6.0 Grand Junction, Colorado, Disposal Site

6.1 Compliance Summary

The Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on December 6, 2017. A portion of the disposal cell remains open to receive low-level radioactive materials from various sources. The open disposal cell and its supporting structures and facilities are not included in the annual inspection. Ongoing disposal cell cover study areas, which include a lysimeter facility adjacent to the disposal cell, are also not inspected. This annual inspection includes the completed portion of the disposal cell and the remaining portions of the disposal site. No changes were observed on the disposal cell or in the associated drainage features. Inspectors did not identify any maintenance needs or cause for a follow-up inspection.

The U.S. Department of Energy (DOE) conducts annual groundwater monitoring as a best management practice. Three monitoring wells are sampled to assess the disposal cell’s performance and to verify that groundwater in onsite paleochannels is not affected if seepage (transient drainage) from the disposal cell occurs. Groundwater monitoring was last completed in September 2017. Groundwater monitoring results confirm that groundwater in the paleochannels continues to be unaffected by potential transient drainage from the disposal cell.

6.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the completed portion of the disposal cell and the remaining portion of the site are specified in the site-specific DOE Interim Long-Term Surveillance Plan for the Cheney Disposal Site near Grand Junction, Colorado (Interim LTSP) (DOE 1998) and in procedures DOE established to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC) general license at Title 10 Code of Federal Regulations Section 40.27 (10 CFR 40.27). Table 6-1 lists these requirements.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>LTSP</th>
<th>This Report</th>
<th>10 CFR 40.27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Inspection and Report</td>
<td>Sections 3.0 and 6.2</td>
<td>Section 6.4</td>
<td>(b)(3)</td>
</tr>
<tr>
<td>Follow-Up Inspections</td>
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<td>(b)(4)</td>
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<tr>
<td>Corrective Action</td>
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<td>Groundwater Monitoring</td>
<td>Section 2.6</td>
<td>Section 6.8</td>
<td>(b)(2)</td>
</tr>
</tbody>
</table>

6.3 Institutional Controls

The 360-acre site, identified by the property boundary shown in Figure 6-1, is owned by the United States. The open portion of the disposal cell is projected to remain open until 2023 or until it is filled to its design capacity, whichever comes first. DOE’s Office of Legacy Management operates the site under authority of Public Law 104-259 (PL 104-259). Until the disposal cell is closed, it will not be accepted under the general license. Institutional controls (ICs) at the site include federal ownership of the property, administrative controls, and the
following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, perimeter fence and signs, boundary monuments, and wellhead protectors.

6.4 Inspection Results

The site, 18 miles south of Grand Junction, Colorado, was inspected on December 6, 2017. The inspection was conducted by S. Woods, K. Roemer, and P. Wetherstein of the DOE Legacy Management Support contractor. R. Bush (DOE); L. Gersey (NRC); and M. Cosby, J. Doebele, and M. Gerber (Colorado Department of Public Health and Environment) attended the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, to identify changes in conditions that might affect conformance with the Interim LTSP, and to determine the need, if any, for maintenance or additional inspection and monitoring.

6.4.1 Site Surveillance Features

Figure 6-1 shows in black the locations of site features, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue text, and new observations identified during the 2017 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are described in the following subsections. Photographs to support specific observations are identified in the text and in Figure 6-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 6.10.

6.4.1.1 Access Road, Entrance Gates, and Entrance Sign

Access to the site is from U.S. Highway 50. There is a steel double-swing access gate, secured by a locking device, along the highway right-of-way fence. DOE is one of several parties with access to the locking device. A right-of-way grant on federal land, administered by the U.S. Bureau of Land Management (BLM), extends approximately 1.7 miles between Highway 50 and the entrance gate. DOE maintains this right-of-way, including a two-lane asphalt access road. The entrance gate is a double-swing chainlink gate secured by a DOE lock and chain. The entrance gate was locked and functional. The entrance sign is next to the entrance gate. No maintenance needs were identified.

