DOE-EM/GJ1633

MOAB UMTRA PROJECT CRESCENT JUNCTION

U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

# Moab UMTRA Project Waste Management Plan

Revision 9

June 2022

U.S. Department of Energy

Office of Environmental Management

*Prepared by the Technical Assistance Contractor under contract number DE-EM0005014 and the Remedial Action Contractor under contract number 89303322DEM000073 for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.*

# Moab UMTRA Project Waste Management Plan

## Revision 9

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# Revision History

| Revision | Date | Reason for Revision |
|---|---|---|
| 0 | July 2008 | Initial issue. |
| 1 | April 2013 | Revisions include content updates reflecting Project progress. |
| 2 | May 2015 | Revision includes references to *Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure* (DOE-EM/GJRAC2160). |
| 3 | March 2016 | Revision includes minor updates, including reference to evaporation pond. |
| 4 | December 2016 | Revision includes new RAC Program Manager signature and new contract number. |
| 5 | September 2018 | Reviewed and reapproved without changes. |
| 6 | November 2018 | Revision includes updates of roles, responsibilities, and position titles in line with current Project activities. |
| 7 | December 2020 | Revision integrates Universal Waste Management Plan DOE-EM/GJRAC1920 and minor edits. |
| 8 | December 2021 | Minor edits and updated hazardous waste status to very small quantity generator. |
| 9 | June 2022 | Revised to include RRM excavation and disposal elements according to Section C.4.2 of the Moab RAC IDIQ Contract No.89303322000073. |

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# Acronyms and Abbreviations

| | |
|---|---|
| BMP | Best Management Practice |
| BMPA | Best Management Practice Area |
| CA | Contamination Area |
| CFR | Code of Federal Regulations |
| DOE | U.S. Department of Energy |
| EC | Environmental Compliance |
| EPA | U.S. Environmental Protection Agency |
| H&S | Health and Safety |
| HRRM | Hazardous Residual Radioactive Material |
| IDW | Investigation-Derived Waste |
| IWP/JSA | Integrated Work Plan/Job Safety Analysis |
| NRC | Nuclear Regulatory Commission |
| PCB | polychlorinated biphenyl |
| pCi/g | picocuries per gram |
| PPE | personal protective equipment |
| RAC | Remedial Action Contract or Contractor |
| RAIP | Remedial Action Inspection Plan |
| RCRA | Resource Conservation and Recovery Act |
| RRM | residual radioactive material |
| SHRRM | Suspected Hazardous Residual Radioactive Material |
| SWPPP | Storm Water Pollution Prevention Plan |
| TAC | Technical Assistance Contract or Contractor |
| TSCA | Toxic Substances Control Act |
| UAC | Utah Administrative Code |
| UMTRA | Uranium Mill Tailings Remedial Action |
| UMTRCA | Uranium Mill Tailings Radiation Control Act of 1978 |
| USC | United States Code |
| VSQG | Very Small Quantity Generator |
| WAC | Waste Acceptance Criteria |

# 1.0 Introduction

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project is a former uranium-processing site owned and operated by the U.S. Department of Energy (DOE). The Project includes the former processing site in Moab, Utah, and the disposal site located near Crescent Junction, Utah. DOE has responsibility for remediation of the site and properly managing all wastes generated from site activities, including operation, maintenance, and remediation activities, including vicinity properties. This Waste Management Plan describes practices that will be used for managing Project wastes and will comply with applicable federal, state, and local statutes, ordinances, and regulations.

## 1.1 Regulatory Background

Title 42 United States Code Section 7901 (42 USC 7901), the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) and 40 Code of Federal Regulations Part 192 (40 CFR 192), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," provide the definition of residual radioactive material (RRM) as radioactive waste in the form of tailings resulting from the processing of ores for extraction of uranium, other valuable constituents of the ores, and other wastes at a processing site that relate to processing.

The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398) designated the Moab UMTRA Project as an UMTRCA Title I process site in 2001. This Act tasked DOE with remediation of the site consistent with remediation performed at other UMTRCA Title I sites and assigned the Nuclear Regulatory Commission (NRC) to oversee the cleanup and issue licenses for the disposal cells.

UMTRCA Title I is a stand-alone statute and is the overriding authority for the remediation of RRM at Title I process sites. Environmental statutes such as 42 USC 6901, the Resource Conservation and Recovery Act (RCRA) or 15 USC 2601, the Toxic Substances Control Act (TSCA) do not regulate RRM, including RRM combined with other hazardous components, because UMTRCA is the regulatory authority for RRM. However, other hazards in RRM that present an unacceptable risk to workers, or the environment may necessitate, as a Best Management Practice (BMP), the use of more protective management methods, such as additional safety controls or isolation or stabilization of the waste, before disposal at the Crescent Junction disposal site. For this reason, workers are trained to both Radiological Worker II and HAZWOPER training (29 CFR 1910.120). Unforeseen circumstances may justify the disposal of RRM combined with particularly hazardous components in an appropriate off-Project facility. DOE will make decisions on a case-by-case basis concerning the methods needed for the special management of RRM combined with other hazardous components.

The state of Utah, though it is an NRC-agreement state, lacks the authority to regulate RRM at the Moab UMTRA Project. However, the state of Utah has the authority to regulate certain activities over which it maintains jurisdiction, such as the management of non-RRM waste. For example, wastes that enter the public domain, such as water discharged from treatment systems and site air emissions, may be subject to state jurisdiction through the Utah Pollutant Discharge Elimination System and the Utah Division of Air Quality, respectively.

## 1.2 Purpose and Scope

The purpose of this Waste Management Plan is to provide direction for properly managing wastes generated at the Moab and Crescent Junction sites, including transportation and disposal in the Crescent Junction disposal cell, in accordance with applicable federal, state, and local requirements and in a manner that is protective of human health and the environment.

This Plan pertains to wastes generated within the Controlled Area of each site, which includes wastes from the Contamination Area (CA) where RRM and operations are located and in the uncontaminated area outside the CA, where office trailers and other facilities that support site operations are located. The Plan encompasses wastes generated by pre-DOE historical activities (ore processing, site maintenance, decommissioning) and wastes generated by DOE contractor/subcontractor activities (investigation and characterization of site environmental media), remediation of RRM, transportation and disposal of RRM, and operation and maintenance of site facilities or equipment.

## 1.3 Roles and Responsibilities

DOE has overall responsibility for the final management remedy for any waste.

The Technical Assistance Contractor (TAC), Remedial Action Contractor (RAC), and their subcontractor personnel are responsible for the proper management of Moab UMTRA Project wastes and must adhere to the principles and requirements of this Plan. Key waste management responsibilities for the specific contractor positions are described below; these responsibilities are not limited to the content contained in the position descriptions.

### 1.3.1 RAC Program Manager and TAC Senior Program Manager

Program Managers are responsible for providing operations management by interfacing with DOE, the Operations/Site Managers, Health and Safety (H&S), Radiological Control, and Environmental Compliance (EC) personnel as necessary to facilitate proper management of wastes.

### 1.3.2 RAC Operations/Site Managers

The Moab and Crescent Junction Operations/Site Managers are responsible for managing and coordinating all RAC personnel. The Managers interface with personnel to facilitate proper management of wastes. Project/Program Managers may also assume the role of an Operations/Site Manager if one is not designated or available.

### 1.3.3 TAC Health, Safety, and Training Manager and RAC H&S Manager

H&S Managers support the needs of the Operations/Site Managers. With regard to wastes, H&S personnel are responsible for: collecting and evaluating worker hazard data; mitigating worker health risks based on industrial hygiene hazards; determining industrial hygiene hazard levels; directing the proper management of waste based on its industrial hygiene hazard level; and facilitating the release of waste from industrial hygiene controls.

### 1.3.4 RAC Radiological Control Manager

The Radiological Control Manager supports the Operations/Site Managers' needs. Radiological Control personnel are responsible for mitigating work health risks based on the radiological hazard, determining radioactivity levels, directing the proper management of wastes based on its radioactivity level, and facilitating the radiological release of wastes from the CA.

### 1.3.5 RAC Environmental Compliance Manager

The Environmental Compliance (EC) Manager supports the needs of the Operations/Site Managers. With regard to wastes, EC personnel are responsible for: interpreting and implementing environmental regulations (e.g., RCRA, TSCA) as necessary to facilitate proper management; collecting and evaluating environmental data; and recommending management remedies for Project waste.

### 1.3.6 Operations Field Personnel

Operations field personnel support the needs of the Operations/Site Managers. With regard to wastes, operations field personnel are responsible for reporting RRM that is suspected of being combined with other hazardous components to H&S personnel and the appropriate Operations/Site Manager, and interfacing with remediation subcontractors, as necessary, to facilitate proper management of wastes.

A diagram of the overall relationship of these personnel with regard to the management of Project wastes is provided in Figure 1. Further details about personnel functions and responsibilities for managing RRM combined with or suspected of being combined with other hazardous components are provided in Section 3.0.

# 2.0 Description of Waste Management Strategy

This section describes the general types of waste that will be generated at the Project and the strategies that will be used for their management.

## 2.1 Waste Description

Project wastes can be categorized as RRM or non-RRM waste. Descriptions of each are detailed below.

### 2.1.1 RRM Waste

RRM is the primary waste generated by the Project. All waste generated within the CA is considered RRM unless determined otherwise by radiological surveys or other information and designated as non-RRM by DOE. RRM is any material that meets the following definition for RRM provided in UMTRCA, and 40 CFR 192: (1) Waste that the Secretary of Energy determines to be radioactive in the form of tailings resulting from the processing of ores for extraction of uranium and other valuable constituents of the ores; and (2) other wastes that the Secretary of Energy determines to be radioactive at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials. The DOE Project personnel, as representatives of the Secretary of Energy, have the authority to determine what constitutes RRM.

