

TECHNICAL SPECIFICATIONS

LIST OF TECHNICAL SPECIFICATIONS

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**SECTION 01300
SUBMITTALS**

PART 1 – GENERAL

1.1 SCOPE

Submittals covered by these requirements include manufacturers' information, test procedures, test results, samples, requests for substitutions, and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, rock gradations, plant materials, fence materials, and fabricated items. CONTRACTOR shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, and schedules and other instructions as specifically required in the contract documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents.

1.2 CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. CONTRACTOR shall verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items which are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated. CONTRACTOR shall ensure that there is no conflict with other submittals and notify ENGINEER in each case where the submittal may affect the work of another CONTRACTOR.
- B. CONTRACTOR shall coordinate submittals with the work so that work will not be delayed. CONTRACTOR shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. CONTRACTOR shall not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment shall be returned to CONTRACTOR stamped "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."
- C. CONTRACTOR shall certify on each submittal document that he has reviewed the submittal, verified field conditions, and complied with the contract documents.
- D. CONTRACTOR may authorize in writing a material or equipment supplier to deal directly with ENGINEER with regard to a submittal. These dealings shall be limited to contract interpretations to clarify and expedite the work.

1.3 STANDARD COMPLIANCE

- A. When materials or equipment must conform to the standards of organizations such as, but not limited to, the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL), documents showing, or proving, conformance shall be submitted.
- B. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual Sections. In lieu of the label or listing, CONTRACTOR shall submit a certificate from an independent testing organization, which is competent to perform acceptable tests, and is approved by

ENGINEER. The certificate shall state that the item has been tested in accordance with the specified organization's standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product, and the referenced standard and shall state that the manufacturer certifies that the product conforms to all requirements of the project Specification and of the referenced standards listed.

1.4 REVIEW OF CONTRACTOR'S INFORMATION

- A. When review and checking for acceptance is required of any drawing, or information regarding materials and equipment, CONTRACTOR shall prepare or secure, and submit two (2) copies for review. ENGINEER, after taking appropriate action, will return (1) marked copy to CONTRACTOR. Within 7 calendar days after receipt of said submittal copies, ENGINEER will return the marked copy indicating one of the following four (4) actions:
1. If review and checking indicates no exceptions, copies will be returned marked "NO EXCEPTIONS TAKEN" and work may begin immediately on incorporating the material and equipment covered by the submittal into the work.
 2. If review and checking indicates limited corrections are required, the copy will be returned marked "MAKE CORRECTIONS NOTED". Work may begin immediately on incorporating into the work the material and equipment covered by the corrected submittal.
 3. If review and checking indicates insufficient, or incorrect data has been submitted, the copy will be returned marked, "AMEND AND RESUBMIT". No work may begin on incorporating the material and equipment covered by this submittal into the work until the submittal is revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
 4. If review and checking indicates the material and equipment submittal is unacceptable, the copy will be returned marked "REJECTED-RESUBMIT". No work may begin on incorporating the material and equipment into the work until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
- B. Approval by ENGINEER shall not relieve CONTRACTOR from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with requirements of this Contract.

1.5 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

Review of contract drawings, methods of work, or information regarding materials or equipment CONTRACTOR proposes to provide shall not relieve CONTRACTOR of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by ENGINEER, or by any officer or employee thereof. The CONTRACTOR shall have no claim under the contract on account of the failure, or partial failure of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN or MAKE CORRECTIONS NOTED" shall mean that ENGINEER has no objection to CONTRACTOR, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

PART 2 – PRODUCTS

2.1 MANUFACTURER’S DATA

Submittals for each manufactured item shall be comprised of manufacturer’s descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts. Manufacturer’s name, trade name, model or catalog number, nameplate data, size, layout dimensions, capacity, project specification references, and any other additional information necessary to establish contract compliance shall be clearly indicated.

PART 3 – EXECUTION

3.1 SUBMITTAL PROCEDURE

- A. At least 7 calendar days prior to CONTRACTORS need for approval, CONTRACTOR shall forward all submittals required by the individual Sections of the Specifications to ENGINEER.
- B. All submittals shall be identified by submittal number and specification section number on the letter of transmittal. Submittals shall be numbered consecutively, and resubmittals shall have a letter suffix. For example:

- 1. First submittal: 05001
- 2. First resubmittal: 05001A
- 3. Second resubmittal: 05001B, *etc.*

3.2 CONTRACTOR SUBMITTALS

Items to be submitted are specified in individual Sections of these Specifications. Submittals for each Section shall be bound together in one book. Book shall have numbered tab dividers for each item. Submittals that are related to or affect each other shall be forwarded simultaneously as a package to facilitate coordinated review. Uncoordinated submittals will be rejected. Do not combine unrelated materials in the same submittal. Submittals shall be arranged in same order as they appear in the Specification Section. Items shall be clearly marked with the same identification number as indicated on the drawings. CONTRACTOR shall include sufficient submittal time for each item of work on the Construction Schedule. ENGINEER will receive submittals at the preconstruction meeting.

END OF SECTION

**SECTION 01400
CONSTRUCTION STAKING**

PART 1 – GENERAL

1.1 CONSTRUCTION STAKING

CONTRACTOR shall provide survey staking for construction. ENGINEER will provide survey control and grading surfaces suitable for use with GPS or conventional total station. If CONTRACTOR requires additional horizontal and/or vertical control CONTRACTOR shall notify ENGINEER of this requirement a minimum of seven (7) working days in advance of this need.

1.2 STAKEOUT AND MEASUREMENT TO BE PERFORMED BY CONTRACTOR

- A. ENGINEER will provide an initial layout of the restoration design in consultation with CONTRACTOR. After the initial layout, CONTRACTOR shall be responsible for staking reference points/markers to complete the work from the initial control points and grading surfaces provided by the ENGINEER and shall be responsible for all measurements required for the execution of the work. CONTRACTOR shall protect all stakes and survey control points and, if necessary, shall pay for the time and materials required to replace stakes and survey control points that have been disturbed or obliterated.
- B. CONTRACTOR shall use information provided by ENGINEER to stake the boundaries of construction extents, access roads, staging areas, cultural resources, materials salvage areas, vegetation preservation areas, grading extents and structure locations. ENGINEER shall approve staking boundaries prior to commencement of work.
- C. CONTRACTOR shall furnish at CONTRACTOR's own expense, such stakes, equipment, tools, materials, and all labor as required in stakeout of any parts of the work from the control points and grading surfaces provided by ENGINEER.
- D. ENGINEER may require that work be suspended at any time when location and limit marks established by CONTRACTOR are not reasonably adequate to permit checking of the work.

END OF SECTION

**SECTION 01505
MOBILIZATION AND DEMOBILIZATION**

PART 1 – GENERAL

1.1 MOBILIZATION

- A. Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all facilities necessary for work on the project; and for all other work and operations which must be performed, or costs incurred prior to beginning work, on the various items on the project site. Mobilization includes obtaining any permits not provided by the Owner and obtaining project-specific bonds.
- B. Mobilization shall also include the construction of temporary ramps and access ways, temporary roads, grading, temporary fencing including highly visible fencing of all wetland edges adjacent to construction limits as marked by ENGINEER, salvaging of weed free topsoil, removing noxious weeds from areas within the construction limits, and the necessary preparatory work required to allow for the safe and stable movement of all vehicles that are required to construct the improvements outlined in the Contract Documents.
- C. Equipment
1. All construction equipment shall be staged in a location and manner to minimize air, soil and water pollution. All equipment shall be washed prior to mobilization to the site to minimize the introduction of foreign materials and fluids to the project site. All equipment shall be free of oil, hydraulic fluid, and fuel leaks. To prevent invasion of noxious weeds or the spread of whirling disease spores, all equipment shall be power washed or cleaned to remove mud and soil prior to mobilization into the project area. It will be CONTRACTOR's responsibility to ensure that adequate measures have been taken.
 2. Equipment shall be in a well-maintained condition to minimize the likelihood of a fluid leak. If a fluid leak does occur, ENGINEER shall be notified immediately, and all work ceased until the leak has been rectified. At all times during the construction phase, fluid spill containment equipment shall be present on-site and ready for deployment should an accidental spill occur.
 3. Storage of fuel and lubricants: All fuel and lubricants shall be stored in containers and areas that are in conformance with the State Department of Environmental Quality, biological opinion or biological assessment terms and conditions, and local, state and federal regulations.
 4. Servicing and refueling equipment: All fuel and lubricants used in the servicing of construction equipment shall be done in a manner that avoids spills and overfilling and shall be done at least 150 feet from all waterbodies. The State Department of Environmental Quality shall be notified immediately of any spill and the operator shall contain the spillage.
 5. If a spill of chemical pollutants such as fuel or hydraulic fluid should occur, immediately attempt to contain the spilled material. The following procedures shall be followed:
 - (a) for spillage on land, construct earthen berms or use other suitable barricade material of sufficient size to contain the spill and keep it from spreading.
 - (b) for spillage on water, attempt to isolate and contain the spilled material. Commercial booms or other suitable materials shall be kept on site during

construction to contain fuel and oil spills on water.

