

ADDENDUM G

Final Remedial Action Plan
DOE-EM/GJ1547
March 2024

Evapotranspiration Cover System Post-Construction Monitoring Plan

Number	Title	
Rev 0	Issued for Construction	May 2024

Dwyer Engineering LLC

Crescent Junction Disposal Site
Evapotranspiration Cover System
Post-Construction Monitoring Plan
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2024

Submitted to North Wind Portage, Inc.

Crescent Junction Disposal Site

Evapotranspiration Cover System Post-Construction Monitoring Plan

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Date: May 22, 2024

Revision 00

EXECUTIVE SUMMARY

This Post-Construction Monitoring Plan addresses post-closure care and monitoring for the U.S. Department of Energy (DOE) Crescent Junction, Utah, Uranium Mill Tailings Impoundment Closure System. This monitoring plan identifies post-closure care and monitoring requirements and activities for the Crescent Junction closure site.

This monitoring is planned to be followed until the site is transferred to the DOE Environmental Management (EM) Office of Legacy Management (LM) portfolio. A tentative inspection and reporting schedule are included.

The Crescent Junction, Utah, uranium tailings impoundment has been closed with an evapotranspiration (ET) cover system. The ET cover is a multilayered cover system that includes from bottom to top: a 1-ft-thick interim soil cover; 4-ft-thick clay radon barrier; and 38.5-in.-thick frost protection soil layer that includes a surface layer 10 in. thick composed of a mixture of rock and soil.

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ACRONYMS

CFR	Code of Federal Regulations
DOE	United States Department of Energy
EM	Environmental Management
ET	Evapotranspiration
FCD	Federal Cleanup Director
LM	Legacy Management
NRC	United States Nuclear Regulatory Commission
NUREG	Nuclear Regulatory Commission Report
RAC	Remedial Action Contractor
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978

1.0 PURPOSE

The Crescent Junction, Utah, Uranium Mill Tailings Impoundment Closure System site elements will be inspected as outlined below during the post-closure monitoring period prior to the acceptance of the project into the United States Department of Energy (DOE) Environmental Management (EM) Legacy Management (LM) portfolio. The long-term effectiveness of the final closure of the Crescent Junction Disposal Site should be for 1000 years, but not less than 200 years (40 CFR 192.02), to provide at a minimum:

- Reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20 picocuries per square meter per second (40 CFR 192.02), and
- The cover system and closure site should minimize erosion and provide long-term stable slopes (NUREG-1623).

1.1 Frequency of Inspections

The objectives of the site inspections are to evaluate and document the condition of the disposal cell and its associated surface water diversion structures; note any changes or modifications to the disposal cell and disposal site over time, and identify potential problems that could affect the performance of the disposal system and the protectiveness of the site. The inspections are intended to detect and document progressive changes as a result of natural modifying processes such as erosion, settlement, or rock degradation that could warrant subsequent evaluation and maintenance or repair. Visual inspection is the initial means of detecting a concern, which is typically documented with photographs (NUREG-1620, Appendix D, D2.2.3[5]). Quantitative measurements (e.g., land or aerial surveys to monitor settlement, rock gradation and durability measurements to monitor riprap degradation) may then follow if warranted. Additionally, each inspection is intended to detect the results of intrusive human actions that can indicate failure of components of the closure or disturbance to the disposal system. Comparing baseline conditions recorded in the completion report to inspection findings provides a basis for evaluating cell performance and overall cell stability.

An inspection is to be conducted at least annually, as required by 10 CFR 40, Appendix A, Criterion 12, and NUREG-1620, Appendix D, D2.2.3(1). The final cover system and erosion and sedimentation control measures shall be inspected quarterly during the initial 5-year monitoring period (or until transferred to DOE EM LM portfolio if sooner than 5-year period) to assess the general condition of the closure system and identify any maintenance or repair issues that may arise. The quarterly inspection schedule is intended to monitor the site and quickly correct any issues identified in the closure. After the initial 5-year monitoring or transfer to DOE EM LM portfolio, inspections are intended on an annual basis thereafter. In addition to the quarterly inspections, if the site experiences a precipitation event that exceeds 1 inch in any given hour (the 100-year, 1-hour design storm event for Thompson Springs, Utah, is 1.47 in./hr.) the site shall also be inspected for any potential damage that may have occurred due to the storm.

An inspection report shall be prepared by the inspection engineer within a month of each inspection. An annual Post-Construction Monitoring Report shall be prepared and submitted to DOE by December 31. Since the site is operated on the government fiscal year (October 1 to September 30), this report will include all information from the prior fiscal year. The annual report

shall include all inspection reports and all monitoring performed in the prior fiscal year along with maintenance and/or repairs performed (if any) and an executive summary describing the cover's overall performance for the year.

