KNIFE RIVER ELBEE BEND BANK STABILIZATION
KNRI 257081

DIVISION 31: EARTHWORK

Knife River Indian Villages National Historic Site – PMIS 257081

SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section consists of clearing, grubbing, removing, and disposing of vegetation and debris within the limits of the Project site as shown on the Drawings. Vegetation and objects designated to remain shall be preserved free from injury or defacement as shown on the Drawings.

B. This Section includes the following:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil material
5. Temporary erosion and sedimentation control.

C. The following is a list of Sections which may be related to this section:

1. Section 01 57 23 – Temporary Storm Water Pollution Prevention
2. Section 31 14 13 - Topsoil Stripping and Stockpiling
3. Section 31 23 00 - Earthwork (Excavation and Fill)
4. Section 31 25 00 – Erosion and Sedimentation Controls
5. Section 31 37 00 - Riprap and Bedding

1.2 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

F. Wetland Vegetation: Groundcovers, grass, sod and other plants within wetland delineation areas.

G. Unauthorized excavation: Consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Contracting Officer.

1.3 FIELD CONDITIONS

A. Soil Stripping, Handling, and Stockpiling: Preform only when the soil is dry or slightly moist.

B. Utility Locator Service: Contractor shall arrange for all utility locates prior to beginning site clearing operations.

C. Do not commence site clearing operations until temporary erosion and sedimentation controls, as specified in Section 01 57 23 – Temporary Storm Water Pollution Prevention and Section 31 25 00 – Erosion and Sedimentation Control are in place.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to the Contracting Officer.

C. The Drawings designate trees, shrubs, plants, and other objects to remain. Any object that is designated to remain and is damaged shall be repaired or replaced as directed by Contracting Officer, at Contractor's expense.

D. No material or debris shall be disposed of within the Project limits.

3.2 TREE AND PLANT PROTECTION

A. Contractor shall take care to safeguard trees and shrubs to remain in place in the final condition. Tree protection fencing shall be completed in accordance with the Drawings.

B. Contractor shall repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.3 EXISTING UTILITIES

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by NPS or others.

3.4 CLEARING AND GRUBBING

A. Grubbing/removal of roots is not allowed unless approved in writing by the Contracting Officer.

B. Remove obstructions, shrubs, and other vegetation from the Site to permit installation of new construction.

C. Undisturbed stumps, roots, and nonperishable solid objects located two (2) feet or more below subgrade or embankment slope may remain in place.

D. Except in areas to be excavated, all holes resulting from the removal of obstructions shall be back-filled with suitable material and compacted in accordance with Section 31 23 00, Earthwork (Excavation and Fill).

E. Trees cut before start of project as shown on Drawings (11103, 12738, 20772, and 21652) shall become the property of the Contractor and shall be removed from the site.

F. Earthwork operations may include unforeseen stumps and large roots that will require removal concurrently with excavation at no additional cost to the Owner.

G. Fill depressions caused by clearing operations with satisfactory soil material unless further excavation or earthwork is indicated.

3.5 TOPSOIL AND WETLAND TOPSOIL STRIPPING

A. Topsoil and wetland topsoil stripping shall be done in accordance with Section 31 14 13 – Topsoil Stripping and Stockpiling and as shown on the Drawings.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal of cleared materials - Subject to approval of the Contracting Officer, material from clearing operations shall be disposed of by removal from the worksite.

B. Disposal of Material by Removal

1. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Government's property.

2. Burning trees, shrubs, other vegetation waste, other waste, and debris is not permitted.

3. Material disposed of by removal from the construction area shall be removed from the areas prior to the completion of the work under these specifications. All materials removed shall become the property of the Contractor.

4. Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the Contractor to make any necessary arrangements with private parties and with local officials pertinent to locations and regulations of such dumping.

5. In hauling any material from the site, it shall be the responsibility of the Contractor to prevent debris from dropping from vehicles and littering the site or area streets and roads. The Contractor shall promptly remove any debris which falls from vehicles.

6. Surplus in soil material generated through striping of riverbank shall be stockpiled and then disposed in the riverbank in compliance with Drawings.

END OF SECTION 31 11 00

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SECTION 31 14 13 – TOPSOIL STRIPPING AND STOCKPILING

PART 1 - PART 1 GENERAL

1.1 SUMMARY

A. This work consists of salvaging and stockpiling topsoil and wetland topsoil and excavating suitable topsoil or wetland topsoil from stockpiles, Contractor sources, available sources, or from the approved natural ground cover to place on designated areas.

B. Topsoil shall be stripped and stockpiled as shown on the Drawings.

1.2 RELATED SECTIONS

A. The following is a list of SPECIFICATIONS which may be related to this section:

1. Section 31 11 00 - Clearing and Grubbing
2. Section 31 23 00 - Earthwork (Excavation and Fill)
3. Section 31 25 00 - Erosion and Sedimentation Control
4. Section 32 91 13 - Topsoil and Wetland Topsoil

PART 2 - PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil shall meet the requirements of Section 32 19 13 - Topsoil and Wetland Topsoil. Topsoil and Wetland Topsoil shall consist of natural onsite ground cover or hauled material from offsite sources.

B. Erosion and Sedimentation Control for Stockpiles shall meet the requirements of Section 31 25 00 - Erosion and Sedimentation Control.

C. Wetland topsoil material shall consist of moist organic soil, including any existing wetland vegetation and seeds. Material shall be excavated from areas as shown on the Drawings, hauled material from offsite sources, or as directed by Contracting Officer. All wetland topsoil materials shall meet the requirements of Section 32 19 13 - Topsoil and Wetland Topsoil.

PART 3 - PART 3 EXECUTION

3.1 TOPSOIL

A. Remove sod and grass before stripping topsoil.

B. Maintain separation of upland and wetland topsoil stockpiles.

C. Topsoil within the limits of the Project shall be salvaged prior to beginning excavating, fill or hauling, operations by excavating topsoil and stockpiling the material at designated locations on Drawings or as designated by Contracting Officer in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage.

D. Imported topsoil shall be hauled to the site and stockpiled in locations designated by Contracting Officer.

E. Salvaged topsoil exceeding the quantity required to complete the project in accordance with the Drawings shall be disposed of at Contractor's expense.

F. Salvaged topsoil exceeding the quantity required to complete the project in accordance with the

Drawings shall be disposed of at Contractor's expense.

G. Store stripped topsoil onsite to re-spread in green areas to meet final conditions. Care shall be taken during stockpiling of topsoil to not contaminate it with other materials.

3.2 STOCKPILE

A. No soil stockpile shall exceed ten (10) feet in height.

B. All topsoil stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing.

C. Any topsoil stockpile remaining longer than 30 days shall be seeded with a sterile temporary cover or the approved specified final seed mixture.

D. Upon completion of Project or as approved by Contracting Officer, remove surplus subsoil and topsoil from site. Grade stockpile area as necessary for planting or seeding.

3.3 WETLAND TOPSOIL

A. Removed sod and grass before stripping topsoil.

B. Maintain separation of upland and wetland topsoil stockpiles.

C. Wetland topsoil material shall be excavated from areas designated on the Drawings or as approved by Contracting Officer to a minimum depth of six (6) inches, or as otherwise designated, and placed within twenty-four (24) hours in the wetland relocation site.

D. Contractor shall prepare the wetland relocation site to elevations specified in the Drawings or as approved by Contracting Officer prior to excavating the wetlands topsoil. If Contracting Officer determines that this is not possible, then Contractor shall stockpile wetland topsoil material in an approved area, to remain undisturbed until the relocation site has been prepared.

E. All wetland topsoil stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing.

F. Storage time within the stockpile shall be as short as possible.

G. If deemed necessary by Contracting Officer, the stockpile shall be protected in such a manner to preserve the wetland seed bank.

H. Wetland topsoil material shall be placed over the prepared relocation areas to a depth of six (6) inches, or as otherwise designated.

I. Store stripped wetland topsoil onsite (separately from topsoil) to re-spread in wetland area shown on plans to meet final conditions. Care shall be taken during stockpiling of wetland topsoil to not contaminate it with other materials.

END OF SECTION 31 14 13

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SECTION 31 22 16.15 – TEMPORARY AND PERMANENT ACCESS ROADS AND TEMPORARY RIVER CROSSING

PART 1 - GENERAL

1.1 SUMMARY

A. 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.

B. Section includes specifications related to constructing, maintaining, and removal of temporary access roads and river crossing, and construction of permanent access road.

1.2 RELATED SECTIONS

A. The following is a list of Sections which may be related to this section:
1. Section 31 14 13 - Topsoil Stripping and Stockpiling
2. Section 31 23 00 - Earthwork (Excavation and Fill)
3. Section 31 37 00 - Riprap and Bedding
4. Section 32 15 00 - Aggregate Surfacing
5. Section 32 91 13 - Topsoil and Wetland Topsoil
6. Section 32 92 19 - Seeding

1.3 DEFINITIONS

A. Temporary Access Road (Temporary Access Road 1 as shown on the Drawings) originates from CR 37 extending to river crossing and continuing on east side of river conveying traffic to Staging Area 1. Temporary Access Road to be installed and removed according to plans and direction laid out in this specification.

B. Permanent Access Road (Access Road 2 as shown on the Drawings) originates from CR 37 extending to Staging Area 2. Temporary Access Road to be installed overtop of existing gravel road and maintained for use upon completion of construction. This is the contractor's employee designated gravel parking area.

C. Temporary River Crossing (as shown on the Drawings) is a temporary crossing of Temporary Access Road 1 at the upstream portion of the project connecting the right and left bank to allow for construction traffic. Upon completion of construction the Temporary River Crossing will be removed and fully reclaimed.

1.4 REFERENCES

A. The following is a list of Specifications which may be related to this section.

1. American Association of Highway Transportation Officials (AASHTO)
2. ASTM International (ASTM)
3. North Dakota Department of Transportation (NDDOT) "Standard Specification for Road and Bridge Construction" 2024 Edition, As Revised.

1.5 SUBMITTALS

A. Submittals shall be in conformance with Contracting Requirements, Specifications, and Division 1 - General Requirements.

B. Contractor shall submit certified laboratory test certificates and manufacturer product data for all items required in this section.

PART 2 - PRODUCTS

2.1 GRAVEL SURFACING MATERIAL

A. Aggregate shall meet the requirements outlined below:

1. Conform to NDDOT Specification Section 816.03, Class 5 Aggregate Base, as defined in Section 31 37 00 Riprap and Bedding.

2.2 RIPRAP

1. Riprap shall meet the requirements outlined below:

a. Conform to NDDOT Specification Section 256.03, Grade II Riprap, as defined in Section 31 37 00 Riprap and Bedding.

2.3 DRAINAGE PIPE

1. Drainage pipes for Temporary Access Road 1 and the Temporary River Crossing shall be corrugated metal pipes (CMP) as shown on the Drawings.

2. CMP shall be metallic coated corrugated steel pipe conforming to NDDOT Specification Section 830.02, Metal Pipe and AASHTO M 36.

2.4 FILTER FABRIC

1. Filter Fabric shall consist of strong, rot-proof synthetic fibers formed into a woven fabric or a non-woven needle-punched fabric meeting all applicable requirements of this section. The fabric shall be free from any treatment or coating that might significantly alter its physical properties before or after installation.

2. The fabric fibers shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from ultraviolet or heat exposure. The fabric shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position with respect to each other.

3. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties. Sheets of fabric may be bonded together or sewn with a fungus resistant material. Do not use nylon thread for sewn seams.

4. No deviation from any physical requirements will be permitted due to the protective covering to protect the fabric from direct sunlight, mud, dust, dirt, and debris.

5. The fabric shall not be exposed to temperatures greater than 140°F.

6. The fabric shall have a grab tensile strength of 200 lbs, elongation of 15% min, trapezoidal tear strength of 90 lbs, puncture strength of 80 lbs, and an apparent opening size of a #60 sieve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The CONTRACTOR shall stake the limits of grading for the Temporary Access Road 1 for Contracting Officer's approval before commencing grading of subgrade.

3.2 PREPARATION OF SUBGRADE (Temporary Access Road 1 Only)

A. Topsoil stripping shall be completed as specified in Section 31 14 13, Topsoil and Wetland Topsoil Stripping and Stockpiling.