6. Sanitary facilities such as chemical toilets shall be located at least 150 feet from water bodies to prevent contamination of surface or subsurface water.

1.2 DEMOBILIZATION AND SITE RECLAMATION

- A. Demobilization shall consist of work and operations necessary to disband all mobilized items and clean up the site. The removal of all temporary ramps, access ways, roads, signs, temporary fencing, construction debris including rock chips, wood debris, construction stakes, and other construction-related refuse, and temporary facilities or works and the restoration of surfaces to an equal or better than existing condition, including decompaction of soil surfaces, replacement of salvaged or other topsoil, fertilization based on soil testing, and seeding with an approved seed mix, shall also be included as part of demobilization.
- B. Site reclamation is included under demobilization. Site reclamation includes reclamation of any other areas not included in item A that are disturbed during construction including replacement of salvaged or other topsoil, fertilization based on soil testing, and seeding with an approved seed mix, to pre-project conditions or better.
- C. All damaged or disturbed streambanks are to be restored to a natural slope pattern and profile for establishment of permanent woody vegetation.
- D. All disturbed streambank and wetland vegetation is to be replaced. Use a variety of species native to the project area, region or as specified on project drawings and specifications. Replant or reseed each area requiring re-vegetation before the end of the first planting season following construction.
- E. Boulders, rock, woody materials and other natural construction materials used for the project shall be obtained beyond the bankfull elevation and at least 150 feet from any water bodies, except for native materials obtained from within the project footprint to be stockpiled and reused on site. Leave native materials, e.g., down wood, where they are found, if possible. If native materials (e.g., downed wood) are destroyed, replace them with a functional equivalent during site restoration.
- F. Stockpiled materials (i.e., trees, vegetation, sand, topsoil, and other excavated material from restoration project areas) shall be used to rehabilitate areas disturbed by equipment to pre-work conditions. Short-term stabilization measures will be implemented until permanent erosion control measures (plant restoration) are effective and include seeding and planting as specified on project drawings and specifications. Reclamation planting shall be completed no later than spring planting season of the year following completion of construction.

1.3 RELATED WORK:

- A. Section 01300, Submittals
- B. Section 01560, Environmental Controls
- C. Section 01600, Protection of Materials
- D. Section 02160, Site Preparation
- E. Section 02900, Seeding

PART 2 – PRODUCTS

Materials and product specifications are included on drawings and in related specifications.

PART 3 -EXECUTION

Not used.

END OF SECTION

**SECTION 01560
ENVIRONMENTAL CONTROLS**

PART 1 – GENERAL

1.1 SITE MAINTENANCE

- A. CONTRACTOR shall keep the work site, staging areas, and CONTRACTOR's facilities clean and free from rubbish and debris. The staging areas are noted on the drawings. Materials and equipment shall be removed from the site when they are no longer necessary. Equipment removed as part of demolition shall not be stored on site. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.
- B. Waste material of any kind will not be permitted to remain on the site or on adjacent roads. Immediately upon such materials becoming unfit for use in the work, they shall be collected, carried off the site, and properly disposed of by CONTRACTOR.
- C. CONTRACTOR may provide temporary restroom and cleanup facilities for CONTRACTOR's employees and shall keep these areas clear of all refuse, rubbish, and debris that may accumulate from any source and shall keep them in a neat condition to the satisfaction of ENGINEER.
- D. In the event that waste material, refuse, debris, and/or rubbish are not so removed from the work by CONTRACTOR, ENGINEER reserves the right to have the waste material, refuse, debris, and/or rubbish removed, and the expense of the removal and disposal charged to CONTRACTOR.

1.2 AIR POLLUTION CONTROL

CONTRACTOR shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the air pollution regulations for the area. CONTRACTOR shall maintain construction vehicles and equipment in good repair. Exhaust emissions that are determined to be excessive by ENGINEER shall be repaired or replaced. If determined to be necessary by the Project Inspector, CONTRACTOR shall provide a water truck to manage project area dust.

1.3 NOISE CONTROL

- A. CONTRACTOR shall comply with all local controls and noise level rules, regulations, and ordinances which apply to any work performed pursuant to the Contract. If the requirements of this Section are more restrictive than those of the local regulations, the requirements of this Section shall govern.
- B. Each internal combustion engine, used for any purpose related to this Contract, shall be enclosed and be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler and enclosure.

1.4 STORMWATER AND EROSION CONTROL

- A. A Stormwater and Erosion Control Plan for construction activities shall be prepared and carried out by CONTRACTOR to prevent pollution related to construction operations.
- B. Erosion control measures shall be in place prior to commencing construction. During construction, all erosion controls shall be inspected by CONTRACTOR daily to ensure they are working adequately.
 - 1. If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately to make repairs, install replacements, or install additional

controls as necessary.

2. Sediment must be removed from erosion controls once it has reached one-third of the exposed height of the control.
- C. CONTRACTOR shall provide appropriate and effective measures to prevent movement of soil into waterways or wetlands using filter bags, sediment traps or catch basins, vegetative strips, berms, jersey barriers, fiber blankets, bonded fiber matrices, geotextiles, mulches or compost, wattles or sediment fences.
- D. CONTRACTOR shall provide appropriate and effective measures to prevent stockpile erosion during rain events or when the stockpile site is not moved or reshaped for more than 48 hours, by surrounding piles with compost berms, covering piles with impervious materials or other equally effective methods.
- E. CONTRACTOR shall provide appropriate and effective measures to prevent construction vehicles from tracking sediment offsite or onto roadways where it is subject to washing into storm drains, waterways, or wetlands. Such measures may include gravel access pads, wheel wash stations, or other equally effective methods.
- F. CONTRACTOR shall install removable pads or mats to prevent soil compaction in all temporary construction access points and staging areas in riparian or wetland areas.

1.5 SUBMITTALS

- A. A Stormwater and Erosion Control Plan for construction activities shall be prepared and carried out by CONTRACTOR to prevent pollution related to construction operations. The plan will include a drawing and narrative that addresses:
 1. Site-specific practices to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.
 2. Site-specific practices to prevent construction debris from dropping into any stream or water body, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.
- B. Submit in accordance with 01300.

PART 2 – PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

**SECTION 01600
PROTECTION OF MATERIALS**

PART 1 – GENERAL

CONTRACTOR furnished materials shall be shipped, handled, stored, and installed in ways that will prevent damage to the items. Damaged items will not be permitted as part of the work, except in cases of minor damage that have been satisfactorily repaired and are acceptable to ENGINEER. Materials supplied by the Owner shall be protected as CONTRACTOR furnished materials upon delivery to the project site.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

3.1 DELIVERY OF MATERIAL

The Owner's and ENGINEER's personnel will not accept material deliveries for CONTRACTOR.

END OF SECTION

**SECTION 01640
OWNER FURNISHED MATERIALS**

PART 1 – GENERAL

Owner-furnished items and materials will be provided for incorporation into the work. CONTRACTOR shall coordinate delivery time, handling, and storage for each material with the Owner.