Inspections of the individual site elements are discussed in Section 2. Reporting requirements are outlined in Section 3. A proposed inspection checklist is provided in Attachment 1. Examples of issues to be inspected for are contained in Attachment 2. This inspection list may be modified as the inspections progress, based on findings and comments during this process.

1.2 Inspection Procedure

The Guidance for Developing and Implementing Long-Term Surveillance Plans for UMTRCA Title I and II Disposal Site (DOE 2012) refers to recommendations on inspection preparation and conduct (10 CFR 40.27[b][3] or 10 CFR 40.28[b][3], and NUREG-1620, Appendix D, D2.2.3[5]). Prior to conducting inspections, the inspector(s) should:

- Review the remedial action plan or reclamation plan, completion report, as-built drawings, and other appropriate documents.
- Review the permanent site file, previous site inspection reports and checklists, site inspection maps, and any maintenance tracking sheets or emergency-measures reports, and interview inspectors who participated in the previous inspection event.
- Prepare a site inspection checklist that indicates protocols (i.e., notifications), site directions and access routes, inspection transects, specific items of concern noted on previous inspections, and site surveillance features to be inspected. Attachment 1 of this Plan is to serve as the basis for the inspection checklist.
- Prepare a site inspection field map that shows areas of concern and site surveillance features.
- Review safety procedures and generate a job safety analysis.
- Schedule the inspection in coordination with the DOE site manager.
- Notify NRC, and state regulators (if applicable) of the inspection; coordinate logistics and provide directions to the site.
- Obtain permission to enter the property, if necessary.
- Prepare a folder that includes a copy of the most recent inspection; the current checklist and site inspection field map, the job safety analysis and pre-job brief/safety meeting attendance record form, the map showing directions to the nearest medical facility, and emergency response numbers and information.
- Assemble equipment and supplies needed to conduct the inspection and perform any minor maintenance that is needed (e.g., folder of paperwork, cell phone and handheld communication radios, camera, first aid kit, water, sunscreen, insect repellent, proper field and work clothing, replacement warning signs and installation equipment, and personal protective equipment). Refer to the list of inspection equipment and supplies.

During an inspection, site inspectors must:

- Observe the condition of the permanent disposal system structures and the balance of the site, including all site surveillance features. Note any anomalous or unexpected features or departures from as-built conditions that may require closer inspection (e.g., cell settlement or slumping, cover degradation, deep-rooted vegetation on the cell, erosion features such as gullies or rills, sediment or vegetation accumulations in surface water diversion channels, vandalism, animal intrusion, noxious weeds, invasive plant growth).
- Record observations as necessary in field notebooks, on site maps, and on the inspection checklist. Field notes shall become part of the permanent site collection.
- Take photographs as necessary to document site conditions and to provide an ongoing record for monitoring changing conditions over time, particularly those that could impact the performance of the disposal system or the protectiveness of the site.

1.3 Personnel

Qualifications for the site inspection engineer include expertise and knowledge of (10 CFR 40.27[b][3] or 10 CFR 40.28[b][3], and NUREG-1620, Appendix D, D2.2.3[4]):

- the disposal site design;
- specific site surveillance requirements; and
- conditions expected at the site.

Specifically for the inspection of the final cover system and associated elements, the site inspector shall be the Design Engineer or an engineer approved by the RAC contractor and/or DOE with expertise in ET cover systems and intimate knowledge of the design. The initial five-year quarterly monitoring should be performed by a qualified engineer familiar with UMTRCA sites and ET Covers in arid climates. Subsequent annual inspections should be provided by a qualified inspector with adequate knowledge of the site, the closure performance objectives, and the design of the closure.

2.0 DESIGN OVERVIEW

The final cover system is an evapotranspiration (ET) cover designed to meet all applicable performance objectives. The ET cover is a multilayered cover system that includes from bottom to top: a 1-ft-thick interim soil cover; a 4-ft-thick clay radon barrier; and a 38.5-in.-thick frost protection soil layer that includes a surface layer 10 in. thick composed of a mixture of rock and soil (Figure 1).

The overall profile provides ample storage capacity to minimize flux through the cover and attenuate radon gas from the covered tailings below established performance criteria. The rock/soil admixture surface layer is designed to minimize erosion while providing a rooting medium for native vegetation and storage capacity for infiltrated precipitation. The cover is intended to provide adequate protection for a design life of 1,000 years.

