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Crescent Junction Disposal Site
Regulations & Performance Criteria Associated with Alternative Final Cover System

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EXECUTIVE SUMMARY

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project is in the process of relocating mill tailings and other contaminated materials from a former uranium-ore processing facility and from off-site properties known as vicinity properties in Moab, Utah, to an engineered disposal cell constructed near Crescent Junction, Utah. The tailings have a relatively high water content. These tailings are reconditioned and dried prior to shipment from Moab to Crescent Junction, Utah. The tailings are then shipped by rail and disposed of in the tailings impoundment. This tailings impoundment was being capped with an approved 9-ft-thick multi-layered final cover system. However, the performance of the existing cover system at this Department of Energy (DOE) site has multiple issues and is proving to be relatively expensive.

A proposed evapotranspiration (ET) cover system will perform better than the approved cover at a substantial costs savings. Consequently, the Crescent Junction Disposal impoundment existing cap will be removed and replaced with an ET cover composed of compacted cover soil overlain by a rock/soil admixture. This document summarizes the regulations and performance criteria associated with the alternative final cover system.

TABLE OF CONTENTS

ACRONYMS

ACL	alternate concentration limits
CFR	Code of Federal Regulations
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
MCL	maximum concentration limit
NEPA	National Environmental Policy Act
NRC	United States Nuclear Regulatory Commission
RRM	residual radioactive material
SOWP	Site Observational Work Plan
TDS	total dissolved solids
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act

1.0 BACKGROUND

The Moab uranium processing facility was constructed in 1956 by the Uranium Reduction Company, which operated the mill until 1962 when the assets were sold to the Atlas Minerals Corporation (Atlas). Uranium processing operations continued under Atlas until 1984. When the processing operations ceased in 1984, the mill had accumulated uranium mill tailings in an unlined impoundment in the floodplain of the Colorado River. The present tailings pile in the west part of the processing site covers approximately 130 acres and is about 750 feet west of the Colorado River. Atlas placed an interim cover over the tailings pile as part of decommissioning activities ongoing between 1988 and 1995.

In 1996, Atlas proposed to reclaim the tailings pile for permanent disposal in its current location. Atlas declared bankruptcy in 1998 and subsequently the U.S. Nuclear Regulatory Commission (NRC) appointed PricewaterhouseCoopers as the Trustee of the Moab Mill Reclamation Trust and licensee for the site. Subsequently, it was mandated that the NRC license for the materials at the Moab Site be terminated and that title and responsibility for cleanup be transferred to the U.S. Department of Energy (DOE) by October 31, 2001. DOE assumed full cleanup responsibility for the site during FY 2001.

2.0 REMEDIAL ACTION HISTORY

Based on the process and evaluation documented in the Final Environmental Impact Statement for the Moab Site (DOE 2005), DOE determined that its preferred alternative for long-term disposal of residual radioactive material (RRM) from the Moab Processing Site was relocation of the tailings predominantly by rail to the Crescent Junction Disposal Site.

The Crescent Junction site was selected as the preferred off-site disposal location because it has: (1) the longest isolation period (time in which contaminants could reach the ground water); (2) the lowest land-use conflict potential (although DOE would need to work with holders of existing oil and gas leases to mitigate any possible impacts); (3) the shortest haul distance from the rail unloading facility into the disposal cell, reducing the size of the radiological control area; and (4) flat terrain, making operations easier and safer.

The Moab tailings pile was constructed with five terraces and consisted of an outer compacted embankment of coarse tailings, an inner impoundment of both coarse and fine tailings, and an interim cover of soils taken from the site outside the pile area. Debris from dismantling the mill buildings and associated structures was placed in an area at the south end of the pile and covered with contaminated soils and fill. Radiation surveys indicated that some soils outside the pile also contained radioactive contaminants at concentrations above U.S. Environmental Protection Agency (EPA) standards listed in 40 CFR 192.

Besides tailings, contaminated soils, and debris, other contaminated materials requiring cleanup include ponds used during ore-processing activities, disposal trenches, other locations used for waste management during mill operation, and buried septic tanks that are assumed to be contaminated. DOE estimated that total RRM at the Moab Site and vicinity properties has a weight of approximately 16 million tons and a volume of approximately 12 million cubic yards.