PART 2 – PRODUCTS

The Owner may provide wood for use in the project.

PART 3 – EXECUTION

3.1 DELIVERY OF MATERIAL

Owner supplied materials will be delivered to the designated Project staging area by Owner. CONTRACTOR shall coordinate deliveries including unloading and transport to the protected storage areas. The Owner shall deliver product data, samples, tests, and certificates to CONTRACTOR. CONTRACTOR shall handle products once on-site, including storage and transportation to points of installation. ENGINEER will not accept material deliveries for the Owner or CONTRACTOR.

3.2 PROTECTION OF MATERIALS

Materials supplied by the Owner shall be protected as CONTRACTOR furnished materials upon delivery to the project site as per Section 01600.

3.3 CONSTRUCTION DELAY

If Owner furnished items cause delay in ENGINEER-approved construction schedule, CONTRACTOR shall notify the Owner in writing. Only changes to ENGINEER-approved construction schedule shall be considered as evidence for changes in contract time.

END OF SECTION

**SECTION 01720
RECORD DRAWINGS**

PART 1 – GENERAL

1.1 SCOPE

This section describes requirements for the preparation and maintenance of the project record drawings used to document as-built conditions based on field changes and modifications.

PART 2 – PRODUCTS

2.1 PROJECT RECORD DRAWINGS

CONTRACTOR shall maintain a neatly and accurately marked set of record drawings showing the final locations and layout of all structures, grading, planting and other facilities. Drawings shall be kept current weekly, with all work instructions and change orders, and construction adjustments. Drawings shall be subject to the inspection of the Owner and ENGINEER at all times, and progress payments, or portions thereof, may be withheld if Drawings are not accurate and current. Prior to acceptance of the work, CONTRACTOR shall deliver to ENGINEER one (1) set of neatly marked record drawings, accurately showing all the information required above. The record drawings shall include the final locations and details of the project with changes/modifications clearly marked in red.

END OF SECTON

**SECTION 02160
SITE PREPARATION**

PART 1 – GENERAL

1.1 SCOPE

This section specifies site preparation which consists of clearing, grubbing, and disposal of materials.

1.2 JOB CONDITIONS

A. Existing Conditions

CONTRACTOR shall determine the actual condition of the site as it affects this portion of work.

B. Protection of Existing Facilities

Site preparation shall not damage existing structures, landscaping, fencing, gates, or vegetation adjacent to the areas designated for site preparation. CONTRACTOR shall repair or replace any and all damaged property.

Operations during fire season (April 1- October 31) required to CONTRACTOR to follow all applicable IFPLs. Fire suppression equipment will be required on all equipment.

1.3 RELATED WORK:

Section 01400 Construction Staking

Section 01505 Mobilization and Demobilization

Section 01505 Environmental Controls

Section 02960 Vegetation Salvage and Transplant

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.1 CLEARING AND GRUBBING

A. General

All areas comprising the work shall be cleared and grubbed in accordance with the requirements of this section.

B. Clearing and Grubbing

Preservation of existing vegetation and trees is of utmost importance. The Project Inspector will flag and walk the entire site with CONTRACTOR's representative to clearly mark the clearing limits and vegetation to be saved or salvaged including, but not limited to those areas specified on project drawings and specifications. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove all stumps, roots, buried logs and all other objectionable material of any kind.

C. Noxious and Invasive Species

Noxious or invasive species shall be marked in the field by CONTRACTOR prior to mobilization and these areas shall either be avoided if possible or material shall be grubbed and handled in accordance with applicable Tribal, state and local laws regarding handling of noxious or invasive weed species.

D. Topsoil Salvage

Where clearing and grubbing requires removal of topsoil, this material shall be salvaged from areas free of noxious or invasive species, or where noxious and invasive species have been effectively treated prior to removal of the soils, and stockpiled for later use in site reclamation.

3.2 PROTECTION

CONTRACTOR shall provide protection devices or demarcation of areas outside the project site to be avoided and protected.

3.3 CLEANUP

CONTRACTOR shall develop a spill prevention control and countermeasure plan & maintain a spill kit on site. Debris, rubbish, and excess material resulting from the clearing and grubbing process shall be removed from the site in a manner that will prevent spillage on streets or adjacent areas.

Spillage shall be removed from streets and adjacent areas. Applicable Tribal, Federal, State, and local hauling disposal regulations shall be complied with. Cleanup shall be an on-going activity throughout the contract period.

3.4 DISPOSAL OF MATERIALS

All debris, rubbish, and excess material removed during clearing and grubbing work shall become the property of CONTRACTOR and shall be removed from the project site at CONTRACTOR's cost. CONTRACTOR shall make his own arrangements for disposing of these materials outside the project site and he shall pay all costs involved. Arrangements shall include, but not be limited to, entering into agreements with property owners and obtaining necessary permits, licenses, and environmental clearances.

END OF SECTION

SECTION 02170 TEMPORARY ACCESS ROADS

PART 1 – GENERAL

1.1 SCOPE

This section specifies methods for construction of temporary access roads. A temporary access road is a road that is designed and built along a temporary alignment, solely for use during construction. Temporary roads focus the ground disturbance of equipment and vehicles along a certain path, so that erosion and sediment movement can be planned and mitigated for in accordance with all applicable permits. Beyond focusing the disturbance, the location and design of temporary roads can actively aid in controlling erosion. Temporary access roads shall be constructed using methods that minimize impact to the riparian area, allow for reuse of temporary road fill and enable efficient reclamation of the site. This will limit the volume of temporary fill, prevent rutting/compaction of the native soil and allow for efficient removal of temporary roadway materials.

1.2 RELATED WORK:

Section 01400 Construction Staking

Section 01505 Mobilization and Demobilization

Section 01505 Environmental Controls

Section 02960 Vegetation Salvage and Transplant

PART 2 – PRODUCTS

Geosynthetic fabric:

Use nonwoven geotextile (Amoco 4553 or equivalent) for material separation in areas where rock or firm soils are present. Use woven geotextile (Mirafi RS280i or equivalent) for strength and separation in areas where soft soils are encountered.

Wood chips:

Most wood species are acceptable. Invasive species and species with large thorns should be avoided. A hogged or shredded material is preferred because of its ability to create a mat of interlocking pieces. This holds the materials together and forms a better and firmer surface. Stumps, brush, and similar materials are good sources for producing road materials because of their tendency to produce a stringy material when shredded.

Wood chip dimensions:

- Length: 2 to 6 inches
- Thickness: <0.5 inches
- Fines <1/8 inches (3 mm), 2 - 5% maximum

Road base:

Use either Vehicle Tracking Control (VTK) or 4" minus pit run as defined in 05001 Engineered Streambed Fill to allow for reuse of road base material in void filled riprap.

PART 3 – EXECUTION

3.1 CLEARING

A. General

All areas to be used for temporary access roads shall be cleared in accordance with the requirements of this section.

B. Flagging

Preservation of existing vegetation and trees is of utmost importance. The Project Inspector will flag and walk the entire site with CONTRACTOR's representative to clearly mark the clearing limits and vegetation to be saved or salvaged including, but not limited to those areas specified on project drawings and specifications.

Contractor shall locate Temporary Roads on locations approved by the ENGINEER. Such location shall include the marking of road centerline or grade-line and the setting of such construction stakes as are necessary to provide a suitable basis for economical construction and the protection of land and streams. Temporary Road surface width shall be limited to truck bunk width plus four (4) feet, except for needed turnouts which shall not exceed two (2) times the bunk width plus four (4) feet.

Additional considerations:

- Locate temporary roads to minimize erosion impacts and avoid cutting into adjacent hillslopes.
- Where appropriate, use geotextiles prior to placement of aggregate. Place aggregate at sufficient depth to support heavy equipment and protect existing pipe culverts from crushing.
- Route runoff from the road to a stabilized area (i.e., vegetated area or sediment trap).

C. Clearing and Grubbing

Within the limits of clearing, vegetation shall be removed by sawing or otherwise cutting near the ground surface. The areas below the natural ground surface shall NOT be grubbed to remove stumps, roots, buried logs or other objectionable material.

