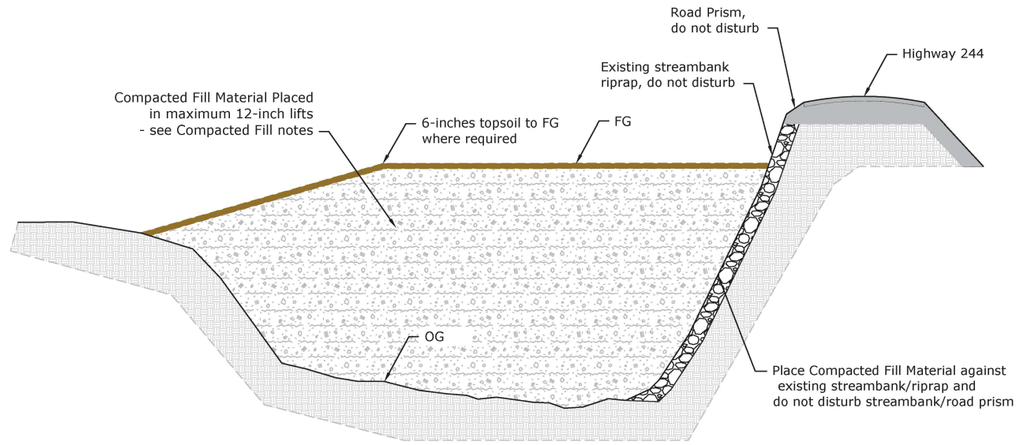
1. Treat fill area prior to fill placement as follows:
   - Salvage existing vegetation at direction of C.O.
   - Salvage exposed boulders greater than 14-inches for re-use
   - Remove organics as necessary and at direction of C.O.
   - Salvage sod and soil as directed by C.O.
2. Prepare Compacted Fill Material:
   - Compacted Fill material shall be a well graded mix and be near optimum moisture content for compaction. Fill material shall be approved by the C.O. before placement at each compacted fill area. Working with the Engineer or C.O., develop well-graded compacted fill material per table herein or as directed.
3. Place compacted fill material in maximum of 12-inch lifts, and compact thoroughly. No testing of compacted density will be performed; acceptance will be by the C.O.or Engineer observing fill placement and compaction effort. The intent of compaction will be to achieve approximately 85% relative density.
4. Place additional lifts and repeat until finish grade is met.
5. Where indicated on plans, place topsoil to finished grade per topsoil specifications, elsewhere, scarify top 3-inches of fill at direction of C.O.

## GENERAL FILL MATERIAL

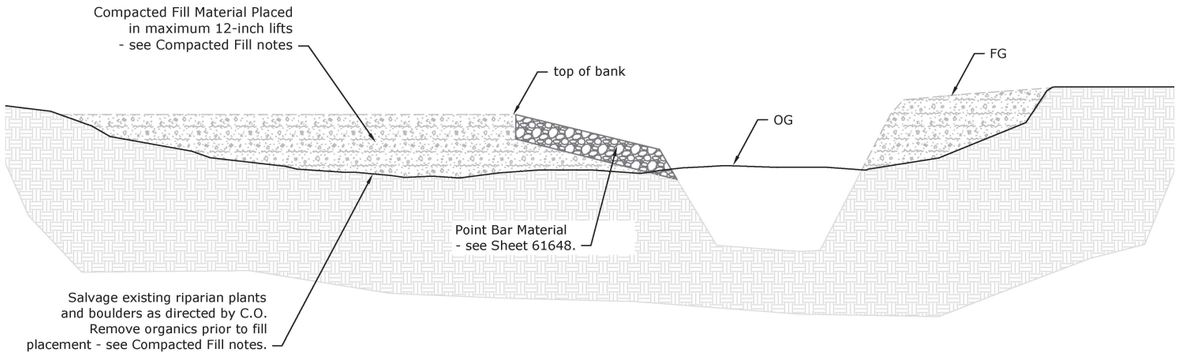
General Fill can be placed in all required floodplain or upland fill areas outside of constructed channel features that are not identified as requiring Compacted Fill. All General Fill shall be approved by the Engineer or C.O. for use as fill material prior to placement. General Fill has a broad range of acceptable material properties, but shall be well-graded, shall be compactable and not contain greater than 10% water content.

## GENERAL FILL NOTES:

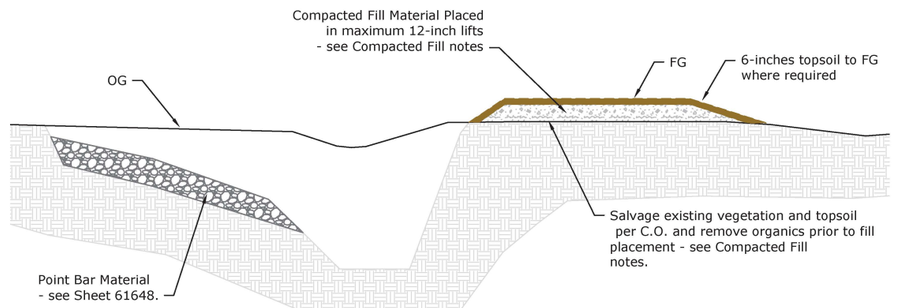
1. Treat fill area prior to fill placement as follows:
   - Salvage existing vegetation at direction of C.O.
   - Salvage exposed boulders greater than 14-inches for re-use
   - Remove organics as necessary and at direction of C.O.
   - Salvage sod and soil as directed by C.O.
2. Place general fill material in maximum of 12-inch lifts, and compact with tracks of machine unless otherwise directed by C.O. to meet finish grade. No testing of compacted density will be performed; acceptance will be by the C.O. observing fill placement and compaction effort. Place additional lifts and repeat until finish grade is met.
3. Where indicated on plans, place topsoil to finished grade per topsoil specifications, elsewhere, scarify top 3-inches of fill at direction of C.O.




**EXISTING CHANNEL FILL TYPICAL HIGHWAY 244 SECTION VIEW**
NOT TO SCALE




**EXISTING CHANNEL FILL TYPICAL SECTION VIEW**
NOT TO SCALE




**FLOODPLAIN FILL TYPICAL SECTION VIEW**
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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Nielsen P.E. |
| DRAWN | J. Nielsen P.E. |
| CHECKED | J. Bryant P.E. |
| | JUSTIN NIELSEN 2020.03.13 12:03:34 -06'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL - PROGRAM MANAGER |
| BOISE, ID | 2020-03-13 |

FILL MATERIALS & PLACEMENT

DETAILS

1678-100-61643

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2020-03-10
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CAD SYSTEM
AutoCAD 23.0s
ACAD FILE NAME
LM-FILL MATERIALS.DWG

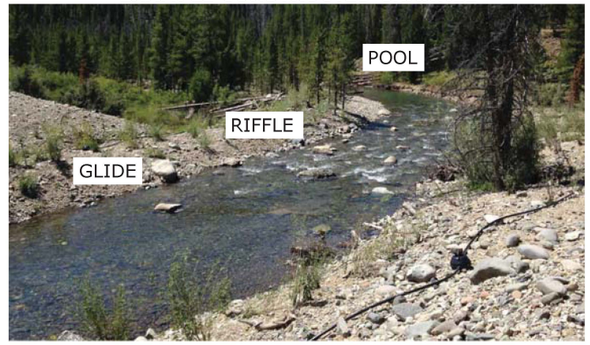
## CHANNEL MATERIALS OVERVIEW

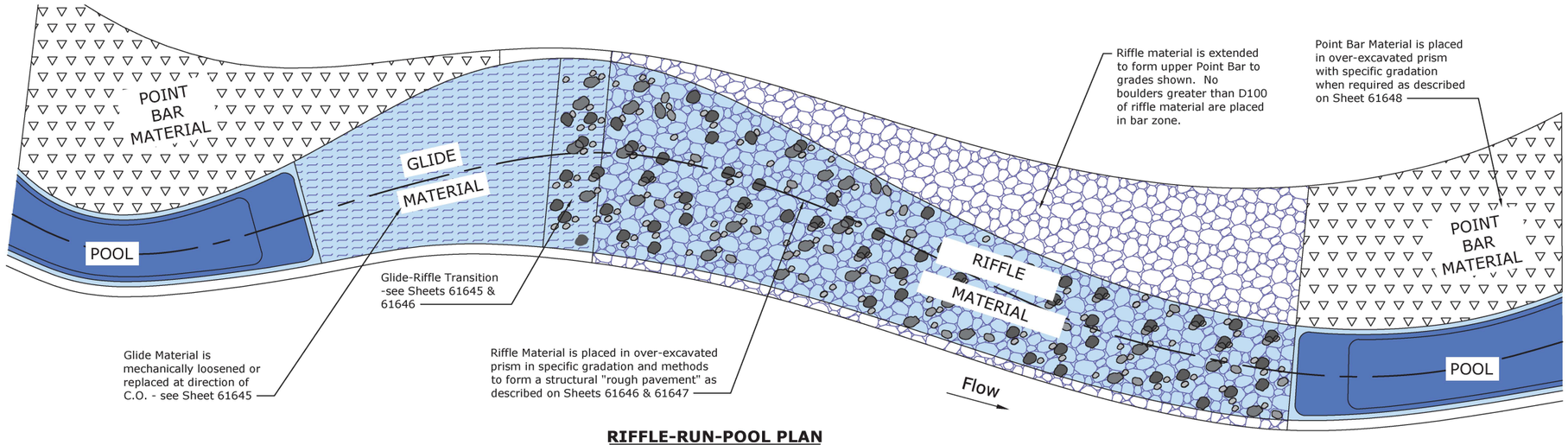
Constructed channel features are intended to mimic a natural stream channel. Riffles are critical to project success and are to be constructed to be stable and to provide hydraulic roughness and fish resting areas through small pocket pool development. Riffles are to be constructed such that low flows remain on the surface. Glide features are located between pools and riffles and are formed by mobile bed material. Glide features are used for spawning by salmon and steelhead, which require clean, sub-rounded to rounded alluvium of specific size. Glides will not be overly compacted and will contain minimum fines. Bar features are located on the inside of meander bends and along longitudinal margins. Bar features are a mixture of alluvial materials with gradations that replenish glide and riffle features during high flow events.

### Channel Material Notes:

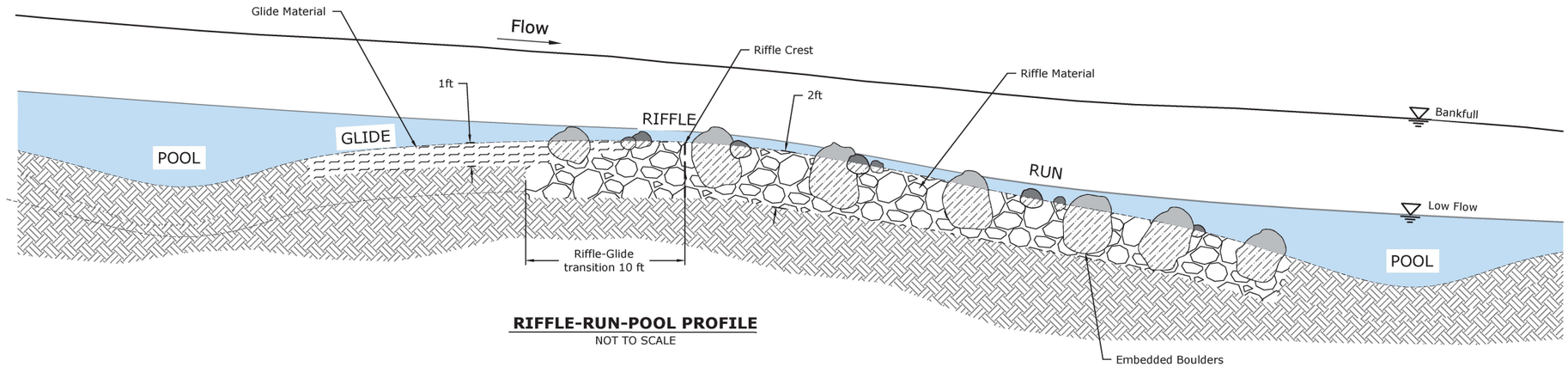
1. This project has been designed to have specific channel materials for both stability and habitat objectives. It is important for the Contractor to pay particular attention to channel materials and specifications as shown in these plans. Channels shall be graded as shown in grading plans with some finish grading required to blend to existing features as directed by the contracting officer (C.O.)
2. Pools are designed to be self-maintaining within native materials and additional large wood for stability and habitat cover as shown in Large Wood plans.
3. Glides are designed to provide lightly packed gravel-cobble of specific size with minimal fines for spawning substrate. Additionally, glides are to provide a transition from pool to riffle crest with boulders placed near each riffle crest transition as directed by the C.O.
4. Riffles are designed to provide a hardened and rough surface made of specific-well-graded material. Riffles are designed to provide vertical channel stability and withstand hydraulic forces. Riffles also provide fish habitat through boulder and margin roughness elements.
5. Runs are designed as riffle transitions to pools and are formed by both riffle and point bar grading. Grading of these transitions is essential and the Contractor must refer to grading plans and additional direction by the C.O.

### EXAMPLE CONSTRUCTED CHANNEL




**RIFFLE-RUN-POOL PLAN**
NOT TO SCALE




**RIFFLE-RUN-POOL PROFILE**
NOT TO SCALE

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GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | M. Knutson P.E. |
| DRAWN | M. Knutson P.E. |
| CHECKED | M. Knutson P.E. |
| | JUSTIN NIELSEN 2020.03.13 12:07:08 -08'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL - PROGRAM MANAGER |
| BOISE, ID | 2020-03-13 |

CHANNEL MATERIALS OVERVIEW

DETAILS

1678-100-61644

SHEET 1

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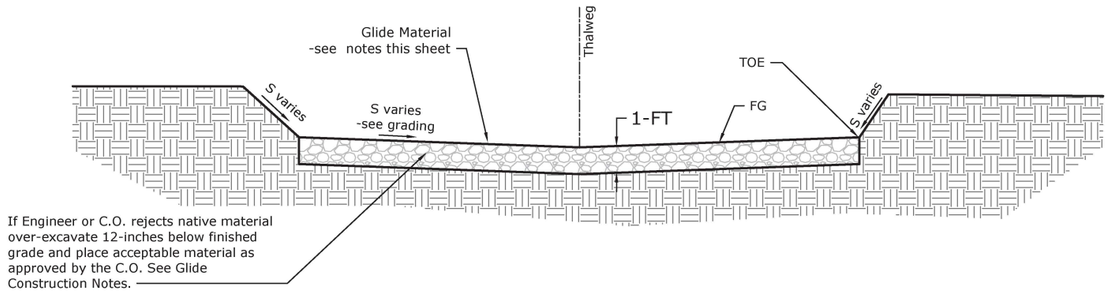
## GLIDE OVERVIEW

Glide features are located between pools and riffles and are formed by mobile bed material. Glide features are used for spawning by salmon and steelhead, which require clean, sub-rounded alluvium of specific size. Glide features will not be overly compacted and will contain minimal fines.

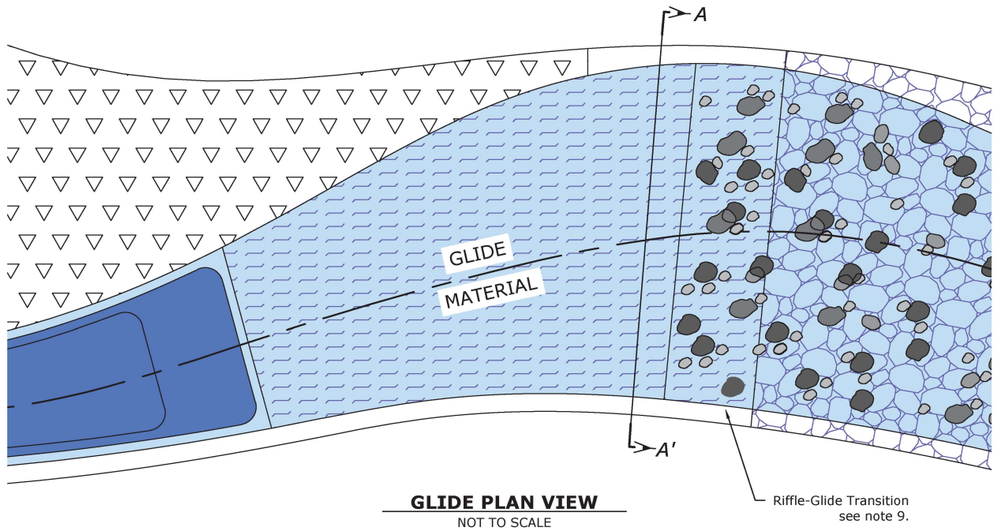
## GENERAL NOTES - GLIDE FEATURES

1. For this project, glides will consist of native material graded to lines and grades within glide areas as shown on grading plans and un-compacted as necessary. However, in locations where native materials are not within prescribed specifications, native materials will be replaced with constructed glide material to a depth of 1-foot as shown and described herein.
2. Locations for native glide material replacement will be made by inspection in the field by the C.O. or Engineer. If the native material is not acceptable, the C.O. and Engineer will work with the Contractor to develop a glide mixture that meets these specifications with materials found onsite.
3. Potential replacement quantities of glide material have been estimated and are tabulated on this sheet. Quantities are based upon identified glide areas assuming a 1-foot replacement depth.




**SECTION A - A' TYPICAL GLIDE MATERIAL SECTION - FOR AREAS WITH UNSUITABLE NATIVE MATERIAL**

NOT TO SCALE




**GLIDE PLAN VIEW**

NOT TO SCALE

## GLIDE CONSTRUCTION NOTES:

1. Excavate native material to design grade. Rip and uncompact native material so it is unconsolidated for a depth of 12-inches below the finished grade.
2. C.O. or Engineer shall inspect and accept or reject glide material after it has been uncompacted.
3. If native material is accepted by C.O. or Engineer leave material in its unconsolidated condition.
4. Replace unsuitable glide material with material that meets constructed glide material gradation as shown on this sheet.
5. For unsuitable material over-excavate glide areas shown on Drawings to 1-foot below finish grade.
6. Place glide material meeting the specifications below for constructed glide material directly upstream of riffles and feather into pool for a natural appearance, as shown in plans and as directed by the C.O.
7. Glide material will be clean and sub-rounded to rounded native gravel and cobble with minimal fines as approved by C.O.
8. Spread glide material with minimal compaction.
9. Feather glide material over riffle at riffle-glide transition to appear natural per C.O.

**POTENTIAL REPLACEMENT QUANTITIES OF GLIDE MATERIALS BY LOCATION** (see General Note 3.)

| VOLUMES OF PLACED GLIDE MATERIAL (IF REQUIRED) | |
|---|---|
| Approximate Channel Thalweg Alignment Station | Glide Material Replacement Quantity (CY) |
| MC 27+50 | 20 |
| MC 31+15 | 160 |
| MC 35+50 | 70 |
| MC 40+95 | 144 |
| MC 43+77 | 142 |
| MC A 0+55 | 77 |
| MC B 0+47 | 73 |
| SC-2 2+91 | 1 |
| SC-3 1+05 | 95 |
| SC-3 4+40 | 7 |
| SC-3 6+35 | 2 |
| SC-5 0+14 | 25 |

| VOLUMES OF PLACED GLIDE MATERIAL (IF REQUIRED) | |
|---|---|
| Approximate Channel Thalweg Alignment Station | Glide Material Replacement Quantity (CY) |
| SC-5 3+75 | 10 |
| SC-5 7+40 | 14 |
| SC-5 10+90 | 4 |
| SC-5 12+90 | 5 |
| SC-5 15+00 | 5 |
| SC-5 16+85 | 12 |
| SC-5 19+65 | 5 |
| SC-5 21+75 | 6 |
| SC-5 23+15 | 9 |
| SC-5B 0+35 | 7 |
| SC-5C 0+23 | 7 |

Table Notes:

1. Quantities for glide features assumed 12 inches over the entire surface area.

| ACCEPTABLE NATIVE GLIDE MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 6 inches |
| 84% | 3 inches - 5 inches |
| 50% | 1 inch - 3 inches |
| 16% | 0.5 inch - 1 inch |

| CONSTRUCTED GLIDE MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 6 inches |
| 84% | 3 inches |
| 50% | 2 inches |
| 16% | 1 inch |
| 10% | < 0.5 inches |

GRADATION NOTES:

1. Percent passing size class is based on the nominal diameter of rock.
2. Nominal diameter shall be measured as the intermediate axis where the small and large axis shall not be more than 3 times less than or greater than the nominal diameter.
3. Acceptable placed glide material may be created from stockpiles of various sized screened materials. The C.O. and Engineer shall work with the Contractor to develop an acceptable mixture to meet the requirements above.

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Bryant P.E.
DESIGNED
J. Bryant P.E.
DRAWN
M. Knutson P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 12:08:14 -08'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

GLIDE MATERIALS & CONSTRUCTION

DETAILS

1678-100-61645

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CAD SYSTEM
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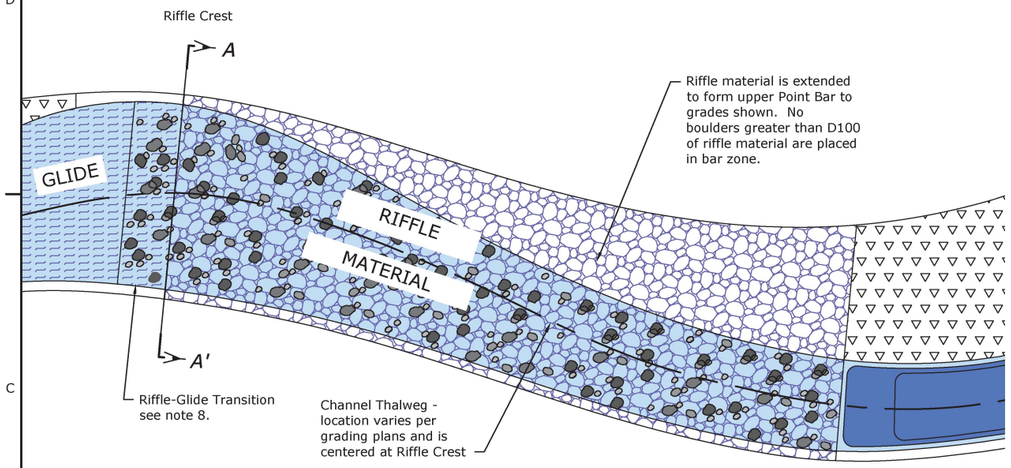
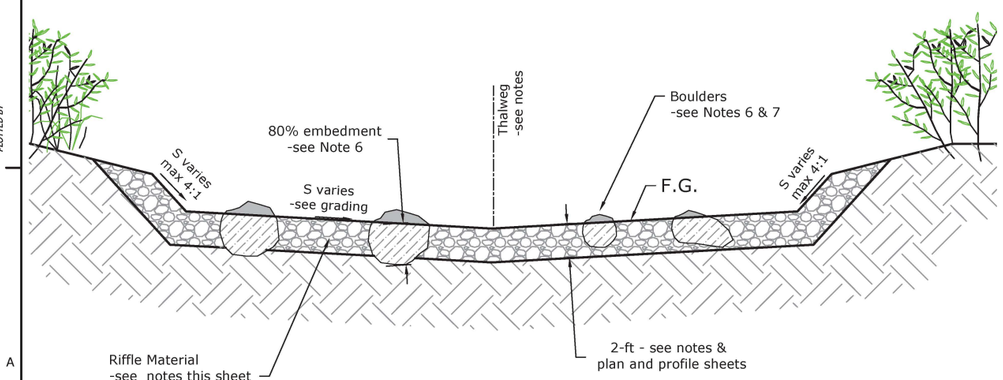
## RIFFLE OVERVIEW

Riffle features are intended to mimic a natural stream channel. Riffles are to be constructed to be stable and to provide hydraulic roughness and fish resting areas through small pocket pool development. Riffles are to be constructed such that low flows remain on the surface.




**TYPICAL RIFFLE PLAN VIEW**
NOT TO SCALE

Note - typical riffle section view shown at Riffle Crest. Thalweg and side slopes vary - see grading plans.

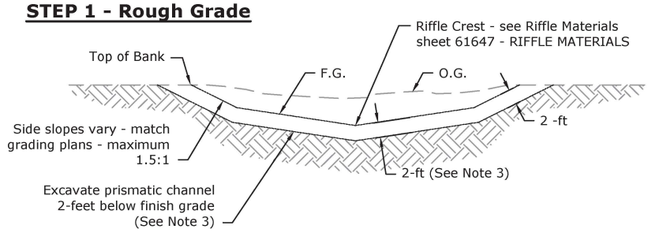



**TYPICAL RIFFLE MATERIAL SECTION A - A' - FOR CONSTRUCTED RIFFLES**
NOT TO SCALE

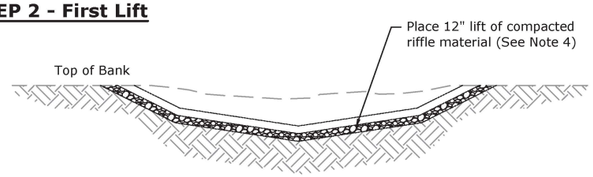
## RIFFLE CONSTRUCTION STEPS

Not to Scale

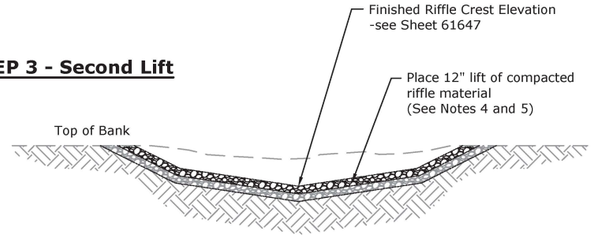
### STEP 1 - Rough Grade



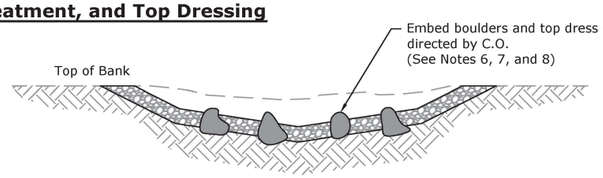

### STEP 2 - First Lift




### STEP 3 - Second Lift



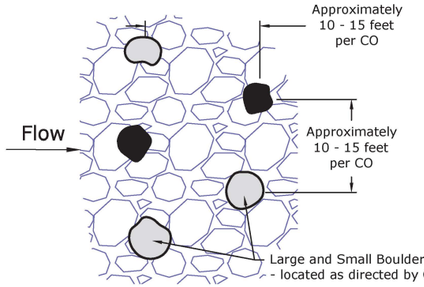

### STEP 4 - Boulder Placement, Bank Treatment, and Top Dressing




## RIFFLE CONSTRUCTION NOTES:

1. Stockpile channel materials per design specifications. Materials are to be stockpiled in the immediate project area or transported from the sorting area as needed.
2. Three placements are required as follows:
   1. Constructed Riffle Material (See Sheet 61647)
   2. Fines (Silty-Sand to wash-in)
   3. Large and Small Boulders (For Embedment)
3. Treat existing channel bed by removing organics and creating a prismatic working surface following channel thalweg and design contours on grading sheets. Rough grade from finish grade 2-ft in channel bed as shown on plan and profile sheets. Rough grade banks by 2-ft to slopes shown on grading plans and not exceeding 4:1.
4. Import well-mixed Riffle Material (see next sheet.) Compact riffle material in 12-inch lifts using tracked 300 Series Excavator, or similar equipment as approved by C.O. Track on matrix material sufficiently to compact material. Add a layer of additional fines on the surface. Wash fines into matrix material using a trash pump and 2-inch hose until water ponds on the surface and approved by the C.O. -see photo this sheet.
5. Repeat riffle construction in another 12-inch lift to design channel thalweg F.G. and shape.
6. Boulders of various sizes (Large and Small - See Table on next sheet) are to be added to the riffle to create diverse flow paths and habitat. Boulders to be located by the C.O. or Engineer. Each boulder is to be embedded to a minimum of 80% of the boulder diameter and re-compacted per note 7.
7. Excavate pockets into riffle material and set boulders to 80% embedment. Wash additional fines into matrix surrounding boulders and compact with excavator bucket as directed by C.O.
8. Feather surrounding channel materials to include glide material at riffle-glide transition and point bar material at riffle-bar transition to form a natural appearance.

**BOULDER PLACEMENT (see Note 6)**
NOT TO SCALE






**WASHING-IN FINES**

FInes are washed in until water ponds on surface for each lift - see note 4.



**COMPLETED RIFFLE**

Note - Finished appearance to include boulders, bank treatment, and water ponded on surface.

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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | M. Knutson P.E. |
| DRAWN | M. Knutson P.E. |
| CHECKED | J. Bryant P.E. |
| TECH. APPR. | JUSTIN NIELSEN 2020.03.13 12:09:04 -07'00' P.E. |
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| BOISE, ID | 2020-03-13 |

RIFFLE CONSTRUCTION DETAILS

1678-100-61646

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## RIFFLE MATERIALS OVERVIEW

These plans contain Class 1, Class 2, and combined Class 1 and Class 2 Riffles. Class 1 riffle zones are critical features to project success and shall be built from materials that are formed by excavation, sorting, and mixing specific sized alluvium to achieve a well graded mixture that is placed at finished grade as shown in riffle construction details. Class 2 riffles are located in less-critical locations that are assumed to have acceptable native alluvial materials meeting Class 2 Riffle Material specifications below finished grade and may not require excavation and replacement. However, in Class 2 Riffle locations where native materials at finished grade are not within prescribed specification, excavation to a depth of 2 FT and replacement with Class 2 Riffle Materials sourced onsite shall occur as described herein.

| CLASS 1 - RIFFLE MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 12 inches |
| 84% | 7 inches |
| 50% | 3 inches |
| 30% | 1.5 inches |
| 16% | 0.5 inch |
| 10% | <0.08 inch |

### Class 1 - Constructed Riffle Material Notes:

1. Class 1 Riffle Materials shall be developed by Contractor onsite by screening and mixing to form a well graded and uniformly mixed substrate for placement in locations identified as Class 1 Riffle features.
2. It is assumed in the bid quantities that Riffle Materials 7-inches and smaller are to be sourced from excavated and screened alluvial materials found onsite unless otherwise approved by Engineer.
3. Riffle Materials 7-inches and larger are assumed to be mostly imported and shall meet specifications.

| CLASS 2 - RIFFLE MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 10 inches to 12 inches |
| 84% | 5 inches to 7 inches |
| 50% | 2 inches to 3 inches |
| 30% | 1 inch to 1.5 inches |
| 16% | 0.5 inch to 1 inch |
| 10% | <0.08 inch |

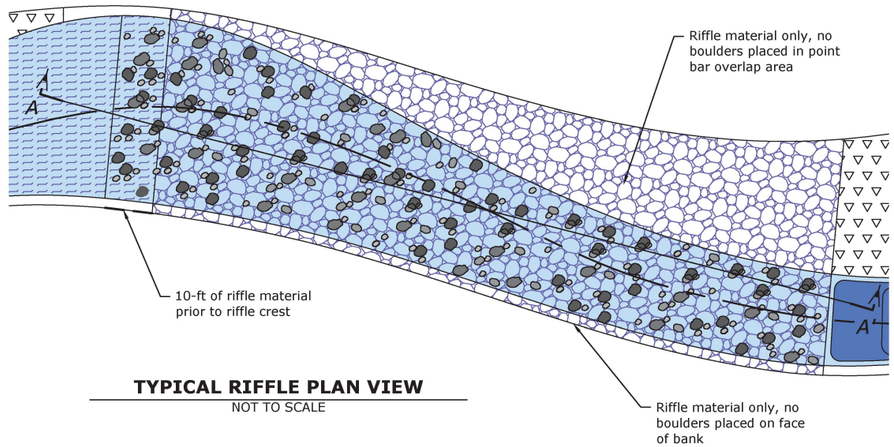
### Class 2 Riffle Material Notes:

1. Class 2 Riffle Material to be inspected and utilized or replaced in locations identified as Class 2 Riffle features within these plans unless otherwise directed by C.O. or Engineer.
2. The C.O. or Engineer shall inspect suitability of Class 2 material and accept or reject based upon the Class 2 Riffle Material gradation shown on this sheet. Inspection will be performed onsite to include pebble counts and photographic analysis.
3. If Class 2 material does not meet the specified Class 2 Riffle gradation, the Contractor shall over-excavate unsuitable material per "constructed riffle" dimensions and replace with suitable materials found onsite that meet Class 2 Riffle Material requirements per "constructed riffle" placement methods (see previous sheet).
4. Where placement of additional Class 2 Riffle Material is required to meet finish grade the Contractor shall follow riffle construction details, refer to previous sheet.