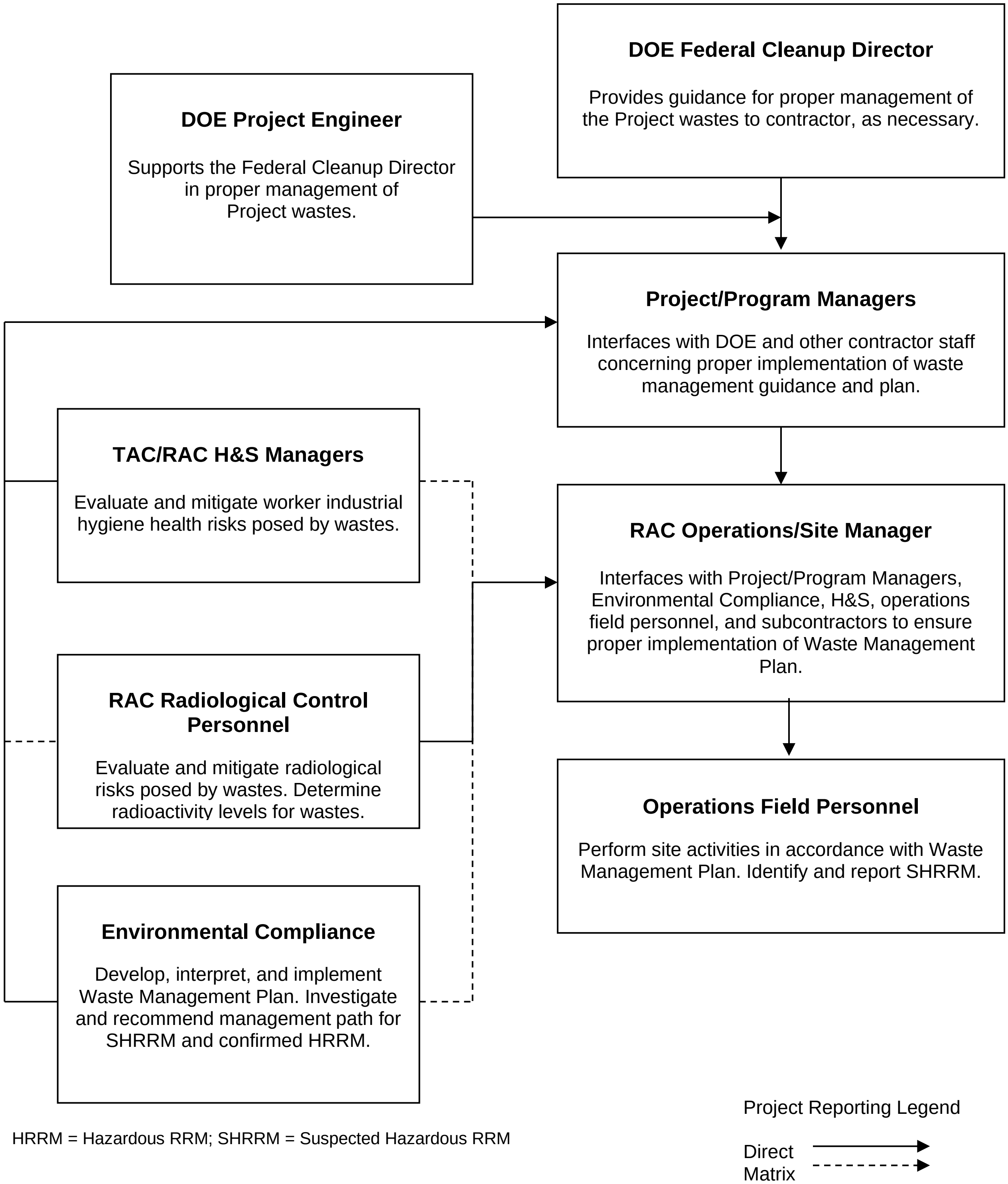



*Figure 1. Waste Management Personnel Relationships*

RRM includes the following:

- Routine RRM – Consists of uranium mill tailings and radioactively contaminated soil and mill debris. Most of the routine RRM in the CA is located in the tailings pile that covers approximately 130 acres of the site. Tailings have also been scattered throughout the other parts of the site as windblown and water-borne contamination. Various areas within the tailings pile also contain the demolished remnants of production and support facilities from the former mill.
- Hazardous RRM (HRRM) – Consists of RRM combined with other hazardous or toxic components that pose significant safety and health risks to workers or may pose long-term environmental risks. It is possible HRRM will be encountered during remediation activities because it is suspected that many types of waste were disposed of on site during historical operations, such as wastes generated by the former mill's processing operations and wastes generated as a result of its demolition.

UMTRCA is the overriding authority for the remediation of RRM. Other environmental statutes, such as the RCRA and TSCA, do not have regulatory authority over RRM or its management as waste, including RRM combined with other hazardous components.

### 2.1.2 Tailings Pile Characteristics

The tailings pile consists of various zones of coarse and fine tailings composed of sand, silt, and clay. Coarse-grained material, from on-site sources, was historically placed as cover on the pile surface to reduce water and wind erosion of underlying fine-grained tailings. Debris consisting of materials associated with infrastructure demolition is also buried within the pile. The debris includes concrete, metal sheeting, pipe, insulation, and other materials. According to Attachment 1, Appendix I, of the *Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at the Crescent Junction, Utah, Disposal Site* (Document X0176600), the following volumes are expected to compose the pile (see Table 1):

*Table 1. Estimated Moab Tailings Pile Volumes by Material Type*

| Material Type | Lateral X-Sections ($yd^3$) | Traverse X-Sections ($yd^3$) | Average ($yd^3$) |
|---|---|---|---|
| Cover Fill | 452,800 | 440,800 | 446,800 |
| Sand Tailings | 2,860,100 | 2,736,700 | 2,798,400 |
| Transitional Tailings | 3,930,500 | 3,903,100 | 3,916,800 |
| Slimes | 3,116,110 | 3,236,600 | 3,176,355 |
| **Total** | **10,359,510** | **10,317,200** | **10,338,355** |

Many of the radiological characteristics of the pile can be inferred from the radium-226 concentration data. Table 1 from Attachment 1, Appendix K, of the *Final Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill tailings at the Crescent Junction, Utah, Disposal Site* has been recreated and presented herein as these initial characteristics defined the original pile state (see Table 2). Comparison of the current pile state can then be made to this initial state.

*Table 2. Summary and Statistics of Average Radium-226 Concentrations in Moab Tailings Pile*

| Measurements | All Data | Sands | Transitional Tailings | Slimes | Sub pile & Interim Cover Materials (Alluvium) | Average of All Samples Without Weighting |
|---|---|---|---|---|---|---|
| Max: | 2,195 | 849 | 917 | 2,195 | 208 | |
| Min: | 2 | 13 | 192 | 236 | 2 | |
| **Average** | **697** | **272** | **530** | **1,349** | **85** | |
| Median | 564 | 202 | 556 | 1,333 | 89 | |
| Std Dev.: | 589 | 224 | 195 | 479 | 66 | |
| Count | 94 | 23 | 28 | 33 | 10 | |
| Material Dry Weight (tons) | 14,546,054 | 3,743,474 | 4,864,651 | 3,258,910 | 2,679,019 | |
| Dry Weight % | 100% | 26% | 33% | 22% | 18% | |
| Weighted Activity (pCi/g) | 565 | 70 | 177 | 302 | 16 | **707** |

This information was used for radon attenuation modeling to determine the capping and repository requirements for the Crescent Junction Disposal Site. In particular, the upper 7 feet of placed waste in the repository cannot exceed the average activity of all samples (without being weighted), 707 pCi/g. North Wind Portage's removal techniques, described later in this text, accommodate, and in fact have been tailored around these pile characteristics, along with other constructability factors.

## 2.2 Excavation

### 2.2.1 Excavation Goals and Methods

This plan establishes goals and methods that support remediation and final closure of the Moab site under the applicable standards listed in Section 1.1. Tasks to complete the project scope include the following:

- Excavation of RRM
- Segregation and processing of non-conforming RRM debris
- Moisture conditioning of RRM
- RRM packaging and shipment
- Placement and compaction
- Radiological sampling and release of Moab site
- Backfill and restoration of Moab site
- Cap and cover disposal cell.

Excavation planning aligns the remediation, disposal cell construction, and closure process with current DOE funding levels and closure schedule. It also manages risk related to uncertainty in waste inventory; probable mill site end-state condition; and natural phenomena.

This Plan works in conjunction with other plans and procedures, such as integrated work plans/job safety analyses (IWPs/JSAs), radiological work permits, and Project-specific procedures.

### 2.2.2 Excavation Sequence and Method

The excavation sequence is optimized for shipment and placement at current funding levels and manages project risks to site closure. Removal is focused on high-concentration RRM and pore water to reduce source term and support closure. Worker, public, and environmental safety and health are integrated into planning all work according to the Project's Integrated Safety Management System Description (DOE-EM/GJ3001).

Excavation generally progresses from west to east, leaving the excavation face open on the east side of the pile, and the west side of the pile remains covered with the "clean" or low radioactivity cover material. This in-place cover protects the pile from flooding of the Colorado River and/or Moab Wash and minimizes fugitive radioactive dust emissions. This method of leaving the embankment in place on the west (down gradient with respect to surface water drainage), by excavating from east to west, also utilizes the pile itself as a large stormwater best management practice (BMP), as the pile prevents surface water that has contacted the open RRM excavation areas from exiting the contaminated area, essentially acting as a large containment berm. Additionally, the majority of high-concentration slimes and pore water are contained by the embankment and cap until excavated for drying and subsequent loadout. Focusing excavation opposite waterways minimizes the exposure of contaminated material to the environment and controls stormwater run-on and run-off in compliance with the Project Stormwater Pollution Prevention Plans (SWPPPs) and CGP UTR359185.

The excavation progression from west to east prioritizes removal of high-concentration slimes early in the project as a strategic sequence that reduces radiological inventory, removes ground-water contamination sources, places higher-concentration RRM in lower elevations of the disposal cell to assure radon protectiveness, and preserves low-concentration RRM for blending with off-pile area RRM. Additionally, the method employed by North Wind Portage blends the entire lithology of the open face of the pile because each cut (made by slot dozing) pushes the material from the top of the pile to the bottom of the pile, blending the materials encountered together across the entire cross section. This has several advantages over discrete excavation of the entire pile, as would happen if loadout occurred as the excavation worked from the top of the pile to the bottom of the pile, via excavator and truck. Specifically, the North Wind Portage methodology immediately blends the cross section of the material, averaging out activity and moisture immediately as the cut is made. The exposed face has a high surface area, allowing both wicking of entrained pore water to exit out the face on the west side of the pile, remaining contained, and allowing for air drying and evaporation to take place on the surface of the soil. The material generated from each slot dozed cut is then picked up with an excavator and trucked to a drying bed, blending the material once again. Then the material is dumped into a drying bed where it is spread with a dozer and then disked to obtain +/-3% of optimum moisture in accordance with the applicable standard proctor of the material, as required by the Contract. This process not only expeditiously dries the wet RRM, but the blending action averages and normalizes the encountered activity within the pile.

As the pile was constructed, the technology utilized to extract the uranium from the ore changed over time, becoming more efficient. This fact comes directly from Site Observational Work Plan for the Moab, Utah, Site Volume I, December 2003, Document IDs GJO-2003-424-TAC and U0032700, and therefore a reasonable assumption can be made that the radium concentration of tailings generated earlier in the milling process is higher than that of the tailings generated more recently. These higher-concentration tailings are more prevalent at depth in the tailings pile. The North Wind Portage excavation method blends the entire cross section of these tailings, averaging the variability in activity into a homogeneous blend. Radium-226 measurements from daily sampling of the loadout material verify concentration levels indicate a decreasing trend now generally well below 707 picocuries per gram (pCi/g) on average.

Additionally, the method of excavating the entire cross section of the pile from west to east has assured removal of the entire waste profile, rather than "cherry picking" just the low-concentration materials, or the high-concentration materials. This method blends the high activity slimes with the transitional materials, sands, and alluvium. To date, the known slimes have been removed and placed at the Crescent Junction disposal cell.

RRM is again blended when is it is loaded out into the intermodal shipping containers. This is accomplished because the RRM was originally placed in an approximate 1-foot lift on the drying bed and the process repeated multiple times as the optimal moisture content is reached. This ultimately results in a drying bed loading platform approximately 10 feet in height in which an excavator sits atop of and loads containers. Providing this optimum platform height helps to minimize spill and overfill that can be difficult to decontaminate for release to shipment. When loading, the excavator removes RRM from the base of the drying bed or platform to the top, removing a cross section of material that originated from multiple locations of the pile. This creates a homogeneous waste with the activity level distributed consistently throughout.

The North Wind Portage slot dozing method leaves large portions of the face undisturbed as the slot dozing progresses from the north to the south along the face. This exposed material has excess moisture content, often exceeding 50%. Exposing this material allows natural drying to begin. During this drying process, salts dissolved in the pore water are left behind as the water evaporates. These salts then form a crust over the surface, which acts as a natural tackifier to aid in minimizing fugitive dust emissions from the pile face. The crust remains in place until the area is disturbed again for the next evolution of slot dozing.