B. Construct temporary access road subgrade at the locations and as shown on Drawings.

C. Before installation of aggregate base course on the Temporary Access Road 1, the subgrade shall be approved by the Contracting Officer.

3.3 TEMPORARY DRAINAGE PIPE (Temporary Access Road 1 and Temporary River Crossing, Only)

A. Furnish pipe required for temporary drainage in accordance with the details shown on the Drawings or as directed. Pipe will become the property of the Contractor upon removal. Temporary use of permanent pipe for use on the project is allowed if the sequence of work permits. If pipe used temporarily is damaged so that it is not acceptable in accordance with the applicable Items, it will not be acceptable for incorporation in the final project. The damaged pipe remains the property of the Contractor.

3.4 SPREADING AND COMPACTING

A. Aggregate should be placed from the furthest point working back towards the source to avoid running equipment on the final surface.

B. Use aggregate that is uniformly mixed at optimum moisture content and spread and compact to the final thickness and width.

C. Compaction shall be completed by one of the following methods:

1. A roller with a minimum of weight of 5 tons shall be used. No vibratory on the drum shall be allowed.
2. A minimum of 4 passes shall be made for compaction.
3. Proof roll with fully loaded aggregate transport vehicle for acceptance.

D. Placement of additional aggregate to maintain the temporary access roads in a safe and passable condition during the duration of the Project shall be completed at no additional cost.

3.5 DESIGN PARAMETERS

A. Locate temporary roads to minimize erosion impacts. Design temporary roads to access sensitive areas at specific locations.

B. At sites where traffic volumes are high, ensure that the entrance and roadway is wide enough for two vehicles to pass safely. Provide adequate turning radius at all entrances.

C. Where appropriate, use geotextiles prior to placement of aggregate. Place aggregate at sufficient depth to support heavy equipment and protect existing and proposed pipe culverts from crushing.

D. Route runoff from the road to a stabilized area (i.e., vegetated area, sediment basin or rip rap lined ditch).

E. Contractor shall grade the Temporary Access Road with appropriate grades that facilitate haul traffic of construction vehicles.

3.6 CONSTRUCTION GUIDELINES

A. Adequately slope temporary roads for good drainage, and install all other structures such as water bars, culverts, and rolling dips, according to Drawings and specifications.

B. Do not use road sloping on grades steeper than 5 percent unless other 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.

C. Make field adjustments, as necessary, to ensure proper performance.

3.7 MAINTENANCE AND INSPECTION

A. Conduct inspections as required by the permit or contract specifications.

B. Make adjustments based on inspections and have accumulated sediment and other debris removed and disposed of properly.

C. At the end of construction, re-contour to original slope and return to natural conditions using permanent erosion and sediment control best management practices. Remove or stabilize trapped sediment and permanently stabilize disturbed areas.

3.8 REMOVAL

A. Remove Temporary Access Road 1, including the Temporary River Crossing, after it is no longer needed to blend in with existing terrain (within the limits of disturbance shown on plans). Removed materials will become the property of the Contractor unless otherwise shown on the Drawings or directed. Removal activities pertain only to Temporary Access Road 1 and temporary river crossing, as shown on the Drawings. Access Road 2 shall remain as a permanent access road following construction.

B. Removal of aggregate shall not exceed the subgrade preparation depth.

C. Before installation of topsoil along the Temporary Access Road 1, the subgrade shall be approved by the Contracting Officer.

D. Seeding shall be completed as specified in Section 32 92 19.

END OF SECTION 31 22 16.15

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SECTION 31 23 00 – EARTHWORK (EXCAVATION AND FILL)

PART 1 - GENERAL

1.1 SUMMARY

A. This work shall consist of excavation, embankment fill, disposal of excess material, shaping, and compaction of all material encountered within the limits of work, including excavation and fill for structures. The excavation shall include, but is not limited to, the native soils which shall be excavated for the Project work. All work shall be completed in accordance with these Specifications, the lines and grades, and typical cross-sections shown on the Drawings.

B. All excavation shall be classified as, "unclassified excavation," or "muck excavation" or "rock excavation," as hereafter described. All embankment shall be classified "embankment material" as hereafter described. All excess material not utilized in the embankment shall be classified as "excess material" as hereafter described.

C. All excess material not utilized in the embankment shall remain the property of the NPS. The Contractor shall stockpile all excess material at an on-site staging location as shown on the Drawings. An off-site stockpile location may be approved as an alternative by the Contracting Officer.

D. Preparing subgrades for aggregate surfacing.

1.2 RELATED SECTIONS

A. The following is a list of Specifications which may be related to this section:

1. Section 31 11 00 – Clearing and Grubbing
2. Section 31 37 00 – Riprap and Bedding
3. Section 31 22 16.15 – Temporary and Permanent Access Roads and Temporary River Crossing
4. Section 32 15 00 – Aggregate Surfacing
5. Section 32 92 19 – Seeding

1.3 REFERENCES

A. The following list of Specifications which may be related to this section.

1. ASTM International (ASTM)

a. ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
b. ASTM E 329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

c. ASTM D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
d. ASTM E 548, Standard Guide for General Criteria Used for Evaluating Laboratory Competence
e. ASTM D 2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
f. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
g. ASTM D 2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
h. ASTM D 2937, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
i. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)).
j. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.4 DEFINITIONS

A. Embankment Material shall consist of approved material acquired from excavation or from outside sources, hauled and placed in embankments.

B. Excess Material shall consist of excavated material that is not used as embankment material and is stockpiled on-site at the direction of the Contracting Officer.

C. Muck Excavation shall consist of the removal of mixtures of soils and organic matter not suitable for foundation material and replacement with approved material.

D. Rock Excavation shall consist of igneous, metamorphic and sedimentary rock which cannot be excavated without the use of rippers, and all boulders or other detached stones each having a volume of one-half (1/2) cubic yard or more, as determined by physical or visual measurement. It shall also include replacement with approved material as required.

E. Unclassified Excavation shall consist of the excavation of all materials of whatever character required of the work, obtained within the Project limits.

F. Trench Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

G. Culvert Backfill: Aggregate used to backfill between the Trench Bedding Course and the Subgrade.

H. Borrow: Satisfactory soil imported from off-site for use as Fill or backfill.

I. Excavation: Removal of material encountered above subgrade elevations.

J. Fill: Unclassified materials used to raise existing grades.

K. Structures: Bridges, footings, foundations, retaining walls, slabs, or other man-made stationary features constructed above or below the ground surface.

L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

M. Topsoil: See Section 32 92 19 – Seeding for definition and specification.

N. Debris: “anything that is not earth which exists at the job site.”

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Aggregate Materials

      a. Material Test Reports: From a qualified testing agency, engaged by the Contractor, indicating and interpreting test results for compliance of the following with requirements indicated:
      b. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Contractor shall engage an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Contractor shall survey final topography and/or cross-sections of areas that are to finished grade and compared to the design section for accuracy. Any deficiencies or deviations between the final topography and design shall be addressed by the Contractor. Final survey information shall be included and submitted with the as-built survey.

C. Final grade shall match design grades within the tolerances discussed in Part 3 Execution.

D. Any material imported from outside the Park shall be tested to be free of any contaminants above North Dakota threshold limits and free of any non-native plant species.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted in writing by Contracting Officer and then only after arranging to provide temporary utility services according to requirements indicated:

B. Do not proceed with utility interruptions without Contracting Officer's written permission.

C. Contact utility-locator service for area where Project is located before excavating.

D. Final disposal location of Exported Materials shall be the responsibility of the contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils for Embankment shall comply with the Drawings. Satisfactory soils shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Embankment Material may consist of approved material acquired from excavations or material hauled from outside the Project limits.

D. Suitable material identified onsite shall be used first for embankments and backfill.

E. Excess excavated native soils which are not used as embankment or backfill shall remain the property of the NPS and shall be stockpiled on-site by Contractor, in a location acceptable to Contracting Officer.

F. Muck Excavation shall also include the replacement of excavated muck with uniformly graded rock, riprap, onsite or imported soils, or other material, whichever is most suitable for the specific situation encountered.

1. Contracting Officer will determine which type of aggregate or other material which shall be used after observing the specific site conditions.

G. Structural Backfill:

1. When specified on the Drawings or as required by Contracting Officer, structural backfill shall meet the gradations outlined in Section Riprap and Bedding (31 37 00).

2. When specified on the Drawings or as required by Contracting Officer, Class I structural backfill shall meet the following gradation requirements:

Sieve Size	% By Weight Passing Square Mesh Sieves
2-inch	100
No. 4	30-100
No. 50	10-60
No. 200	5-20

3. In addition, this material shall have a liquid limit not exceeding thirty-five (35) and a plasticity index of not over six (6).

H. Impervious structural backfill, where shown or specified, shall consist of material having one hundred percent (100%) finer than two (2) inches in diameter and a minimum of thirty-five percent (35%) passing a No. 200 U.S. Standard Sieve.

I. Trench Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve. All crushed stone provided shall be sandstone or other approved by the Contracting Officer. No Limestone shall be allowed.

J. Trench Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve. All crushed stone provided shall be sandstone or other approved by the Contracting Officer. No Limestone shall be allowed.

K. Free Draining Base: AASHTO #57 Stone. All crushed stone provided shall be sandstone or other approved by the Contracting Officer. No Limestone shall be allowed.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

B. Detectable Warning Tape: Provided detectable warning tape for underground utilities that would otherwise not be detectable by above ground utility locating methods. Detectable warning tape shall include metallic core encased in a protective jacket for corrosion protection and be detectable by a metal detector when tape is buried up to 30 inches deep.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, signs, benches marked to remain, trees that will remain and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide erosion-control measures outlined within Section 31 25 00 - Erosion and Sedimentation Controls to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.

D. Protect subgrades and foundation soils from freezing temperatures and frost.

E. Comply with all provisions and all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.

F. Prevent surface water and ground water from entering excavations and from flooding Project site and surrounding area. Protect excavations from softening and damage by rain or water accumulation.

G. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.

3.2 GENERAL EXCAVATION/EMBANKMENT

A. General:

1. Provide protection for all open excavations, backfill trenches on same day in which excavation occurs to avoid leaving excavations open overnight.

2. The excavation and embankment shall be finished to reasonably smooth and uniform surfaces.

3. Materials shall not be wasted without permission of Contracting Officer.

4. Excavation operations shall be conducted so that material outside of the limits of slopes will not be disturbed.

5. Prior to beginning grading operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with Section 31 11 00 - Clearing and Grubbing.

6. Contractor shall notify Contracting Officer in sufficient time before beginning excavation or embankment such that the necessary topography and/or cross-sections may be taken. Contractor shall not excavate beyond the dimensions and elevations established, and material shall not be removed prior to surveying the site.

7. Employ equipment and methods appropriate to the work site. Small mechanical excavators may be used in areas where there is sufficient space so as not to damage adjacent improvements, and where the locations of all existing utilities have been determined.

8. When Contractor's excavating operations encounter remains of prehistoric people's dwelling sites or artifacts of historical or archaeological significance, the operations shall be temporarily discontinued.

    a. Contracting Officer will contact archaeological authorities to determine the disposition thereof.
    b. When directed, Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the proper state authorities.
    c. Such excavation will be considered and paid for as extra work.

B. Excavation:

1. Unclassified:

   a. All excess suitable material excavated from the Project site and not used for embankment shall be stockpiled on-site at a location approved by the Contracting Officer.
   b. Where material encountered within the limits of the work is considered unsuitable for embankment (fills) on any portion of this Project, such material shall be excavated as directed by Contracting Officer and replaced with suitable fill material.
   c. All unsuitable excavated material from excavation consisting of any type of debris (surface or buried), excavated rock, bedrock or rocks larger than six (6) inches in diameter, and boulders shall not be used as Compacted Fill for embankment construction.

2. Muck:

   a. Where excavation to the finished grade section results in a subgrade or slopes of unsuitable soil, Contracting Officer may require Contractor to remove the unsuitable materials and backfill to the finished graded section with approved material.
   b. Disposal of the unsuitable material and replacement with suitable material shall be at Contractor's expense.