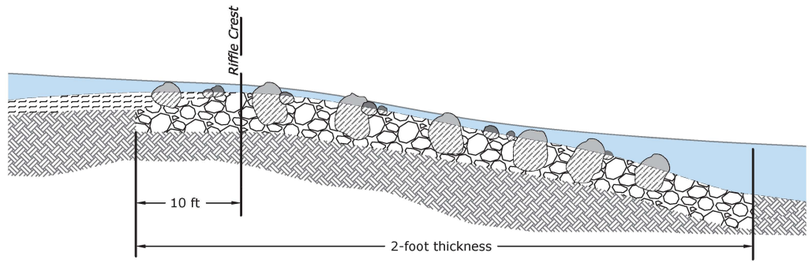
| BOULDERS | |
|---|---|
| Description | Size Class |
| Large Boulders | Greater than 24 inches |
| Small Boulders | 14 inch - 24 inch |

### Boulder Notes:

1. Large and Small Boulders to be stockpiled from known locations as identified on plans, from local haul sites, and from general excavation on site for use in Riffles as directed by C.O.
2. Boulder to be located for placement in each riffle by C.O. or Engineer.
3. Estimated quantities of boulders are shown in Riffle Requirements herein.




**TYPICAL RIFFLE PLAN VIEW**
NOT TO SCALE




**TYPICAL RIFFLE MATERIAL SECTION A - A' - FOR CONSTRUCTED RIFFLES**
NOT TO SCALE

### GRADATION NOTES:

1. Percent passing size class is based on the nominal diameter of rock.
2. Nominal diameter shall be measured as the intermediate axis where the small and large axis shall not be more than 3 times less than or greater than the nominal diameter.
3. Size Class is unique to these drawings and is not the Unified Soil Classification.
4. Acceptable riffle material may be created from stockpiles of various sized screened materials. The C.O. and Engineer shall work with the Contractor to develop an acceptable mixture to meet the requirements above.

## RIFFLE REQUIREMENTS BY CHANNEL STATION

| RIFFLE REQUIREMENTS BY CHANNEL STATION | | | | |
|---|---|---|---|---|
| Channel Station | Riffle Crest Elevation at Thalweg | Class 1 Volume Required (CY) | Class 2 Volume IF Required (CY) | Boulder (EA) |
| MC 27+75 | 3071.40 | | 800 | 60 |
| MC 31+85 | 3072.50 | 743 | | 74 |
| MC 31+85 | 3072.50 | | 758 | 44 |
| MC 36+10 | 3071.10 | | 548 | 33 |
| MC 41+50 | 3069.40 | 896 | | 92 |
| MC 44+72 | 3067.75 | 1300 | | 110 |
| MC A 1+20 | 3071.60 | | 929 | 61 |
| MC B 1+43 | 3067.50 | 405 | | 28 |
| SC-1 0+31 | 3083.00 | 12 | | 0 |
| SC-2 1+01 | 3080.50 | 87 | | 2 |
| SC-2 3+11 | 3080.00 | | 91 | 2 |
| SC-2 20+31 | 3072.20 | 137 | | 0 |
| SC-2 A 0+20 | 3072.00 | 245 | | 0 |
| SC-3 1+95 | 3080.50 | 269 | | 14 |
| SC-3 4+65 | 3079.40 | 283 | | 11 |
| SC-3 6+60 | 3078.60 | | 143 | 4 |

| RIFFLE REQUIREMENTS BY CHANNEL STATION | | | | |
|---|---|---|---|---|
| Channel Station | Riffle Crest Elevation | Class 1 Volume Required (CY) | Class 2 Volume IF Required (CY) | Boulders (EA) |
| SC-3 16+15 | 3074.10 | 288 | | 0 |
| SC-3 17+45 | 3072.60 | 142 | | 0 |
| SC-5 1+35 | 3067.80 | 193 | | 9 |
| SC-5 4+15 | 3067.00 | | 273 | 9 |
| SC-5 7+85 | 3065.90 | | 198 | 8 |
| SC-5 11+20 | 3064.90 | | 197 | 6 |
| SC-5 13+20 | 3064.40 | 107 | | 2 |
| SC-5 15+20 | 3063.80 | | 167 | 5 |
| SC-5 17+20 | 3063.20 | 277 | | 12 |
| SC-5 19+90 | 3062.30 | | 85 | 2 |
| SC-5 22+00 | 3061.80 | | 184 | 6 |
| SC-5 23+45 | 3061.40 | 226 | | 7 |
| SC-5A 1+00 | 3067.60 | 104 | | 7 |
| SC-5A 1+00 | 3067.60 | | 157 | 12 |
| SC-5B 0+70 | 3064.60 | 96 | | 3 |
| SC-5C 0+54 | 3062.30 | | 139 | 3 |

### Table Notes:

1. Quantities for Class 1 Riffle features based on area identified for constructed riffle by the depth requirements shown on riffle construction details.
2. Quantities for Class 2 Riffle features are shown in the event that the material is determined to be unsuitable. The quantity for each riffle is based on replacement of the entire area shown to a depth of 2 feet. The quantity in the bid sheet shows full replacement for all Class 2 Riffles however, payment shall only be made for Class 2 Riffles requiring replacement as determined by inspection, see specifications.

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Managing Water in the West

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95773PE
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OREGON
JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Bryant P.E.
DESIGNED
J. Bryant P.E.
DRAWN
M. Knutson P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 12:09:43 -08'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - PROGRAM MANAGER
BOISE, ID 2020-03-13

RIFFLE MATERIALS

DETAILS

1678-100-61647
SHEET 1

DATE AND TIME PLOTTED
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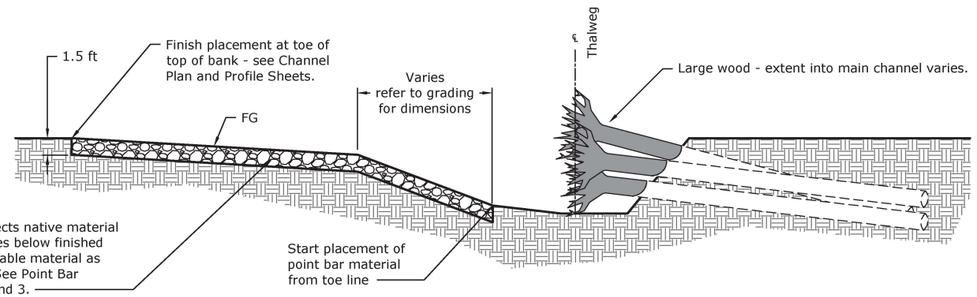
CAD SYSTEM
CAD FILENAME

## POINT BAR OVERVIEW

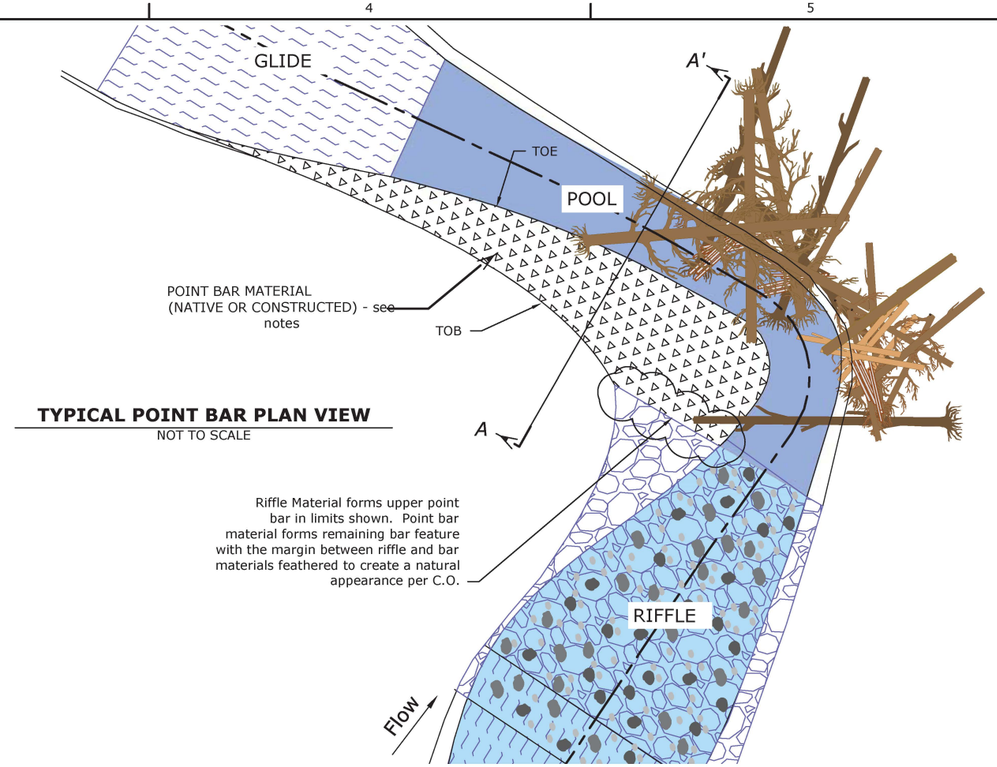
Point bars are located at inside of meander bends and consist of well-graded alluvium that is stored by the stream and mobilized in large storm events. This material replenishes glide and riffle material.

## GENERAL NOTES - POINT BAR FEATURES

1. For this project, point bars will consist of either 18-inches of constructed point bar material placed to finish grade or native material graded to lines and grades within point bar areas as shown on grading plans and compacted as detailed herein. Point bars in areas requiring fill (typically existing channels) to meet lines and grades are assumed to require full placement of constructed point bar materials. Point bars in areas of cut (typically newly excavated channels) to meet finished lines and grades may meet the acceptable native point bar material specifications and may not require excavation and replacement. However, in locations where native materials at finished grade are not within prescribed specifications, excavation to a depth of 18" and replacement with constructed point bar material to finished grade is required. Estimated volumes of Constructed Point Bar Materials are listed in the tables below for each point bar based on the assumption of the point bar areas shown in these plans to a depth of 18 inches. Payment for point bar bid item shall only be made on point bars requiring placement of constructed point bar materials, see specifications.
2. Locations for point bar re-construction may vary from these plans with determinations made in the field by the C.O. or Engineer. The C.O. and Engineer will work with the Contractor to develop a point bar construction mixture that meets specifications with materials found onsite.
3. Point bar extents are shown on channel plan and profile sheets and shall generally extend from toe at top of channel to toe of bank and feather into adjacent riffle and glide features.
4. Potential replacement quantities of point bar material have been estimated and are tabulated on this sheet. Quantities are based on identified point bar areas assuming an 18-inch replacement depth.




**A - A' TYPICAL POINT BAR POOL CROSS SECTION**
NOT TO SCALE




**TYPICAL POINT BAR PLAN VIEW**
NOT TO SCALE

## POTENTIAL REPLACEMENT QUANTITIES OF POINT BAR MATERIALS BY LOCATION (see General Note 4)

| POINT BAR REQUIREMENTS BY CHANNEL STATION | |
|---|---|
| Approximate Channel Thalweg Alignment Station | Volume Required (CY) |
| MC 8+00 | 320 |
| MC 29+50 | 704 |
| MC 34+75 | 354 |
| MC 37+50 | 559 |
| MC 40+00 | 597 |
| MC 43+00 | 487 |
| MC 45+50 | 443 |
| MC 58+00 | 119 |
| MC B 2+75 | 69 |
| SC-2 22+25 | 119 |
| SC-3 6+25L | 59 |
| SC-3 6+25R | 490 |
| SC-3 18+65 | 120 |
| SC-5 3+25 | 105 |
| SC-5 6+75 | 167 |

| POINT BAR REQUIREMENTS BY CHANNEL STATION | |
|---|---|
| Approximate Channel Thalweg Alignment Station | Volume Required (CY) |
| SC-5 10+50 | 66 |
| SC-5 12+00 | 54 |
| SC-5 14+50 | 36 |
| SC-5 15+00 | 30 |
| SC-5 16+25 | 41 |
| SC-5 17+00 | 15 |
| SC-5 18+25 | 28 |
| SC-5 19+00 | 20 |
| SC-5 21+00 | 66 |
| SC-5 21+50 | 47 |
| SC-5 23+00 | 105 |
| SC-5B 1+50 | 42 |
| SC-5C 1+75 | 30 |

Table Notes:
1. Quantities for point bars assumed 18 inches over the entire surface area.

## POINT BAR CONSTRUCTION NOTES:

1. Refer to Channel Plan and Profile sheets for Point Bar extents, design elevations, and offsets of pool sections.
2. Engineer or C.O. shall inspect suitability of native material and accept or reject native material based on the acceptable native point bar material gradation shown on this sheet.
3. If native material does not meet the specified gradation, the Contractor shall over-excavate unsuitable material to 18-inches depth and replace with specified point bar material (See constructed point bar material gradation this sheet) to design finish grade.
4. Point Bar material shall meet the gradations on this sheet and shall be well-mixed.
5. Point Bar material is to be placed in maximum of 1-foot lifts with machine compaction utilizing tracked excavator or dozer as accepted by Engineer.

| ACCEPTABLE NATIVE POINT BAR MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 6 inches |
| 84% | 3 inches - 5 inches |
| 50% | 1 inch - 3 inches |
| 16% | 0.5 inch - 1 inch |

| CONSTRUCTED POINT BAR MATERIAL | |
|---|---|
| Percent Passing | Size Class |
| 100% | 6 inches |
| 84% | 3 inches |
| 50% | 2 inches |
| 16% | 1 inches |
| 10% | < 0.5 inches |

## GRADATION NOTES:

1. Percent passing size class is based on the nominal diameter of rock.
2. Nominal diameter shall be measured as the intermediate axis where the small and large axis shall not be more than 3 times less than or greater than the nominal diameter.
3. Acceptable placed point bar material may be created from stockpiles of various sized screened materials. The C.O. and Engineer shall work with the Contractor to develop an acceptable mixture to meet the requirements above.

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JAN. 14,2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

J. Bryant P.E. — DESIGNED
J. Bryant P.E. — DRAWN
M. Knutson P.E. — CHECKED
JUSTIN NIELSEN 2020.03.13 12:10:21 -06'00' P.E. — TECH. APPR.
TED DAY — APPROVED (ADMIN APPROVAL - PROGRAM MANAGER)
BOISE, ID 2020-03-13

POINT BAR MATERIALS & CONSTRUCTION

DETAILS

1678-100-61648
SHEET 1

DATE AND TIME PLOTTED
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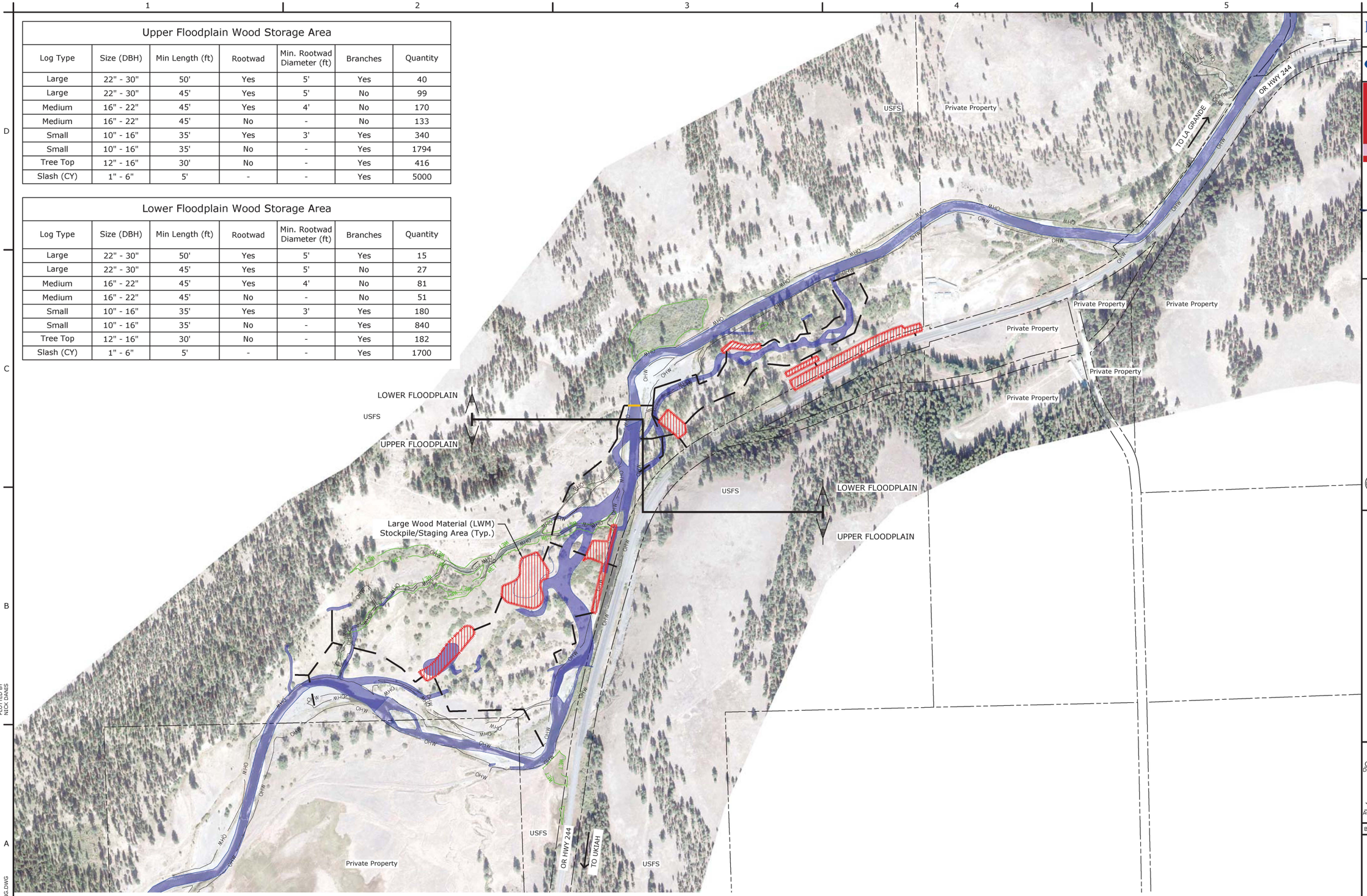
CAD SYSTEM
CAD FILENAME

| Upper Floodplain Wood Storage Area | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 50' | Yes | 5' | Yes | 40 |
| Large | 22" - 30" | 45' | Yes | 5' | No | 99 |
| Medium | 16" - 22" | 45' | Yes | 4' | No | 170 |
| Medium | 16" - 22" | 45' | No | - | No | 133 |
| Small | 10" - 16" | 35' | Yes | 3' | Yes | 340 |
| Small | 10" - 16" | 35' | No | - | Yes | 1794 |
| Tree Top | 12" - 16" | 30' | No | - | Yes | 416 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 5000 |

| Lower Floodplain Wood Storage Area | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 50' | Yes | 5' | Yes | 15 |
| Large | 22" - 30" | 45' | Yes | 5' | No | 27 |
| Medium | 16" - 22" | 45' | Yes | 4' | No | 81 |
| Medium | 16" - 22" | 45' | No | - | No | 51 |
| Small | 10" - 16" | 35' | Yes | 3' | Yes | 180 |
| Small | 10" - 16" | 35' | No | - | Yes | 840 |
| Tree Top | 12" - 16" | 30' | No | - | Yes | 182 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 1700 |




WOOD MATERIAL QUANTITIES & STAGING

300 0 300 600 900
SCALE OF FEET

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19319PE
OREGON
NICHOLAS DANIS
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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

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BOISE, IDAHO 2020-03-13

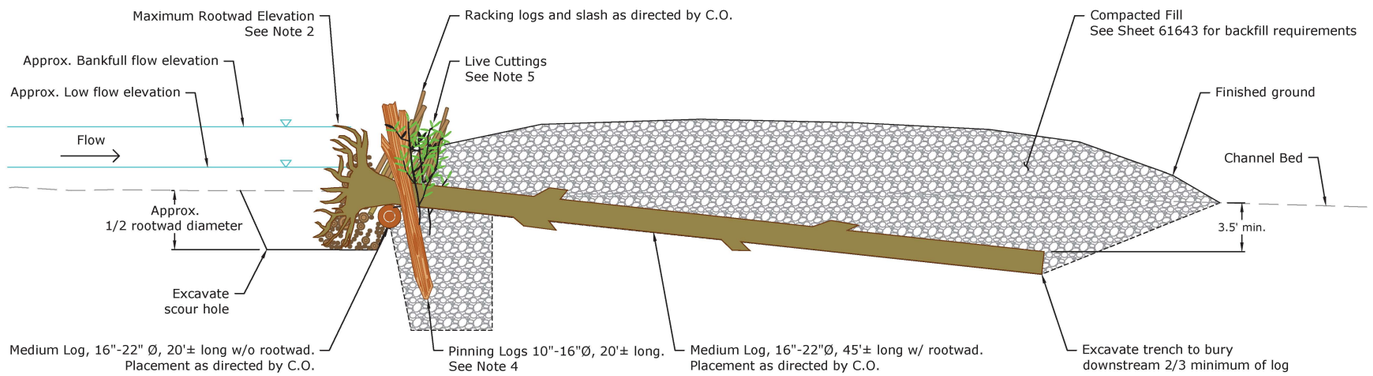
WOOD MATERIAL QUANTITIES & STAGING

1678-100-61649
SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LWM STAGING.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Plan Sheet |
|---|---|---|---|---|---|
| MC-1 | 2+50 | Left | A | Apex | 61606 |
| MC-10 | 7+15 | Left | A | Apex | 61607 |
| MC-43 | 36+10 | Left | A | Apex | 61612 |
| MC-60 | 44+60 | Left | A | Apex | 61613 |
| MC-61 | 44+60 | Right | A | Apex | 61613 |
| MC-62 | 46+55 | Right | A | Apex | 61613 |
| MC-63 | 54+45 | Right | A | Apex | 61614 |
| MC-64 | 57+60 | Right | A | Apex | 61615 |
| MC-68 | 65+50 | Right | A | Apex | 61616 |
| SC5-10 | 13+20 | Left | A | Apex | 61631 |
| SC5-20 | 20+07 | Right | A | Apex | 61632 |




SECTION A-A'

## Hydraulic Purpose:

* Create split flow, and protect or create vegetated island or gravel bar.
* Create scour pool and sort sediment.

## Habitat Purpose:

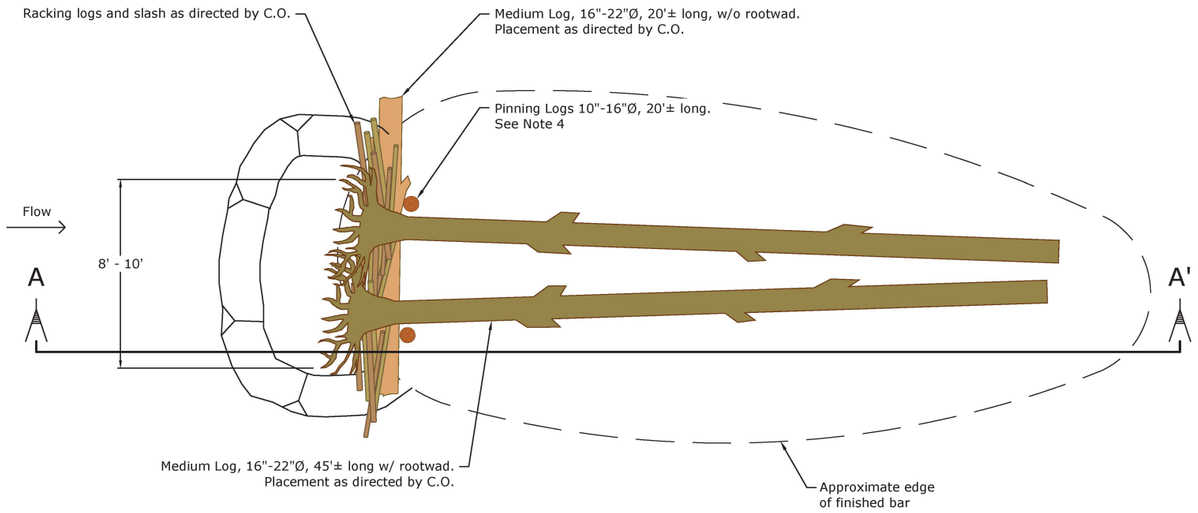
* Accumulate debris over time.
* Enhance fish habitat complexity and diversity.

| TYPE A - APEX JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH*) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Medium | 16" - 22" | 45' | Yes | 4' | No | 2 |
| Medium | 16" - 22" | 20' | No | - | No | 1 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 5 |
| Pinning | 10" - 16" | 20' | Optional | - | No | 2 |
| Slash (CY) | 1" - 6" | - | - | - | Yes | 5 |
| Live Cuttings | - | - | - | - | - | 9 |

* DBH = Diameter at breast height

## Construction Notes:

1. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
2. Top of rootwad should not exceed more than 1/2 foot above top of bank.
3. Backfill structure with Compacted Fill per Sheet 61643.
4. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs with rootwads shall be used and installed by excavation per Sheet 61660.
5. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be provided by Contracting Agency. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted.
6. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
7. Structure location may be field adjusted By C.O.
8. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
9. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.




PLAN VIEW

TYPE A - APEX JAM
NOT TO SCALE

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Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
THOMAS S. [illegible]
EXPIRES: 12/31/21

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:17:22 -06'00' P.E.
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BOISE, IDAHO 2020-03-13

TYPE A - APEX JAM

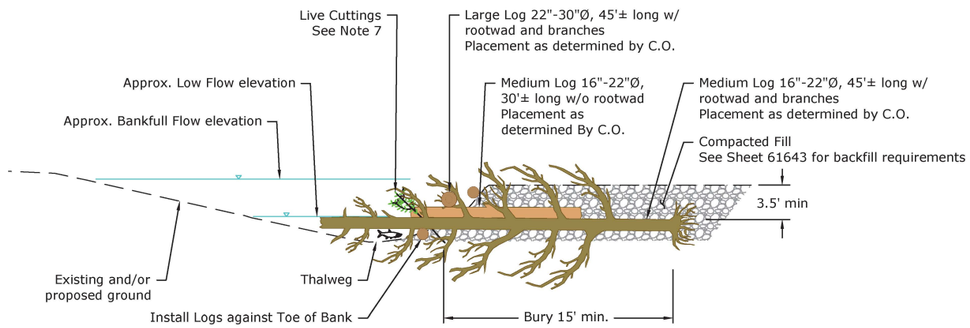
1678-100-61650

SHEET 1

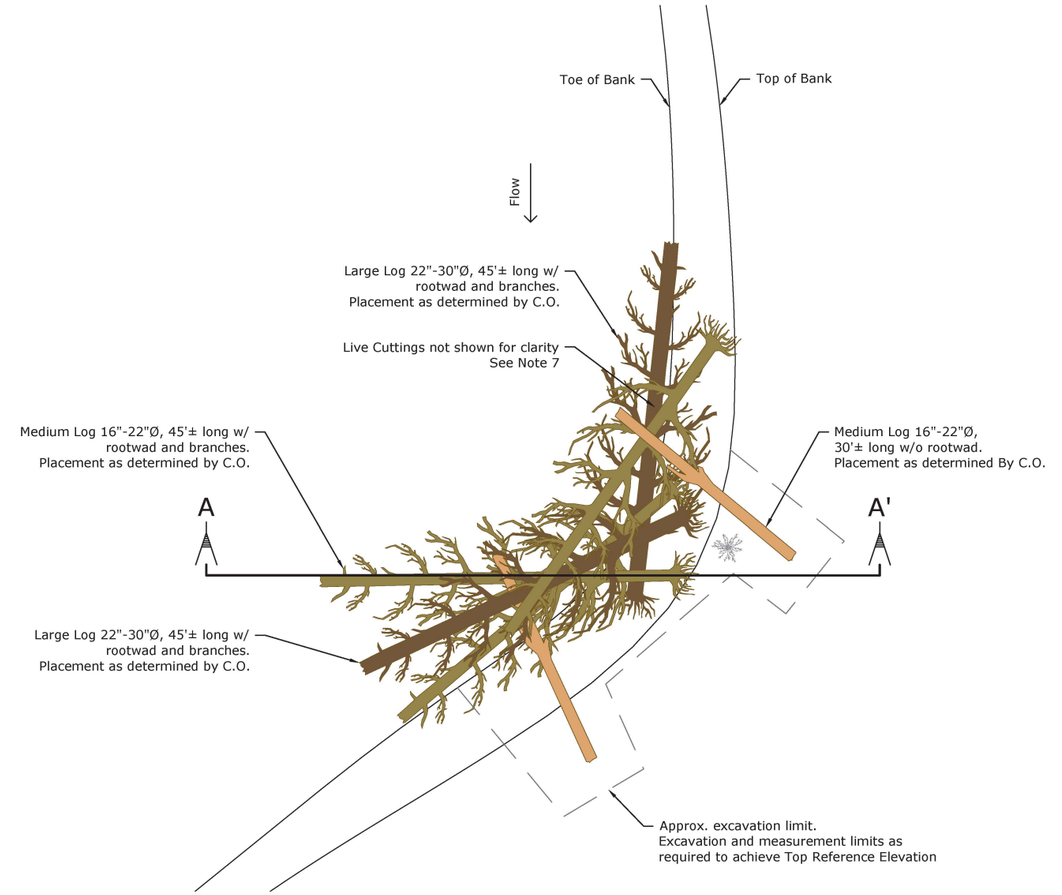
DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_APEX JAM.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-36 | 34+45 | Left | B | Meander Mallet | 3076.5 | 3066.0 | 61611 |
| MCB-1 | 2+85 | Left | B | Meander Mallet | 3073.0 | 3062.5 | 61619 |
| SC3-9 | 6+00 | Right | B | Meander Mallet | 3081.0 | 3070.5 | 61626 |
| SC5-8 | 10+65 | Right | B | Meander Mallet | 3070.5 | 3060.0 | 61630 |
| SC5-9 | 11+90 | Left | B | Meander Mallet | 3069.5 | 3059.0 | 61631 |
| SC5-11 | 13+80 | Right | B | Meander Mallet | 3069.5 | 3059.0 | 61631 |
| SC5-12 | 16+15 | Left | B | Meander Mallet | 3068.5 | 3058.0 | 61631 |
| SC5-16 | 18+30 | Left | B | Meander Mallet | 3068.5 | 3058.0 | 61631 |
| SC5-21 | 20+45 | Left | B | Meander Mallet | 3067.5 | 3057.0 | 61632 |




SECTION A-A'




PLAN VIEW

TYPE B - MEANDER JAM MALLET JAM
NOT TO SCALE

## Hydraulic Purpose:

* Limit channel migration in the short term to restore aquatic and riparian habitat.
* Angle stream power into bed creating sustainable scour hole.

## Habitat Purpose:

* Enhance fish habitat by creating large bank side pools for fish holding and sediment sorting.
* Accumulate debris over time.
* Provide cover.

| TYPE B - MEANDER JAM MALLET JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH*) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 45' | Yes | 5' | Yes | 2 |
| Medium | 16" - 22" | 45' | Yes | 4' | Yes | 3 |
| Medium | 16" - 22" | 30' | No | - | No | 2 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 20 |
| Slash (CY) | 1" - 6" | - | - | - | - | 20 |
| Live Cuttings | - | - | - | - | - | 21 |

* DBH = Diameter at breast height

## Construction Notes:

1. Contractor to select Large and Medium logs, per table above with the approval of the C.O.
2. Contractor shall excavate to Foundation Elevation, by subtracting diameters of stacked logs from Top Reference Elevation. Approximate Foundation Elevation shown assumes a structure height of 10.5 feet. Foundation Elevation will vary based on materials and field conditions and is being provided for contractor reference only. Top Reference Elevation Point shall be held for finish grade by Contractor.
3. Contractor shall place logs as described in sequence plans on Sheet 61652.
4. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
5. Backfill structure with Compacted Fill per Sheet 61643.
6. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs w/ rootwads shall be used and installed by excavation per Sheet 61660.
7. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be provided by Contracting Agency. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted.
8. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
9. Structure location may be field adjusted By C.O.
10. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
11. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.

