

4.0 Durango, Colorado, Disposal Site

4.1 Compliance Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducted the Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site annual inspection on June 15, 2021, and the annual groundwater monitoring event in June 2021. No cause for a follow-up inspection was identified.

Inspectors noted no change in depth or length of the linear depression on the toe of the northeast side slope. LM will continue monitoring the linear depression to understand its cause and potential impacts. No changes were observed on the top of the disposal cell or associated drainage features. Inspectors identified several maintenance needs that will be addressed.

LM conducts annual groundwater sampling and analysis to monitor potential contaminant migration downgradient from the disposal cell. The most recent annual sampling event occurred in June 2021. Concentrations in the three point-of-compliance (POC) wells are below site-specific thresholds. In addition, LM monitors one background well and three best management practice (BMP) wells. BMP well 0618 is monitored more frequently in response to variable uranium concentrations that are typically above site-specific thresholds. Increased monitoring of BMP well 0618 will continue to determine if removing the holding pond and closing the transient drainage system will affect water quality values.

4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (DOE 2019) (LTSP) in accordance with procedures 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 4-1 lists these requirements.

Table 4-1. License Requirements for the Durango, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 4.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 4.5	(b)(4)
Maintenance	Section 3.5	Section 4.6	(b)(5)
Emergency Measures	Section 3.5	Section 4.7	(b)(5)
Environmental Monitoring	Section 3.6	Section 4.8	(b)(2)
Corrective Action	Section 3.6	Section 4.9	--

4.3 Institutional Controls

The 121-acre site, identified by the property boundary shown in Figure 4-1, is owned by the United States and was accepted under the NRC general license in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, LM is responsible for the

custody and long-term care of the site. 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 gates, warning or no-trespassing signs (entrance and perimeter signs), site markers, survey and boundary monuments, and wellhead protectors.

4.4 Inspection Results

The site, 3.5 miles southwest of Durango, Colorado, was inspected on June 15, 2021. The inspection was conducted by D. Holbrook and D. Atkinson of the Legacy Management Support (LMS) contractor. J. Dayvault (LM site manager); M. Cosby (Colorado Department of Public Health and Environment); A. Denny, O. Bustillo, and E. Rojas (LM); and M. Williams (LMS) attended the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate whether maintenance or additional inspection and monitoring are needed.

4.4.1 Site Surveillance Features

Figure 4-1 shows the locations of site features, including site surveillance features and inspection areas, in black and gray font. 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 2021 annual inspection are shown in red font. Photographs to support specific observations are identified in the text and in Figure 4-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 4.11.

4.4.1.1 Site Access, Entrance Gates, and Entrance Sign

Access to the site is via La Plata County Road 212, an improved dirt road that is accessed via a locked gate along La Plata County Road 210. Entrance to the site is through the locked steel entrance gate along County Road 212 and an older, original entrance gate. All gates were locked and functional. The entrance sign is located at the older entrance gate inside the property boundary.

4.4.1.2 Perimeter Signs

There are 82 perimeter signs, attached to steel posts set in concrete, that delineate the property boundary. Perimeter signs are inspected for legibility and position to ensure they are functioning. Two additional perimeter signs (P83 and P84), also attached to steel posts, were installed in 2014 inside the property boundary along the east perimeter of Ditch No. 1. These additions act as surrogates for perimeter signs P40–P43, which are on a steep, densely wooded hillside. Perimeter signs P40–P43 are not routinely inspected because of their location and surrounding vegetation.

Inspectors noted that perimeter sign P26 is surrounded by vegetation that was treated after the inspection. The concrete bases of several perimeter signs continue to be undercut, but the positions of the signs remain uncompromised. No other maintenance needs were identified.