As debris is encountered during slot dozing, it is segregated from the RRM. The dozer isolates the debris from the immediate work and an excavator then piles it up and loads it into a haul truck that transports the debris to the debris staging area. The debris can then be size reduced and loaded out separately such that the proper ratio of soil-to-debris mix can be maintained for placement at the Crescent Junction disposal site. Debris may be placed at any depth in the disposal cell, but disposal is optimized by placing of debris in the sacrificial lift located on the floor of the disposal cell. This allows for a more efficient approach to placement and can mitigate risks associated with potential schedule impacts.

Off-pile RRM areas are relatively small in volume and located across areas currently used to support remediation. Excavation of these areas is planned for the final years of the project, concurrent with final status surveys, as contamination is distributed in mostly contained separate small areas and/or contiguous with facilities and infrastructure that currently support the bulk remediation. Additionally, sub-pile RRM located beneath the footprint of the pile will be remediated in a similar fashion nearing the end of the project. The majority of the off-pile and sub-pile RRM is considered to be on the lower level of the activity scale, and remediation of the areas will coincide with the placement of the top 7 feet of RRM in the disposal cell at Crescent Junction.

Tailings pile management operations at the Moab site are influenced by seasonal climate considerations. When hot, dry weather prevails in the Moab area, higher-moisture-content RRM is placed in drying beds during the summer months for moisture conditioning. Material moisture conditioning and drying bed construction are primary operational goals during spring, summer, and fall months, when the weather is favorable. The moisture-conditioned material is then ready for shipment to the Crescent Junction site during the cooler winter months. The location of the load-out area and the drying beds varies with the progression of the excavation and the availability of floor space.

During the winter months, shipments of RRM to the Crescent Junction site are maintained by a process of direct loading of lower-moisture-content, granular RRM. Direct loading material is currently an effective method for making up the balance of annual material shipment during winter months. From a tailings pile management perspective, it is also desirable to create as much area as possible (floor space or otherwise) for material conditioning. This helps ensure that a sufficient quantity of material is available for shipment when needed. Direct-loaded RRM is sampled and measured for radium-226 concentration prior to shipment. Figure 2 shows pile management information 2022 volume analyses. Figure 3 shows RRM process flow.

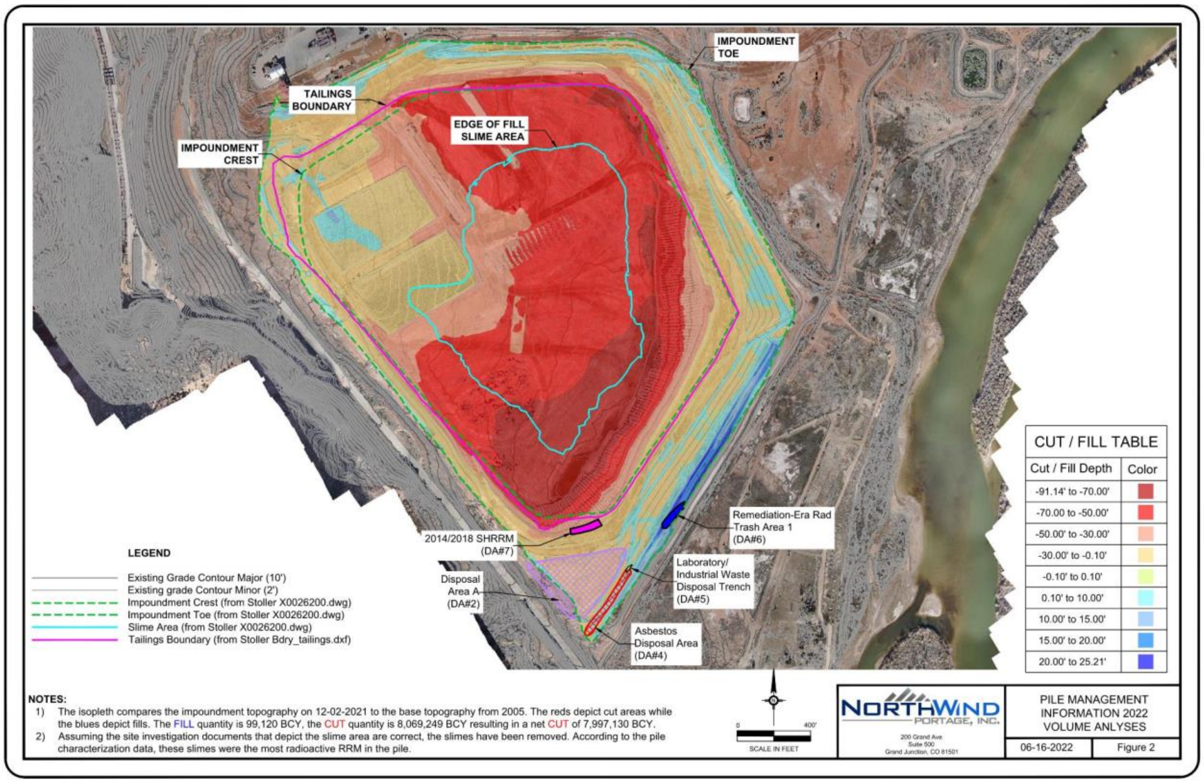



*Figure 2. Pile Management Information 2022 Volume Analyses*

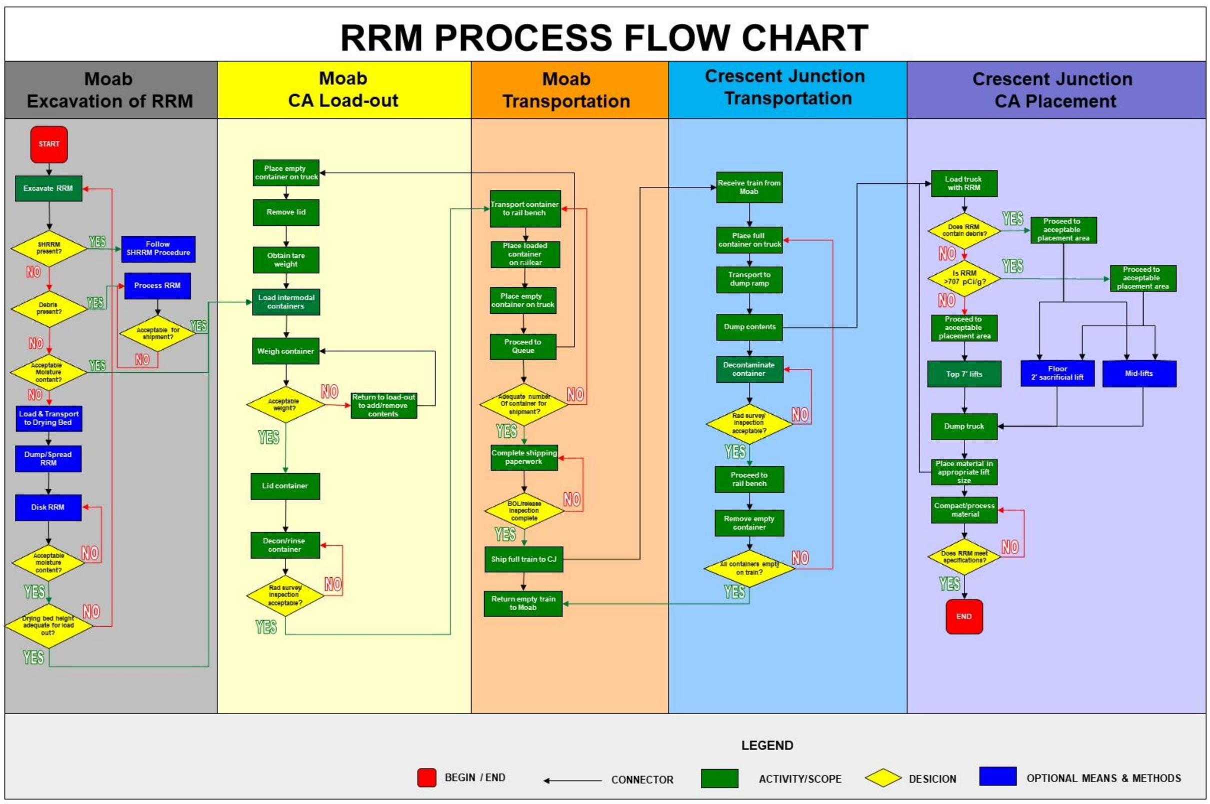



*Figure 3. RRM Process Flow Chart*

### 2.2.3 Excavation Procedure

The activities associated with excavation, load-out, transportation, and placement in the disposal cell are summarized in the RRM process flow chart (Figure 3). The variable operational factors related to the excavation and conditioning (drying) that could impact the way materials are prepared for disposal include the following:

- The ratio of dry, sandy material to transition tailings material to slimes in any given section of the pile
- The cohesive strength of the slimes material relative to supporting excavation equipment
- The amount of free water encountered while excavating RRM
- The stability of the excavation slopes
- The time required to dry RRM to obtain acceptable moisture levels
- The concentration and associated activity of radium-226 and other radionuclides present in the tailings
- The quantity and characteristics of debris mixed with the tailings
- Anomalies encountered within the tailings, including the discovery of unknown materials
- The location and floor area available for drying bed construction
- Storm water and dust control
- Extreme or inclement weather.

When encountered during excavation, an anomaly may impact the planned tailings excavation by diverting excavation around the anomaly. Depending on the nature of the anomaly, additional characterization and planning may be required before removal and disposal. Anomalies are managed in accordance with the *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633) and the *Moab UMTRA Project Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure* (DOE-EM/GJRAC2160).

Appendix B of DOE-EM/GJRAC2160 summarizes seven disposal areas, including the location or presumed location of each disposal area, the contents of the area, and the disposal timeline. Records indicate that three areas have already been excavated—two associated with vanadium drums and sludge, and the other referred to as the northwest bench area in Atlas records. The remaining areas are located in the southwest corner of the pile and include a sump collection pond filled with mill debris, an asbestos disposal landfill, a laboratory chemical/industrial waste trench, an area used for radioactive investigation-derived waste used by DOE during project initiation, and an area of nuisance odors encountered during excavation in 2014 and 2018. These areas are shown in Figure 2.

### 2.2.4 Equipment

In general, tailings pile excavation is performed using several pieces of heavy equipment in various configurations. The equipment used in excavation and load-out of RRM at Moab includes a typical complement of tracked excavators, tracked dozers, a motor grader, a wheeled loader, articulated trucks, highway trucks (Sterling or equivalent) and a tractor and disk. Additional equipment may be used as necessary to achieve operational goals (e.g., size-reducing debris).

Two excavation operations may be working concurrently. Wide-track, low ground pressure dozers are used to slot doze RRM down the face of the tailings pile to the excavation floor. Tracked excavators or a wheeled loader is used to load RRM into an articulated truck on the protected excavation floor. The excavator normally sits atop the material that has been pushed down by the dozers. The excavator then removes the material along the base of the pile and loads it into trucks that pull up parallel to the toe of the pile, beneath the excavator.

The material is then transported by articulated trucks to drying beds for conditioning. Alternatively, material may be directly loaded into intermodal containers if the material is suitable for placement at Crescent Junction without being conditioned (see Section 2.3.1 for a discussion of material conditioning acceptability). In addition to space on the excavation floor, the entire top of the pile may be used as drying beds until excavation activities dictate that these areas be removed.