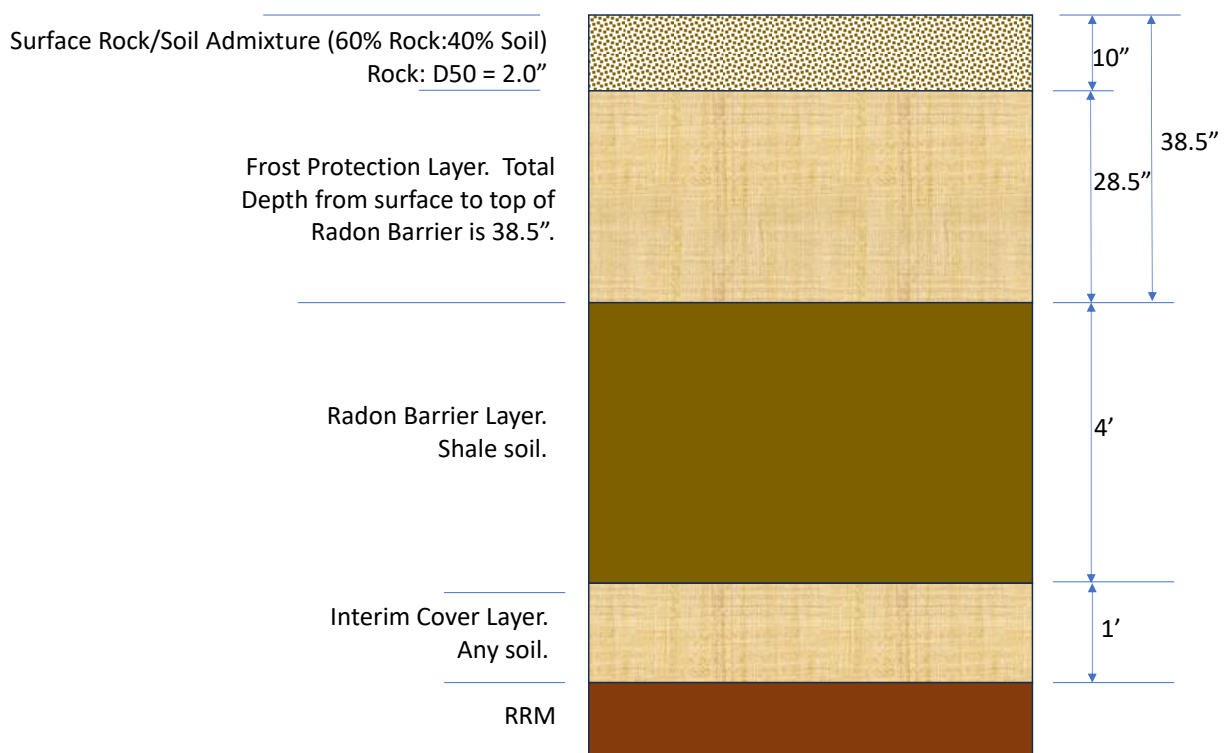


Figure 1. ET Cover Profile

Design documents containing applicable information include:

1. Dwyer 2024a,
2. Dwyer 2024b,
3. Dwyer 2024c, and
4. Dwyer 2024d.

3.0 SITE ELEMENTS MONITORED

This Post-Construction Monitoring Plan covers the following elements of the Crescent Junction Disposal Site final cover system:

- Aerial survey,
- ET cover system,
- Stand pipes for saturated conditions,
- Storm water control systems, including the Run-on Diversion Wedge,
- Fencing,
- Erosion and sedimentation control measures,
- Revegetation of disturbed areas,
- Site access, and
- ET cover system settlement.

All inspections performed shall be included in the inspection reports to be compiled and included in the annual Post-Construction Monitoring Report submitted to DOE. Inspection records and documentation of corrective actions will be retained in the project file and provided with the annual report along with an executive summary detailing the cover's performance.

3.1 Aerial Survey

An aerial survey of the site shall be performed immediately after construction is complete and performed on an annual basis thereafter.

3.2 ET Cover

The general integrity of the ET cover system shall be inspected. The top slope and side slopes shall be examined for potential degradation of the cover system, such as erosion (as evidenced by rilling or gullyng), quality and quantity of vegetation establishment, areas of subsidence, biointrusion, cracking, slope instability, and wet areas. The overall integrity of the cover on the top slope and side slopes system shall be inspected and observations shall be recorded with digital photos in an inspection report that includes the checklist contained in Attachment 1. Any maintenance or repair issues identified in an inspection shall be repaired as soon as weather permits. Any repairs requiring additional fill shall use fill from an approved borrow source meeting requirements set forth for cover soil in the design specifications.

3.2.1 Biointrusion Monitoring

As part of each inspection, the ET cover surface will be visually monitored for significant fauna burrowing. The surface layer, composed of a mixture of 60% rock to 40% soil by volume, should discourage burrowing but may not prevent it. Large woody roots of trees can provide preferential flow paths through soil covers. Significant burrowing or establishment of trees shall be reported in the attached inspection checklist. At a minimum, any animal burrows larger than 3 in. in diameter shall be reported.