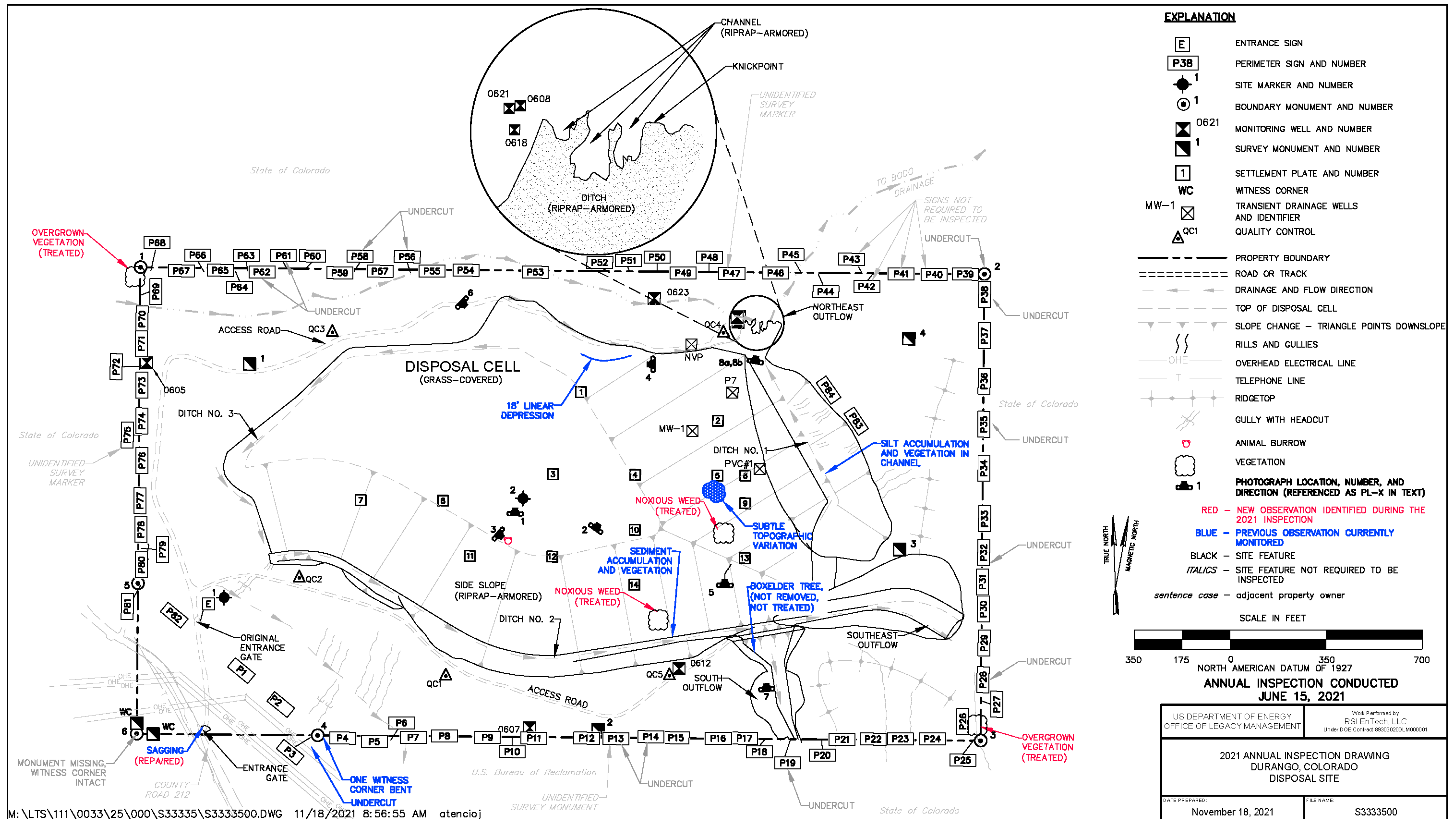


Figure 4-1. 2021 Annual Inspection Drawing for the Durango, Colorado, Disposal Site

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4.4.1.3 Site Markers

The site has two site markers. Site marker SMK-1 is just inside the original entrance gate and was in good condition. Site marker SMK-2 (PL-1) is on the top slope of the disposal cell. No new maintenance needs were identified.

4.4.1.4 Survey and Boundary Monuments

Four survey monuments and six boundary monuments (each with two witness corners) delineate the property boundary. Boundary monument BM-6 has been missing since the adjacent U.S. Bureau of Reclamation (BOR) pipeline was installed, bringing the current number of boundary monuments to five. However, both witness corners to boundary monument BM-6 were present, so replacement of boundary monument BM-6 is not warranted at this time. Boundary monument BM-1 was obscured by vegetation that was treated following the inspection. No other maintenance needs were identified.

4.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments were inspected during the 2021 annual inspection. No maintenance needs were identified during the inspection.