### 2.2.5 Sloping

Sloping is the primary method used for excavation. Sloping is performed with dozers that slot doze the pile face. The benefits of sloping include enhanced stability on the working face, a blending of the principal types of soil material found in the pile (which is beneficial for conditioning), less restricted space for equipment to operate safely, and enhanced efficiency in removal of RRM from the tailings pile for placement on drying beds or stockpiles. Operational efficiency is additionally enhanced because less machine time is spent creating stable benches for RRM excavation and truck loading.

The track-walking of the tailings pile slopes that occurs during sloping operations is also beneficial to pile management because it compacts the near-surface soil materials, limiting the ability of precipitation to infiltrate into the RRM, and is a typical stormwater BMP. Additionally, the grouser marks left behind from the dozer create small, horizontal indentions in the material that perform similar to a water bar. These indentions dissipate and divert energy of the water in events of heavy precipitation, effectively reducing slope erosion associated with these events. Since sloping became the primary method of removing RRM from the tailings pile, significant drying of the working face has been observed. The resulting decrease in the volume of slimes and water flowing from seeps also enhance operational efficiency, because the RRM is easier to excavate and load and it requires less time to condition.

### 2.2.6 Benching

In some instances, it may be beneficial to utilize benching as the protective system to ensure safe operations. Examples may include creating working platforms for equipment or the construction of haul roads. Benches may be created by excavating the face of the tailings pile with a tracked excavator and removing the material by haul truck or by cutting into the face of the pile with a tracked dozer.

### 2.2.7 Excavation Considerations

In general, the tailings materials and water/seepage conditions are observed continuously during all excavation activities. If materials with poor cohesion, wet areas, or seeps are encountered in significant quantities (i.e., other than small, localized zones), excavation is discontinued at that location until further assessment is made, and procedures and/or limits are put in place to ensure safety.

The RAC excavation team identifies and protects native soils by discontinuing excavation activities above the original ground surface. This approach allows the excavation floor to be used as another solid working surface (for drying bed construction and other RRM removal activities) without compromising the original native soils. Test pits and existing borehole and pre-mill topographic maps are used to determine the pre-mill ground surface. Periodic monitoring of the radium content may be performed to verify that excavation of RRM is above 15 picocuries per gram plus background. The purpose of the periodic monitoring is to limit any over-excavation of material at the site.

## 2.3 Materials and Loading

### 2.3.1 Material Conditioning

Excavated RRM generally consists of a combination of the four principal types of material identified in Section 2.1.2. The excavation face currently exposes the four types of material commonly referred to as sandy, transitional, slimes, and fatty clays. The working face of the pile has drained significantly since sloping methods have been used to push material down the face of the pile, and slimes are becoming less of an operations issue. Very dry material may also be encountered, which requires blending with moist material or moisture conditioning, or may be suitable for direct load-out.

After the haul trucks are loaded, material is transported to a drying bed for material conditioning. Normally, there are several drying beds in various stages of completion where material may be dumped based on material characteristics. As described in Section 2.2.2, drying bed construction is the primary operational goal during summer months, so that suitable moisture-conditioned material will be available for load-out. Direct loading of suitable in-place material for shipment often occurs concurrently with drying bed construction activities.

After haul trucks dump the material onto the drying bed, a dozer spreads the material into appropriately sized lifts. Equipment pulling a disk (a common soil cultivator used in agriculture) conditions the material by making multiple passes to turn and mix the surface of the lift. Disking the material facilitates evaporation and conditioning to reach the desired moisture content. Material is ready for loadout when it has reached acceptable moisture content levels for shipment to the Crescent Junction disposal cell.

Optimum moisture content is determined in accordance with the material testing procedures detailed in Addendum E of the Moab UMTRA Project Remedial Action Plan (DOE-EM/GJ1547). For as-low-as-reasonably-achievable (ALARA) purposes, the moisture content should be maintained in the acceptable range before shipping.

### 2.3.2 Material Load-out Operations

Material load-out is conducted by direct loading from selective areas of the tailings pile or from conditioned material in drying beds or stockpiles. As conditioning activities progress, and the footprint of material drying bed stockpiles increases, the ability to move load-out operations to other locations on the pile exists. Load-out may be moved to improve safety and achieve operational goals including, but not limited to dust suppression, inclement weather, lower radiological exposure, or to generally increase the efficiency of the Project.

### 2.3.3 Direct Loading

Direct loading is the practice of excavating suitable in-place material and loading it directly into shipping containers on haul trucks. This practice is used during times when the material stacked on drying beds is not completely conditioned and/or drying beds are under construction. It may also be used during times when other materials are frozen and harder to excavate. The construction of drying beds for material conditioning may proceed concurrently with direct loading of RRM for shipment. The in-place material suitable for direct loading is generally more granular with lower moisture content.

### 2.3.4 Loading Conditioned Material

Load-out of conditioned material is done by using a tracked excavator to excavate the face of the drying bed (or stockpile) and then placing the material into shipping containers transported by truck. Excavators typically load material into the containers from the top of the drying bed. The haul truck stations the container on the excavated floor, parallel to the edge of the drying bed, while the excavator strips material from the face and loads the container.

### 2.3.5 Container Weighing and Cleanout

Target weights for short and tall containers are optimized to railcar capacity. Each railcar can hold four containers and is configured with a mix of light (normally short) and heavy (tall) containers to prevent overloading the railcar. In some instances, tall containers may be loaded to the target weight for a short container based on railcar capacity. This distributes use across the fleet of containers, which consists of 25% more tall containers. Individual container tare weights vary in the fleet based on age, repair history, and coating/liner configurations. Containers are weighed in accordance with the Moab UMTRA Project Residual Radioactive Material Weight Determination Procedure (DOE-EM/GJRAC2098). If the weight of the truck and loaded container is within the target weight threshold, the container is prepared for shipment. If the weight of the truck and loaded container is outside of the established weight thresholds, material is added to or removed from the container with the load-out excavator.

“Holdback” is RRM that did not come out of the container during the dumping process at the Crescent Junction repository and is, therefore, returned to the Moab site in the container. Holdback is reduced by minimizing the duration containers remain loaded prior to dumping and loading RRM with lower optimum moisture contents during colder periods. Holdback is identified in accordance with the tare weight tracking and the individual container interior visual inspections performed in accordance with the Weight Determination Procedure.

## 2.4 Water Management

Multiple current and historic methods are employed to manage storm water and pore water associated with the tailings pile. Control of surface water is achieved with standard construction practices, including catchments, berms, swales, straw bales, and wattles, pursuant to the Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan (DOE-EM/GJRAC1475).

The tailings pile contained a wick system installed prior to excavation. This system consisted of a series of fabric wicks orientated vertically in the center of the tailings pile that were designed to dewater the slimes present within the tailings. Most of the wick components have been excavated. Although mostly inoperable, when remaining wicks are encountered seeps may occur.

Where necessary, temporary holding ponds may be dug to capture pore fluids as they drain from the excavation areas, keeping the fluids on tailings. Once contained, pore water may evaporate in-place and/or be removed from ponds and used for dust control in non-work areas on the pile to minimize employee exposure.

Porewater has a pH level as low as 2.0. Potholing on the surface of the pile may be performed to help remove free pore water from the pile. This is done by pumping the water from the potholes to temporary holding ponds. If subsurface water continues to be of concern, the RAC may install perforated, corrugated pipe at well points or sumps, pump the collected water to the temporary holding ponds or haul it to remote tailing's locations for spreading to promote evaporation.

When slimes are excavated, additional quantities of subsurface water may be encountered. Relatively small quantities of water may be absorbed using dry cover material or tailings, and the mixture may then be loaded into haul trucks for transport to the drying beds.

Berms may be used near the face of the excavation to minimize the impacts of larger quantities of water on the floor of the excavation and the future drying beds. Berms may be used to direct water on the excavation floor to sumps positioned so they do not interfere with tailings pile removal operations. When significant quantities of water are accumulated, a determination is made whether to manage the water in place, pump it to a temporary holding pond, or haul it to remote tailing's locations for spreading, depending on current site conditions.

## 2.5 Managing Debris and Anomalies

Material is managed in accordance with the Moab UMTRA Project Waste Management Plan (DOE-EM/GJ1633) and the Moab UMTRA Project Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure (DOE-EM/GJRAC2160). Debris encountered in the tailings pile is generally associated with structure demolition and includes concrete, structural steel, piping, and other demolished milling equipment. Debris sizing and containerization are performed and verified at the Moab site in accordance with the Remedial Action Plan. During excavation, other materials or objects may be encountered, including drums, gas cylinders, tanks, or other unusual items referred to as anomalies.

There is a significant quantity of debris in the southern end of the tailings pile (some of which has already been excavated) that will continue to be excavated. The debris is primarily structural steel and concrete. To the extent practicable, the debris is separated from tailings material before loading the debris onto haul trucks. The structural steel and concrete debris are separated and hauled to a storage bed, where the debris may either be direct loaded into containers for transport to the CJ disposal facility or size-reduced for future loading. Concrete debris is size reduced with hydraulic breakers, and steel debris is sized with a shear.

Construction and demolition debris and anomalous materials are categorized into three groups:

1. Items that fit into containers
2. Items that require size reduction before load-out
3. Potentially hazardous items.

*Items that Fit into Containers*

Smaller items that fit into the containers and meet the disposal requirements set forth in the Remedial Action Plan are containerized and shipped to the disposal facility.

*Items Requiring Size Reduction Before Load-out*
Larger items, such as lengths of steel beam and pipe or concrete slabs that do not meet the Remedial Action Plan disposal requirements, are size reduced before being containerized for disposal.

*Potentially Hazardous Items*
During tailings pile excavation, the RAC expects to encounter hazardous waste that the U.S. Environmental Protection Agency (EPA) defines as "characteristic waste," asbestos-containing material (ACM), drums, gas cylinders, or other containers. Suspected hazardous RRM (SHRRM) is RRM encountered during remediation that is suspected of containing hazardous or toxic components that pose an increased risk to workers or the environment. The requirements for managing hazardous waste and SHRRM include proper notification, mitigation, identification, delineation, evaluation, and hazard determination as described in the Waste Management Plan. The initial response to SHRRM includes the SIN principle: "Safety first and always, Isolate and deny entry, Notifications."

## 2.6 Disposal Facility Methods

The Crescent Junction disposal repository is designed and constructed to 40 CFR 192 Subpart A disposal standards for control of RRM based on specific performance requirements to ensure that a disposal cell will be reasonably effective for up to 1,000 years (and a minimum of 200 years), to limit the release of radon-222 to the atmosphere, and to provide ground water protection. RRM is placed and compacting in accordance with the Remedial Action Inspection Plan (RAIP). Stockpiling RRM at the repository is generally avoided and RRM is placed and compacted upon receipt. When inclement weather or operational constraints delay placement, RRM may be stockpiled within the repository.

Cell expansion phases 4B, 4C, and 4D remain to be constructed and with construction occurring as needed to accommodate RRM and debris placement and funding allows. The phases are shown in Figure 4.

In general, cell excavation and placement operations occur from West to East and North to South. North Wind Portage has designed the CJ placement operations to allow for parallel (concurrent) activities, which greatly compress the project schedule when compared to conducting activities in series (start to finish subsequent activities, rather than start to start with some periods of lag). Concurrent activities that may occur while RRM placement activities occur include the following:

- Cell expansion on the east
- Placement of Interim and Protective cover soil atop RRM that has achieved the designed Top of Waste grades
- Placement of Mancos Shale as radon barrier on the middle portion of the cell that already has interim cover soil placed
- Rock placement or cap conversion to ET cover on the western portions of the cap (Areas already covered with cap rock or frost protection soil)

The placement methods developed by North Wind Portage also provide additional benefit beyond task concurrency. By placing RRM from west to east and north to south, bringing the grade up to the designed top of waste grades in a manner that slopes drainage to the south and east, inherent stormwater control is built into the placement scheme. This pushes the

RRM contact water to the southeast where it can be managed and does not inhibit operations within the CA. Additionally, by placing the fill areas directly adjoining areas that have achieved top of waste finish grades, the areas at grade can be covered with interim cover as the placement operations progress. Covering the top of waste minimizes radioactive fugitive dust and minimizes contact water that touches RRM. Water that flows from the interim cover can be discharged to the site clean stormwater BMP features, minimizing stormwater that contacts the RRM and must be contained within the CA.

