Dwyer Engineering LLC

Crescent Junction Disposal Site

ALTERNATIVE FINAL COVER SYSTEM CONSTRUCTION QUALITY ASSURANCE PLAN (CQAP)

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Submitted to North Wind Portage

Crescent Junction Disposal Site

Alternative Final Cover System
Construction Quality Assurance Plan (CQAP)
60% Draft Submittal

PREPARED FOR:

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

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ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AMRL	AASHTO Materials Reference Laboratory
ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
CQA	Construction Quality Assurance
CQAP	Construction Quality Assurance Plan
CQC	Construction Quality Control
CY	cubic yard(s)
DOE	U.S. Department of Energy
ESH&Q	Environment, Safety, Health, and Quality
ET	evapotranspiration
FCD	Federal Cleanup Director
ft	foot or feet
MAX	maximum
MDD	maximum dry density
MIN	minimum
NNSA	National Nuclear and Security Administration
in.	inch(es)
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PLS	pure live seed
QA	Quality Assurance
QC	Quality Control

CHANGE SUMMARY PAGE

Procedure/Plan No: CQAP – Crescent Junction Disposal Site: Final Cover System

Change No.	Date	Affected Page(s)	Change Summary
REV. 0	08/2021	ALL	Original Issuance

1.0 Introduction

This document contains the Quality Assurance (QA) requirements for construction of the final cover system referred to as an evapotranspiration (ET) cover for the Crescent Junction Disposal Site. QA is a planned system of activities that provides the owner/operator and permitting/licensing agency documentation that the facility was constructed as specified in the design. The QA requirements summarized in this Plan shall be followed unless otherwise directed by the U.S. Department of Energy (DOE).

The disposal cell is being constructed under the DOE Moab Uranium Mill Tailings Remedial Action (UMTRA) Project. The purpose of the disposal cell is to isolate and stabilize uranium mill tailings and other contaminated materials, known as residual radioactive material (RRM), removed from the former mill site in Moab, Utah. The disposal cell is designed to be effective for 1,000 years to the extent reasonably achievable, with a minimum performance period of 200 years.

1.1 Purpose and Scope

The purpose of this CQA/QC Plan is to address the Construction Quality Assurance (CQA) and Construction Quality Control (CQC) procedures and requirements to be used during construction activities at the site in order to assure that the project is constructed in conformance with the submitted Technical Specifications and Drawings, as well as applicable regulatory requirements and permit conditions. The CQA/QC Plan, herein referred to as the CQAP, is intended to: (1) define the individuals and organizations who will be involved in construction activities and their respective responsibilities and qualifications; (2) establish guidelines for the flow of information and project communication; (3) establish protocols for project documentation; and (4) establish specific CQA/QC procedures for the major components of the project.

This CQAP addresses construction of the following:

- Removal of existing cover system (where applicable)
- Borrow areas and stockpiles (if any)
- Diversion channels
- Construction of an ET soil cover for the disposal site
- Construction of runoff control and diversion channels as necessary
- Seeding of ET cover system.

1.2 Definition of Terms

In the context of this CQAP, the following definitions apply:

Construction Quality Assurance (CQA): A planned and systematic pattern of means and actions designed to assure adequate confidence that the materials or services meet contractual and regulatory requirements and will perform satisfactorily in service. CQA refers to the means and actions employed by the involved parties to assure conformity of the project work with this CQAP, the

Drawings, and the Technical Specifications. These actions are under the control of the owner and/or Design Engineer. The owner will likely not employ a separate team to validate CQC findings. Thus, the actual quality performed on this project will all be under the direction of the Site Contractor chosen by DOE to perform Moab/Crescent Junction closure activities and will be referred to simply as CQA. This Contractor is North Wind Portage, Inc.

Construction Quality Control (CQC): Actions that provide a means to measure and regulate the characteristics of an item or service in relation to contractual and regulatory requirements. CQC refers to those actions taken by the Contractor, technicians, or other involved parties to verify that the materials and the workmanship meet the requirements of this CQAP, the Drawings, and the Technical Specifications. These activities are under the control of the Contractor performing the work activities.

Technical Specifications (60% Draft, Dwyer Engineering August 2021): The document that prescribes the requirements and standards for the specific elements of the design. The Technical Specifications will be prepared in final form prior to commencement of construction activities.

Drawings (60% Draft, Dwyer Engineering August 2021): The detailed project drawings to be used in conjunction with the Technical Specifications. These drawings will be prepared in final form as construction drawings prior to commencement of construction activities.

Construction Project: The total authorized/approved project that requires several construction segments to complete.

Construction Segment: A portion of the total construction project involving a specific area or type of work. Several construction segments will likely take place simultaneously during the project.

Construction Task: A basic construction feature of a construction segment involving a specific construction activity.

ASTM Standards: The latest versions of the American Society for Testing and Materials (ASTM) specifications, procedures, and methods.

1.3 Involved Parties and Personnel

Each construction task within each segment of the overall project will consist of a CQA component and compliance reporting that will be completed for each segment. Upon completion of all project segments, a Construction Completion Report will be prepared by the Design Engineer. Following is a listing of the parties (organizations and individuals) that will be involved in the implementation of the CQAP during work activities at the Site, including a discussion of each party's responsibility, authority, and qualifications.

1.4 Personnel Qualifications

An important factor in assessing the quality of any cover system installation is the degree to which key personnel involved in the process are qualified to perform the required tasks. QA and QC personnel must be familiar with:

1. The project's design, including plans and specifications
2. Project layout
3. Materials to be used
4. Drainage control features
5. Soil borrow materials
6. Construction procedures, complications, schedule, and equipment
7. Material placement techniques and requirements
8. Equipment to be used and its capabilities
9. Site-specific complications/concerns.

A copy of the site-specific drawings and specifications, CQAP, and QA and QC documentation reports shall be retained at the facility. The CQAP shall include a detailed description of all QA/QC activities to be used during materials inspection and construction to manage the installed quality of the covers and associated facilities.

Refer to Figure 1 for the communication and authority hierarchy for the following project personnel.

1.5 Federal Cleanup Director

The disposal cell is being constructed under the DOE Moab Uranium Mill Tailings Remedial Action (UMTRA) Project. The federal cleanup director (FCD) for the Moab project is Russell McCallister (Russell.McCallister@emcbc.doe.gov), 200 Grand Ave. Suite 500, Grand Junction, CO 81501, Ph: 970-257-2115. The FCD has authority over the entire project.

1.6 Contractor

Responsibility & Authority: The Contractor refers to the company contracted by the DOE to manage the Moab and Crescent Junction sites. The Moab Remedial Action Contract (RAC) contractor is North Wind Portage, Inc., contracted to perform the construction work in accordance with this CQAP, the Drawings, and the Technical Specifications. The Contractor will work under the direction of and report directly to the FCD. The Project Manager is the Contractor responsible party.

1.7 Project Manager

Responsibility & Authority: The Project Manager is responsible for the conduct, direction, and supervision of all Crescent Junction Disposal Site closure activities. The Project Manager is Greg Church (gchurch@northwindgrp.com), North Wind Portage, Inc., 200 Grand Avenue, Suite 500, Grand Junction, CO 81501, Ph: 970-

257-2117. He is responsible and accountable for all aspects of the RAC portion of the project, including health and safety, quality, budget, cost, and schedule. As the Program Manager, Mr. Church leads a multi-disciplined team comprised of about 150 personnel with responsibility for remediating about 17 million tons of RRM and debris from the Moab site; excavating, blending, conditioning, and removing RRM; constructing and expanding an NRC disposal cell; transporting the radioactive material from Moab to the disposal cell in Crescent Junction; operating and maintaining the disposal cell and the site infrastructure at both Moab and Crescent Junction sites; performing interim cap/cover of the disposal cell; and designing and supporting construction of a final cover over the cell. The Project Manager will interact as required with all parties involved in implementing the reclamation, including the Design engineer, CQA/QC personnel, and the DOE FCD. The Project Manager will report directly to the FCD.