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REGISTERED PROFESSIONAL ENGINEER
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JOHN T. OKEY
03/13/2020
EXPIRES: 12/31/21

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ENHANCEMENT PROJECT

Contractor
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JUSTIN NIELSEN 2020.03.13 13:18:05 -06'00' P.E.
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BOISE, IDAHO 2020-03-13

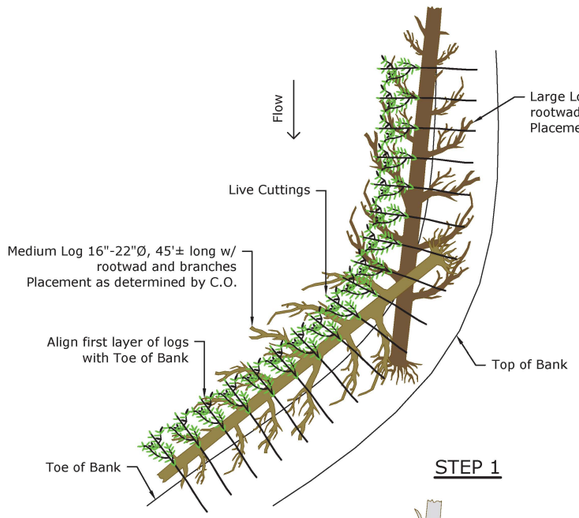
TYPE B - MEANDER JAM
MALLET JAM

1678-100-61651

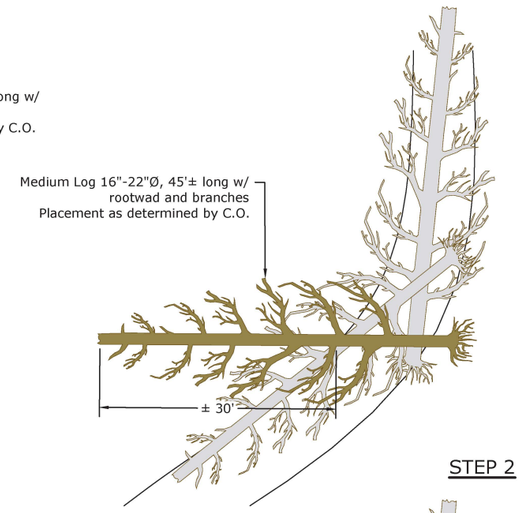
SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

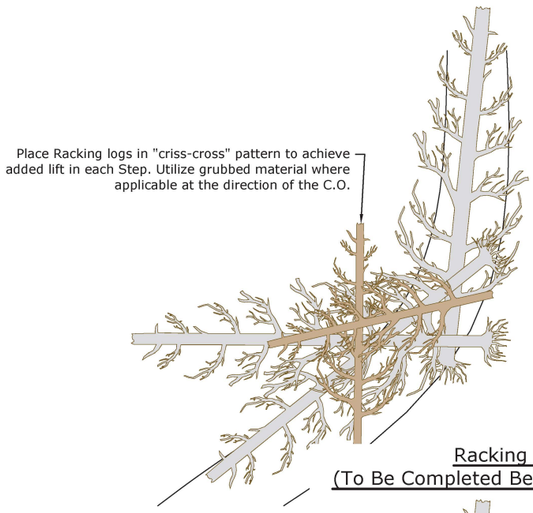
CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_MEANDER JAM.DWG



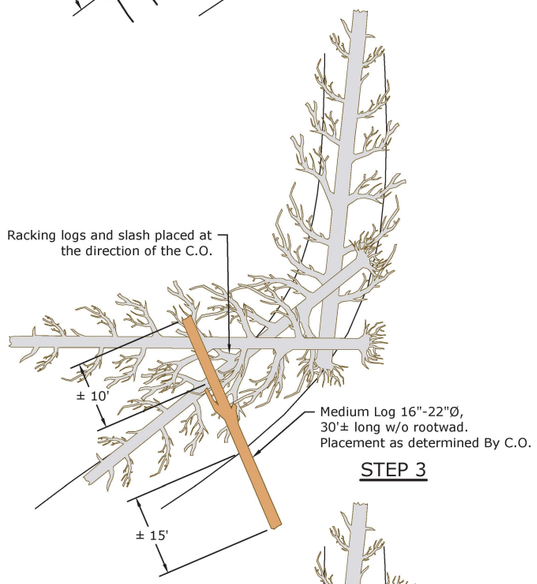

STEP 1



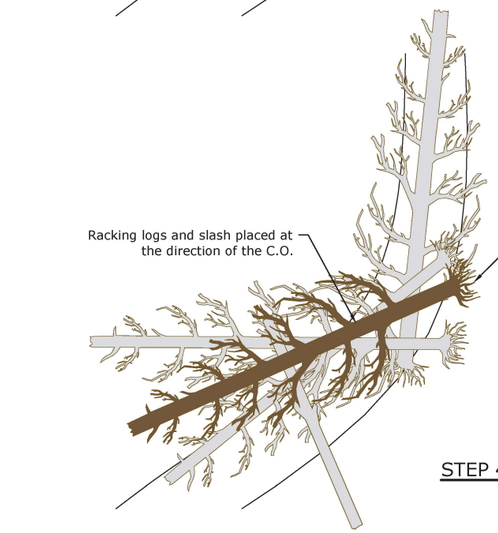

STEP 2



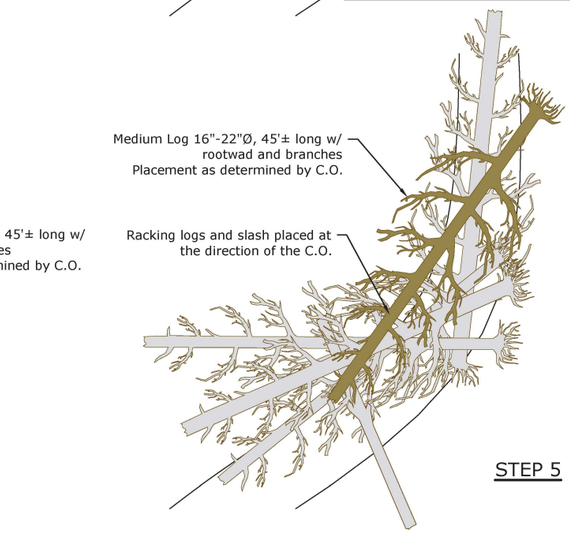

Racking Step
(To Be Completed Between Each Step)



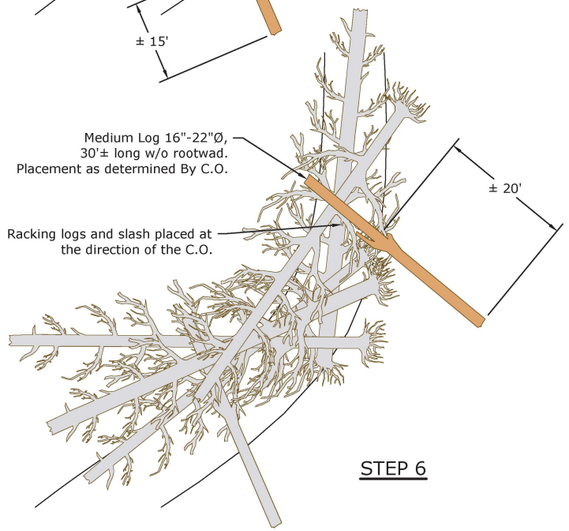

STEP 3




STEP 4




STEP 5




STEP 6

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79319PE
OREGON
03/13/2020
EXPIRES: 12/31/21

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:18:46 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

TYPE B - MEANDER JAM
MALLET JAM
SEQUENCING

SEQUENCING

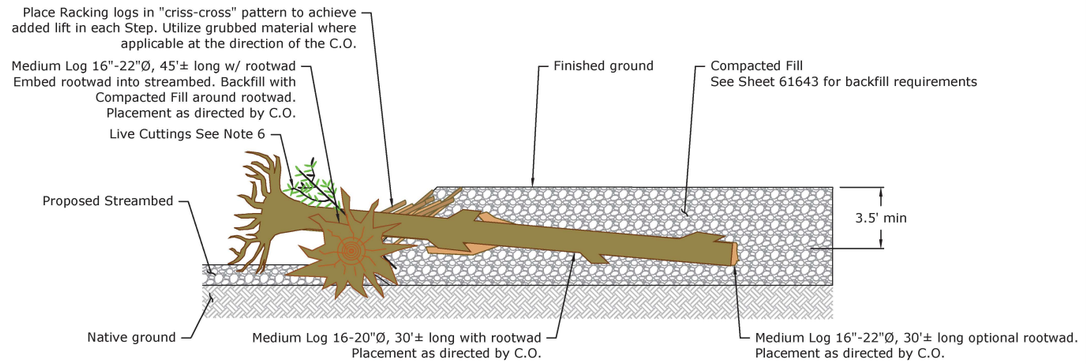
1678-100-61652

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_MEANDER JAM.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-32 | 32+10 | Right | C3 | 3-Log Channel Margin | - | - | 61611 |
| MC-33 | 32+55 | Right | C3 | 3-Log Channel Margin | - | - | 61611 |
| MC-34 | 33+00 | Right | C3 | 3-Log Channel Margin | - | - | 61611 |
| MC-42 | 35+80 | Right | C3 | 3-Log Channel Margin | - | - | 61611 |
| MC-65 | 57+75 | Right | C3 | 3-Log Channel Margin | - | - | 61615 |
| MC-66 | 57+85 | Right | C3 | 3-Log Channel Margin | - | - | 61615 |
| SC3-1 | 2+05 | Left | C3 | 3-Log Channel Margin | - | - | 61626 |
| SC3-8 | 5+60 | Right | C3 | 3-Log Channel Margin | - | - | 61626 |
| SC3-10 | 6+45 | Right | C3 | 3-Log Channel Margin | - | - | 61626 |
| SC3-11 | 14+70 | Left | C3 | 3-Log Channel Margin | - | - | 61628 |
| SC3-12 | 15+00 | Left | C3 | 3-Log Channel Margin | - | - | 61628 |
| SC3-15 | 15+80 | Right | C3 | 3-Log Channel Margin | - | - | 61628 |
| SC5-4 | 5+55 | Right | C3 | 3-Log Channel Margin | - | - | 61630 |




SECTION A-A'

## Hydraulic Purpose:

* Temporarily stabilize new banks in the short term to restore aquatic and riparian habitats.
* Maintain scour holes by flow convergence.
* Divert high flows into side channels and floodplain.
* Sort and retain gravel.

## Habitat Purpose:

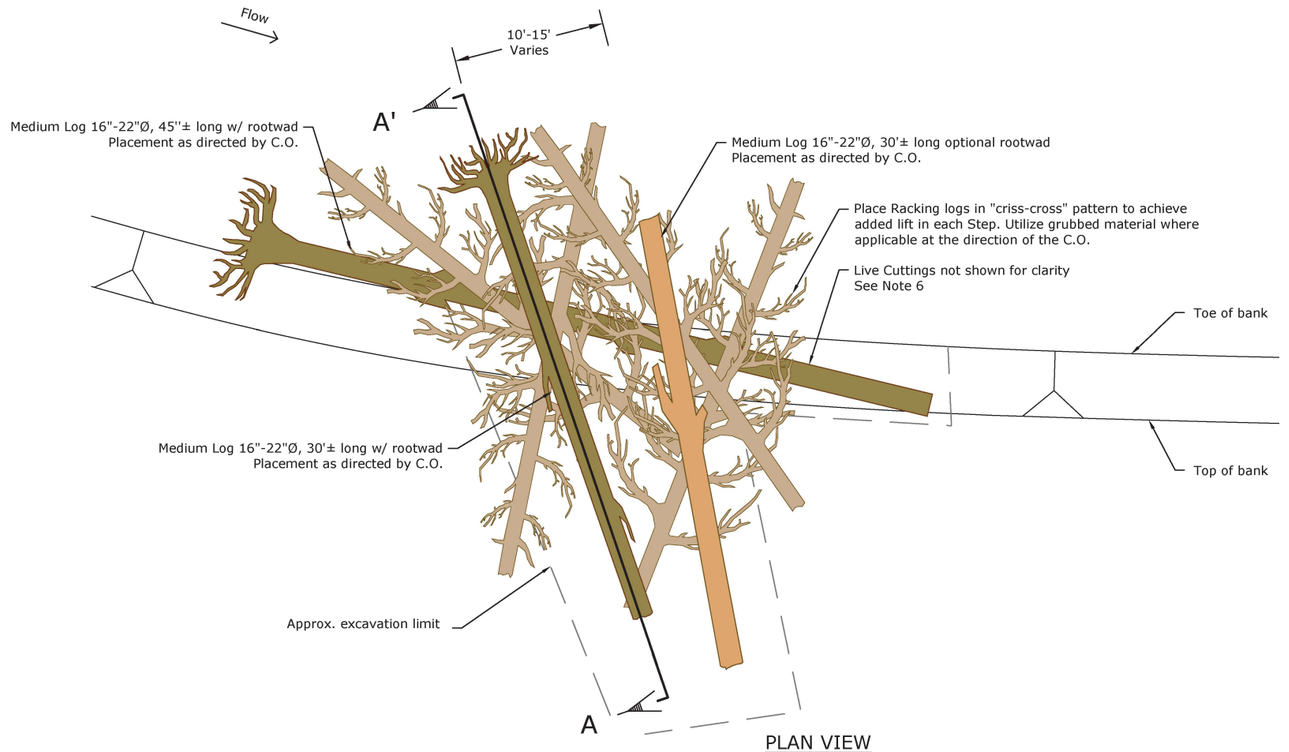
* Create diverse fish habitat along channel margin.
* Provide cover.

| TYPE C3 - 3-LOG CHANNEL MARGIN JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Medium | 16" - 22" | 45' | Yes | 4' | No | 1 |
| Medium | 16" - 22" | 30' | Yes | 4' | No | 1 |
| Medium | 16" - 22" | 30' | Optional | - | No | 1 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 5 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 15 |
| Live Cuttings | - | - | - | - | - | 9 |

* DBH = Diameter at breast height

## Construction Notes:

1. Contractor to select Large and Medium logs, per table above with the approval of the C.O.
2. Contractor shall place logs as described in sequence plans on Sheet 61655.
3. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
4. Medium log shall be placed so its upstream end rests on stream bed, and its downstream end is embedded up to 6". Backfill and compact around Medium log with Compacted Fill per Sheet 61643
5. Backfill structure with Compacted Fill per Sheet 61643.
6. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
7. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
8. Structure location may be field adjusted By C.O.
9. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
10. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.




PLAN VIEW

TYPE C3 - 3-LOG CHANNEL MARGIN JAM
NOT TO SCALE

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER 79319PE OREGON EXPIRES: 12/31/21

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:19:34 -08'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

TYPE C3 - 3-LOG CHANNEL MARGIN JAM

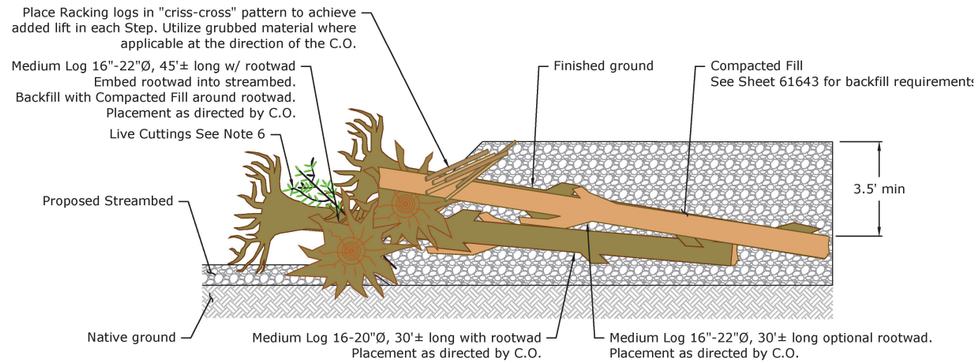
1678-100-61653

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LONGITUDINAL JAM.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-4 | 4+60 | Left | C6 | 6-Log Channel Margin | - | - | 61606 |
| MC-9 | 6+50 | Left | C6 | 6-Log Channel Margin | - | - | 61606 |
| MC-30 | 30+75 | Right | C6 | 6-Log Channel Margin | - | - | 61610 |
| MC-45 | 37+50 | Right | C6 | 6-Log Channel Margin | - | - | 61612 |
| MC-47 | 37+95 | Right | C6 | 6-Log Channel Margin | - | - | 61612 |
| MC-67 | 65+35 | Right | C6 | 6-Log Channel Margin | - | - | 61616 |
| MC-69 | 65+85 | Right | C6 | 6-Log Channel Margin | - | - | 61616 |
| MCB-2 | 3+40 | Left | C6 | 6-Log Channel Margin | - | - | 61619 |
| SC3-3 | 3+10 | Left | C6 | 6-Log Channel Margin | - | - | 61626 |
| SC3-5 | 3+60 | Left | C6 | 6-Log Channel Margin | - | - | 61626 |
| SC3-7 | 4+10 | Left | C6 | 6-Log Channel Margin | - | - | 61626 |
| SC3-13 | 15+40 | Right | C6 | 6-Log Channel Margin | - | - | 61628 |
| SC5-1 | 2+75 | Right | C6 | 6-Log Channel Margin | - | - | 61629 |
| SC5-3 | 3+65 | Right | C6 | 6-Log Channel Margin | - | - | 61629 |
| SC5-15 | 16+75 | Right | C6 | 6-Log Channel Margin | - | - | 61631 |
| SC5-19 | 19+15 | Right | C6 | 6-Log Channel Margin | - | - | 61632 |
| SC5C-1 | 1+75 | Right | C6 | 6-Log Channel Margin | - | - | 61636 |




SECTION A-A'

## Hydraulic Purpose:

* Temporarily stabilize new banks in the short term to restore aquatic and riparian habitats.
* Maintain scour holes by flow convergence.
* Divert high flows into side channels and floodplain.
* Sort and retain gravel.

## Habitat Purpose:

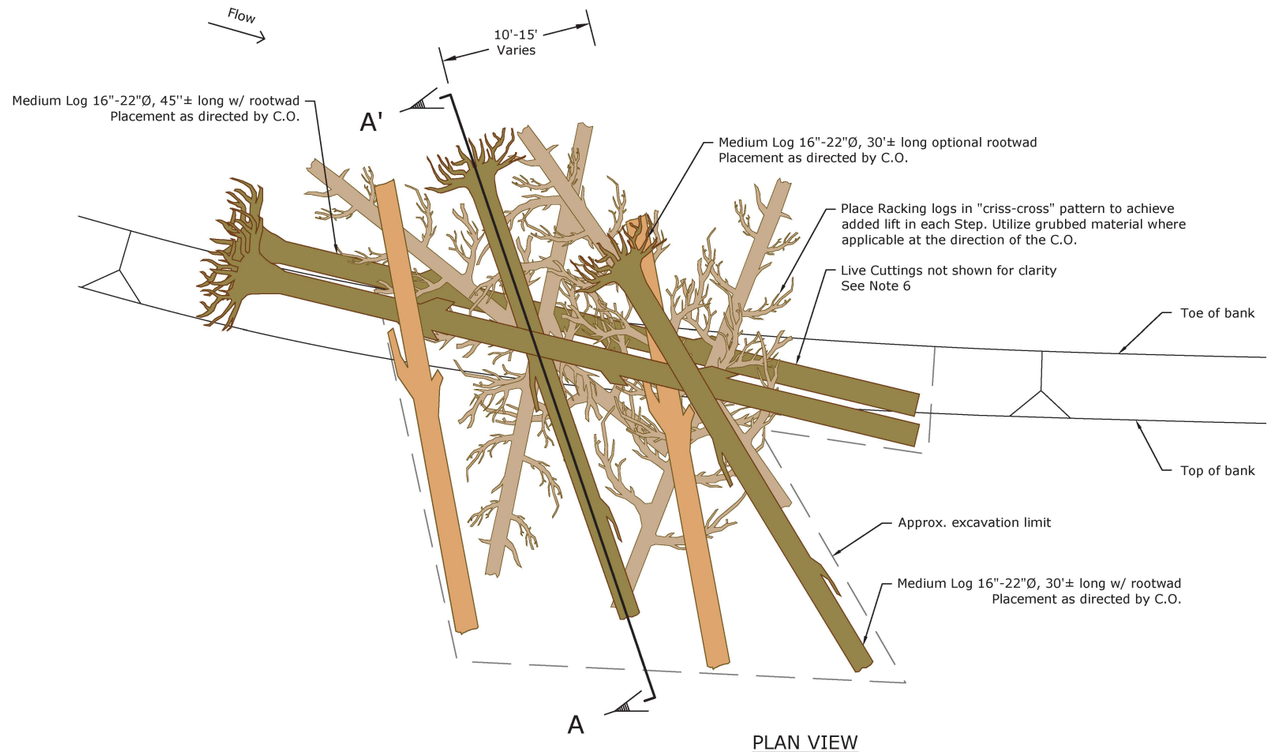
* Create diverse fish habitat along channel margin.
* Provide cover.

| TYPE C6 - 6-LOG CHANNEL MARGIN JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Medium | 16" - 22" | 45' | Yes | 4' | No | 2 |
| Medium | 16" - 22" | 30' | Yes | 4' | No | 2 |
| Medium | 16" - 22" | 30' | Optional | - | No | 2 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 10 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 30 |
| Live Cuttings | - | - | - | - | - | 18 |

* DBH = Diameter at breast height

## Construction Notes:

1. Contractor to select Large and Medium logs, per table above with the approval of the C.O.
2. Contractor shall place logs as described in sequence plans on Sheet 61655.
3. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
4. Medium log shall be placed so its upstream end rests on stream bed, and its downstream end is embedded up to 6". Backfill and compact around Medium log with Compacted Fill per Sheet 61643
5. Backfill structure with Compacted Fill per Sheet 61643.
6. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
7. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
8. Structure location may be field adjusted By C.O.
9. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
10. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.




PLAN VIEW

TYPE C6 - 6-LOG CHANNEL MARGIN JAM
NOT TO SCALE

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
EXPIRES: 12/31/21

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:20:19 -08'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

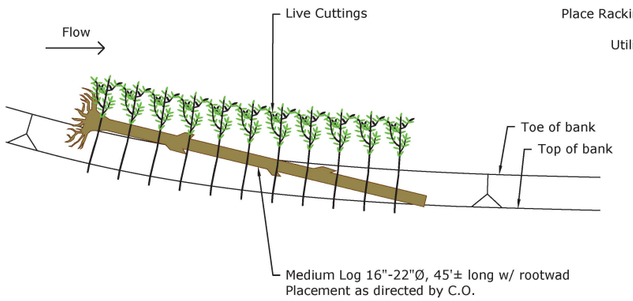
TYPE C6 - 6-LOG CHANNEL MARGIN JAM

1678-100-61654

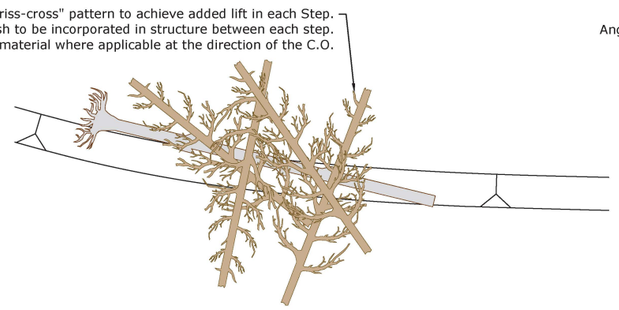
SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

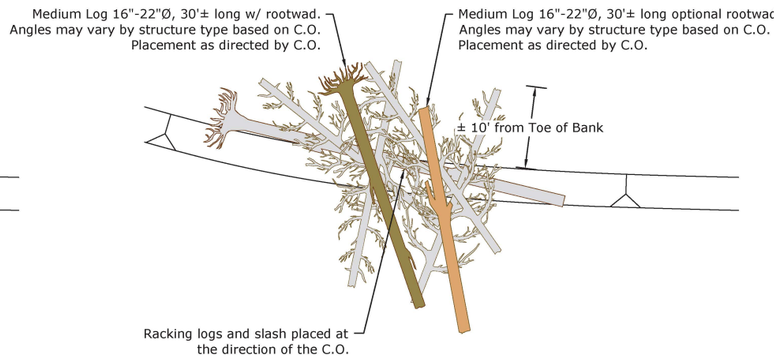
CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LONGITUDINAL JAM.DWG



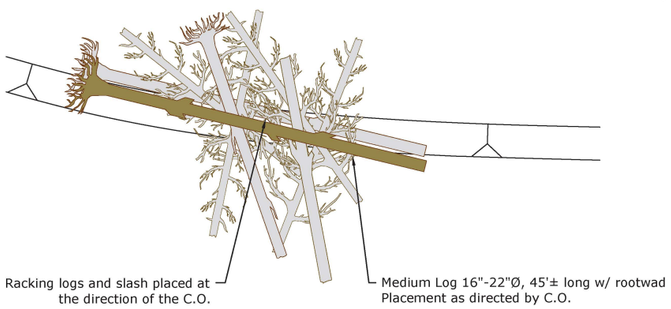

STEP 1



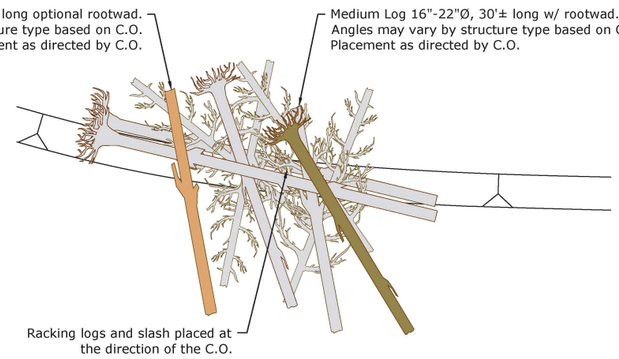

Racking Step
(To Be Completed Between Each Step)




STEP 2
(Type C3 Structure Completed Here)




STEP 3




STEP 4
(Type C6 Structure Completed Here)

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
JUSTIN A. NIELSEN
03/13/2020
EXPIRES: 12/31/21

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT
ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:21:00 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

TYPE C6 - CHANNEL
MARGIN JAM
SEQUENCING

SEQUENCING

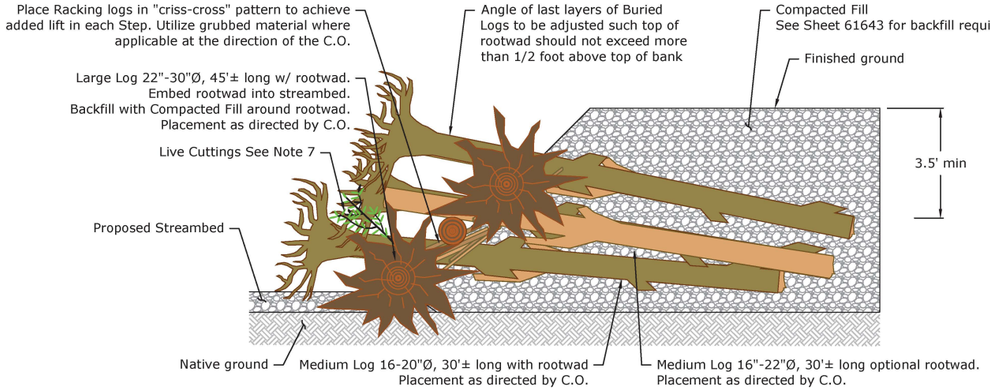
1678-100-61655

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LONGITUDINAL JAM.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-6 | 5+00 | Left | C9 | 9-Log Channel Margin | 3086.0 | 3075.0 | 61606 |
| MC-7 | 5+50 | Left | C9 | 9-Log Channel Margin | 3086.0 | 3075.0 | 61606 |
| MC-8 | 6+15 | Left | C9 | 9-Log Channel Margin | 3086.0 | 3075.0 | 61606 |
| MC-11 | 20+05 | Right | C9 | 9-Log Channel Margin | 3082.0 | 3071.0 | 61609 |
| MC-40 | 35+10 | Left | C9 | 9-Log Channel Margin | 3078.0 | 3067.0 | 61611 |
| MC-48 | 39+80 | Left | C9 | 9-Log Channel Margin | 3075.0 | 3064.0 | 61612 |
| MC-49 | 40+05 | Left | C9 | 9-Log Channel Margin | 3075.0 | 3064.0 | 61612 |
| MC-50 | 40+50 | Left | C9 | 9-Log Channel Margin | 3075.0 | 3064.0 | 61612 |
| MC-51 | 41+95 | Right | C9 | 9-Log Channel Margin | 3074.0 | 3063.0 | 61612 |
| MC-59 | 43+50 | Right | C9 | 9-Log Channel Margin | 3075.0 | 3064.0 | 61613 |
| SC2-1 | 0+25 | Right | C9 | 9-Log Channel Margin | 3086.0 | 3075.0 | 61621 |
| SC5-2 | 3+20 | Right | C9 | 9-Log Channel Margin | 3073.0 | 3062.0 | 61629 |
| SC5-6 | 6+50 | Left | C9 | 9-Log Channel Margin | 3071.5 | 3060.5 | 61630 |
| SC5-7 | 7+00 | Left | C9 | 9-Log Channel Margin | 3071.5 | 3060.5 | 61630 |
| SC5-22 | 22+35 | Right | C9 | 9-Log Channel Margin | 3068.0 | 3057.0 | 61632 |
| SC5-23 | 22+80 | Right | C9 | 9-Log Channel Margin | 3068.0 | 3057.0 | 61632 |




SECTION A-A'

## Hydraulic Purpose:

* Temporarily stabilize new banks in the short term to restore aquatic and riparian habitats.
* Maintain scour holes by flow convergence.
* Divert high flows into side channels and floodplain.
* Sort and retain gravel.