It should also be noted that the placement methods, combined with the moisture conditioning methods conducted in Moab, minimize stockpiling of RRM in the cell, allowing direct placement, compaction, and testing of the material. Eliminating double handling shortens the project schedule, benefits the environment, and increases overall operational efficiency. Another important operational consideration for CJ is the fact that construction water is pumped over 20 miles to the site. This means RRM containing sufficient water as it arrives from Moab is of high importance for direct placement and minimizing water addition for moisture conditioning during placement.

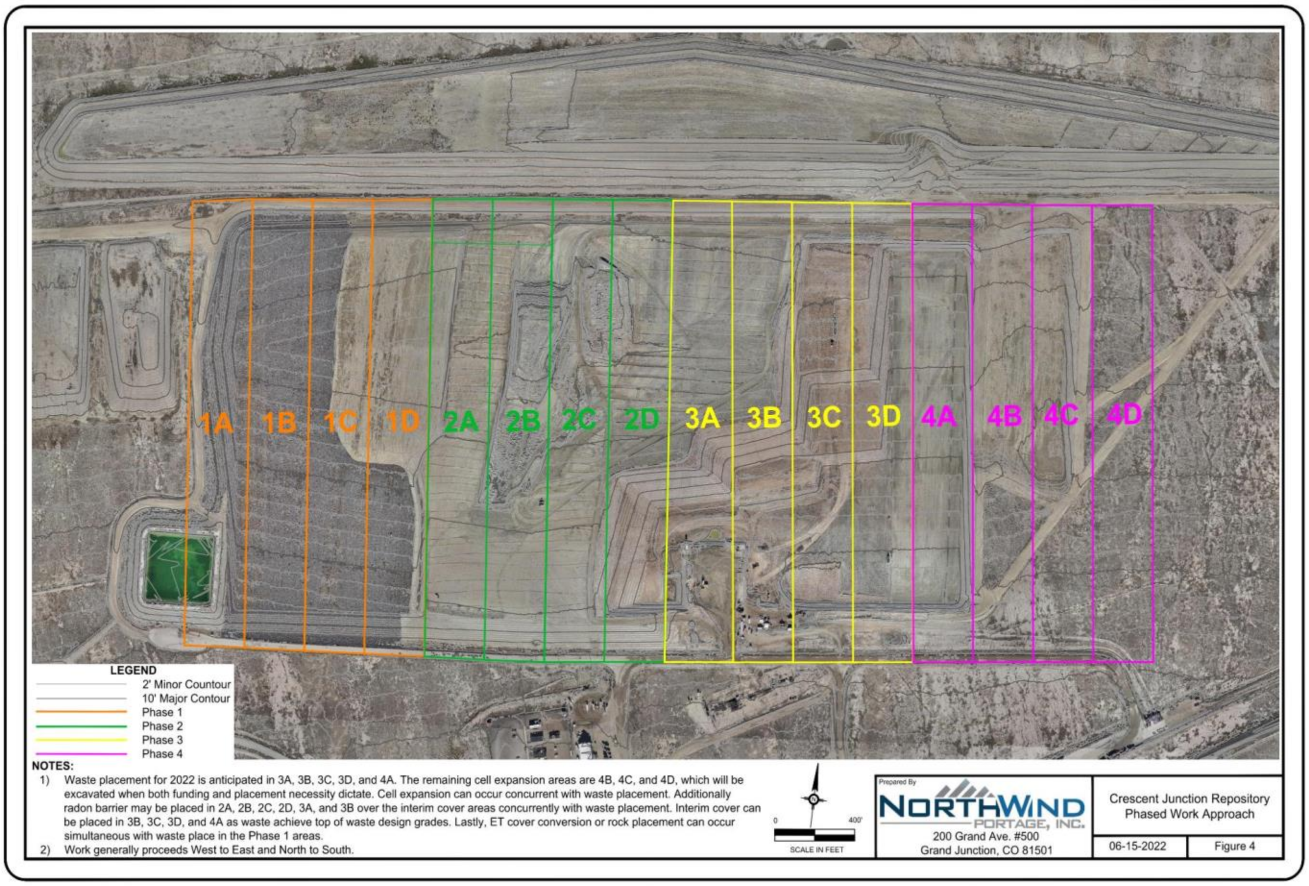



*Figure 4: Crescent Junction Phased Work Approach*

## 3.0 Waste Management Strategy

There are different requirements for managing RRM and non-RRM waste because of differing regulating authorities and waste composition.

## 3.1 RRM

RRM shall be remediated in accordance with the standards for the control and cleanup of RRM provided in 40 CFR 192 Subparts A through C. Additional cleanup standards may be established for radioactive contaminants present in RRM other than radium-226, such as thorium or uranium, based on 10 CFR 835, "Occupational Radiation Protection," DOE Order 458.1, Administrative Change 3, "Radiation Protection of the Public and the Environment," various guidance from DOE, EPA, NRC, and human health and ecological risk assessments. DOE will be asked to approve cleanup standards for radioactive contaminants in RRM that are not established in 40 CFR 192.

Routine RRM, such as uranium mill tailings and radioactively contaminated soil and debris, will be excavated and handled using standard RRM remediation/construction methods and as required by the approved remedial action and work plans. Procedures for controlling radiological contamination will be used to protect site workers, the public, and the environment. Routine RRM meets the NRC-approved Waste Acceptance Criteria (WAC). RRM that meets the WAC will be transported and disposed of at the Crescent Junction disposal site.

HRRM shall also be remediated in accordance with the standards in 40 CFR 192, Subparts A through C. Though the hazardous components in HRRM are not subject to regulation by environmental statutes such as RCRA or TSCA, additional cleanup protocols may be established for these hazardous components to provide adequate worker safety. Hazardous components that present an increased risk to workers or the environment may necessitate further characterization efforts and the use of more protective excavation and handling methods. HRRM that meets the appropriate WAC may be placed at the Crescent Junction disposal site with DOE concurrence. The management requirements for HRRM and suspected HRRM are discussed more thoroughly in Section 4.0.

RRM may be decontaminated if warranted, feasible, and cost effective. Reusable equipment or materials that become radioactively contaminated during remedial action should be decontaminated whenever possible. If it is not feasible or cost effective to decontaminate reusable equipment or materials, they may be disposed of at the disposal site. The *Moab UMTRA Project Radiological Release of Materials and Equipment Plan* (DOE-EM/GJRAC2091) contains procedures for decontaminating RRM, including release limits for radioactivity.

## 3.2 Non-RRM Waste

Waste generated outside the CA is non-RRM unless radiological surveys or other information indicate otherwise. The Radiological Assessment for Non-Pile Areas of the Moab Project Site (DOE-EM/GJ901-2005) evaluates the extent of contamination from RRM within the Project boundaries. It should be noted that any wastes generated within the controlled area of the site (Crescent Junction or Moab) which have been potentially impacted by radiological materials associated with RRM, will be handled as RRM waste, even if the materials are located outside the CA. This last point is particularly relevant for items spilled onto the ground within the Controlled Area, but outside the Contaminated Area.

Non-RRM waste is material that does not meet the aforementioned definition of RRM. Generally, non-RRM waste is non-radioactive material that meets the definition of solid waste provided in 40 CFR 261 (§ 261.4(a)). Typical non-RRM waste consists of materials such as office trash, construction debris, and discarded wood, plastic, or metal.

Non-RRM waste that contains other hazardous components may be generated in the uncontaminated support area outside the CA or within the CA and is non-radioactive, such as used oil or other spent petroleum products generated from equipment maintenance. Oil changes within the CA would be done under the supervision of a Radiological Control Technician to ensure oil does not become radiologically contaminated.

Non-RRM waste is not governed by UMTRCA, but is instead governed by other statutes, such as RCRA or TSCA. Non-RRM waste combined with other hazardous components is subject to more stringent regulation than typical non-RRM solid waste, such as by the hazardous waste regulations at 40 CFR 261, "Identification and Listing of Hazardous Materials," and the corresponding state of Utah hazardous waste regulations at Utah Administrative Code (UAC) Rule 315, "Utah Hazardous Waste Management Rules."

Non-RRM waste shall be managed in accordance with federal, state, and local requirements and regulations pertinent to the waste. There are no specific handling or storage requirements for typical non-RRM waste, such as office trash, wood, plastic, or metal. These solid waste materials should be accumulated using standard practices and disposed of at the local municipal landfill. Non-RRM waste shall not be disposed of at the disposal site. The contractor will make reasonable efforts to minimize the generation of non-RRM wastes and to recycle non-RRM wastes and materials per DOE Order 436.1, "Departmental Sustainability." Recycling bins are provided for paper, aluminum, and plastic.

Proper management of non-RRM waste also requires evaluation to determine if it contains hazardous or toxic components. Non-RRM waste that contains hazardous or toxic components shall be managed in accordance with the hazardous waste regulations at 40 CFR 261, the universal waste regulations at 40 CFR 273, "Standards for Universal Waste Management," and the corresponding state of Utah hazardous waste and universal waste regulations at UAC R315. These management requirements encompass proper tracking, containerization, labeling, storage, treatment, transportation, disposal, and record keeping.

### 3.3 Universal Waste

Universal Wastes are classified as common hazardous wastes. The United States (US) EPA has defined these wastes in 40 CFR 273.9. In general, these wastes include batteries, pesticides, mercury-containing equipment, fluorescent light bulbs, and aerosol cans. Universal Waste generated within the CA or that has become radiologically impacted within the site-controlled areas will be handled as HRRM, while all other non-RRM impacted Universal Waste generated at the site is handled as Universal Waste as detailed below.
Hazardous wastes handled as Universal Waste includes:

- Spent batteries found in electronic equipment, hand tools, mobile phones, cameras, computers, and emergency backup lighting. Mercury containing devices, including thermostats, thermometers, barometers, manometers, relays, and switches.

- Lighting waste includes lamps, bulbs, or tubes with small amounts of mercury and possibly cadmium. Fluorescent, high intensity discharge, neon, mercury vapor, high-pressure sodium, and metal halide lamps. Note this does NOT include polychlorinated biphenyl (PCB) containing electrical equipment, such as PCB containing ballasts.
- Unused pesticides that have been recalled or for which use has been suspended are Universal Waste.
- Aerosol cans become waste on the date they are discarded or no longer usable. As described in section R315-273-9, they are not hazardous waste. An aerosol can shall be managed as a hazardous waste if the can or its contents exhibit one or more of the characteristics identified in sections R315-261-20 through 24, or if its contents are listed in sections R315-261-30 through 35.
- Antifreeze (ethylene glycol, propylene glycol) becomes waste on the date it is discarded or no longer usable.
- Lead acid (automotive) batteries will be stored in a leak proof box and will be covered. These storage locations are in the maintenance area. They will be dated on the day they become waste and stored in the correct area.
- Nickel cadmium, silver, mercury, alkaline or lithium batteries will also be dated and stored in universal waste battery buckets, taping the battery ends to prevent unwanted contact with each other. These buckets can be found on both sites in most of the buildings.