3. Good surface drainage shall be provided around all permanent cuts to direct surface runoff away from the cut face.

4. Rock:

   a. Unless otherwise specified, rock shall be excavated to a minimum depth of 0.5 foot below subgrade within the limits of the riverbed area, and the excavation shall be backfilled with material shown on the Drawings or as designated by Contracting Officer.
   b. Disposal of material and replacement with suitable approved material shall be at Contractor's expense.

C. Embankment Construction:

1. Embankment construction shall consist of constructing all fill areas, including preparation of the areas upon which they are to be placed, the placing and compacting of approved material within areas where unsuitable materials have been removed, and the placing and compacting of Embankment Material in holes, pits and other depressions within the Project area.

2. Only approved materials shall be used in the construction of embankments and backfills.

3. Approved materials shall consist of onsite soils or approved imported soils in compliance with Drawings and Specifications.

4. Onsite soils or imported soils shall be placed and compacted in six-inch (6") horizontal loose lifts, using equipment and procedures that produce recommended moisture contents and densities throughout the lift and embankment height. Onsite or imported cohesive soils shall be compacted within a moisture content range of two percent (2%) below, to two percent (2%) above optimum moisture content and compacted to ninety-five percent (95%) of the

Maximum Standard Proctor Density (ASTM D698).

5. When embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built one-half (1/2) width at a time, the slopes that are steeper than four-to-one (4:1) when measured longitudinally or at right angles to the adjacent ground shall be continuously benched over those areas where it is required as the work is brought up in layers.

    a. Benching shall be well "keyed" and where practical a minimum of eight (8) feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts.
    b. Material thus cut out shall be recompacted along with the new Embankment Material at Contractor's expense.

6. The ground surface underlying all fills shall be carefully prepared by removing all organic matter, scarification to a depth of eight (8) inches and recompacting to ninety-five percent (95%) of the Maximum Standard Proctor Density (ASTM D698) at optimum moisture content + or - two percent (2%) prior to fill placement.

7. Embankment Fill Material shall be placed in horizontal layers not exceeding six inches (6") (loose measurement) and shall be compacted to ninety five percent (95%) of the Maximum Standard Proctor Density (ASTM D698) at optimum moisture content + or - two percent (2%).

    a. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compacting.
    b. As the compaction of each layer progresses, continuous leveling and manipulating required to ensure uniform density.

8. Excess material stockpile (shown on Drawings): Place and compact fill to the lines and grades shown on the Drawings. Unless otherwise shown on the Drawings or specified, place fill materials in stockpile in layers not more than 24 inches in loose depth for material compacted by heavy equipment (5 tons or greater operating weight), and not more than 6 inches in loose depth for material compacted by light compaction equipment (less than 5 tons operating weight) hand – operated tampers or walk-behind compactors. Compacting shall be completed parallel to the contours, not perpendicular.

9. Materials which are removed from excavations beneath the water table may be over the optimum moisture content and shall be required to be dried out prior to reusing them.

10. Cross hauling or other action as appropriate will be ordered when necessary to ensure that the best available material is placed in critical areas of embankments. No additional payment will be made for cross hauling ordered by Contracting Officer.

11. Frozen materials shall not be used in construction of embankments.

12. During the construction of the channels, the channel bottom shall be maintained in such condition that it will be well drained at all times.

13. Excavation, fill, and structural backfill work that is eroded or washed away or becomes unstable as a result of either rains, snow, snow melt, channel flows, or lack of proper water control

shall be either removed and replaced, recompacted, or reshaped as directed by Contracting Officer and in accordance with the Drawings and Specifications at Contractor's sole expense.

14. Removed unsuitable materials shall be hauled away and disposed of at Contractor's expense. Placing of replacement materials for removed unsuitable materials shall be purchased, placed, and compacted at Contractor's expense.

D. Proof Rolling:

1. Proof rolling with a heavy rubber-tired roller shall be required, if designated on the Drawings or when ordered by Contracting Officer.

2. Proof rolling shall be done after specified compaction has been obtained. Areas found to be weak and those areas which failed shall be ripped, scarified, wetted if necessary, and recompacted to the requirements for density and moisture at Contractor's expense.

3. Proof rolling shall be done with equipment and in a manner acceptable to Contracting Officer. Proof rolling as shown on the Drawings or as ordered by Contracting Officer shall not be measured and paid for separately, but shall be considered incidental to the work and included in the bid price.

3.3 EXCAVATION AND BACKFILL FOR STRUCTURES

A. Poor foundation material for any of the work shall be removed, by Contractor, as directed by Contracting Officer.

B. Contractor will be compensated for removal and replacement of such materials in accordance with Muck Excavation.

C. Contractor is cautioned that construction equipment may cause the natural soils to pump or deform while performing excavation work inside and on footings, structural floor slabs, or other structure foundation areas.

D. Contractor shall remove and replace at Contractor's expense any foundation materials which are:

1. Saturated by either surface or subsurface flows because of the lack of adequate water control or dewatering work by Contractor;

2. Frozen for any reason; or

3. Disturbed by Contractor's work or caused to become unacceptable for foundation material purposes by means of Contractor's equipment, manpower, or methods of work.

E. Dewatering shall not be conducted by pumping from inside footings, or other structure foundation limits. This may decrease the supporting capacity of the soils.

F. Care shall be taken when excavating the foundations to avoid disturbing the supporting materials. Excavation by either hand or careful backhoe soil removal, may be required in excavating the last few inches of material to obtain the subgrade of any item of the concrete work.

G. Any over-excavated subgrades that are due to Contractor's actions, shall be brought back to subgrade elevations, as indicated on the DRAWINGS, by Contractor and at Contractor's expense in the following manner:

1. For over-excavations of two (2) inches or less, either backfill and compact with approved granular materials; backfill with one-half (1/2) inch crushed rock.

2. For over-excavations greater than two (2) inches, backfill and compact with an approved granular material.

3. Backfill, and fill within three (3) feet adjacent to all structures and for the full height of walls, shall be selected non-swelling material.

4. It shall be granular, well graded, and free from stones larger than two (2) inches.

5. Material may be job excavated, but shall selectivity be required as determined by Contracting Officer.

6. Stockpiled material, other than topsoil from the excavation, shall be used for backfilling unless an impervious structural backfill is specified.

7. The backfill material shall consist of either clean onsite granular material free of stones larger than two (2) inches in diameter with no more than twenty percent (20%) passing the No. 200 sieve, or equivalent imported materials.

8. All backfill around the structures shall be consolidated by mechanical tamping.

9. The material shall be placed in six-inch (6") loose lifts within a range of two percent (2%) above to two percent (2%) below the optimum moisture content and compacted to ninety-five percent (95%) of Maximum Standard Proctor Density (ASTM D698) for cohesive soils, or to seventy-five percent (75%) relative density for pervious material as determined by the relative density of cohesionless soils test, ASTM D4253.

10. Impervious structural backfill shall be placed in six-inch (6") loose lifts within a range of two percent (2%) above to two percent (2%) below the optimum moisture content and compacted to ninety-five percent (95%) of Maximum Standard Proctor Density for cohesive soils as determined by ASTM D698.

3.4 GENERAL EXCAVATION

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

B. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STORMWATER TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 18 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for barrels of pipes. Remove projecting stones and sharp objects along trench subgrade.

1. Shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped bedding course backfill.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.7 BACKFILL

A. Refer to Spec Section 32 15 00 - Aggregate Surfacing for requirements for placement of trail aggregate.

B. Place and compact backfill in excavations promptly, but not before completing the following:

1. Inspecting stormwater culverts

2. Removing trash and debris.

3.8 FILL

A. Refer to Spec Section 32 15 00 - Aggregate Surfacing for requirements for placement of gravel parking lot aggregate.

B. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

C. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

D. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas “green areas”, use satisfactory or unsatisfactory soils for fill embankment so long as they are clean and free of trash and debris.

2. Under trail grade and pavements, use satisfactory soils for fill embankment

3. Under footings and foundations, use satisfactory soils for fill embankment

4. In sliver fills use Class 1 Rip Rap

3.9 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

B. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil in the following conditions:

1. Under trail bed scarify and recompact top 6 inches below subgrade and compact. Use proof roll method with loaded transport vehicle or other NPS approved vehicle of similar weight and size.

2. Under green or unpaved areas, place fill with tracked equipment or bucket of machine. Make compactive effort to stabilize the surface. Material shall not be dumped into place without tracking in of material.

3. In areas of drainage pipe and structural backfill, backfill material shall be compacted to 95 percent of maximum density.

3.11 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades, new grades and bridge/ramp approaches.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water towards ditches and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Trail bed: Plus 1/2 inch. Trail must meet flush with structures with a 2% max cross slope.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Have testing agency inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency shall test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Temporary Drainage Pipe Backfill: Two compaction tests shall be performed for each drainage pipe installation. Tests shall be scheduled to be taken at different lifts and areas of the pipe alignment.

2. Excess Material Stockpile: Two compaction tests shall be performed during each lift for every 4,000 CY placed.

3. Embankment and All Other Fill: Two compaction tests shall be performed during each lift at a distance no greater than every 200 linear feet.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris until accepted by NPS.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Scarify or remove and replace soil material to depth as directed by Contracting Officer; reshape and recompact.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

E. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Refer to Spec Section 31 11 00 - Clearing and Grabbing for requirements for disposal of surplus ad waste material.

B. Disposal: Transport surplus satisfactory soil to acceptable offsite spoil yard.

C. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 23 00

SECTION 31 23 19.01 DEWATERING

PART 1 - GENERAL

1.1 SUBMITTALS

A. Informational Submittals:

1. Water Control Plan and Dewatering Systems
2. Discharge permits
3. Discharge permit reporting requirements

1.2 WATER CONTROL PLAN

A. As a minimum, include:

1. Descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment; methods; standby equipment and power supply, pollution control facilities, discharge locations to be utilized, and provisions for immediate temporary water supply as required by this section.
2. Drawings showing locations, dimensions, and relationships of elements of each system.
3. Design calculations demonstrating adequacy of proposed dewatering systems and components.

B. Water Control Plan and Dewatering Systems shall be prepared by a Groundwater Control Specialist:

1. A licensed professional engineer currently registered in the State of North Dakota with a minimum of 5 years of experience designing dewatering plans and systems.
2. Contracting Officer's review and acceptance of the submittal does not imply approval by the Contracting Officer of the associated Water Control Plan and Dewatering Systems. The Contractor will be solely responsible for designing, installing, operating, and maintaining the system(s) required to satisfactorily perform all necessary dewatering.

C. If system is modified during installation or operation revise or amend and resubmit Water Control Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Continuously control water during course of construction, including weekends and holidays and during periods of work stoppages, and provide adequate backup systems to maintain control of

water.

3.2 SURFACE WATER CONTROL

A. See Section 31 25 00 - Erosion and Sedimentation Controls.

B. See Section 01 50 00 – Submittals ND Game and Fish ANS Inspection Checklist

C. Remove surface runoff controls when no longer needed.

3.3 DEWATERING SYSTEMS

A. Provide, operate, and maintain dewatering systems of sufficient size and capacity to permit excavation and subsequent construction in dry and to lower and maintain groundwater level a minimum of 3 feet below the lowest point of excavation. Continuously maintain excavations free of water, regardless of source, and until backfilled to final grade.

B. Design and Operate Dewatering Systems:

1. To prevent loss of ground as water is removed.

2. To avoid inducing settlement or damage to existing facilities, completed Work, or adjacent property.

3. To relieve artesian pressures and resultant uplift of excavation bottom.

C. Provide sufficient redundancy in each system to keep excavation free of water in event of component failure.

D. Provide 100 percent emergency power backup with automatic startup and switchover in event of electrical power failure.

E. Provide supplemental ditches and sumps only as necessary to collect water from local seeps. Do not use ditches and sumps as primary means of dewatering.

3.4 MONITORING FLOWS

A. Monitor volume of water pumped per calendar day from excavations, as Work progresses. Also monitor volume of water introduced each day into excavations for performance of Work. Monitor flows using measuring devices acceptable to Contracting Officer.

3.5 DISPOSAL OF WATER

A. Obtain discharge permit for water disposal from authoritieshaving jurisdiction.

B. Treat water collected by dewatering operations, as required by regulatory agencies, prior to discharge.

C. Discharge water as required by discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.

D. Remove solids from treatment facilities and perform other maintenanceof treatment facilities as necessary to maintain their efficiency.

