

Dwyer Engineering LLC

Crescent Junction Disposal Site Alternative Final Cover System Technical Specifications

Stephen F Dwyer, PhD, PE

2021

Submitted to North Wind Portage

Crescent Junction Disposal Site

Technical Specifications Alternative Final Cover System **60% Draft Submittal**

PREPARED FOR:

North Wind Portage
Crescent Junction UMTRA Project Site
15 CR 223
Thompson Springs, UT 84540

PREPARED BY:

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60% Report Date: August 15, 2021

REVISION 00

Technical Specifications

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Crescent Junction Disposal Site

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August 2021

Prepared by:



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Project Engineer

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DIVISION 1

GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Project is located at the Crescent Junction Disposal Site, in Thompson Springs, Utah. Dwyer Engineering LLC. has been subcontracted by North Wind Portage, Inc. who was contracted by the U.S. Department of Energy (DOE) Grand Junction Site Office to design a replacement cover system for the Crescent Junction Disposal Site to be compliant with 40 CFR 192.
- B. These Specification covers only the Moab UMTRA Project Final Cover System conversion to an ET Cover, including the removal of the previously approved final cover and placement of the new ET Cover.
- C. All work shall be performed in accordance with North Wind Portage safety and project requirements
- D. The scope of work is indicated by the requirements of each Specification.
- E. The work includes, but is not limited to:
 - Removal and stockpiling of existing cover system;
 - Construction of an evapotranspiration (ET) soil final cover;
 - Seeding of evapotranspiration (ET) soil final cover system.
- F. The Contractor shall use the design documents, to include but not be limited to these Specifications and the Construction Drawings, to construct the final cover system.

1.02 DEFINITIONS

- A. The Owner shall mean Department of Energy (DOE).
- B. The Contractor shall mean North Wind Portage, Inc. contracted to install the replacement cover system.
- C. The Engineer shall mean the Engineer of Record from Dwyer Engineering LLC. The Engineer of Record may designate someone to act on his behalf, under his supervision.
- D. The Subcontractor shall mean any individual or company contracted by the Contractor to provide services or perform work associated with the project.
- E. Where “as shown,” “as detailed,” “as noted,” “as indicated,” or words of like meaning are used in the Contractor documents, it shall be understood that reference is being made to the drawings unless otherwise noted.

PART 2 MATERIALS

Not Applicable

PART 3 EXECUTION

3.01 SPECIFICATIONS

The priority of Contract Documents is Specifications to Drawings to Project Scoping Plans. This flow-down means that the Specifications take precedence over the Drawings which take precedence over the ancillary Project Scoping Plans.

3.02 DRAWINGS

- A. An index of Project drawings is shown on the Drawings.
- B. Dimensions shown on the Drawings take precedence over scaled dimensions. Large-scale details have precedence over smaller scale.

END OF SECTION

SECTION 01090

ABBREVIATIONS

PART 1 GENERAL

1.01 ABBREVIATIONS

- A. Abbreviations used in these Contract Documents shall refer to and designate the following, as applicable:

AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CQAP	Construction Quality Assurance Plan
CY	cubic yards
DOE	United States Department of Energy
D50	median rock size
EFR	Engineer's Field Representative
ET	Evapotranspiration
FS	Federal Specifications
GTL	Geotechnical testing laboratory
H	Horizontal
HASP	Health and Safety Plan
Inc.	Incorporated
MARV	minimum average roll value
MDD	maximum dry density
MSL	mean sea level
NA	not applicable
NUREG	Nuclear Regulatory Report
OSHA	Occupational Safety and Health Act
PLS	Pure live seed
QA	Quality assurance
QC	Quality control
RRM	Residual Radioactive Material
SWPPP	Storm Water Pollution Prevention Plan
TBD	to be determined
UMTRA	Uranium Mill Tailings Remedial Action
USDA	United States Department of Agriculture
V	Vertical

UNITS OF MEASURE

AC	Acre
cm/sec	Centimeters per second
Ft	Foot (feet)
in.	Inch(es)
lb.	Pound(s)
mm	millimeter
pcf	Pounds per cubic foot
psi	Pounds per square inch

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01330

SURVEY DATA

PART 1 GENERAL

1.01 LINES, GRADES, AND MEASUREMENTS

- A. The Contractor shall make all measurements and check all dimensions necessary for the proper construction of the Work called for by the Drawings and Specifications. During the execution of the Work, the Contractor shall make all necessary measurements to prevent misfitting in said work, and shall be responsible therefore and for the accurate construction of the Work.

1.02 DIMENSIONS OF EXISTING FEATURES

- A. The dimensions and locations of existing structures, topography, and drainage swales are of critical importance in the installation or connection of new work, the Contractor shall verify such dimensions and locations in the field before the construction or fabrication of any structure, material or equipment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01340

SHOP DRAWINGS, SAMPLES, AS-BUILTS, AND OTHER SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General Instruction.
- B. Samples.
- C. Shop Drawings.
- D. Product Data.

1.02 RELATED SECTIONS AND REQUIREMENTS

- A. Division 1 - General Requirements.
- B. Construction Quality Assurance Plan for Crescent Junction Disposal Site, August 2021.

1.03 GENERAL INSTRUCTIONS

- A. Within ten working days after the formal execution of the contract, the Contractor shall submit a Submittal Schedule to the Engineer. The Engineer will review the schedule and return either approved or modified copies to the Contractor. Once accepted by the Engineer, the schedule shall be followed throughout the project unless superseded by a new schedule accepted by the parties involved. The Engineer will require ten working days to properly review this schedule. The Engineer will add or delete submittals required for review.
- B. Information submitted as a separate submittal or as part of another submittal that has not been listed on the schedule as a required submittal will be scanned briefly by the Engineer. Such extraneous and unrequired information will be marked as "NO ACTION TAKEN" and returned.
- C. When Shop Drawings are required by the various technical specification sections or elsewhere in the Contract Documents, the names and addresses of the proposed manufacturers (if different from those listed in the Contract Documents) shall be submitted prior to the submittal of the Shop Drawings so that the Engineer may consider and approve or disapprove the manufacturer and/or the supplier as to his or their ability to furnish a product meeting the requirements of the Contract Documents. This preliminary submittal is subject to final approval of the particular material or equipment. As requested, the Contractor or equipment supplier shall also submit data relating to the materials and equipment he proposes to incorporate into the work, in sufficient detail to enable the Engineer to identify the particular product in question and to form an opinion as to its conformity to the contract requirements. Such data shall be submitted in a manner similar to that specified for Shop Drawings.
- D. The normal time allowed for review of Shop Drawings, and other submittals, is two calendar weeks after receipt of the submittal by the Engineer, or other party responsible for the review. Requirements for shorter review periods must be presented in writing by the Contractor.

- E. Submittals shall be approved by the Engineer, as shown by the Engineer's approval marked on each copy. Submittals shall not be accepted from subcontractors, suppliers, manufacturers, or representatives. Submittals shall be identified by reference to Contract document number, drawing number, equipment number and specification section number, equipment or material schedule, or room numbers, as appropriate. Submittals shall be numbered consecutively by the Contractor, or equipment supplier, as appropriate. Resubmissions shall use the same number with a suffix added to identify each resubmission (i.e., "A" shall identify the first resubmission).
- F. Minimum sheet size: 8-1/2-in. x 11-in.
- G. Number of submittals required:
 - 1. Shop Drawings: Submit the number of opaque reproductions, which the Contractor requires, plus four copies which will be retained.
 - 2. As-Built Drawings: Submit one electronic version in AutoCAD most recent version and one hard copy suitable for reproduction.
 - 3. Product Data: Submit the number of copies which the Contractor requires, plus four copies which will be retained.
 - 4. Samples: Submit the number stated in each specification section.
 - 5. Certificates: Submit three copies which will be retained.
- H. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number.
 - 3. Contract identification.
 - 4. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 - 5. Identification of the product, with the specification section number and other appropriate information.
 - 6. Field dimensions, clearly identified as such.
 - 7. Relation to adjacent or critical features of the work or materials.
 - 8. Applicable standards, such as American Society for Testing and Materials (ASTM) or Federal Specification (FS) numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on resubmittals.
 - 11. 8 in. x 3 in. blank spaces for Contractor and the Engineer's review stamps.
 - 12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

1.04 SAMPLES

- A. If the Engineer so requires, either prior to beginning or during the progress of the work, the Contractor or equipment supplier shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the Specifications. Such samples, including concrete test cylinders, shall be furnished, taken, stored, packed, and shipped as directed, at the expense of the Contractor. Except as otherwise specified, the Contractor shall make arrangements for, and pay for, the actual tests.

- B. All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the building or work and location for which the material is intended, and the name of the Contractor or equipment supplier submitting the sample.
- C. To ensure consideration of samples, the Contractor or equipment supplier shall notify the Engineer in writing that the samples have been shipped and shall properly describe the samples in the letter. In no case shall the letter of notification be enclosed with the samples.
- D. The Contractor or equipment supplier shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection, testing, and approval before the materials and equipment are needed for incorporation in the work.
- E. When required, the Contractor or equipment supplier shall furnish to the Engineer triplicate copies of manufacturer's attesting to the accuracy of shop or Mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.
- F. The materials and equipment used on the Work shall correspond with the samples submitted.

1.05 SHOP DRAWINGS

- A. The Contractor or equipment supplier, as appropriate, shall submit for approval at least four (4) print copies (plus any additional copies required by the Contractor or subcontractors or equipment suppliers) of Shop Drawings of materials fabricated especially for this contract, and of equipment and materials for which such drawings are specifically requested in the Contract Documents. One copy, plus any additional copies provided, will be reviewed, stamped, and returned to the Contractor.
- B. Such drawings shall show the principal dimensions, weights, structural and operating features, performance characteristics and capacities, wiring and piping diagrams, space required, clearances required, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawings. Show location, size, dimensions and embedment depth for anchor bolts. List special tools required to operate, and maintain equipment. Describe tool's purpose. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this contract.
- C. The Contractor or equipment supplier shall be responsible for the prompt submission of all Shop Drawings in accordance with the Shop Drawing Schedule so that there shall be no delay to the work due to the absence or lateness of such drawings.
- D. No material shall be purchased or fabricated especially for this Contract until the required Shop Drawings have been submitted and reviewed as conforming to the Contract requirements. All materials and work involved in the construction shall then be as represented by said drawings.
- E. Only Shop Drawings which have been checked and corrected by the fabricator shall be submitted to the Contractor by the Contractor's subcontractors and vendors. Prior to submitting Shop Drawings to the Engineer, the Contractor shall check thoroughly all such drawings so that the subject matter thereof conforms to the Drawings and Specifications in all respects. Shop Drawings which are correct shall be marked with the date, checker's name and indication of the Contractor's

approval, and then shall be submitted to the Engineer; other drawings shall be returned to the fabricator or subcontractor for correction.