D. Noxious and Invasive Species

Noxious or invasive species shall be marked in the field by CONTRACTOR prior to mobilization and these areas shall either be avoided if possible or material shall be grubbed and handled in accordance with applicable Tribal, state and local laws regarding handling of noxious or invasive weed species.

3.2 CONSTRUCTION

The recommended method for construction of temporary access road is as follows:

- Clear a 15-foot wide corridor by sawing off trees and shrubs near the ground to avoid disturbance of the root system.
- Stockpile native material along the edge of the corridor for use in reclamation.
- Drape 20-foot lengths of 8-foot wide geosynthetic fabric perpendicular to the road alignment, beginning at the downstream end with 1-foot overlap.
- Place a 15-foot wide, 6-inch lift of wood chips over the fabric.
- Place suitable washed aggregate road base material to fill dips and create a level driving surface where required. Compact as necessary to achieve suitable driving surface.

- Adequately slope temporary roads for good drainage, and install all other structures such as water bars, culverts, and rolling dips, as necessary.
- Do not use road sloping on grades steeper than 5 percent unless other drainage structures are also used. If road is steeper than 5 percent, use gravel surfacing to minimize erosion, and slope the road to the side that has a ditch.
- Wrap 2-foot ends of geosynthetic fabric over the wood chip and road base fill to encapsulate the material.
- Place temporary wood mats to distribute the load from the heavy equipment where soft soils are present.

3.3 PHASING

Construction of the project will be phased with construction of Site 3 first. This will enable the temporary access road road to be decommissioned during construction of Sites 1 and 2 and for reuse of the road base material in the void filled riprap. This will also enable the dewatering pipe from site 3 to be re-used for the Site 1/2 bypass.

3.4 MAINTENANCE

- Conduct inspections on a regular basis to ensure adequate performance of temporary roads.
- Make adjustments based on inspections and have accumulated sediment and other debris removed and disposed of properly.
- At the end of construction, re-contour to original slope and return to natural conditions using permanent erosion and sediment control BMPs. Remove or stabilize trapped sediment and permanently stabilize disturbed areas.

END OF SECTION

**SECTION 02200
EARTHWORK**

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, grading, hauling, and compaction required to complete the work shown on the Drawings, and specified herein. The work shall include, but not necessarily be limited to excavation, backfilling and grading for structures; excavation, backfill and grading for streambanks and channels; placement of rock materials for channels and structures; disposal of surplus and unsuitable materials; and all incidental related work.

1.2 QUALITY ASSURANCE

- A. CONTRACTOR is responsible for checking grade to assure grading is in accordance with design surface provided by ENGINEER. CONTRACTOR may use equipment with survey-grade GPS capability or may elect to use conventional total station or other means to ensure work is completed as specified. If requested, ENGINEER shall furnish CONTRACTOR with computer files representing finished ground surfaces and structure subgrade for use with GPS equipment.
- B. ENGINEER shall inspect excavation, backfill, and graded surfaces, and will either approve or reject grading based on conformance with design surface, the Drawings, and these specifications.

1.3 RELATED WORK

Section 01560 Environmental Controls

Section 02140 Dewatering, Fish Salvage and Work Area Isolation

Section 02160 Site Preparation

Section 02960 Vegetation Salvage and Transplant

Section 05010 Floodplain Roughness

PART 2 – PRODUCTS

2.1 EXCAVATION AND BACKFILL VOLUME ESTIMATES

All volumes reported on the Drawings are based on estimates from terrain model surfaces. Earthwork quantities reported on the Drawings do not include subgrade quantities or quantities of imported materials such as logs and rock. Earthwork quantities reported on the Drawings do not include adjustment factors to account for moisture or compaction. CONTRACTOR shall use the surfaces provided by ENGINEER to confirm earthwork quantities.

PART 3 – EXECUTION

3.1 GENERAL

A. Control of Water

CONTRACTOR shall keep excavations free from water during construction. Additional requirements for dewatering are specified in Section 02140, Dewatering.

B. Surplus Material

Unless otherwise specified, surplus excavated material shall be disposed of at CONTRACTOR's expense. CONTRACTOR shall confirm that there is sufficient material available for the completion of the work before disposing of any material inside or outside the site. Shortage of material, caused by premature disposal of any material by CONTRACTOR, shall be replaced at CONTRACTOR's expense.

C. Hauling

When hauling is done over highways or streets, the loads shall be trimmed, and the vehicle shelf areas shall be cleaned to avoid spillage.

D. Maintenance of Roadways

All earthwork operations shall be performed in a manner which does not disrupt the continuous flow of traffic on existing roadways. All public streets shall be swept clean daily where dirt and debris result from CONTRACTOR's operations.

E. Finish Grading

Finish grades and existing or natural grades in the area of work are indicated on the plans. CONTRACTOR shall do all grading, filling or excavating as required to completely grade the site to lines and grades shown. Where finished grade corresponds practically with existing grade, the ground shall be worked up and graded off evenly with existing grade. Filled areas shall be compacted so as to prevent settlements and CONTRACTOR shall be responsible for a period of one year after final acceptance of the project to provide additional fill as necessary to bring to grade any areas which settle below the indicated grades and to replace or repair any planting or work damaged by such settlement.

G. Tolerances

Finished grade shall be to the line and grade shown on the plans to within a vertical tolerance of plus or minus 0.3 feet for general grading and for structures. Allowance for topsoil and grass cover, and sub-base and pavement thickness shall be made so that the specified thickness can be applied to attain the finished grade. Horizontal tolerance shall be plus or minus 1.0 feet for grading and structures.

H. Control of Erosion

CONTRACTOR shall maintain earthwork surfaces true and smooth and protected from erosion.

I. Excavation of unsuitable soils

Where organic materials, yielding subgrade, or other deleterious materials are encountered during excavations, they shall be removed, as directed by ENGINEER. The resulting excavation shall be backfilled with material approved by ENGINEER. CONTRACTOR shall promptly notify ENGINEER if these materials are encountered and excavation shall not proceed without approval of ENGINEER.

3.2 EXCAVATION

A. General

Excavation shall be in accordance with the grading plan indicated on the Drawings and as required for construction. Excavations shall be kept free from water while construction is in progress. ENGINEER shall be notified immediately in writing in the event that it becomes necessary to remove soft, weak, or wet material.

Soil disturbed or weakened by CONTRACTOR's operations and soils permitted to soften from

exposure to weather shall be excavated to firm foundation and refilled with 6-inch minus quarry rock. All work of this nature will be at CONTRACTOR's expense.

3.3 SUBGRADE PREPARATION

- A. Ground surfaces receiving Engineered fill shall be prepared by clearing and grubbing as specified in Section 02160, Site Preparation, and by removing soil which is high in organic content and other deleterious material. Removed topsoil that is high in organic content and not occurring within areas of existing weed infestations, or is otherwise suitable as growth media, should be stockpiled for later use in site reclamation as described in Section 02160, Site Preparation.

3.4 SALVAGE, SORTING AND STAGING SPECIFIED CATEGORIES OF SUBSTRATE

- A. CONTRACTOR shall salvage specified materials prior to excavation or backfilling.
- B. CONTRACTOR shall sort and mix excavated materials to generate volumes of specified substrate categories identified on the Drawings. Sorting and mixing shall occur in conformance with gradations specified in Section 05001 Engineered Fill
- C. CONTRACTOR shall stage at an approved staging area salvaged and sorted materials for use during construction.

3.5 FILLING OPERATIONS

Filling operations must comply with criteria specified in the Drawings.

3.6 COMPACTION

Compaction requirements for individual fill components shall comply with specifications listed on the Drawings. Compaction for Subgrade surfaces created shall be accomplished using the weight of equipment with minimum weight of 15 tons, unless specified otherwise on the Drawings. Compaction of fill within structures shall be by equipment bucket compaction unless specified otherwise on the Drawings.

3.7 CLEAN UP

After completing all earthwork, CONTRACTOR shall leave the site in a neat and clean condition, doing such grading as is required by the plans. Any existing features, structures, and other facilities damaged or affected by the work shall be replaced, repaired, or restored to their original condition or better.