4.4.1.6 Monitoring Wells

The site has seven monitoring wells and two transient drainage wells. All wellhead protectors observed during the inspection were undamaged and locked. No maintenance needs were identified.

4.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into six inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the top of the disposal cell, (2) the side slopes of the disposal cell, (3) the drainage ditches, (4) the holding pond, (5) the site boundary, and (6) the outlying areas. 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 LTSP requirements.

4.4.2.1 Top of Disposal Cell

The disposal cell, completed in 1990, occupies 60 acres (PL-2). It has a vegetated cover consisting primarily of perennial grasses and broadleaf plants. There was no evidence of erosion, settling, slumping, or other modifying processes on top of the disposal cell. Several small animal burrows were observed on the cell top-slope (PL-3) but are shallow and do not require repairs. Several noxious weeds were found on the top slope and will be treated following the inspection. No other maintenance needs were identified.

4.4.2.2 Side Slopes of Disposal Cell

The side slopes of the disposal cell are armored with rock riprap. Rock has moved along the north toe of the disposal cell, resulting in a linear depression approximately 18 feet (ft) long (PL-4) that first was observed in 2015 and continues to be monitored. Inspectors did not observe significant changes to the depression. Inspectors will continue to monitor this area.

A subtle topographic variation in the surface of the northeast side slope, first observed during the 2018 annual inspection, was observed again in 2021. The variation does not pose a concern for disposal cell integrity at this time, as no evidence of erosion or subsidence was found during the 2021 inspection. Inspectors will continue to monitor the variation.

Inspectors found several young volunteer trees and several noxious weeds growing on the side slopes. The noxious weeds were treated after the inspection. Inspectors noted several points on the side slopes that had sustained lightning strikes (PL-5). No other maintenance needs were identified.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed at the toes of the side slopes on the east (Ditch No. 1), south (Ditch No. 2), and northwest and west (Ditch No. 3) sides of the disposal cell (PL-6). Stormwater is directed into these ditches and conveyed away from the site into natural drainages. The ditches have sufficient depth and rock protection to carry stormwater runoff from a probable maximum precipitation event. Erosion occurs on some of the steep slopes above the ditches, depositing sediment in the riprap-armored channel. This sediment favors plant establishment but does not adversely affected the performance of the ditches, so maintenance is not needed at this time.

The riprap-covered outflows of the drainage ditches were designed to self-armor over time. The outflows and drainage channels below them are monitored annually. A larger boxelder tree is growing along the edge of the south outflow channel but does not affect the stability or effectiveness of the channel. A large arroyo has formed below the southeast outflow (PL-7), which indicates the drainage ditch is functioning properly. The uplands above the northeast outflow are steadily eroding (PL-8(a) and PL-8(b)), but this is not affecting the stability or effectiveness of the outflow area. No maintenance needs were identified.

4.4.2.4 Holding Pond

Inspectors noted that the former holding pond area, removed in 2017, is revegetating successfully and contains several species of native, pollinator-friendly wildflowers. No evidence of erosion or damage to the newly vegetated area was observed. Several noxious weeds were identified in the area and were treated following the inspection. No other maintenance needs were identified.

4.4.2.5 Site Boundary

Boundary monuments and perimeter signs delineate the site boundary with one exception: The site boundary marked by boundary monument BM-6 is not delineated with perimeter signs

because the signs cut across the corner of the site (perimeter signs P82, P1, P2, and P3). Inspectors noted no new activities or changes to the site boundary area. Gullies on the southeast and southwest portion of the site remain stable and do not threaten the integrity of the disposal cell or drainage ditches. No maintenance needs were identified.

4.4.2.6 Outlying Areas

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 changes or new features were identified. Colorado Parks and Wildlife manages land to the north, west, and east of the site, and BOR manages land to the south. The primary land uses are wildlife habitat and recreation. Mountain bikers, hikers, and other recreationists commonly use County Road 212.

4.5 Follow-Up Inspections

LM 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) LM 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.