6.4.1.2 Perimeter Fence and Signs

A perimeter fence encloses the disposal cell features and operations areas. It consists of a standard four-strand barbed-wire fence in some areas and a woven wire fence topped with barbed wire in others. There are 29 perimeter signs attached to steel posts set in concrete, positioned at regular intervals along the property boundary (PL-1). Perimeter signs P16 and P20 have bullet damage but remain legible. No maintenance needs were identified.

6.4.1.3 Site Markers

Granite site markers similar to those at other UMTRCA sites will not be installed until the disposal cell is closed.
Figure 6-1. 2017 Annual Inspection Drawing for the Grand Junction, Colorado, Disposal Site
6.4.1.4 **Boundary Monuments**

Four boundary monuments delineate the corners of the property boundary (PL-2). No maintenance needs were identified.

6.4.1.5 **Monitoring Wells**

The groundwater monitoring network consists of three monitoring wells. All wellhead protectors were locked and undamaged. No maintenance needs were identified.

6.4.2 **Inspection Areas**

In accordance with the Interim LTSP, the site is divided into four inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the closed portion of the disposal cell, (2) diversion structures and drainage channels, (3) the area between the disposal cell and the site boundary, and (4) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of erosion, settling, slumping, or other modifying processes that might affect the site’s conformance with the Interim LTSP requirements.

6.4.2.1 **Closed Portion of the Disposal Cell**

The closed portion of the disposal cell is armored with basalt riprap to control erosion. The rock showed no significant weathering. There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell (PL-3).

On the disposal cell cover, numerous areas with alkali deposits have been reported during previous inspections and were visible during the 2017 annual inspection. The deposits are thought to be evaporite minerals. There is no indication that the alkali areas are related to the performance of the disposal cell; therefore, these areas are not noted by inspectors.

Grasses and weeds were growing on most of the disposal cell cover (PL-4). Historically, deep-rooted shrubs have been treated with herbicide on the disposal cell top slope. Although treatment is not required by the Interim LTSP, DOE plans to continue controlling the deep-rooted shrubs as needed until more is known about the potential effects of vegetation on the disposal cell cover.

During the 2014 annual inspection, several small erosion channels were noted in soils at the base of the disposal cell’s southwestern corner. The channels do not threaten the integrity of the disposal cell, and no significant changes were noted in 2017 (PL-5). No maintenance needs were identified.

6.4.2.2 **Diversion Structures and Drainage Channels**

The south diversion channel is a large, riprap-armored structure that intercepts run-on water from offsite and onsite, as well as runoff from the disposal cell, and conveys the water into a natural drainage that flows away from the site to the southwest. Grasses, weeds, and shrubs grow within the diversion channel, but this vegetation is not expected to degrade the channel’s performance. The discharge area of the channel is armored with large-diameter basalt riprap (PL-6).
Other drainage features at the site include north and south storm water collection ditches, the north storm water retention pond, and the east storm water and sediment collection pond. These small drainage features control storm water runoff primarily from the various stockpiles of cover materials. The storm water collection ditches also capture storm water run-on from offsite locations. The diversion channel, ditches, and ponds were functioning as designed. An offsite diversion structure on private property was repaired in 2017. The repair was necessary to prevent water from entering a breached ditch located on BLM-administered land approximately one-half mile upgradient from (northeast of) the site; the breach caused water to flow into the north storm water collection ditch in past years. No maintenance needs were identified.

6.4.2.3 Area Between the Disposal Cell and the Site Boundary

There are 11 discrete stockpiles of rock and soil between the disposal cell and the perimeter fence on the north and east sides of the site. Most of these materials eventually will be used to cover and close the open disposal cell. Vegetation and surface rocks generally protect the stockpiles from significant erosion.

Most of the flat areas between the disposal cell and the site (property) boundary are vegetated with native shrubs, scant perennial grasses, and annual weeds. Some localized erosion has occurred along the perimeter road near the east storm water and sediment collection pond. No areas of significant erosion were present that could threaten the integrity of the disposal cell or site features. Erosion rills on the west side of the perimeter road will continue to be monitored. No maintenance needs were identified.