END OF SECTION

**SECTION 02900
SEEDING**

PART 1 – GENERAL

1.1 DESCRIPTION:

This section specifies seeding including seed acquisition, seed bed preparation and broadcast seeding. CONTRACTOR shall provide all labor, tools, equipment, and incidentals necessary to complete the Work as specified.

1.2 RELATED WORK:

- A. Section 01300 Submittals
- B. Section 01505 Mobilization and Demobilization
- C. Section 01560 Environmental Controls
- D. Section 01600 Protection of Materials
- E. Section 02160 Site Preparation
- F. Section 02920 Fence
- G. Section 05010 Floodplain Roughness

1.3 QUALITY ASSURANCE:

- A. ENGINEER shall mark by flags or stakes the outer extent of each seeding location prior to seeding.
- B. ENGINEER shall be notified at least seven (7) working days in advance of seeding.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01300, Submittals.
- B. Seeding equipment and CONTRACTOR qualifications shall be approved by ENGINEER.
- C. Seed bed preparation shall be inspected and approved by ENGINEER prior to seed application.

1.5 APPLICABLE PUBLICATIONS:

ANSI Z60.1-2014 American Nursery and Landscape Association: American Standard for Nursery Stock

PART 2 – PRODUCTS

2.1 SEED

CONTRACTOR shall furnish the seed and deliver the seed to the project site. CONTRACTOR shall keep seed cool, dry, and rodent free after delivery.

2.2 GROWTH MEDIA

Growth media shall consist of 4” – 6” of native soil at finished grade elevation or salvaged and stockpiled top soils as described in Section 02160, Site Preparation, or other approved on-site or off-site sources of topsoil, with similar texture and chemistry properties as the native soil, that is approved by ENGINEER.

PART 3 – EXECUTION

3.1 SEED BED PREPARATION

ENGINEER shall mark seeding areas with flags and/or stakes, indicating extents for each seed mix. The final seeding acreages shall be provided to CONTRACTOR by ENGINEER prior to seeding.

CONTRACTOR shall ensure that all surfaces to be seeded are properly prepared. Seed bed preparation methods vary depending on the final grading surface conditions, the seed application method, and the final restoration or reclamation surface designs.

Reclaimed access routes and staging areas shall be decompacted and left without large clumps or blocks of soil prior to seeding. Equipment traffic on access routes with fine textured soils may compact lower soil layers and additional topsoil may be needed to achieve the pre-project elevation and to match the elevation of adjacent undisturbed surfaces.

Seedbed preparation within restoration seeding areas, with or without floodplain roughness, shall ensure that the soil surface is firm but not overly compacted, and free of equipment tracks prior to application of seed. Within restoration areas, seeding shall occur after floodplain roughness and other floodplain treatments, such as willow brush trenches, is complete and approved by ENGINEER. This sequence is necessary ensure proper seed bed preparation and to limit equipment or foot traffic over seeded areas.

3.2 BROADCAST SEEDING

Sow seed at rate based on final seed mix provided. CONTRACTOR shall plant seed using broadcast methods, whereby seed is scattered on the surface of the ground instead of planted in the ground. Broadcast seeding methods shall use a hand operated broadcast seed spreader or other similar tools as approved by ENGINEER. CONTRACTOR shall follow seeding with an application of certified weed free straw mulch over the seed bed.

END OF SECTION

**SECTION 02929
VEGETATIVE CUTTINGS**

PART 1 – GENERAL

1.1 DESCRIPTION:

This section specifies the acquisition, transport, and staging of vegetative cuttings from collection sites to the project area.

1.2 RELATED WORK:

- A. Section 01300 Submittals
- B. Section 01560 Environmental Controls
- C. Section 01600 Protection of Materials

1.3 QUALITY ASSURANCE:

- A. ENGINEER shall be notified at least three (3) working days in advance of vegetative cutting harvest.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01300, Submittals.
- B. Written information providing the location(s) of proposed collection site(s) within the designated collection area, descriptions of species present and their health.
- C. Written description identifying staging area for cuttings.

1.5 APPLICABLE PUBLICATIONS:

USDA-NRCS Plant Materials Technical Note #29: Collecting Willow, Poplar and Redosier Dogwood Hardwood Cuttings for Riparian Site Plantings.

PART 2 – PRODUCTS

2.1 VEGETATIVE CUTTINGS

Vegetative cuttings from woody trees and shrubs shall be provided by CONTRACTOR. Cuttings for vegetated brush bank structures shall be between 6 feet and 8 feet in length. All cuttings shall be between ¾ inch and 1-½ inches in diameter at the base of the cuttings and contain at least two nodes. Cuttings shall appear healthy with no signs of pests, disease, rot, or damage. Cuttings shall be bundled in groups of consistent numbers, approximately 25 to 50 stems depending upon their size. Cuttings shall be handled and transported so that they remain moist, shaded, and cool at all times. Suitable species for vegetative cuttings shall be native willows (*Salix* species) that occur within the on-site collection area. Actual species to be harvested shall be approved by ENGINEER.

PART 3 – EXECUTION

3.1 CUTTING, DELIVERY, AND HANDLING

- A. Cuttings shall be collected at locations approved by ENGINEER and in quantities as specified on the project Drawings. Collection shall be during the leafless, dormant period, not occurring prior to October 1st annually. Cuttings shall be taken from disease free stands. All cuts shall be made with a

sharp, clean tool to produce a clean, smooth cut and prevent disease transfer. No more than one-third of the plant shall be harvested from a single shrub and cuttings shall not be taken from shrubs where recent cutting or beaver herbivory have already removed one-third or more the plant growth. Collection of cuttings shall be dispersed throughout a stand so that the impact of removing cuttings is not readily visible.

B. Cuttings shall be covered during transport from the collection site the staging area.

3.2 STORAGE

A. CONTRACTOR shall construct a staging area for cuttings at the project site. The staging area shall consist of a ponded area between 1 and 3 feet deep that is large enough to store the specified number of cuttings with a minimum of one-third of the stem length submersed in the water. The staging area must be approved by ENGINEER before cuttings are delivered.

B. Cuttings shall be placed in the staging area immediately upon delivery to the site, where they must be covered with burlap or other shade cloth and kept moist the entire time they are held in the staging area. Cuttings shall not be stored for more than one week before installation. Cuttings shall be protected to prevent browse from wildlife.

3.3 COLLECTIONSITES

Harvest locations are to be approved by ENGINEER. Harvest sites must be accessible by vehicle.

END OF SECTION

SECTION 04100

PIPE INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section includes installation of temporary pipes for temporary water bypass. Trenching, pipe bedding, pipe laying, connections and backfilling are included in this section. For temporary slope drains and temporary culvert pipes, furnish culvert pipe fabricated from corrugated metal for use in diverting water through or around work areas. Furnish temporary culvert pipe placed beneath the temporary access roads fabricated from corrugated metal or plastic conforming to HS-20 (M-18) loading rating in AASHTO, Load and Resistance Factor Design (LRFD) Bridge Design Specifications.

1.2 RELATED WORK:

- A. Section 01400, Construction Staking
- B. Section 01600, Protection of Materials
- C. Section 02200, Earthwork

1.3 QUALITY ASSURANCE:

- A. ENGINEER shall be notified at least seven (7) working days in advance of pipe installation.
- B. ENGINEER shall approve the pipe layout and inspect the construction staking prior to excavation.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01300, Submittals.