DOE and contractors will manage universal waste as a “very small quantity handler,” which does not accumulate 1,000 kilograms (2,200 pounds) or more total universal wastes, or 1 kg (2.2 pounds) of acute hazardous waste on site at any one time. A very small quantity handler of universal waste is not required to notify the Utah Division of Environmental Quality or Colorado Department of Public Health and Environment (depending on site location) of universal waste-handling activities.

Very small quantity universal waste handlers are prohibited from disposing of universal waste and must ensure waste is recycled or delivered to a permitted facility. The very small quantity handler facility is prohibited from diluting or treating universal wastes.

For storage, the very small quantity handler of universal waste must label or mark universal waste or containers to identify the type of Universal Waste (e.g., “Universal Waste Batteries,” “Universal Waste – Fluorescent Tubes”).

Universal Waste will be managed in a way that prevents a release of any component of the waste. Containers must be structurally sound, be compatible with contents, and show no evidence of leakage, spillage, or damage that could cause leakage. If stored outside, containers must be covered to prevent precipitation from encountering the waste.

A very small quantity handler of universal waste may accumulate universal waste for no longer than 1 year from the date the waste is generated, unless accumulation activity is solely for the purpose of accumulating quantities sufficient to facilitate proper recycling or disposal. If the time limit is greater than 1 year, the very small quantity handler must prove its facility has a feasible recycling market.

The very small quantity handler of universal waste who accumulates universal waste must be able to demonstrate the length of time the waste has been accumulated from the date it became a waste by:

- Placing universal waste in a container and marking or labeling the container with the earliest date that any universal waste became a waste.
- Marking or labeling each individual item of universal waste (e.g., battery, lamp, and thermostat) with the date it became a waste and placed in the storage container.
- Maintaining an on-site inventory system that identifies the date each universal waste became a waste.
- Placing the universal waste in a specific accumulation area and identifying the earliest date that any waste in the area became a waste.

A very small quantity handler of universal waste is prohibited from sending or taking universal wastes to a place other than another universal waste handler or a destination facility for recycling or disposal.

Although very small quantity handlers of universal waste are not required to keep records of shipments of universal waste per UAC R315-16-2, “Standards for Small Quantity Handlers of Universal Waste,” records of recycling document Project sustainability metrics and should include destination facility, quantity of each type of universal waste, and date of shipment. Mechanics and/or maintenance or responsible employees will provide the required records or manifest information to the Environmental Compliance staff for filing in the DOE records system.

Whereas the Moab UMTRA Project sites in Moab and Crescent Junction follow universal waste regulations dictated by UAC, the Grand Junction DOE office follows universal waste regulations dictated by Colorado Code. Guidelines specific to the Grand Junction office will be managed as described below.

- Aerosol cans containing hazardous waste such as paint, brake cleaner, and solvents, or those that contain a hazardous waste propellant, are considered universal waste. The Grand Junction office’s goals are to ensure all aerosol cans are fully consumed or used, have no residual product (less than 10 percent), and can be disposed as solid waste in normal trash. Manual or pump applicators (e.g., glass cleaner) are the preferred dispensing option. Aerosol cans have to be properly stored and labeled prior to proper disposal to commercial service vendors.
- Used electronic devices and components (e-waste other than batteries) that fail the toxicity test for heavy metals, such as computers, monitors, color televisions, and circuit boards, are covered under the universal waste regulations and will be managed in the Grand Junction office from all three Moab UMTRA Project sites by the TAC IT department. Proper labeling of area or container includes, storage, accumulation time limit, shipment (Colorado and Utah do not require hazardous waste manifest system), and disposal are required.
- Mercury-containing devices (e.g., mercury thermostats, gauges, flow regulators, electronic switches, and relays) and lamps are a building maintenance issue and will be managed by the building owner.
- Pesticides are building maintenance issues and will be managed by the building owner.
- The Project’s goal will be to maintain a classification as a “Very Small Quantity Generator” (VSQG) that generates less than 100 kilograms or approximately 220 pounds of total
- hazardous waste per month and accumulates no more than 1,000 kilograms or 2,200 pounds at one time. The Project EPA ID number is UTD980717607.

### 3.4 Investigation-derived Waste

Investigation-derived waste (IDW) is waste generated in the field during site investigation and monitoring activities associated with ground water or soils. IDW includes personal protective equipment (PPE), disposable sampling equipment, excess soil (e.g., well-drilling cuttings, trenching spoils), excess ground water (e.g., well development, purge water), or miscellaneous trash (e.g., empty containers, plastic, packaging materials).

IDW may be RRM or non-RRM waste. IDW may also contain hazardous components other than radioactivity. IDW will be managed in a manner that is consistent with the DOE UMTRA Project "Technical Approach for the Management of UMTRA Ground Water Investigation-Derived Wastes" (DOE-AL/62350-109) (as revised for the UMTRA Ground Water project), the U.S. Environmental Protection Agency (EPA) "Guide to Management of Investigation-Derived Waste" (9345.3-03FS), and the requirements of this Plan.

IDW shall be managed in accordance with the requirements of this Plan for RRM and non-RRM waste and in a manner that is consistent with the "Technical Approach for the Management of UMTRA Ground Water Investigation-Derived Wastes" (as revised for the UMTRA Ground Water project) and the EPA "Guide to Management of Investigation-Derived Waste."

The "Technical Approach for the Management of UMTRA Ground Water Investigation-Derived Wastes" was developed, in part, for managing excess ground water by dispersing it on the ground near the well from which it originated.

The "Guide to Management of Investigation-Derived Waste," grants greater flexibility for returning contaminated IDW, such as excess soil generated during well drilling or trenching, to its point of origination in instances when these materials will be remediated at a later date.

A list of options for managing IDW is detailed below.

#### 3.4.1 IDW that is RRM

IDW that is RRM is subject to the same management requirements as RRM with similar characteristics:

- IDW that is RRM that does not contain other hazardous components can be managed in a manner similar to other routine RRM and be disposed of at the disposal site. Alternately, such IDW that is solid, like RRM/soil, can be combined with similar RRM that is scheduled for remediation at a later date.
- IDW that is RRM/ground water that does not contain other hazardous components can be managed as RRM.
- IDW that is RRM suspected or confirmed to contain other hazardous components shall be managed in the same manner as the source material. When feasible, such IDW should be returned to or recombined with the source material.
- If circumstances warrant, such IDW can be containerized and stored near the source material until proper disposition is determined. IDW that is suspected or confirmed to contain other hazardous components shall not be combined with RRM that does not contain the same
- hazardous components. The requirements for managing RRM that contains other hazardous components are further explained in Section 4.0.

### 3.4.2 IDW that is Non-RRM

IDW that is non-RRM waste must be evaluated to determine if it contains hazardous or toxic components. IDW that is non-RRM waste is subject to federal, state, and local requirements and regulations pertinent to the waste, as follows.

- IDW that is non-RRM waste that does not contain other hazardous components does not require any special management. Non-RRM IDW that is solid, such as trash, can be accumulated and disposed of in a municipal waste landfill.
- IDW that is non-RRM ground water that does not contain other hazardous components can be dispersed on the soil near the well from which the ground water was extracted.
- IDW that is non-RRM waste that contains other hazardous components must be managed in accordance with the hazardous waste regulations at 40 CFR 261 and the corresponding state of Utah hazardous waste regulations at UAC R315.
- IDW that is non-RRM ground water that contains other hazardous components that are not hazardous waste must be managed in accordance with the "Technical Approach for the Management of UMTRA Ground Water Investigation-Derived Wastes" (as revised for the UMTRA Ground Water project). That document provides procedures for determining whether such IDW can be dispersed on the soil near the well from which the ground water was extracted.

## 3.5 Waste Acceptance Criteria

1. Dispose of the following contaminated items at the disposal site, including tailings pile material bound for disposal site, subject to sizing, placement restrictions, and other special management as specified below.
    - Tailings, soil, organic soil matter, and rock fragments. Spread and compact as contaminated fill.
    - Plant material from tree removal, clearing, grubbing, and stripping. Process, size, and place as specified.
    - Pieces of wood, concrete, and masonry. Process, size, and place as specified.
    - Structural steel members and similar long items. Process, size, and place as specified.
    - Other structural debris, including building siding of various materials. Size and place as specified.
    - Pipes and ducts. Process, size, and place as specified.
    - Geomembranes and similar products from decommissioned ponds, ditches, and temporary facilities. Process and size as specified.
    - Tires excavated from or generated in the CAs. Process, size, and place as specified.
    - Free liquids that do not pass the paint filter test, but do not contain hazardous or suspect hazardous substances. Dewater or stabilize to pass the paint filter test before placement.
    - Sludge that requires stabilization for efficient handling but does not contain hazardous or suspect hazardous substances. Stabilize as necessary before placement.
    - Containerized waste and already packaged asbestos. Handle and place as specified.
    - Lead-based paint and objects coated with such paint. Place as specified for debris and oversized materials.
    - Contaminated trash and debris from construction operations, including contaminated PPE. Place as specified.
    - Other materials as directed by the Operations/Site Manager.

2. Dispose of the contaminated materials listed below in the disposal site only if specified procedures for hazardous or suspect hazardous substances have been observed and if required, suitable pre-treatment has been performed. Disposal is subject to sizing, placement, restrictions, and other special management as specified.
   - Free liquids or sludge containing hazardous or suspect hazardous substances.
   - Used oil, volatile organic compounds, and similar wastes.
   - Asbestos requiring protective packaging.
   - Liquid polychlorinated biphenyl (PCB) compounds.
   - Automotive batteries.
   - Materials with highly concentrated contaminants, such as metallic sludge.
   - Substances that may pose imminent safety or health hazards.

3. Do not dispose of the materials described below in the disposal site.
   - Equipment that can be readily decontaminated.
   - Uncontaminated material used by the Project in the course of its activities.
   - Materials containing hazardous or suspect hazardous substances that have not been properly characterized or subjected to suitable pretreatment.
   - With DOE concurrence, other materials considered by the RAC to be unsuitable for disposal in the disposal site.

4. Materials placed in the disposal site must be processed and sized as specified.

5. With DOE concurrence, the RAC will determine the acceptability of contaminated material not falling clearly under any of the waste acceptance criteria.

6. In specific cases, the RAC, with DOE concurrence, may direct those materials subject to special management, with or without pretreatment, be disposed of off-site and not within the disposal site

It is anticipated that all RRM wastes, whether containing hazardous materials or not, will be placed in the CJ repository unless proven free of radioactivity. Further, any wastes that are generated within the Controlled Area of the site, even those outside of the CA, which have the potential for radioactivity or contamination from site soils, will be disposed of in the CJ repository. This ensures that the DOE does not become liable for another cleanup at some other disposal facility. Wastes that are definitely non-RRM and can be reasonably assumed to have not become contaminated (such as office wastes) may be disposed of off project.

## 3.6 Waste Minimization and Pollution Prevention

Waste minimization and pollution prevention are integrated into the waste management strategy. Activities shall be evaluated to identify waste minimization/pollution prevention opportunities. Potential improvements must be warranted, feasible, and cost effective to be implemented.

An important waste minimization/pollution prevention method that will be continually used is keeping materials and wastes, especially materials and wastes containing hazardous components (e.g., chemicals, petroleum products, batteries), free of radioactive contamination whenever possible. Materials and wastes should not enter the CA unless required. Materials and wastes that must be taken into the CA should be protected from becoming radioactively contaminated or should be decontaminated if feasible and cost effective.