3.3 Stand Pipes Monitoring

Check the remaining stand pipes located within the footprint of the disposal cell for any saturated conditions that may exist. The stand pipes will be left in place to verify whether there is any standing water that has accumulated within the stand pipe on the floor of the disposal cell. Record any issues or damage associated with the stand pipes (if any). The monitoring and sampling of water (if any) present in the standpipes will be performed in accordance with the Moab UMTRA Project Groundwater/Surface Water Sampling and Analysis Plan (DOE-EM/GJRAC1830) (DOE 2023). This standpipe water sampling will be performed separately by the RAC.

3.4 Storm Water Control Systems

This inspection is separate from the Stormwater Pollution Prevention Plan (SWPPP) monitoring to be performed by the RAC. This inspection is intended to observe the general integrity of the site drainage channels and culverts. The channels and the transition of the channels shall be inspected for evidence of degradation, erosion, subsidence, sediment accumulation, undercutting, obstructions, slope instability, and other disturbances to the channels. The overall integrity of the drainage channels and culverts shall be inspected, and observations shall be recorded using the table in Attachment 1. If any of the issues listed in Attachment 1 are observed to be significant, they are to be repaired as soon as weather permits. Any repairs requiring additional fill and/or rock shall use material from an approved borrow source. Repairs requiring additional material such as riprap shall use materials that meet the design specifications.

3.5 Fencing

Fencing is used to control access to the site. Fencing at the site includes perimeter fencing and access gates around the site. The integrity of all fencing shall be inspected. This length of fencing shall be inspected for any damage, including but not limited to: bent posts, loose posts, broken links or wire, and damaged gates. Any damage observed shall be noted in the inspection report and repaired as soon as weather permits.

3.6 Erosion and Sedimentation Control

Condition of temporary erosion measures shall be inspected for their integrity and usefulness during the time period they are deemed essential. If temporary erosion control measures are deemed to be damaged, they are to be repaired or replaced with similar materials as designated by the Engineer. All damage shall be noted in the inspection report along with recommended maintenance. These repairs or replacements are to be performed as soon as weather permits.

Condition of permanent erosion control measures shall be inspected. These include the cover system surface admixture, drainage channels, diversion wedge, and riprap protecting the perimeter of the impoundment. Any degradation or damage shall be noted in the inspection reports along with recommended repair or maintenance for each occurrence. These repairs or maintenance items are to be performed as soon as weather permits.

Condition of perimeter drains shall be inspected for presence of sediments, breaches, presence of vegetation or debris, etc. Sediments, vegetation, or debris retarding storm water runoff will be removed as needed. Breaches shall be repaired using the appropriate materials.

3.7 Revegetation of Disturbed Areas

Vegetation is a desired feature of the ET cover. Revegetation of all disturbed areas including the ET cover will be inspected for success based on type of vegetation, percent bare area, and size of native vegetation seeded during the cover installation. These values will be recorded by the Inspection Engineer in each inspection report. Furthermore, the vegetation will be monitored for continued robustness to ensure there are no unintended stresses on it. Digital photos will be taken during each inspection and included in the quarterly report to monitor the maturation and success of the vegetation. Should problems with vegetation be identified during an inspection, the problem will be noted along with a recommended repair or further evaluation recommendations.

3.8 Site Access

Continued access to the site will be inspected. Access shall be made available for any maintenance or repairs required, as noted during the inspections.

3.9 ET Cover System Settlement

Differential settlement can lead to surface ponding and tension cracking in the cover system. To identify any signs of differential settlement, a visual inspection of the cover surface will be conducted. If it is detected, the surveying of a grid established on the cover surface will determine the extent and magnitude of the settlement. Regular monitoring of the cover system will also be carried out by surveying the grid to track any changes in differential settlement. Should ponding or significant cracking occur, maintenance and repairs will be promptly addressed under the guidance of the engineer.

4.0 COMMUNICATION/REPORTING REQUIREMENTS

An annual Post-Construction Monitoring Report shall be submitted to the DOE until the site is adopted by the DOE EM LM. These annual reports shall include all inspection reports as well as any recommended maintenance or repairs inclusive of documentation that the recommended repair was properly performed.

Attachment 1 provides a Post-Construction Monitoring Checklist for guidance during the inspections. Digital photos of key elements shall be included in each inspection report in addition to a summary of the condition of the site and any changes, damage, or other issues, along with any maintenance or repairs recommended. The annual Post-Construction Monitoring Report shall include an executive summary summarizing the condition and performance of the cover. It shall also include, at a minimum, the following information for each reporting period:

- Summary of the condition of each site element identified.
- Photographs of the site features taken at the locations.
- Summary of all findings.
- Summary of all changes or repairs made to the site (if any), indicating consultation with DOE and/or the Design Engineer and approval of those changes, when necessary.
- Summary of any applicable contacts or discussions with representatives of the local community, public interest groups, or government agencies.
- Summary of all problems or potential problems encountered (if any).
- Summary of actions taken and being taken to rectify problems (if any).
- Changes in key project personnel (if any).
- Copies of inspection reports and any other relevant records.