1.8 Site Operations Manager

Responsibility & Authority: The Site Operations Manager will provide day-to-day, on-site oversight of closure activities, including the CQA/QC activities. The Site Operations Manager will report directly to the Project Manager. The Site Operations Manager is Mike McCullough (mike.mccullough@gjemrac.doe.gov), North Wind Portage, Inc., Railroad Rd., Thompson Springs, UT 85450, Ph: 435-564-3298.

1.9 Design Engineer

Responsibility & Authority: The Design Engineer is responsible for the design of the various elements of the ET Cover for closure of the Crescent Junction Disposal Site and for preparing the applicable engineering documents such as the Drawings and Technical Specifications. Throughout the cover project, the Design Engineer will interact as necessary with the FCD, CQA/QC staff, and North Wind Portage personnel. The Design Engineer (as approved by FCD and Project Manager) will approve all design changes that arise during the course of the Project. The responsible Design Engineer is Stephen F. Dwyer, PhD, PE, Dwyer Engineering LLC, (dwyerengineering@yahoo.com) 1813 Stagecoach Rd SE, Albuquerque, NM 87123; Ph: 505-270-0215.

1.10 ESH&Q Manager

Responsibility & Authority: The Environment, Safety, Health, and Quality (ESH&Q) Manager will lead and oversee all aspects of the project's Environmental Compliance, Safety and Health, Quality Assurance/Control, and Radiation Protection programs, including providing direction, supervision, and leadership for ESH&Q personnel; ensuring ESH&Q Programs, Procedures, and Processes are maintained in compliance with all contractual and legal requirements; and providing liaison and coordination with all ESH&Q personnel. The ESH&Q Manager is Neil Kiely (nkiely@northwindgrp.com), North Wind Portage, Inc., Railroad Rd., Thompson Springs, UT 85450, Ph: 865-413-1021.

1.11 CQA Manager

Responsibility & Authority: The CQA Manager will provide day-to-day, on-site oversight of the CQA/QC activities. The CQA Manager is Kathy Turvy (kathy.turvy@moabem.doe.gov), North Wind Portage, Inc., 2021 N. Highway 191, Moab, UT 84532, Ph: 435-719-2830. The CQA Manager will report directly to the Project Manager or ESH&Q Manager, and will interact with the Design Engineer and others as project activities take place. The CQA Manager will maintain a thorough understanding of the Crescent Junction Disposal Site project design documents, including the Drawings, Technical Specifications, and this CQAP. She will be responsible for notifying the Project Manager and Design Engineer immediately if controls, tests, or records are not conforming to the CQAP, the Construction Plans, or the Technical Specifications. The approval of the CQA Manager is mandatory for all Test Result Reports required in this CQAP. Specific responsibilities of the CQA Manager will include the following:

1. Attend all CQA-related meetings, including Project Kickoff and Pre-Construction Meetings.
2. Provide direct oversight of any CQC activities.
3. Assign locations for testing and sampling.
4. Observe the collection of laboratory test samples.
5. Review results of field and laboratory testing and any test results provided by the Contractor and make appropriate recommendations.
6. Review the calibration and condition of on-site testing equipment, and Contractor's equipment documentation.
7. Report any deviations from the CQAP, Drawings, or Technical Specifications to the Project Manager and arrange consultation with other parties as necessary to find solutions to unsolved problems.
8. Prepare a daily field report for submittal to the Project Manager.
9. Administer the CQC testing program (i.e., provide supervision of and manage all CQC personnel and activities).
10. Provide and document all necessary training and certifications for CQC personnel.
11. Review and approve the Contractor's CQC Plan(s), if applicable.
12. Attend Project Kickoff and Pre-Construction Meetings, and make site visits as needed.
13. Perform ongoing, timely review of all CQC documentation and provide signature on all CQC documentation.

1.12 CQC Consultant (To Be Determined)

Responsibility & Authority: The CQC Consultant is responsible for observing and documenting the various activities comprising the Project in accordance with this CQAP, the Technical Specifications, and the Drawings. Testing may include field and laboratory testing of various construction materials to be used on the project. The CQC Consultant will be responsible for issuing at designated intervals a report that will document construction and associated CQC activities. The CQC Consultant will work in coordination with the Contractor, CQA Manager, and Design Engineer.

Qualifications: The CQC Consultant shall be a well-established firm specializing in geotechnical and reclamation engineering that possesses the equipment, personnel, and licenses necessary to conduct the observation and testing required. The CQC Consultant will be experienced with earthwork, revegetation, and other reclamation activities. The CQC Consultant will be experienced in the preparation of CQC documentation, including field documentation, field testing procedures, laboratory testing procedures, and CQC reports.

1.13 CQC Technicians

Responsibility & Authority: The CQC Technicians will perform and document specific QC tasks throughout the project to verify the adequacy of construction materials and procedures. The CQC Technicians will be retained by the Contractor and work under the direct supervision of the Contractor and the CQA Manager.

1.14 CQC Laboratory (To Be Determined)

Responsibility & Authority: The CQC Laboratory is a party, independent from the Site Owner and Contractor, responsible for conducting tests of soils and other project materials in accordance with ASTM and other applicable standards in either an on-site or off-site laboratory. More than one CQC Laboratory may be used to perform testing during work activities, depending upon the material being tested. The CQC Laboratory will work in coordination with other personnel and will report results directly to the CQC Consultant.

Qualifications: The CQC Laboratory will be an American Association of State Highway and Transportation Officials (AASHTO) Materials Reference Library (AMRL) accredited laboratory in testing soils and rock using the ASTM standards outlined in the Technical Specifications and this plan. The CQC Laboratory will be capable of providing test results within a maximum of 7 days of receipt of samples and will maintain that capability for the duration of the project.

2.0 Project Communication

2.1 Flow of Information

Effective communication is necessary to ensure a high degree of quality during installation of the Alternative Final Cover System project at the Crescent Junction Disposal Site. Specific meetings of key project personnel will take place, including a Pre-Bid Meeting, Resolution Meeting, Pre-Construction Meeting, weekly Progress Meetings, and Problem or Work Deficiency Meetings. In addition, informal communication and cooperation will take place between the various parties listed in Section 1. The organizational chart showing the proposed lines of communication between the various parties is shown in *Figure 1, Project Organization*. The planned project meetings are described in the following sections.