6.4.2.4 Outlying Area

The area beyond the site boundary for a distance of 0.25 mile was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. No such changes were identified. Most of the land surrounding the site is rangeland administered by BLM and private property on the west side used primarily for cattle grazing. No land use changes were evident in this area. Outside the site’s eastern boundary is a 40-acre temporary withdrawal area of federal land. Some of the withdrawal area is included within the perimeter fence and contains materials stockpiles. This area is not included in the Interim LTSP but is inspected as an offsite area.

6.5 Follow-Up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No need for a follow-up inspection was identified.

6.6 Maintenance and Repairs

No maintenance needs were identified.
6.7 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

6.8 Groundwater Monitoring

In accordance with the Interim LTSP, DOE conducts annual groundwater monitoring as a best management practice. Groundwater at the site qualifies for supplemental standards because it is designated as “limited use,” a designation given to groundwater that is not a current or potential source of drinking water. Groundwater in the uppermost aquifer is designated as “limited use” because total dissolved solids (TDS) exceed 10,000 milligrams per liter (mg/L). Under this designation, groundwater monitoring is not required. Confined groundwater in the uppermost aquifer lies approximately 750 feet (ft) below the ground surface and is geologically isolated from the tailings material by low-permeability mudstones and shales of the Mancos Shale Formation. DOE monitors groundwater from three monitoring wells adjacent to and in the disposal cell to assess the disposal cell’s performance and to verify that groundwater in onsite paleochannels is not affected if seepage (transient drainage) from the disposal cell occurs. The most recent sampling event occurred in August 2017.

Two monitoring wells (0731 and 0732) are completed in (or very near) buried alluvial paleochannels adjacent to the disposal cell, and one monitoring well (0733) is in the tailings stored in the disposal cell (Figure 6-2 and Table 6-2). The paleochannel monitoring wells are located along the downgradient edge (west side of the disposal cell) and are screened at the interface between the alluvium and shallow Mancos Shale Formation. The third monitoring well is in the southwest corner of the open portion of the disposal cell and is completed in tailings. Disposal cell construction was initiated by excavating Mancos Shale, which resulted in the base of the disposal cell being below the unconsolidated soil contact with the Mancos Shale. Monitoring well 0733 is primarily used to measure water levels within the disposal cell. As long as water levels in the disposal cell are less than those measured in monitoring wells 0731 and 0732, water within the disposal cell cannot flow out of the disposal cell in the more permeable unconsolidated soil, which includes the adjacent paleochannels.

Table 6-2. Groundwater Monitoring Network at the Grand Junction, Colorado, Disposal Site

<table>
<thead>
<tr>
<th>Monitoring Well</th>
<th>Hydrologic Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>0731</td>
<td>Paleochannel, downgradient, edge of disposal cell, north side</td>
</tr>
<tr>
<td>0732</td>
<td>Paleochannel, downgradient, edge of disposal cell, south side</td>
</tr>
<tr>
<td>0733</td>
<td>Disposal cell, deepest location, downgradient, center</td>
</tr>
</tbody>
</table>
Figure 6-2. Groundwater Monitoring Network for the Grand Junction, Colorado, Disposal Site
6.8.1 Groundwater-Level Monitoring

Static water level measurements are obtained from each monitoring well before water quality samples are collected (Figure 6-3). In addition, water levels have been measured continuously at 4-hour increments since September 2006 using a datalogger and transducers installed in each of the monitoring wells. The continuous record shows that the water level in disposal cell monitoring well 0733 has increased approximately 4 ft but has always remained lower than the adjacent water levels in the two paleochannel monitoring wells (Figure 6-3). The lower water level in the disposal cell relative to surrounding water levels prevents outflow of the disposal cell into the adjacent unconsolidated soils.

![Figure 6-3. Water Level Measurements at the Grand Junction, Colorado, Disposal Site](image)

6.8.2 Groundwater Quality Monitoring

Annual groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, selenium, sulfate, TDS, uranium, vanadium, and polychlorinated biphenyls. Key indicator analytes are molybdenum, nitrate, selenium, and uranium. The U.S. Environmental Protection Agency has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6-3) (40 CFR 192 Table 1 Subpart A). Monitoring results are compared to the MCLs for evaluation only and not for compliance purposes.
Table 6-3. Maximum Concentration Limits for Groundwater at the Grand Junction, Colorado, Disposal Site

<table>
<thead>
<tr>
<th>Constituent</th>
<th>MCL $^a$ (mg/L)</th>
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<tr>
<td>Molybdenum</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate (as nitrogen)</td>
<td>10</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.01</td>
</tr>
<tr>
<td>Uranium</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Note:

$^a$ MCLs as listed in 40 CFR 192 Table 1 Subpart A.