3.6 PROTECTION OF PROPERTY

A. Make assessment of potential for dewatering induced settlement. Provide and operate devices or systems, including but not limited to reinjection wells, infiltration trenches and cutoff walls, necessary to prevent damage to existing facilities, completed Work, and adjacent property.

B. Securely support existing facilities, completed Work, and adjacent property vulnerable to settlement due to dewatering operations. Support shall include, but not be limited to, bracing, underpinning, or compaction grouting.

END OF SECTION 31 23 19.01

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SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furnishing, installing, and maintaining temporary soil erosion controls and temporary sedimentation controls.
   2. Tree Protection
   3. Temporary seeding

B. Related Sections:
   1. Section 01 11 00 – Summary of Work
   2. Section 31 11 00 – Clearing and Grubbing
   3. Section 32 92 13 - Seeding

1.2 DEFINITIONS

A. Temporary erosion controls shall include grassing, mulching, watering, and reseeding on-site sloped surfaces, providing berms at the top of the slopes and providing interceptor ditches at the ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or minimized, and that no disturbed soils enter existing ditches or wetlands, storm sewers or culverts, and that no soil leaves the project site.

1.3 SUBMITTALS

A. Product data for silt barriers, erosion control and mulch blankets and netting, tree protection, fiber rolls, oil boom, filter fabric, and ND DOT Class 5 aggregate.

B. The Contractor shall review the Erosion and Sediment Control Plans in the Drawings and identify any additional erosion control measures to be employed, along with a construction sequencing plan and schedule as necessary to meet federal, state and local regulations. The Contractor shall properly maintain and operate the erosion and sediment control plan, inspect the construction activity as necessary by local and state regulations/permits, and take any needed corrective actions.

C. Storm Water Operator Qualifications
   1. Contractor shall submit name of their Storm Water Operator for the project.
   2. Storm water operator shall have all necessary required state and/or certifications and will be responsible for all required site inspections and documentations.

1.4 QUALITY ASSURANCE

A. Provide erosion control methods in accordance with methods as indicated on the erosion control plan and requirements of authorities having jurisdiction. Comply with North Dakota Pollutant Discharge Elimination (NDPDES) rules and regulations in terms of both installation and maintenance during construction.

B. The Contractor shall make application for the project NDPDES Permit. Contractor will familiarize themselves with the requirements of this permit and be responsible for execution of these requirements.

C. Erosion control devices as shown on the drawings are the minimum effort required based upon the finished grades for the site. Contractor is responsible for adhering to all applicable storm water regulations. Contractor is responsible to provide ongoing maintenance of all erosion control measures and provide additional devices for erosion protection at the Contractor's expense to minimize sediment leaving the site or entering wetlands, ditches, or storm sewers during all phases of activity.

D. The Contractor's Storm Water Operator shall inspect the construction activity at least once per week, and within 24 hours after every precipitation event that results in a discharge from the site, to determine if any corrective actions are needed. The Contractor shall promptly take all necessary corrective actions. The Storm Water Operator shall keep a log of the inspection and corrective actions available, for inspection by the (CO) and the public at the construction site at all times. The Contractor shall retain the log on file for a period of 3 years from the date of the latest inspection or corrective action. The Contractor shall also furnish a copy of this log to the Contracting Officer upon completion of the project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass and other seed crop materials in sealed containers.

B. Damaged packaging containing product is not acceptable.

PART 2 - PRODUCT

2.1 SILT-FENCE

A. Filter stone shall be crushed one (1)-inch stone without excessive fines or dust.

B. Silt fence material shall be industry approved woven geotextile.

2.2 TEMPORARY SEED MATERIALS

A. Seed mixtures for temporary erosion/soil protection application shall be perennial ryegrass, alfalfa;

2.3 EROSION CONTROLMATTING

A. Natural or earth tone colored woven matting of coir made from high strength coconut fiber conforming to ASTM D 5199, 5261, 4595, 1388, 4355 and 1117.

B. Wide width tensile strength shall be a minimum of 1512 x 1032 lbs/ft (dry) and 924 x 684 lbs/ft (wet).

C. Matting shall be capable of withstanding water velocities of 12 ft/s and shear stress of 4.5 psf.

D. UV stability shall be a minimum of 80% at 500 hrs.

2.4 EROSION CONTROL BLANKET

A. 100% coconut fiber erosion control blanket conforming to ASTM D 6475, 6525, 6818, 6567 and 1117.

B. Erosion control blanket shall have a minimum tensile strength of 240 x 164 lbs/ft.

C. Blanket shall be capable of withstanding water velocities of 9.0 ft/s and shear stress of 2.25 psf.

2.5 TREE PROTECTION

A. Tree Protection Fencing: Orange plastic fence, minimum height, 4 feet as shown on Drawings.

2.6 FIBER ROLL

A. Fiber roll shall be 12 or 20 inch fiber roll with overlapping staking.

B. Install fiber roll and stakes as shown on Drawings.

2.7 OIL BOOM

A. Oil boom shall have a UV resistant polypropylene skin with carbon steel fastening rings and clips.

B. Test rope shall have 400 lb strength.

C. Each 10 foot section shall be capable of absorbing 12 gallons oil and oil based liquids.

2.8 SILT CURTAIN

A. Silt curtain shall be constructed and installed as shown on the Drawings.

2.9 TEMPORARY ROCK CONSTRUCTION ENTRANCES

A. Temporary rock construction entrances shall include filter fabric under 6 inches of gravel surfacing material as shown on the Drawings.

PART 3 - EXECUTION

3.1 PROTECTION

A. Locate, identify, and protect park features that remain from damage.

B. Protection of Wetlands, Streams, Drainage ways: Contractor shall be responsible for protection of NPS contiguous land to the project work zone. If any erosion of fill or cut slopes start migrating outside the works, the Contractor shall notify the Contracting Officer immediately and the Contracting Officer shall identify corrective action that needs to take place. Corrective action will be dependent on condition but can range from placing rip rap on slope to prevent further erosion to installing a silt fence.

C. Erosion Control and Dust Control: Contractor shall be responsible for dust control until final construction operations are complete.

D. Environmental protection: Comply with any applicable permits.

E. Protect benchmarks from damage and displacement.

3.2 GENERAL

A. The Contractor shall construct the sedimentation control devices prior to clearing and grubbing the remaining site to ensure complete silt control.

B. Silt dams, traps, barriers, and appurtenances shall be installed and shall be maintained in place for duration of construction. This is done by periodically replacing silted structures or removing the

silt from the upgradient side of it, and until permit is released.

C. Erosion and sedimentation controls shall be maintained in a condition which will retain unfiltered water.

D. The Contractor shall be solely responsible for ensuring that no silt or debris leaves the construction site or enters protected wetlands, streams, or drainage ditches. Any silt or debris that does leave the immediate site shall be immediately cleaned up, and the area disturbed shall be returned to its natural state as directed by the Contracting Officer at the Contractor's expense.

E. The Contractor shall be responsible to clean-up all silt debris built up on the site and for the removal of all erosion control measures at the appropriate times as directed by the Contracting Officer.

F. Upon completion of construction the contractor shall be responsible for removing all temporary erosion control measures and installing final erosion control measures including erosion control blanket and matting.

3.3 TREE PROTECTION FENCING

A. Tree Protection Fencing: Install as shown on Drawings.

3.4 TEMPORARY SEEDING

A. Seed Bed Preparation:

1. Rough grade areas to smooth, even surface with loose uniformly fine texture. Roll, rake, and drag lawn areas. Remove ridges and fill depressions as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

2. Prepared seed bed shall be friable topsoil, free from subsoil clay lumps, brush, weeds, and other litter, and shall be free of roots, stumps, and stones larger than 1 inch in any dimension.

3. If seed bed has become muddy, hard or excessively dry, retill to a smooth, friable, uniform condition; free from stones or lumps. Regrade all settling prior to seeding. Seed immediately after bed preparation.

B. Seeding Areas Less Steep Than a 1 Vertical to 3 Horizontal Slope:

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

2. Place seed with a mechanical drill seeder. Distribute seed evenly over entire area by drilling equal quantity in 2 directions at right angles to each other.

3. Do not seed immediately following rain or if seed bed is muddy.

4. Roll sown area with a roller weighing at least 200 pounds per lineal foot.

5. Immediately after seeding and compacting, apply mulch material to attain even coverage over the entire target area.

END OF SECTION 31 25 00

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SECTION 31 37 00 - RIPRAP AND BEDDING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes excavation, grading, and installation of riprap, boulders, soil riprap, void-filled riprap and bedding placed at the locations shown on the Drawings. The materials to be used and the construction of such structures shall be as specified herein.

1.2 RELATED SECTIONS

A. The following is a list of Specifications, which may be related to this section:
1. Section 31 11 00 - Clearing and Grubbing
2. Section 31 14 13 - Topsoil Stripping and Stockpiling
3. Section 31 23 00 - Earthwork (Excavation and Fill)
4. Section 32 15 00 - Aggregate Surfacing
5. Section 32 91 13 - Topsoil and Wetland Topsoil
6. Section 32 92 19 - Seeding

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO):

a. T85, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
b. T96, Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
c. T103, Standard Method of Test for Soundness of Aggregates by Freezing and Thawing.
d. T104, Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
e. T248, Reducing Field Samples of Aggregate Test Size.

2. 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)).

3. North Dakota Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, 2024.

1.4 DEFINITIONS

A. ECB and Rock Slope Warranty Period: Period starts after final completion is achieved and will last for one calendar year. During the warranty period the Contractor is required to re-installation of Initial surface protection (ECB, topsoil, seed), and repairs to rock slope.

1.5 SUBMITTALS

A. Stone Data:

1. Prior to installation, the Contractor shall obtain from the commercial source and submit to the Contracting Officer a certificate indicating the following:

a. Stone classification
b. Stone weight per cubic foot
c. Gradation and durability

2. Field Samples: The Contractor shall supply samples of stone to be displayed at the site with appropriate weights marked for the minimum, maximum and one-half (50%) weight range specified. These samples of stone shall be from the same commercial source and of the same type of stone as that to be supplied for the job and shall be delivered to the site in advance of the time when placing the stone is expected to begin. The Contractor will not be granted an extension of time or extra compensation due to delay caused by sampling, testing, approval, or disapproval of stone protection material to meet the requirements of the Specifications.

B. Bedding Data:

1. Prior to installation, the Contractor shall provide 5 pounds sample of each bedding aggregates for approval.

2. Submit test results and a Certificate of Compliance verifying that aggregate gradation meets contract requirements. Sample the material before incorporation into the work as follows:

a. For commercially produced aggregates: at the producer's plant or stockpile.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty. The Contractor will be notified by the end of the initial surface protection (ECB) and rock slope warranty period by the Contracting Officer with areas that require re-installation of ECB, topsoil and repairs to rock slope.

PART 2 - PRODUCTS

2.1 MATERIALS

A. RIPRAP

1. Use field or quarry stone that is clean and free of deleterious material that conforms to NDDOT Section 256, Riprap.

2. Riprap used shall be the type designated on the Drawings and shall conform to Table 1.

Table 1: Riprap Gradation

ND DOT Grade II	
Size (inches)	**Percent Smaller**
28	100
22	30-80
16	20-50
10	0-5
6	0-2

NDDOT Sect. 256.03.C.1

3. Do not use Riprap that:
    a. Consists of sandstone, shale, or soft limestone;
    b. Contains cracks or flaws that would cause splitting or breakup; or
    c. Is easily abraded or crushed.

4. The riprap designation and total thickness of riprap shall be as shown on the Drawings. The maximum stone size shall not be larger than the thickness of the riprap.

5. Neither width nor thickness of a single stone of riprap shall be less than one-third (1/3) of its length.

6. The specific gravity of the riprap shall be two and one-half (2.5) or greater.

7. Riprap specific gravity shall be according to the bulk-saturated, surface-dry basis, in accordance with AASHTO T85.

8. 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.

9. 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

10. 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.