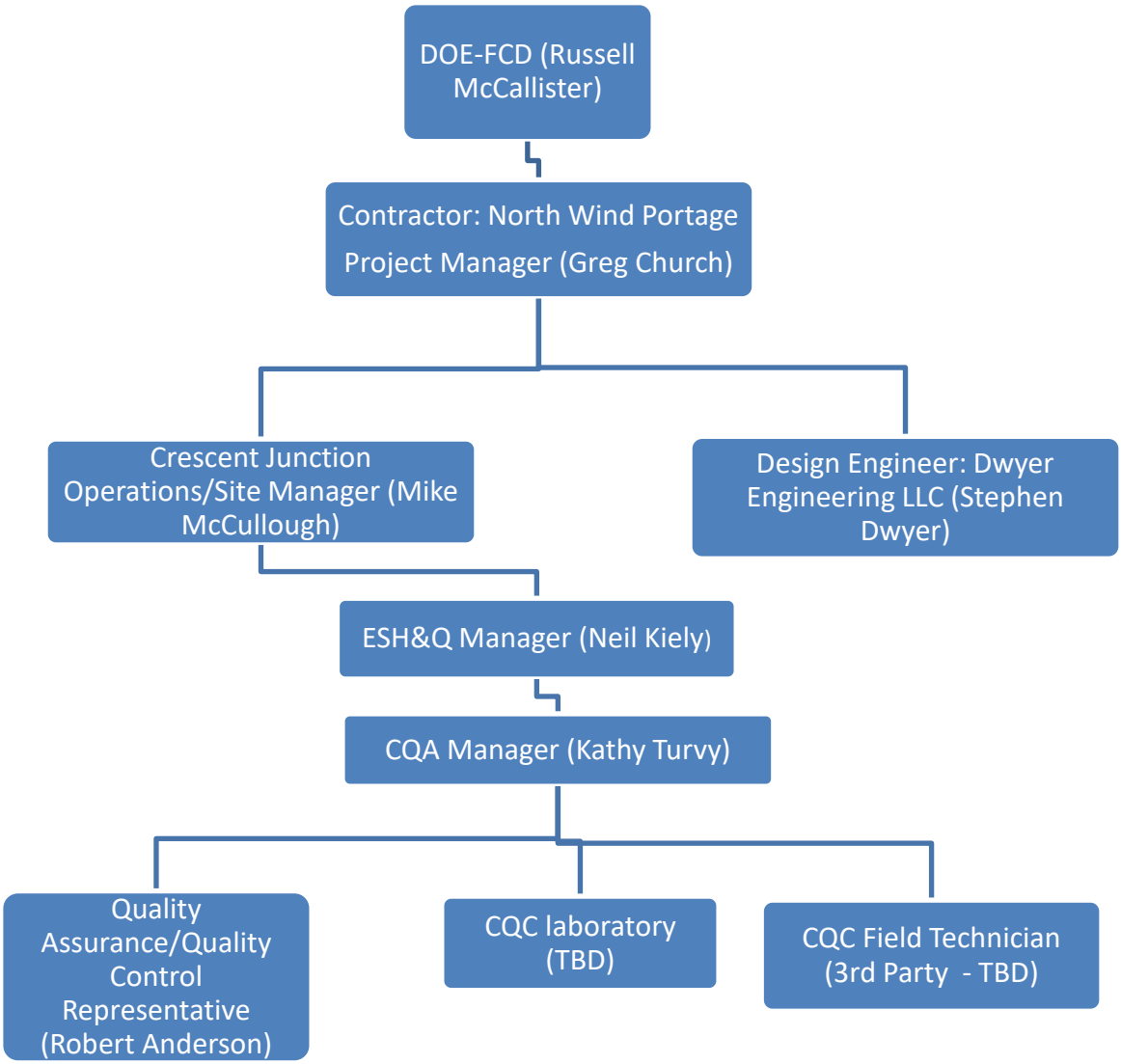

Figure 1. Project Organization

2.2 Project Kick-Off Meeting

A project Kick-Off Meeting will be performed prior to the commencement of converting the final cover system for the Crescent Junction Disposal Site from a rock cover to an ET cover. The objectives of the Kick-Off Meeting are to establish lines of communication, review construction plans and specifications, emphasize the critical aspects of the project needed to achieve proper quality, begin planning and coordination of tasks, identify potential factors that might cause difficulties or delays in construction, and rectify any identified problems with the CQAP or other design documents. The meeting shall be attended by appropriate DOE personnel, the project's Design Engineer, Project Manager, ESH&Q Manager, CQA Manager, and designated representatives of the Contractor.

The meeting shall cover the following activities:

- An individual shall be assigned to take minutes.
- Individuals will be introduced to one another along with identification of their project responsibilities (or potential responsibilities).
- Copies of the project plans and specifications shall be made available for group discussion.
- The CQAP can be distributed.
- Copies of any special permit restrictions that are relevant to construction or QA shall be distributed.
- The plans and specifications shall be described, along with unique design features (so the contractors would understand the rationale behind the general design), potential construction problems, and questions will be answered from any of the parties concerning the construction.
- The CQAP shall be reviewed and discussed, with the Design Engineer and CQA Manager outlining their expectations and identifying the most critical components of their project participation.
- Procedures for quality control proposed by installers and contractors shall be reviewed and discussed.
- Corrective actions to resolve potential construction problems shall be discussed.
- Procedures for documentation and distribution of documents shall be discussed.
- Each organization's responsibility, authority, and lines of communication shall be discussed.
- Suggested modifications to the CQAP that would improve quality management on the project shall be solicited.
- Climatic variables (e.g., precipitation, wind, temperature) that might affect the construction schedule shall be discussed.
- Reporting procedures, distribution of documents, the schedule for routine project meetings, and resolution of construction problems shall be discussed.

- Site requirements and logistics, including safety procedures, shall be reviewed.
- The project design, critical construction aspects, and scheduling and sequencing issues shall be reviewed.
- Quality control procedures to be employed by suppliers and subcontractors contracted to the general contractor shall be discussed.
- Quality control procedures to be employed by the installer or contractor shall be discussed.
- A list of action items requiring resolution and assigning responsibilities for these items shall be compiled.

Familiarizing all project participants with inspection and testing procedures and the criteria for pass/fail decisions (including the resolution of test data outliers) is a key objective of this meeting. Additionally, it is imperative that all parties understand the key problems QA personnel have identified and that all parties fully understand their roles and responsibilities and the procedures regarding problem resolution.

2.3 Progress Meetings

Progress meetings will be held weekly at the site or by teleconference, including the DOE FCD designated representative, Design Engineer, Site Operations Manager, CQA Manager, Project Manager, and other concerned parties participating in project construction. This meeting will include discussions of the current project progress, planned activities for the next week, and revisions to the work plan or schedule. The Project Manager will appoint an individual to document the meeting and send meeting minutes to all attendees for review and comment.

At times, additional progress meetings can be called at the discretion of the FCD, Design Engineer, Project Manager, and/or CQA Manager. Meeting attendees shall be those involved in the specific issues being discussed.

2.4 Problem or Work Deficiency Meetings

It is anticipated that most work deficiencies will be minor and can be resolved in the field by the CQC Technicians, CQA Manager, and Design Engineer. The deficiency and resolution will be recorded in the daily field reports and weekly summary reports prepared by the CQA Manager.

A special meeting will be held when and if a problem or deficiency is present, or likely to occur, that cannot be easily resolved in the field. The meeting will be attended by the Project Manager, CQA Manager, Design Engineer, and other parties as appropriate. If the problem requires a design modification, the Design Engineer and/or DOE FCD should either be present at, consulted prior to, or notified immediately upon conclusion of this meeting. The Project Manager will appoint an individual to record the meeting and send meeting minutes to all attendees for review and approval. The purpose of the work deficiency meeting is to define and resolve the problem or work deficiency as follows:

1. Define and discuss the problem or deficiency;

2. Identity cost and schedule issues;
3. Review alternative solutions;
4. Select a suitable solution agreeable to all parties; and
5. Implement an action plan to resolve the problem or deficiency.

2.5 Sample Custody

All samples shall be identified and described. Whenever a sample is taken, a chain of custody record shall be made for that sample. If the sample is transferred to another individual or laboratory, records of the transfer shall be established so that a chain of custody can be traced. The purpose for the records of sample custody is to assist in tracing the cause of anomalous test results or other testing problems, and to minimize the potential for accidental sample loss.

2.6 Weather

Weather can play a significant factor in construction activities and material placement during cover installation. The contractor or installer is responsible for complying with the contract plans and specifications (along with the quality control for the various components of the cover system). Specifications shall include restrictions on weather conditions for certain construction activities such as soil placement where dry soil placement is critical. The contractor or installer is responsible for ensuring that these weather restrictions are served during construction.

2.7 Work Stoppages

Unexpected work stoppages can result from a variety of causes. The CQA Manager shall be careful during any work stoppages to determine: (1) whether in-place materials were covered and protected from damage, (2) whether partially covered materials were adequately protected, and (3) whether manufactured materials were properly stored and properly or adequately protected from the elements. In essence, the cessation of construction during work stoppages does not mean that QA inspection and documentation temporarily ceases.