4.6 Maintenance

Inspectors noted the sagging entrance gate identified in the 2020 inspection was repaired before this year's inspection. The following minor maintenance needs were addressed following the 2021 inspection:

- Removed vegetation around perimeter sign P26 and boundary monument BM-1
- Treated noxious weeds on the side and top slopes of the disposal cell

4.7 Emergency Measures

Emergency measures are the actions that LM will take in response to “unusual damage or disruption” that threatens or compromises site safety, security, or integrity in compliance with Criterion 12 of 10 CFR 40, Appendix A. No need for emergency measures was identified.

4.8 Environmental Monitoring

4.8.1 Groundwater Monitoring

In accordance with the LTSP, LM conducts annual groundwater sampling and analysis to monitor disposal cell performance. BMP monitoring wells 0608, 0618, and 0623 are sampled more frequently to support the evaluation of variable uranium concentrations observed in well 0618 (DOE 2019). The most recent annual sampling event occurred at the site in June 2021. LM inspected the monitoring wells during the sampling event, and no maintenance needs were identified.

The LTSP establishes three POC wells at the site. The POC wells are completed in the uppermost aquifer (bedrock of the Cliff House Sandstone and the Menefee Formation) because of the limited extent of saturated alluvium underlying the site. A background well is also completed in the uppermost aquifer.

Table 4-2 and Figure 4-2 show the current groundwater monitoring network at the site.

Table 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

Monitoring Well	Well Compliance Type	Hydrologic Relationship (LTSP)
0605	Background	Upgradient (uppermost aquifer)
0607	POC	Downgradient (uppermost aquifer)
0608	BMP	Downgradient (alluvium)
0612	POC	Downgradient (uppermost aquifer)
0618	BMP	Downgradient (alluvium)
0621	POC	Downgradient (uppermost aquifer)
0623	BMP	Upgradient (alluvium)

Groundwater is sampled annually from POC wells and more frequently from BMP wells for three constituents: molybdenum, selenium, and uranium. The site-specific concentration limits or standards for the three constituents represent the respective maximum observed background concentrations reported in groundwater samples collected from wells completed in the bedrock aquifer, as identified in Table 4 of the LTSP. Table 4-3 provides these site-specific standards. Figure 4-3 through Figure 4-5 show the time-concentration plots for the three constituents, along with corresponding site-specific standards. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (<https://gems.lm.doe.gov/#site=DUD>).

Table 4-3. Site-Specific Groundwater Standards for the Durango, Colorado, Disposal Site Based on Background Concentrations

Constituent	Standard (mg/L)
Molybdenum	0.22
Selenium	0.042
Uranium	0.077

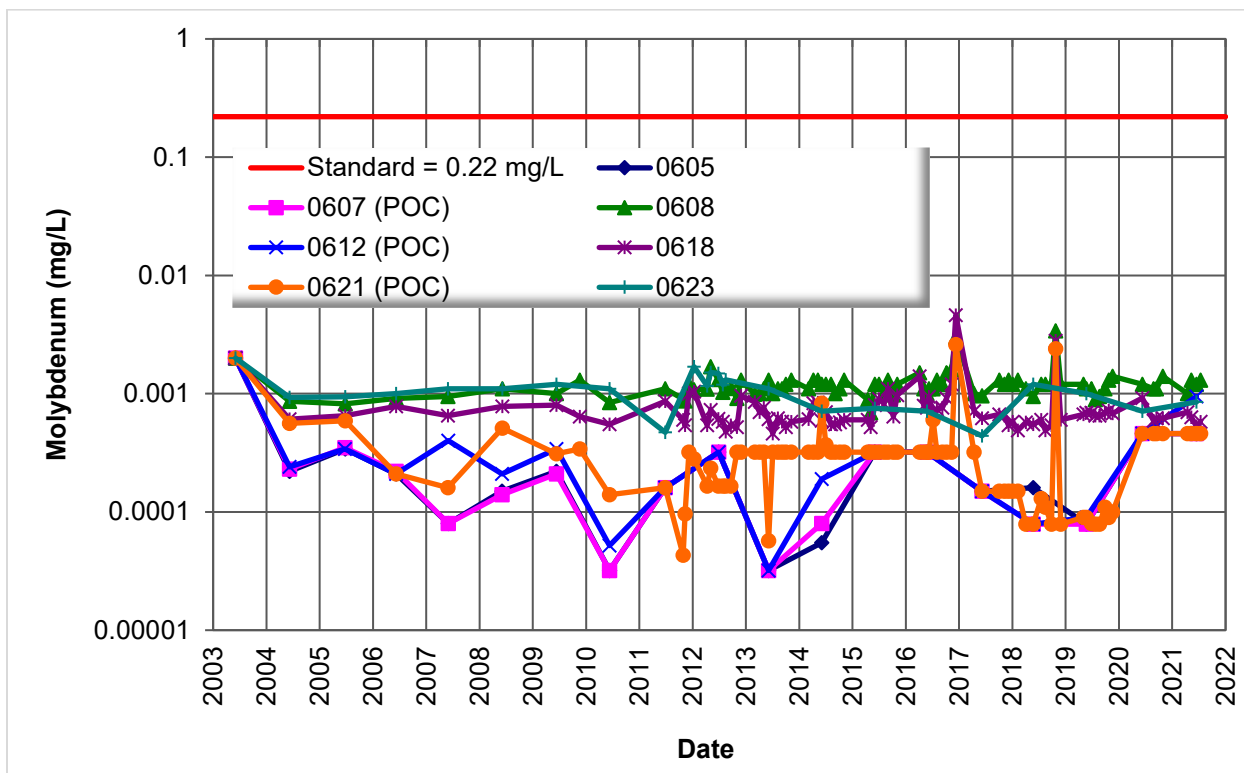
Abbreviation:

mg/L = milligrams per liter



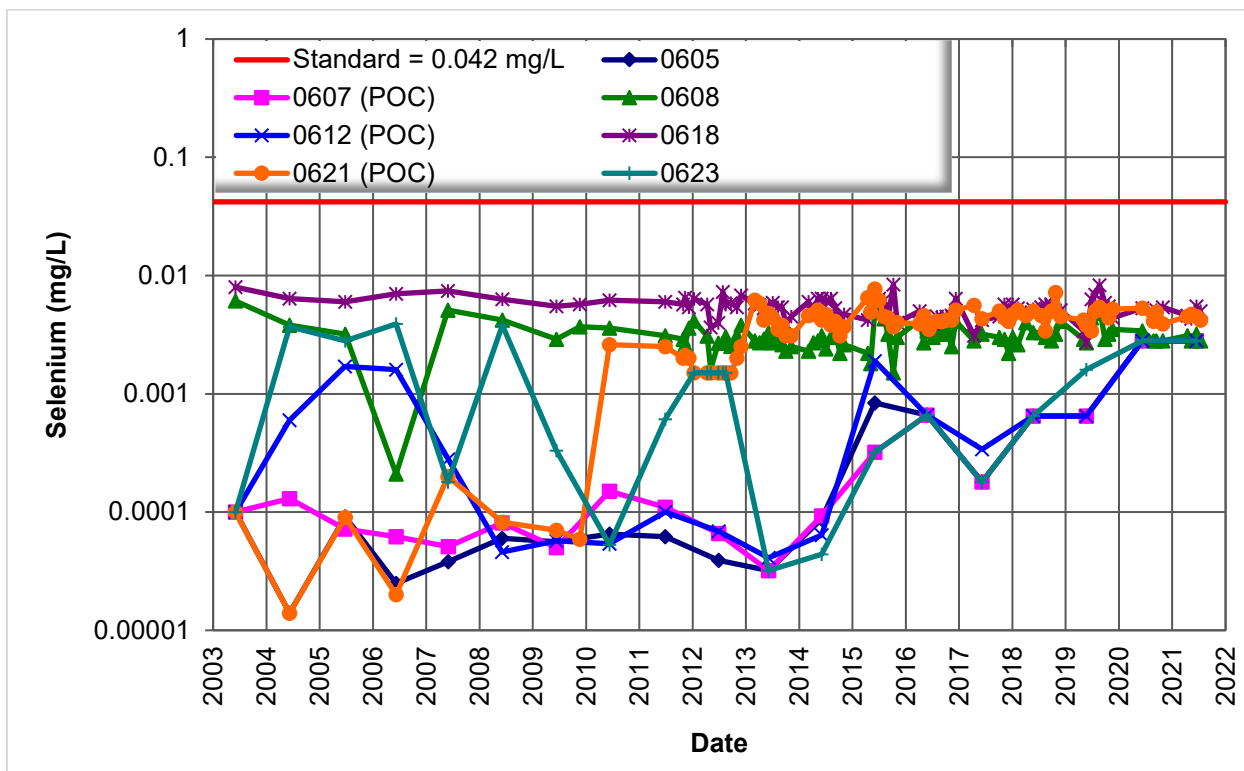
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Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site



Note: Results include validated data only; results below the detection limit are presented at the laboratory reported value.