## Habitat Purpose:

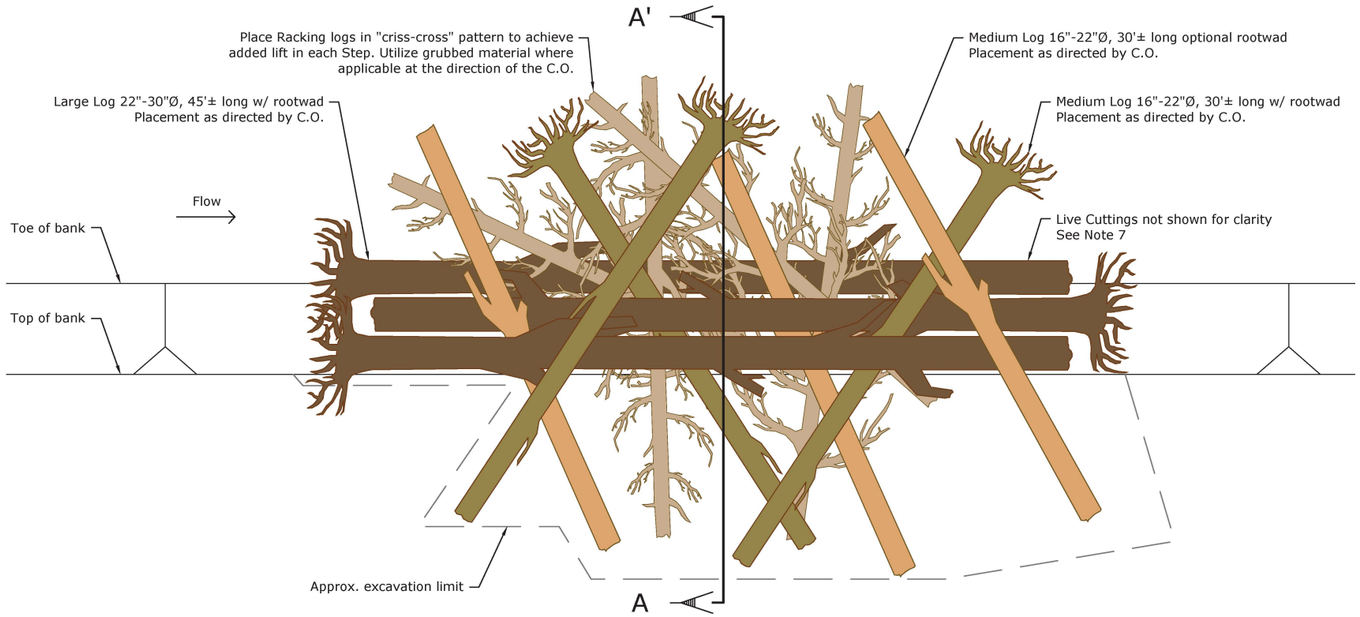
* Create diverse fish habitat along channel margin.
* Provide cover.

| TYPE C9 - 9-LOG CHANNEL MARGIN JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 45' | Yes | 5' | No | 3 |
| Medium | 16" - 22" | 30' | Yes | 4' | No | 3 |
| Medium | 16" - 22" | 30' | Optional | - | No | 3 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 15 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 45 |
| Live Cuttings | - | - | - | - | - | 27 |

* DBH = Diameter at breast height

## Construction Notes:

1. Contractor to select Large and Medium logs, per table above with the approval of the C.O.
2. Contractor shall excavate to Foundation Elevation, by subtracting diameters of stacked logs from Top Reference Elevation. Approximate Foundation Elevation shown assumes a structure height of 11.0 feet. Foundation Elevation will vary based on materials and field conditions and is being provided for contractor reference only. Top Reference Elevation Point shall be held for finish grade by Contractor.
3. Contractor shall place logs as described in sequence plans on Sheet 61658.
4. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
5. Medium log shall be placed so its upstream end rests on stream bed, and its downstream end is embedded up to 6". Backfill and compact around Medium log with Compacted Fill per Sheet 61643
6. Backfill structure with Compacted Fill per Sheet 61643.
7. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
8. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
9. Structure location may be field adjusted By C.O.
10. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
11. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.




PLAN VIEW

TYPE C9 - 9-LOG CHANNEL MARGIN JAM
NOT TO SCALE

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
72319PE
OREGON
NICHOLAS S. DANIS
03/13/20
EXPIRES: 12/31/21

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 13:21:32 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

TYPE C9 - 9-LOG CHANNEL MARGIN JAM

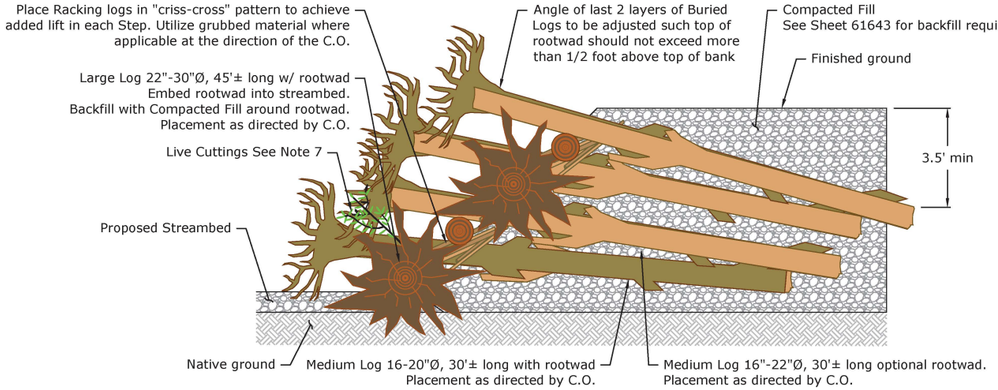
1678-100-61656

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LONGITUDINAL JAM.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-13 | 20+50 | Right | C12 | 12-Log Channel Margin | 3082.0 | 3068.0 | 61609 |
| MC-15 | 20+90 | Right | C12 | 12-Log Channel Margin | 3082.0 | 3068.0 | 61609 |
| MC-17 | 21+35 | Right | C12 | 12-Log Channel Margin | 3082.0 | 3068.0 | 61609 |
| MC-18 | 21+90 | Right | C12 | 12-Log Channel Margin | 3082.0 | 3068.0 | 61609 |
| MC-19 | 26+70 | Left | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-21 | 27+10 | Left | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-22 | 28+85 | Right | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-24 | 29+30 | Right | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-26 | 29+80 | Right | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-28 | 30+30 | Right | C12 | 12-Log Channel Margin | 3080.5 | 3066.5 | 61610 |
| MC-38 | 34+70 | Left | C12 | 12-Log Channel Margin | 3080.0 | 3066.0 | 61611 |
| MC-52 | 42+10 | Right | C12 | 12-Log Channel Margin | 3076.0 | 3062.0 | 61612 |
| MC-53 | 42+30 | Right | C12 | 12-Log Channel Margin | 3076.0 | 3062.0 | 61612 |
| MC-55 | 42+70 | Right | C12 | 12-Log Channel Margin | 3076.0 | 3062.0 | 61613 |
| MC-57 | 43+05 | Right | C12 | 12-Log Channel Margin | 3076.0 | 3062.0 | 61613 |




SECTION A-A'

## Hydraulic Purpose:

* Temporarily stabilize new banks in the short term to restore aquatic and riparian habitats.
* Maintain scour holes by flow convergence.
* Divert high flows into side channels and floodplain.
* Sort and retain gravel.

## Habitat Purpose:

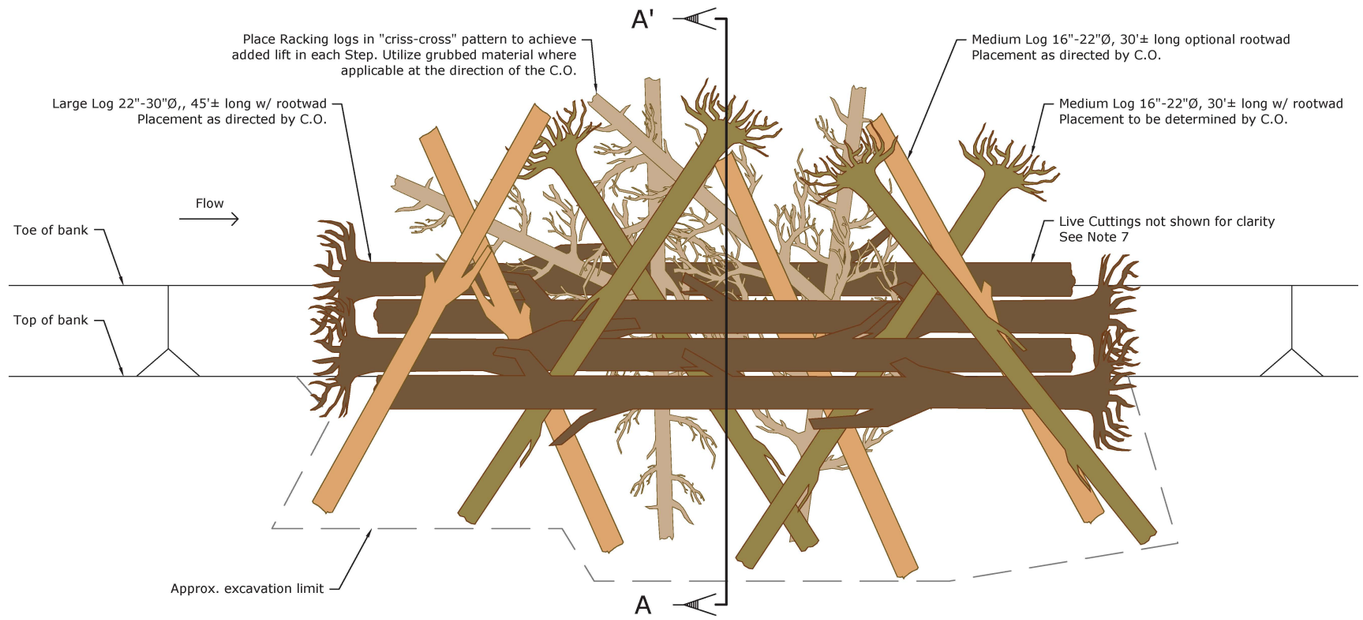
* Create diverse fish habitat along channel margin.
* Provide cover.

| TYPE C12 - 12-LOG CHANNEL MARGIN JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 45' | Yes | 5' | No | 4 |
| Medium | 16" - 22" | 30' | Yes | 4' | No | 4 |
| Medium | 16" - 22" | 30' | Optional | - | No | 4 |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 20 |
| Slash (CY) | 1" - 6" | 5' | - | - | Yes | 60 |
| Live Cuttings | - | - | - | - | - | 36 |

* DBH = Diameter at breast height

## Construction Notes:

1. Contractor to select Large and Medium logs, per table above with the approval of the C.O.
2. Contractor shall excavate to Foundation Elevation, by subtracting diameters of stacked logs from Top Reference Elevation. Approximate Foundation Elevation shown assumes a structure height of 14.0 feet. Foundation Elevation will vary based on materials and field conditions and is being provided for contractor reference only. Top Reference Elevation Point shall be held for finish grade by Contractor.
3. Contractor shall place logs as described in sequence plans on Sheet 61658.
4. Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
5. Medium log shall be placed so its upstream end rests on stream bed, and its downstream end is embedded up to 6". Backfill and compact around Medium log with Compacted Fill per Sheet 61643
6. Backfill structure with Compacted Fill per Sheet 61643.
7. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
8. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
9. Structure location may be field adjusted By C.O.
10. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
11. All cut ends of logs shall be cut or broken off even if buried to create natural appearance. No flat cuts allowed.




PLAN VIEW

TYPE C12 - 12-LOG CHANNEL MARGIN JAM
NOT TO SCALE

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Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
NICHOLAS T. DANIS
EXPIRES: 12/31/21

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
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BOISE, IDAHO 2020-03-13

TYPE C12 - 12-LOG CHANNEL MARGIN JAM

1678-100-61657

SHEET 1

DATE AND TIME PLOTTED
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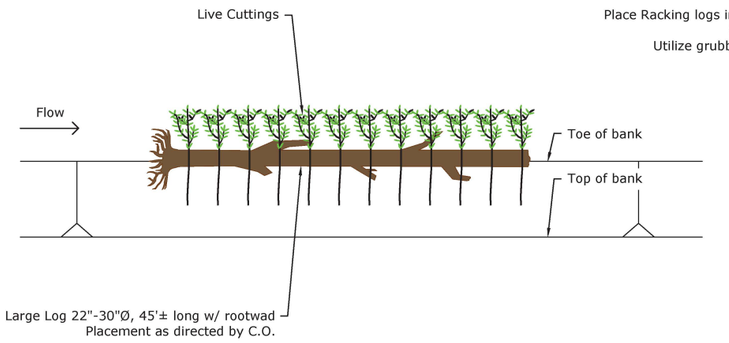
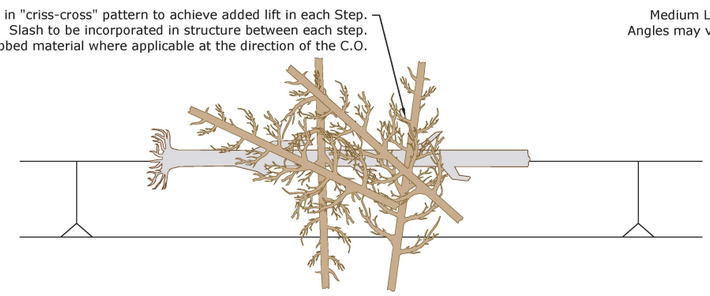
NICK DANIS

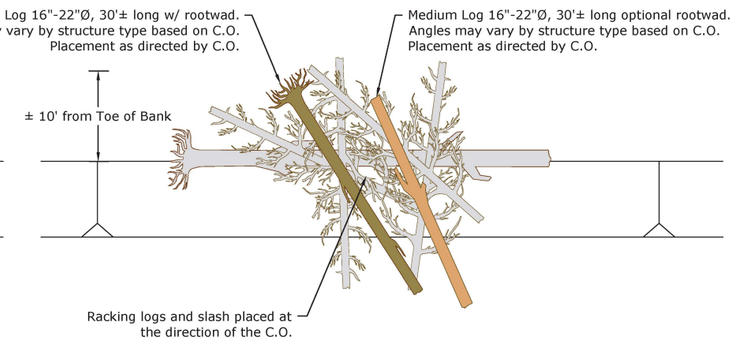
CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_LONGITUDINAL JAM.DWG




STEP 1




Racking Step
(To Be Completed Between Each Step)

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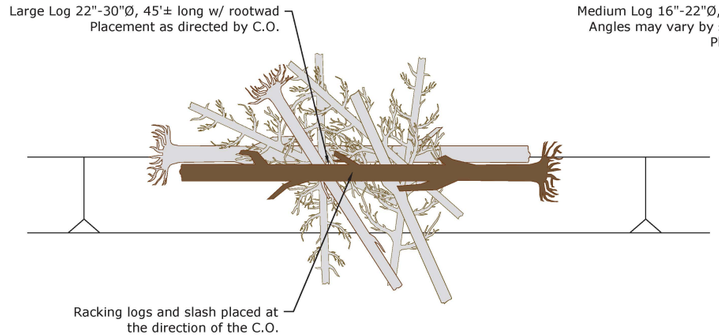


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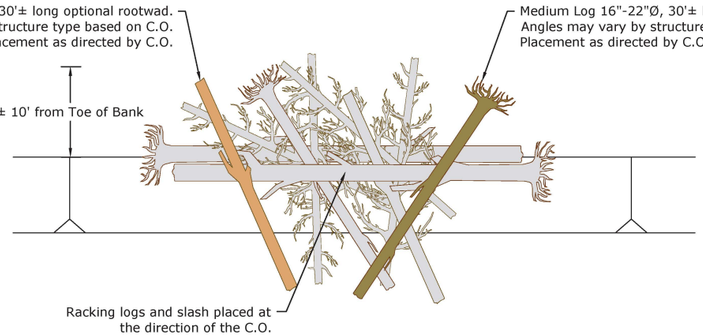


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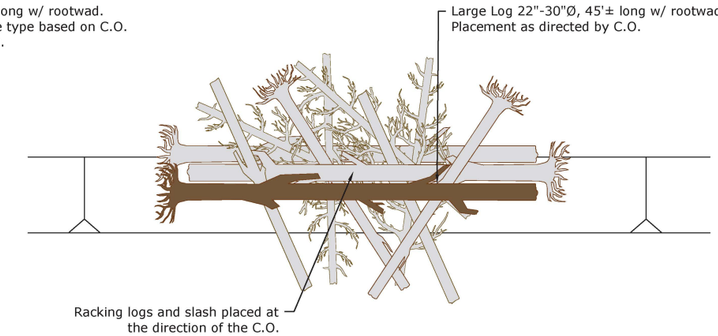


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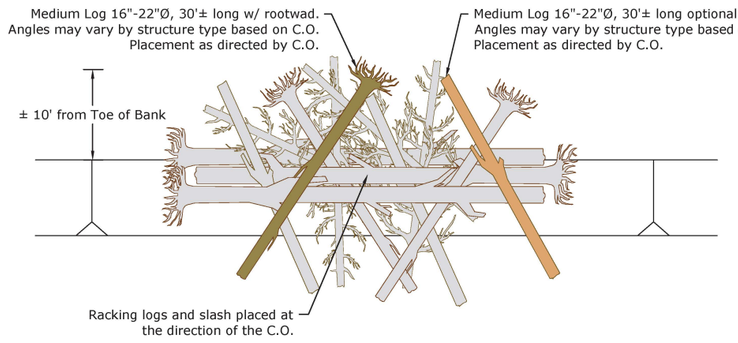


STEP 6
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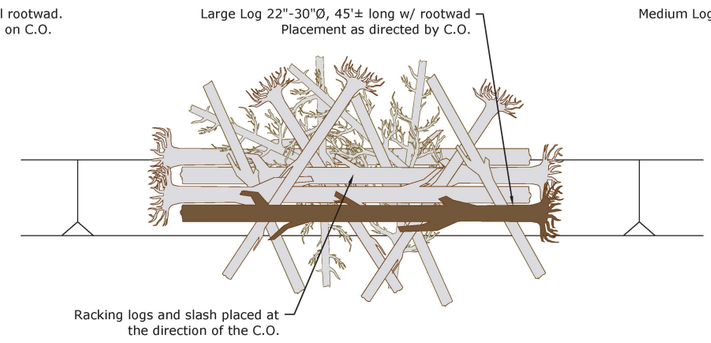
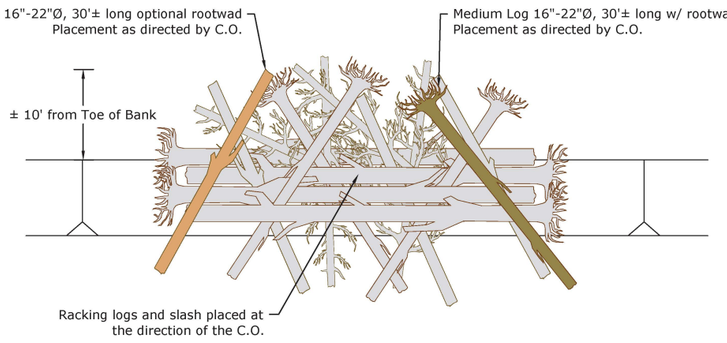



STEP 7




STEP 8
(Type C12 Structure Completed Here)

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OREGON
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TYPE C12 - CHANNEL
MARGIN JAM
SEQUENCING

SEQUENCING

1678-100-61658

SHEET 1

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-2 | 4+05 | Left | D | Type E-Sweeper | - | - | 61606 |
| MC-3 | 4+50 | Left | D | Type E-Sweeper | - | - | 61606 |
| MC-5 | 4+90 | Left | D | Type E-Sweeper | - | - | 61606 |
| MC-12 | 20+25 | Right | D | Type E-Sweeper | - | - | 61609 |
| MC-14 | 20+70 | Right | D | Type E-Sweeper | - | - | 61609 |
| MC-16 | 21+20 | Right | D | Type E-Sweeper | - | - | 61609 |
| MC-20 | 27+05 | Left | D | Type E-Sweeper | - | - | 61610 |
| MC-23 | 28+90 | Right | D | Type E-Sweeper | - | - | 61610 |
| MC-25 | 29+35 | Right | D | Type E-Sweeper | - | - | 61610 |
| MC-27 | 29+90 | Right | D | Type E-Sweeper | - | - | 61610 |
| MC-29 | 30+45 | Right | D | Type E-Sweeper | - | - | 61610 |
| MC-31 | 30+95 | Right | D | Type E-Sweeper | - | - | 61610 |
| MC-35 | 34+40 | Left | D | Type E-Sweeper | - | - | 61611 |
| MC-37 | 34+60 | Left | D | Type E-Sweeper | - | - | 61611 |
| MC-39 | 34+95 | Left | D | Type E-Sweeper | - | - | 61611 |
| MC-44 | 37+10 | 0 | D | Type E-Sweeper | - | - | 61612 |
| MC-46 | 37+65 | Right | D | Type E-Sweeper | - | - | 61612 |
| MC-54 | 42+50 | Right | D | Type E-Sweeper | - | - | 61612 |
| MC-56 | 42+85 | Right | D | Type E-Sweeper | - | - | 61613 |
| MC-58 | 43+35 | Right | D | Type E-Sweeper | - | - | 61613 |
| SC3-2 | 2+15 | Left | D | Type E-Sweeper | - | - | 61626 |
| SC3-4 | 3+20 | Left | D | Type E-Sweeper | - | - | 61626 |
| SC3-6 | 3+85 | Left | D | Type E-Sweeper | - | - | 61626 |
| SC3-14 | 15+70 | Right | D | Type E-Sweeper | - | - | 61628 |
| SC3-16 | 16+00 | Right | D | Type E-Sweeper | - | - | 61628 |
| SC5-5 | 6+40 | Left | D | Type E-Sweeper | - | - | 61630 |
| SC5-13 | 16+25 | Left | D | Type E-Sweeper | - | - | 61631 |
| SC5-14 | 16+60 | Right | D | Type E-Sweeper | - | - | 61631 |
| SC5-17 | 18+55 | Left | D | Type E-Sweeper | - | - | 61632 |
| SC5-18 | 19+05 | Right | D | Type E-Sweeper | - | - | 61632 |

## Hydraulic Purpose:

* Redirect flow.

## Habitat Purpose:

* Encourage gravel deposition.

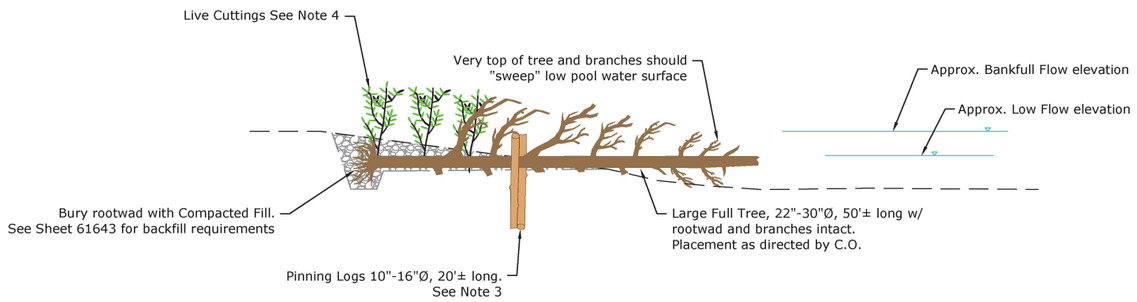
| TYPE D - SINGLE LOG SWEEPER JAM | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Large | 22" - 30" | 50' | Yes | 5' | Yes | 1 |
| Pinning | 10" - 16" | 20' | Optional | - | No | 2 |

* DBH = Diameter at breast height

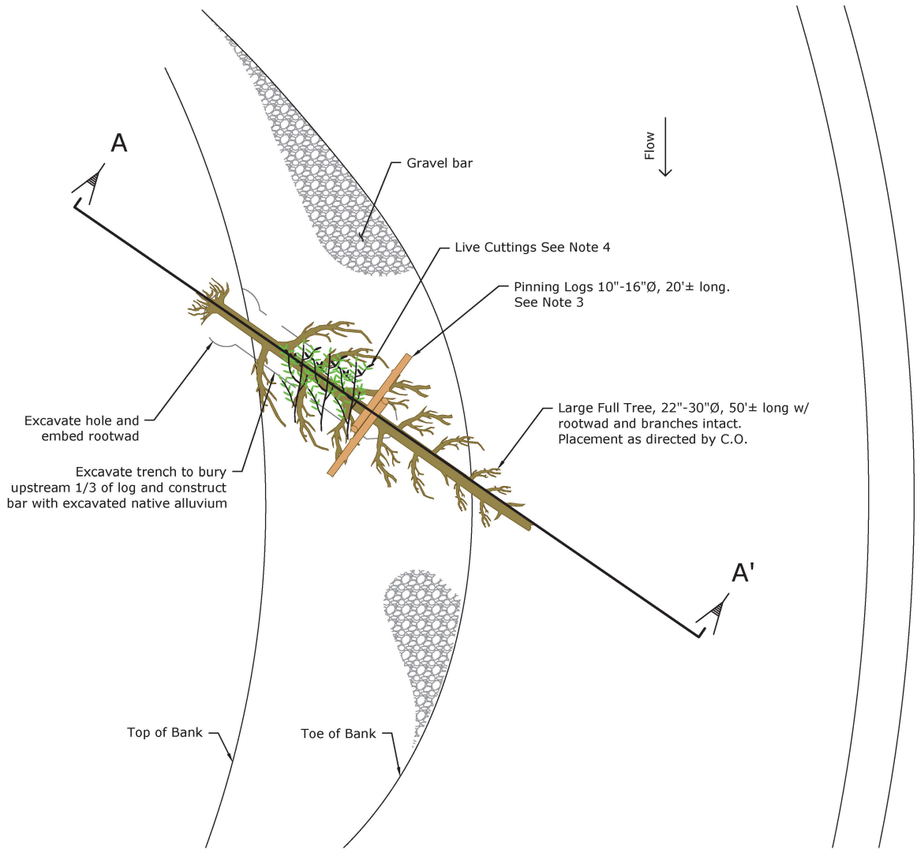
** 25 Extra Large Full Trees have been added to the Bid Quantities that have not been located on the plans. Extra full trees are to be placed at the direction of the the C.O.

## Construction Notes:

1. Trees with branches or multiple trunks preferred.
2. Backfill structure with Compacted Fill per Sheet 61643.
3. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs w/ rootwads shall be used and installed by excavation per Sheet 61660.
4. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be provided by Contracting Agency. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted.
5. If located in Side Channels, structure may be constructed with smaller logs as directed By C.O.
6. Structure location may be field adjusted By C.O.
7. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
8. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.




SECTION A-A'




PLAN VIEW

TYPE D - SINGLE LOG SWEEPER JAM

NOT TO SCALE

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Managing Water in the West

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OREGON
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LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor

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TYPE D - SINGLE LOG SWEEPER JAM

1678-100-61659

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:21 AM
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NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_SWEEPER JAM.DWG

## Hydraulic Purpose:

* Increase hydraulic roughness of channel.

## Habitat Purpose:

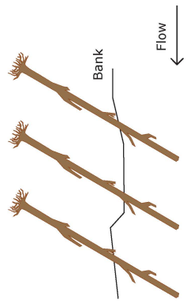
* Encourage sediment deposition.
* Provide cover.

| TYPE E - COVER LOG | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min. Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Racking | 10" - 16" | 20' | Optional | - | Optional | 1 |
| Pinning | 10" - 16" | 20' | Optional | - | No | 2 |

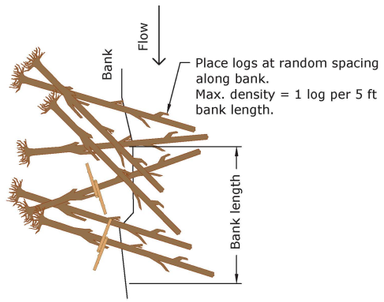
* DBH = Diameter at Breast Height

## Construction Notes:

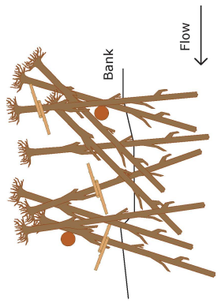
1. Whole coniferous trees with rootwads and limbs intact are preferred. Limbs not shown for clarity.
2. Bottom of cover logs shall be in contact with water at low flow.
3. Number of cover logs will vary by location and will be determined in the field by the C.O.
4. Cover Logs shall not be placed in more than groups of 2 based on location. Evenly spread Cover Logs throughout reach where included with other bank treatments. Cover Logs to be placed to protect exposed bank where applicable.
5. Cover logs will be field located by the C.O.
6. Protect existing trees. Remove only trees as marked or directed by C.O.
7. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs w/ rootwads shall be used and installed by excavation per detail this Sheet.
8. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.
9. Cover Logs are shown in groupings of 5 (five). Contractor shall verify with C.O. on desired quantities in the field prior to placement. See Sheets 61596 thru 61601 for Cover Log quantities.




NOT ACCEPTABLE
Uniform spacing
Parallel angles

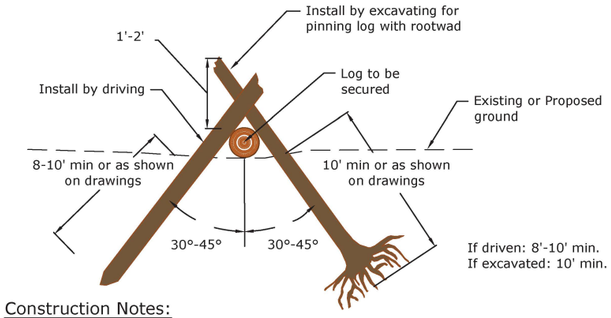



ACCEPTABLE
Random spacing
Predominantly angled downstream
Varied angles




WHERE EXISTING FEATURES PERMIT
Bunch and cluster cover logs around existing vegetation, trees, or rock features.
Hook branches on existing features.
Lace logs through existing features.

## COVER LOG CONFIGURATIONS

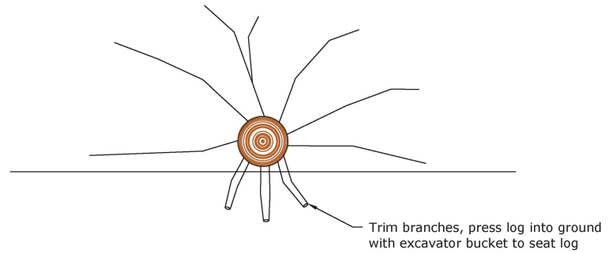



## Construction Notes:

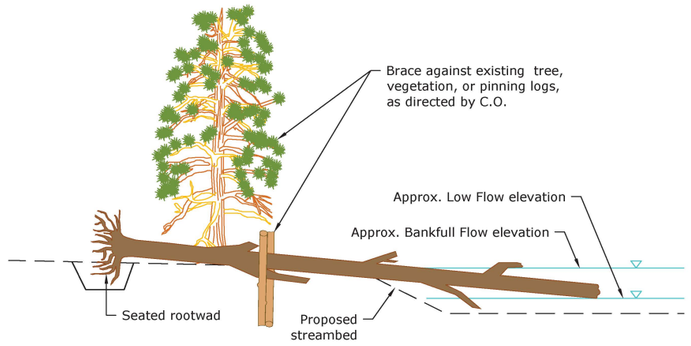
1. All driven piles to be marked with paint 12' from bottom prior to installation to ensure proper embedment as directed by C.O.
2. Pinning logs to be driven. If pinning logs cannot be driven to minimum burial, then pinning logs with rootwads shall be used and installed by excavation.
3. If bedrock is encountered and minimum burial is not achievable by means of excavation, Contractor shall immediately contact the Engineer. Number and location of piles may be field adjusted by C.O. at the direction of the Engineer.