Each inspection report shall include a list of any recommended maintenance or repairs based on findings from the recent inspection (if any). Subsequent inspection reports shall include a follow-up review of previous maintenance or repairs performed, verifying their effectiveness at addressing the issue (if any). Examples of maintenance or repairs needed may include:

- Localized areas of the cover where vegetation is deemed to be inadequate. Reseeding or further investigation may be required.
- Localized erosion, including formation of grills/gullies, will require repair and potential redesign to address the situation.
- Localized differential settlement that has created, or may create, ponding or surface cracking will require repairs by adding additional soil in depressed area and reseeded.
- Excessive or large burrowing. Large burrow holes can be filled with soil; excessive burrowing may adversely affect the cover performance and should be addressed in addition to repairs to the cover system.

Included in each inspection report are areas of concern to be closely monitored on subsequent inspections (if any). These may include localized vegetation distress, settlement, erosion,

cracking, an unexpected increase in cover moisture, etc. These issues on a case-by-case basis may trigger a more in-depth review.

A project file containing records of all inspections, monitoring, and maintenance performed shall be maintained by DOE Environmental Management Grand Junction Field Office. The annual Post-Construction Monitoring Report will be prepared and provided to the DOE prior to December 31 containing all information from the prior fiscal year.

The name, address, and telephone number for the individual to contact during the post-closure period is as follows:

Matt Udovitsch, Acting Federal Cleanup Director (FCD)
US Department of Energy – Grand Junction Field Office
200 Grand Ave., Suite 500
Grand Junction, CO 81501
Ph: 970-257-2161
Cell: (970) 623-5578
Email: Matthew.Udovitsch@emcbc.doe.gov

4.1 Criteria for Routine Site Maintenance and Emergency Measures

Consistent with NUREG-1620, Appendix D, D2.2.5, Table 1 (below) provides a set of examples consistent with DOE Criteria for Maintenance and Emergency Measures. This table is to be considered as a guide and is to be updated as the site requires.

Table 1. DOE Criteria for Maintenance and Emergency Measures

Priority	Description*	Example	Response
1	Breach of disposal cell with dispersal of radioactive material.	Seismic event that exceeds design basis and causes massive discontinuity in cover.	Notify DOE who will then notify NRC. Immediate follow-up inspection by DOE radiological control personnel. Emergency actions to prevent further dispersal, recover radioactive materials, and repair breach.
2	Breach without dispersal of radioactive material.	Partial or threatened exposure of radioactive materials.	Notify DOE who will then notify NRC. Immediate follow-up inspection by DOE radiological control personnel. Emergency actions to repair the breach.
3	Breach of site security.	Human intrusion, vandalism.	Restore security; urgency based on assessment of risk.
4	Maintenance of specific site surveillance features.	Deterioration of signs, markers.	Repair at first opportunity.
5	Minor erosion or undesirable changes in vegetation.	Erosion not immediately affecting disposal cell, invasion of undesirable plant species.	Evaluate, assess impact, and respond as appropriate.

*Other changes or conditions will be evaluated and treated similarly on the basis of risk.

5.0 REFERENCES

1. 10 CFR 40, “Domestic Licensing of Source Material.”
2. 40 CFR 192, “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.”
3. Dwyer, 2024a, Moab UMTRA Project Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, 2024, Revision 3 (or latest revision).
4. Dwyer, 2024b, Moab UMTRA Project Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, 2024, Revision 3 (or latest revision); Addendum B *Evapotranspiration Cover System - Technical Specifications for Crescent Junction Disposal Site UMTRA Final Cover System*, prepared by Dwyer Engineering LLC.
5. Dwyer, 2024c, Moab UMTRA Project Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, 2024, Revision 3 (or latest revision); Addendum C *Evapotranspiration Cover System - Technical Drawings for Crescent Junction Disposal Site UMTRA Final Cover System*, prepared by Dwyer Engineering LLC.
6. Dwyer, 2024d, Moab UMTRA Project Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site, 2024, Revision 3 (or latest revision); Addendum D *Evapotranspiration Cover System - Design Report, Crescent Junction Disposal Site*, prepared by Dwyer Engineering LLC.
7. NUREG-1620, 2003, *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C.
8. NUREG-1623, 2002, *Design of Erosion Protection for Long-Term Stabilization. Final Report*, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C.
9. U.S. Department of Energy (DOE) Legacy Management, 2012, *Guidance for Developing and Implementing Long-Term Surveillance Plans for UMTRCA Title I and Title II Disposal Sites*, November, LMS/S003396.
10. U.S. Department of Energy (DOE) Office of Environmental Management. 2023. Moab UMTRA Project Groundwater/Surface Water Sampling and Analysis Plan (DOE-EM/GJRAC1830), Revision 8, January 2023.