Figure 4-3. Molybdenum Concentrations in Groundwater at the Durango, Colorado, Disposal Site



Note: Results include validated data only; results below the detection limit are presented at the laboratory reported value.

Figure 4-4. Selenium Concentrations in Groundwater at the Durango, Colorado, Disposal Site

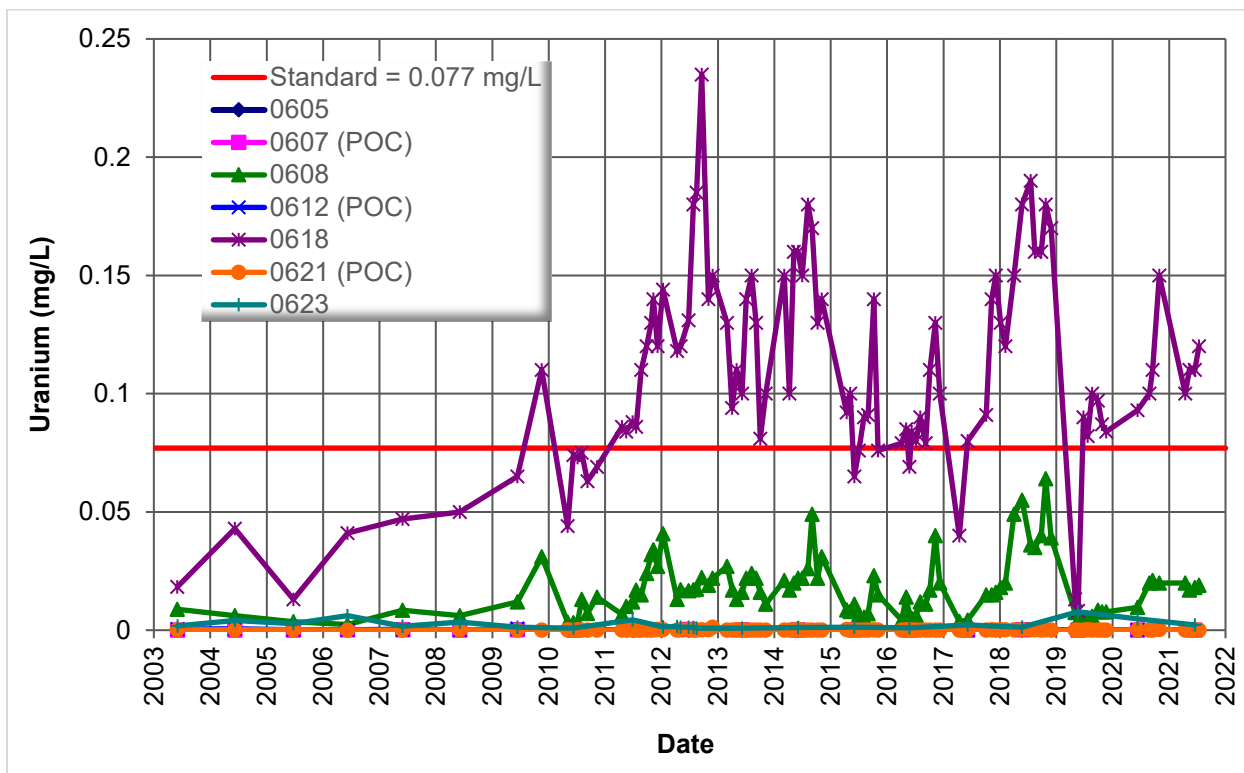


Figure 4-5. Uranium Concentrations in Groundwater at the Durango, Colorado, Disposal Site

Molybdenum, selenium, and uranium concentrations in POC wells (0607, 0612, and 0621) in the uppermost aquifer are below their respective standards.