## PINNING LOGS

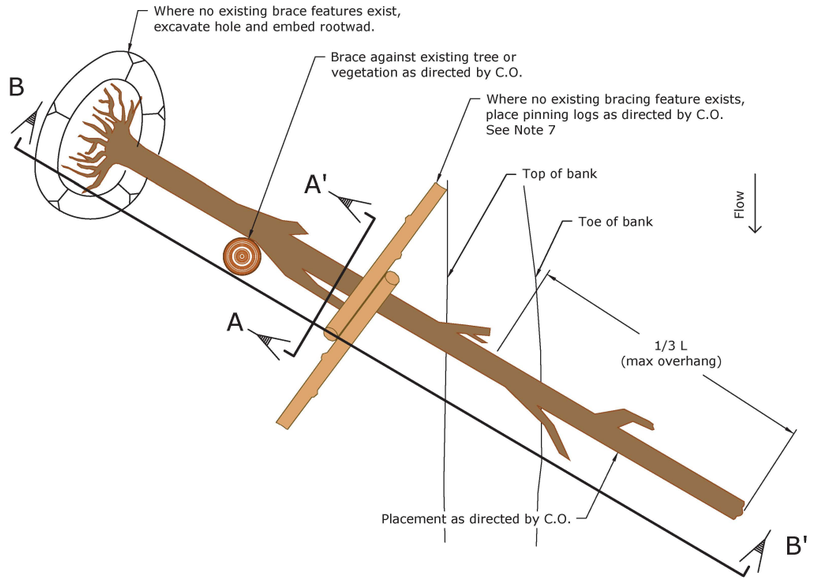
NOT TO SCALE




## SECTION A-A'




## SECTION B-B'




## PLAN VIEW

## TYPE E - COVER LOG

NOT TO SCALE

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TYPE E - COVER LOG

1678-100-61660

SHEET 1

DATE AND TIME PLOTTED
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CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
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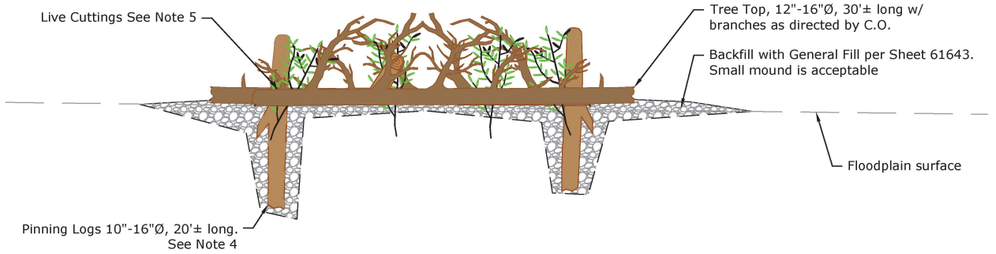
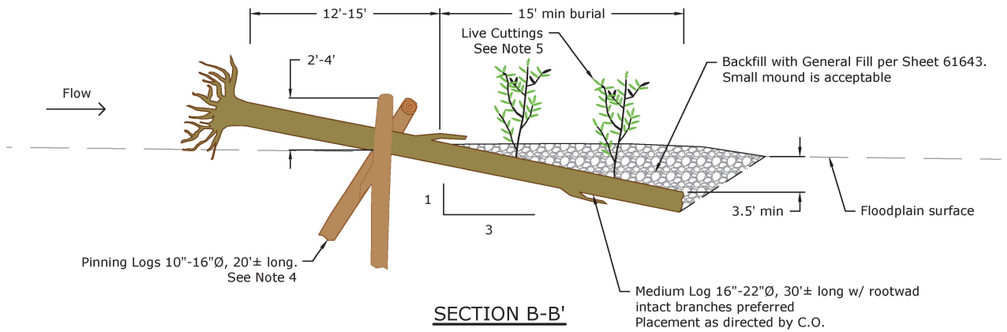
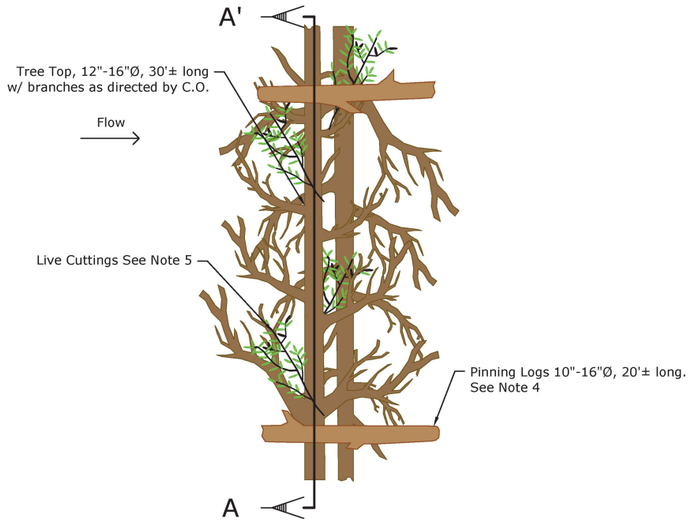



SECTION A-A'

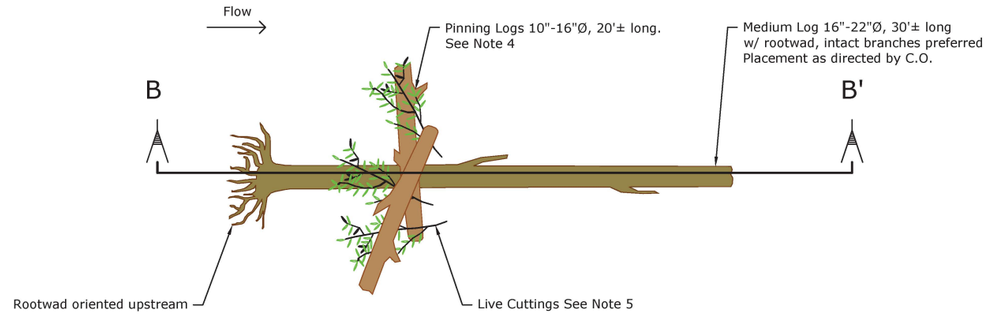



SECTION B-B'




PLAN VIEW

TYPE F - FLOODPLAIN ROUGHNESS
NOT TO SCALE




PLAN VIEW

TYPE F - FLOODPLAIN ROUGHNESS (HIGH ENERGY)
NOT TO SCALE

| TYPE F - FLOODPLAIN ROUGHNESS | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Pinning | 10" - 16" | 20' | Optional | - | No | 2 |
| Tree Tops | 12" - 16" | 30' | No | - | Yes | 2 |
| Live Cuttings | - | - | - | - | - | 6 |

| TYPE F - FLOODPLAIN ROUGHNESS (HIGH ENERGY) | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Medium | 16" - 22" | 30' | Yes | 4' | Optional | 1 |
| Pinning | 10" - 16" | 20' | Optional | - | No | 2 |
| Live Cuttings | - | - | - | - | - | 3 |

* DBH = Diameter at breast height

Hydraulic Purpose:
* Increase hydraulic roughness of floodplain.

Habitat Purpose:
* Encourage sediment deposition.

Construction Notes:
1. Install on floodplains or bars as directed by C.O.
2. Floodplain Roughness shall be Type F - Floodplain Roughness and Type F - Floodplain Roughness (High Energy) structures at locations as shown on the plans.
3. Orientation to vary as to not encourage preferential flow paths between structures per C.O.
4. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs w/ rootwads shall be used and installed by excavation per Sheet 61660.
5. Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
6. Structure location may be field adjusted By C.O.
7. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
8. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.
9. See Sheets 61596 thru 61601 for Floodplain Roughness quantities.

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TYPE F - FLOODPLAIN ROUGHNESS

1678-100-61661

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:22 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_FLOODPLAIN ROUGHNESS.DWG

| Structure ID | Station | Bank | Structure Type | Structure Description | Top Elevation | Foundation Elevation | Plan Sheet |
|---|---|---|---|---|---|---|---|
| MC-41 | 35+15 | Left | G | Habitat Structure | - | - | 61611 |
| SC6-1 | 5+85 | Spanning | G | Habitat Structure | - | - | 61637 |

## Hydraulic Purpose:

* Raise water table and bed elevation upstream of structure.
* Reduce flow velocities in side channels and floodplain.
* Retain sediment in side channels and floodplain.

## Habitat Purpose:

* Create habitat complexity.
* Create off channel rearing habitat.

| TYPE G - REINFORCED HABITAT STRUCTURE | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min. Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity* |
| Medium | 12" - 18" | 35' | Optional | 4' | Yes | 4 |
| Pinning | 12" | 20' | Optional | - | No | 13 |
| Dead Brush Layer and Slash | 6" - 12" | - | - | - | Yes | ± 10 CY |
| Compacted Fill (Preferably Topsoil) | - | - | - | - | - | ± 20 CY |
| Compacted Riffle Material | - | - | - | - | - | ± 20 CY |
| Live Cuttings | - | - | - | - | - | 12 |

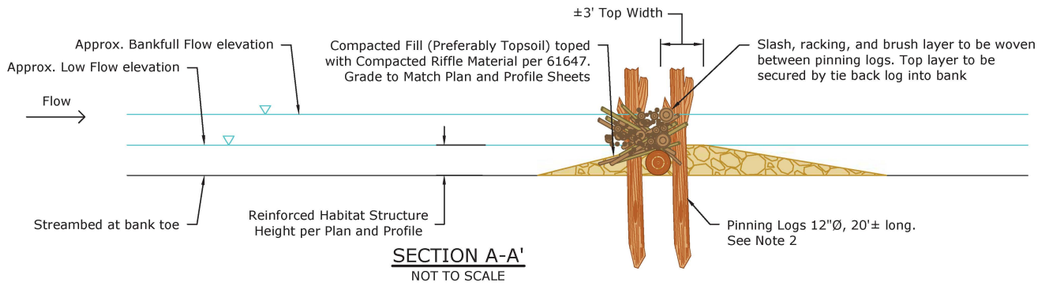
* DBH = Diameter at breast height
** Width of structure may vary based on width of channel to be spanned. Quantities will vary as directed by the C.O.

## Construction Notes:

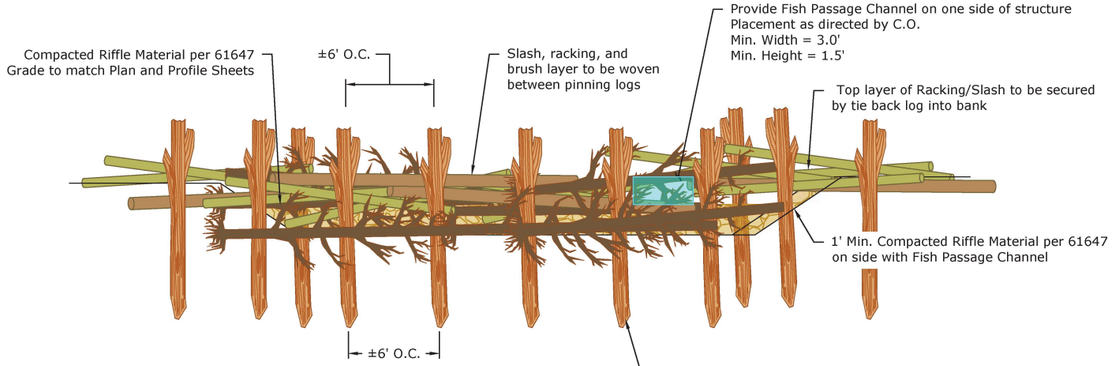
1. Pinning logs to be driven ±6-foot on center in back row, with 2 additional pinning logs 4' upstream side at the toe of the bank. Pinning logs to be embedded to a minimum depth of 8-feet and shall be cut to 1-foot above bank level or as directed by C.O.
2. Pinning logs to be driven. If pinning logs cannot be driven, then pinning logs with rootwads shall be used and installed by excavation per Sheet 61660. At Direction of C.O., minimal number of excavated pinning log may be able to be installed without rootwads, based on spacing needs.
3. Place medium logs or whole small trees between and against upstream side of pinning logs at the direction of the C.O.
4. All Large and Medium Logs to be brought to structure location in 45' lengths. Logs listed at 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
5. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.
6. Compacted Fill (Preferably Topsoil) shall be placed against upstream side to within 1' of finish grade, compacted such that water will stack against face.
7. Compacted Riffle Material shall be placed per 61647 at the grades shown in the Plan and Profile Sheets.
8. Additional riffle material shall be placed on backside of structure to form a narrow, low gradient fish passage channel (spillway). Fish passage channel will typically be graded to a "V"or "U" shaped form and installed in a manner the minimizes steep slopes that provides preferential flow path at low flows. Excessive slope can be address by grading the spillway from near bank towards center of downstream channel.
9. Place small diameter matrix of racking, slash, and brush woven within and through pinning logs to develop a stable interlaced matrix. Matrix material shall be woven into pinning logs at various angles and positions to add complexity and minimize preferred flow paths. Matrix material to be compacted to increase structural density and reduce permeability with the intent of capturing fine material and creating an upstream pond.
10. Provide Fish Passage Channel on one side of structure as directed by C.O.
11. Additional tree tops shall be pinned at each side of structure to protect from flanking.



EXAMPLE: INSTALLED TYPE G - REINFORCED HABITAT STRUCTURE




SECTION A-A'
NOT TO SCALE

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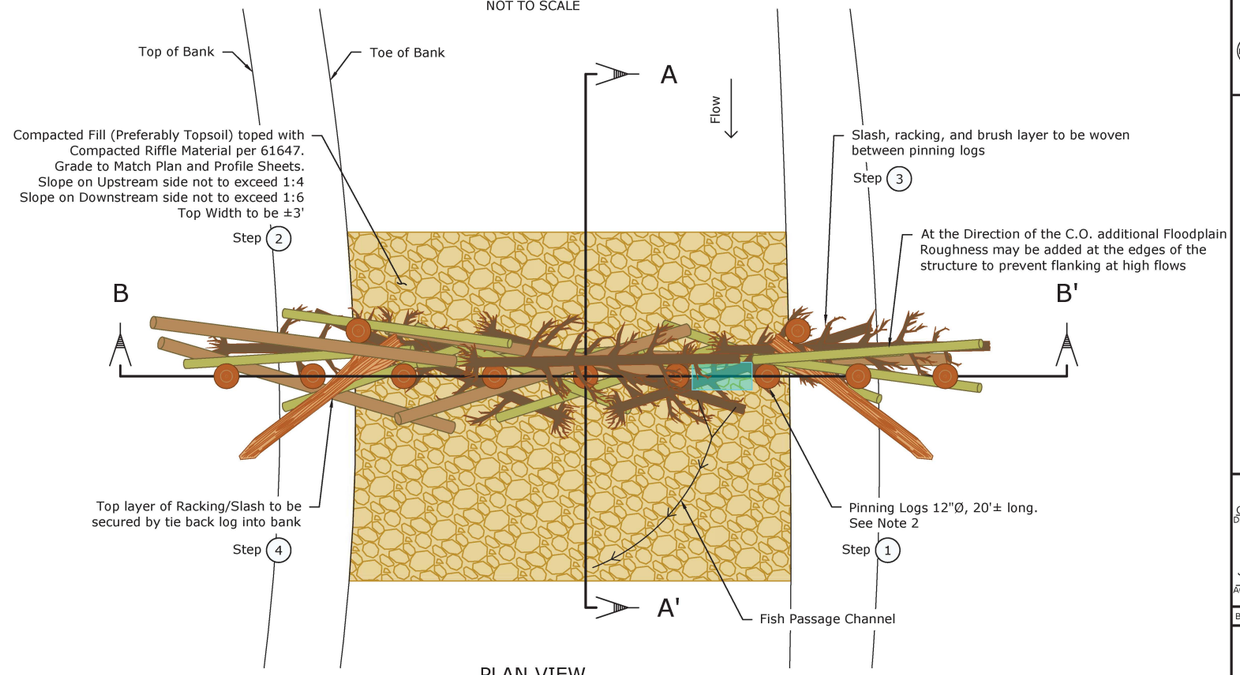


PLAN VIEW

TYPE G - REINFORCED HABITAT STRUCTURE
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TYPE G - REINFORCED HABITAT STRUCTURE

1678-100-61662
SHEET 1

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LONGLEY_BEAVER_DAM_ANALOG.DWG

## Flood Fence

The purpose of the flood fence is to slow flood waters and to trap sediment and debris in flood prone areas that have been cleared of native riparian vegetarian. Live Cutting cuttings are used to provide immediate benefits and to re-establish woody riparian vegetation. Woody material can be woven between poles to simulate rafted flotsam and provide rapid results.

### Hydraulic Purpose:

* Increase hydraulic roughness of floodplain.

### Habitat Purpose:

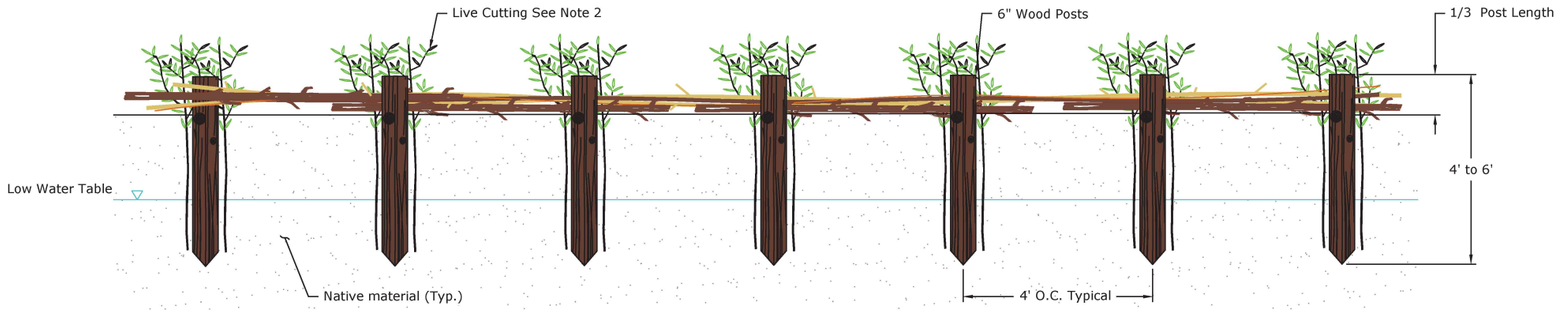
* Encourage sediment deposition.

| Flood Fence Material Schedule (Per 30 ft Length) | | | | |
|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Branches | Quantity |
| Post | 6" | 8'-10' | No | 7 |
| Woven | 1.5"-3" | 10'-15' | Optional | 20 |
| Live Cuttings | - | - | - | 14 |

* DBH = Diameter at breast height

### Construction Notes:

1. Posts shall be from tree boles of large branches that are supplemented with live cuttings. Live Cottonwood tree boles or branches are preferred as available and per C.O.
2. Install live cuttings at a rate of 2 cuttings per Post while installing logs. Live cuttings shall be installed near face of each structure within excavation limits as directed by C.O. Live cuttings shall be placed such that a minimum of 6" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
3. Backfill structure with Compacted Fill per Sheet 61643.
4. All visible ends of logs shall be cut or broken off to create natural appearance. No flat cuts allowed.
5. See Sheets 61596 thru 61601 for Flood Fence quantities.




SECTION A-A'

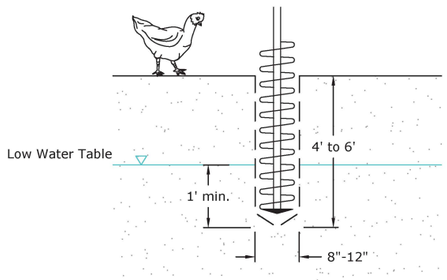



PLAN VIEW

FLOOD FENCE
NOT TO SCALE

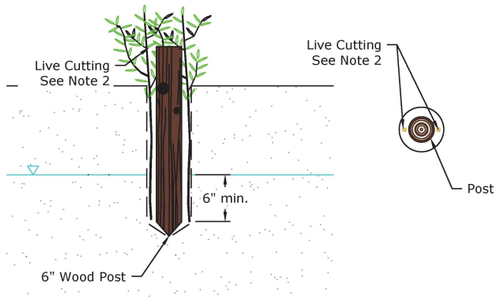
### Installation:

Step 1: Auger 8"-12" diameter hole to 1' below water table. Minimum 4' depth overall.



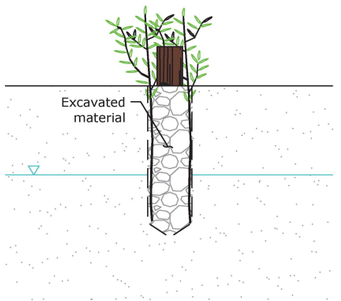

STEP 1

Step 2: Install 6" Wood Post with 2 Live Cutting cuttings. One on either side of live wood post as shown.



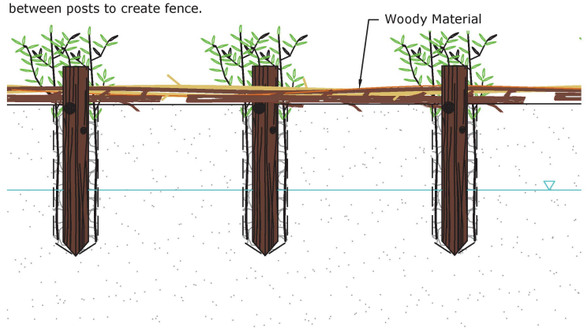

STEP 2

Step 3: Wash excavated material into void space using trash pump.




STEP 3

Step 4: Weave woody material between posts to create fence.




STEP 4

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FLOOD FENCE

1678-100-61663

SHEET 1

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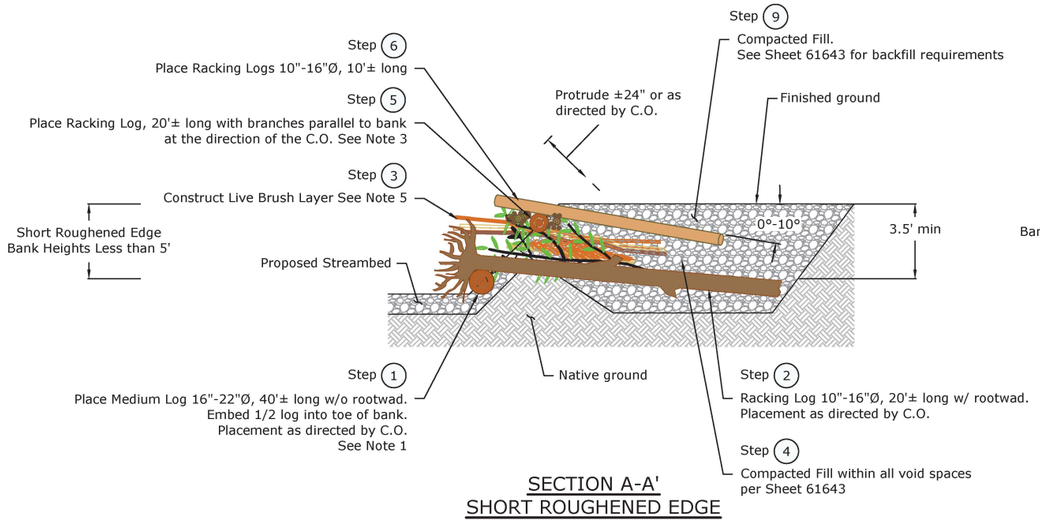
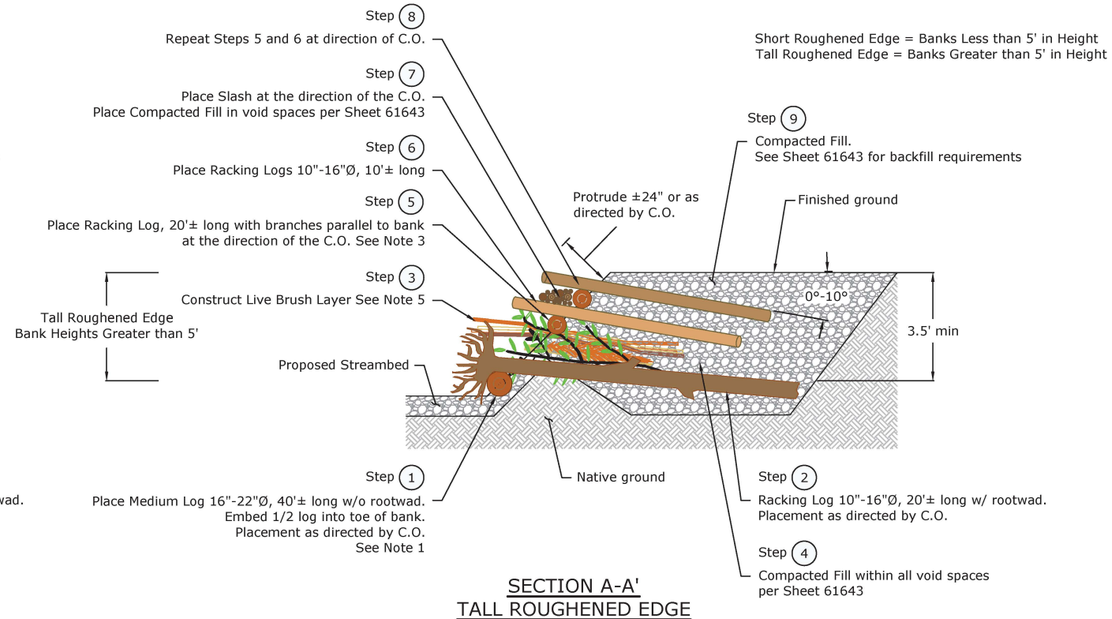
CAD FILENAME
LONGLEY_FLOOD FENCE.DWG




SECTION A-A'
SHORT ROUGHENED EDGE



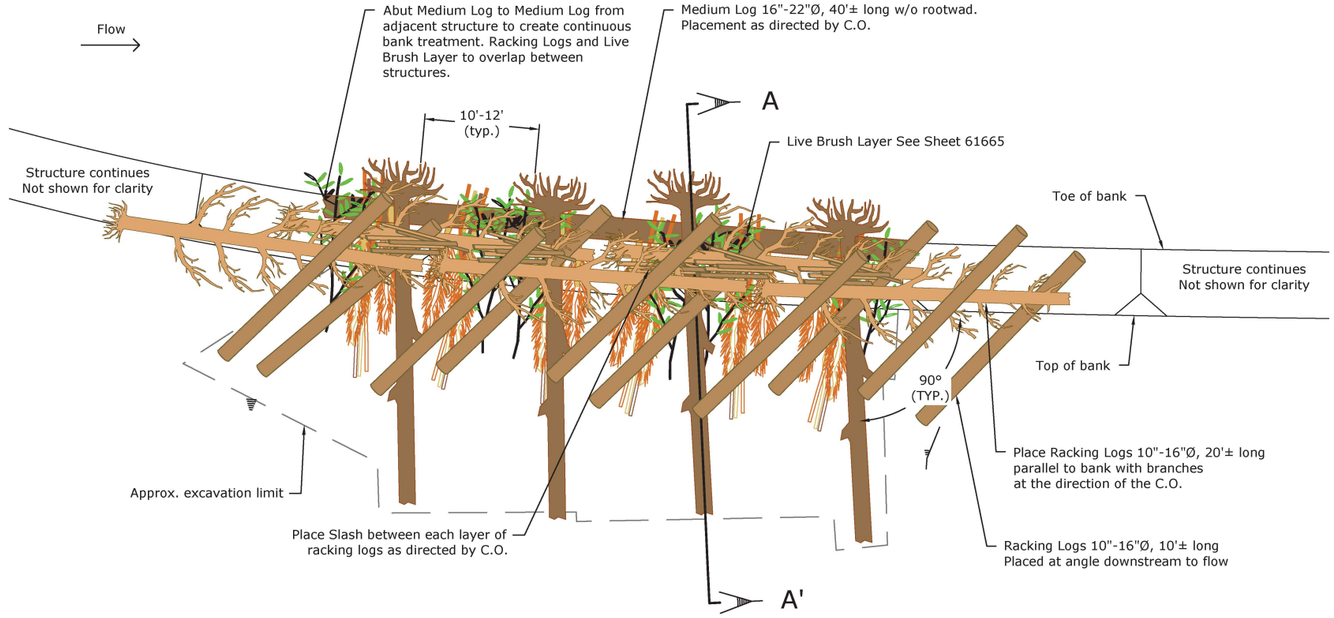

SECTION A-A'
TALL ROUGHENED EDGE

| Roughened Edge Material Schedule (Per 40 ft Length) | | | | | | |
|---|---|---|---|---|---|---|
| Log Type | Size (DBH) | Min Length (ft) | Rootwad | Min. Rootwad Diameter (ft) | Branches | Quantity |
| Medium | 16" - 22" | 40' | No | - | - | 1 |
| Racking | 10" - 16" | 20' | Yes | 3' | - | 4 |
| Racking | 10" - 16" | 20' | Optional | - | Yes | 2 |
| Racking | 10" - 16" | 10' | Optional | - | - | 36*** |
| Slash (CY) | 1" - 6" | 5' | - | - | - | 20 |

* DBH = Diameter at breast height
** Quantities listed above are associate with Short Roughened Edge for banks less than 5' in height. For Tall Roughened Edge for banks greater than 5' in height, quantities for racking and slash should be doubled.
*** Additional racking logs may be required based on field conditions and bank height. Placed at the direction of the C.O.
**** For quantities associated with Live Brush Layer see Sheet 61665.

## Construction Notes:

1. Roughened Edge Bank treatment shall be constructed at locations as shown on the plans. The exact location of each occurrence of bank roughness shall be staked by the Contractor and approved by the C.O. prior to constructing a particular occurrence.
2. Medium log (footer) shall be placed so its upstream end rests on the stream bed, with 1/2 the log embedded into bank. Backfill and compact around footer log with Compacted Fill.
3. Racking logs with rootwads shall be installed on top of Medium log. Rootwads shall be placed over top of footer log with rootwad as close to bank as possible and as directed by C.O.
4. Place general fill over placed materials and compact to create a approximate 45-degree surface for installation of Live Brush Layer.
5. Construct Live Brush Layer per detailed on Sheet 61665.
6. Place Compacted Fill per Sheet 61643 from excavation on Brush Layer such that all void spaces are filled and compact.
7. Place Racking Logs, 20'± long with branches parallel to bank and along bank at top of structure, pin with two Racking Logs, 10'± long angled with exposed ends downstream to flow. Ensure that Racking logs are not too steeply vertically angled from front to back by placing fill at backside as necessary. Racking logs shall be placed such that vertical angle is between 0° and 10°.
8. Backfill to top of angled logs with compacted fill per Compacted Fill Sheet 61643.
9. Place slash along top of backfill at bank edge as directed by C.O.
10. Repeat Steps 5,6,7, and 8 at the direction of the C.O. until desired height of bank protection is achieved.
11. Backfill to F.G. Backfill shall be placed in 6" lifts, with the first lift to be washed into the Live Brush Layer with water to eliminate voids. Supplemental lifts shall be compacted per Compacted Fill Sheet 61643.




PLAN VIEW

ROUGHENED EDGE BANK TREATMENT
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ROUGHENED EDGE BANK TREATMENT

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SHEET 1

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**EXAMPLE: INSTALLED LIVE BRUSH LAYER**

## Live Brush Layer within Roughened Edge

The purpose of the Live Brush Layer is to establish a healthy riparian bank condition on a newly constructed channel that is supported by live roots. The Live Brush Layer provides near-channel bank stability and channel boundary roughness with live and dead native materials. In the near term, edge roughness is provided by dead material that in-turn provides bank stability through slowing of near-bank flow velocities. In the long-term, live vegetation re-establishes bank strength through root structure and replaces roughness through growth.

| Live Brush Layer Material Schedule (Per 10 ft Length) | | |
|---|---|---|
| Item | Description | Quantity |
| Live Cuttings | 4' to 5' live willow cutting | 10 |
| Slash (CY) | 6" thick layer of live and dead brush when compressed | ±4 |

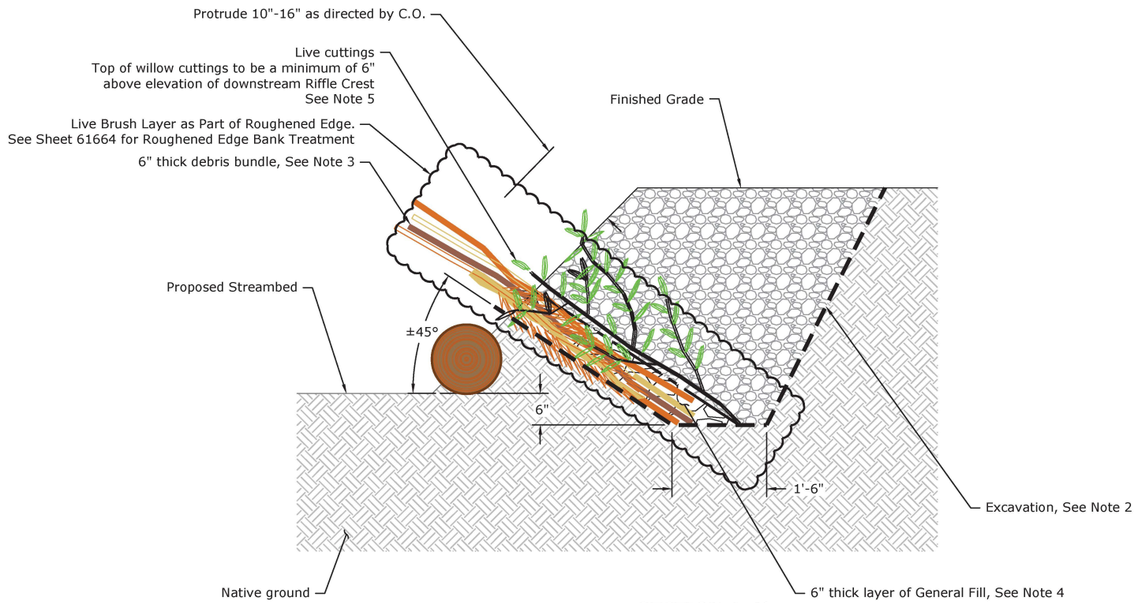
## Construction Notes:

1. Live Brush Layer shall be constructed at locations of Roughened Edge Bank Treatment as shown on the plans.
2. Excavate material as shown on Section A-A' and stockpile. Excavated materials are to be used as backfill if meeting requirements of Compacted Fill per Sheet 61643. Excavation shall tie into proposed streambed at edge as shown in section view.
3. Install debris and slash including tree branches, stems, live cuttings, and general brush to form a compacted 6 inch thick debris layer. Material should be between 4 and 7 feet in length and consist of a range of stem diameters between 1/2 inch to 4 inches. Material can be a mixture of live and dead material.
4. A 6-inch layer of General Fill per Sheet 61643, shall be placed over debris and slash to ensure willow cuttings have consistent soil contact to support establishment. First lift to be washed into the Live Brush Layer with water to eliminate voids.
5. Live Cuttings shall be placed at 12 inches on center along the base of the soil backfill. The cuttings shall be 1/4 inch to 3 inches in trunk diameter and from 4 to 5 feet in length. Live cuttings shall be provided by Contracting Agency. Live Cuttings will have the top foot of the previous year's growth removed. Cuttings shall be cut and installed as detailed herein. Bottom of live Cuttings need to be 6-inches below channel thalweg in Riffles, Glides and Runs and 6-inches below the top of low flow water surface at pools as directed by C.O. Top of willow cuttings to be a minimum of 6-inches above elevation of downstream Riffle Crest.