Attachment 1. Post-Construction Monitoring Checklist

Post-Construction Monitoring Checklist for the Crescent Junction Disposal Site Closure

Site Name: Crescent Junction Disposal Site	Date of Inspection:
City: Thompson Springs	Weather:
State: Utah	Temperature:
Agency: Department of Energy	Site Map:
Inspector:	Note: Indicate the location of any deficiency noted below on the site map
ET Cover – Top Slope	Remarks
1. Settlement (Low Spots): Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
2. Surface Cracks: Yes () No () Length: Width: Depth: Repairs Necessary Yes () No () If yes, explain	
3. Erosion: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
4. Biointrusion Holes: Yes () No () Areal Extent: Depth: Suspected Cause (Rodent or Other): Repairs Necessary Yes () No () If yes, explain	
5. Vegetation Condition: General Condition progressing as expected: Yes () No () If no, explain Issues Observed: Yes () No () If yes, explain Repairs Necessary: Yes () No () If yes, explain	
6. Rill/Gully: Yes () No () Areal Extent: Height: Suspected Cause Repairs Necessary Yes () No () If yes, explain	
7. Wet Areas: Yes () No () Ponding: Yes () No () Areal Extent: Seeps: Yes () No () Areal Extent:	

Estimated Flow Rate: Soft Subgrade: Yes () No () Areal Extent: Repairs Necessary Yes () No () If yes, explain	
8. Slope Instability: Yes () No () Slides: Yes () No () Areal Extent: Probable Slide Interface: Suspected Cause: Exposed Cover Components: Repairs Necessary Yes () No () If yes, explain	
9. Surface Rock/Soil admixture: General Condition progressing as expected: Yes () No () Issues Observed: Yes () No () If yes, explain Repairs Necessary: Yes () No () If yes, explain Areal Extent: Suspected Cause: Repairs Necessary Yes () No () If yes, explain	
ET Cover – Side Slopes	
1. Settlement (Low Spots): Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
2. Cracks: Yes () No () Length: Width: Depth: Repairs Necessary Yes () No () If yes, explain	
3. Erosion: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
4. Biointrusion Holes: Yes () No () Areal Extent: Depth: Suspected Cause (Rodent or Other): Repairs Necessary Yes () No () If yes, explain	
5. Vegetation Condition: General Condition progressing as expected: Yes () No () If no, explain Issues Observed: Yes () No () If yes, explain Repairs Necessary: Yes () No () If yes, explain	
6. Rill/Gully: Yes () No () Areal Extent: Height: Suspected Cause: Repairs Necessary Yes () No () If yes, explain	

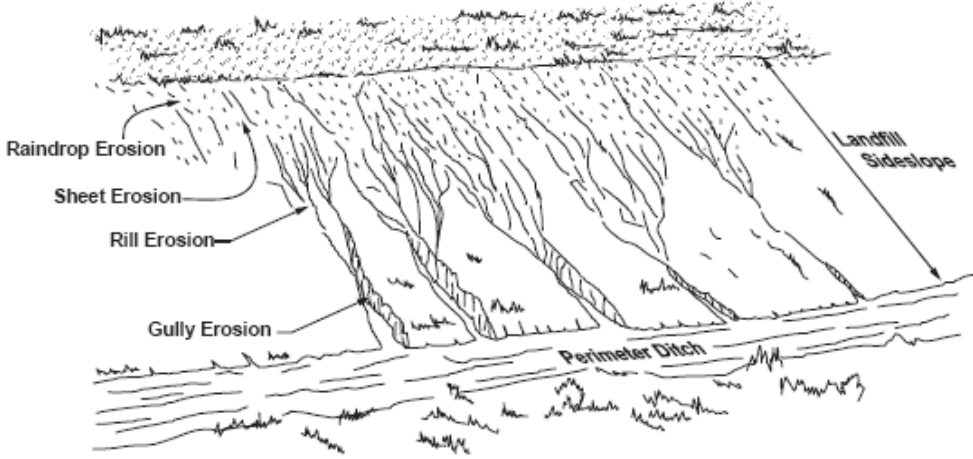
7. Wet Areas: Yes () No () Ponding: Yes () No () Areal Extent: Seeps: Yes () No () Areal Extent: Estimated Flow Rate: Soft Subgrade: Yes () No () Areal Extent: Repairs Necessary Yes () No () If yes, explain	
8. Slope Instability: Yes () No () Slides: Yes () No () Areal Extent: Probable Slide Interface: Suspected Cause: Exposed Cover Components: Repairs Necessary Yes () No () If yes, explain	
9. Surface Rock/Soil admixture: General Condition progressing as expected: Yes () No () Issues Observed: Yes () No () If yes, explain Repairs Necessary: Yes () No () If yes, explain Areal Extent: Suspected Cause: Repairs Necessary Yes () No () If yes, explain	
Riprap Lined Drainage Channels	
1. Settlement: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
2. Material Degradation: Yes () No () Material Type: Areal Extent: Degree of Degradation: Repairs Necessary Yes () No () If yes, explain	
3. Erosion: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
4. Undercutting: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
5. Obstructions: Yes () No () Type: Areal Extent: Size: Repairs Necessary Yes () No () If yes, explain	
6. Slope Instability:	