PART 2 - PRODUCTS

2.1 PIPE BEDDING MATERIAL

This material shall be free from dirt, vegetable matter, cinder, ashes, refuse, organic matter or other unsuitable foreign substance. Frozen material may not be used. Type 1 material shall be a crushed rock having a minimum of two fractured faces and meet the following gradation requirements by dry weight:

A. Type 1 - Bedding Material

Passing 1 inch sieve.....	100%
Passing 3/4 inch sieve.....	90-100%
Passing 3/8 inch sieve.....	20-55%
Passing #4 sieve.....	0-10%
Passing #8 sieve.....	0-8%

2.2 BULK BAG FILL MATERIAL

Type 1 - Bedding Material

Passing 1 inch sieve.....	100%
Passing 3/4 inch sieve.....	90-100%
Passing 3/8 inch sieve.....	20-55%
Passing #4 sieve.....	0-10%
Passing #8 sieve.....	0-8%

PART 3 - EXECUTION

3.1 EXCAVATION AND PREPARATION OF TEMPORARY PIPE SUPPORTS

A. Trenches

The length of trench excavation shall be kept to a minimum. Excavations shall either be closed up at the end of the day or protected. The trench shall be excavated to the depth and grade as staked by ENGINEER. Trenches must be of sufficient width in the pipe zone to permit proper installation and bedding of the pipe and to provide the required compaction of backfill. Above the top of the pipe zone, CONTRACTOR may excavate to any width. All boulders and stones shall be removed to provide a minimum of 6 inches clearance under all portions of the pipe.

Placement of bedding material shall precede the installation of all pipes. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on a uniformly dense unyielding foundation. When, after excavating to the foundation level, the material remaining in the trench bottom is determined to be unsuitable by ENGINEER, excavation shall be continued to such additional depth and width as required by ENGINEER. Unsuitable foundation materials shall be disposed of at an approved site. The trench foundation shall be backfilled to the bottom of the pipe zone with gravel backfill for foundations, gravel backfill for pipe zone bedding, or other suitable material, and compacted to form a uniformly dense, unyielding foundation.

If any part of the excavated material meets the specifications of pipe bedding material, ENGINEER may require that such material, in the quantity required, be selectively removed, stockpiled separately, and used as pipe bedding instead of quantities of gravel backfill for pipe bedding. If material so stockpiled becomes contaminated, CONTRACTOR shall furnish suitable material in an amount equal to that lost by contamination at no expense to the Owner. All costs involved in storing, protecting, re-handling, and placing the material shall be included in other items of work on the project.

CONTRACTOR shall furnish, install, and operate all necessary equipment to keep excavations above the foundation level free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workers for the operation of the pumping equipment.

B. Supporting using bulk bags

Bulk bags shall be used to support corrugated metal pipe over bedrock. Here are the general steps to follow:

1. Prepare the site: Before installing the pipe, the area where the pipe will be placed must be properly prepared. This means removing any loose rocks or debris from the bedrock and ensuring the surface is relatively level.
2. Determine the required number of bulk bags: The number of bulk bags needed will depend on the diameter of the pipe and the length of the span that needs to be supported.
3. Place the bulk bags: Place the bulk bags in a line perpendicular to the direction of the pipe. This will create a stable base that will help distribute the weight of the pipe evenly. The bulk bags should be placed directly on the bedrock.
4. Position the pipe: Carefully position the corrugated metal pipe on top of the bulk bags. It is important to ensure that the pipe is level and properly aligned.

5. Restraints: Once the pipe is in place, place bulk bags around the sides and on top of the pipe at specified intervals and at changes in direction or slope. The bulk bags will help to prevent the pipe from shifting.
6. Inspect: After installation, inspect the pipe periodically to ensure that it remains properly aligned and supported. Any signs of movement or settling should be addressed promptly to prevent further damage.

3.2 PIPE INSTALLATION

A. Survey Line and Grade

Survey line and grade control hubs will be placed in a manner consistent with accepted practices.

B. Pipe Laying – General

After an accurate grade line has been established, the pipe shall be laid in conformity with the established line and grade. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

Pipe shall be laid to a true line and grade at the invert of the pipe and CONTRACTOR shall exercise care in matching pipe joints for concentricity and compatibility. In no case shall two pipes be joined together with ends having the maximum manufacturer's tolerance. The invert line may vary from the true line and grade within the limits stated to develop uniformity, concentricity, and uniform compression of jointing material provided such variance does not result in a reverse sloping invert. The limit of the variance at the invert shall not exceed plus or minus 0.3 feet. Checking of the invert elevation of the pipe may be made by calculations from measurements on the top of the pipe.

The pipe, unless otherwise approved by ENGINEER, shall be laid up grade from point of connection on the existing pipe or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

Where pipe joints must be deflected within the manufacturer's recommended limits to accommodate required horizontal or vertical curvature, it shall first be joined in straight alignment and then deflected as required. Where pipe joints must be deflected to an amount greater than the manufacturer's recommended limits to accommodate required horizontal or vertical curvature, the curves shall be achieved with a series of tangents and shop fabricated bends, subject to the approval of ENGINEER.

Upon final acceptance of the Work, all pipe and appurtenances shall be open, clean, and free draining.

G. Jointing of Dissimilar Pipe

Dissimilar pipe shall be joined by use of a factory-fabricated adapter coupling or a pipe collar as detailed in the Drawings.

3.3 BACKFILLING

If required for equipment access, a blanket of select material or bank run gravel is to be placed on top of the pipe. CONTRACTOR shall not operate tractors or other heavy equipment over the top of the pipe until the backfill has reached a height of 2 feet above the top of the pipe.

END OF SECTION

**SECTION 05000
ENGINEERED LARGE WOOD**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies construction of wood structures in channels and streambanks. Structures consist of complexes of logs.

1.2 RELATED WORK:

- A 01400 Construction Staking
- B 01560 Environmental Controls
- C 01600 Protection of Materials
- D 01640 Owner Furnished Materials
- E 02160 Site Preparation
- F. 02200 Earthwork
- G 05001 Engineered Streambed Fill

1.3 QUALITY ASSURANCE:

- A. ENGINEER shall be notified at least 48 hours in advance of construction.
- B. ENGINEER or representative shall be present during construction.
- C. ENGINEER will provide subgrade excavation and subgrade preparation surfaces for CONTRACTOR's use in machinery with GPS capability.
- D. ENGINEER shall inspect subgrade and foundation surfaces prior to installation of rock and logs.

1.4 APPLICABLE PUBLICATIONS:

U.S. Army Corp of ENGINEERS. 2021. Large Wood National Manual: Guidelines for Planning, Design, Placement, and Maintenance of Large Wood in Fluvial Ecosystems.

USDA NRCS. June 2021. Practice Code 580 – Toe Wood: Streambank and Shoreline Protection.

PART 2 - PRODUCTS

Materials shall be delivered to the site and stored in a manner that preserves the integrity of each material to be incorporated into the work. Wood materials will be stored proximate to the work site, and sorted into piles of like material composition (i.e., large logs, medium logs, small logs, and brush) as identified on the Drawings.

2.1 ROCK

Rock will be used to build the foundation, or bench, for large wood structures, and will be used for backfill around wood members to counteract buoyancy. Rock must comply with Section 05001, Engineered Streambed Fill, and the gradation listed on the Drawings.

2.2 LOGS AND BRUSH

Owner will provide small logs and brush. Logs and brush used for large wood structures shall comply with the dimensions shown on the Drawings. CONTRACTOR shall roughen and break saw-cut ends of logs and brush that will be exposed above finished ground surfaces in order to create a natural appearance.

2.3 ANCHORING HARDWARE

If specified on the Drawings, anchoring hardware shall be used to secure wood members at locations specified or as indicated in the field by ENGINEER. Anchoring hardware shall meet ASTM A706, and sizes of anchoring hardware shall comply with dimensions listed on the plans. At CONTRACTOR's discretion, it is permissible to sharpen one end of the anchoring hardware for ease in driving hardware through wood members.

PART 3 - EXECUTION

3.1 SUBGRADE EXCAVATION

Subgrade excavation shall be in accordance with the elevations and locations shown on the Drawings. CONTRACTOR shall salvage and stockpile woody vegetation removed at the structure location. Alluvium rock that is excavated from the subgrade trench shall be separated and stockpiled for use as backfill in a nearby location. Salvaged alluvium rock shall be inspected by ENGINEER prior to use as backfill. Excavated material that does not meet the gradation specified for backfill shall be hauled away or used for general fill in a nearby location approved by ENGINEER. CONTRACTOR shall identify a temporary stockpile location for excavated material subject to approval by ENGINEER. Excavation for structure installation and handling of excess material are incidental to the work.