Other waste minimization/pollution prevention methods that could be used are listed below in order of preference.

1. Source reduction by methods such as product substitution, inventory control, or equipment replacement or modification.
2. Recycling (Metals must be approved for recycling by the Radiological Control Manager).
3. Decontamination.
4. Treatment.

Site-specific planning documents should provide recommendations for waste minimization/pollution prevention practices as applicable to the particular activities being planned. Waste minimization and pollution prevention activities should be documented as memoranda to file as a means of tracking the performance and progress of these efforts.

The general waste-management strategy is summarized in a flowchart in Figure 5.

# 4.0 Identification and Management of Suspected Hazardous RRM and HRRM

Suspected Hazardous RRM (SHRRM) is RRM encountered during remediation that is suspected of containing hazardous or toxic components that pose a significant and unacceptable risk to workers or the environment and further evaluation of this material is required. HRRM is RRM confirmed to contain hazardous or toxic components. This section discusses the requirements for identifying and managing SHRRM and HRRM.

## 4.1 SHRRM

The Project recognizes that it does not have a complete understanding of all waste management processes/practices that were utilized at the Moab site. After a review of available information, materials that may be encountered include asbestos, PCBs, laboratory chemicals, unknown petroleum products, or unknown chemicals related to ore processing.

SHRRM may be indicated as a result of historical evidence, pre-remediation characterization or operational activities, or remediation activities. Certain historical information indicates particular areas within the CA may have been used for disposal of laboratory wastes, demolition debris, petroleum products, or trash. Trash and petroleum-contaminated soils have been encountered in the CA during some radiological investigations. The initial response to SHRRM includes the SIN principal: “Safety first and always, Isolate and deny entry, Notifications.” Personal protective equipment (PPE) requirements associated with the identification and initial response to SHRRM and HRRM will comply with the *Moab UMTRA Project Respiratory Protection Program* (DOE-EM/GJ1620) and the *Moab UMTRA Project Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure* (DOE-EM-GJRAC2160).

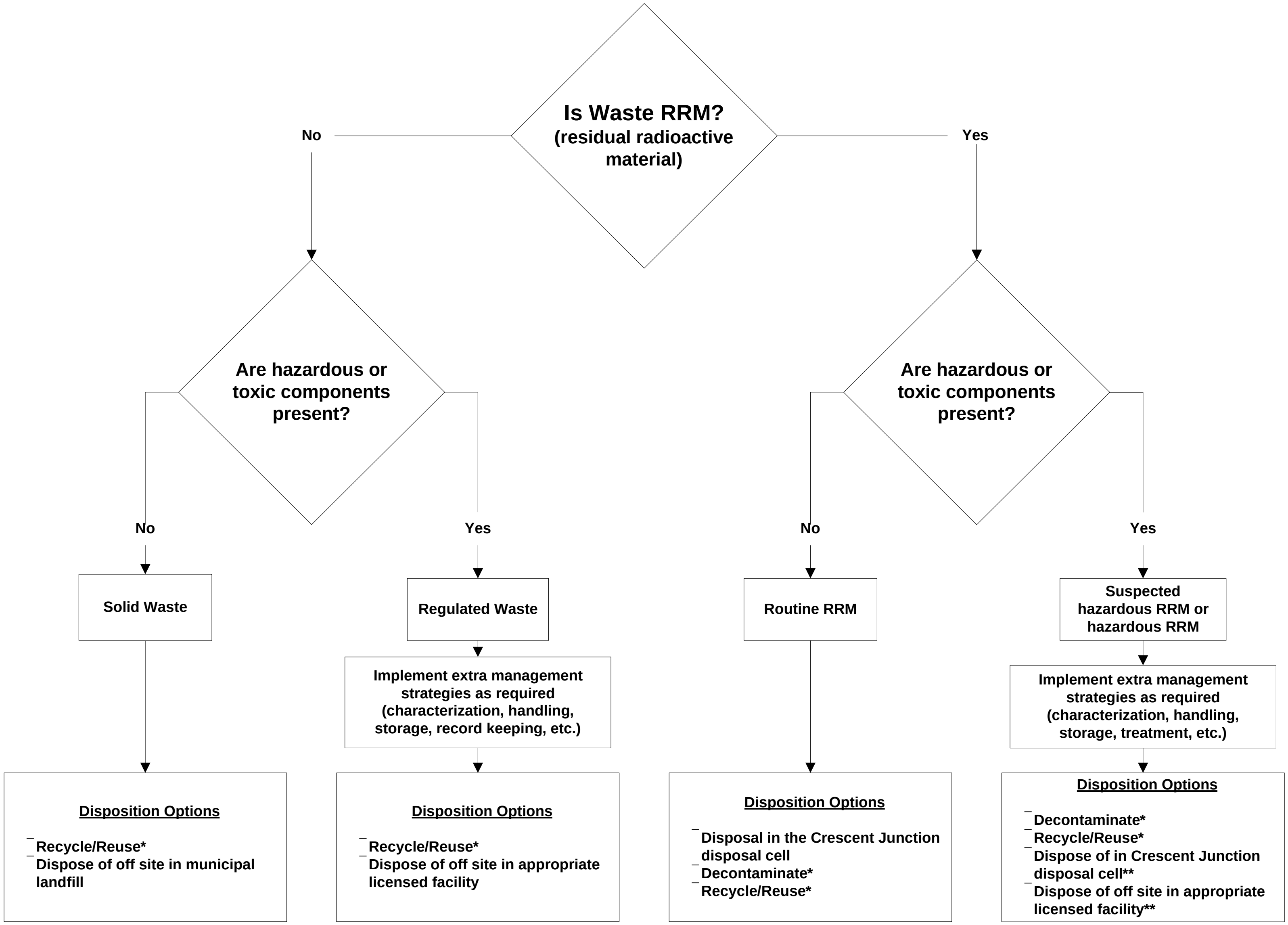
The requirements for managing SHRRM include proper notification, mitigation, identification, delineation, evaluation, and hazard determination.

### 4.1.1 Notification

Once it has been determined that SHRRM may be present, the Operations/Site Manager, site H&S personnel, and DOE shall be notified. Work shall be temporarily halted in the area of the potential SHRRM and continued in another area if necessary.

### 4.1.2 Mitigation

Whenever potential SHRRM is observed, the first priority is worker health and safety. All reasonable measures shall be taken to ensure workers do not undergo unnecessary or unacceptable exposure to hazards. H&S will mitigate worker hazards by identifying and implementing protective measures when potential SHRRM is managed, such as when handling, excavating, or moving this material. Management of SHRRM also includes proper storage, disposition evaluation, and if applicable, mitigation of the hazardous material. Mitigation activities will be directed by Integrated Work Plan/Job Safety Analysis (IWP/JSA) or sampling and analysis plans per the *Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure.*




*Metals must be approved for recycling by *the Radiological Control Manager*

***If feasible and cost effective**
****Requires DOE concurrence and must meet disposal cell WAC**

*Figure 5. General Waste Management Strategy*

### 4.1.3 Identification

The decision to designate RRM as SHRRM shall be made on a case-by-case basis, contingent upon the circumstances and taking into consideration the following factors.

- SHRRM should be distinguishable from surrounding “normal” RRM by physical characteristics, such as color, texture, consistency, “crystal” growth, or odor that indicates the presence of an un-natural, manmade substance (e.g., a chemical), or by the presence of stressed vegetation or dead wildlife potentially attributable to such substances.
- SHRRM may be identified by observations and/or physical indications experienced among workers, such as skin irritation, respiratory irritation, headaches, dizziness, nausea, or unusual taste or smell (though SHRRM or HRRM may not affect workers to any noticeable degree).
- Field instrumentation measurements or field test kit results may indicate that SHRRM is present (e.g., photoionization detector measurements, Draeger tube results, etc.).
- There should be a significant quantity or concentration of suspicious material to qualify as SHRRM; that is, a connected deposit of significant depth, area, or concentration (i.e., the physical characteristics that make it distinguishable from surrounding RRM is of significant intensity of color, odor). This quantity is not definable but will be based on the particular circumstances.
- SHRRM may involve distinct units or containers (e.g., 55-gallon drums) that are intact and filled (or partially filled) or damaged and leaking.

RRM that simply appears different from surrounding RRM (i.e., different soil types, such as silt and clay) would not necessarily be suspected of containing hazardous or toxic components that are worth evaluating further. The other factors listed above also must be considered. SHRRM may be indicated because one or a combination of these factors is applicable. Depending on the circumstances, it may be necessary to temporarily halt work in the area where potential SHRRM is encountered until the identification process is completed. If possible, work should continue in another area.

The Operations/Site Manager or designee shall specify qualified staff from among the Project and functional groups (Radiological Control, H&S, EC, or Operations groups) that are responsible for identifying SHRRM. These may include the following:

- Operations/Site Manager or designee.
- Radiological Control Supervisor or designee.
- H&S Manager or designee.
- EC Manager or designee.
- Operations field personnel.
- Remediation subcontractor personnel.

Those designated with the authority and responsibility to identify SHRRM shall receive appropriate training for performing these duties.

### 4.1.4 Delineation

Once SHRRM has been identified, the Operations/Site and H&S Managers shall delineate and isolate the SHRRM in situ in an area designated as a Best Management Practice Area (BMPA). The purpose of a BMPA is to segregate and temporarily store SHRRM so that these materials can be further evaluated to determine if HRRM exists. If deemed necessary, the SHRRM may be moved into a BMPA at another location to facilitate continued remediation near the affected area and/or to enable more successful evaluation of the SHRRM. Further information is provided about the BMPA in Section 4.3. The Operations/Site Manager shall notify the contractor Project and EC Managers when SHRRM is identified.

#### 4.1.5 Hazard Evaluation

Once the SHRRM has been delineated and the appropriate personnel have been notified, the Operations/Site Manager, H&S Manager, and the EC Manager will work cooperatively to determine how to further investigate the SHRRM to determine if it is HRRM. The investigation approach will vary depending on the circumstances. The SHRRM must be adequately characterized by additional field testing or collecting samples for laboratory analysis. Field characterization activities will be directed by IWP/JSA or sampling and analysis plans in compliance with the *Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure.*

The EC Manager is responsible for taking the lead in researching and recommending the evaluation approach.

#### 4.1.6 Hazard Determination

SHRRM shall be further investigated as agreed to by the Operations/Site Manager, H&S Managers and EC Manager. This group assesses the results of SHRRM investigations and determines whether this material qualifies as HRRM. The Operations/Site Manager and other appropriate contractor staff will make an HRRM recommendation to DOE. DOE has final concurrence authority for identifying material as HRRM.

### 4.2 HRRM

The requirements for managing HRRM include proper storage, disposition evaluation, and if applicable, mitigation. Similar to SHRRM, managing HRRM activities will be directed by IWPs/JSAs or sampling and analysis plans in compliance with the *Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure*.

#### 4.2.1 Storage

Once HRRM has been identified, it will remain stored in a BMPA until final disposition. HRRM must remain segregated from other RRM in a BMPA to ensure additional HRRM is not created. Further information is provided about the BMPA in Section 3.4.

#### 4.2.2 Disposition Evaluation

Once HRRM has been identified, further evaluation must be performed to determine the appropriate disposition of this material. DOE, the Operations/Site Managers, H&S Manager, and EC Manager shall evaluate each instance of HRRM on a case-by-case basis to determine appropriate disposition. Disposition options may include the following:

- Disposal of HRRM at the Crescent Junction disposal site without any special hazard mitigation other than that required to protect workers.
- Mitigation of the environmental hazards posed by HRRM before disposal at the Crescent Junction disposal site.
- Unforeseen circumstances may justify the disposal of particularly hazardous RRM in an appropriate off-site facility.