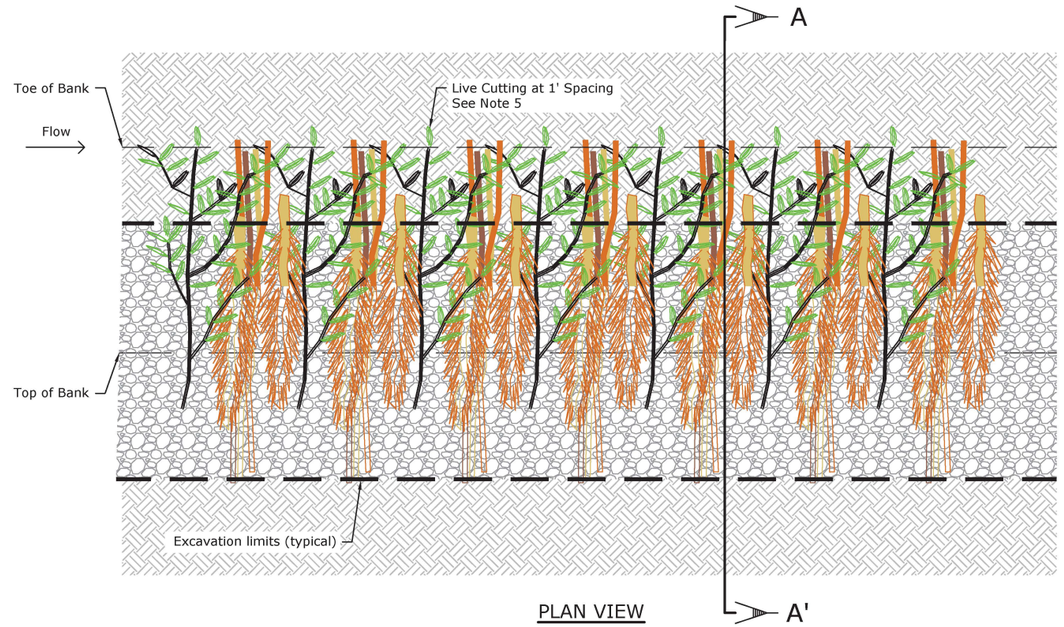
## Live Cuttings*

Live Cuttings consist of locally harvested willow, cottonwood, or red-osier dogwood cuttings. Live Cuttings are between approximately 1/4-inch to 3-inches in diameter depending upon species and source. Live Cuttings harvested with care and cut to lengths of 4 feet to 5 feet. Live Cuttings shall be bundled and submerged in standing water for 5 to 7 days prior to planting. Care should be taken to mark upward or downward ends of cuttings (i.e. dipped in latex paint or other) when harvesting such that they are re-planted in the appropriate direction. Harvested live-cuttings shall not be allowed to dry-out and must be planted after removal from soaking location. Cuttings should be buried by a minimum of 75% of their length and must have some small portion of their top exposed to air.

*Note - Live Cuttings provided by Contracting Agency unless otherwise directed.




SECTION A-A'




PLAN VIEW

LIVE BRUSH LAYER
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LIVE BRUSH LAYER

1678-100-61665
SHEET 1

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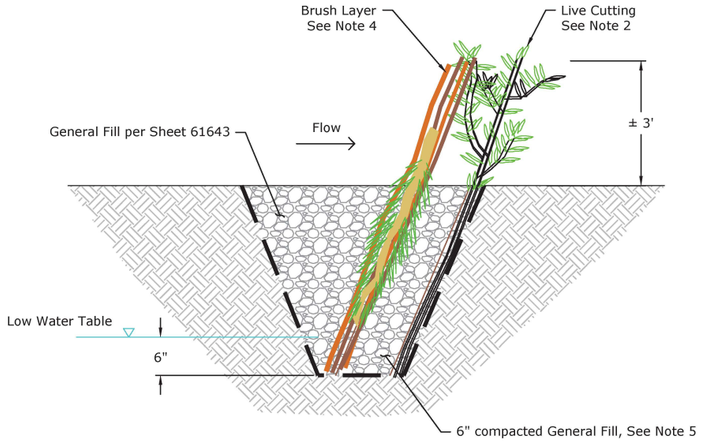
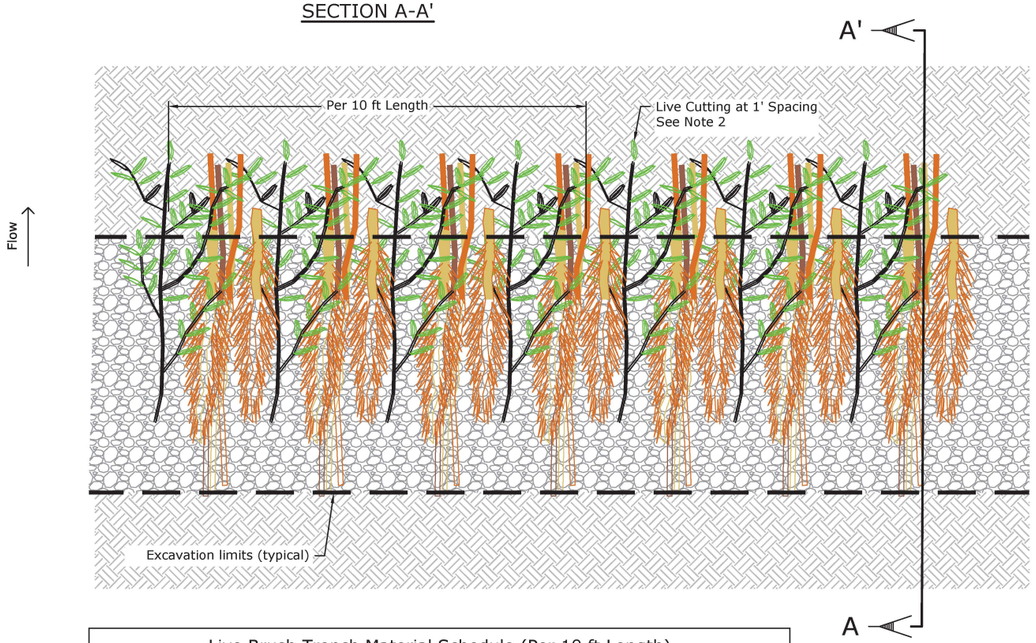



SECTION A-A'

## Live-Brush Trench

Intent of live brush trench is to establish woody vegetation in exposed alluvial surfaces (floodplains and gravel bars) that have near term roughness provided by dead material consisting of various woody branches from shrubs and trees and long term roughness provided by live willow growth.

Material is placed facing downstream and angled to resist ice flows for stability. Brush layer is dense enough to capture debris and to slow velocities, but not too dense to completely obstruct flow.




| Live Brush Trench Material Schedule (Per 10 ft Length) | | |
|---|---|---|
| Item | Description | Quantity |
| Live Cuttings | 4' to 5' live willow cutting | 10 |
| Slash (CY) | 6" thick layer of live and dead brush when compressed | ±4 |

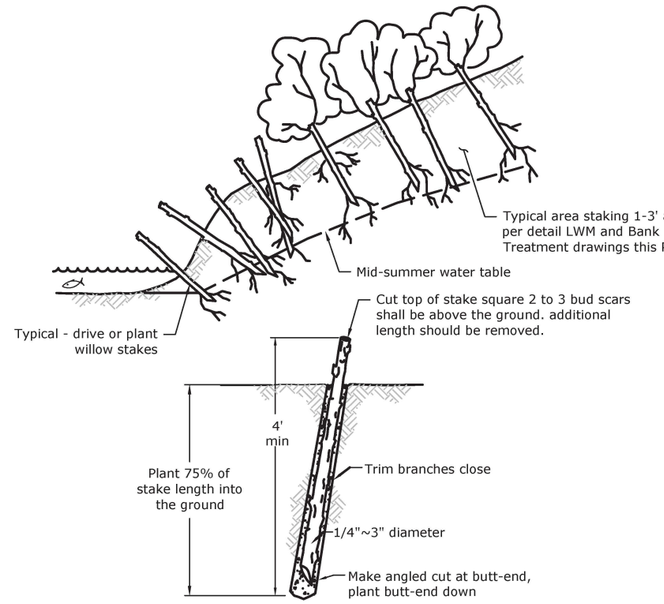
### Construction Notes:

1. Excavate hole to 6" below low water table.
2. Place layer 1 - Live Cuttings 6" below low water table in manner as specified by "Live Willow Staking". Place along outside of hole on downstream face at 1' spacing as directed by C.O.
3. Place 6" layer of material excavated from hole on layer 1 (Live Cuttings) and compact against layer 1 with bucket.
4. Place 6" layer of brush consisting of live and dead stems and branches of mixed diameter between 1/4" to 3" and sufficient length to protrude ± 3' above surface as shown and per C.O.
5. Backfill structure with General Fill per Sheet 61643.
6. Blend over any remaining excavated material into floodplain at the direction of C.O.

PLAN VIEW

LIVE BRUSH TRENCH

NOT TO SCALE




### Construction Notes:

1. Live Willow Cuttings will be provided by C.O.
2. Make clean cuts and do not damage stakes or split ends during installation, use a pilot bar in firm soils.
3. Soak cuttings for 24 hours (min.) prior to installation.
4. When backfilling "Rod" or Mud" by filling the hole with water and then soil to make a mud slurry followed by rod tamping to remove air pockets.
5. Tamp the soil around the stake.

LIVE WILLOW STAKING

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LIVE BRUSH TRENCH AND LIVE STAKING

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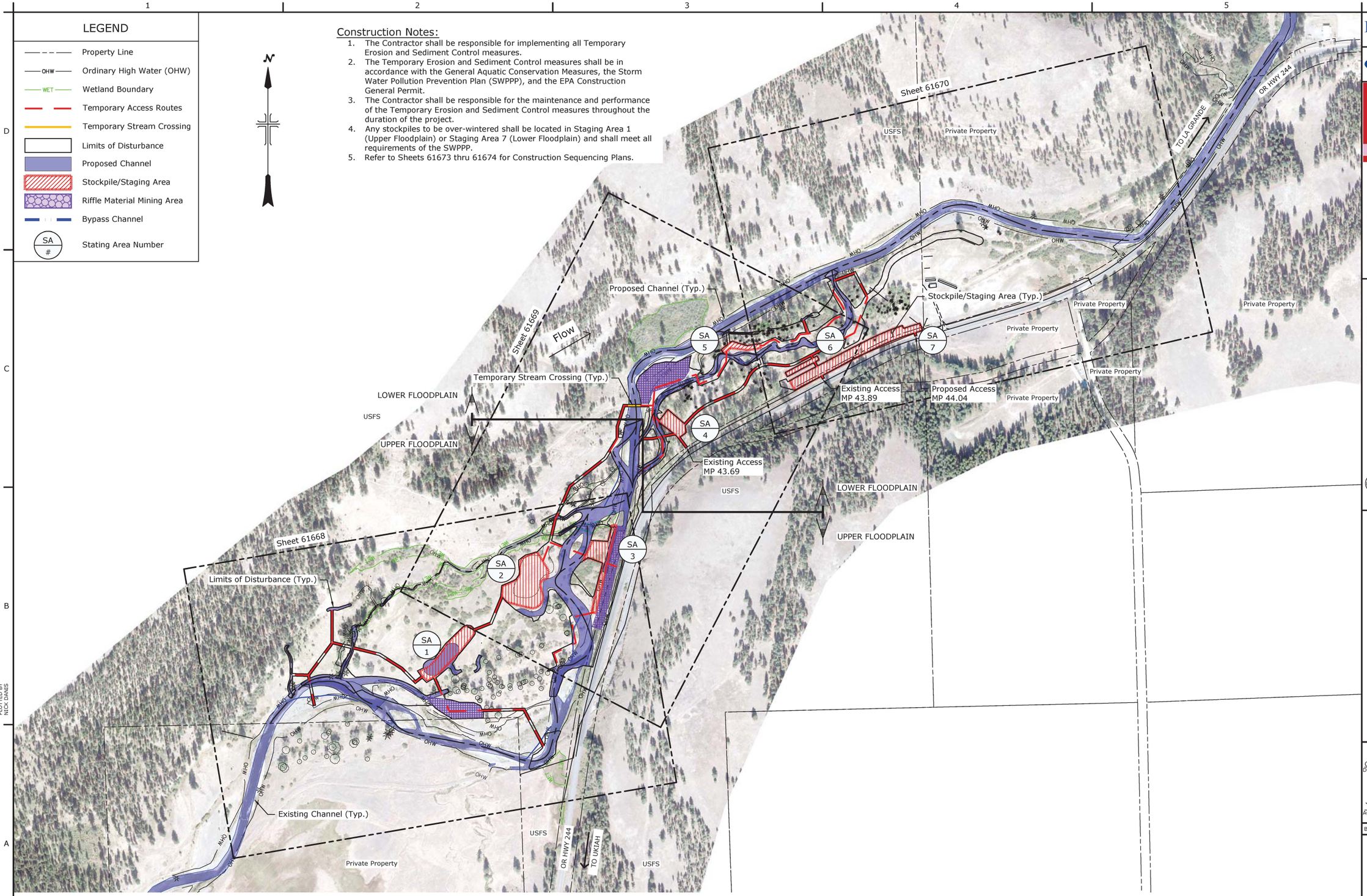
## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Temporary Access Routes
- Temporary Stream Crossing
- Limits of Disturbance
- Proposed Channel
- Stockpile/Staging Area
- Riffle Material Mining Area
- Bypass Channel
- SA # — Stating Area Number

## Construction Notes:

1. The Contractor shall be responsible for implementing all Temporary Erosion and Sediment Control measures.
2. The Temporary Erosion and Sediment Control measures shall be in accordance with the General Aquatic Conservation Measures, the Storm Water Pollution Prevention Plan (SWPPP), and the EPA Construction General Permit.
3. The Contractor shall be responsible for the maintenance and performance of the Temporary Erosion and Sediment Control measures throughout the duration of the project.
4. Any stockpiles to be over-wintered shall be located in Staging Area 1 (Upper Floodplain) or Staging Area 7 (Lower Floodplain) and shall meet all requirements of the SWPPP.
5. Refer to Sheets 61673 thru 61674 for Construction Sequencing Plans.




ACCESS AND STAGING PLAN KEY MAP

300 0 300 600 900
SCALE OF FEET

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ACCESS AND STAGING PLAN KEY MAP

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## LEGEND

- Property Line
- Ordinary High Water (OHW)
- Wetland Boundary
- Temporary Access Routes
- Temporary Stream Crossing
- Limits of Disturbance
- Proposed Channel
- Stockpile/Staging Area
- Riffle Material Mining Area
- Bypass Channel
- SA # — Stating Area Number

N

USFS

Temporary Access Road (Typ.)

Stockpile/Staging Area (Typ.)

SA 1

SA 2

SA 3

Match Line - (Sheet 61669)

Proposed Channel (Typ.)

Existing Channel (Typ.)

Limits of Disturbance (Typ.)

Temporary Bypass
(Typ. See Sheets 61677 thru 61680)

Riffle Material Mining Area (Typ.)

Temporary Culvert to be Installed within Bypass Channel

No disturbance to historic railroad grade unless otherwise specified

Private Property

USFS

OR HWY 244

USFS

ACCESS AND STAGING PLAN 1

100 0 100 200 300
SCALE OF FEET

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
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JUSTIN NIELSEN 2020.03.13 12:58:39 -08'00' P.E.
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BOISE, IDAHO 2020-03-13

ACCESS AND STAGING PLAN 1

1678-100-61668

SHEET 1

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NICK DANIS

CAD SYSTEM
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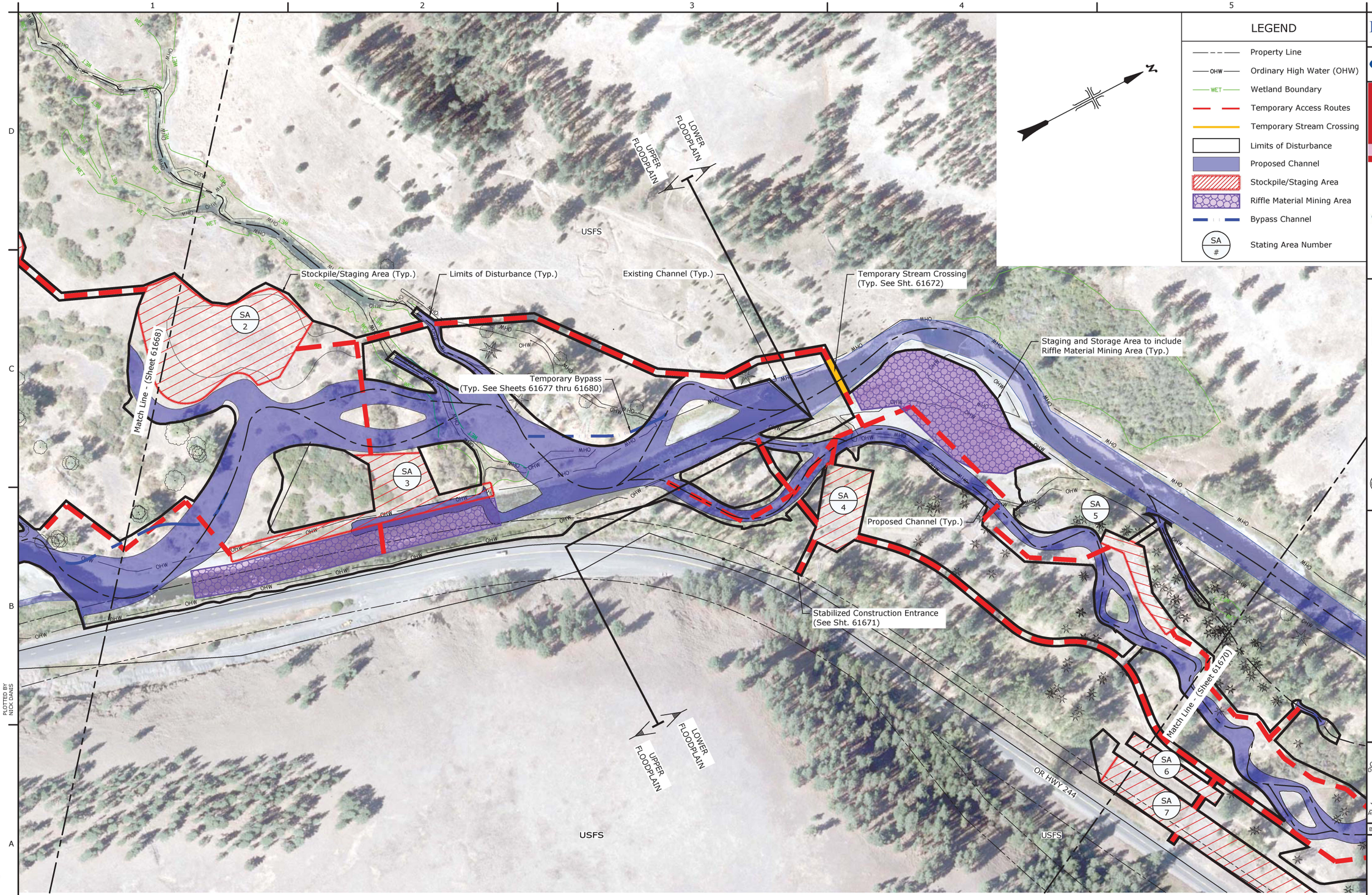


ACCESS AND STAGING PLAN 2

100 0 100 200 300
SCALE OF FEET

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
EXPIRES: 12/31/21

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

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ACCESS AND STAGING
PLAN 2

1678-100-61669

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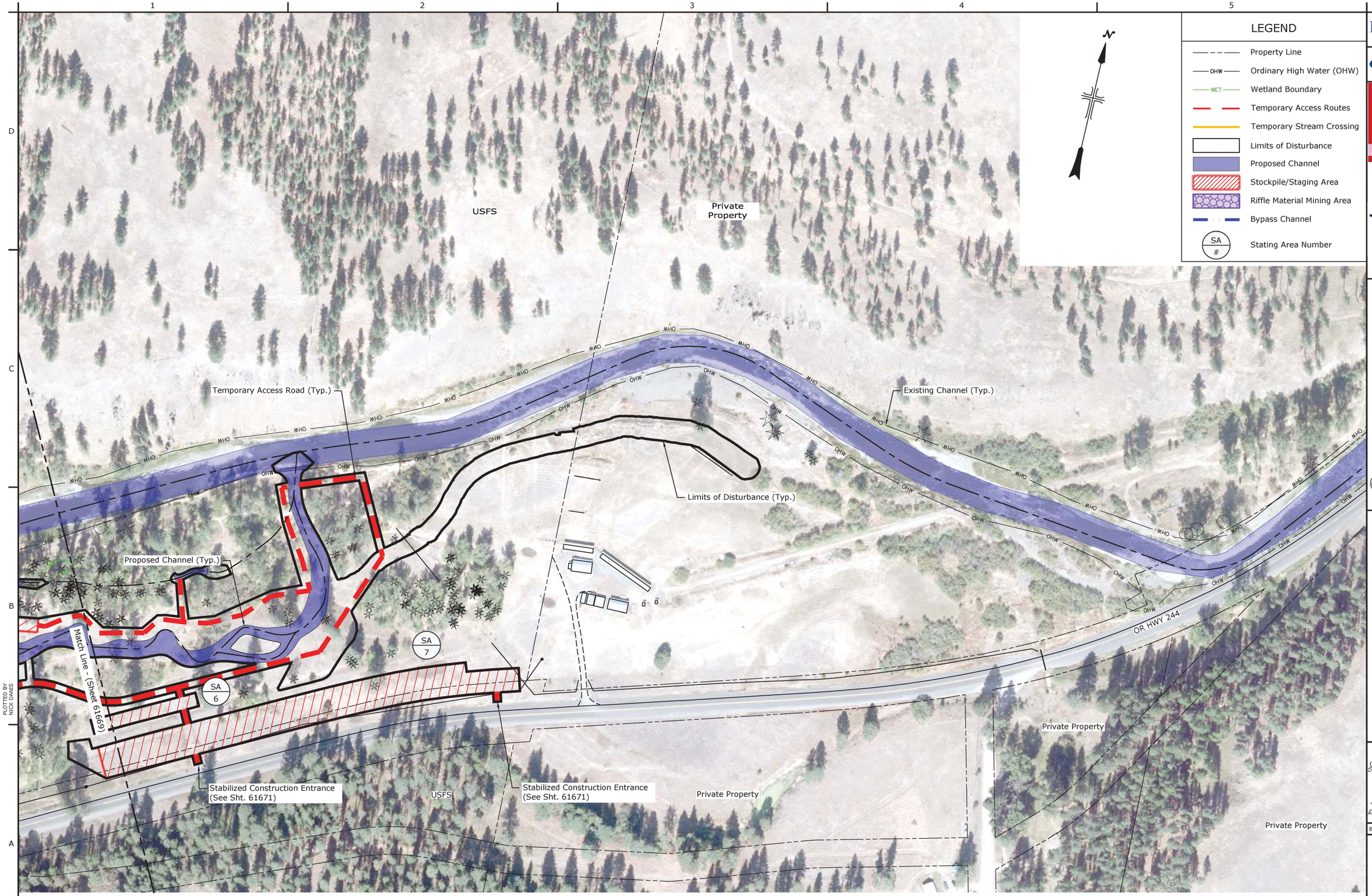


## LEGEND

- Property Line
- OHW — Ordinary High Water (OHW)
- WET — Wetland Boundary
- Temporary Access Routes
- Temporary Stream Crossing
- Limits of Disturbance
- Proposed Channel
- Stockpile/Staging Area
- Riffle Material Mining Area
- Bypass Channel
- SA # — Stating Area Number

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OREGON
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03/13/2020
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ACCESS AND STAGING PLAN 3

1678-100-61670

SHEET 1

ACCESS AND STAGING PLAN 3

100 0 100 200 300
SCALE OF FEET

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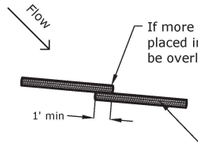
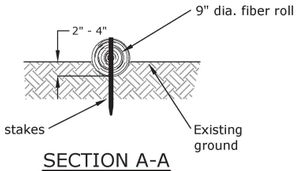
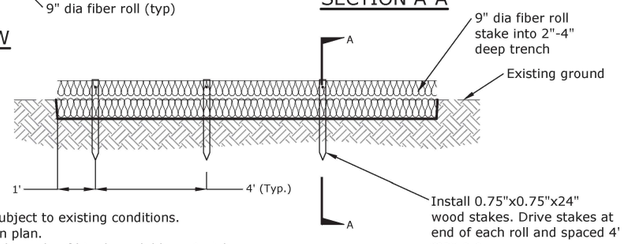



PLAN VIEW




SECTION A-A

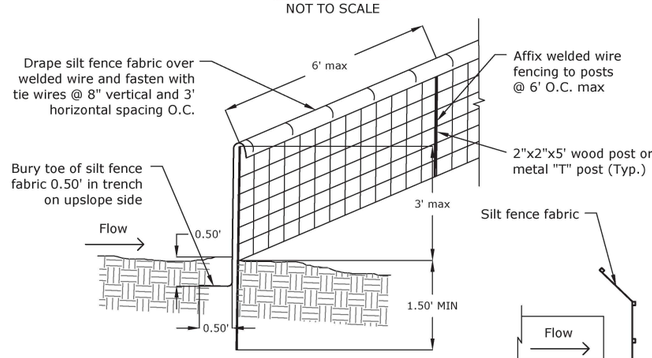



Construction Notes:

1. Placement of fiber rolls is subject to existing conditions.
2. Place fiber rolls as shown on plan.
3. Fiber rolls shall be completely made of bio-degradable material.
4. Place gravel bags over fiber roll when stakes cannot be used due to bedrock.

PROFILE VIEW

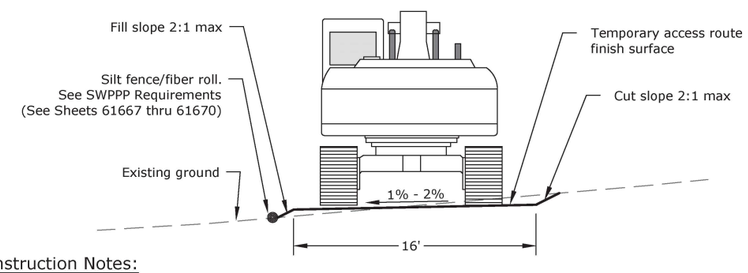
FIBER ROLL
NOT TO SCALE




Construction Notes:

1. Contractor may use pre manufactured sediment control fence as approved by the C.O.
2. Place fencing such that storm runoff cannot pass around or under fence.

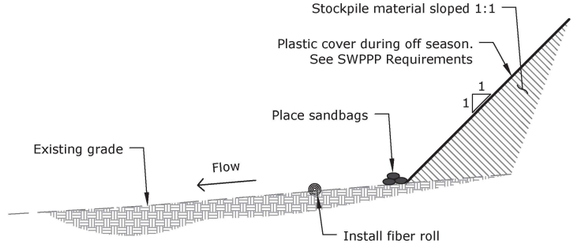
SILT FENCE
NOT TO SCALE




Construction Notes:

1. Temporary access routes shall follow previously established routes where available.
2. Place temporary access routes as far as possible away from streams, surface waters and wetlands.

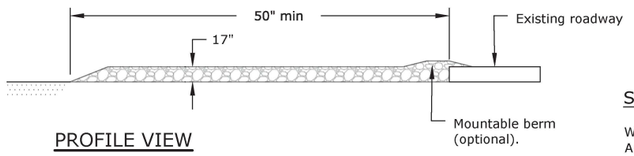
TEMPORARY ACCESS ROUTE
NOT TO SCALE



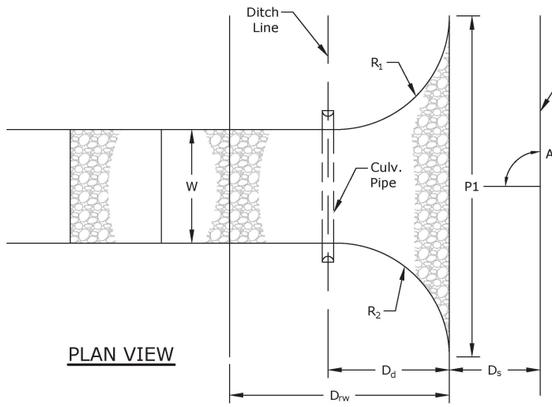

Construction Notes:

1. All stockpiles shall be covered and protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
2. Repair and/or replace perimeter controls and covers as needed, or as directed by engineer, to keep them functioning properly.
3. Locate stockpiles away from concentrated flows of storm water, drainage courses, and inlets.
4. Protect all stockpiles from storm water run-on using a temporary perimeter sediment barrier such as berm, dikes, fiber rolls, silt fences, sandbag or gravel bag barriers.
5. Implement wind erosion control practices as appropriate on all stockpiled material.

STAGING AND STOCKPILE AREA
NOT TO SCALE




PROFILE VIEW




PLAN VIEW

Specifications:

| | |
|---|---|
| Width (W): | 15 ft |
| Angle (A): | 90 deg |
| Radius 1 ($R_1$): | 15 ft |
| Radius 2 ($R_2$): | 15 ft |
| Paving Limit 1 ($P_1$) | 45 ft |
| Surface ($D_s$) | 11 ft |
| Ditch ($D_d$) | 16 ft |
| R/W | 29 ft |

Culvert Pipe Material: Corrugated Metal (CMP)
Culvert Pipe Diameter: 18 in
Culvert Pipe Length: 20 ft
Pipe End Slopes: 1:6

Sub Base Course: 75mm - 0 Aggregate Base (3" - 0)
Thickness: 12 in

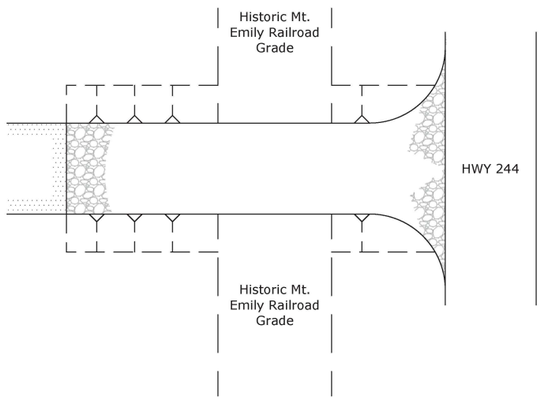
Course Base: 25mm - 0 Aggregate Base (1" - 0)
Thickness: 3 in

Wear Course: Gravel
Thickness: 2 in

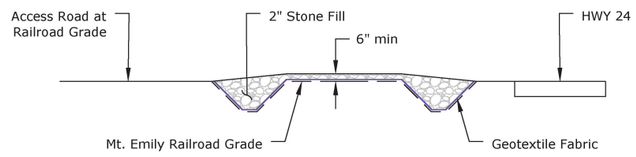
Construction Notes:

1. Maintenance - The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public right-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way must be removed immediately.
2. Periodic inspection and needed maintenance shall be provided after each rain.
3. When necessary, wheels shall be cleaned prior to entrance onto public right-of-way.
4. When washing is required, it shall be done on an area stabilized with crushed stone or native tailings that drains into an approved sediment trap or sediment basin.
5. Use sandbags or other approved methods to channelize runoff to basin as required.
6. Culvert Safety End Sections not required (pipe diameter < 600mm).
7. Contractor shall remove any material used to construct temporary roadways, parking areas, construction entrances, and access roads prior to contract completion that are requested by the Contracting Officer to be removed. All materials removed shall become property of the Contractor and shall be disposed of at an approved disposal location.

STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE




PLAN VIEW




PROFILE VIEW

Construction Notes:

1. Temporary Access will be consistent with Temporary Access Road Detail this sheet.
2. Culvert locations shall be outside of Historic Railroad Grade to create no impact.
3. There are 6 locations with varied levels of interaction with historic railroad grade. Work with C.O. to determine requirements at each location.
4. Lay Geotextile Fabric underneath the 2 inch stone.
5. Post construction stone and geotextile fabric to be removed leaving historic railroad grade intact.

TEMPORARY ACCESS AT RAILROAD GRADE
NOT TO SCALE

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ACCESS AND STAGING TESC DETAILS

1678-100-61671

SHEET 1

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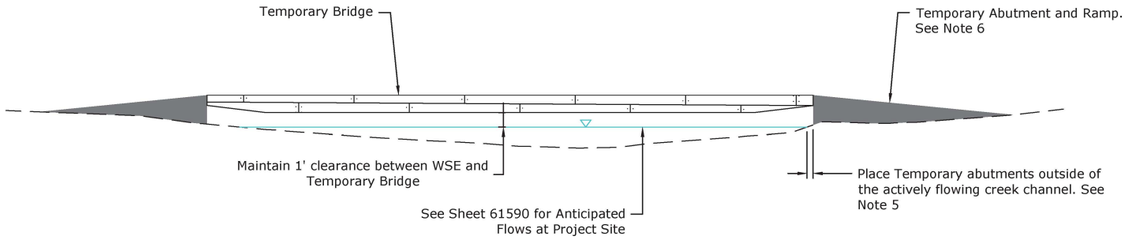
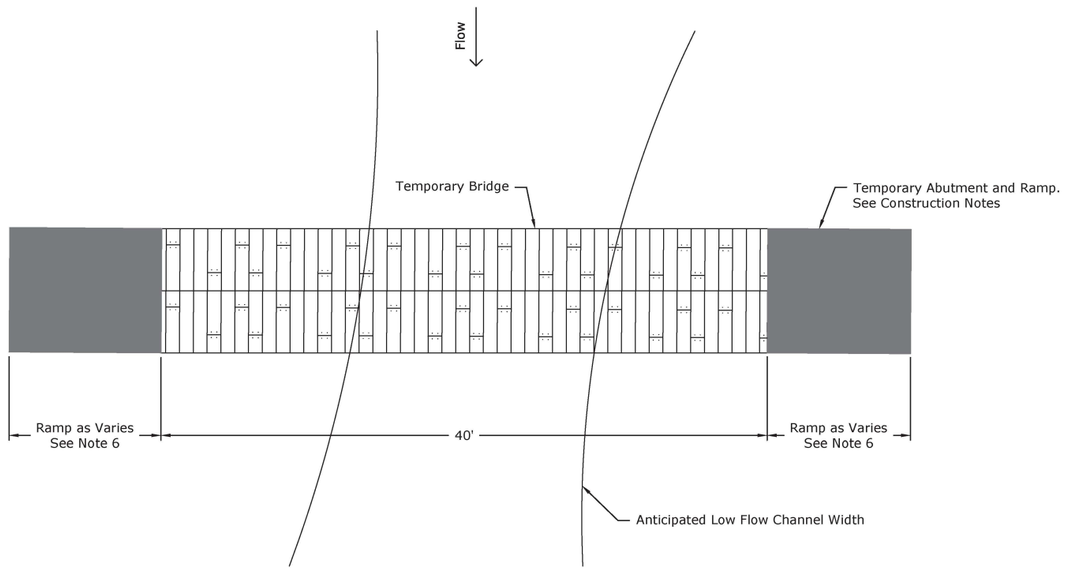



PROFILE VIEW




PLAN VIEW

Construction Notes:

1. The Contractor shall submit a Temporary Bridge Crossing Plan, including Shop drawings of bridges to be installed for temporary channel crossings. Shop drawings shall include all pertinent details of the bridge and bridge superstructure deck including manufacture date, structural makeup, current condition, weight, load rating, etc.
2. The Contractor is solely responsible for supplying a structurally sound bridge including temporary abutments, structural support members, and bridge deck capable of supporting all equipment, machinery, and material deliveries that will cross the actively flowing river. The bridge shall be a single span with a minimum span of 40 feet supported by temporary abutments at each end.
3. The Contractor shall inspect and maintain the bridge and all associated components daily from the time of installation to the time of removal. The Contractor shall remove and replace any bridge components that become unfit or unsafe for use at no additional cost to the Contracting Agency.
4. Place temporary abutments outside of the actively flowing creek channel. Abutments shall be placed at an elevation such that the low chord of the bridge used for the temporary crossing sits a minimum of 1 foot above the water surface elevation at the time of installation.
5. 40' bridge may not be adequate to span the entire wetted surface. At the discretion of the C.O., limited encroachment with the approaches and abutment may be allowed.
6. Temporary ramps shall be constructed as deemed necessary by the Contractor to safely access and utilize the bridge deck.
7. The Contractor may cross the Grande Ronde River with tracked equipment prior to bridge installation to place abutments and to position the bridge on the abutments. Once the bridge is in place the Contractor shall use the temporary channel crossing for all channel crossings.
8. Removal of the temporary channel crossings shall be accomplished by first removing the bridge deck and structural members, isolating abutments within the wetted channel if necessary, and removing abutments. Material placed for temporary ramps shall be removed by the Contractor and disposed of as directed by the Contracting Officer.
9. The Contractor shall minimize the number of trips across the Grande Ronde River without the crossing in place during installation and removal of the crossing.
10. The exact location, elevation of the bridge deck, and configuration of approach ramps, will be determined in the field with the aid of the C.O. The work show on this sheet is an example of an acceptable method. Detailed method shall be included in Temporary Bridge Crossing Plan submitted by the Contractor.
11. Bridge Installation and Removal shall occur within the in-water work window between July 1 and October 15, and shall not remain in place between UPPER FLOODPLAIN and LOWER FLOODPLAIN of the project.

TEMPORARY BRIDGE CROSSING
NOT TO SCALE

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ACCESS AND STAGING - TEMPORARY CROSSINGS

1678-100-61672

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## LEGEND

- Upper Floodplain Construction Area
- Construction Stockpile/ Staging Area
- Newly Constructed Channel
- Previously Constructed Channel
- Riffle Material Mining Area
- Temporary Access Route
- Temporary Stream Crossing
- Bypass Channel
- Thalweg
- WET — Existing Wetlands
- OHW — Ordinary High Water (OHW)
- Property Line

## Longley Meadows- Upper Floodplain Construction

1. Mobilize, implement SWPPP, establish Upper Floodplain stockpile and staging areas.
2. Survey channel alignment and avoidance areas.
3. Establish access/haul routes.
4. Establish de-watering basins.
5. Harvest and stockpile large wood.
6. Mine existing gravel bar for Class 1 Riffle Material
7. While maintaining levees between new channel and existing channel, excavate and de-water new channel segments in floodplain Side Channels 1, 2, 2A, and 3. Stockpile material in preparation of fill of existing channel.
8. Mine existing channel for Class 1 Riffle Material.
9. Construct channel bed and install LWM in new channel segments.
10. Perform In Water Work: Within active river channel (Main Channel Sta 0+00 to Sta 47+50), excavate and sort existing channel bed material, fill/enhance existing channel, install habitat elements and install LWM.
11. Isolate channel with levee and/or coffer dam.
12. Dewater and perform fish rescue operations.
13. Mine existing channel for Class 1 Riffle Material.
14. Perform construction activities in new channel segments.
15. Flush newly constructed channel sections.
16. Remove levee/coffer dams.
17. Install floodplain roughness elements.
18. Decommission completed areas, winterize and demobilize.
19. Any stockpiles to be over-wintered shall be located in Staging Area 1 (Upper Floodplain) or Staging Area 7 (Lower Floodplain) and shall meet all requirements of the SWPPP.







CONSTRUCTION SEQUENCING OVERVIEW PLAN - UPPER FLOODPLAIN

300 0 300 600 900
SCALE OF FEET

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CONSTRUCTION SEQUENCING OVERVIEW PLAN - UPPER FLOODPLAIN

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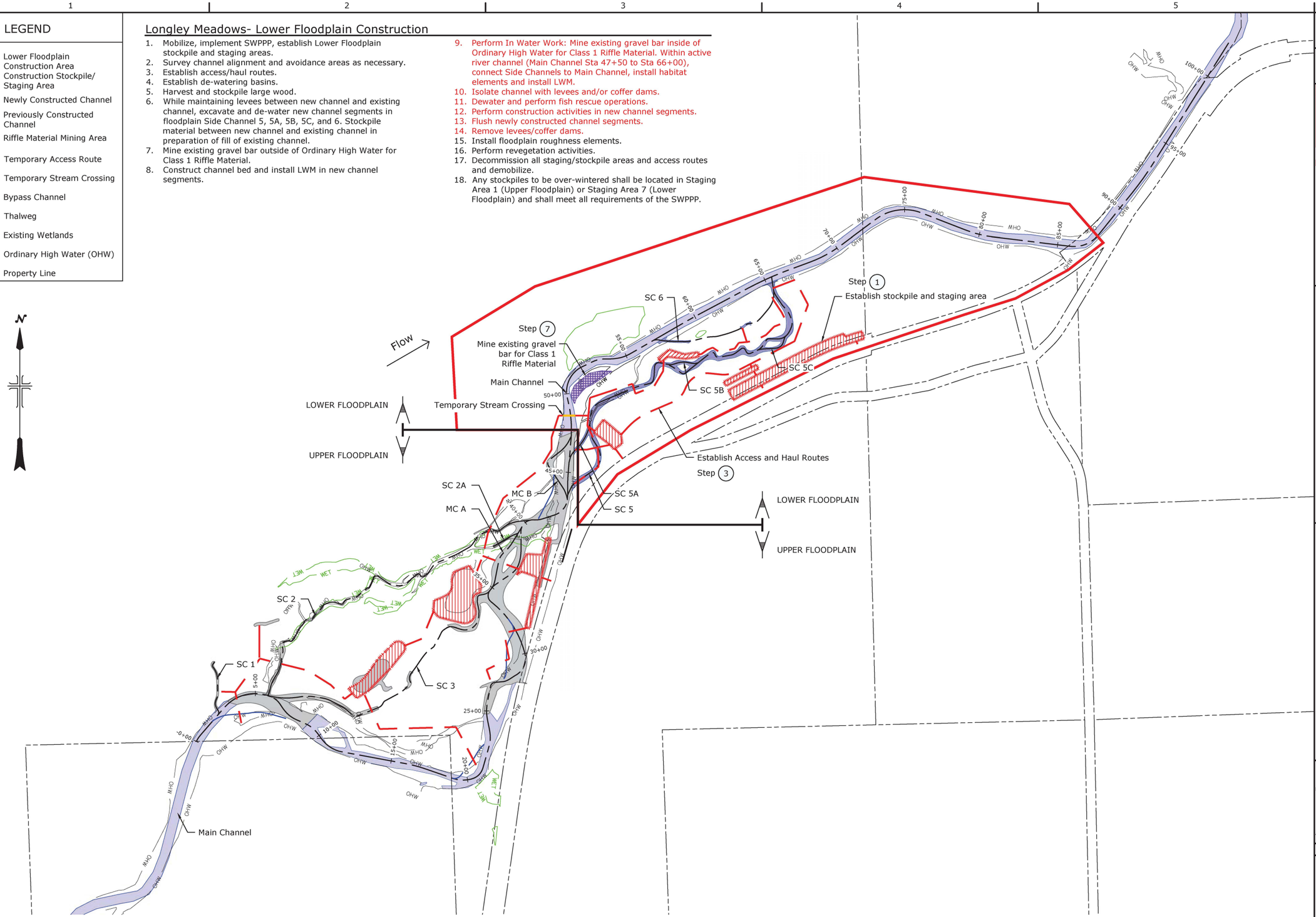
## LEGEND

- Lower Floodplain Construction Area
- Construction Stockpile/ Staging Area
- Newly Constructed Channel
- Previously Constructed Channel
- Riffle Material Mining Area
- Temporary Access Route
- Temporary Stream Crossing
- Bypass Channel
- Thalweg
- WET — Existing Wetlands
- OHW — Ordinary High Water (OHW)
- Property Line

## Longley Meadows- Lower Floodplain Construction

1. Mobilize, implement SWPPP, establish Lower Floodplain stockpile and staging areas.
2. Survey channel alignment and avoidance areas as necessary.
3. Establish access/haul routes.
4. Establish de-watering basins.
5. Harvest and stockpile large wood.
6. While maintaining levees between new channel and existing channel, excavate and de-water new channel segments in floodplain Side Channel 5, 5A, 5B, 5C, and 6. Stockpile material between new channel and existing channel in preparation of fill of existing channel.
7. Mine existing gravel bar outside of Ordinary High Water for Class 1 Riffle Material.
8. Construct channel bed and install LWM in new channel segments.
9. Perform In Water Work: Mine existing gravel bar inside of Ordinary High Water for Class 1 Riffle Material. Within active river channel (Main Channel Sta 47+50 to Sta 66+00), connect Side Channels to Main Channel, install habitat elements and install LWM.
10. Isolate channel with levees and/or coffer dams.
11. Dewater and perform fish rescue operations.
12. Perform construction activities in new channel segments.
13. Flush newly constructed channel segments.
14. Remove levees/coffer dams.
15. Install floodplain roughness elements.
16. Perform revegetation activities.
17. Decommission all staging/stockpile areas and access routes and demobilize.
18. Any stockpiles to be over-wintered shall be located in Staging Area 1 (Upper Floodplain) or Staging Area 7 (Lower Floodplain) and shall meet all requirements of the SWPPP.




CONSTRUCTION SEQUENCING OVERVIEW PLAN - LOWER FLOODPLAIN

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SCALE OF FEET

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CONSTRUCTION SEQUENCING OVERVIEW PLAN - LOWER FLOODPLAIN

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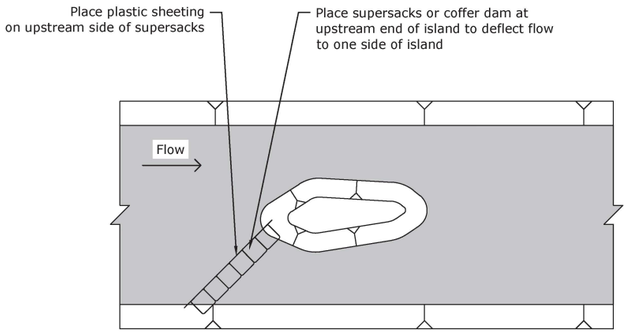
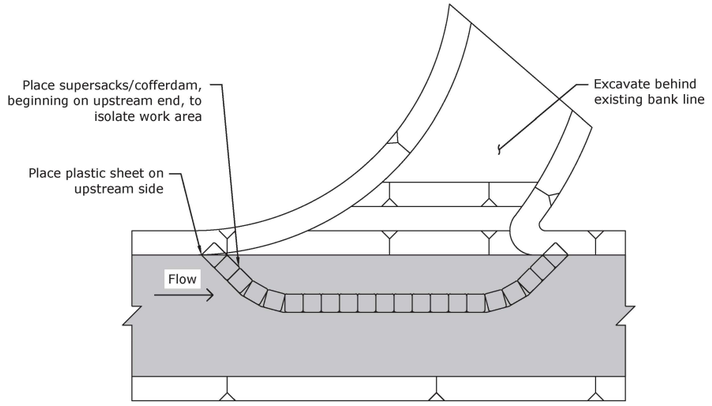


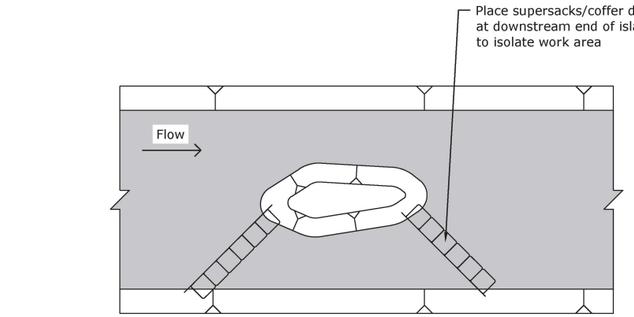

STEP 1



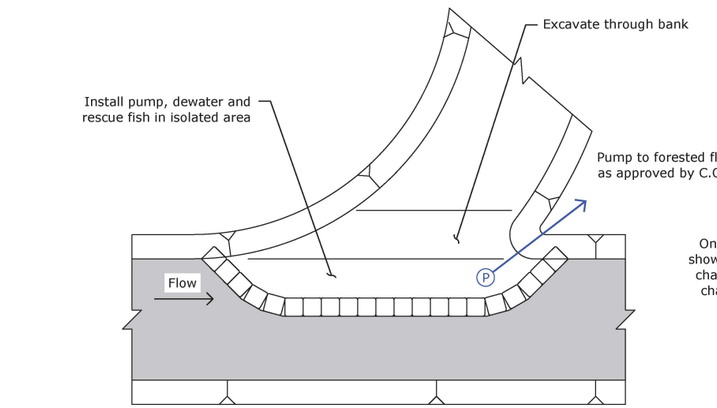

STEP 1

## Construction Notes:

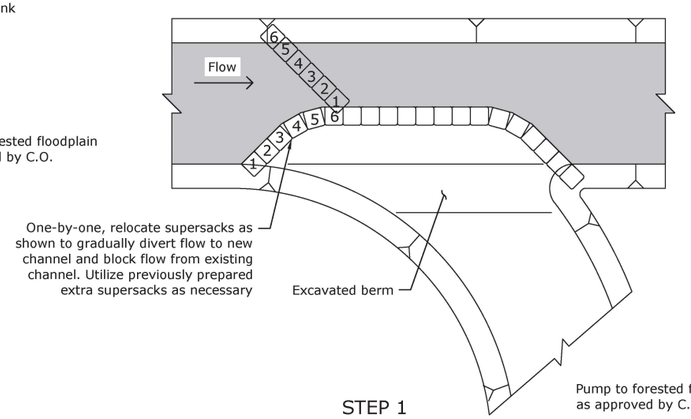
1. The contractor is solely responsible for designing and implementing measures to perform in-water work in compliance with work requirements and permit conditions.
2. A Cofferdam and Flow Diversion Plan and Dewatering Plan shall be submitted by the Contractor within ten (10) days of receiving notice-to-proceed in accordance with the Specifications.
3. See General Notes and Abbreviations Sheet 61590 for Grande Ronde Flow Statistics at this site.
4. Maintain fish passage during project construction.
5. Material used for temporary access shall be removed from the channel upon completion of the project, and deposited in an upland location where it will not re-enter the river.
6. If bulk bags or smaller gravel bags are used to construct cofferdams or flow diversion dams, material used to fill the bags shall not contain fines and shall be of similar gradation to the existing channel substrate. Material must be approved by the Contracting Officer and clearly defined in the Cofferdam and Flow Diversion Plan submittal
7. Notify C.O. minimum 5 days prior to performing in-water work.
8. The Contractor will monitor turbidity during construction. Turbidity sampling will be performed using a calibrated turbidimeter or by visual observation, every four hours while work is being implemented, or more often if turbidity disturbances vary greatly. Background samples or observations will be taken at a relatively undisturbed area approximately 100 feet upstream from the project area. The second turbidity sample or observation will take place immediately after the upstream observation 50 feet downstream from the project area in streams that are 30 feet wide or less, and 100 feet downstream from the project area in streams that are between 30 and 100 feet wide, every two hours. If the observed/measured turbidity downstream is more than background measurement (>10%), the activity must be modified to reduce turbidity. If the exceedance continues after the second monitoring interval, the activity must stop until the turbidity levels return to background.
9. The Contractor shall coordinate with the Contracting Agency for fish removal and shall notify the Contracting Officer a minimum of 5 working days prior to requiring fish removal services.



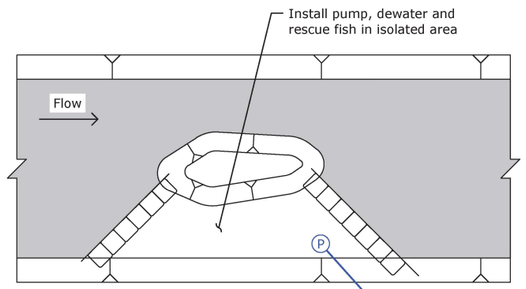

STEP 2




STEP 2



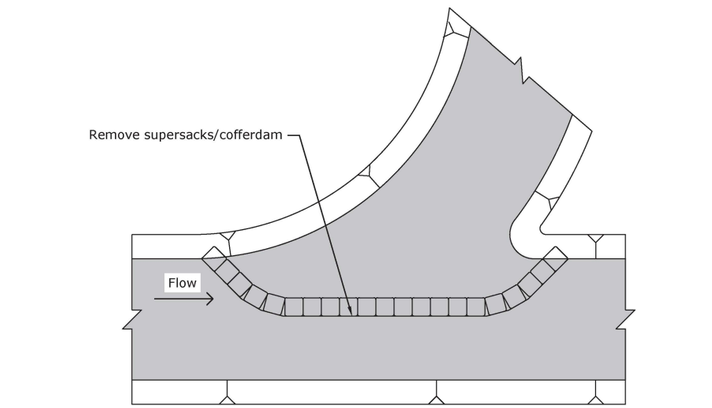

STEP 1




STEP 3

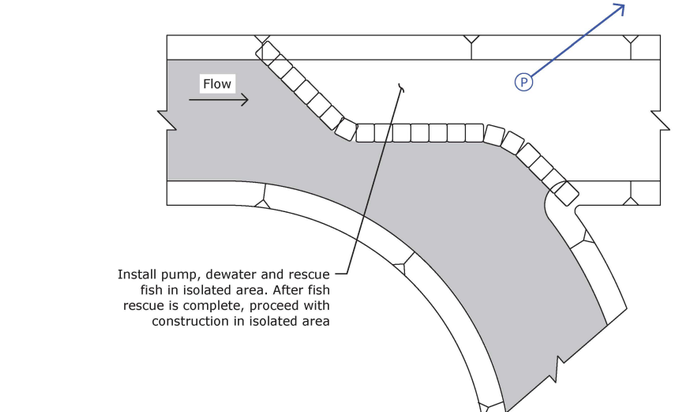
Pump to forested floodplain as approved by C.O.

WATER REMOVAL AROUND ISLAND/SIDE CHANNEL
NOT TO SCALE




STEP 3

WATER REMOVAL AT CONFLUENCE
NOT TO SCALE




STEP 2

ADJUST COFFER DAMS
NOT TO SCALE

RECLAMATION
Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
EXPIRES: 12/31/19

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 12:50:22 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

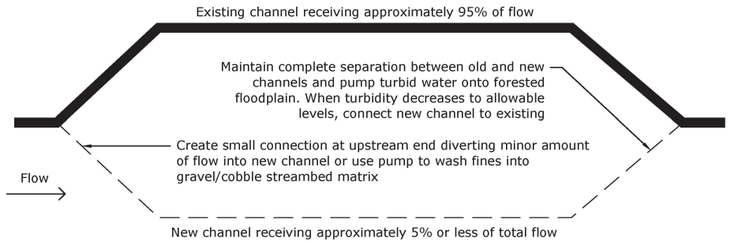
REMOVAL OF WATER PLAN

1678-100-61675

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:23 AM
PLOTTED BY
NICK DANIS

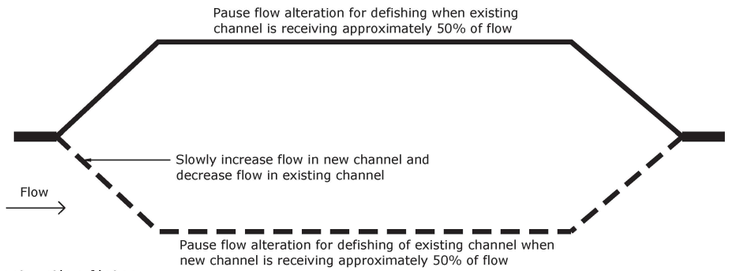
CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_WATER REMOVAL DETAILS.DWG




Construction Notes:

1. Use pumped water applied to new channel to wash fines into the gravel/cobble bed material. Alternatively, a small opening can be made in the upstream diversion to allow a minor amount of flow from the river to enter the new channel. During either process, place a pump at the downstream end of the new channel that will pump turbid water onto an upland area. The capacity of the downstream pump shall exceed the amount of flow applied upstream.
2. When water pumped from the downstream end is no longer significantly turbid, the pump can be removed and the downstream end of the new channel can be opened up to the existing channel. Amount of allowable turbidity of the flow in the new channel varies depending on the flow rate in the new channel vs. flow rate in the existing channel. After mixing at the downstream connection, flow in the river channel shall meet water quality standards for maximum turbidity as required by multiple state and federal permits.
3. Following open connection, monitor turbidity of water in the creek 300 feet downstream of where new channel and existing channel meet. Incrementally increase upstream connection to 50% of total flow as turbidity of water at monitoring station decreases to allowable levels.

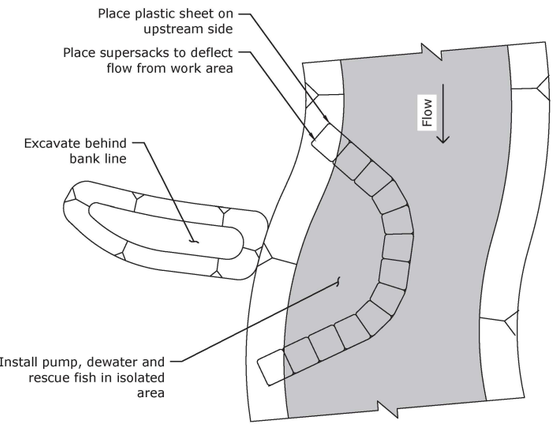
STEP 1



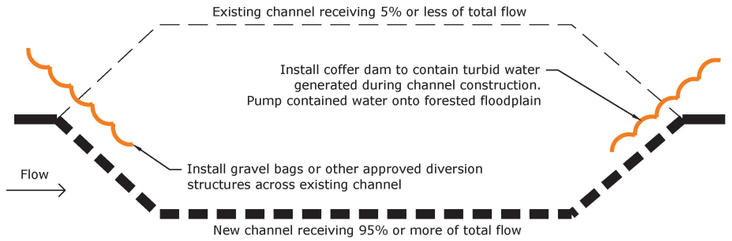

Construction Notes:

1. Slowly increase the amount of flow entering the new channel. The Contracting Officer (C.O.) will determine the rate to increase flow into the new channel. It is critical that the flow increase is done slowly to minimize turbidity generated in the new channel, and to prevent stranding of fish in the existing channel where flow rate is decreasing.
2. When approximately half of the flow is in the new channel, pause work that increases flow rate in the new channel allow the Contracting Agency to perform defishing of the old channel.

STEP 2



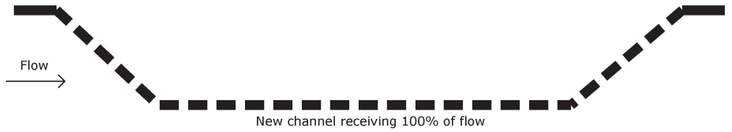

STEP 1




Construction Notes:

1. After defishing of existing channel is complete as determined by the Contracting Officer. resume work to slowly increase amount of total flow entering the new channel.
2. Install temporary diversion dam across upstream end of existing channel to complete diversion. Install temporary coffer dam at downstream end of existing channel to contain turbid water generated during fill placement in existing channel.

STEP 3

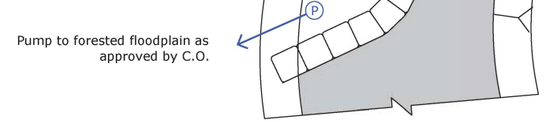



Construction Notes:

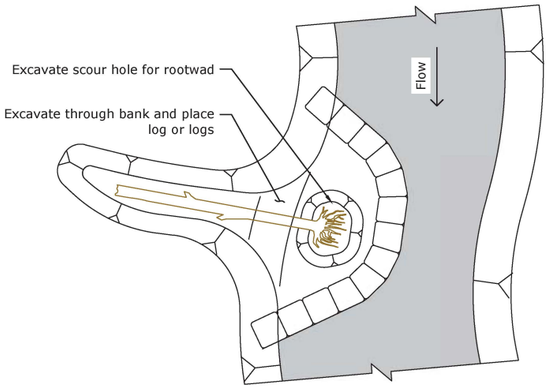
1. Fill existing channel as shown in Grading Plan sheets in these Drawings.
2. Remove temporary diversion dam and coffer dam from abandoned channel.