11. Rock shall be free of calcite intrusions.

12. Gradation:

    a. Each load of riprap shall be reasonably well graded from the smallest to the largest size specified.
    b. 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.
    c. Control of gradation shall be by visual inspection. However, in the event Contracting Officer determines the riprap to be unacceptable, Contracting

Officer shall pick two (2) random truckloads to be dumped and checked for gradation.

d. Mechanical equipment and labor needed to assist in checking gradation shall be provided by Contractor at no additional cost

13. Color

a. The color of the riprap shall be approved by Contracting Officer prior to delivery to the Project site.

b. Color shall be consistent on the entire Project and shall match the color of rock to be used for all other portions of the work.

14. Broken concrete or asphalt pavement shall not be acceptable.

15. Rounded riprap (river rock) is not acceptable, unless specifically designated on the Drawings.

B. VOID-FILLED RIPRAP:

1. Rock requirements are to comply with riprap material specifications in Part 2 of this specification.

2. Samples of riprap and void-fill materials shall be submitted for the review and approval of the Contracting Officer prior to construction.

3. Where "Void-Filled Riprap" 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.

4. Mix proportions and material gradations in Table 2 are approximate and are subject to adjustment by the Contracting Officer. No adjustment in unit price for void-filled riprap will be allowed based on modifications to the mix proportions.

Table 2: Mix Requirements for Grade II Void-Filled Riprap

Approximate Proportions (loader buckets)	Material Type	Material Description
6	Riprap	Grade II
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	Crushed rock (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	Class 3 Granular Bedding (NDDOT 816.02)

½ to 1	Void-fill material	Native topsoil

Note: Mix proportions and material gradations are approximate and are subject to adjustment by the Contracting Officer

C. SOIL RIPRAP

1. Rock requirements are to comply with riprap as specified in Table 1of this specification.

2. The soil material shall be native or imported topsoil and mixed with seventy-five percent (75%) void-filled riprap and twenty five percent (25%) soil by volume.

3. Soil riprap shall consist of a uniform mixture of soil and void-filled riprap (Table 2 of this specification) without voids.

D. BEDDING:

1. Gradation for access roads shall conform to NDDOT Class 5 in Table 3.

2. Gradation for granular bedding shall conform to the gradation in Table 4.

3. Granular bedding designation and total thickness of bedding shall be as shown on the Drawings.

4. Granular bedding shall meet the same requirements for specific gravity, absorption, abrasion, sodium sulfate soundness, calcite intrusion, and freeze-thaw durability as required for riprap.

5. Broken concrete asphalt pavement or sledge, shall not be acceptable. Rounded river rock is not acceptable unless specifically designated on the Drawings.

6. The requirements for the wear test in AASHTO T96 shall not apply.

Table 3: Aggregate Gradation (reference NDDOT Sect 816.02)

	NDDOT Aggregate Class	
	3	**5**
U.S. Standard Sieve Size or Testing Method	**Percent Passing or Testing Requirement**	
3 inches	100	
1½ inches		
1 inch		100
3/4 inch	80-100	90-100
1/2 inch		
3/8 inch		

No. 4	35-85	35-70
No. 8		
No. 10		
No. 30	20-50	16-40
No. 200	0-15	4-10
ND T 113, Shale (max %)	12.0%	12.0%
AASHTO T 96, L.A. Abrasion (max %)		50%
NDDOT 4, Fractured Faces[1]		25%

Table 4: Granular Bedding Gradation for Embankment (Choke Filter)

Sieve # or Size (in)	Sieve Size	Percent Passing (by Weight)	
	(mm)	Minimum	Maximum
3/8 in	9.5	100	
#4	4.75	95	100
#16	1.18	45	58
#50	0.3	10	30
#100	0.15	2	10
#200	0.075	0	2

E. UNDERWATER FILL:

1. Rock requirements are to comply with riprap material specifications in Table 1 of this specification.

2. Where "Underwater Fill" is designated on the Drawings, material shall be a mix of fifty percent (50%) void filled riprap (Table 2) and fifty percent (50%) material sourced from unclassified excavation (Section 31 23 00) by volume.

PART 3 - EXECUTION

3.1 PREPARATION

A. Channel slope, bottom, or other areas that are to be protected with riprap, soil riprap, or void filled riprap shall be free of brush, trees, stumps, and other objectionable material and be graded to a smooth compacted surface as shown on the Drawings.

B. Contractor shall excavate areas to receive riprap to the subgrade as shown on the Drawings accounting for granular bedding.

C. Contractor shall excavate areas to receive bedding, soil riprap or void filled riprap to the specified depth.

D. Subgrade Materials:

1. The subgrade materials shall be stable.
2. If unsuitable materials are encountered, they shall be removed and replaced as Muck Excavation in accordance with Section 31 23 00 - Earthwork (Excavation and Fill) for subgrade that has been excavated in undisturbed soil.

E. Additional Compaction:

1. Additional compaction shall not be required unless specified by Contracting Officer
2. When subgrade is built up with embankment material it shall be compacted to ninety five percent (95%) maximum density (ASTM D698).

F. Bedding:

1. After an acceptable subgrade is established, bedding shall be immediately placed and leveled to the specified elevation on the Drawings.
2. Immediately following the placement of the bedding material, the riprap shall be placed.
3. If bedding material is disturbed for any reason, it shall be replaced and graded at Contractor's expense.
4. Contamination:
    a. In-place bedding materials shall not be contaminated with soils, debris or vegetation before the riprap is placed.
    b. If contaminated, the bedding material shall be removed and replaced at Contractor's expense.

3.2 PLACEMENT

A. Riprap

1. Following acceptable placement of granular bedding, riprap placement shall commence as follows:

2. Machine Placed Riprap:

    a. Riprap shall be placed on the prepared slope or channel bottom areas in a manner which will produce a reasonably well graded mass of stone with the minimum practicable percentage of voids.
    b. Riprap shall be machine placed, unless otherwise stipulated in the Drawings or Specifications.
    c. It is the intent of these Specifications to produce a fairly compact riprap protection in which all sizes of material are placed in their proper proportions. Unless otherwise authorized by Contracting Officer, the riprap protection shall be placed in conjunction with the construction of embankment or channel bottom with only sufficient delay in construction of the riprap protection, as may be necessary, to allow for proper construction of the portion of the embankment and channel bottom which is to be protected.

3. Slope Placement:

    a. When riprap is placed on slope, placement shall commence at the bottom of the slope working up the slope.
    b. The entire mass of riprap shall be placed on either channel slope or bottom so as to be in conformance with the required gradation mixture and to line, grade, and thickness shown on the Drawings.
    c. Riprap shall be placed to full course thickness at one operation and in such a

manner as to avoid displacing the underlying bedding material. Placing of riprap in layers, or by dumping into chutes, or by similar methods shall not be permitted.

d. All material used for riprap protection for channel slope or bottom shall be placed and distributed such that there shall be no large accumulations of either the larger or smaller sizes of stone. Some hand placement may be required to achieve this distribution.

e. The basic procedure shall result in larger materials flush to the top surface with faces and shapes arranged to minimize voids, and smaller material below and between larger materials.

f. Surface grade shall be a plane or as indicated, but projections above or depressions under the finished design grade by more than ten percent (10%) of the rock layer thickness shall not be allowed.

g. Smaller rock shall be securely locked between the larger stone. It is essential that the material between the larger stones are not loose or easily displaced by flow or by vandalism.

h. The stone shall be consolidated by the bucket of the backhoe or other means that will cause interlocking of the material.

i. All rock is to be placed in a dewatered condition beginning at the toe of the slope or other lowest point.

j. Contractor shall maintain the riprap protection until accepted. Any material displaced for any reason shall be replaced to the lines and grades shown on the Drawings at no additional cost. If the bedding materials are removed or disturbed, such material shall be replaced prior to replacing the displaced riprap.

4. Hand Placed Riprap:

a. Hand placed riprap shall be performed during machine placement of riprap and shall conform to all the requirements of PART 2, above.

b. Hand placed riprap shall also be required when the depth of riprap is less than two (2) times the nominal stone size, or when required by the Drawings or Specifications.

c. After the riprap has been placed, hand placing or rearranging of individual stones by mechanical equipment shall be required to the extent necessary to secure a flat uniform surface and the specified depth of riprap, to the lines and grades as shown on the Drawings.

5. Soil Replacement Over Riprap:

a. Where riprap is designated to be buried, place onsite excavated material that is free from trash and organic matter in riprap voids by washing and rodding.

b. Prevent excessive washing of material into stream.

c. When voids are filled and the surface accepted by Contracting Officer, place a nominal six (6) inches of topsoil over the area, or as designated on the Drawings.

d. Fine grade, seed, and mulch per the Specifications.

B. Soil Riprap

1. Adjacent stockpiles of riprap and soil shall be created and mixing done at the stockpile location, not at the location where soil riprap is to be placed.

2. Mix twenty-five percent (25%) soil by volume with stockpiled riprap, using additional moisture and control procedures that ensure a homogenous mixture; where the soil fills the inherent voids in the riprap without displacing riprap.

3. With prior approval of Contracting Officer, layering the riprap and soil instead of premixing may be allowed if the native soil is granular.

4. Place a first layer of smaller soil riprap of approximate d_{50}thickness. Then place the top layer with surface rocks that are largely d_{50} or greater, filling voids as necessary with smaller planted riprap. Create a smooth plane as described in Part 2 of this specification.

5. The mixture shall be consolidated by large vibratory equipment or backhoe bucket to create a tight, dense interlocking mass.

6. The soil shall be further wetted to encourage void filling with soil.

7. Any large voids shall be filled with rock and small voids filled with soil.

8. Excessively thick zones of soil prone to washing away shall not be created (for example, no thicknesses greater than six (6) inches).

9. For buried soil riprap, the top surface shall be covered with six (6) inches of topsoil such that no rock points are protruding.

10. The final surface shall be thoroughly wetted for good compaction, smoothed and compacted by vibrating equipment; the surface shall then be hand raked to receive planting or seeding.

C. Void Filled Riprap

1. The Contracting Officer shall observe mixing and placing of the material.

2. 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 Contracting Officer 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.

3. 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.

4. 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.

5. 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 (D_{50} size or larger) flush to the top surface with faces and shapes arranged to minimize voids, and smaller material between and below larger materials.

6. 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.

7. 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 Contracting Officer to assure that the work is installed correctly.

8. At the direction of the Contracting Officer, a 50:50 mixture of pit run and Class 3 Granular Bedding (NDDOT Specification Section 816.02) 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.

9. 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.

10. 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. 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 Contracting Officer. Compaction of void-filled riprap shall be reviewed and approved by the Contracting Officer.

11. Where 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.

12. Contractor shall install a test section of at least 100 square feet of void-filled riprap for the review and approval of the Contracting Officer prior to installation of the remaining void filled-riprap.

13. Elevation tolerance for the void-filled riprap shall be 0.10 feet. Thickness of void-filled riprap shall be no less than thickness shown and no more than 2-inches greater than the thickness shown.

3.3 REJECTION OF WORK AND MATERIALS:

A. Contracting Officer will reject placed riprap, soil riprap, void filled riprap, underwater fill, and bedding that do not conform to this section. Contractor shall immediately remove and re-lay the riprap, soil riprap, void filled riprap, underwater fill, and bedding to conform to Specifications.

B. Riprap, soil riprap, void filled riprap, underwater fill and bedding that do not conform to this section shall be rejected, whether delivered to the job site or placed.

C. Rejected riprap, soil riprap, void filled riprap, underwater fill, and bedding shall be removed from the Project site by Contractor at Contractor's expense.

END OF SECTION 31 37 00

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SECTION 31 50 00 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes temporary excavation support and protection systems.

1.2 RELATED SECTIONS

B. The following is a list of Specifications which may be related to this section:
   1. Section 31 23 00 -Earthwork (Excavation and Fill)
   2. Section 31 37 00 - Riprap and Bedding

1.3 PERFORMANCE REQUIREMENTS

A. Furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
   1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
   2. Prevent surface water from entering excavations by grading, dikes, or other means.
   3. Install excavation support and protection systems without damaging existing pavements, and other improvements adjacent to excavation.

1.4 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.
   1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For Installer and professional engineer.

C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

D. Utility Locates

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Contract Officer or Contracting Officer's Representative and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report is available for this Project.

C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Contract Officer or Contracting Officer's Representative if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

B. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

C. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

B. Remove all excavation support and protection systems unless directed otherwise by Contract Officer or Contracting Officer's Representative.