3.2 SUBGRADE PREPARATION

CONTRACTOR shall place rock to build the foundation of the structure as shown on the Drawings. The foundation shall be compacted using excavator bucket compaction.

3.3 LOG PLACEMENT AND REBAR PINNING

CONTRACTOR shall place logs on the subgrade foundation as shown on the Drawings. Key log members shall be pinned together using anchoring hardware. Anchoring hardware shall be driven fully through both logs and shall be driven flush with the top surface of the logs except

for applications requiring bolts. Logs and brush shall be interlocked with and woven together to prevent buoyancy and movement.

3.4 LOG MEMBER END TREATMENT

Exposed saw-cut ends of all large wood shall be roughened and broken. Exposed sawed butt ends are not acceptable. Trees and logs shall be handled and transported such that damage is minimized to the rootwad, stem, limbs, bark and branches.

3.5 BACKFILL

CONTRACTOR shall backfill the logs and brush with angular rock to the finished ground elevations as shown on the Drawings. CONTRACTOR shall use backfill techniques that prevent damage to logs and brush during backfilling. CONTRACTOR shall compact the backfill using excavator bucket compaction. Care shall be taken to minimize damage to containerized plants installed in the subgrade trench. CONTRACTOR shall stabilize structure end points with rock or logs as approved by ENGINEER. The upstream and downstream ends of the large wood structures shall transition smoothly into a stable streambank or other structure to reduce the potential for short-term erosion.

END OF SECTION

**SECTION 05001
ENGINEERED STREAMBED FILL**

PART 1 - GENERAL

1.2 DESCRIPTION:

This section specifies Subgrade Fill, Channel Fill, Floodplain Fill and Boulders used to create a stable river channel bed and banks, including the sourcing and delivery of rock materials to the staging area. The construction of channel bed features such as boulder step pools, and all other channel bed features and floodplains shall comply with this section.

1.3 RELATED WORK:

- A. Section 01600, Protection of Materials
- B. Section 02200, Earthwork
- C. Section 05000, Engineered Large Wood

1.4 QUALITY ASSURANCE:

- A. CONTRACTOR shall cooperate with ENGINEER in obtaining and providing samples of all specified materials.
- B. CONTRACTOR shall submit certified laboratory test certificates for all items required in this section. Rock material sourcing and selection shall be approved by ENGINEER prior to delivery.
- C. ENGINEER shall be notified at least seven (7) working days in advance of materials delivery to project site.
- D. ENGINEER shall be notified at least three (3) working days in advance of streambed placement, at least three (3) working days in advance of streambed sealing, and at least three (3) working days in advance of boulder placement.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01300, Submittals.
- B. Supplier information and Materials Data: Submit the following as one package to ENGINEER:
 - 1. Rock source, size, description, and gradation.
 - 2. Rock density and absorption tests results.
 - 3. Borrow area location(s) for all materials.

1.6 APPLICABLE PUBLICATIONS:

- A. ASTM Method C-127. Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. T85, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
 - 2. T96, Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

3. T103, Standard Method of Test for Soundness of Aggregates by Freezing and Thawing.
4. T104, Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
5. T248, Reducing Field Samples of Aggregate Test Size.
6. ASTM International (ASTM): D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).

PART 2 - PRODUCTS

2.1 ROCK - GENERAL

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering.

The rock shall have the following properties:

- A. Bulk specific gravity (saturated surface-dry basis) not less than 2.6.
- B. Absorption not more than 2 percent by weight.

2.2 ALLUVIUM ROCK

Alluvium rock is natural round river rock, and the origin of the rock material must be from the riverbed, or an approved alluvial source. The least dimension of an individual rock fragment shall be approximately one-third the greatest dimension of the fragment. Alluvium rock is placed below grade and at the surface of the streambed at depths, extents, and grades indicated on the plans.

2.3 RIPRAP

- A. Riprap is angular rock, originating as broken quarry stone or rubble. Individual rock fragments shall be hard, sound, and durable, free from seams, cracks and other defects. For individual rock fragments, the least dimension of any stone shall not be less than 1/3 of its greatest dimension.
- B. Riprap used shall be the type designated on the DRAWINGS and shall conform to Table 1, Riprap Gradation:
 1. Each load of riprap shall be reasonably well graded from the smallest to the largest size specified.
 2. Stones smaller than the two to ten percent (2 to 10%) size will not be permitted in an amount exceeding ten percent (10%) by weight of each load.
 3. Control of gradation shall be by visual inspection. However, in the event ENGINEER determines the riprap to be unacceptable, ENGINEER shall pick two (2) random truckloads to be dumped and checked for gradation.
 4. Mechanical equipment and labor needed to assist in checking gradation shall be provided by CONTRACTOR at no additional cost.

Table 1. Riprap Gradation

Riprap Designation	% Smaller Than Given Size By Weight	Intermediate Rock Dimension (inches)
WSDOT	100	30
Class B	80 - 95	28
	50 - 80	22
	15 - 50	16
	15 max.	10

- C. Neither width nor thickness of a single stone of riprap shall be less than one-third (1/3) of its length.
- D. The specific gravity of the riprap shall be two and one-half (2.5) or greater.
- E. Riprap specific gravity shall be according to the bulk-saturated, surface-dry basis, in accordance with AASHTO T85.
- F. The bulk density for the riprap shall be 1.3 ton/cy or greater.
- G. The riprap shall have a percentage loss of not more than forty percent (40%) after five hundred (500) revolutions when tested in accordance with AASHTO T96.
- H. The riprap shall have a percentage loss of not more than ten percent (10%) after five (5) cycles when tested in accordance with AASHTO T104 for ledge rock using sodium sulfate.
- I. The riprap shall have a percentage loss of not more than ten percent (10%) after twelve (12) cycles of freezing and thawing when tested in accordance with AASHTO T103 for ledge rock, procedure A.
- J. Rock shall be free of calcite intrusions.
- K. Broken concrete or asphalt pavement shall not be acceptable for use in the WORK.
- L. Rounded riprap (river rock) is not acceptable, unless specifically designated on the DRAWINGS.

2.4 VOID-FILLED RIPRAP

- A. Rock requirements are to comply with riprap material specifications in Paragraph A.
- B. Samples of riprap and void-fill materials shall be submitted for the review and approval of the ENGINEER prior to construction.
- C. Where “Subgrade Fill” or “Floodplain Fill” is designated on the DRAWINGS, riprap shall be mixed with the materials and associated proportions listed in Table 2 to fill the voids of the riprap. Where “Streambed Fill” is designated on the DRAWINGS, riprap shall be mixed with the materials and associated proportions listed in Table 3 to fill the voids of the riprap.
- D. Mix proportions and material gradations in Tables 2 and 3 are approximate and are subject to adjustment by the ENGINEER. No adjustment in unit price for void-filled riprap will be allowed based on modifications to the mix proportions.

Table 2: Mix Requirements for Void-Filled Riprap without River Cobble		
Approximate Proportions (loader buckets)	Material Type	Material Description
6	Riprap	WSDOT Class B
2	Void-fill material	7-inch minus crushed rock surge (100% passing 7-inch sieve, 80-100% passing 6-inch sieve, 35-50% passing 3-inch sieve, 10-20% passing 1.5-inch sieve)
1	Void-fill material	VTC (Vehicle Tracking Control) rock (crushed rock with 100% passing 4-inch sieve, 50-70% passing 3-inch sieve, 0-10% passing 2-inch sieve)
1	Void-fill material	4-inch minus pit run surge (round river rock and sand, well graded, 90-100% passing 4-inch sieve, 70-80% passing 1.5-inch sieve, 40-60% passing 3/8-inch sieve, 10-30% passing #16 sieve).
1	Void-fill material	Type II bedding
½ to 1	Void-fill material	Native soil
Note: Mix proportions and material gradations are approximate and are subject to adjustment by the ENGINEER.		