The remedial action consists of the removal and subsequent relocation of all RRM to the Crescent Junction disposal cell. Disposal consists of constructing an approximately 230-acre engineered cell

partially below grade. The disposal cell is generally rectangular in shape. The cell is designed for two-thirds of the RRM to be below grade and the remainder above grade. The depth of the cell excavation is based on keying into the weathered Mancos shale bedrock at least 2 feet and reusing the shale (after conditioning) to construct the radon barrier. Excavated material is used as material for construction of the disposal cell's exterior berms, interim cover, and freeze-thaw layer, and will be used to construct the protective wedge to the north of the disposal cell.

3.0 EPA STANDARDS

As required by the Uranium Mill Tailings Radiation Control Act (UMTRCA), remedial action at the site must comply with regulations established by the EPA in 40 CFR 192, Subparts A to C. The regulations provide standards for both disposal and cleanup. Disposal and ground water protection standards apply at the disposal site (Crescent Junction) while cleanup standards for soil and ground water apply at the processing site (Moab). EPA disposal and ground water protection standards in 40 CFR 192 specify that control of RRM and its listed constituents shall be designed to be effective for up to 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years.

Additionally, as described in the Standard Review Plan (SRP) for inactive uranium mill tailings (NRC 1993), DOE must meet the following basic requirements to receive NRC's concurrence on DOE's proposed remedial action:

- There must be reasonable assurance of compliance with the EPA control requirements of 40 CFR 192 for durability of stabilization and control of radon, and protection of ground water resources in the disposal cell area; and
- There must be reasonable assurance of compliance with the EPA requirements in 40 CFR 192 for cleanup of the processing site.

More detailed discussion of compliance with ground water requirements at the processing site is found in the Site Observational Work Plan (SOWP) (DOE 2003).

4.0 REGULATORY FRAMEWORK

The following subsections identify the regulatory framework to be applied to the selected ground water compliance strategy at the Moab site to achieve compliance with the EPA standards in 40 CFR 192 and the final rule to the standards published in the Federal Register at 60 FR 2854.

4.1 Floyd D. Spence National Defense Authorization Act

Requirements of the Floyd D. Spence Act Remediation of the Moab site is mandated by the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, Public Law 106-398 (the Act). The act specifies that the license issued by NRC for the materials at the Moab site be terminated and that the title and responsibility for cleanup be transferred to DOE. The act further designates that the Moab site undergo remediation in accordance with Title 1 of UMTRCA (42 United States Code [U.S.C.] 7901), with certain exemptions. The act also specified that DOE "…prepare a plan for remediation, including ground water restoration, of the Moab site in accordance with Title I of the Uranium Mill Tailings Radiation Control Act of 1978…" The act

further required the Secretary of Energy to obtain "...the technical advice, assistance, and recommendations of the National Academy of Sciences in objectively evaluating the costs, benefits, and risks associated with various remediation alternatives, including removal or treatment of radioactive or other hazardous materials at the site, ground water restoration, and long-term management of residual contaminants."

4.2 Uranium Mill Tailings Radiation Control Act

The U.S. Congress passed UMTRCA in 1978 in response to public concerns about potential health hazards from long-term exposure to uranium mill tailings. UMTRCA authorized DOE to stabilize, dispose of, and control uranium mill tailings and other contaminated materials at inactive uranium-ore processing sites in a safe and environmentally sound manner.

Three UMTRCA titles apply to uranium-ore processing sites. Title I of UMTRCA designates inactive processing sites for remediation and stipulates that remedial action be selected and performed with the concurrence of NRC and in consultation with affected states and Indian tribes, directs NRC to license the disposal sites for long-term care, and directs DOE to enter into cooperative agreements with the affected states and Indian tribes. Title II applies to active uranium mills and directs NRC to regulate uranium mill tailings at those processing sites. Title III applies to certain uranium mills in New Mexico.

Title I directs DOE to complete remedial action at inactive uranium mill tailings sites at which all or a substantial portion of uranium was processed for sale to a federal agency, and which no longer had a license to process uranium ore as of January 1, 1978. The Secretary of Energy was given the authority to add sites to the list (DOE 1996). In 1988, Congress passed the Uranium Mill Tailings Remedial Action Amendments Act (42 U.S.C. Section 7922 et seq.), authorizing DOE to extend without limitation the time needed to complete ground water remediation at the Title I processing sites. Congress amended UMTRCA in 2000 to designate the Moab milling site as a processing site in accordance with Title I of UMTRCA, 2.2.1 EPA Ground Water Standards. As directed by UMTRCA, EPA published 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

The standards in 40 CFR 192, Subparts A, B, and C, apply to the remediation and final disposition of contaminated materials, including ground water, for Title I sites. Remediation of the Moab site must be in compliance with these standards. The Subpart A standards for control of residual radioactive materials apply to disposal of these materials at processing or disposal sites and were established as a means of monitoring long-term performance of the disposal system. Subpart A provides numerical standards to be met for ground water protection from future contamination released from the disposal system after disposal is complete. Provisions are also made for the application of alternate concentration limits (ACLs) as the protection standards, where appropriate. Corrective actions are required within 18 months if contaminant concentrations in ground water at disposal sites exceed the ground water protection standards. Subpart A standards will apply to ground water associated with the long-term disposal of tailings from the Moab site, whether that disposal is on site or at a relocation site.