- F. The Engineer review of Shop Drawings will follow a general check made to ascertain conformance with the design concept and functional results of the Project and compliance with the information given in the Contract Documents. The Contractor shall be responsible for dimensions to be confirmed and correlated at the job site and for coordination of the work of all trades. The Contractor, or equipment supplier if appropriate, shall also be responsible for information that pertains solely to the fabrication processes or to techniques of construction.
- G. The Engineer classifications are as follows:

APPROVED	(___)
APPROVED AS CORRECTED	(___)
REVISE AND RESUBMIT	(___)
REJECTED	(___)
NO ACTION TAKEN	(___)

- H. The Contractor or equipment supplier shall make any corrections required by the Engineer and shall return the required number of corrected copies of Shop Drawings until approved.
- I. At the time of each submission or resubmission, the Contractor or equipment supplier shall direct specific attention, in writing, to deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents or corrections required by the Engineer on previous submissions.
- J. The Contractor's stamp of approval on Shop Drawings and samples shall constitute a representation to the Engineer that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data (or he assumes full responsibility for doing so) and that the Contractor has reviewed or coordinated each Shop Drawing and sample with the requirements of the Contract Documents. Submittals received without this information will be returned without being reviewed by the Engineer.
- K. The approval of Shop Drawings and samples shall not relieve the Contractor or equipment supplier from responsibility for any deviations from the requirements of the Contract Documents, unless the Engineer has been notified, in writing, and has given written approval to such deviation, nor shall any approval by the Engineer relieve the Contractor or equipment supplier from responsibility for errors and omissions in Shop Drawings.

1.06

PRODUCT DATA

- A. Product data may be submitted instead of Shop Drawings when the information required for Shop Drawings is contained in Manufacturer's standard literature.
- B. Manufacturer's standard catalog data, schematic drawings and diagrams:
 1. Mark each copy to identify pertinent products or models.
 2. Modify drawings and diagrams to delete information which is not applicable to the work.
 3. Supplement standard information to provide information specifically applicable to the work.

1.07

CERTIFICATES

- A. Types of certificates required are specified in respective Specification Sections.
- B. Shop tests: Provide Manufacturer's sworn reports for actual product to be incorporated in the work.
- C. Laboratory tests: Provide independent testing laboratory reports for actual product to be incorporated in the work.
- D. Certificates of compliance: Provide Manufacturer's sworn statement or independent testing laboratory's report for products similar to those to be incorporated in the work with information indicating compliance with specifications. Test used to show compliance shall have been made within one year of the date of submission, unless approved otherwise by the Engineer.
- E. Certified drawings: Provide certified drawings from the manufacturer as required in each specification section.
- F. Refer to Section 01400 for certification requirements relative to an alternative to on-site sampling and testing.

1.08

AS-BUILT DOCUMENTS

- A. The North Wind Portage Project Manager shall keep a record of all changes approved by the owner and all field changes, including changes to lines and grades.
- B. The Contractor shall maintain one current record hard copy of all Specifications, Drawings, Addenda, Change Orders and Shop Drawings at the site. The documents shall be kept current, in good order, and annotated to show all changes made during the construction process and be clearly marked "AS-BUILT Documents." These As-Built documents shall be available for review by the Engineer during all normal working hours.
- C. The Contractor shall submit to the Engineer, within 10 days after the completion of contract, one set of the above "AS-BUILT" documents containing all changes, additions or deviations from the original set of Documents that have been incorporated into the Work. The Contractor is responsible for the accuracy of these AS-BUILT documents.
- D. The Engineer, within 15 days after receipt of the As-Built documents will produce a final electronic version of the As-Built documents provided by the contractor. The electronic version will be in AutoCAD (most recent version).
- E. The Contractor shall include As-Built Documents in the submitted Schedule of Values.

1.09

PROGRESS PHOTOGRAPHS

- A. The Contractor shall take progress photographs throughout the duration of the contract. Photographs shall be taken at weekly intervals or as may be specifically directed by the Owner.
- B. Digital photographs shall be taken of each process to document status, progress, and quality. Selected color prints (4 per 8.5 x 11 page or as approved by the Engineer) shall be provided with monthly progress reports. Additional color prints shall be provided to the Engineer upon request.
- C. Each digital photograph shall contain the date taken and formatted on an electronic file to contain a description, indicating the location, direction, and what is shown.

1.10

HASP

A. Refer to the North Wind Portage, Inc. Site Approved HASP for requirements regarding environmental health and safety.

PART 2 PRODUCTS
Not Used.

PART 3 EXECUTION
Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor is responsible for quality control and shall establish and maintain an effective Project Quality Control Plan for the Crescent Junction Disposal Site final cover system.
- B. The Construction Quality Control Plan shall be adhered to for the installation of the Crescent Junction Disposal Site final cover system.

1.02 RELATED SECTIONS AND REQUIREMENTS

- A. The Construction Quality Assurance Plan for the Crescent Junction Disposal Site final cover system project, August 2021.

1.03 MATERIALS CERTIFICATION

- A. For certain products, assemblies, and materials, in lieu of on-site sampling and testing procedures, the Engineer will accept from the Contractor the manufacturer's certification, with respect to the product(s) involved, upon the conditions set forth in the following paragraphs:
 - 1. Certification shall state that the named product conforms to the Specifications and that representative samples have been sampled and tested as specified.
 - 2. Certification shall be accompanied with a certified copy of the test results.
 - 3. The certification shall give name and address of the manufacturer and the testing agency, the date of test, and shall set forth the means of identification which will permit field determination of the products delivered to the project as being one product covered by the certification.
 - 4. The certification shall be duplicated with one (1) copy sent with shipment of the covered product to the Contractor and one (1) copy sent to the Engineer.
 - 5. The Contractor shall be responsible for any additional costs for certification and for any costs of sampling and testing.
 - 6. The Engineer reserves the right to require samples and test products to assure compliance with pertinent requirements with respect to fire certification of the products by the manufacturer thereof.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

- A. The Contractor's approved Construction Quality Assurance Plan (CQAP) defines the minimum construction requirements to be implemented to ensure that the approved design requirements are met or exceeded. The quality assurance (QA) team will report to the Contractor's Project Manager on behalf of the Owner.
- B. A Construction Completion Report shall be prepared by the Engineer of Record following the completion of construction activities. This document shall be submitted to DOE after the final inspection of the completed project.

END OF SECTION

DIVISION 2

SITE WORK

SECTION 02005

SURVEYING

PART 1

GENERAL

1.01

DESCRIPTION OF WORK

- A. The work to be performed under this section shall include:
 - 1. Project as-built surveys as required herein and elsewhere in the Technical Specifications.
 - 2. Surveys during the life of the project as directed by the Engineer, and surveys required to measure the quantities of completed work for determining the value of partial payments as described in other sections of these Specifications.
 - 3. Pre-construction and construction topographic surveys.
- B. The survey work shall be performed under the direction of a Land Surveyor registered in the State of Utah who shall be subcontracted by the Contractor to perform the survey work. Topographic, cross-sectional, and grade verification surveys will include the development by the Surveyor of topographic drawings for the use by the Engineer in verifying field conditions, measurement of quantities, and adjusting the design as necessary.

1.02

RELATED SECTIONS AND REQUIREMENTS

- A. Construction Quality Assurance Plan for Crescent Junction Disposal Site final cover system, August 2021.
- B. Technical Drawings for Crescent Junction Disposal Site final cover system, August 2021.

1.03

SUBMITTALS

- A. Prior to commencement of work under this item, the Contractor shall submit the name, address, and telephone number of the Surveyor that will perform this work on the Project.
- B. The Contractor shall organize the placement of the components of the cover systems into manageable areas of work. The Contractor shall submit to the Engineer the pre-construction surveys before commencing excavation, fill placement, or cover system work. Additional topographic surveys of the completed work shall be submitted with each payment request and shall be a condition precedent to the Engineer's approval of the Contractor's request for partial payment. Topographic surveys and as-built surveys to be developed include the following:
 - 1. Pre-construction topographic survey plan shall depict the existing conditions within the limits of work prior to earth disturbance of the landfill
 - 2. The Contractor, at a minimum, shall also prepare construction topographic and as-built surveys for each of the following surfaces as shown on the Contract Drawings and described in the Technical Specifications.
 - a. Existing topography of the impoundment, including locations and elevations of any existing structure on the disposal site.
 - b. Subgrade surface after removal of existing cover material (cover system).

- c. The top surface of the subgrade beneath the impoundment cover.
 - d. The top surface of the impoundment.
 - e. Top surface of the subgrade.
 - f. Surface water control features (ditches, culverts, etc.).
3. The Contractor shall, at a minimum, prepare construction topographic surveys for other areas within the limit of work (but beyond the impoundment surface) for each of the following surfaces as shown on the Drawings and described in the Technical Specifications:
 - a. The final grades of all permanent stormwater management structures (to include all related pipe locations, sizes, and invert elevations).
4. The coordinate system requirements for deliverables are North American Datum 83 and North American Vertical Datum 088, unless otherwise directed by the Engineer.
5. All topographic survey plans shall be prepared at a scale of 1 in. = 30 ft with a 2- ft contour interval applying National Map Standards, unless otherwise directed by the Engineer.
6. The Contractor shall compile all topographic surveys performed for work during the course of the Contract into composite plans for the respective surfaces of each area surveyed. The composite plans shall be prepared at a scale of 1 in. = 30 ft with 2-ft contour intervals (with spot elevations at all tops and toes of slopes) and shall be submitted to the Engineer no later than 15 working days after the scheduled completion date for the Construction.
7. For all work under this item, the Contractor shall submit disk copies of the topographic survey plans in AutoCAD (latest version) format with executable files along with two (2) prints for each survey plan required.
8. The Engineer reserves the right to require the submittal of copies of any or all survey field notes from the Contractor.
9. Tolerance on construction shall be ± 0.1 ft every 100 ft with no compounding of tolerance except for asphalt and concrete surface which shall have a tolerance of ± 0.10 ft every 100 ft with no compounding of tolerance. All minimum and maximum slopes shall be maintained.

PART 2 MATERIALS

Not Applicable.

PART 3 EXECUTION

3.01.1 SURVEYING

- A. The Contractor shall locate, protect, and verify survey control points established from local elevation and coordinate datum prior to starting site work and preserve these points during construction. These controls will be permanent monuments used throughout construction and post-construction for any needed topographic, radial stakeout, and benchmark elevations. The Contractor shall promptly report to the Engineer lost, relocated or destroyed control points. The Contractor shall maintain complete and accurate field notes for all control points and survey points as work progresses.
- B. The Contractor shall perform and update the as-built surveys throughout the life of the Contract as necessary and at the end of the project.
- C. For all survey work, survey points shall be obtained using a 50-ft grid. Additional points shall be surveyed at toe and top of slopes and as necessary to provide accurate topography in areas where slopes vary between the above noted grid points. All point elevations shall be accurate to a tenth of a foot. All pipe invert elevations shall be accurate to a hundredth of a foot.
- D. Initial Staking will include angle points for fence relocation at the northeast end of the main landfill and centerline cut and fills for proposed access routes.
- E. Upon completion of survey work the Contractor shall submit to the Engineer the deliverables (including plans, drawings, electronic disks, and survey notes), in accordance with subsection 1.02.
- F. All deliverables under this item shall be signed and sealed by the QA Surveyor.