END OF SECTION 31 50 00

KNIFE RIVER ELBEE BEND BANK STABILIZATION
KNRI 257081

DIVISION 32: EXTERIOR IMPROVEMENTS

Knife River Indian Villages National Historic Site – PMIS 257081

SECTION 32 15 00 – AGGREGATE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Finished surface aggregate on the Existing Gravel Parking Lot by Access Road 2 as shown on the Drawings (North of Awatixa Village – Sakakawea Site).

1.2 REFERENCES

A. The following is a list of Specifications which may be related to this section.

1. American Association of Highway Transportation Officials (AASHTO):

   a. AASHTO T-96, Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

2. ASTM International (ASTM):

   a. ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Aggregate by Abrasion and Impact in the Los Angeles Machine
   b. ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

3. North Dakota Department of Transportation "Standard Specification for Road and Bridge Construction" 2024 Edition, As Revised.

   a. Section 816 – Aggregates

1.3 RELATED SECTIONS

A. The following is a list of Specifications, which may be related to this section:

1. Section 31 37 00 – Riprap and Bedding

1.4 DELIVERY, STORAGE, AND HANDLING

A. Aggregate: Stockpile, remove, transport, and spread aggregates in a manner that will preserve specified gradation and avoid contamination. Do not intermingle stockpiles of aggregate having different gradations.

1.5 SCHEDULING

A. Weather Limitations: To be placed at optimum moisture, placement is not recommended if the forecasted weather is too cold or wet to allow the material to meet compaction requirements.

PART 2 - PRODUCTS

2.1 FINISHED SURFACE AGGREGATE

A. Aggregate shall meet the requirements outlined below:

1. Conform to NDDOT Specification Section 816, Class 5 Aggregate Base, as defined in Section 31 37 00 Riprap and Bedding.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the existing surface aggregate on the existing Gravel Parking Lot (North of Awatixa Village – Sakakawea Site) that will be used for "Access Road 2" for drainage concerns.

B. The CONTRACTOR shall stake the existing aggregate limits of the Gravel Parking Lot (North of Awatixa Village – Sakakawea Site).

3.2 PREPARATION OF SUBGRADE

A. No subgrade preparations to the existing Gravel Parking Lot (North of Awatixa Village – Sakakawea Site). Obtain written approval of the Contracting Officer before placing aggregate.

3.3 SPREADING AND COMPACTING

A. Aggregate should be placed from the furthest point working back towards the source to avoid running equipment on the final surface.

B. Use aggregate that is uniformly mixed at optimum moisture content and spread and compact to the final thickness and width. Obtain compaction by one of the following methods:
   1. A roller with a minimum of weight of 5 tons shall be used. No vibratory on the drum shall be allowed.
   2. A minimum of 4 passes shall be made for compaction.
   3. Proof roll with fully loaded aggregate transport vehicle for acceptance.

C. Immediately following final spreading, smoothing, and compacting, contractor shall correct any irregularities or depressions that develop by adding or removing material until the surface is smooth, uniform and compacted.

3.4 ACCEPTANCE, TESTING, SAMPLING, TOLERANCES

A. Do not vary the total compacted thickness of the aggregate or place it consistently below or above the specified depth.

B. Do not vary the aggregate width by more than 2 inches from the specified width or place it consistently narrower or wider than the specified width.

C. Line and grade will be checked by the Contracting Officer using the stringline method. The grade shall not vary by more than 0.04 feet from the elevation shown on the Drawings. Contractor shall provide the Contracting Officer notice when tolerances need to be checked.

END OF SECTION 32 15 00

SECTION 32 91 13 – TOPSOIL AND WETLAND TOPSOIL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This work consists of placing of topsoil or wetland topsoil upon constructed cut and fill slopes or in designated areas after grading operations are complete.

1.2 RELATED SECTIONS

A. The following is a list of SPECIFICATIONS which may be related to this section:

1. Section 31 11 00 - Clearing and Grubbing
2. Section 31 41 13 - Topsoil Stripping and Stockpiling
3. Section 31 23 00 - Earthwork (Excavation and Fill)
4. Section 31 25 00 - Erosion and Sedimentation Controls
5. Section 32 92 19 - Seeding

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):

a. D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
b. D5268, Standard Specification for Topsoil Used for Landscaping Purposes.

1.4 SUBMITTALS

A. Imported material testing results shall be provided to the Contracting Officer for approval prior to materials arriving on site.

B. Informational Submittals:

1. Certified Topsoil Analysis Reports:

a. Indicate quantities of materials required to bring onsite
b. Provide certification of topsoil compliance with gradation requirements.
c. Provide certification of topsoil compliance with Chemical attribute requirements.
d. Provide certification of topsoil compliance with minimum ammonium bicarbonate DPTA (chelate) extractable nutrient requirements.

1.5 SEQUENCING AND SCHEDULING

A. TOPSOIL

1. Topsoil shall be placed directly upon completed cut and fill slopes whenever conditions and the progress of construction will permit.

B. WETLAND TOPSOIL

1. Contractor shall prepare the wetland relocation site to elevations specified in the DRAWINGS or as approved by Contracting Officer prior to excavating the wetlands topsoil. If Contracting Officer determines that this is not possible, then Contractor shall stockpile wetlands topsoil material in an approved area, to remain undisturbed until the relocation site has been prepared.
2. Wetland topsoil shall be placed within twenty four (24) hours in the wetland relocation site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. TOPSOIL

1. Topsoil shall consist of natural, friable, sandy loam, native upland topsoil with characteristics as defined in Section 2.1.A.3. Topsoil shall be obtained from pre-approved on-site collection areas or pre-approved imported materials from off site.
2. Topsoil shall have the following characteristics: resulting from a current agronomic and full textural class analysis of a topsoil sample collected from the actual soil proposed to be used. The results of the tests shall be submitted to the Contracting Officer and must include sample date and reference the collection location.
3. Composition shall be in general accordance with ASTM D5268 subject to the following:

a. Gradation

Texture Class	% of Total Weight	Average %
Sand (0.05-2.0 mm dia. range)	25 - 75	50
Silt (0.002-0.05mm dia. range)	15 - 40	27.5
Clay (< 0.002 mm dia. range)	15 - 30	22.5

b. Chemical Attributes

Chemical Attribute	Range
pH	6.8 - 7.5
Organic Matter	1% - 3%
Salinity	EC<2 mmhos/cm

c. Topsoil shall contain the following minimum ammonium bicarbonate DPTA (chelate) extractable nutrients.

Nutrient	Concentration
Nitrogen	5 ppm air dried basis
Phosphorous	5 ppm
Potassium	30 ppm
Iron (Fe)	5 ppm

B. WETLANDS TOPSOIL
   1. Wetlands topsoil shall meet the requirements of Section 2.01 A above.
   2. Topsoil collected from wetlands sites shall be used only in wetlands areas.
   3. Wetlands Topsoil salvaged from the site shall not be used as topsoil outside of areas designated on the Drawings.

C. Source: Stockpile material onsite, in accordance with Section 31 14 13 - Topsoil and Stripping and Stockpiling. Import topsoil if onsite material is insufficient in quantity, or quality.

2.2 SOURCE QUALITY CONTROL

A. Topsoil Analysis/Testing: Performed by county or state soil testing service or approved certified independent testing laboratory.

PART 3 - EXECUTION

3.1 IMPORTED MATERIAL TESTING

A. Any material imported from outside the Park shall be tested to be free of any non-native plant species.
B. Any soil imported from outside the Park shall be tested to confirm below the Ecological Screening Values for Soil (Supplement Table after end of Section 32 91 13). Three (3) discrete soil samples shall be collected randomly from the soil material per 1,000 cubic yards of material.

3.2 TOPSOIL PLACEMENT

A. Do not place topsoil when subsoil or topsoil is frozen, excessively wet, or otherwise detrimental to the work.

B. Topsoil shall be placed directly upon completed cut and fill slopes whenever conditions and progress of construction permit.

C. Approved topsoil shall be placed at locations and to the thickness as designated in the Drawings and Specifications. Prior to final placement of topsoil, any areas compacted by construction activities shall be decompacted to at least 85 Proctor by repeated ripping in rows twelve inches (12”) or less, apart, to a depth of twelve inches (12”). All subsoil areas, including any graded areas or cut slopes should be roughened with furrows four to six inches (4”-6”) deep to key the topsoil into the subsoil.

D. Water shall be applied to the topsoil in a fine spray by nozzles or spray bars so the topsoil areas will not be washed or eroded.

E. Uniformly distribute topsoil to within 1/2 inch of final grades. Fine grade topsoil eliminating rough or low areas and maintaining levels, profiles, and contours of subgrade.

F. Material shall be free from objects larger than 1-1/2 inches maximum dimension including hard clods of heavy clay, shale, decomposed shale or other subsoil, noxious weed parts (roots, seeds, or shoots), grass, refuse, stumps, roots, brush, other foreign matter, hazardous or toxic substances, and deleterious material that may be harmful to plant growth or may hinder grading, planting, or maintenance.

G. Placed topsoil shall be stabilized immediately by:
   1. Preparing and seeding with the approved seed mixture and mulch,
   2. Installing perimeter silt fence and/or straw wattles,
   3. Roughening and application of 2500 pounds per acre hydromulch with 150 pounds per acre approved tackifier and later seeding and mulching, per the plans.

3.3 WETLANDS TOPSOIL PLACEMENT

A. All subsoil areas, including any graded areas or cut slopes should be roughened with furrows four to six inches (4”-6”) deep to key the topsoil into the subsoil.

B. Wetlands topsoil salvaged from the site shall be placed in locations specified on the Drawings to a depth of eighteen inches (18") or as otherwise designated.

C. Wetland topsoil in an unworkable condition due to excessive moisture, frost or other conditions shall not be placed until it is suitable for spreading.

D. Water shall be applied to the topsoil in a fine spray by nozzles or spray bars so the topsoil areas will not be washed or eroded.

E. After the wetland topsoil is spread all large stiff clods, rocks, roots and other foreign matter shall be cleared and disposed of by the Contractor.

END OF SECTION 32 91 13

SECTION 32 92 19 – SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following: Specifications for temporary and permanent seeding and mulching to revegetate the Project site during construction and mowing, weed control and watering after construction.

B. Section includes

1. Temporary Seeding materials.
2. Permanent Seeding materials.
3. Fertilizers.
4. Mulches.
5. Herbicides and pesticides.

C. Related Sections

1. Section 01 11 00 – Summary of Work
2. Section 31 10 00 – Site Clearing
3. Section 31 25 00 – Erosion and Sedimentation Control
4. Section 32 91 13 – Topsoil and Wetland Topsoil

1.2 REFERENCES

A. The following is a list of Specifications which may be related to this section.

1. ASTM International (ASTM):
2. ASTM D 5268, Standard Specification for Topsoil Used for Landscaping Purposes
3. ASTM C602, Agricultural Liming Materials
4. ASTM D4427, Standard Classification of Peat Samples by Laboratory Testing
5. ASTM D4972, Standard Test Methods for pH of Soils

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Onsite Topsoil: Native topsoil or surface soil modified to become topsoil; mixed with soil amendments. Stockpiled separately for installation during restoration as the top layer of planting soil.

D. Wetland Topsoil: Native topsoil stripped from wetland delineated areas and stockpiled separately for installation during restoration onto wetland delineated areas as the top layer of planting soil.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

F. Weeds: Include all thistles, and all other North Dakota noxious weeds.

G. Control: Prevent a weed from spreading by:
   1. Suppressing its seeds or propagating parts; or
   2. Destroying either the entire plant or its propagating parts.