The contractor shall obtain DOE concurrence for the preferred HRRM disposition option before its implementation.

### 4.2.3 Mitigation

If deemed necessary, the environmental hazards posed by HRRM shall be mitigated. The contractor shall obtain DOE concurrence for any treatment methods and treatment performance levels proposed for HRRM. The Operations/Site Managers, H&S Managers, and EC Manager shall oversee the performance of mitigation measures. The effectiveness of the mitigation measures shall be verified before disposal of this material at the Crescent Junction disposal site. Figure 6 is a flowchart that illustrates the process for identifying and managing SHRRM and HRRM.

## 4.3 Best Management Practice Area

As stated previously, a BMPA is a distinct location established for temporarily managing SHRRM or HRRM. SHRRM is managed in a BMPA so that it may be evaluated to confirm the presence of hazardous or toxic components.

Confirmed HRRM is managed in a BMPA until final disposition of this material can be determined. Mitigation of the hazardous components in RRM, such as by treatment, is conducted within a BMPA. Establishment of a BMPA enables remediation to continue in surrounding non-hazardous RRM, reduces the chance that HRRM will spread into surrounding non-hazardous areas, and reduces hazards to workers.

Possible features of a BMPA are described below.

- A BMPA may be established at the original location of the SHRRM or HRRM. Alternately, if deemed necessary, these materials may be relocated to a BMPA that is segregated from the original location.
- SHRRM or HRRM may be stored in a BMPA in different ways, such as in bulk piles or in containers (e.g., drums, roll-off bins).
- Multiple BMPAs may be established to manage multiple types of SHRRM or HRRM, such as uranium mill tailings, soil, chemicals, equipment, debris, or miscellaneous other materials.

A summary of management controls required for a BMPA is described below.

- A BMPA shall be a delineated and posted area (i.e., a BMPA will typically be a roped-off area with an identifying sign).
- If deemed necessary by the Operations/Site Managers, H&S Manager, and EC Manager, a BMPA will be bermed and plastic-lined to minimize the release of SHRRM or HRRM to the surrounding environment.
- If deemed necessary the Operations/Site Managers, H&S Manager, and EC Manager, SHRRM or HRRM in a BMPA will be covered with plastic sheeting or a tarp, containerized, or otherwise protected to minimize release to the surrounding environment.
- All containers of SHRRM or HRRM in a BMPA shall be marked or labeled with identifying information.
- SHRRM or HRRM in a BMPA shall be tracked through the use of an inventory that will be updated as SHRRM or HRRM enters or leaves a BMPA.
- SHRRM or HRRM in a BMPA shall be inspected as necessary to determine hazard conditions, ensure the integrity of containers, and minimize releases to the surrounding environment.

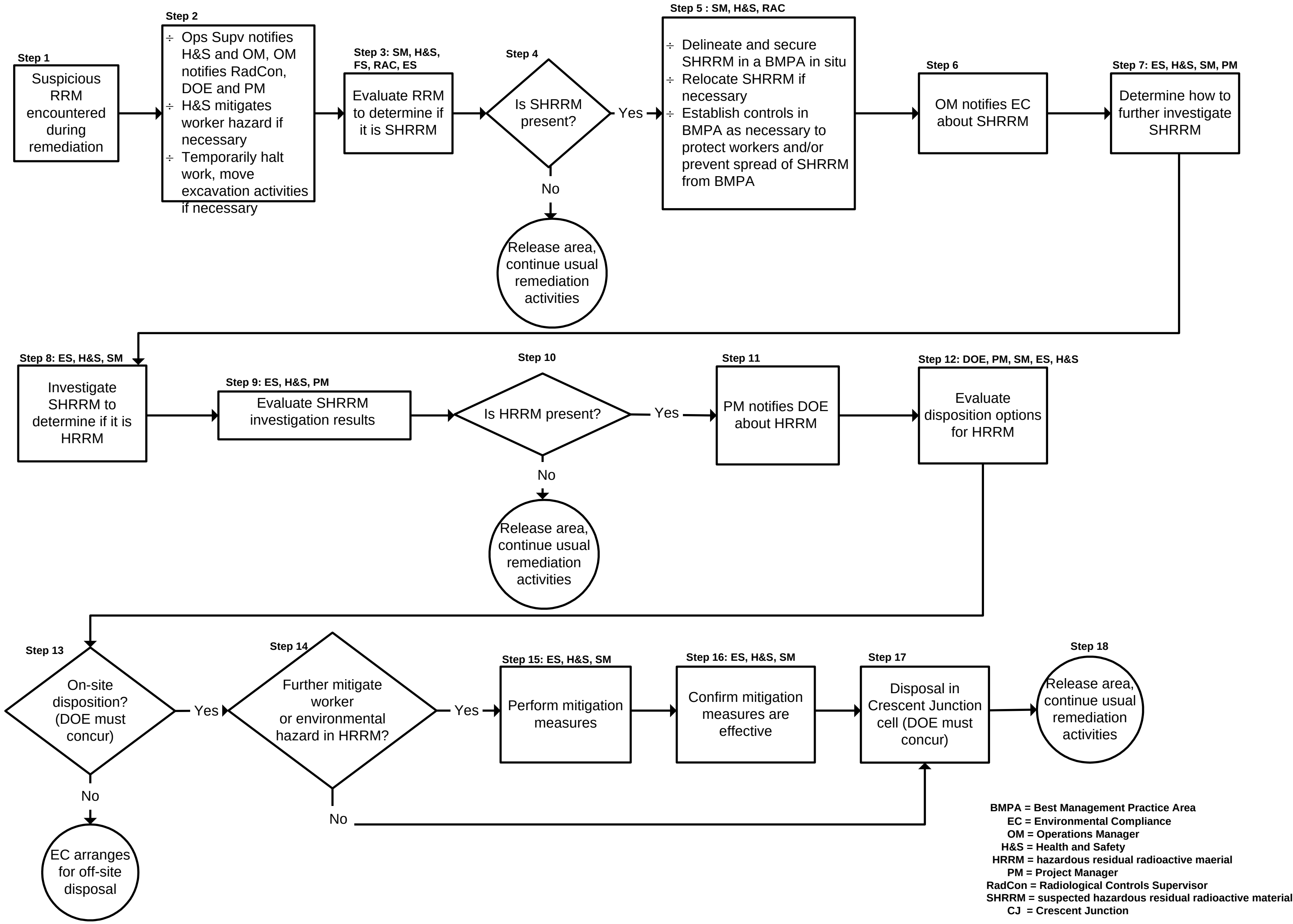



*Figure 6. Management Process for SHRRM and HRRM*

## 5.0 Definitions

***Best Management Practice Area (BMPA)*** – For the purposes of this Plan, a BMPA is a location for temporarily managing RRM suspected of being combined or that is combined with a hazardous or toxic component until further evaluation or disposition of this material is completed.

***Contamination area (CA)*** – An area containing removable surface (radioactive) contamination at levels greater than those identified in 10 CFR 835, Appendix D, "Limits."

***Controlled Area*** – Per 10 CFR §835 a controlled area means any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material. In the context of this plan and this project, all soil-like materials encountered within the controlled area are presumed radioactive unless proved otherwise.

***Decontamination*** – For the purposes of this Plan, decontamination refers to the removal of radioactive material.

***Hazardous residual radioactive material (HRRM)*** – For the purposes of this Plan, hazardous RRM refers to RRM combined with a hazardous or toxic component other than radioactivity, such as hazardous chemicals, PCBs, asbestos, or unknown petroleum products.

***Hazardous waste*** – A solid waste, as defined in 40 CFR 261.2, which meets the definition of hazardous waste at 40 CFR 261.3. This generally refers to an RCRA characteristic or listed hazardous waste, as defined in 40 CFR 261 Subparts C and D.

***Investigation-derived waste (IDW)*** – Waste generated in the field as a result of site assessment, characterization, and monitoring activities.

***Non-residual radioactive material (non-RRM) waste*** – Waste that does not meet the definition of RRM. Generally, non-RRM waste is either a solid waste or a regulated waste.

***Regulated waste*** – For the purposes of this Waste Management Plan, regulated waste generally refers to any waste that is not RRM but has a hazardous or toxic component that is regulated by certain environmental statutes, such as an RCRA characteristic or listed hazardous waste or a TSCA toxic substance (e.g., PCBs).

***Residual radioactive material (RRM)*** –UMTRCA and 40 CFR 192 define RRM. Specifically, UMTRCA Section 101(7) and 40 CFR 192.01(a) define RRM as (1) waste the Secretary of Energy determines to be radioactive in the form of tailings resulting from the processing of ores for extraction of uranium and other valuable constituents of the ores; and (2) other wastes the Secretary of Energy determines to be radioactive at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials.

***Solid waste*** – Any material that meets the definition of solid waste provided in 40 CFR 261.2. For the purposes of this Plan, solid waste generally refers to any waste that is not RRM and not combined with a regulated hazardous or toxic component.

***Suspected HRRM (SHRRM)*** – For the purposes of this Plan, SHRRM refers to RRM suspected of containing a hazardous or toxic component other than radioactivity.

***Universal waste*** – A category of waste materials designated as "hazardous waste" that consists of very common materials, such as batteries, mercury containing thermostats, and fluorescent lamps.

## 6.0 References


10 CFR 835 (Code of Federal Regulations), "Occupational Radiation Protection."

40 CFR 192 (Code of Federal Regulations), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

40 CFR 261, (Code of Federal Regulations), "Identification and Listing of Hazardous Waste."

40 CFR 273, (Code of Federal Regulations), "Standards for Universal Waste Management"

15 USC 2601 (United States Code), Toxic Substances Control Act.

42 USC 6901 (United States Code), Resource Conservation and Recovery Act.

42 USC 7901 (United States Code), Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 102-386).

DOE (U.S. Department of Energy), *Moab UMTRA Project Health and Safety Suspected Hazardous Residual Radioactive Material Response Procedure* (DOE EM/GJRAC2160).

DOE (U.S. Department of Energy), *Moab UMTRA Project Radiological Release of Materials and Equipment Plan* (DOE-EM/GJRAC2091).

DOE (U.S. Department of Energy), *Moab UMTRA Project Respiratory Protection Program* (DOE EM/GJ1620).

DOE (U.S. Department of Energy), *Moab UMTRA Project Crescent Junction Storm Water Pollution Prevention Plan* (DOE EM/GJ1238).

DOE (U.S. Department of Energy), *Moab UMTRA Project Moab Storm Water Pollution Prevention Plan* (DOE EM/GJ1475).

DOE (U.S. Department of Energy), *Radiological Assessment for Non-Pile Areas or the Moab Project Site* (DOE-EM/GJ901-2005).

DOE (U.S. Department of Energy), Order 436.1, "Departmental Sustainability."

DOE (U.S. Department of Energy), Order 458.1, Administrative Change 3, "Radiation Protection of the Public and the Environment."

DOE (U.S. Department of Energy), "Technical Approach for the Management of UMTRA Ground Water Investigation-Derived Wastes" (DOE-AL/62350-109), February 1991.

EPA (Environmental Protection Agency), "Guide to Management of Investigation-Derived Waste" (9345.3-03FS), January 1992.

Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398).

UAC R315 (Utah Administrative Code), "Utah Hazardous Waste Management Rules."