END OF
SECTION

SECTION 02100

CLEARING AND STRIPPING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The work to be performed under this Section includes all requirements for the clearing and stripping of all areas within the Contract Limit of Work in accordance with the Documents.

1.02 DEFINITIONS

- A. Clearing is the removal from the ground surface and disposal, within the contract limit of disturbance, of brush, shrubs, other vegetation, rubbish, and debris (natural and man-made).
- B. Stripping is the removal and stockpiling, within the contract limit of disturbance or as provided for by the Engineer, of all topsoils and cover soils that are above the limits of waste including matted roots, and organic materials.

PART 2 MATERIALS

Not Applicable.

PART 3 EXECUTION

3.01 GENERAL

- A. Do not start earthwork operations in areas where clearing and stripping is not complete. Comply with erosion, sediment control, and storm management measures specified in the **SWPPP** and Section 02930 (Temporary Erosion and Sediment Control).

3.02 CLEARING

- A. Clear all items to the limits necessary to perform construction activities and shred all cleared and grubbed material for use in topsoil applications. The Contractor is responsible to dispose of cleared and grubbed materials in accordance with State and Federal guidelines.
- B. Burning of any material shall not be permitted on the Site.

3.03 STRIPPING

- A. Where applicable, cut existing vegetation in the affected areas as close to the existing ground surface as possible. Remove material from the ground surface and use it as mulch for temporary stabilization.
- B. Where applicable, disk the first 6 to 8 in. of cover soils, including stubble vegetation. Thoroughly mix the soils with the vegetative matter.
- C. Where applicable, remove the completed disked material and stockpile as topsoil.
- D. Do not over excavate the topsoil material.

- E. Assure the topsoil is segregated from the waste and cover soils.

END OF SECTION

SECTION 02270

DRAINAGE CHANNELS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The work to be performed under this section includes furnishing all labor, materials, tools, and equipment necessary for providing protection for slopes, ditches, channels, and riprap outlet protection to the configuration and extents indicated in accordance with the Contract Documents.

1.02 RELATED WORK

- A. Section 310000 – Earthwork.
- B. Section 02750 – Stormwater Management and Discharge.
- C. Section 02930 – Temporary Erosion and Sediment Control.
- D. SWPPP for Crescent Junction Disposal Site.
- E. Construction Quality Assurance Plan for Crescent Junction Disposal Site, August 2021.

1.03 SUBMITTALS

- A. In accordance with Section 01340, submit a Certificate of Compliance before delivery of materials related to work on any drainage channel.

PART 2 PRODUCTS

2.01 STONE FOR OUTLET AND CHANNEL PROTECTION

- A. Stone shall be a durable rock such as a hard basalt or limestone. Sandstone is not permitted. Durability of rock is to be submitted for approval prior to delivery to the site.
- B. Stone for riprap shall be composed of a crushed rock with D50 (median) size as dictated in the Drawings. Submit certification of rock size and type prior to delivery to site.
- C. Riprap shall be reasonably well-graded from the smallest to the largest size specified and shall be controlled by visual inspection.
- D. No broken concrete shall be used as riprap.

PART 3

EXECUTION

3.01

CHANNEL EXCAVATION

- A. The drainage channels shall be excavated to the slopes and grades shown on the design Drawings. The channel widths shall be constructed to the dimensions shown on the design Drawings. The side slopes of the channels shall be as shown on the drawings.
- B. Fill material required for meeting grades and slopes shall consist of material from channel excavation or select borrow soils.
- C. The final channel slope subgrades shall be prepared by removing vegetation, roots, and loose materials to provide a firm surface for geotextile/geomembrane placement. The final channel subgrades shall be compacted with approved construction equipment to form a smooth, competent foundation for the filter layer. In areas requiring fill placement to achieve final grades, after topsoil removal, the upper 6 inches shall be scarified, moisture conditioned and compacted prior to fill placement.
- D. All subgrade soils shall be compacted to a minimum of 95% of the maximum dry density per ASTM D698.
- E. The completed grading for the diversion channels, in soil, shall be within 0.1 foot (horizontally) of the lines as designed, and within 0.1 foot (vertically) of the elevations as designed. The final surfaces shall be smoothed to avoid abrupt changes in surface grade or areas of runoff concentration.
- F. The completed grading for the diversion channels in rock (if encountered) shall be within 2.0 feet (horizontally) of the lines as designed, and within 0.5 foot (vertically) of the elevations as designed. The final rock surfaces will be rough and should not be filled to make grade. The bedrock channel should be constructed at or below the design grades in order to meet the intent of the design.

3.02

RIPRAP PLACEMENT

- A. Place riprap to the extent shown on the Drawings. Placement shall be in one operation in such a manner as to not disturb underlying material. End dumping of rock upon the geotextile shall not be permitted.
- B. The larger stones shall be well distributed and compact. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the required results.
- C. Riprap shall be placed starting at the toe of slope and proceeding upslope.

END OF SECTION

SECTION 02750

STORMWATER MANAGEMENT AND DISCHARGE

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This section includes the requirements for the management and discharge of waters collected during and post construction activities.

1.02 RELATED SECTIONS

- A. SWPPP for Crescent Junction Disposal Site.
- B. Section 02930 – Temporary Erosion and Sediment Control.

PART 2 MATERIALS

Not Applicable

PART 3 EXECUTION

3.01 STORMWATER MANAGEMENT

- A. Controls to be used by the Contractor shall conform to the approved details stated in the SWPPP.

END OF SECTION

SECTION 02930

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The work to be performed under this section includes furnishing all labor, materials, tools, and equipment needed to install, operate, and maintain temporary erosion and sediment controls as shown on the Drawings or directed by the Engineer and specified herein.

1.02 RELATED SECTIONS

- A. SWPPP for Crescent Junction Disposal Site.

1.03 STORMWATER POLLUTION PREVENTION

- A. Prior to initiating earth-moving activities, implement the soil erosion and sedimentation controls as shown on the Drawings and detailed in the SWPPP.
- B. Fines and related costs resulting from failure to provide adequate protection against soil erosion and sedimentation are the obligation of the Contractor.
 - 1. Silt, sediment, and mud leaving the site will be construed as damage to neighboring property and evidence of negligence on the part of the Contractor.
 - 2. Damages to any property outside of the project limits due to negligence by the Contractor shall be rectified and/or restitution shall be paid by the Contractor.
- C. Erosion and sedimentation control measures employed will be subject to approval and inspection by governing agencies having jurisdiction over such work.
- D. The temporary control provisions proposed shall be coordinated with the project schedule, sequence of construction, and temporary and permanent site facilities to assure economical, effective and continuous erosion control throughout the construction and post construction period with no violation of the federal, state, and local regulations.
- E. The Engineer may limit the active area of earthwork operations in progress commensurate with the Contractor's capability in controlling erosion and sediment-laden runoff.

1.04 SUBMITTALS

- A. Samples: Submit samples of materials being used including names, sources, and descriptions.

1.05 QUALITY CONTROL

- A. All erosion and sediment control work shall comply with applicable requirements of governing authorities having jurisdiction. The Specifications and Drawings are

not comprehensive, but rather convey the intent to provide complete slope protection and erosion control.

- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas that are subject to severe erosion, and off-site areas that are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive special attention.
- C. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time and the length of the time of exposure.
- D. Surface water runoff originating upgradient of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.
- E. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.

PART 2 MATERIALS

2.01 STRAW BALES

- A. Straw bales, if used, shall be either wire-bound or string-tied with bindings around sides rather than over and under.

2.02 CRUSHED STONE

- A. Crushed stone for stabilized construction entrance(s) shall be American Association of State Highway and Transportation Officials (AASHTO) #3.

2.03 SILT FENCE

- A. Prefabricated silt fence shall meet the following requirements:
 - 1. Silt fences shall be prefabricated.
 - 2. The geotextile for the fencing shall meet the following requirements:

<u>Property</u>	<u>Test Value</u> ⁽¹⁾	<u>Test Method</u>
Grab Tensile Strength	90 lbs.	ASTM D4632
Burst Strength	190 psi	ASTM D3786
Puncture Resistance	40 lbs.	ASTM D4833
Permittivity	>0.1 sec ⁻¹	ASTM D4491
AOS	>30 US sieve	ASTM D4751
UV Resistance (500 hr.)	70%	ASTM D4355

¹Minimum average roll values (MARV)

- 3. Posts shall be metal or hard wood.
- 4. The geotextile height shall be a minimum of 3 ft and shall be provided with a tensioning cord.

2.04 2.04 EROSION CONTROL MATS

- A. Erosion control mats shall be American Excelsior Co., type Hi-velocity Curlex Blanket; PPS Packaging Co. type Super Duty Blanket; or Engineer approved equal.

2.05 EROSION CONTROL BLANKET

- A. Erosion control blanket material shall be XCELL type regular blanket (0.98 #/sy), Curlex blanket type (0.97 #/sy), or approved equal.

PART 3 EXECUTION

3.01 STRAW BALE BARRIERS

- A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 in.
- B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lower middle bale.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale.
- D. The gaps between bales shall be filled by wedging straw in the gaps to prevent water from escaping between the bales.
- E. Any straw bales which become clogged or otherwise deteriorate shall be properly maintained or replaced as necessary at no additional cost to the Owner.

3.02 STABILIZED CONSTRUCTION ENTRANCE

- A. Specifications include:
 - 1. Washing: When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right-of-way or landfill entrance road. When washing is required, it shall be done on any area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through use of sand bags, gravel, boards, or other approved methods.
 - 2. Maintenance: The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto the landfill entrance road or public right-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout or any measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto the transfer station access road or public right-of-way must be removed immediately by the Contractor at no cost to the Engineer.

3.03 SILT FENCING

- A. A 6-in. by 6-in. trench shall be excavated along the alignment of the silt fence. Excavated material shall be stockpiled on the upside of the trench.
- B. Fence posts shall be positioned on the downstream side of the fence and driven into the ground. Fence posts shall be spaced no more than ten (10) ft apart.
- C. The fabric flap shall be laid in the trench and backfilled with material stockpiled from excavation. The backfill shall be tamped into place.
- D. The Contractor shall join fence sections together as recommended by the manufacturer and as approved by the Engineer to prevent silt from escaping through the adjoining sections.
- E. The Contractor shall maintain silt fences (removing and disposing of silt, repairing fence which falls down, and replacing damaged fence, etc.) throughout the duration of the Contract at no additional cost to the Engineer. Silt shall be disposed of in

such a manner that it will not erode from the site and shall be placed within the stockpile.