3.0 Project Documentation

In addition to ensuring the correct installation of the cover system, another major intent of the QA process is to provide documentation of the construction process. The CQA Manager will be responsible to prepare documentation which demonstrates that quality requirements have been addressed and satisfied. ***All QC testing will be made available to the CQA Manager for concurrence.*** Documentation may include monitoring logs, testing data sheets, photo logs, equipment calibration forms, daily field reports, weekly summary reports, reports of design or specification changes, and a final CQA Report. All documentation will be maintained in the project files and will be available to the DOE FCD, Design Engineer, and Project Manager at all times. The CQA Manager and Project Manager will be responsible for preparing or approving all necessary forms that will be required throughout the Project. These forms will be used to document CQA activities.

Daily reporting and documentation procedures shall be required. The CQA Manager shall prepare daily written inspection reports that are to be included in the final QA documentation. The daily reports shall include information about the work accomplished, tests performed, and observations made, along with descriptions of the adequacy of the work completed.

All documentation created as a result of compliance with this plan is considered a Project record and will be managed in accordance with the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), which follows DOE orders, policies, and regulations for retention and maintenance of records.

3.1 Daily Summary Reports

A daily written summary is to be prepared by the CQC Consultant. These reports provide a chronological framework for identifying and recording all other reports and aids in tracking what activities/tasks were completed and by whom. At a minimum, the daily summary reports shall include the following:

- Date, project name, location, construction observed, personnel involved in major activities, and other relevant identification information.
- Description of weather conditions, including temperature, cloud cover, and precipitation.
- Summaries of any meetings held and actions recommended or taken.
- Specific work segments and locations of construction under way during that particular day.
- Equipment and personnel being utilized in each work task, including subcontractors.
- Identification of areas or units of work being inspected.
- Description of off-site materials received, including any quality control data provided by the supplier.
- Calibrations or recalibrations of test equipment, including actions taken as a result of recalibration.

- Decisions made regarding approval (or disapproval) of units of material or of work and/or corrective actions to be taken in instances of substandard or suspect quality.
- Inspection data sheets and/or problem reporting and corrective measures used to substantiate any QA decisions described in the previous item.
- Signature of the CQC Consultant.
- Any other pertinent information.

3.2 Testing Reports

All observations, results of field tests, and results of laboratory tests performed on- or off-site shall be recorded on a data sheet. Recorded observations and test results can take the form of notes, charts, sketches, or photographs, or a combination of these.

At a minimum, the inspection data sheets shall include the following information:

- Project name and date of inspection.
- Description or title of the inspection activity.
- Applicable section(s) of Technical Specifications.
- Location of the inspection activity or location from which the sample was taken.
- Type of inspection activity and procedure used (reference to standard method when appropriate or specific method described in CQAP).
- Recorded observation or test data.
- Results of the inspection activity (pass/fail); comparison with specification requirements.
- In addition to the individual preparing the data sheet, identification of all personnel involved in the inspection.
- Signature of the CQC Technician and review signature by the CQA Manager.

3.3 Field Change Reports

A problem is defined as material or workmanship that does not meet the requirements of the plans, specifications, or CQAP for a project or any obvious defect in material or workmanship (even if there is conformance with plans, specifications, and the CQAP). Changes that do not alter the intent of the Construction Plans or Technical Specifications, or affect the cost or schedule of the project, may be made during construction in order to fit field conditions. Field changes require the approval of the Project Manager, Design Engineer, and CQA Manager. Field changes are to be reported on Form No. 2 (included in Appendix A). At a minimum, problem identification and corrective measures reports shall contain the following information:

- Location of the problem.

- Description of the problem (in sufficient detail and with supporting sketches or photographic information where appropriate) to adequately describe the problem.
- Probable cause for the problem.
- How and when the problem was identified (reference to inspection data sheet or daily summary report by inspector).
- Where relevant, estimation of how long the problem existed.
- Any disagreement noted by the inspector between him/her-self and contractor about whether or not a problem existed or the cause of the problem.
- Suggested corrective measure(s).
- Documentation of correction, if corrective action was taken and completed prior to finalization of the problem, and completed corrective measures report (reference to inspection data sheet, where applicable).
- Where applicable, outline of suggested methods to prevent similar problems in the future.
- Signature of the CQC Technician and review signature by the CQA Manager.

3.4 Design or Specification Changes

During construction, design or specification changes may be required. Design changes will require the written approval of the Design Engineer and will take the form of technical memorandum and/or an addendum to the Drawings or Technical Specifications. Design changes are to be reported on Form No. 3 (included in Appendix A). Design changes must be approved in writing by the DOE.

3.5 CQA Compliance Reports

At the completion of each construction segment, the CQA Manager will prepare a CQA Compliance Report signed and by the CQA Manager. The CQA Report will acknowledge that the work has been performed in conformance with the Drawings and Technical Specifications. The CQA Report will include all supporting documentation including:

1. All daily field reports and weekly summary reports
2. Laboratory test reports
3. Field change reports
4. Construction problems and resolution data sheets
5. Documentation of design or specification changes.

Compliance Reports are to be completed on Form No. 1 (included in Appendix A).

3.6 Drawings of Record

Drawings of record (also referred to as “as-built” drawings) shall be prepared to document the actual lines, grades, and conditions of each component of the covers/facilities. For the cover soil components, the record drawings shall include

survey data that identifies lower and upper elevations of a particular component (layer), the plan dimensions of the component, and locations of all destructive and nondestructive test sampling sites.

3.7 Document Control

The QA documents shall be maintained under a document control procedure. Any modifications to the documents shall be reported to and agreed upon by all parties involved.

3.8 Storage of Records

During construction, the CQA Manager shall be responsible for all QA documents, including copies of the design criteria, specifications, plan revisions, and originals of all data sheets and reports. Duplicate records shall be kept at a separate location to prevent the loss of this valuable information if the originals were inadvertently destroyed.

3.9 Final Documentation and Certification

At the conclusion of Construction, the Design Engineer or a designated representative will prepare a Construction or Project Completion Report. This report will be submitted to the DOE within 90 calendar days after the Final Inspection and receipt of validated final laboratory analytical data. This report will include, at a minimum:

1. A description of the outstanding items identified in the pre-final inspection, and certification that any issues were corrected;
2. A summary of the work defined in the work plan, and a description of the final design and construction demonstrating that the work was conducted in accordance with the DOE direction and approval;
3. A summary and description of any changes made to the work defined in the work plan, and an explanation of why the changes were necessary and/or beneficial;
4. Recommendations for the overall project; and
5. Drawings of Record, as-built conditions.

4.0 Construction Method Approval

Prior to construction, the Contractor will submit a summary of its proposed construction methods, equipment, and testing protocols to the Design Engineer for approval. The Design Engineer will review the submittal and provide approval, in writing, of the Contractor's plans. The Contractor may be required to modify its proposed methods, equipment, or testing protocols prior to approval.

5.0 Cell Excavation and RRM Placement

The cell excavation and placement of RRM shall be performed in accordance with *Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Residual Radioactive Material at the Crescent Junction, Utah, Disposal Site; Addendum E; Remedial Action Inspection Plan*, latest revision (DOE-EM/GJ1547).

Exception: Soils including RRM shall be compacted to meet the required densities outlined in DOE-EM/GJ1547 with the exception that soils shall be compacted as dry as possible not to exceed the optimum moisture content as determined by ASTM D698. In case of a precipitation event or other means that moistens the existing top soil layer to a moisture content wet of the optimum moisture content, that layer is to be dried prior to placement of the subsequent lift of soil.

6.0 Cover System

A multi-layered cover system will be placed over the prepared RRM. The material specifications, layer configurations, layer thicknesses, borrow sources, placement methods, and compaction requirements are described in the Technical Specifications. The CQC Technicians will monitor placement, moisture conditioning, and compaction of the backfill material as it is placed.