Yes () No () Type: Areal Extent: Repairs Necessary Yes () No () If yes, explain	
7. Siltation: Yes () No () Areal Extent: Depth: Repairs Necessary Yes () No () If yes, explain	
8. Drop Inlet Structures: Working Properly Yes () No () Condition: Extent of Damage: Repairs Necessary Yes () No () If yes, explain	
Fencing	
1. Fence: bent posts: Yes () No () loose posts: Yes () No () broken links or wire: Yes () No () damaged gates: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
Temporary Erosion & Sedimentation Control Measures (if any)	
1. Erosion Control Blanket, etc.: Functional Yes () No () if no, describe locations Damaged Blanket: Yes () No () Other damage: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
Permanent Erosion & Sedimentation Control Measures	
1. Riprap Reinforced Side Slope: Functional Yes () No () if no, describe locations Damage or degradation: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
2. Rock Check Dams: Functional Yes () No () if no, describe locations Damage, displaced rock, or other damage: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
3. Diversion wedge: Functional Yes () No () if no, describe locations Damage, adjunct erosion, slope problem, or other damage/degradation: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
4. Drainage Channels adjacent to Wedge: Functional Yes () No () if no, describe locations	

Damage, adjunct erosion, slope problem, or other damage/degradation: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
5. Other: Functional Yes () No () if no, describe locations Damage or degradation: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
Site Access	
1. Access Restrictions: Yes () No () Description: Repairs Necessary Yes () No () If yes, explain	
General	
1. Vandalism: Yes () No () Description of damage: Repairs Necessary Yes () No () If yes, explain	
2. Land Use Change: Yes () No () Description: Repairs Necessary Yes () No () If yes, explain	
Summary of Recommended Maintenance and/or Repairs	
1. Maintenance / Repairs Necessary Yes () No () If yes, explain	
Other	
1. Describe	

Attachment 2. Examples of Inspection Issues

The following are examples of inspection issues to be identified and described during each inspection.

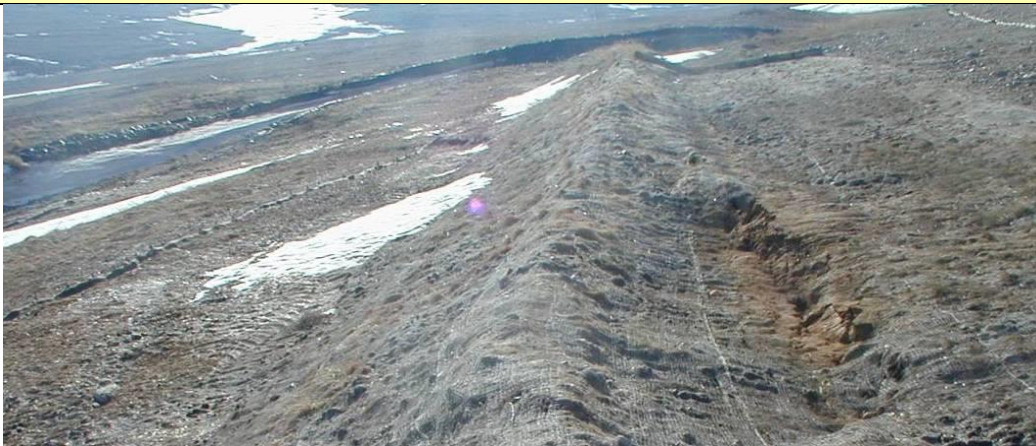
Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
EROSION	Erosion can appear in excessive sheet erosion or in rill and gully formation.	
a. Sheet	Loss of cover soil and collection of sediments at or near base of slopes.	Incorporate further temporary or permanent erosion protection methods to prevent future erosion of the cover soils. If it is determined that excessive cover soils have been eroded, additional cover soil will also be added. Reseed affected areas.
b. Rill/Gully	Rill formation in areas of concentrated surface water runoff flows. Gully formation is advanced rill development.	Evaluate surface water runoff controls in place and adjust as required. Replace all eroded soils and compact to meet specification of placed soils for the affected area. Reseed affected areas.