3.04 DUST CONTROL

- A. The Contractor shall submit a Dust Control Plan to the Engineer for approval prior to any earthwork activities. Dust generated from the Contractor's performance of work, either inside or outside the limits of work, shall be controlled by the Contractor by applying water, calcium chloride, or other materials with the approval of the Engineer.
- B. The Engineer has the right to stop construction activity, if in his opinion; the excavations are generating excessive amounts of dust.

3.05 SOIL STABILIZATION

- A. Following initial soil disturbance or redisturbance, permanent or temporary stabilization shall be completed in accordance with: a) 7 calendar days as to the surface of all perimeter controls, dikes, swales, ditches, perimeter slopes, stockpiles, and all slopes greater than 2 horizontal to 1 vertical (2:1) and b) 14 days as to all other disturbed or graded areas on the project site. The in-place sediment control measures will be maintained on a continuing basis until the site is permanently stabilized and all permit requirements are met.

3.06 CHANNELS (Temporary), SLOPES (Temporary), AND STOCKPILES

- A. All channels, swales, ditches, stockpiles, etc. shall be stabilized with permanent or temporary seeding, in accordance with Section 02932 immediately upon reaching an interim grade.
- B. The channel beds shall be covered with an erosion control mat. The erosion control mat shall be installed as recommended by the manufacturer of the blanket.
- C. Where slopes require temporary stabilization, the Contractor shall install erosion control blankets, as directed by the Engineer.

3.07 MAINTENANCE

- A. Inspection
 - 1. Erosion and sediment control will be inspected by the Contractor the next working day after rainfall events in excess of 0.5 in. and prior to forecasted storms.
 - 2. At a minimum, the Contractor will perform inspections of the erosion and sediment control system once every 14 calendar days and following storm events of 0.5 in.
- B. Repair
 - 1. All erosion swales and gullies in excess of 6 in. deep will be filled and compacted to their original condition and reseeded as required.
 - 2. Erosion and sediment control structures (i.e., silt fencing) will be replaced as required to assure the integrity of the system.

3.08 SEDIMENT TRAPS

- A. The Contractor is solely responsible to construct and maintain the proposed sediment traps and their effluent upon commencing any earth disturbance activity.
- B. The Engineer reserves the right to require upgrades to existing traps or installation of additional structures should any discharge released not meet quality standards.

END OF SECTION

SECTION 02932

SEEDING, MULCHING, AND RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The work to be performed under this section shall include furnishing and installing all seed, fertilizer, mulch, mulch binder, erosion mats, and initial watering of seeded areas wherever existing site surface soils will be placed as topsoil shown on the Drawings or as directed by the Engineer. This work shall also include maintaining seeded areas as shown on the Drawings until accepted by the Engineer.
- B. The areas to be seeded under this item shall include all areas designated by the Engineer and as described on the Drawings. All areas outside of specified limits where the vegetative growth has been injuriously disturbed or destroyed by the Contractor shall be restored and seeded in accordance with these specifications by the Contractor at his own expense.

1.02 RELATED SECTIONS

- A. Section 31 00 00 – Earthwork.

1.03 SUBMITTALS

- A. The Contractor shall submit the following items:
 - 1. Catalog data, including sources of supply for amendments, mulch, tackifier, fertilizer, and erosion control blankets.
 - 2. Certification substantiating that material complies with specified requirements.
 - 3. Submit certified seed bag tags and copies of seed invoices identified by project name.
 - 4. Installation instructions, including proposed seeding schedule. Coordinate with specified maintenance periods to provide maintenance from date of final acceptance. Once schedule is accepted, revise dates only with Engineer approval after documentation of delays.

1.04 QUALITY ASSURANCE

- A. Seeding Subcontractor Qualifications:
 - 1. Perform work by a single firm experienced with the type and scale of work required and having equipment and personnel adequate to perform the work satisfactorily.
- B. Material Quality Control:
 - 1. Provide seed mixture in containers showing species percentages in seed mix; test information including, purity, germination and noxious and restricted weeds; net weight; date of packaging; and location of packaging.

2. Furnish seed labeled in accordance with the requirements of federal and Utah statutes and regulations governing seed labeling. Such resulting requirements include but are not necessarily limited to: Federal Seed Act and Amendments, rules and regulations established by the USDA; the Utah Seed Law; and all resulting regulations or restrictions established by other authorized entities.
3. In addition, ensure seed mix and its application comply with the requirements of all other federal and Utah statutes and regulations governing seeds, plants, and weeds. These requirements include but are not necessarily limited to: the Noxious Weed Control Act and all rules, regulations, or control measures by a noxious weed control district embracing Grand County, Utah; and the Harmful Plant Act.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged materials in sealed containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. Opened or wet seed shall be rejected and returned to the responsible party.

PART 2 MATERIALS

2.01 SEED

- A. Obtain native grass seed from sources whose origin would ensure site adaptability. Plant sources from Utah or surrounding states are preferred.
- B. Obtain shrub and wildflower seed from sources whose origin would ensure site adaptability. Plant sources from Utah or surrounding states are preferred.
- C. Cover crops (e.g., annual barley, oats, winter rye, etc.) may be used only as a temporary stabilization measure and shall not be used in conjunction with a perennial seed mix.
- D. Furnish certification, showing origin of seed and pure live seed (PLS) content as determined by a certified authority. Provide bags of seed that are tagged and sealed in accordance with the State Department of Agriculture or other local certification authority within the state of origin. The tag or label shall indicate analysis of seed and date of analysis, which shall not be more than 9 months prior to delivery date. Seed may be premixed by the seed dealer and appropriate data indicated on the bag label for each variety.
- E. Develop seed mixture from the following guidelines. TBD

NATIVE PERENNIAL MIX

Common Name	Scientific Name	% of Mix
Grasses		
TBD	TBD	TBD
Forbs/ Wildflowers		
TBD	TBD	TBD

*Species particularly suited for especially dry sites

2.02

STRAW MULCH

- A. Straw shall be stalks from oats, wheat, rye, barley, or rice that are free from noxious weeds, mold, or other objectionable material. At least 65% of the herbage by weight of each bale of straw shall be 10 in. in length or longer. Rotted, brittle, or molded straw is not acceptable. Straw from introduced grasses is acceptable if cut prior to seed formation. If possible, provide marsh grass composed of mid to tall native grasses (usually tough and wiry grass and grass-like plants found in the lowland areas within the Rocky Mountain Region).

2.03

HYDRAULIC MULCH/TACKIFIER

- A. Provide mulch material consisting of 100 percent virgin wood fibers manufactured expressly from whole wood chips, such as Eco-Fibre or Conwed. Process chips in such a manner as to contain no growth or germination inhibiting factors. Do not produce fiber from recycled material such as sawdust, paper, cardboard, or residue from pulp and paper plants. Provide materials free from contaminants such as lead paint, varnish or other metal contaminants. Hydraulic mulch shall contain non-toxic dye to assist in visually determining even distribution. Mulch material shall meet the following specifications:

<u>Parameter</u>	<u>Value</u>
pH at 3% consistency	4.5 +/- 0.5
Ash content	0.8% +/- 0.2%
Moisture holding capacity	1250 (grams water/100 grams oven dry fiber)
Moisture content	12% +/- 3% (Wet weight basis)

- B. Combine mulch with an organic plantago based tackifier, such as M-binder, etc., that has no growth or germination inhibiting factors and is nontoxic. Apply the uniform mixture to the seeded area.
- C. Bagged mulch/tackifier mix that is homogenous within the unit package may also be used. Tackifier shall adhere to the fibers during manufacturing to prevent separation during shipment and to avoid chemical agglomeration during mixing in the hydraulic mulching equipment.

2.04

ROLLED EROSION CONTROL PRODUCTS

- A. Provide a Straw/ coir blend blankets around the entire perimeter of the finished impoundment after seeding. The blankets shall be installed at the base of each landfill slope from the intersection with a drainage channel and/or culvert up the hill nominally 8-ft wide or as determined by the width of the erosion control blanket used. The blanket shall run perpendicular to the slope around the perimeter of the landfill. A machine produced straw /coir fiber erosion control blanket using 70 percent straw /30 percent coir fibers sewn into a heavy weight photo degradable top net and a medium weight photo degradable bottom net. Enviroscope SC3000 Double Net Straw, Greenfix America CFS072R, or other may be used. Submit product literature for approval prior to delivery to site.

2.05

AMENDMENTS / SOIL ADDITIONS

- A. All soil amendments shall be submitted and approved by the Engineer prior to use. Soil amendments shall be determined based on cover soils used and potential nutrient deficiencies with those soils. Amendments that might be used include:
 - 1. Fertilizer: Apply slow-release organic fertilizers such as Biosol Mix, Biosol, Osmocote, composted manure, or Engineer approved equal to minimize deficiencies of the topsoil. If composted manure is to be applied, test the nutrient content and interpret before it is used.
 - 2. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth.
 - 3. Wood chips: Wood chips shall have a relatively large surface area to volume ratio to be more easily broken down in the soil. Incorporate wood chips at low rates (0.5 ton/ AC) in order to assure the carbon to nitrogen ratio in soil is at favorable conditions for plant germination and growth. If higher rates are used, add nitrogen fertilizer to assure nutrient availability to plants.

PART 3 EXECUTION

3.01 PREPARATION

- A. Preparation of the surface to be seeded.
 - 1. If landfill surface has been compacted due to traffic or other, loosen the upper surface to a maximum depth of 4 inches to prepare it for seeding. Large clods and stones, or other foreign material should not be present on the landfill surface that could interfere with seeding equipment.
 - 2. Do not till on ground that is already loose to a depth of 2 in. or more.
 - 3. Do not do work when moisture content of soil is unfavorable or ground is otherwise in a non-tillable condition. To minimize dust problems for adjoining areas, do not till when wind speeds exceed 10 miles per hour (mph).
 - 4. The extent of seedbed preparation shall not exceed the area on which the entire seeding operation can be accomplished within a 24-hour period.
- B. Soil Amendments/Additions
 - 1. If soil amendments are used, uniformly apply to prepared seedbed in accordance with manufacturer recommended rates.
- C. Prepare seedbed again if prior to seeding, the Engineer determines that rain or some other factor has affected prepared surfaces and that it may prevent seeding to proper depth.
- D. On excessively steep slopes (steeper than 2:1), hydraulic/broadcast seeding may be appropriate. If seeding in this fashion, multiply application rate of seed by a factor of 2.
- E. If cover crop has been established in area to be seeded, mow cover crop early in growing season before cover crop is ready to drop seeds.

3.02 APPLICATION OF SEED

- A. General:
 - 1. **Avoid seeding between October 1 and April 15.** Provide for temporary soil stabilization measures between these dates. Do not seed during windy weather, or when topsoil is dry, saturated or frozen.