Figure 2 shows cover profile options dependent on where in the footprint of the impoundment the cover is placed (refer to the 60% Design Report, Dwyer Engineering, August 2021, and 60% Draft Technical Drawings). This is subject to change in the 90% draft design submittal.

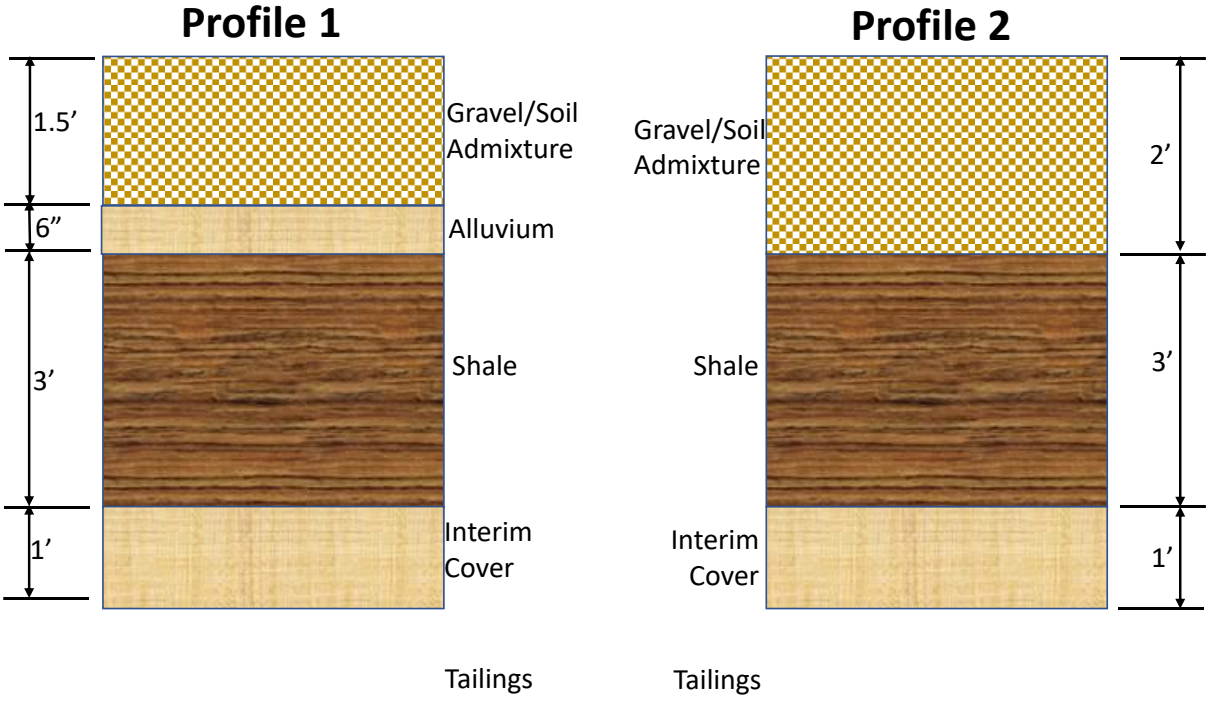

Figure 2. ET Cover Profile with Surface Admixture Depth Options

The cover will be placed in multiple segments with a compacted lift thickness not to exceed 1 ft without formal approval by the Design Engineer. The bottom foot will be the interim cover as described in the Technical Specifications. This soil can be either alluvium or shale soil excavated from the approved on-site borrow sources. The next segment of the cover system will be 3 ft of Mancos shale soil. In Profile 1, the next 6 in. of soil shall be alluvium soil excavated from the on-site borrow source. The top 1.5 ft shall be composed of alluvium cover soil excavated from the approved on-site borrow source uniformly mixed with rock from the approved stockpile. In Profile 2, the top 2 ft shall be composed of alluvium cover soil excavated from the approved on-site borrow source uniformly mixed with rock from the approved stockpile.

All mixing methods must be approved prior to commencement of this activity. Uniformity of final soil composition for all soil layers is critical.

Quality Assurance of the cover soil shall accomplish these objectives:

- Ensure layer material quality meets specifications;
- Ensure rock/soil admixture and soil texture combination soil layers are uniformly mixed; and
- Ensure each layer material is properly placed.

Uniformity of compaction for all soil layers is critical. That is, each lift of cover soil shall be placed and compacted within a tight density tolerance. This will allow for the storage capacity requirements for the cover soil while minimizing the potential for preferential flow and differential settlement. Compaction of soil shall be carried out dry of optimum moisture contents, yet still within the acceptable density range. Intended benefits of dry of optimum compaction include minimizing water within the initial complete soil/RRM profile, the cover soil layers will have greater water storage capacity than if they were compacted under wetter soil conditions, and drier soils can be easier to work with during construction. Furthermore, compaction of dry soil minimizes the potential for desiccation cracking and thus preferential flow.

During cover placement, it is crucial that each lift be bonded to the previous lift. This cuts down on the creation of inter-lift passageways (cracks) for the water to travel along as it passes from an overlying lift to a lower one. To minimize the creation of inter-lift passageways, if a smooth-rolled compactor is used, each lift shall be scarified to a depth of 1 to 2 in. prior to the placement of the next lift, thus establishing continuity between the lifts.

6.1 Material Conformance Monitoring and Testing

The CQA Manager will oversee monitoring and verification testing to ensure that the fill materials meet the gradation and classifications specifications. The CQA Manager will monitor earthmoving operations to ensure that the fill material is taken from the proper borrow sources.

Prior to the placement of the next layer of the cover, the CQA Manager shall inspect the completed layer and document any of the following:

- Erosion of the layer surface
- Cracking or desiccation of the surface
- Fill areas that may contain excessive organics or other debris
- Depressions, or settlement of the layer
- Irregularities in the layer surface (e.g., grading errors).

Any documented items that constitute non-conformance with the Drawings and Technical Specifications shall be corrected prior to placement of the subsequent layer of the cover.

6.2 Cover Soils

The cover soils shall be obtained from the approved borrow sources and shall meet the gradation and placement requirements outlined in the Technical Specifications. Soil shall be free of roots, debris, and organic or frozen material. Overburden/alluvium and weathered Mancos shale shall be excavated, pulverized, wetted, and mixed to produce a uniform soil texture.

6.2.1 Interim Cover Soil Layer

The first layer or interim cover soil layer shall be composed of soil from the on-site approved borrow source. This layer shall be a minimum of 1 ft thick after compaction.

6.2.2 Mancos Shale Cover Soil Layer

The middle layer of the cover profile shall be a minimum of 3 ft after compaction. This layer shall be placed in three approximate equal and uniform lifts. This cover soil shall be processed Mancos shale from the on-site approved borrow source.

6.2.3 Alluvium Intermediate Cover Soil Layer (Profile 1 only)

The intermediate layer of the cover soil directly above the Mancos shale soil layer in Profile 1 shall be a minimum of 6 in. after compaction. This soil shall be alluvium soil from the approved on-site borrow source. This layer may be placed as a 6-in. lift or as a 1-ft lift with the top 6 in. having rock uniformly mixed into it to form the base of the surface rock/soil admixture layer.

6.2.4 Surface Rock/Soil Admixture

For Profile 1, the surface layer shall consist of a soil with rock uniformly mixed into it and compacted to 18 in. The lift can be placed as two approximate 9-inch lifts or a 6-inch and 1-ft lift. Profile 2 shall have an admixture depth of 2 ft placed in two equal lifts. Thicker lifts are prohibited unless approved by the Design Engineer. The method utilized to mix the soil and gravel shall be submitted and approved by the Design Engineer prior to commencement of this activity.

The rock portion of the admixture will consist of rock from approved borrow sources. Rock shall meet approved size and durability requirements. The surface admixture material shall be free from roots, branches, rubbish, and debris. Submittal of rock size and durability shall be approved prior to shipment.