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
SETTLEMENT	Differential settlement can create ponding that in turn leads to increased infiltration, cover flux, and eventually contaminant transfer.	An example of ponding on a cover is seen below:
a. Ponding	Localized sediment deposits within the cover system, localized excessive vegetation, vegetation variance such as salt cedar or other plants that would appear only if there was excess moisture available.	 All ponded areas should be filled with a mixture of soil and rock meeting the specifications of the given cover surface admixture. These soils will be placed consistent with the original specifications for the given cover soils. After the area has been graded to the desired final grade with positive drainage, the area will be reseeded with a native seed mix matching that originally specified for the cover.
b. Surface Cracking	Surface tension cracks, particularly cracks perpendicular to surface water flow.	Surface cracks that appear due to differential settlement can be exaggerated in arid climates where soils tend to form surface crusts. These cracks lead to localized saturated flow through the cover or preferential flow. These cracks will be excavated to just beyond their full depth. The soils will then be replaced in the area to match the original placement specifications for the cover soil. After the crack has been completely repaired physically and the area matches the adjacent grades, the disturbed area will be reseeded with a native seed mix to match that originally specified for the cover system.

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
		An example of a surface tension crack is seen below: 

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
VEGETATION a. Establishment	Inadequate vegetation establishment	If areas within the cover systems have failed to establish adequate vegetation, the cover soils will be evaluated for adequate nutrients or excessive salt content. If the soils are found to have inadequate nutrients, amendments will be provided and mixed into the soils. If excessive salts are found in the soils, the salts will be evaluated as to whether they potentially migrated up through the cover from underlying source material, or the cover soil used had excessive salts. If the salts are deemed to have migrated up through the cover soils, the soils will be excavated and replaced meeting the specifications for original placement of the cover system. If the salts are deemed to have come from borrow soils that are high in such salts as calcium carbonate or other naturally occurring salts, the localized soils will be replaced with soils that meet the original cover soils material and placement specifications from accepted borrow areas.
b. Distress	Localized plant distress	Examine the cover soils for potential salt migration from underlying source materials into cover soils. The soils will be excavated and tested for excessive salts. An example of localized plant distress due to salt migration up through the cover (in this case due to burrowing animals excavating and depositing the salt on the surface) is seen below:

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
SLOPE STABILITY	Slope failures are commonly accompanied by surface cracks.	Slope failures can be caused by a variety of events and circumstances. The areas of concern for slope failure are the steeper side slopes. In this case, failure will likely occur either by significant differential settlement of fill materials or loss of strength due to localized saturated soils and excessive seepage generally near the toe of the slope. These areas will be inspected for early warning signs of any potential slope failures. An example of a slope failure due to excessive seepage is seen below with the surface crack above the slope that has begun to slide:

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
HUMAN INTRUSION	Vandalism	 Should any surface cracking or localized saturation presumably due to excessive seepage be identified, this area will be evaluated for redesign to stabilize the slope. Human intrusion at the site is not expected since this is a remote site in a fenced and protected area. However, if any vandalism or damage due to human intrusion is identified, the areas will be repaired to meet the original design and specifications for the affected area(s).
BIOINTRUSION		Biointrusion is a natural part of cover systems and burrowing is possible on the cover system. However, excessive biointrusion that affects the ability of the cover to function properly will be identified and maintained as required.
a. Burrowing animals/insects	Burrow holes, ant hills are all considered biointrusion due to animals and insects.	Small amounts of burrowing by mammals and insects can actually be good for a cover system. It allows for ventilation and provides soil turnover. However, excessive burrowing can harm a cover system. Furthermore, bringing excessive source materials to the surface can also be a problem. These issues will be monitored and maintained as required.

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
		An example of localized problems where source materials were brought to the surface from biointrusion is seen below.  Excessive burrowing in a local area can create excessive preferential flow. This type of burrowing will be maintained by excavating the affected areas and replacing the soil to meet original cover soil placement specifications. The disturbed area will then be reseeded with native vegetation as originally specified for the given cover system. An example of excessive burrowing in a localized area is seen below:

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
b. Plants DRAINAGE	Root intrusion into source materials. Cover draining to designed surface water management facilities	 Biointrusion due to vegetation generally comes from plant roots growing into source material. This issue will be monitored for and maintained as required. Cover system final grades and surface water management facilities have been designed to control runoff. Should drainage from a cover system not be directed toward appropriate surface water control facilities, the affected area will be regraded to rectify the situation. The affected area will then be reseeded with native vegetation to match that originally specified for the given cover system.

Maintenance Issue	Monitoring Indications	Maintenance of Issue ¹
WASTE OR SOURCE MATERIAL MIGRATION	Salt deposits on surface of cover or vegetation distress	Excavate cover material and replace with clean material to prevent further waste/source material migration if salts have moved vertically up through the cover soils. The affected area will then be reseeded with native vegetation to match that originally specified for the given cover system.

- 1 If a significant maintenance issue is identified, the designated FCD representative will be alerted by the inspection personnel to discuss maintenance, possible redesign, or other possible fixes of the problem.