2. Equip seed boxes used for drill and broadcast seeding with an agitator.
 3. To prevent stratification of seed mix, do not run seed box agitators while seeding is not being performed.
 4. If seed mix is transported to site in a seed box or other equipment that subjects mix to shaking or similar movement that has the potential to cause stratification, remix seed prior to application.
 5. Seeding equipment shall be calibrated as appropriate to distribute seed at the specified rates.
 6. Unless otherwise shown on Drawings, seed areas disturbed by or denuded by construction operations or erosion.
 7. Use markers to ensure that no gaps will exist between passes of seeding equipment.
 8. If cover crop has been established, mow the crop and drill seed perennial seed mix into the crop stubble.
- B. Drill Seeding (drill seeding shall be utilized unless otherwise approved by the Engineer):

When drill seeding, plant seed mix at a rate of 30 - 35 PLS lbs./acre. Uniformly apply prescribed mix over area to be seeded as follows:

1. Accomplish seeding operations, where practical, by drilling in a direction across slope and along the contour.
 2. Plant seeds approximately 1/4 inch deep. Do not exceed 4 inches distance between drilled furrows. If furrow openers on drill exceed 4 inches, drill area twice to obtain a 4-inch distance between furrows.
 3. Seed with grass wheels, rate control attachments, seed boxes with agitators, and separate boxes for small seed.
 4. Once seed is applied, apply full complement of mulch. This shall allow seed to be in good contact with soil surface and not suspended in mulch matrix.
 5. Prohibit vehicles from traveling over the seeded areas.
- C. Broadcast Seeding (small areas may be broadcast seeded as approved by the Engineer):

When broadcast seeding, plant seed mix at a rate of 32 - 37 PLS lbs./acre.

1. Where it is not practical to accomplish seeding by drilling, mechanically broadcast seed by use of a hydraulic mulch slurry blower, rotary spreader, or a seeder box with a gear feed mechanism. If seeding is done with a slurry blower, use highest pressure and smallest nozzle opening that will accommodate the seed.
2. Immediately following seeding operation, thoroughly rake seedbed to provide approximately 1/4 inch of soil cover over of the seed.
3. If hydraulically applying mulch as part of the broadcast seeding process, use a 2-step process. Apply seed with a tracer. Once seed is applied, apply full complement of mulch. This shall allow seed to be in good contact with soil surface and not suspended in mulch matrix.
4. Prohibit vehicles from traveling over the seeded areas.

3.03 STRAW MULCH: for slopes flatter than 3:1, Non-irrigated Projects

- A. Apply straw mulch at a minimum rate of 1.5 tons per acre of air-dry material. Spread straw mulch uniformly over area either by hand or with a mechanical mulch spreader to achieve 80 percent ground cover. When spread by hand, tear

bales of straw apart and fluff before spreading. Depth of applied straw mulch shall not exceed 3 inches. Do not mulch when wind velocity exceeds 10 mph.

- B. Straw mulch shall only be used where use of crimping equipment is practical. Place mulch in manner noted above and anchor the straw into the soil to a minimum depth of 2 inches and not to exceed 3 inches. Use a crimper or heavy disc such as a mulch tiller, with flat serrated discs at least 1/4 inch in thickness, having dull edges, and spaced no more than 9 inches apart. Provide discs of sufficient diameter to prevent frame of equipment from dragging the mulch. Where practical, perform crimping in perpendicular directions. Do not use Sheep's Foot Rollers, heavy equipment tracks, and standard disc cultivators for crimping.
- C. If straw mulched areas cannot be anchored by crimping, use hydraulic mulch wood fibers with tackifier. Mix slurry in a tank with an agitation system and spray under pressure uniformly over the soil surface. Keep all materials in uniform suspension throughout the mixing and suspension cycle when using hydraulic mulching equipment. Mix 100 lb. of wood fiber with a minimum 150 lbs. to 200 lbs. of tackifier to anchor straw mulch. Apply mixture at a rate of 250 - 300 lbs./acre.
- D. Use both horizontal and vertical movements in the applicator to achieve an even application of the slurry material

3.04 HYDRAULIC MULCHING/TACKIFIER: for slopes flatter than 2:1, Irrigated Projects

- A. Mix slurry in a tank with an agitation system and spray, under pressure, uniformly over soil surface. Apply mulch evenly across landscape at a rate of 2000 lbs./ acre.
- B. Use both horizontal and vertical movements in applicator to achieve an even application of slurry material. Keep all materials in uniform suspension throughout mixing and suspension cycle when using hydraulic mulching equipment.
- C. When using plantago based tackifier as mulch, apply tackifier at a rate of 150 lbs./acre.
- D. Prohibit foot/vehicle traffic from hydraulically mulched areas.

3.05 EROSION CONTROL BLANKET

- A. Place blankets over native grass seeding immediately following the raking/chaining operation.
- B. Install per manufacturers recommendations

3.06 WATERING

- A. Where temporary watering is required for seeded areas, provide temporary water system which may be a sprinkler system, or a water truck with a spray boom or any other method satisfactory to distribute a uniform coverage of clean water (free of oil, acid, salt or other substances harmful to plants) to previously seeded and mulched areas.
- B. If a temporary sprinkler system is used, keep all pipe connections tight to avoid leakage and loss of water, and to prevent washing or erosion of growing areas. Maintain sprinklers in proper working order during watering.
- C. Do not drive trucks with spray systems on seeded areas and ensure water force does not cause movement of mulch or seed on the ground.

- D. Apply water at a maximum of 0.5 in. per hour for 2 hours. Additional applications of water may be made as designated by the Engineer.

3.07

MAINTENANCE

- A. Begin maintenance immediately after planting. Keep re-vegetated areas free of noxious weeds.
- B. Maintain seeded areas for not less than 60 days after final acceptance of work and longer as required to achieve final stabilization as described in Section 3.09 ACCEPTANCE.
- C. Reseed significant areas where vegetation has not been adequately established as determined by the Engineering Post-Closure Inspections to be performed.

3.08

CLEANUP AND PROTECTION

- A. Protect seeded areas, work and materials from damage due to vehicles, pedestrians, and operations by other subcontractors. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged work as directed.
- B. Upon completion of all seeding operations, clean the portion of the project site used for storing materials and equipment of all debris. Remove all superfluous materials and equipment from the project site. Sweep walks and pavement clean upon completion of work in this section.

3.09

ACCEPTANCE

- A. Seeded areas will be reviewed for acceptance by the Engineer when final stabilization has been achieved. Final stabilization is defined as “All soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of a minimum of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.” Stabilization shall be in conformance with the site approved Storm Water Pollution Prevention Plan (SWPPP), as applicable.

In the event that all other work required by the Subcontract is completed before final stabilization is achieved or because seasonal limitations prevent seeding, partial acceptance of the work shall be made with final acceptance delayed until satisfactory vegetative growth has been established.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 00 00

EARTHWORK

This Earthwork Specification covers only the earthwork in support of the Moab UMTRA Project Final Cover System conversion to an ET Cover, including the removal of the previously approved final cover and placement of the new ET Cover.

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Section Includes

1. All labor, materials, equipment, and incidentals necessary to perform excavation, backfill, fill, grading, and compaction required for completion of the work shown on the Drawings and specified herein. The work shall include, but not be limited to:
 - a. Dust Control.
 - b. Excavation of materials from the designated area.
 - c. Backfill of excavated areas designated.
 - d. Construction of the ET Cover system.
 - e. Subgrade preparation for the cover system, drainage channels, concrete structures, asphalt pavement.
 - f. Finish grading of the site.

1.02 RELATED SECTIONS

- A. Section 01330 Survey Data
- B. Section 01340 Shop Drawings, Samples, As-builts, and other Submittals
- C. Section 01400 Quality Control
- D. Section 02005 Surveying
- E. Section 02100 – Clearing and Stripping
- F. Section 02270 – Drainage Channels
- G. Section 02750 – Storm Drain System
- H. Section 02930 – Temporary Erosion and Sediment Control
- I. Section 02932 Seeding, Mulching, and Restoration
- J. SWPPP for Crescent Junction Disposal site.
- K. Construction Quality Assurance Plan (CQAP) for Crescent Junction Disposal Site ET Cover System, August 2021.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 1. ASTM D75 - Standard Practice for Sampling Aggregates
 2. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils

3. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
4. ASTM D1140 - Standard Test Methods for Amount of Material in Soils Finer than the No. 200 (75- μ m) Sieve
5. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method
6. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)
8. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
9. ASTM D3042 - Standard Test Method for Insoluble Residue in Carbonate Aggregates
10. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
11. ASTM D4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
12. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
13. ASTM D4373 - Standard Test Method for Rapid Determination of Carbonate Content of Soils
14. ASTM D4643 - Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
15. ASTM D5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
16. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.04

DEFINITIONS

A. Definitions pertinent to the earthwork requirements of this project include:

1. Excavation: Excavation is defined as excavation required to reach the lines and grades indicated on the Drawings or specified herein. It shall include excavation of soil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulders or detached pieces of solid rock.
2. Waste Materials Excavation: Any waste material excavation or contact with waste at the site shall be in accordance with the site safety and health plan.
3. Borrow Soils Excavation: Excavation of borrow materials including soil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulders and removal of detached pieces of solid rock carried out to reach lines and grades indicated on

the Drawings or specified herein. This excavation shall include excavations for cover and finish grading.

4. Over excavation: Over excavation is defined as excavation carried out beyond the lines and grades indicated on the Drawings or in the Specifications.
5. Percent Maximum Density: Percent maximum density is a percentage of the maximum density obtained by the test procedure presented in ASTM D698, as applicable.
6. Subgrade: when referencing the cover system, the subgrade refers to the top of the tailings and/or waste soils that were placed, graded, and/or compacted to be covered by the final cover system.
7. Subgrade Preparation: Subgrade preparation includes fine grading and compaction of excavations for the installation of the cover systems including drainage ditches, backfills, and cover upon which bedding materials, riprap, or other features are to be constructed.
8. Cover Soil: Cover soil shall consist of soil removed from the designated borrow source as shown on the Drawings.
9. Gravel/Soil Admixture: Also referred to as a 'Desert Pavement' is the top layer of the final cover system composed of a defined percent by volume of rock uniformly mixed with a defined percent of cover soil from the designated cover borrows source(s).
10. Unsuitable material – unsuitable material not meeting the requirements set forth herein for fill materials or as otherwise determined by the Engineer to be inappropriate and/or unacceptable for use. Unsuitable material shall be disposed of by the Contractor.
11. Common fill shall include satisfactory materials from site excavation or from approved borrow for general site grading, subgrade preparation, and other activities, as needed and as directed by the Engineer.
12. Gravel. Rock larger than #4 sieve (4.75 mm) is considered gravel.