Wells completed in the alluvium are sampled as a BMP. Uranium concentrations in well 0618 have consistently been higher than concentrations in the other onsite wells. To monitor and compare the elevated and variable uranium concentrations observed in this well, BMP wells 0608, 0618, and 0621 are sampled monthly as weather permits. Figure 4-5 shows variable uranium concentrations between 0.0082 milligrams per liter (mg/L) and 0.235 mg/L in well 0618 beginning in 2009 and continuing to the present. Uranium concentrations in well 0618 were measured at 0.12 mg/L in July 2021, which is within the range of measured historical concentrations. The cause of the variability in uranium concentration at well 0618 will be a focus of further investigation.

4.8.2 Vegetation Monitoring

Vegetation on top of the disposal cell remains healthy. The LTSP requires deep-rooted plants on the disposal cell cover and side slopes to be eliminated by either selective spraying or mechanical removal when their shoot height equals or exceeds 3.5 ft. Several noxious weeds identified at the time of the inspection were treated following the inspection.

4.9 Corrective Action

In accordance with the LTSP, implementation of a corrective action program will be taken within 18 months of verification of an established exceedance of a concentration limit for one or more constituents in a POC well. No need for corrective action was identified.

4.10 References

10 CFR 40 Appendix A. U.S. Nuclear Regulatory Commission, “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content,” *Code of Federal Regulations*.

10 CFR 40.27. U.S. Nuclear Regulatory Commission, “General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites,” *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2019. *Long-Term Surveillance Plan for the Durango, Colorado, Disposal Site*, LMS/DUD/S06297, May.

4.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	—	Site Marker SMK-2
PL-2	35	Diverse Vegetation on Top Slope
PL-3	130	Animal Burrows on Top Slope
PL-4	270	Monitoring Grid over Linear Depression
PL-5	—	Lightning Strike on Side Slope
PL-6	135	Northeast Drainage Channel
PL-7	355	Southeast Outflow
PL-8	10	(a) Northeast Outflow in 2021 (b) Northeast Outflow in 2006 (Photo for Comparison)

Note:

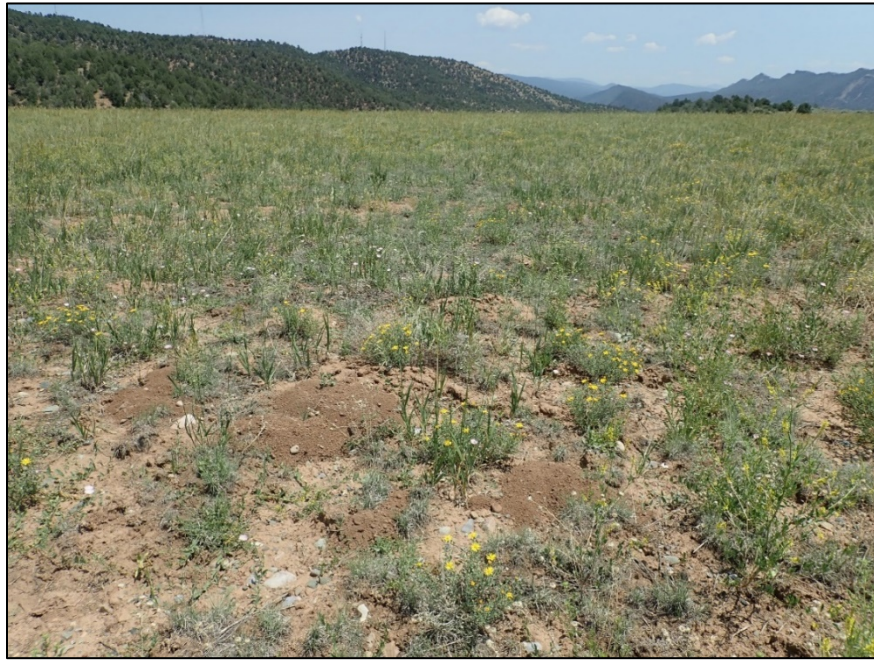
— = Photograph taken vertically from above.



PL-1. Site Marker SMK-2



PL-2. Diverse Vegetation on Top Slope



PL-3. Animal Burrows on Top Slope



PL-4. Monitoring Grid over Linear Depression



PL-5. Lightning Strike on Side Slope



PL-6. Northeast Drainage Channel



PL-7. Southeast Outflow

Photos continued on next page.



PL-8(a). Northeast Outflow in 2021



PL-8(b). Northeast Outflow in 2006 (Photo for Comparison)

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