The mixtures of rock to soil shall be 33% rock (Profile 1: D_{50} = 2.0 in., Profile 2: D_{50} = 2.5 in.) to 67% soil by volume. The method used to mix the rock and soil shall be submitted and approved prior to the start of these activities.

The gradation specifications for the rock used for the admixture material shall be confirmed by gradation testing prior to mixing with the soil, to determine the particle sizes.

Soils used in the cover soil shall come from alluvium soil excavated from on-site approved borrow sources only and possess an adequate supply of plant nutrients while limiting the amount of salts. The gradation specifications for rock admixture material (soil-rock mixture) shall be confirmed by gradation testing, on samples collected from the point of placement (on the cover).

Rock/soil admixture thickness will be controlled through the establishment of grade stakes placed on a 200 × 200-ft grid on the top slope of the cover and by a 100 × 100-ft grid on the side slopes or other approved method. Physical checks of gravel admixture depth will be accomplished through the use of hand-dug test pits at the center of each grid in addition to monitoring the depth indicated on the grade stakes.

6.2.5 Material Placement

The CQC Technicians will observe the surface condition prior to fill placement. If the compacted surface of any layer of fill is too smooth to bond properly with the layer of material to be placed thereon, it will be reworked with a harrow, scarifier, or other suitable equipment to a 1- to 2-in. depth to provide a satisfactory bonding surface before the next succeeding layer of fill is placed.

If the compacted surface of any layer of fill in-place is too wet (e.g., due to precipitation), it will be reworked with harrow, scarifier, or other suitable equipment to reduce the moisture content to the required level. It will then be recompacted to the fill requirements.

Nesting of oversized material will be controlled through selective excavation of stockpiled material, observation of placement by CQC Technicians with authority to stop work and reject material being placed, and by culling oversized material from the fill using a grader. Successive loads of material will be placed on the fill so as to produce the best practical distribution of material.

The CQC Technicians will monitor the weather and temperature conditions. No material will be placed when the fill material or the underlying material is frozen or when ambient temperatures do not permit the placement or compaction of the materials to the specified density without developing frost lenses in the fill.

The CQC Technicians will monitor and document the lift thicknesses frequently to ensure the specifications are met. The required layer and lift thicknesses are listed in Table 1.

Table 1. Summary of Cover Components Layer and Lift Thicknesses

Cover Component	Material Type	Layer Thickness	Placement Lift Thickness
Interim Cover Soil Layer	Alluvium or Mancos shale from approved on-site borrow.	12 in. (min.) compacted	Place in 1 lift
Middle Soil Layer	Mancos shale from approved on-site borrow.	3 ft (min.) compacted	Place in 3 lifts
Interim Alluvium soil (Profile1)	Alluvium from approved on-site borrow.	6 in. (min.) compacted	Place in 1 lift
Surface Admixture (soil and rock mixture)	Alluvium mixed with rock from approved borrow.	Profile 1: 18 in. (min.) Profile 2: 2-ft (min.)	Place in 2 lifts

min. = minimum

6.2.6 Moisture and Density Control

The CQC Technicians will monitor placement, moisture conditioning, and compaction of each fill as it is placed. Prior to the start of field compaction operations, appropriate laboratory compaction curves will be obtained for the range of materials to be placed (ASTM D698). Laboratory compaction curves based on complete Proctor tests will be conducted at the frequencies outlined in Tables 2 through 4, depending on the variability of materials being placed.

Each layer of the cover soil shall be conditioned so that the moisture content is relatively uniform throughout the layer prior to and during compaction. As far as practicable, the materials will be brought to the proper moisture content before placement. If necessary, water will be added after lift placement to the material by sprinkling on the layer. Each lift will be compacted by a sufficient number of roller passes or other compaction equipment to achieve the required dry density. Material that is too wet or does not meet the required density will be rejected and will be reworked until the moisture content and density are within the specified limits. Reworking may include removal, re-harrowing, reconditioning, re-rolling, or combinations of these procedures.

The required testing frequencies are included in Tables 2 through 4. Field density testing may be conducted with the sand cone test (ASTM D1556) or a nuclear density gauge (ASTM D6938, or as modified by the CQA Manager). Correlation of nuclear density gauge results shall be by comparison with results from sand cone test(s) and laboratory testing for water content(s) using the oven drying method (ASTM D2216) on similar material.

Field density tests shall be compared with Standard Proctor tests (ASTM D698 Method A or C) on the same material. Rock corrections (ASTM D4718) for oversize particles may be required for the rock/soil admixture (or other materials) depending on the gradation of the rock material selected.

The actual frequency of testing may be increased by the CQA Manager if variability of materials is noted at the site, during adverse conditions, or to isolate failing areas of the construction.

6.2.7 Surface Slopes and Grades

Each layer of the cover profile shall have the slope as designated in the Drawings and Technical Specifications. The slopes shall be free from abrupt changes in grade or areas of runoff concentration.

6.3 Tolerances

The layer thicknesses shall meet the required minimum thicknesses. Slopes shall be within '+' or '–' 0.2% for the bottom and middle soil layers and '+' or '–' 0.1% for the surface layer.

6.4 Nonconformance, Corrective Action and Stop Work

A problem is defined as material or workmanship that does not meet the requirements of the plans, Technical Specifications, or CQAP for the project of any obvious defect in material or workmanship (even if there is conformance with plans, Technical Specifications, and the CQAP). The CQA Manager and CQC Technicians will have the authority to reject material that is brought to the Site or material that has been placed.

For a failed field moisture/density test, the CQC Technicians will determine the extent and depth of the affected area and require the Contractor to re-work the material as described above. If persistent failed tests occur, indicating inadequate compaction methods, the CQA Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that the moisture/density specifications can be met. The Design Engineer should be involved in determination of nonconformance. The CQA Manager shall be involved in determining the extent and depth of affected area.

At a minimum, problem identification and corrective measures reports shall contain the following information:

- Location of the problem
- Description of the problem (in sufficient detail and with supporting sketches or photographic information where appropriate) to adequately describe the problem
- Probable cause for the problem
- How and when the problem was identified (reference to inspection data sheet or daily summary report by inspector)

- Where relevant, estimation of how long the problem existed
- Any disagreement noted by the inspector between him/herself and contractor about whether or not a problem existed or the cause of the problem
- Suggested corrective measure(s)
- Documentation of correction, if corrective action was taken and completed prior to finalization of the problem, and completed corrective measures report (reference to inspection data sheet, where applicable)
- Where applicable, outline of suggested methods to prevent similar problems in the future
- Signature of the CQC Technician and review signature of CQA Manager.

6.5 Documentation

All field and laboratory test results, observations of fill placement, and field compaction test results will be recorded using the Daily Field Reports and CQA Compliance Reports.

Tables 2 through 4 include a summary of the required materials testing and frequencies for the cover components.

6.5.1 Hold Points

There will be 3 hold points for placement of the cover profile: (1) after completion of the interim cover soil layer; (2) after completion of the Mancos shale cover soil layer; and (3) after completion of the surface rock/soil admixture layer.

After mixing (for appropriate layer), placement, and compaction of each cover layer, the final condition of the material shall be inspected by the CQA Manager for concurrence. A CQA Compliance Report will be completed by the CQA Manager.