1.05 SUBMITTALS

- A. All submittals shall be made in accordance with the requirements of the Project Submittal Specifications, Section 1340.
- B. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, filling, compaction, and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.
- C. Submit to the Engineer proposed mixing method to be utilized to uniformly mix the rock and cover soil for the top 'gravel/soil admixture' layer of the cover system.
- D. Submit to the Engineer proposed mixing method to be utilized to uniformly mix dissimilar soil textures for any layer within the cover system.
- E. Submit to the Engineer type of nutrient amendments proposed for cover soils deficient in the required nutrients and application methods. Refer to Specifications Section 02932.
- F. Dust Control Plan: Contractor to follow approved site dust control plan.

Part 2 PRODUCTS

2.0 COVER MATERIALS

A. General:

1. Cover soil materials shall be obtained from the borrow source(s) designated and approved by the Engineer.
2. All soil properties shall be submitted to the Engineer for approval. This includes as a minimum: grain size distribution (ASTM D422 and ASTM D1140) and moisture density relationship (ASTM D698). Other properties may be required by the Engineer.
3. The Contractor shall make his own determination of any processing that may be required, and shall perform testing as required to meet the Specifications for the various construction materials.
4. The Engineer shall be granted access to each proposed source to collect samples for testing. The Engineer may perform additional tests to determine if the materials meet the requirements specified herein.
5. Approval will be based on evidence of compliance with the requirements specified herein.

2.1 RRM MATERIAL

RRM material will consist of uranium mill tailings from the Moab Pile, off-pile contaminated soils, and demolition debris and other waste materials stored in the Pile at Moab. Most of the material will be uranium mill tailings, consisting of contaminated sands, slimes, intermediate material, and cover soil. The RRM material will be excavated, mixed and blended, dried to near optimum moisture content for compaction, loaded in containers, and shipped to Crescent Junction for disposal. Off-pile contaminated soil material will be excavated and hauled to the tailings pile and eventually mixed with the tailings. Demolition debris and other waste materials will be excavated, placed in containers, and shipped like the RRM material. In the waste cell, non-soil materials will be placed in the contaminated RRM fill in a manner that will not result in voids or differential settlement in the waste mass.

2.2 INTERIM COVER SOIL LAYER / ALLUVIUM SOIL LAYER

Interim Cover Soil will be soil from the excavation of the Crescent Junction waste cell. It will be material that has been produced on site by modifying the existing overburden soil and/or weathered Mancos Shale excavated on site. Overburden and weathered Mancos Shale shall be excavated, pulverized, wetted, and mixed to produce a uniform fine-grained soil dry of optimum moisture content for compaction. Soil shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size of 2 inch at the time of compaction, based on a visual inspection.

2.3 MANCOS SHALE LAYER

The Mancos shale layer is the layer constructed on top of the interim cover layer and the contaminated tailings material in the waste cell. The Mancos shale soil shall be produced by modifying the weathered Mancos Shale excavated on site. Weathered Mancos Shale shall be excavated, separated from other excavated materials, pulverized, wetted, and mixed to produce a uniform fine-grained fill soil at or below optimum moisture content for compaction. It shall be free of roots, debris, organic or frozen material, and shall have a maximum particle size of 3 inches at the time of compaction. Mancos shale fill soil used in the cover system shall comply with the criteria listed in Table 1. Testing of Mancos shale soil to verify conformance with the following table is described in Section 3.07 and 3.08.

Placement of Mancos shale will be visually inspected to make sure there are no locations where rock type particles accumulate in a concentrated location. Particles found in a concentrated location will be removed or reworked per QC direction.

Table 1. Required Physical Properties of Mancos Shale Cover Soil

Test Property	Test Value	Method
Max. particle size (inches)	3 in	ASTM D 422
Min. percent passing No. 4 sieve	80	ASTM D 422
Min. percent passing No. 200 sieve	50	ASTM D 1140
Min. liquid limit	30	ASTM D 4318
Max. liquid limit	50	ASTM D 4318
Min. plasticity index	10	ASTM D 4318
Max. plasticity index	40	ASTM D 4318

2.4 SURFACE ADMIXTURE LAYER

The surface admixture layer is the surface layer composed of a mixture of rock and alluvium soil at the ratio of 33% rock to 67% soil by volume. The rock for the final cover layers, infiltration and bio-barrier layer and rock armoring, shall be rock material that has long-term chemical and physical durability. The cover soil shall be that described in Section 2.2. The rock and soil shall be mixed with a method submitted to and approved by the Engineer prior to mixing.

2.4.1 Rock for final cover surface admixture layer shall achieve an acceptable score for its intended use, in accordance with the following rock scoring and acceptance criteria:

Table 2. NRC Table of Scoring Criteria for Rock Quality

Laboratory Test	Weighting factor													
	L*	S*	I*	10	9	8	7	6	5	4	3	2	1	0
Specific Gravity	12	6	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30	2.25
Absorption, %	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	3.5
Sodium Sulfate, %	4	3	11	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0	30.0
LA Abrasion, %	1	8	1	1.0	3.0	5.0	6.7	8.3	10.0	12.5	15.0	20.0	25.0	30.0
Schmitt Hammer	11	13	3	70	65	60	54	47	40	32	24	16	8	0

* L= Limestone; S = Sandstone; I = Igneous

Notes:

1. Scores were derived from Tables 6.2, 6.5, and 6.7 of NUREG/CR-2642, Long-Term Survivability of Riprap for Armoring Uranium Mill Tailings and Covers: A Literature Review, 1982.
2. Weighing Factors are derived from Table 7 of "Petrographic Investigations of Rock Durability and Comparisons of Various Test Procedures," by G.W. Dupuy, Engineering Geology, July 1965. Weighing factors are based on inverse of ranking of test methods for each rock type. Other tests may be used; weighing factors for these tests may be derived using Table 7, by counting upward from the bottom of the table.
3. Test methods should be standardized, if a standard test is available and should be those used in NUREG/CR2642, so that proper correlations can be made.

2.4.2 Rock Acceptance Criteria

An acceptable rock score depends on the intended use of the rock. The rock's score must meet the following criteria:

- For occasionally saturated areas, which include the top and sides of the final cover, the rock must score at least 80% or the rock is rejected. If the rock scores between 50% and 80% the rock must be approved by the Engineer and will require oversizing per the Engineer's instructions.
- For frequently saturated areas, which include all channels and buried slope toes, the rock must score 65% or the rock is rejected. If the rock scores between 65% and 80%, the rock may be used, but must be oversized. If the rock score is 80% or greater, no oversizing is required.

2.5 IMPORTED MATERIAL ACCEPTANCE

A. All imported materials specified in this section are subject to the following requirements:

1. All tests necessary for the Contractor to locate an acceptable source of imported material shall be made by the Contractor. Certification that the material conforms to the Specification requirements along with copies of the test results from a qualified independent testing laboratory shall be submitted to the Engineer for approval at least 20 days before the material is required for use. Samples shall be representative clearly marked to show the source of the material and the intended use on the project. Sampling of the material source shall be done by the Contractor in accordance with ASTM D75. Notify the Engineer or the Engineer's Field Representative (EFR) at least 24 hours prior to sampling. The Engineer may, at the Engineer's option, observe the sampling procedures. Tentative acceptance of the material source shall be based on an inspection of the source by the Engineer and/or the certified test results submitted by the Contractor to the Engineer, at the Engineer's discretion. No imported materials shall be delivered to the site until accepted in writing by the Engineer.
2. Classification tests shall be made by the Contractor on samples taken at the place of production prior to shipment. Samples of the finished product for gradation testing shall be taken from each 2,500 tons of prepared materials or more often as determined

by the Engineer, if variation in gradation is occurring, or if the material appears to depart from the Specifications. Test results shall be forwarded to the Engineer within 48 hours after sampling.

3. If tests conducted by the Contractor or the Engineer indicate that the material does not meet Specification requirements, material placement will be terminated until corrective measures are taken.
4. Material which does not conform to the Specification requirements and is placed in the work shall be removed and replaced at the Contractor's sole expense.
5. Sampling and testing performed by the Contractor shall be done at the Contractor's sole expense.

2.6 EQUIPMENT: All equipment to be used for the construction of the cover systems and related monitoring equipment must be submitted to and approved by the Engineer.

PART 3 EXECUTION

3.01 GENERAL

- A. All soils, waste material and fill materials shall be placed and compacted to the lines and grades shown on the Drawings. The cover layer thicknesses and slopes, as designated in these specifications and plans, shall be measured on final grade for each layer. Survey requirements shall be consistent with the Construction Quality Assurance Plan.
- B. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill materials.
- C. Place and spread subgrade materials in horizontal lifts (or lifts parallel to final slope) of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.
- D. Maximum loose lift thickness for subgrade soils to be compacted shall be 12-inches unless stated otherwise or approved by the Engineer.
- E. Subgrade soils to be placed and compacted as dry as possible while maintaining required minimum densities and dust control. The upper foot of subgrade soils shall be dry of their optimum moisture content as determined by ASTM D698 prior to placement of cover soil. Should these soils exceed this upper moisture content tolerance, the Contractor shall scarify these subgrade soils and allow them to dry or replace the clean subgrade soil and recompact prior to cover soil placement.
- F. The Contractor shall place material to a grade as described in the Drawings while maintaining a positive drainage off of the cover systems throughout construction to preclude the ponding of water. No fill shall be placed on any area where ponding has been allowed to occur. Where ponding has occurred and the subgrade soil is required to be placed, the water shall be removed and the subgrade reprocessed to a minimum of 95 percent of the maximum dry density and dry of the optimum moisture content per ASTM D698. Materials shall not

be placed on frozen subgrade or embankment material foundations, nor shall froze material be used as fill.

- G. Do not place fill if material is frozen, or if surface upon which fill is to be placed is frozen.
- H. Tolerances: The Contractor shall meet the following tolerances for thickness and grade. Tolerances will be verified by survey in accordance with the CQA Plan and Section 02005 Surveying.
- I. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on water quality.
- J. The Contractor is responsible for all stormwater damage including damage resulting from storms exceeding the 25-year, 24-hour storm event and shall carry All-Risk Builders Risk Insurance to cover such damage. Owner is not responsible for stormwater damage or delays.
- K. If any portion of the clean fill soil used as subgrade soil does not meet the specified requirements, the Contractor shall remove such material and replace it with fill materials meeting the specification at no additional cost. Material to be removed will be determined by the Engineer.

3.02 DUST CONTROL

- A. The Contractor shall comply with the site approved dust control plan.

3.03 PROTECTION

- A. Protect existing surface and subsurface features on-site and adjacent to site as necessary, in accordance with the approved site safety plan.