Molybdenum concentrations in all three monitoring wells have remained steady since 1998; 2017 concentrations were less than or about equal to 0.003 mg/L. Time-concentration plots from 1998 through 2017 for the other key indicator analytes—nitrate (as nitrogen), selenium, and uranium—are shown in Figure 6-4 through Figure 6-6.

Since 1999, nitrate (as nitrogen) concentrations in disposal cell monitoring well 0733 continue to decline, reaching a low of 1.0 mg/L this year (Figure 6-4). Nitrate concentrations continue to exceed the MCL of 10 mg/L in the paleochannel monitoring wells 0731 and 0732 but remain within historical levels (Figure 6-4).

Figure 6-4. Nitrate (as Nitrogen) in Groundwater at the Grand Junction, Colorado, Disposal Site
Selenium concentrations continued to exceed the MCL of 0.01 mg/L in the paleochannel monitoring wells 0731 and 0732, with no apparent trend in either well since 2001 (Figure 6-5). Selenium occurs naturally in the Mancos Shale deposits that underlie the disposal cell at concentrations slightly greater than the MCL of 0.01 mg/L. Paleochannel monitoring wells 0731 and 0732 are screened at the Mancos Shale unconsolidated soil contact. Background groundwater quality in the Mancos Shale is brackish, with elevated TDS levels ranging from 870 to 7010 mg/l; this supports the theory that the shale is the source of the elevated selenium concentrations in both paleochannel monitoring wells. In disposal cell monitoring well 0733, the selenium concentrations remain below the MCL.

Figure 6-5. Selenium in Groundwater at the Grand Junction, Colorado, Disposal Site
Uranium concentrations in groundwater continued to be below the MCL of 0.044 mg/L in paleochannel monitoring well 0732 in 2017, but they exceeded the MCL in paleochannel monitoring well 0731 for the first time since 2003. Paleochannel monitoring wells 0731 and 0732 have shown an increasing trend since 2011 (Figure 6-6). The uranium concentration in disposal cell monitoring well 0733, screened in the tailings but hydraulically isolated from the surrounding unconsolidated soil by an inward hydraulic gradient, continues to increase with a 2017 concentration of 0.20 mg/L.

![Figure 6-6. Uranium in Groundwater at the Grand Junction, Colorado, Disposal Site](image)

Comparison of the disposal cell water level with the paleochannel water levels shows an inward hydraulic gradient between the disposal cell and the surrounding unconsolidated soils, which effectively isolates the disposal cell from adjacent unconsolidated soils.

### 6.9 References


6.10 Photographs

<table>
<thead>
<tr>
<th>Photo Location Number</th>
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<th>Photograph Description</th>
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<tbody>
<tr>
<td>PL-1</td>
<td>90</td>
<td>Perimeter Sign P2</td>
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<tr>
<td>PL-2</td>
<td>345</td>
<td>Boundary Monument BM-1</td>
</tr>
<tr>
<td>PL-3</td>
<td>250</td>
<td>East End of the South Side Slope of Disposal Cell</td>
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<td>PL-4</td>
<td>55</td>
<td>Top of Southwest Corner of Disposal Cell</td>
</tr>
<tr>
<td>PL-5</td>
<td>40</td>
<td>Erosion Rills at Bottom of Southwest Corner of Disposal Cell</td>
</tr>
<tr>
<td>PL-6</td>
<td>325</td>
<td>South Diversion Channel at Southeast Corner of Site</td>
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PL-1. Perimeter Sign P2

PL-2. Boundary Monument BM-1
PL-3. East End of the South Side Slope of Disposal Cell

PL-4. Top of Southwest Corner of Disposal Cell
PL-5. Erosion Rills at Bottom of Southwest Corner of Disposal Cell

PL-6. South Diversion Channel at Southeast Corner of Site