Table 3: Mix Requirements for Void-Filled Riprap with River Cobble		
Approximate Proportions (loader buckets)	Material Type	Material Description
6	Riprap	WSDOT Class B
2	Void-fill material	7-inch minus crushed rock surge (100% passing 7-inch sieve, 80-100% passing 6-inch sieve, 35-50% passing 3-inch sieve, 10-20% passing 1.5-inch sieve)
1	Void-fill material	VTC (Vehicle Tracking Control) rock (crushed rock with 100% passing 4-inch sieve, 50-70% passing 3-inch sieve, 0-10% passing 2-inch sieve)
1	Void-fill material	4-inch minus pit run surge (round river rock and sand, well graded, 90-100% passing 4-inch sieve, 70-80% passing 1.5-inch sieve, 40-60% passing 3/8-inch sieve, 10-30% passing #16 sieve).
1	Void-fill material	Type II bedding
½ to 1	Void-fill material	Native soil
Top layer	Top dressing	Additional 4 to 12-inch cobbles (round washed river rock that is well graded, 80- 100% passing 12-inch sieve, 35-50% passing 6-inch sieve, 5-20% passing 4-inch sieve) shall be mixed in on the surface of exposed sections of void-filled riprap (covering approximately 15% of the surface) prior to compaction of the void-filled riprap. Cobbles shall be fully embedded into the mass of the void-filled riprap.
Note: Mix proportions and material gradations are approximate and are subject to adjustment by the ENGINEER.		

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

Materials shall be delivered to the site and stored in a manner that preserves the gradation and identity of each material to be incorporated into the work. ENGINEER will measure and inspect the materials upon delivery to determine compliance with these specifications and the Drawings. ENGINEER may reject any or all construction materials that do not satisfactorily meet requirements.

3.2 MIXING

Materials of varying gradations and angularity shall be mixed to create mixture specific to that rock type in conformance with rock material gradations shown on plans prior to placement. The mixture shall contain a minimum of 10% fines smaller than the #200 sieve, measured by weight. Materials shall be thoroughly mixed to create a homogenous rock mixture prior to placement.

3.3 PLACEMENT

If materials originate from different sources or different size classes, materials of varying gradations and angularity shall be mixed to create a homogenous mixture prior to placement.

Rock material shall be placed by machine in small increments and released as close to their final position as practical. Rehandling, “raking”, or dragging should be minimized to prevent stone segregation and breakage. For similar reasons, dropping stone materials from excessive height will not be accepted.

- A. The ENGINEER and/or CONSTRUCTION INSPECTOR shall observe mixing and placing of the material.
- B. Approved individual component materials of void-filled riprap mix shall be delivered to site in separate marked stockpiles. Mixing shall be accomplished using a front end loader or other approved means to add the specified number of “loader buckets” of each material to a mixing stockpile. Ensure that each loader bucket comprises an approximately equal volume. If the loader operator is only able to fill the bucket partially full with large riprap (due to the force required to push the bucket into the pile), but uses full buckets of finer material, the mix proportions will not be correct. Avoid picking up excessive amounts of native soil from the subgrade under the stockpiled materials during the loader bucket mixing operations. The ENGINEER may reduce or eliminate the volume of topsoil added to the mixture based on the amount of native soil was incorporated during the bucket mixing operation.
- C. Once all the materials have been added to the mixing stockpile in the specified proportions, thoroughly mix the pile using a loader, large track- hoe excavator, or other approved means to fill the voids of the riprap without displacing the riprap or creating pockets of finer material absent of riprap.
- D. Segregation of materials shall be minimized when hauling from the stockpile to the installation location. Remixing shall occur as necessary to correct for any segregation as the material is placed.
- E. The loose material shall be placed in a single lift of sufficient height such that final grade will be achieved upon compaction. Additional mixing with a track excavator shall be required after initial placement to ensure that the void-filled riprap is thoroughly mixed and no segregation or excessive amount of smaller void-fill material is present on the surface. The mixing and placement process shall result in larger riprap (D50 size or larger) flush to the top surface with faces and shapes arranged to minimize voids, and smaller material between and below larger materials.
- F. If the top of the compacted material is below final grade, placement of only the smaller void-fill materials to achieve final grade will not be permitted. Additional void-filled riprap shall be added and the entire section mixed with a track excavator to eliminate the presence of smaller void-fill material on the surface.
- G. Avoid segregation of materials and remix any section where the combined material consists primarily of the void-fill materials. The density and interlocking nature of riprap in the mixed material shall essentially be the same as if the riprap was placed without filling the voids. This requires care and persistence on the part of the CONTRACTOR to install the work and on the part of the ENGINEER to assure that the work is installed correctly.
- H. At the direction of the ENGINEER, a 50:50 mixture of pit run and Type II bedding shall be sprinkled on the surface of the void-filled riprap and washed-in with water using a high pressure hose to fill-in small voids. This shall be done just prior to compaction of the void-filled riprap.
- I. If specified as part of the cobble mix, the top dressing of cobbles shall also be mixed in on the surface of exposed sections of void-filled riprap material prior to compaction of the riprap material.
- J. Compaction of the void-filled riprap shall be performed by running over the void-filled riprap with a large, heavy duty track excavator or dozer or by bucket compaction. The moisture

content of the mixture shall be at optimum conditions prior to compaction and water shall be added, as necessary, at the direction of the ENGINEER. Compaction of void-filled riprap shall be reviewed and approved by the ENGINEER.

- K. Where Floodplain Fill is indicated on the DRAWINGS, a surface layer of 4 to 6 inches moist topsoil shall be placed over the void-filled riprap. The topsoil surface layer shall be compacted to approximately 85% of maximum density and within two percentage points of optimum moisture in accordance with ASTM D698. Topsoil shall be added to any areas that settle.
- L. CONTRACTOR shall install a test section of at least 100 square feet of void-filled riprap for the review and approval of the ENGINEER prior to installation of the remaining void filled-riprap.
- M. Thickness of void-filled riprap shall be no less than thickness shown and no more than 0.3 feet greater than the thickness shown.

END OF SECTION

**SECTION 05010
FLOODPLAIN ROUGHNESS**

PART 1 – GENERAL

1.1 DESCRIPTION:

This section specifies preparatory work and operations necessary to create floodplain roughness. Floodplain roughness consists of excavating ridges and furrows (microtopography) in constructed floodplain surfaces and placing woody debris within these microtopography features. This treatment creates areas within the floodplain to trap seed and organic matter for new plant growth.

1.2 RELATED WORK:

- A. Section 01400 Construction Staking
- B. Section 01560 Environmental Controls
- C. Section 01600 Protection of Materials
- D. Section 02160 Site Preparation
- E. Section 02200 Earthwork
- F. Section 02900 Seeding

1.3 QUALITY ASSURANCE:

- A. ENGINEER shall be notified at least three (3) working days in advance of floodplain roughness grading.
- B. CONTRACTOR shall mark by flag or stake areas requiring floodplain roughness.

PART 2 – PRODUCTS

2.1 LOGS

Small log dimensions and placement criteria for floodplain roughness shall comply with the Drawings. CONTRACTOR shall roughen and break saw-cut ends of logs that will be exposed above finished ground surfaces in order to create a natural appearance.

2.2 BRUSH

Brush dimensions and placement criteria for floodplain roughness shall comply with the Drawings. CONTRACTOR shall roughen and break saw-cut ends of brush that will be exposed above finished ground surfaces in order to create a natural appearance.

PART 3 – EXECUTION

3.1 RIDGES AND FURROWS

Floodplain microtopography shall extend over the entire floodplain surface in each treatment area. Approximately 20 percent of the total surface area of each treatment area shall consist of furrows and approximately 20 percent shall consist of ridges. Ridges are elevated areas, graded 0.5 feet above the surface grade, by approximately 3 feet wide and 3 feet long. Furrows are low areas, graded 0.5 feet below the surface grade, by approximately 3 feet wide and 3 feet long.

3.2 LOG AND BRUSH PLACEMENT

CONTRACTOR shall transport logs and brush from staging areas to installation points as listed on the Drawings. Transport of logs and brush is incidental to floodplain roughness work.

Small logs and brush shall be partially buried within the floodplain surface to a depth of two feet, with one half the length below the finished ground elevation, and one half the length exposed. Small log and brush material and installation criteria shall comply with the Drawings.

END OF SECTION