3.04 EXCAVATION

- A. Cap materials shall be soil material from the waste cell excavation. Materials shall be excavated, segregated into common fill and weathered Mancos Shale, and stockpiled for use as cap materials. Stockpiles shall be at locations shown in the project plans or as directed by the Project Manager.
- B. The Contractor shall execute all miscellaneous earth excavation related to specified tasks required under this contract.
- C. During construction, perform excavation in a manner and sequence that will provide proper drainage at all times.
- D. At all times during construction, provide and maintain proper equipment and facilities to remove all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The Contractor shall, where required, design a dewatering system to remove stormwater and prevent damages resulting from storm events. The Contractor shall submit to the Engineer for review the design of the dewatering systems prior to commencing work.
- E. Removal of dewatering equipment shall be accomplished after the system is no longer required.
- F. The Contractor shall perform required excavation to the lines and grades indicated on the Drawings. Where practicable and as approved by the Engineer, suitable

materials removed from excavation shall be used as fill in various areas of the site. Excavated material may be stockpiled for later use.

G. Preparation:

1. Required lines, levels, contours and datum shall be identified prior to the start of excavation.
2. Extracted soil, soil stockpiles, equipment, nor vehicles shall be allowed within 2 feet of an open excavation.
3. Unsatisfactory or Excess Materials: Unsatisfactory and excess excavated uncontaminated material generated during the Work and not approved for use in the Work shall be disposed of as directed by the Project Manager or Engineer.

3.05 COVER SOIL AND SUBGRADE MATERIAL PLACMENT

- A. Subgrade Soil Layer: Subgrade soil shall be compacted to a minimum of 95% of maximum dry density as determined by ASTM D698. Soil shall be placed in lifts not to exceed 1-ft and compacted to the highest density possible and determined by the Engineer. Quality assurance shall be performed on the upper foot for moisture and density criteria for the subgrade soils. The final grading of this subgrade soils shall be as designated in the Drawings and within the tolerances identified in this specification. Additionally, the subgrade soils shall be dry of the optimum moisture content as determined by ASTM D698 prior to placement of cover soil. Should these soils exceed this upper moisture content tolerance, the Contractor shall scarify these subgrade soils and allow them to dry or replace the clean subgrade soil and recompact prior to cover soil placement.
- B. RRM Material: RRM Material shall be placed dry of the optimum moisture content and compacted to a minimum of 90% of maximum dry density as determined by ASTM D698. Each lift of soil is to be dry of the optimum moisture content per ASTM D698 prior to placement of the subsequent lift of soil. Waste material shall be placed in lifts not to exceed 1-ft and compacted to the highest density possible and determined by the Engineer. Quality assurance shall be performed on the upper foot for moisture and density criteria for the subgrade soils. The final grading of this subgrade soils shall be as designated in the Drawings and within the tolerances identified in this specification. Additionally, the subgrade soils shall be dry of the optimum moisture content as determined by ASTM D698 prior to placement of cover soil. Should these soils exceed this upper moisture content tolerance, the Contractor shall scarify these subgrade soils and allow them to dry or replace the clean subgrade soil and recompact prior to cover soil placement.
- C. Interim Cover Soil: Interim Cover Soil shall be placed in loose lifts not to exceed 1-ft thick. The Interim Cover Soil shall be placed at a moisture content not to exceed the optimum moisture content and compacted to a 90% of the maximum dry density as determined by ASTM D698 (+/- 5 pcf). Each lift of soil is to be dry of the optimum moisture content per ASTM D698 prior to placement of the subsequent lift of soil. Quality assurance shall be performed on the upper foot for moisture and density criteria for the subgrade soils. The final grading of this Interim Cover soils shall be as designated in the Drawings and within the tolerances identified in this specification.

- D. Manco Shale Cover Soil: Mancos Shale Cover Soil shall be placed in loose lifts not to exceed 1-ft thick. The Mancos Shale Cover Soil shall be placed at a moisture content not to exceed the optimum moisture content and compacted to a 90% of the maximum dry density as determined by ASTM D698 (+/- 5 pcf). Each lift of soil is to be dry of the optimum moisture content per ASTM D698 prior to placement of the subsequent lift of soil. Quality assurance shall be performed on the upper foot for moisture and density criteria for the subgrade soils. The final grading of this Mancos shale Cover soils shall be as designated in the Drawings and within the tolerances identified in this specification.
- E. Alluvium Cover Soil: Alluvium Cover Soil shall be placed in loose lifts not to exceed 1-ft thick. The Alluvium Cover Soil shall be placed at a moisture content not to exceed the optimum moisture content and compacted to a 90% of the maximum dry density as determined by ASTM D698 (+/- 5 pcf). Each lift of soil is to be dry of the optimum moisture content per ASTM D698 prior to placement of the subsequent lift of soil. Quality assurance shall be performed on the upper foot for moisture and density criteria for the subgrade soils. The final grading of this alluvium cover soils shall be as designated in the Drawings and within the tolerances identified in this specification.
- F. Surface Admixture Cover Soil: In general, the surface admixture is to be placed in two separate lifts (placed cover soil and mixed in rock is one lift). Surface Admixture Cover Soil shall be placed in loose lifts not to exceed 1-ft thick. The soil shall be placed as dry as possible not to exceed the optimum moisture content per ASTM D698. The rock is then to be placed on top of this cover soil in a volume to meet the desired ration of 33% rock to 67% soil by volume. The rock is then to be mixed uniformly into the cover soil to the extent of the lift thickness and not beyond. The mixed layer is then to be compacted to 90% of the maximum dry density as determined by ASTM D698 (+/- 5 pcf). Each lift of soil is to be dry of the optimum moisture content per ASTM D698 prior to placement of the subsequent lift of soil. Quality assurance shall be performed on each lift for uniformity of rock / soil mixture, moisture and density criteria for the mixed soils. The final grading of this admixture soils shall be as designated in the Drawings and within the tolerances identified in this specification.
- G. Fill materials shall be placed in continuous and approximately uniformly thick layers for their full length and width unless otherwise specified. Backfill shall be completed in lifts not to exceed 1-ft in thickness.
- H. The method of dumping and spreading the materials shall ensure uniform distribution of the material.
- I. Construction: Shape subgrade to line, grade, and cross section in accordance with the plans and compact as specified. Shape the entire subgrade to line, grade, and cross section.
- J. If subgrade preparation is adversely affected prior to construction completion, the Contractor shall rework the subgrade soil or replace clean fill soil to meet specified requirements at the Contractor's expense. The repaired subgrade shall be approved by the Engineer before any work is placed thereon.
- K. Provide moisture control system necessary to successfully complete compaction and construction requirements.
- L. Any areas of subgrade damaged by traffic, erosion, settlement, or other cause, shall be repaired and the grades shown on the drawings shall be reestablished. Any exposed

subgrade, which exhibits desiccation cracking, shall be regraded and compacted prior to placement of any cover material.

- M. Field compaction and moisture testing shall be performed in accordance with ASTM D698 at a rate consistent with the CQAP. This testing will be performed on the top lift.

3.06 BACKFILLING-COMMON FILL

- A. Each layer of shaping fill materials leading to the final prepared subgrade shall be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D698. During compaction, the moisture content of shaping fill material shall be maintained to be dry of the optimum moisture content (ASTM D698).
- B. Field compaction and moisture testing shall be performed in accordance with ASTM D698 at rate consistent with the CQAP. This testing will be performed on the top lift.
- C. All lift surfaces must maintain a uniform slope.
- D. Fill placed at densities outside of the specified allowable density range or at moisture contents outside the specified acceptable range of moisture content shall be reworked to meet the density and moisture requirements or removed and replaced by acceptable fill compacted to meet these requirements.
- E. Satisfactory materials may be used for the construction of an adequate subgrade. Material conforming to the requirements of common fill shall be placed in lifts having a maximum thickness of 1-ft measured after compaction.
- F. Clods or hard lumps of earth exceeding 4 inches in greatest dimension shall be broken up or removed before compaction of the material.
- G. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making due allowance for settlement of the material.
- H. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the Drawings, and no soft spots or under compacted areas shall be allowed in the work. Refer to tolerances in Section 02005 Surveying.
- I. No compaction shall be performed when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.
- J. Backfilling shall not be performed when the soil is frozen.

3.07 COVER PLACEMENT

- A. There are two options for the cover profile depending on the location within the impoundment footprint. Profile 1 shall be used for cover slopes as designated in the drawings on the north slope and south slope length less than or equal to 1100 ft. Profile 2 shall be used as designated in the drawings on the south slope with slope length greater than 1100 ft. Cover soil placement specifics for each cover layer are described below:

3.07.1 **Profile 1 (as described in Design Report, Dwyer Engineering, August 2021):**

1. Bottom layer of cover profile. The bottom 1-ft of cover soil from the approved borrow source(s) shall be an interim cover as described in Section.2.2 and 3.05 (C).

- a. This soil is to be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
- b. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
2. Mancos Shale cover soil layer. Directly on top of the interim cover shall be A 3-ft thick layer of Mancos Shale as described in Section 2.3 and 3.05 (D). This layer is to be placed in three equal lifts.
 - a. This soil is to be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - b. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
3. Directly on top of the Mancos Shale layer shall be a layer of alluvium soil as described in Section 2.2 and 3.05 (E). The layer shall be 6-in of compacted soil.
 - a. This soil is to be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - b. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
4. The surface layer is to be an 18-inch-thick mixture of rock and cover soil as described in Section 2.4 and 3.05 (F).. This layer is to be placed in two equal lifts. Placement in one lift requires consent of the Engineer.
 - a. The rock shall be mixed with accepted cover soil to produce an erosion resistant gravel admixture top layer of the cover system. All rock testing and grain size distribution shall be submitted to the Engineer for approval.
 - b. The rock shall be D50 of 2-inches. The rock to soil ratio shall be 33% rock to 67% soil by volume.
 - c. The rock and soil are to be uniformly mixed prior to placement. The mixing method and location as well as equipment to be used are to be approved by the Engineer prior to commencing. Uniformity of rock to soil throughout the material to be placed and compacted on the final cover is critical. Quality assurance activities shall verify uniformity of mixing prior to placement on the final cover.
 - d. The rock/soil admixture shall be placed and compacted to the grades and depth shown on the Drawings. Positive drainage shall be maintained at all times.
 - e. The rock/soil admixture shall be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - f. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
 - g. At the discretion of the Engineer, the rock/soil admixture shall be scarified or disced to a depth not to exceed 6-in prior to seeding of the final cover after the final grades and depth have been accepted.