Subpart B standards for cleanup provide numerical standards for cleanup of residual radioactive materials based on concentrations of radium-226 in surface materials (e.g., soils) and for exposure to radiation in buildings. Numerical standards for the cleanup of ground water are the same as the protection standards specified in Subpart A. The cleanup standards also permit use of ACLs or

supplemental standards as the appropriate cleanup standards based on site-specific circumstances. However, unlike Subpart A, an extended time frame is permitted for attaining Subpart B ground water cleanup standards. In addition to active remediation, natural flushing is an acceptable means of meeting the standards if they can be met within 100 years and if enforceable institutional controls can be put in place during that time. Subpart C of 40 CFR 192 provides guidance for ensuring that provisions of Subparts A and B are met. Subpart C requires that conditions of Subparts A and B are met on a site-specific basis using information gathered during site characterization and monitoring. The approach to meet the conditions of Subparts A and B should be stated in the remedial action plan(s), including a consideration of ground water movement. If natural flushing is part of the ground water compliance strategy, Subpart C requires compliance monitoring and has requirements for points of compliance to verify anticipated plume movement and the associated reduction in plume contamination. Subpart C specifies certain criteria under which DOE may apply supplemental standards to contaminated ground water in lieu of background levels, maximum concentration limits (MCLs) in 40 CFR 192, or ACLs identified in Subpart A. Supplemental standards may be applied if any of the following conditions are met:

- Remedial action necessary to implement Subpart A or B would pose a significant risk to workers or the public.
- Remedial action to meet the standards would directly produce environmental harm that is clearly excessive, compared to the health benefits of remediation, to persons living on or near the sites, now or in the future.
- The estimated cost of remedial action is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.
- There is no known remedial action.
- The restoration of ground water quality at a designated processing site is technically impracticable from an engineering standpoint.
- The ground water meets the criteria of limited-use ground water.

Subpart B of 40 CFR 192 defines limited-use ground water as ground water that is not a current or potential source of drinking water because at least one of the following conditions is present: (1) the concentration of total dissolved solids (TDS) exceeds 10,000 milligrams per liter (mg/L); (2) widespread, ambient contamination is present that cannot be cleaned up using treatment methods reasonably employed in public water systems; (3) the quantity of water available to a well is less than 150 gallons per day (0.1 gpm).

When limited-use ground water applies, supplemental standards ensure that current and reasonably projected uses of the ground water are preserved. Radiation from radionuclides other than radium-226 and its decay products is present in sufficient quantity and concentration to constitute a significant radiation hazard from RRM.

4.3 National Environmental Policy Act

UMTRCA is a major federal action that is subject to the requirements of NEPA (42 U.S.C. Section 4321 et seq.). Regulations of the Council on Environmental Quality (to implement NEPA) are codified in 40 CFR 1500; these regulations require each federal agency to develop its own implementing procedures (40 CFR 1507.3). DOE-related NEPA regulations are established in 10 CFR 1021, "National Environmental Policy Act Implementing Procedures." DOE guidance is provided in Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements (DOE 2004).

5.0 REFEERENCES

1. U.S, DOE. 2003. Site Observational Work Plan. GJO-2003-424-TAC. December 2003.
2. U.S. DOE. 2004. Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, 2nd Edition. December 2004.
3. U.S. DOE. 1996. NEPA Contracting Reform Guidance. U.S. Department of Energy Environmental, Safety, Health, Office of NEPA Policy and Assistance. December 1996.
4. U.S. DOE. 2005. Remediation of the Moab Uranium Mill tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement. July 2005. DOE/EIS-0355.
5. U.S. NRC. 1993. Final Standard Review Plan for the Review and Remedial Action of Inactive Mill tailings Sites under Title I of the Uranium Mill Tailings Radiation Control Act. U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Division of Low-Level Waste Management and Decommissioning. June 1993.