H. North Dakota noxious weeds: A plant propagated by either seed or vegetative parts and determined to be injurious to public health, crops, livestock, land, or other property by:

   1. The commissioner in accordance with section 4.1-47-05;
   2. A county weed board in accordance with section 4.1-47-10; or
   3. A city weed board in accordance with section 4.1-47-21.
   4. Includes the following at a minimum:

      a. Absinth wormwood (Artemisia absinthium L.).
      b. Canada thistle (Cirsium arvense (L.) Scop.).
      c. Dalmatian toadflax (Linaria genistifolia subsp. dalmatica).
      d. Diffuse knapweed (Centaurea diffusa Lam.).
      e. Houndstongue (Cynoglossum officinale L.)
      f. Leafy spurge (Euphorbia esula L.).
      g. Musk thistle (Carduus nutans L.).
      h. Palmer amaranth (Amaranthus palmeri)
      i. Purple loosestrife (Lythrum salicaria L., Lythrum virgatum L., and all cultivars).
      j. Russian knapweed (Centaurea repens L.).
      k. Saltcedar (Tamarisk spp.).
      l. Spotted knapweed (Centaurea maculosa Lam.).
      m. Yellow toadflax (Linaria vulgaris)

I. Temporary Seeding: Temporary seeding required to establish vegetative cover to maintain construction stormwater permit compliance before permanent seed mix is installed. Seed mixtures for temporary erosion / soil protection application shall be perennial ryegrass, alfalfa, or as approved. Install temporary seeding in accordance with Section 31 25 00 – Erosion and Sedimentation Control.

J. Permanent Planting Establishment Period: Calendar time period for the permanent plant establishment period. When there is more than one establishment period, the boundaries of the planted areas covered for each period shall be described. Contractor shall include as-built documentation of tree locations and planting boundaries for shrubs, seeding, wetland sod, and plugs.

K. Permanent Planting Warranty Period: Period starts after final completion is achieved and will last for one calendar year. During the warranty period the Contractor is required to replace plantings that have died or appear to show unsatisfactory growth.

1.4 SUBMITTALS

A. Submit the following to the Contracting Officer in accordance with requirements of Division 01 Section, "Submittal Procedure."

B. Product Data:

a. Fertilizers.
b. Mulches.
c. Herbicides and Pesticides.

C. Certification of Grass Seed: Seed vendor's signed statement of turf seed analysis, certifying that each lot of seed has been tested in accordance with applicable North Dakota certification rules and seed laws within the previous 6 months by a recognized independent State Seed Testing Laboratory or by an independent commercial laboratory with a certified seed analysis technician. This statement shall include:

1. Name and address of laboratory.
2. Date of analysis.
3. Origin and lot number for each type of seed variety.
4. Results of analysis, including, for each seed variety.

a. Botanical and common name (species and variety).
b. Percentage by weight of variety in overall mixture.
c. Percentage of purity.
d. Percentage of germination.
e. Percentage by weight of weed content.
f. Percentage by weight of inert content.

D. Seed Mix: The Contractor must provide actual planting list for NPS review.
1. Name and address of laboratory.
2. Date of analysis.

E. Weed-free certification for straw mulch.

F. Mowing and Watering Plan: The Contractor must provide a mowing and watering plan for approval by the Contracting Officer. The Contractor will be responsible for mowing and watering during the warranty period.

G. Weed Control Plan: The Contractor must provide a weed control plan for approval by the Contracting Officer. The Contractor will be responsible for weed control during the warranty period.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

C. Sample Warranty: For special warranty. The Contractor will be notified by the end of the planting warranty period by the Contracting Officer with areas that require re-seeding.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit recommended procedures to be established by Contracting Officer for maintenance of plants during a calendar year. The maintenance data shall be submitted before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Submit all materials certifications demonstrating conformance to this specification.

B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

C. All seed shall be furnished in containers showing common and scientific name of the seed; full name and address of the supplier; percentage of pure live seed; month and year of the germination test; origin of the seed; lot number; and net weight of seed in each container. Seed treated with chemicals which are toxic to humans, livestock, or wildlife shall not be used. Wet, moldy, or otherwise damaged seed will be rejected. Under no circumstances will field mixing of seed be acceptable. The seed shall be certified free of noxious weed seeds listed by the State of North Dakota.

D. Contractor shall furnish the Contracting Officer duplicate copies of the seed analysis reports as prepared by the Seed Testing Laboratory. A Tetrazolium Viability Test will be accepted in lieu of the Germination portion of the Service Sample Seed Analysis Report as prepared by the testing laboratory.

E. Herbicides, insecticides and pesticides must comply with all applicable state and federal laws. When applicable, these chemicals must be registered with the U.S. Environmental Protection Agency and applied by a certified operator and in accordance with the label’s requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed in original sealed, labeled, and undamaged containers.

B. Store seed in a cool dry area and in accordance with the supplier recommendations.

C. Fertilizer, Gypsum, Sulfur, Iron, and Lime - Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer, gypsum, sulphur, iron, and lime may be furnished in bulk with certificate indicating the above information.

D. Store Fertilizer, Gypsum, Sulfur, Iron, and Lime in a cool dry area and in accordance with the supplier recommendations.

E. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 SCHEDULING

A. Planting Restrictions: Coordinate planting establishment periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Planting shall be between April 15 and September 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit. No seeding shall be performed with temperatures below 32 degrees is forecasted in the next 21 days.

C. Do not plant when the ground is wet, frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

PART 2 - PRODUCTS

2.1 REVEGETATION

A. The temporary seed mix can be the permanent seed mix or cover crop:

B. The Permanent seed mix must contain each of the following species at the prescribed percent of mix:

1. Refer to Upland and Wetland Seed Mixes shown on the Drawings.

C. Seed must be sourced from North Dakota, South Dakota, Iowa, Wisconsin or Minnesota, with preference for seed originating within Omernik level 3 ecoregions, Northwestern Great Plains or Northwestern Glaciated Plains.

D. The rates should be based on Pure Live Seed (PLS) weight not bulk weight.

E. Seed mix must be free of noxious weeds as defined by the rules and regulations of the North Dakota.

F. Conditioned to remove all pieces of stem, straw, or other chaff longer than 1 ½ inches, so it can pass through a drill seeder without plugging.

G. Blend and package components of native seed mixes according to size to allow for installation from appropriate seed box of native seeding equipment in accordance with the following:

1. Combine seeds of sedges and rushes for installation by hand or with the small seed box
2. Combine seeds of the small and medium seeded forbes for installation with the small seed box
3. Combine seeds of most grasses and large-seeded forbes for installation with the fluffy seed box
4. Combine large seeds of cover crops species such as oats and winter wheat for the installation with the grain box

H. Species substitutions may be made only if authorized by the Contracting Officer.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5 to 7.6, a minimum of 1.5 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. NPS prefers the Contractor to use onsite topsoil if possible.

1. Topsoil Source (On-site): Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
2. Topsoil Source (off Site): Import topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes. Any imported topsoil shall be certified weed free.

2.3 FERTILIZERS

A. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Mycorrhizal Fungi: If required per seed supplier's recommendations, mycorrhizal fungi shall bedry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.4 MULCHES

A. Straw mulch: Provide certified weed-free, air-dry, clean, mildew- and seed-free salt hay or threshed straw or wheat, rye, oats, or barley straw. Straw mulch shall be placed as necessary in areas to be seeded without erosion control blanket to prevent loss of seed.

B. Shredded/chipped tree slash or deadfall harvested from clearing operations shall be placed as needed.

1. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
2. Color: Natural.

C. Straw mulch shall be crimped into the soil with a serrated disk crimper.

D. In accessible areas, weed-free straw will be applied with a straw sprayer and then crimped with a tractor-pulled implement. On steep slopes where a straw sprayer cannot reach, the straw will be spread out and crimped by hand, or hydromulch will be considered.

2.5 MULCH TACK

A. Mulch tack for hydraulic seeding shall be a commercial mulch tackifier approved by the Contracting Officer. Handling and mixing shall be in accordance with the manufacturer's recommendations

2.6 WEED CONTROL

A. The Contractor is responsible for weed control during the warranty period.

2.7 EROSION CONTROL MATERIALS

A. Erosion Control Blankets and Mesh shall be installed as shown on the Drawings and in accordance with Section 31 25 00 – Erosion and Sedimentation Control.

2.9 WATERING AND MOWING

A. The Contractor is responsible for watering and mowing during the warranty period.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive seeding for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1. All denuded areas scarred, backfilled, and graded by the contractor are to be seeded.

3.2 PREPARATION

A. Limit preparation to areas that will be planted within 72 hours.

1. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and waterways.

3.3 SEEDING

A. The CONTRACTOR shall install seed using an allowable method that best fits the situation.

B. All seeding should be done at a right angle to surface drainage

C. The following seeding methods will be allowed.

1. Drop Seeding. Seed Installation - Seed should be installed with a drop seeder that will accurately meter the types of seed to be planted, keep all seeds uniformly mixed during the seeding and contain drop seed tubes for seed placement (Brillion-type). The drop seeder should be equipped with a culti-packer assembly to ensure good seed-to-soil contact.
2. Hydro Seeding. Seed Installation – Allowed for steep slopes or other areas inaccessible to conventional seeding equipment. The seed-water slurry should be applied within one hour after the seed is added to the hydro seeder tank. When seeding in conjunction with a hydraulic mulch a two-step operation must be used. Seed shall be placed first and the hydraulic mulch be applied afterwards.
3. Broadcast Seeding. Seed Installation – Seed should be installed with a mechanical "cyclone" seeder, by hand seeding or by any other method that scatters seed over the soil surface. Seed should be mixed thoroughly prior to seeding and should be mixed occasionally in the spreader to prevent separation and settling.
4. Drill Seeding. Seed Installation – Seed should be installed with a seed drill that will accurately meter the seed to be planted and keep all seeds uniformly mixed during the drilling. The drill should contain a legume box for small seeds, and it should be equipped with disc furrow openers and packer assembly to compact the soil directly over the drill rows.

D. Dormant Seeding and Snow Seeding methods are not allowed.

E. When planting ditches and wet areas ensure that seeding equipment is capable of dispensing fluffy native grass seed without plugging and evenly distributing the seed of various sizes that are found in these seed mixes.

F. Erosion Control Blankets and Mesh shall be installed according to the Drawings. Any areas not covered by erosion control products shall have a layer of mulch applied to protect the seed.

3.4 FERTILIZER

A. If required, fertilizer shall be applied at rates as determined by laboratory soil analysis of the soils at the job site.

3.5 HYDRO / HYDRAULIC SEEDING

A. Seed shall be applied by approved hydraulic methods and by experienced personnel and shall meet the following requirements.

1. Hydraulic equipment used for the application of the slurry mixtures shall be of a type acceptable to Contracting Officer having built-in agitators that will keep seed, fertilizer, mulch, mulch tack, and water, or various combinations thereof, mixed homogeneously until pumped from the tank. Pump pressure shall be such as to maintain a continuous, non-fluctuating stream of slurry.

2. The seed, fertilizer, mulch, mulch tack, and water shall be combined and applied as specified herein. After the tank is at least one-third full, the mulch and remainder of water shall be added as the slurry is continuously agitated to maintain the homogeneous mixture. When the tank is full of water, the seed and fertilizer shall be added and allowed to mix for at least 5 minutes prior to starting application. The seed and fertilizer shall not remain together in the tank for more than 45 minutes. If the 45 minutes is exceeded, CONTRACTOR, at his own expenses, shall add additional seed equal to the original amount specified.
3. Seeding rates (shown on Landscaping Plan Sheets) shall be doubled.
4. Mulch shall be applied at a rate of 2000 pounds per acre.
5. Mulch tack will be applied at a rate of 200 pounds per acre.
6. Seed, fertilizer, water, and approximately 100 pounds per acre of hydraulic mulch shall be mixed and uniformly applied to the areas to be seeded.
7. The remaining hydraulic mulch and mulch tack shall then be mixed with water and uniformly applied. This application shall then be accomplished within 36 hours after the first application has been completed.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove erosion-control measures after grass establishment period.

3.7 MOWING

A. The Contractor shall be responsible for mowing during the warranty period. If vegetation exceeds 18 inches, it shall be mowed back to 8 inches. Mowing with blades set 8” or higher during the June timeframe.

3.8 WEED CONTROL

A. The Contractor shall be responsible for weed control during the warranty period.

3.9 WATERING

A. The Contractor shall be responsible for watering for during the warranty period.

END OF SECTION 32 92 19

KNIFE RIVER ELBEE BEND BANK STABILIZATION
KNRI 257081

DIVISION 32 SUPPLEMENT

Table 1. Ecological Screening Values for Soil

Table 1. Ecological Screening Values for Soil (mg/kg).

Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards			ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
Inorganics												
Aluminum	●					600	50					**50**
Antimony	●						5				3.5	**3.5**
Arsenic	●	20	30	50	60	100	10	12	29	55	34	**10**
Barium	●	200	400	2000		3000	500	500	200	625	165	**165**
Beryllium	●						10				1.1	**1.1**
Boron						20	0.5					**0.5**
Bromine		20	50	300			10					**10**
Cadmium	●	1	5	20	20	20	0.4	10	0.8	12	1.6	**1.6**
Calcium	●											
Chromium	●	100	250	8000	32 [h]	10	1	64	100	380	100	**32**
Cobalt	●	20	50	800		1000	20		20	240	33	**20**
Copper	●	50	100	500	50	100	100	63	36	190	40	**40**
Cyanide, free	●	1	10	100				0.9	1	2		**0.9**
Cyanide, complex	●	5	50	500								**5**
Cyanide complex (pH<5)	●								5	650		**5**
Cyanide complex (pH>5)	●								5	50		**5**
Fluorine					30	30	200					**30**
Iodine							4					**4**
Iron	●					200						**200**
Lanathum						50						**50**
Lead	●	50	150	600	500	900	50	140	85	530	140	**50**
Lithium						10	2					**2**
Magnesium	●											
Manganese	●					100	500					**100**
Mercury (inorganic)	●	0.5	2	10	5 [i]	30	0.3	6.6	0.3	10	2.2	**0.3**
Molybdenum		10	40	200		200	2		10	200	254	**2**

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Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards		MPC[l]	ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]		
Nickel	●	50	100	500	200	90	30	50	35	210	38	**30**
Potassium	●											
Selenium	●				70	100	1				0.81	**0.81**
Silver	●					50	2					**2**
Sodium	●											
Sulfur		2	20	200								**2**
Technetium							0.2					**0.2**
Thallium	●						1	1			1.3	**1**
Tin		20	50	300		2000	50				53	**50**
Thiocyanates										20		**2**
Titanium						1000						**1000**
Tungsten						400						**400**
Uranium							5					**5**
Vanadium	●					20	2	130			43	**2**
Zinc	●	200	500	3000	200	100	50	200	140	720	160	**50**
Organics												
1,1,1-Trichloroethane	✓											
1,1,2,2-Tetrachloroethane	✓											
1,1,2-Trichloroethane	✓											
1,1-Dichloroethane	✓											
1,1-Dichloroethylene	✓											
1,2,3,4-Tetrachlorobenzene					10							**10**
1,2,3-Trichlorobenzene					20							**20**
1,2,4-Trichlorobenzene	✓				20							**20**
1,2-Dichlorobenzene	✓											
1,2-Dichloroethane	✓											

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		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
1,2-Dichloroethylene (trans)	✓											
1,2-Dichloropropane	✓				700							**700**
1,3-Dichlorobenzene	✓											
1,3-Dichloropropene	✓											
1,4-Dichlorobenzene	✓				20							**20**
2,3,4,5-Tetrachlorophenol					20							**20**
2,3,5,6-Tetrachloroaniline					20		20					**20**
2,4,5-Trichloroaniline					20		20					**20**
2,4,5-Trichlorophenol	✓				9		4					**4**
2,4,6-Trichlorophenol	✓				10							**10**
2,4-Dichloroaniline					100							**100**
2,4-Dichlorophenol	✓											
2,4-Dimethylphenol	✓											
2,4-Dinitrophenol	✓						20					**20**
2,4-Dinitrotoluene	✓											
2,6-Dinitrotoluene	✓											
2-Chloronaphthalene	✓											
2-Chlorophenol	✓											
2-Hexanone	✓											
2-Methyl-4,6-dinitrophenol	✓											
2-Methylnaphthalene	✓											
2-Nitrophenol	✓											
3,3'-Dichlorobenzidine	✓											
3,4-Dichloroaniline					20							**20**
3,4-Dichlorophenol	✓				20		20					**20**
3-Chloraniline					30		20					**20**
3-Chlorophenol	✓				10		7					**7**

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		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
4-Bromophenyl phenyl ether	✓											
4-Chloroaniline	✓											
4-Chloro-m-cresol	✓											
4-Chlorophenyl phenyl ether	✓											
4-Nitrophenol	✓				7							**7**
-BHC	✓								0.0025			**0.0025**
Acenaphthene	✓						20					**20**
Acetone	✓											
-Chlordane	✓											
Acrylonitrile						1000						**1000**
Aldrin	✓								0.0025			**0.0025**
Aliphatic Chlorinated Hydrocarbons (each)		0.1	5	50								**0.1**
Aliphatic Chlorinated Hydrocarbons (total)		0.1	7	70								**0.1**
Anthracene	✓	0.1	10	100								**0.1**
Atrazine									0.00005	6		**0.00005**
-BHC	✓								0.001			**0.001**
Benzene	✓	0.1	0.5	5				0.5	0.05	1		**.05**
Benzidine	✓											
Benzo[a]anthracene	✓											
Benzo[a]pyrene	✓	0.1	1	10				0.7				**0.1**
Benzo[b]fluoranthene	✓											
Benzo[g,h,i]perylene	✓											
Benzo[k]fluoranthene	✓											
Benzoic acid	✓											
Benzyl alcohol	✓											
Biphenyl							60					**60**

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		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
Bis(2-chloroethoxy) methane	✓											
Bis(2-chloroethyl) ether	✓											
Bis(2-chloroisopropyl) ether	✓											
Bis(2-ethylhexyl)phthalate	✓											
Bromodichloromethane	✓											
Bromoform	✓											
Bromomethane (Methyl bromide)	✓											
Butylbenzyl phthalate	✓											
Carbaryl										5		**0.5**
Carbofuran										2		**0.2**
Carbon disulfide	✓											
Carbon tetrachloride	✓					1000						**1000**
Catechol										20		**2**
Chlorinated hydrocarbons		1	8	80								**1**
Chloroacetamide					2							**2**
Chlorobenzene (each)	✓	0.05	1	10								**0.05**
Chlorobenzene (total)	✓	0.05	2	20	40					30		**0.05**
Chloroethane	✓											
Chloroethene (Vinyl chloride)	✓											
Chloroform	✓											
Chloromethane (Methyl chloride)	✓											
Chloronaphthalene										10		**1**
Chlorophenols (each)	✓	0.01	0.5	5								**0.01**
Chlorophenols (total)	✓	0.01	1	10						10		**0.01**
Chrysene	✓											
1,4-dichloro-2-butene (cis)						1000						**1000**
1,4-dichloro-2-butene (trans)						1000						

Table 1. Ecological Screening Values for Soil (mg/kg).

Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards			ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
Cresols (total)										5		**0.5**
Cyclohexane		0.1	6	60								**0.1**
Cyclohexanone									0.1	270		**0.1**
-BHC	✓											
DDT/DDE/DDD (total)	✓								0.0025	4		**0.0025**
Dibenz[a,h]anthracene	✓											
Dibenzofuran	✓											
Dibromochloromethane	✓											
Dichlorobenzene (total)	✓								0.01			**0.01**
Dichloromethane (Methylene chloride)	✓									20		**2**
Dichlorphenols (total)	✓								0.003			**0.003**
Dieldrin	✓								0.0005			**0.0005**
Diethyl phthalate	✓						100					**100**
Dimethyl phthalate	✓				200							**200**
Di-n-butyl phthalate	✓						200					**200**
Di-n-octyl phthalate	✓											
Endosulfan I	✓											
Endosulfan II	✓											
Endosulfan sulfate	✓											
Endosulfan, mixed isomers	✓											
Endrin	✓								0.001			**0.001**
Endrin ketone	✓											
Ethylbenzene	✓	0.05	5	50				0.7	0.05	50		**0.7**
Ethylene glycol								960				**960**
Fluoranthene	✓	0.1	10	100								**0.1**
Fluorene	✓											
Furan							600					**600**

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Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards			ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
Gasoline		20	100	800								**20**
-BHC (Lindane)	✓								0.00005			**0.00005**
-Chlordane	✓											
Heptachlor	✓											
Heptachlor epoxide	✓											
Hexachlorobenzene	✓					1000			0.0025			**0.0025**
Hexachlorobutadiene	✓											
Hexachlorocyclopentadiene	✓						10					**10**
Hexachloroethane	✓											
Hydrochinon										10		**1**
Indeno(1,2,3-c,d)pyrene	✓											
Iodine							4					**4**
Isophorone	✓											
Maneb										35		**3.5**
Methoxychlor	✓											
Methyl ethyl ketone	✓											
Methyl isobutyl ketone	✓											
Mineral Oils		100	1000	5000					50	5000		**50**
m-Nitroaniline	✓											
Monocyclic Aromatic Hydrocarbons (total)		0.1	7	70								**0.1**
m-Xylene	✓											
Naphthalene	✓	0.1	5	50				0.6				**0.1**
Nitrobenzene	✓				40	1000						**40**
N-Nitrosodiphenylamine	✓				20							**20**
N-Nitrosodipropylamine	✓											
o-Cresol (2-Methylphenol)	✓											
o-Nitroaniline	✓											

Table 1. Ecological Screening Values for Soil (mg/kg).

Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards		MPC[l]	ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]		
Organochlorinated Pesticides (each)		0.1	0.5	5								**0.1**
Organochlorinated Pesticides (total)		0.1	1	10								**0.1**
DDD	✓											
DDE	✓											
DDT	✓							0.7				**0.7**
PAHs (total)		1	20	200					1	40		**1**
PCB 1016	✓											
PCB 1221	✓											
PCB 1232	✓											
PCB 1242	✓											
PCB 1248	✓											
PCB 1254	✓											
PCB 1260	✓											
PCBs (total)	✓	0.05	1	10			40	0.3	0.02	1		**0.02**
p-Cresol (4-Methylphenol)	✓											
Pentachloroaniline					100							**100**
Pentachlorobenzene					20				0.0025			**0.0025**
Pentachlorophenol	✓				6	400	3	7.6	0.002			**0.002**
Pesticides (total)		0.1	2	20								**0.1**
Phenanthrene	✓	0.1	5	50								**0.1**
Phenol	✓	0.02	1	10	30	100	70	3.8	0.05	40		**0.02**
Phthalates (total)									0.1	60		**0.1**
p-Nitroaniline	✓											
Pyrene	✓	0.1	10	100								**0.1**
Pyridine		0.1	2	20					0.1	1		**0.1**
Resorcinol										10		**1**
Styrene	✓	0.1	5	50			300		0.1	100		**0.1**

Table 1. Ecological Screening Values for Soil (mg/kg).

Constituent	TAL/ TCL[a]	U.S. Fish and Wildlife Service[b]			Oak Ridge National Laboratory			CCME[j]	Dutch Ministry Standards			ESV
		A[c]	B[d]	C[e]	Earthworms[f]	Micro-organisms[f]	Soil Phytoxicity[g]		Target Value[k]	Intervention Value[k]	MPC[l]	
Tetrachlorobenzenes (total)									0.01			**0.01**
Tetrachloroethylene	✓							0.2	0.01	4		**0.01**
Tetrachloromethane									0.001	1		**0.001**
Tetrachlorophenols (total)									0.001			**0.001**
Tetrahydrofuran		0.1	4	40					0.1	0.4		**0.1**
Tetrahydrothiophene		0.1	5	50					0.1	90		**0.1**
Toluene	✓	0.05	3	30			200	0.8	0.05	130		**0.05**
Toxaphene	✓											
Trichlorobenzenes (total)	✓								0.01			**0.01**
Trichloroethylene	✓							3	0.001	60		**0.001**
Trichloromethane (Chloroform)									0.001	10		**0.001**
Trichlorophenols (total)										0.001		**0.0001**
Vinyl acetate	✓											
Vinyl chloride										0.1		**0.01**
Xylenes (total)	✓	0.05	5	50								**0.05**

a- TAL/TCL designation: ●=TAL; ✓=TCL.
b- Beyer (1990).
c- A-refers to background concentrations in soil or detection limits.
d- B-refers to moderate soil contamination that requires additional study.
e- C-refers to threshold values that require immediate cleanup.
f- Efroymson et al. (1997a).
g- Efroymson et al. (1997b).
h- Value is for Chromium III.
i- Mercury value taken from Eisler (1987).
j- CCME (1998b).
k- MHSPE (1994).
l- Crommentuijn et al. (1997).