3.07.2 Profile 2 (as described in Design Report, Dwyer engineering, August 2021):

1. Bottom layer of cover profile. The bottom 1-ft of cover soil from the approved borrow source(s) shall be an interim cover as described in Section 2.2 and 3.05 (C).
 - a. This soil is to be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - b. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
2. Mancos Shale cover soil layer. Directly on top of the interim cover shall be A 3-ft thick layer of Mancos Shale as described in Section 2.3 and 3.05 (D). This layer is to be placed in three equal lifts.
 - a. This soil is to be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - b. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
3. The surface layer is to be an 2-ft-thick mixture of rock and cover soil as described in Section 2.4 and 3.05 (F).. This layer is to be placed in two equal lifts.
 - a. The rock shall be mixed with accepted cover soil to produce an erosion resistant gravel admixture top layer of the cover system. All rock testing and grain size distribution shall be submitted to the Engineer for approval.
 - b. The rock shall be D50 of 2.5-inches. The rock to soil ratio shall be 33% rock to 67% soil by volume.
 - c. The rock and soil are to be uniformly mixed in place. The mixing method and location as well as equipment to be used are to be approved by the Engineer prior to commencing. Uniformity of rock to soil throughout the material to be placed and compacted on the final cover is critical. Quality assurance activities shall verify uniformity of mixing prior to placement on the final cover.
 - d. The rock/soil admixture shall be placed and compacted to the grades and depth shown on the Drawings. Positive drainage shall be maintained at all times.
 - e. The rock/soil admixture shall be placed dry of the optimum moisture content as determined by ASTM D698. Quality assurance will verify the moisture content prior to placement of the subsequent lift of soil.
 - f. The compacted soil density is to be 90% of the maximum dry density as determined by ASTM D698. The tolerance for this placement density is plus or minus 5 pcf.
 - g. At the discretion of the Engineer, the rock/soil admixture shall be scarified or disced to a depth not to exceed 6-in prior to seeding of the final cover after the final grades and depth have been accepted.

3.08 SUMMARY OF COVER AND SUBGRADE/RRM CONSTRUCTION

All soils and gravel shall be approved by the Engineer brought to the site.

PROFILE 1 (as described in Design Report, Dwyer Engineering, August 2021)

Soil Property	Surface Layer Cover Rock/Soil Admixture	Middle Layer Alluvium Soil Layer	Middle Layer Mancos Shale Layer	Bottom Layer Interim Cover	Subgrade Soil/RRM
Depth	18 inches (minimum)	6 inches (minimum)	3-ft (minimum)	12 inches (minimum)	NA
Allowable soil texture	Alluvium soil from designated borrow source. Uniformly mixed with rock: 33% rock to 67% soil by volume. Rock: 2-inch dia. (d50) rock per Table 2.	Alluvium soil for designated borrow source.	Mancos Shale soil per Table 1.	Alluvium soil and/or Mancos shale soil from designated borrow source.	RRM and or subgrade soil
Allowable rock size	D50 of 2-in diameter	NA	NA	NA	NA
Max. object size	Soil - Nominally 4-in dia.	Nominally 2-in dia.	Nominally 3-in dia.	Nominally 2-in dia.	NA
Soil compaction	Moderate compaction	Moderate compaction	Moderate compaction	Moderate compaction	High compaction
Minimum	90% of maximum dry density (ASTM D698) less 5 pcf	90% of maximum dry density (ASTM D698) less 5 pcf	90% of maximum dry density (ASTM D698) less 5 pcf	90% of maximum dry density (ASTM D698) less 5 pcf	95% of maximum dry density (ASTM D698).
Maximum	90% of maximum dry density (ASTM D698) plus 5 pcf	90% of maximum dry density (ASTM D698) plus 5 pcf	90% of maximum dry density (ASTM D698) plus 5 pcf	90% of maximum dry density (ASTM D698) plus 5 pcf	No maximum
Soil moisture content	Dry of optimum moisture content (ASTM D698)	Dry of optimum moisture content (ASTM D698)	Dry of optimum moisture content (ASTM D698)	Dry of optimum moisture content (ASTM D698)	Dry of optimum moisture content (ASTM D698)
Minimum	No minimum other than minimizing dust during placement	No minimum other than minimizing dust during placement	No minimum other than minimizing dust during placement	No minimum other than minimizing dust during placement	No minimum other than minimizing dust during placement
Maximum	Optimum moisture content (ASTM D698)	Optimum moisture content (ASTM D698)	Optimum moisture content (ASTM D698)	Optimum moisture content (ASTM D698)	Optimum moisture content (ASTM D698)

3.09 GRADING

- A. Installation of cover material shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown or otherwise as directed by the Engineer. During the process of grading, the subgrade shall be maintained in such condition that it shall be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the work.
- B. If at the time of grading it is not possible to place any material in its proper location, it shall be stockpiled in approved areas for later use. No extra payment shall be made for the stockpiling or double handling of the excavated material.
- C. The Engineer reserves the right to make minor adjustments or revisions in lines or grades as necessary during the progress of the work.
- D. All cut and fill slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the Drawings or as directed by the Engineer.
- E. Grading Classifications - Operations, in areas designated for grading, shall comply with the following classifications, as specified on the Drawings.
 - 1. Rough Grading, when specified, shall produce reasonably uniform surface, free of major ruts, wind-rows and undulations. Rough grades shall match plan grades or contours within 0.5 foot.
 - 2. Fine Grading, when specified, shall produce a uniform ground surface, free of ruts, windrows, and undulations. Finish grades shall closely match plan grades or contours within a tolerance of 0.1 foot, except as otherwise indicated on the Drawings or Specifications, or otherwise indicated by the Engineer.

3.10 SLOPE SURFACE PREPARATION

- A. All slopes shall be constructed to the lines, grades, and elevations shown on the Drawings or as directed by the Engineer.

3.11 DISPOSAL OF SURPLUS MATERIAL

- A. No excavated materials shall be removed from the site or disposed of by the Contractor except as directed by the Project Manager or Engineer. Materials shall be neatly piled so as to minimize inconveniencing operations.
- B. Items and materials of salvage value as determined by the Engineer, unless incorporated in the new work, shall remain on the property of the Owner and shall be delivered to storage areas as directed by the Engineer. Such items and materials shall be carefully removed and delivered in such a manner as to permit reuse.

3.12 SAFETY

- A. The Contractor shall ensure full compliance with applicable requirements of OSHA and the site approved HASP.
- B. Special attention is directed to Title 29 Labor, Part 1518, "Safety and Health Regulations for Construction" and detailed requirements of Subpart P "Excavations, Trenching and Shoring."
- C. Comply with local and specific requirements of the State of Utah.

3.13 TEMPORARY STOCKPILING

- A. Contractor may temporarily stockpile materials at a staging location approved by the Engineer in the vicinity of the cover system or construction areas. Confine stockpiles to approved locations only. Do not obstruct roads or streets.
- B. Material shall be placed in temporary stockpiles as follows:
 - 1. Place material in maximum 2-foot lifts and compact with a minimum four passes with earth-moving equipment.
 - 2. Maximum slopes shall be 3H:1V. Minimum slopes shall be 3 percent to promote drainage.

3.14 STOCKPILE ACCESS AND EXCAVATION

- A. Always keep stockpile neat and orderly and work there in a systematic manner. Take necessary precautions to maintain existing erosion and dust control measures and prevent offsite sediment and dust releases.
- B. When work is completed in the stockpile area, grade area to drain surface water runoff to appropriate collection and discharge points.

3.15 CLEANUP AND DISPOSAL

- A. Garbage, refuse, debris, oil, and any waste material which is generated by the Contractor and is harmful to the environment or offensive to the area shall be removed from the job site and disposed of offsite in a manner approved by the authority having jurisdiction over the disposal site.
- B. Disposal of Materials
 - 1. The Contractor shall dispose of all vegetative materials off-site or as directed by the Engineer or Owner.
 - 2. Burning of cleared and grubbed materials shall not be permitted.

PART 4 QUALITY CONTROL/QUALITY ASSURANCE

4.01 QUALITY CONTROL

A. General

1. Unless otherwise indicated, all laboratory and field testing shall be performed by an independent geotechnical testing laboratory (GTL) employed by the Contractor, with test materials furnished by the Contractor under the direction of the Engineer. The GTL proposed by the Contractor shall be reviewed and approved by the Engineer. The laboratory shall, at a minimum, be in compliance with ASTM D3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rocks as Used in Engineering Design and Construction.
2. The Contractor shall test materials as set forth in the applicable referenced sections and as required herein.

B. Preconstruction Material Testing Requirements

1. Only approved borrow sources shall be used for cover soil. Should other borrow sources need to be used or evaluated, the Contractor shall arrange for an inspection by the Engineer of each proposed borrow source prior to the commencement of earthwork operations. During said inspection, the Contractor shall provide any equipment necessary to excavate test pits throughout the limits of the proposed source so as to provide the Engineer with a thorough inspection of the type(s) and uniformity of material(s) throughout the proposed source. Upon the Engineer's visual inspection and preliminary acceptance of a proposed borrow source, the Contractor shall collect representative samples of the borrow soils for subsequent geotechnical testing in accordance with the approved CQAP. Tests identified in the CQAP can be altered or changed at the discretion of and as directed by the Engineer.
2. The Contractor is required to submit representative samples of each proposed borrow material to the GTL at the minimum frequencies specified in the CQAP. The physical property tests shall be completed for each sample and the material approved prior to use of the material at the site. The Contractor shall complete all testing on materials prior to delivery to the site at the frequency specified in the CQAP. Cover materials (soil and rock) must be pre-approved prior to delivery to the site. Additional quality control testing will be performed on samples of delivered material. If, during the course of construction, an alternative borrow source is used, the material must be pre-approved by the Engineer in accordance with the requirements of this Specification prior to delivery to the site.
3. The results of this preconstruction testing program shall be submitted to the Engineer for approval at least two (2) weeks before use of these soils at the site. These test results may be applied toward the test frequency requirements. Physical specimens of all proposed foreign borrow materials shall also be submitted to the Engineer, if requested. The Engineer shall have the authority to reject any and all soils that are believed to be inappropriate for earthwork construction.

C. Field Quality Control Testing Requirements

1. The Contractor shall provide all horizontal and vertical controls necessary for all earthworks as well as associated grid layout and staking using benchmarks and monuments, if any, shown on the Drawings and required by these Specifications.

2. Placing soil material and performing earthworks will be subject to periodic QA inspection by the Engineer. The GTL shall provide continuous quality control (QC) inspection including field moisture and density tests during the compaction of each lift of soil in accordance with the CQAP. The Contractor shall also provide labor and equipment to prepare smooth surface spot locations as designated by the independent GTL or the Engineer on which to perform field tests.
3. Following the placement and compaction of each lift of soil, said lift shall be tested in accordance with the CQAP to determine the in-place compacted dry density and moisture content of the in-place soils, and to determine conformance of these data with the project specifications, before subsequent lifts are placed.
4. Tests outside of the window shall be considered failing unless otherwise approved by the Engineer. Deficient areas shall be recompacted in accordance with approved techniques as stated herein.
5. The Engineer may direct the Contractor to provide inspection trenches or test pits be cut into the designated borrow area(s) prior to this soil's removal or into the cover system after installation to determine that the Specifications have been met. Such trenches or pits will be of limited depth and size, and shall be backfilled with the material excavated there from, or other fill material meeting the requirements for the zones cut into. Backfill shall be compacted to a density equal to that of the contiguous fill.

END OF SECTION