Table 2. Testing and Performance Criteria for Borrow Source Areas
(Tested & Approved at Borrow Sources prior to placement)

Component	Parameter	Test Method	Minimum Frequency	Performance Criteria Objective	Performance Criteria Tolerance	Response to Nonconformance
Surface Rock/Soil Admixture Layer	Soil texture: borrow source alluvium/overburden	TBD	TBD	No stone or clod larger than 4-in. diameter, no large roots, frozen material or foreign objects.	No large roots, frozen material or foreign objects	Reject if rock not uniformly distributed through layer. Remove large objects, roots.
	Rock	Durability testing per 60% Draft Technical Specifications (Dwyer Engineering Aug 2021)	TBD	Profile 1: D_{50} 2.0-in. dia. Profile 2: D_{50} 2.5-in. dia.	Rock to be relatively uniform in size. No large roots, frozen material or foreign objects	Reject if rock does not meet Technical Specifications requirements. If oversizing is required, Design Engineer to evaluate. Remove large objects, roots.
Alluvium Cover Soil Layer (Profile 1 only)	Soil texture: borrow source alluvium/overburden	TBD	TBD	No stone or clod larger than 4-in diameter, no large roots, frozen material or foreign objects.	No large roots, frozen material or foreign objects	Remove large objects, roots.
Mancos Shale Cover Soil Layer	Soil texture: borrow source Mancos Shale Particle Size Analysis (wet sieve)	ASTM D698 ASTM D2216 ASTM D422 ASTM D1140 ASTM D4381	A minimum of three tests for maximum dry density (ASTM D698); optimum moisture content tests (ASTM D2216) shall be performed for each type of soil observed to establish the optimum moisture for radon barrier material placement. 1 (ASTM D422, ASTM D1140, ASTM D4381) per 10,000 CY of soil.	Max. particle size = 3 in. Min. passing no. 4 sieve = 80% Min. passing No. 200 sieve = 50% Min. liquid limit = 30 Min. plasticity index = 10 Max. plasticity index = 40 No large roots or foreign objects	NA	Reject if criteria not met; Remove large objects, roots.

Component	Parameter	Test Method	Minimum Frequency	Performance Criteria Objective	Performance Criteria Tolerance	Response to Nonconformance
			CQA Manager or Design Engineer can request additional tests depending on consistency of soil.			
Interim Cover Soil Layer	Soil texture: borrow source alluvium/overburden or Mancos shale soil	TBD	TBD	No stone or clod larger than 4-in. diameter, no large roots, frozen material or foreign objects	No large roots, frozen material or foreign objects	Remove large objects, roots.

ASTM = American Society for Testing and Materials
NA = not applicable
TBD = to be determined

Table 3. Testing and Performance Criteria for Cover Soils

Component	Parameter	Test Method	Minimum Frequency	Performance Criteria Objective	Performance Criteria Tolerance	Response to Nonconformance
Interim Cover Soil Layer	Density	ASTM D6938	1 test per 5000 CY	90% of the maximum dry density as determined by ASTM D698	Tolerance +/- 5 pcf of maximum dry density	rework
		ASTM D1556	1 per 25 ASTM D6938 readings for calibration purposes	90% of the maximum dry density as determined by ASTM D698	Tolerance +/- 5 pcf of maximum dry density	rework
	Moisture	ASTM D6938	1 test per 5000 CY	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework
		ASTM D2216	1 per 25 ASTM D6938 readings for calibration purposes	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework
	Depth	Survey or Approved method	Complete coverage	Bottom layer of cover shall be a minimum of 1 ft after compaction	1 ft, min.	Add soil where depth is insufficient
Mancos Shale Soil Layer	Density	ASTM D6938	1 test per 5000 CY	90% of the maximum dry density as determined by ASTM D698.	Tolerance +/- 5 pcf of maximum dry density	rework
		ASTM D1556	1 per 25 ASTM D6938 readings for calibration purposes	90% of the maximum dry density as determined by ASTM D698.	Tolerance +/- 5 pcf of maximum dry density	rework
	Moisture	ASTM D6938	1 test per 5000 CY	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework
		ASTM D2216	1 per 25 ASTM D6938 readings for calibration purposes	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework

Component	Parameter	Test Method	Minimum Frequency	Performance Criteria Objective	Performance Criteria Tolerance	Response to Nonconformance
	Depth	Survey or Approved method	Complete coverage	Middle layer of cover shall be a minimum of 3 ft after compaction	3 ft, min.	Add soil where depth is insufficient
Surface Rock/Soil Admixture Layer	Density	ASTM D6938	1 test per 5000 cy	90% of the maximum dry density as determined by ASTM D698	Tolerance +/- 5 pcf of maximum dry density	rework
		ASTM D1556	1 per 25 ASTM D6938 readings for calibration purposes	90% of the maximum dry density as determined by ASTM D698	Tolerance +/- 5 pcf of maximum dry density	rework
	Moisture	ASTM D6938	1 test per 5000 cy	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework
		ASTM D2216	1 per 25 ASTM D6938 readings for calibration purposes	Dry of optimum moisture content as determined by ASTM D698	Dry of optimum moisture content as determined by ASTM D698	rework
	Depth	Survey or Approved method	Complete coverage	Profile 1: 18 in. min. Profile 2: 2 ft, min.	Profile 1: 18 in. min. Profile 2: 2 ft, min.	Add soil/gravel mixture where depth is insufficient

ASTM = American Society for Testing and Materials
pcf = pounds per cubic foot
CY = cubic yards
min. = minimum

Table 4. Testing and Performance Criteria for Gravel Admixture

Component	Parameter	Test Method	Minimum Frequency	Performance Criteria/Objective	Performance Criteria Tolerance	Response to Nonconformance
Rock (approved vendor, or approved equal)	Size	Vendor certification	1 per rock source	Vendor certification and submittal approved by Design Engineer. Rock to contain no more than 5% material passing #4 sieve as delivered to site.	Profile 1: D_{50} of 2.0 in. diameter; Profile 2: D_{50} of 2.5 in. diameter	reject
	Durability	Must be durable rock (sandstone is not acceptable)	1 per rock source	Vendor certification of durability and approval by Design Engineer		reject
Rock/Soil Admixture	Volumetric mixture	ASTM C136 or approved equal	1 per 1,000 CY	Verify prior to placement on cover. 33% rock by volume to 67% by volume Soil	Rock must be uniformly mixed with no clumping thought layer	reject
	Depth	Survey or Approved method	Complete coverage	Profile 1: 18 in., min. Profile 2: 2 ft, min.	Profile 1: 18 in., min. Profile 2: 2 ft, min.	Add rock/soil admixture where depth is insufficient

ASTM = American Society for Testing and Materials
CY = cubic yards
min. = minimum
D_{50} = mean size of rock

7.0 Channel Rock Protection and Erosion Control

The drainage channels will be lined with riprap. The size, thickness, and gradation requirements for the rock protection are provided in the Drawings and Technical Specifications.

7.1 Material Conformance Monitoring and Testing

Riprap will be a screened product transported from an approved vendor or borrow source. The CQC Technicians will verify compaction characteristics of the subgrade, the placed and compacted sand filter material, and confirm that the riprap and sand meet the gradation specifications. The CQC Technicians will perform monitoring and will conduct the appropriate verification testing to ensure that the riprap meets the gradation and durability specifications. During active riprap placement, each load of material will be visually checked against standard piles for gradation prior to transport to the channel locations.

All QC testing will be made available to the CQA Manager for concurrence.

7.2 Drainage Channel Subgrade

The CQC Technicians shall monitor the shaping and compaction of the subgrade soil. All soils on which the drainage channels are to be built are to be graded to meet elevations, shape, and slopes designated in the Drawings and Technical Specifications. The soil is to be compacted to a minimum of 95% of the maximum dry density per ASTM D698.

7.3 Diversion Channel Riprap

Material for the diversion channels will consist of granular materials from approved sources. The rock must be durable (certification from vendor is required to ensure and to be submitted to Design Engineer for approval prior to transport of the material to the site).

Rock shall be a screened product, free from roots, branches, rubbish, and debris. Designated gradations and minimum thickness for the rock placement will be specified in the Drawings and Technical Specifications.

Material specifications for the rock shall be confirmed by gradation testing conducted by the CQC Laboratory. Testing shall consist of particle-size distribution testing (ASTM D422 or approved) at a frequency of at least one test per rock size designation, or when rock characteristics show a significant variation.