STEP 4

CHANNEL DIVERSION PROCEDURE
NOT TO SCALE

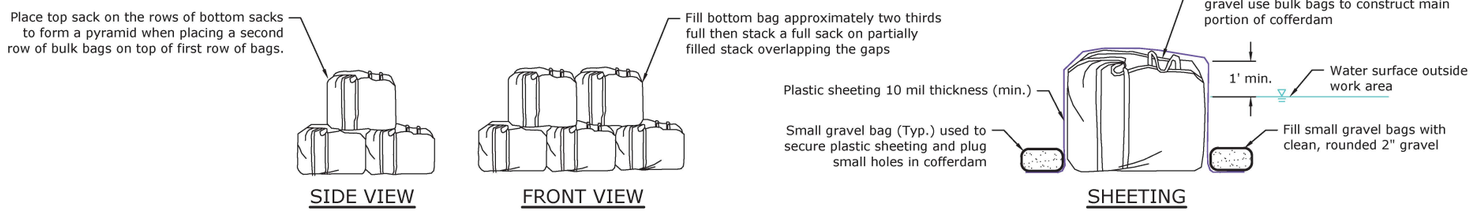



STEP 2




STEP 3

WOOD STRUCTURE PLACEMENT
NOT TO SCALE




SUPERSACK INSTALLATION DETAIL
NOT TO SCALE

RECLAMATION
Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
EXPIRES: 12/31/19

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 12:50:59 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

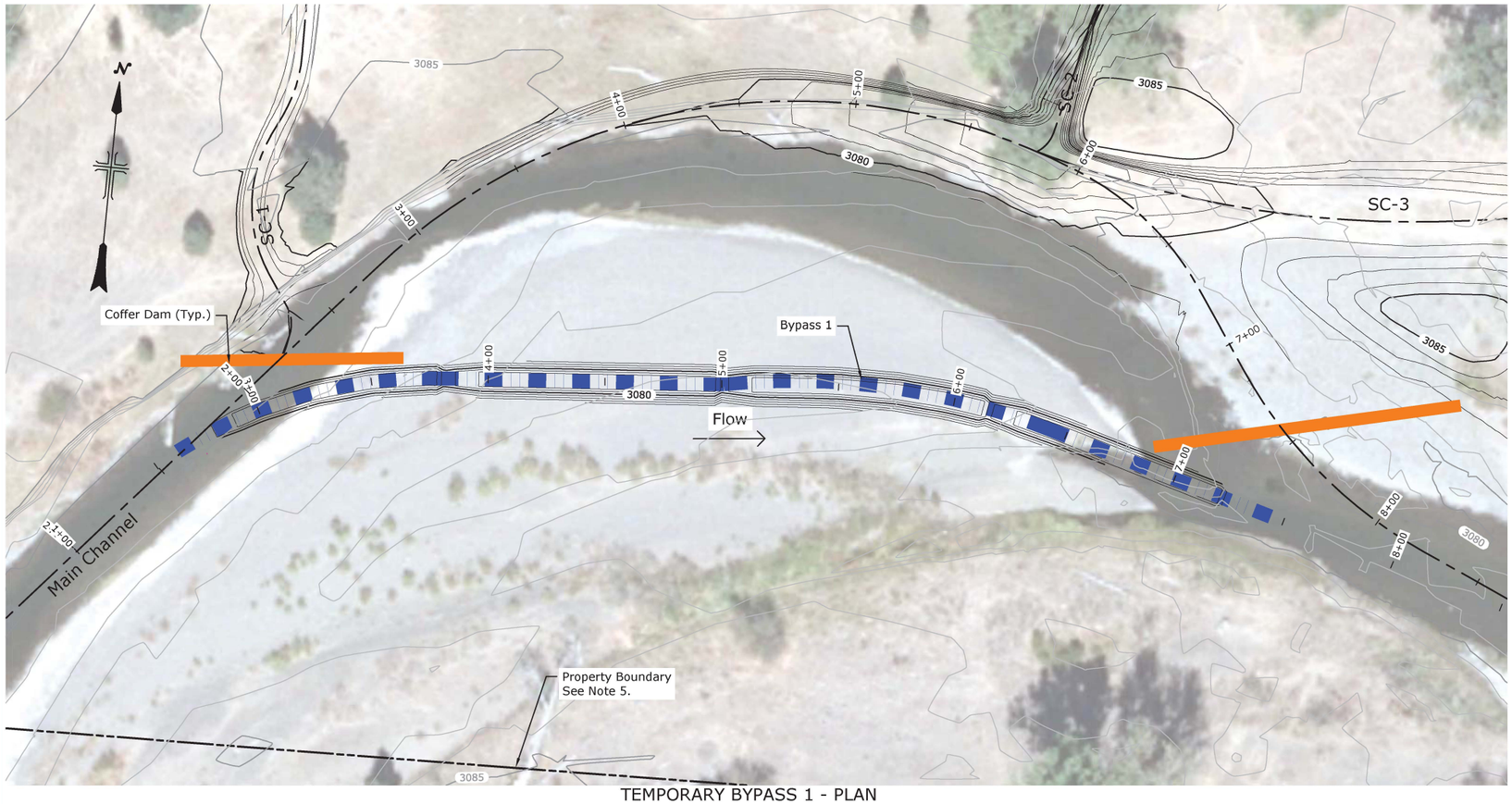
REMOVAL OF WATER PLAN

1678-100-61676

SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:23 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_WATER REMOVAL DETAILS.DWG




TEMPORARY BYPASS 1 - PLAN

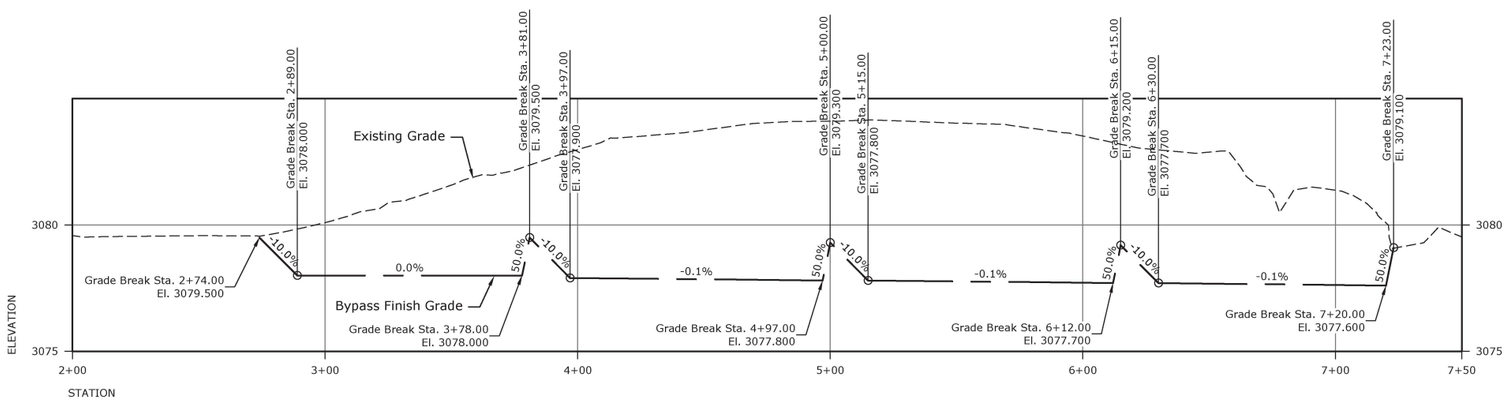
STA. 2+00 To STA. 8+00

30 0 30 60 90

SCALE OF FEET

Bypass 1 Notes:

1. Bypass through point bar to construct left bank wood features and SC1 and SC2 Inlet grading.
2. Bypass channel approximately 460 ft in length.
3. Coffer dams approximately 230 ft in length.
4. Located on USFS property.
5. Property boundary to be flagged by C.O.




TEMPORARY BYPASS 1 - PROFILE

HORIZONTAL SCALE

30 0 30 60 90

SCALE OF FEET

VERTICAL SCALE

3 0 3 6 9

SCALE OF FEET

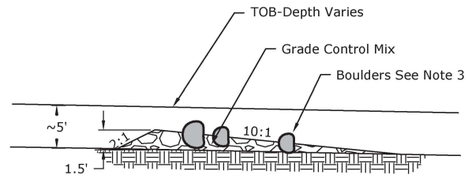
LEGEND

- ELEV — OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Finish Grade Profile
- Existing Grade Profile
- Bypass Channel
- Coffer Dam

Notes:

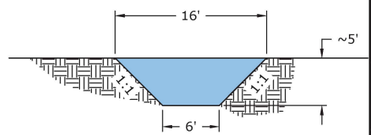
1. Contractor to cut rough grade trapezoidal channel with slopes as shown.
2. Contractor to construct grade control riffles at locations shown, using appropriate sized riffle material per C.O.
3. Grade Controls to be compacted using excavator bucket. Boulders to be place per C.O. on Grade Control face for energy dissipation and fish resting.

| GRADE CONTROL MIX | |
|---|---|
| Particle Class | Size |
| D84 | 9.0 inch |
| D50 | 4.0 inch |
| D10 | ≤ .08 inch |




GRADE CONTROL DETAIL

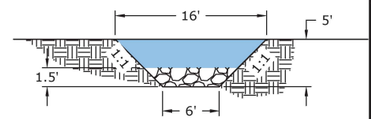
N.T.S.




ROUGH CUT DITCH SECTION

8 0 8 16 24

SCALE OF FEET




GRADE CONTROL CREST SECTION

8 0 8 16 24

SCALE OF FEET

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN

EXPIRES: 12/31/2022

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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRAND RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| J. Gilder | DESIGNED |
| J. Gilder | DRAWN |
| J. Bryant P.E. | CHECKED |
| JUSTIN NIELSEN 2020.03.13 12:11:20 -08'00' | P.E. |
| TED DAY | TECH. APPR. |
| | APPROVED ADMIN APPROVAL - TITLE |
| BOISE, ID | 2020-03-13 |

TEMPORARY BYPASS 1

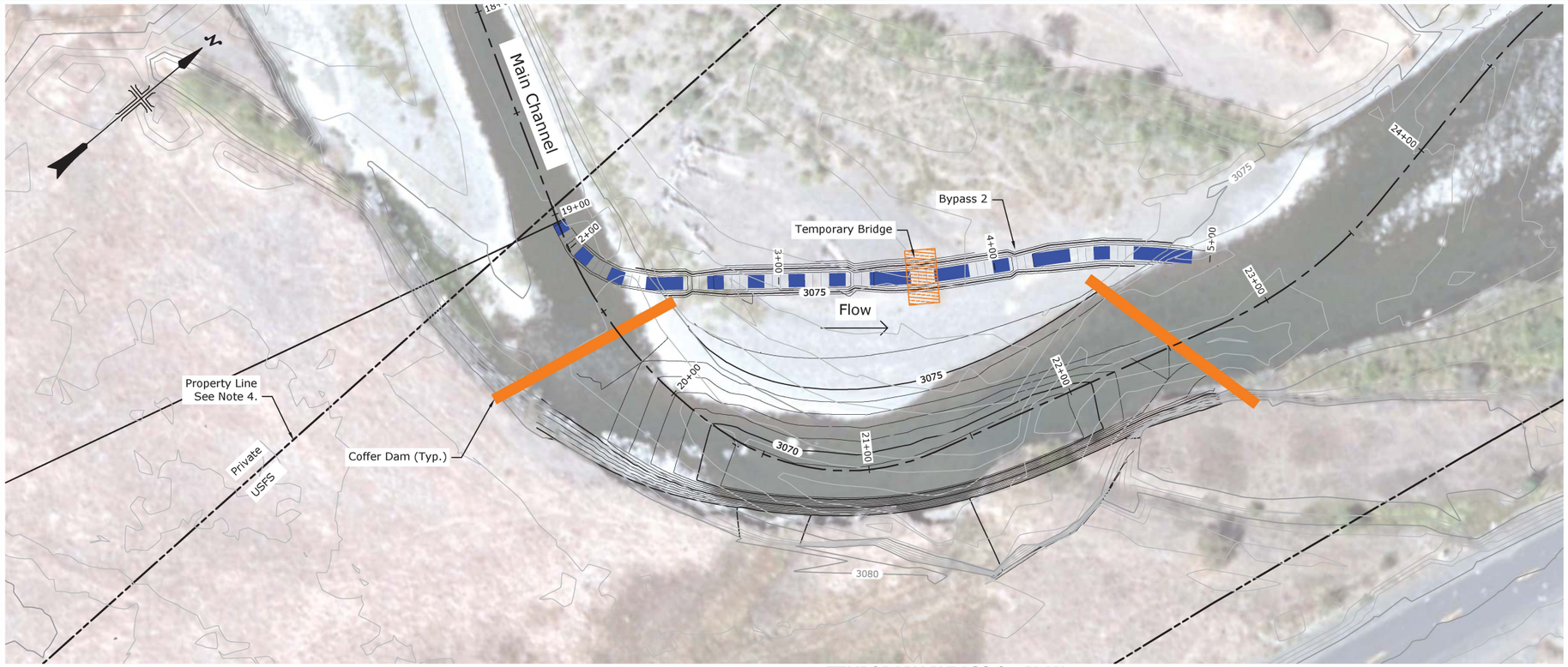
PLAN & PROFILE

1678-100-61677

SHEET 1

LAST SAVED DATE
2020.01.14
LAST SAVED BY
JHNIELSEN

CAD SYSTEM
AutoCAD 23.0S (LMS TECH)
CAD FILENAME
LM-BYPASS.DWG




TEMPORARY BYPASS 2 - PLAN

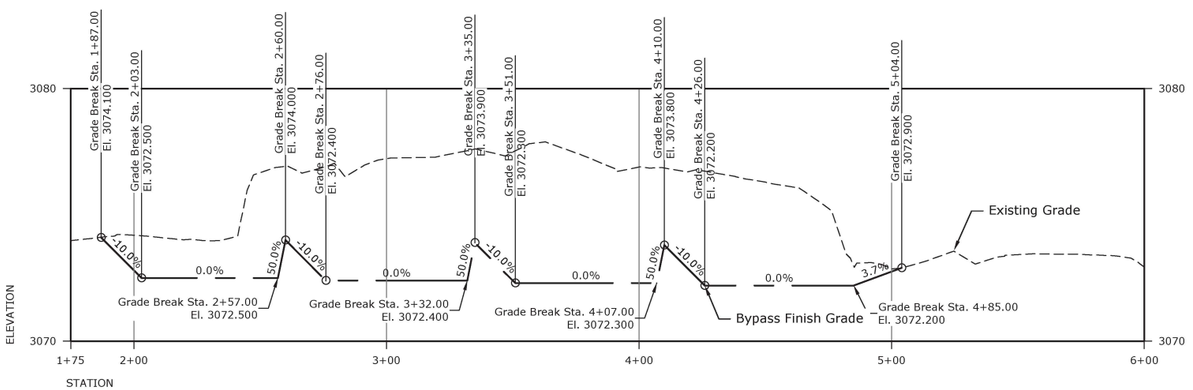
STA. 2+00 To STA. 5+00

30 0 30 60 90

SCALE OF FEET

Bypass 2 Notes:

1. Bypass through point bar to construct right bank wood structures and pool grading.
2. Bypass channel approximately 305 ft in length.
3. Coffer dams approximately 200 ft in length.
4. Located on USFS property, property boundary to be flagged by C.O.




TEMPORARY BYPASS 2 - PROFILE

HORIZONTAL SCALE

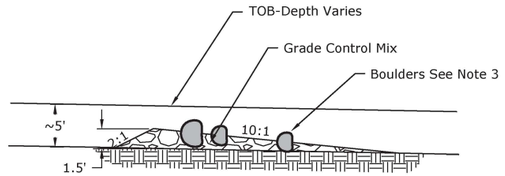
30 0 30 60 90

SCALE OF FEET

VERTICAL SCALE

3 0 3 6 9

SCALE OF FEET

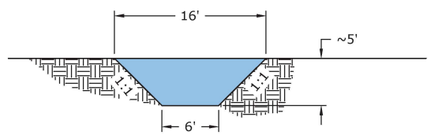



GRADE CONTROL DETAIL

N.T.S.

Notes:

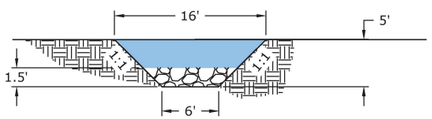
1. Contractor to cut rough grade trapezoidal channel with slopes as shown.
2. Contractor to construct grade control riffles at locations shown, using appropriate sized riffle material per C.O.
3. Grade Controls to be compacted using excavator bucket. Boulders to be place per C.O. on Grade Control face for energy dissipation and fish resting.




ROUGH CUT DITCH SECTION

8 0 8 16 24

SCALE OF FEET




GRADE CONTROL CREST SECTION

8 0 8 16 24

SCALE OF FEET

| GRADE CONTROL MIX | |
|---|---|
| Particle Class | Size |
| D84 | 9.0 inch |
| D50 | 4.0 inch |
| D10 | ≤ .08 inch |

LEGEND

- OG Major Contour (ELEV)
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Finish Grade Profile
- Existing Grade Profile
- Bypass Channel
- Coffer Dam

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN

EXPIRES: 12/31/2022

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BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRAND RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J. Gilder
DESIGNED
J. Gilder
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 12:12:23 -08'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - TITLE
BOISE, ID 2020-03-13

TEMPORARY BYPASS 2

PLAN & PROFILE

1678-100-61678

SHEET 1

LAST SAVED DATE
2020-03-13
LAST SAVED BY
JHNIELSEN

CAD SYSTEM
AutoCAD 23
CAD FILENAME
LM-BYPASS.DWG

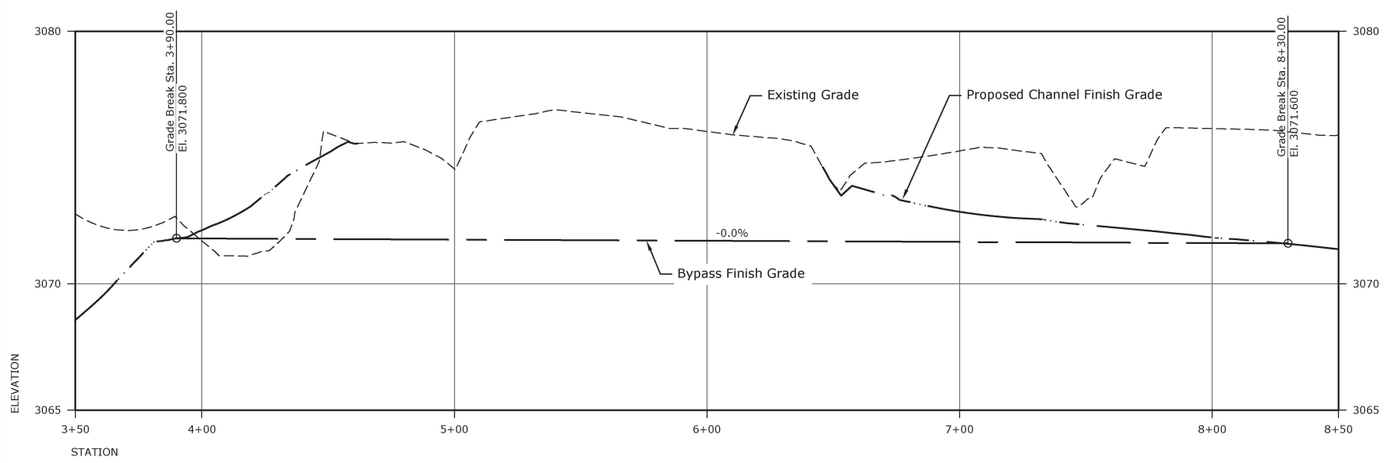



TEMPORARY BYPASS 3 - PLAN
STA. 4+00 To STA. 8+00

LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Finish Grade Profile
- Existing Grade Profile
- Bypass Channel
- Coffer Dam

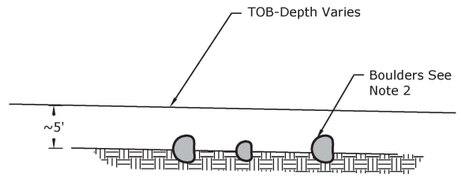
Bypass 3 Notes:
1. Bypass through point bar into completed remeandered main channel to isolate existing channel to fill and build right bank.
2. Bypass channel approximately 440 ft in length.
3. Coffer dams approximately 280 ft in length.
4. Located on USFS property, property boundary to be flagged by C.O.



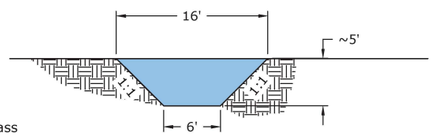

TEMPORARY BYPASS 3 - PROFILE

HORIZONTAL SCALE
30 0 30 60 90
SCALE OF FEET

VERTICAL SCALE
3 0 3 6 9
SCALE OF FEET




GRADE CONTROL DETAIL
N.T.S.




ROUGH CUT DITCH SECTION

8 0 8 16 24
SCALE OF FEET

Notes:
1. Contractor to cut rough grade trapezoidal channel with slopes as shown.
2. Boulders to be placed per C.O. within bypass channel for energy dissipation and fish resting.

RECLAMATION
Managing Water in the West

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REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14, 2020
JUSTIN NIELSEN
EXPIRES: 12/31/2022

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRAND RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

J Gilder
DESIGNED
J. Gilder
DRAWN
J. Bryant P.E.
CHECKED
JUSTIN NIELSEN 2020.03.13 12:13:01 -06'00' P.E.
TECH. APPR.
TED DAY
APPROVED
ADMIN APPROVAL - TITLE
BOISE, ID 2020-03-13

TEMPORARY BYPASS 3

PLAN & PROFILE

1678-100-61679

SHEET 1

LAST SAVED DATE
2020.03.13
LAST SAVED BY
JHNIELSEN

CAD SYSTEM
AutoCAD 2015 (LMS TECH)
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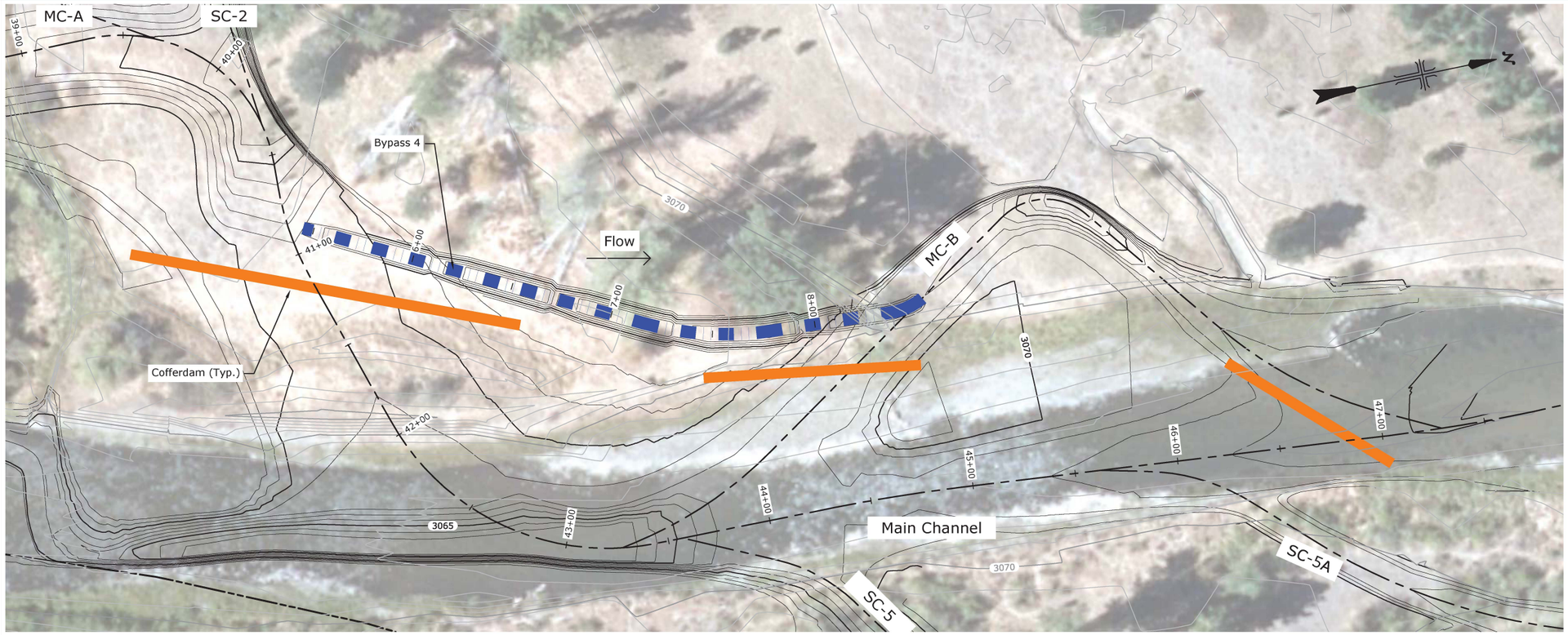
LM-BYPASS.DWG




TEMPORARY BYPASS 4 - PLAN

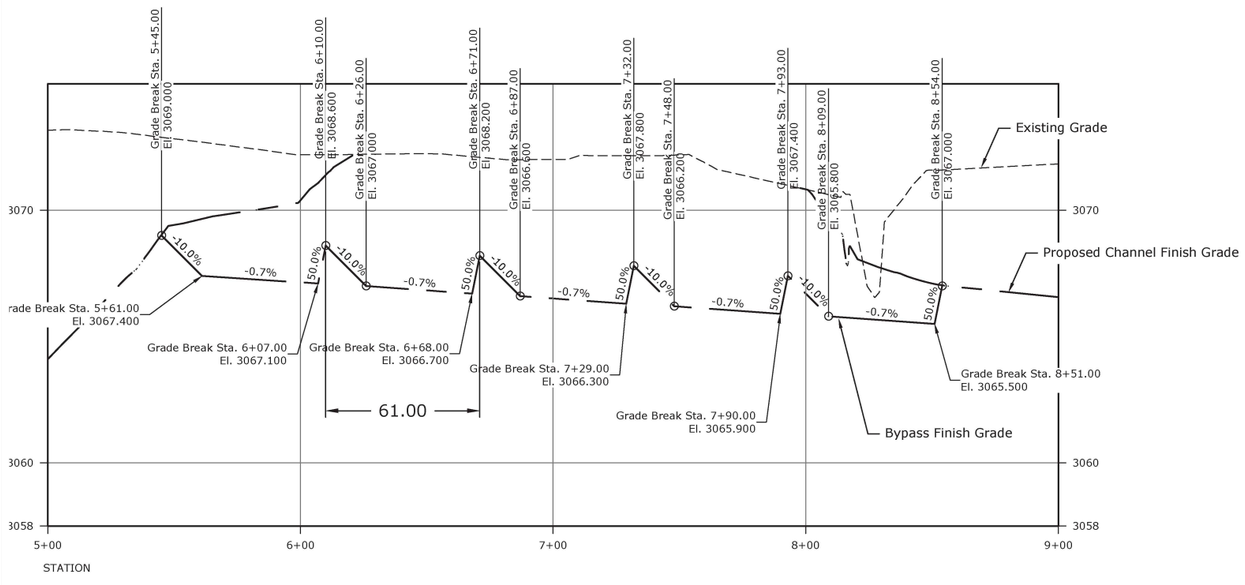
STA. 5+00 To STA. 8+00

LEGEND

- OG Major Contour
- OG Minor Contour
- FG Major Contour
- FG Minor Contour
- Property Line
- Finish Grade Profile
- Existing Grade Profile
- Bypass Channel
- Coffer Dam

Bypass 4 Notes:

1. Bypass through point bar into completed remeandered MCB. Significant cofferdams to isolate main channel for riffle/pool/LW installations.
2. Bypass channel approximately 308 ft in length.
3. Located on USFS property, property boundary to be flagged by C.O.




TEMPORARY BYPASS 4 - PROFILE

HORIZONTAL SCALE

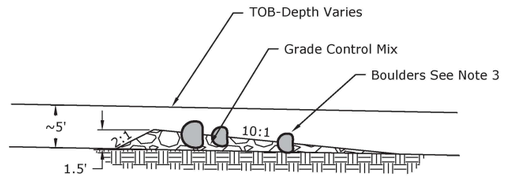
30 0 30 60 90

SCALE OF FEET

VERTICAL SCALE

3 0 3 6 9

SCALE OF FEET



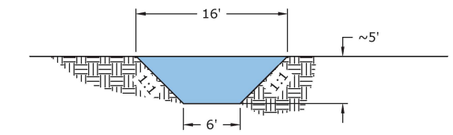

GRADE CONTROL DETAIL

N.T.S.

Notes:

1. Contractor to cut rough grade trapezoidal channel with slopes as shown.
2. Contractor to construct grade control riffles at locations shown, approximately every 48', using appropriate sized riffle material per C.O.
3. Grade Controls to be compacted using excavator bucket. Boulders to be placed per C.O. on Grade Control face for energy dissipation and fish resting.

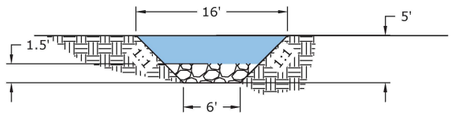
| GRADE CONTROL MIX | |
|---|---|
| Particle Class | Size |
| D84 | 9.0 inch |
| D50 | 4.0 inch |
| D10 | ≤ .08 inch |




ROUGH CUT DITCH SECTION

8 0 8 16 24

SCALE OF FEET




GRADE CONTROL CREST SECTION

8 0 8 16 24

SCALE OF FEET

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
95773PE
DIGITALLY SIGNED
OREGON
JAN. 14,2020
JUSTIN NIELSEN

EXPIRES: 12/31/2022

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRAND RONDE RIVER SUBBASIN
LONGLEY MEADOWS FISH
HABITAT ENHANCEMENT PROJECT

| | |
|---|---|
| DESIGNED | J. Gilder |
| DRAWN | J. Gilder |
| CHECKED | J. Bryant P.E. |
| | JUSTIN NIELSEN 2020.03.13 12:13:38 -08'00' P.E. |
| TECH. APPR. | TED DAY |
| APPROVED | ADMIN APPROVAL - TITLE |
| BOISE, ID | 2020-03-13 |

TEMPORARY BYPASS 4

PLAN & PROFILE

1678-100-61680

SHEET 1

LAST SAVED DATE
2020.01.14 10:41:17
LAST SAVED BY
JHNIELSEN

CAD SYSTEM
AutoCAD Civil 3D (LMS TECH)
CAD FILENAME
LM-BYPASS.DWG

92

## LEGEND

- Seed Mix A
- Seed Mix B
- Seed Mix C







RESTORATION & SEEDING PLAN

300 0 300 600 900
SCALE OF FEET

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
EXPIRES: 12/31/21

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM

GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 12:52:04 -08'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

RESTORATION & SEEDING PLAN

1678-100-61681
SHEET 1

DATE AND TIME PLOTTED
3/12/2020 11:24 AM
PLOTTED BY
NICK DANIS

CAD SYSTEM
AutoCAD Rel. 22.0s (LMS Tech)
CAD FILENAME
LONGLEY_SEEDING.DWG

| Seed Mix A - Wetlands and Swales | | |
|---|---|---|
| Common Name | Botanical Name | Proportion of Mix |
| | | |
| Bluebunch wheatgrass | Pseudoroegneria spicata | 10% |
| Blue wildrye | Elymus glaucus | 10% |
| Idaho Fescue | Festuca idahoensis | 10% |
| Western yarrow | Achillea millefollium | 3% |
| Tufted hairgrass | Deschampsia cespitosa | 20% |
| Slender hairgrass | Deschampsia elongata | 10% |
| Nebraska Sedge | Carex nebrascensis | 10% |
| Beaked sedge | Cyperaceae utriculata | 5% |
| Small fruited bulrush | Scirpus microcarpus | 5% |
| Baltic rush | Juncus balticus | 5% |
| Creeping spikerush | Eleocharis palustris | 5% |
| Small fruited bulrush | Scirpus microcarpus | 5% |
| Lewis Flax | Linum lewisii | 2% |
| Mix Total | | 100% |

| Seed Mix B - Riparian and Floodplain | | |
|---|---|---|
| Common Name | Botanical Name | Proportion of Mix |
| | | |
| Bluebunch wheatgrass | Pseudoroegneria spicata | 10% |
| Blue wildrye | Elymus glaucus | 10% |
| Idaho Fescue | Festuca idahoensis | 10% |
| Western yarrow | Achillea millefollium | 3% |
| Tufted hairgrass | Deschampsia cespitosa | 20% |
| Slender hairgrass | Deschampsia elongata | 10% |
| Nebraska Sedge | Carex nebrascensis | 10% |
| Beaked sedge | Cyperaceae utriculata | 5% |
| Small fruited bulrush | Scirpus microcarpus | 5% |
| Baltic rush | Juncus balticus | 5% |
| Creeping spikerush | Eleocharis palustris | 5% |
| Small fruited bulrush | Scirpus microcarpus | 5% |
| Lewis Flax | Linum lewisii | 2% |
| Mix Total | | 100% |

| Seed Mix C - Uplands | | |
|---|---|---|
| Common Name | Botanical Name | Proportion of Mix |
| | | |
| Bluebunch wheatgrass | Pseudoroegneria spicata | 30% |
| Blue wildrye | Elymus glaucus | 19% |
| Idaho fescue | Festuca idahoensis | 18% |
| Great Basin wildrye | Leymus cinereus | 8% |
| Sandberg bluegrass | Poa secunda | 8% |
| Prairie junegrass | Koeleria macrantha | 5% |
| Mountain Brome | Bromus carinatus | 3% |
| Mountain monardella | Monardella odortissima | 2% |
| Nettleleaf giant hyssop | Agastache urticifolia | 2% |
| Lewis flax | Linum lewisii | 1% |
| Silverleaf phacelia | Phacelia hastata | 1% |
| Sticky purple geranium | Geranium viscosissimum | 1% |
| Western yarrow | Achillea millefolium | 1% |
| White sagebrush | Artemisia ludoviciana | 1% |
| Mix Total | | 100% |

Seeding Notes:

1. All seed shall will be provided to the Contractor at no cost by the Contracting Officer.
2. Seed shall be evenly distributed over shown areas at a rate of 15 lbs/acre Pure Live Seed (PLS). Actual weight per acre will be determined by C.O. based on purity and germination.
3. All seed will be specified as free of all Oregon-listed noxious weeds.

RECLAMATION
Managing Water in the West

Cardno

REGISTERED PROFESSIONAL ENGINEER
79319PE
OREGON
JUSTIN A. NIELSEN
03/13/2020
EXPIRES: 12/31/21

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GRANDE RONDE RIVER SUBBASIN

LONGLEY MEADOWS FISH HABITAT ENHANCEMENT PROJECT

Contractor
DRAWN

JUSTIN NIELSEN 2020.03.13 14:14:29 -06'00' P.E.
ACCEPTED

BOISE, IDAHO 2020-03-13

RESTORATION & SEEDING PLAN NOTES

1678-100-61682

SHEET 1

DATE AND TIME PLOTTED
3/13/2020 1:01 PM
PLOTTED BY
NICK DANIS

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CAD FILENAME
LONGLEY_SEEDING.DWG