Rock layer thickness will be controlled through the establishment of grade stakes placed at no greater than 100-ft intervals along the channel, at varying locations on the cross-section (or approved method as submitted and approved by the Design Engineer). Physical checks of riprap depth will be accomplished through the use of hand-dug test pits at each stake in addition to monitoring the depth indicated on the grade stakes during placement.

7.4 Material Placement

The CQC Technicians will monitor riprap placement. Riprap material will be hauled to the channels and spread by an approved method and equipment. Riprap shall be spread in a manner to minimize segregation of the material. Depth of placement will be controlled through the establishment of grade stakes. Physical checks of riprap depth will be accomplished through the use of hand-dug test pits at the center of each grid in addition to monitoring the depth indicated on the grade stakes. The Contractor will excavate the test pits, and the CQC Technicians will observe and document the excavation. Placement of the riprap will avoid accumulation of riprap sizes less than the minimum D_{50} size and nesting of the larger-sized rock.

The CQA Manager will monitor riprap placement. The riprap layer shall be compacted by an approved method with approved equipment, in order to key the rock for stability.

The geotextile and/or geosynthetic material shall meet that designated in the Drawings and Technical Specifications. The material is to be placed to avoid any wrinkling that would hinder the flow of water as it drains in the channel. The material is to be secured prior to placement of riprap to ensure that no significant movement occurs resulting from placement of riprap.

7.5 Surface Slopes and Grades

The final channel surfaces shall have a positive slope toward the drainage point with maximum side slopes as designated in the Drawings and Technical Specifications.

7.6 Tolerances

The completed riprap thickness shall meet the minimum requirements. The drainage slope and side slopes shall meet that designated in the Drawings and Technical Specifications.

7.7 Nonconformance, Corrective Action and Stop Work

The CQA Manager and CQC Technicians will have the authority to reject riprap or geotextile/geosynthetics that are brought to the site or has been placed. For rejected materials, the CQC Technicians will identify the extent and will require the Contractor to excavate the material and place additional materials. If persistent failed tests occur, indicating inadequate placement methods, the CQA Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that the materials can be placed according to the specifications.

7.8 Documentation

All field and laboratory test results, observations of material placement, and field compaction test results will be recorded using the Daily Field Reports and CQA Compliance Reports. Table 5 includes a summary of the required materials testing and frequencies for the erosion protection materials.

Table 5. Summary of Testing Frequency and Criteria for Channel Materials

Component	Test	ASTM Standard	Frequency	Criteria
Riprap	Gradation with 200 Wash	D422	1 per rock size designation, minimum	D_{50} and Durability*

ASTM = American Society for Testing and Materials

7.8.1 Hold Points

There will be two hold points for placement of drainage channels: (1) subgrade soils are compacted and meet slope and size requirements; and (2) completion of the riprap channel.

A CQA Compliance Report will be completed by the CQA Manager after completion of each of the hold points is agreed to be complete.

8.0 Protection of Soil Stockpiles

The contractor shall maintain proper erosion control measures for stockpiles and may be required to cover piles in situations where precipitation is anticipated. The CQA Manager should document improper stockpile management in situations where the integrity of the material is being affected. The Project Manager and/or the CQA Manager should determine corrective measures.

9.0 Seeding Quality Control

Vegetation improves the success of an ET cover system. It provides for long-term stability of the cover surface; minimizes erosion; and reduces flux. Ensuring an adequate stand of vegetation begins with ensuring the quality of seed used. A variety of mechanisms can be used to control and ensure high-quality seeding operations. The seeding contractor shall be required to develop and submit a seeding plan detailing all seeding equipment to be used, fertilizer types, and mulch sources for inspection prior to initiation of work. Seed and fertilizer formulation certifications from the suppliers shall be submitted prior to material use.

Qualified seeding contractors and operators shall be employed. Seeding native seed mixes requires experience and familiarity with the various seed types to ensure proper planting. The proper equipment for seeding the specified native mix must be used. Not all seed drills are capable of proper planting of native grass/forb mixes in a rock/soil admixture.

Seed and seed mixtures shall be delivered in sealed containers. Wet, moldy, or otherwise damaged seed or packages shall be rejected and unacceptable materials removed from the job site. All labeling required by law shall be intact and legible. After delivery to the work site, seeds shall be stored in a cool, dry, weatherproof, and rodent-proof place or container in a manner that protects the seed from deterioration and permits easy access for inspection.

All seed shall be subject to inspection and concurrence by the Design Engineer before the subcontractor is authorized to proceed with the seeding operation. Seed shall be tested according to the Association of Official Seed Analysts, International Seed Testing Association, and the Federal Seed Act standards. A certificate of analysis from a certified testing laboratory shall accompany seed. Certify the following individual seed tests:

- Purity and germination: Before seed is used, retest for germination all seed stored over 6 months from the date of the original acceptance test, and resubmit the results for inspection.
- Prohibited noxious weed seed: Seed shall not contain any federal- or state-listed prohibited noxious weed seed (an amount within the tolerance of 0%) as determined by a standard purity test.
- Restricted noxious weed seed: Seed shall contain no more than 40 seeds per pound of any single species, or 150 seeds per pound of all species combined, of restricted noxious weed seed.
- Weed seed: Seed shall contain no more than 1% by weight of weed seed of other crops and plant species as determined by standard purity tests.

Certification from a certified seed-testing laboratory for seed testing within 6 months of date of delivery includes the following:

- Name and address of laboratory
- Date of test
- Lot number of each seed type

- Results of tests, including name, percentage of purity and germination, percentages of weed content for each kind of seed furnished, hard seed content, and in case of seed mixtures, pure live seed (PLS) proportions of each kind of seed as specified.

The seed vendor on each standard sealed container label can provide information regarding the seed mixture. The labels shall include the following information:

- Seed mixture name
- Lot number
- Total net weight and PLS weight of each seed type
- Percentages of purity and germination
- Seed coverage (in acres) on a PLS basis
- Percentage of maximum weed seed content clearly marked for each seed type.

The vendor shall package seed such that the acre coverage of each container is equal for convenience of inventory. Prior to planting any seed, the seed labels and certification documentation shall be inspected by CQA personnel to ensure the seed provided meets the requirements specified.

Seeding is to be done by drill seeding unless otherwise approved by the Design Engineer. Equipment and methods are to be submitted prior to commencement of seeding. Equipment proposed for use and the methods of seeding shall be inspected for concurrence prior to the commencement of seeding operations. The equipment shall be checked for compliance to safety requirements (in the contractor's health and safety plan) prior to the commencement of seeding operations. Equipment calibration tests shall be conducted immediately prior to commencement of seeding operations and when the seed mix changes or different equipment is used.

Consider environmental conditions and perform seeding operations only during periods when successful results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, seeding operation shall be discontinued.

Appendix A
Forms No. 1, 2, and 3

Form No. 1

COMPLIANCE REPORT

Project No._____ Date:_____

Construction Segment:_____

_____

Drawing No.:_____

Specification No.:_____

Description of Completed Construction Segment:

_____

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By: CQA Manager _____

Approvals:

Design Engineer _____

Project Manager _____

Form No. 2

FIELD CHANGE ORDER

Project No._____ Date:_____

Drawing No.:_____

Specification No.:_____

Design Feature:

_____

_____

_____

_____

Modifications:

_____

_____

_____

_____

Reason:

_____

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_____

Initiated by:_____

Approved by:_____
CQA Manager

Form No. 3

DESIGN CHANGE ORDER

Project No._____ Date:_____

Drawing No.:_____

Specification No.:_____

Design Feature:

_____

_____

_____

Change in Design:

_____

_____

_____

Reason:

_____

_____

_____

Initiated by:_____

Approvals:

CQA Manager:_____

Project Manager:_____

Design Engineer:_____