

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 (site) annual site inspection on June 20, 2018 and the annual groundwater monitoring event in May 2018. No cause for a follow-up inspection was identified.

Monitoring of the minor linear depression on the toe of the northeast side slope continues; inspectors noted that there may have been some movement of rocks in the interior of the linear depression (rotated inward) on the toe of the northeast side slope. Monitoring of the depression will continue to help LM understand its cause(s) and mitigate any problems that may arise as a result. No changes were observed on the top of the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs and have already addressed a few.

The most recent groundwater results indicate concentrations in point-of-compliance (POC) wells are below site-specific thresholds. One best management practice monitoring well (0618) continues to be sampled more frequently in response to variable uranium concentrations typically above site-specific thresholds for the POC wells. Well 0618 is not a POC well, and the concentrations in this well do not affect compliance with the site-specific LM Long-Term Surveillance Plan (LTSP) (DOE 2015) and do not pose a risk to human health and the environment.

4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the LTSP and in procedures LM established to comply with the requirements of the U.S. Nuclear Regulatory Commission 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 general license in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, 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 20, 2018. The inspection was conducted by M. Kastens and D. Atkinson of the Legacy Management Support (LMS) contractor. J. Dayvault (LM site manager) and D. Miller and J. Lobato (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 determine the need, if any, for maintenance or additional inspection and monitoring.

4.4.1 Site Surveillance Features

Figure 4-1 shows the locations of site features in black, 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 2018 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 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. Entrance to the site is through the locked steel entrance gate along County Road 212 and an older, original entrance gate. Both gates were locked and functional. The entrance sign is at the original entrance gate within the property boundary. No maintenance needs were identified.

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 recent additions act as surrogates for perimeter signs P40–P43 because perimeter signs P40–P43 are on a steep densely wooded hillside. Perimeter signs P40–P43 are not routinely inspected unless the dense vegetation recedes.

The concrete bases of several perimeter signs have been and continue to be undercut (PL-1), but the position of the signs remain uncompromised. The concrete base of perimeter sign P45, located in the natural drainage on the north end of the site, was almost entirely free-standing (PL-2). Following the inspection, LM moved perimeter sign P45 approximately 25 feet (ft) to the east, a location less prone to erosion. Vegetation was encroaching on perimeter sign P51 (PL-3) and was removed in fall 2018 following the inspection. No other maintenance needs were identified.

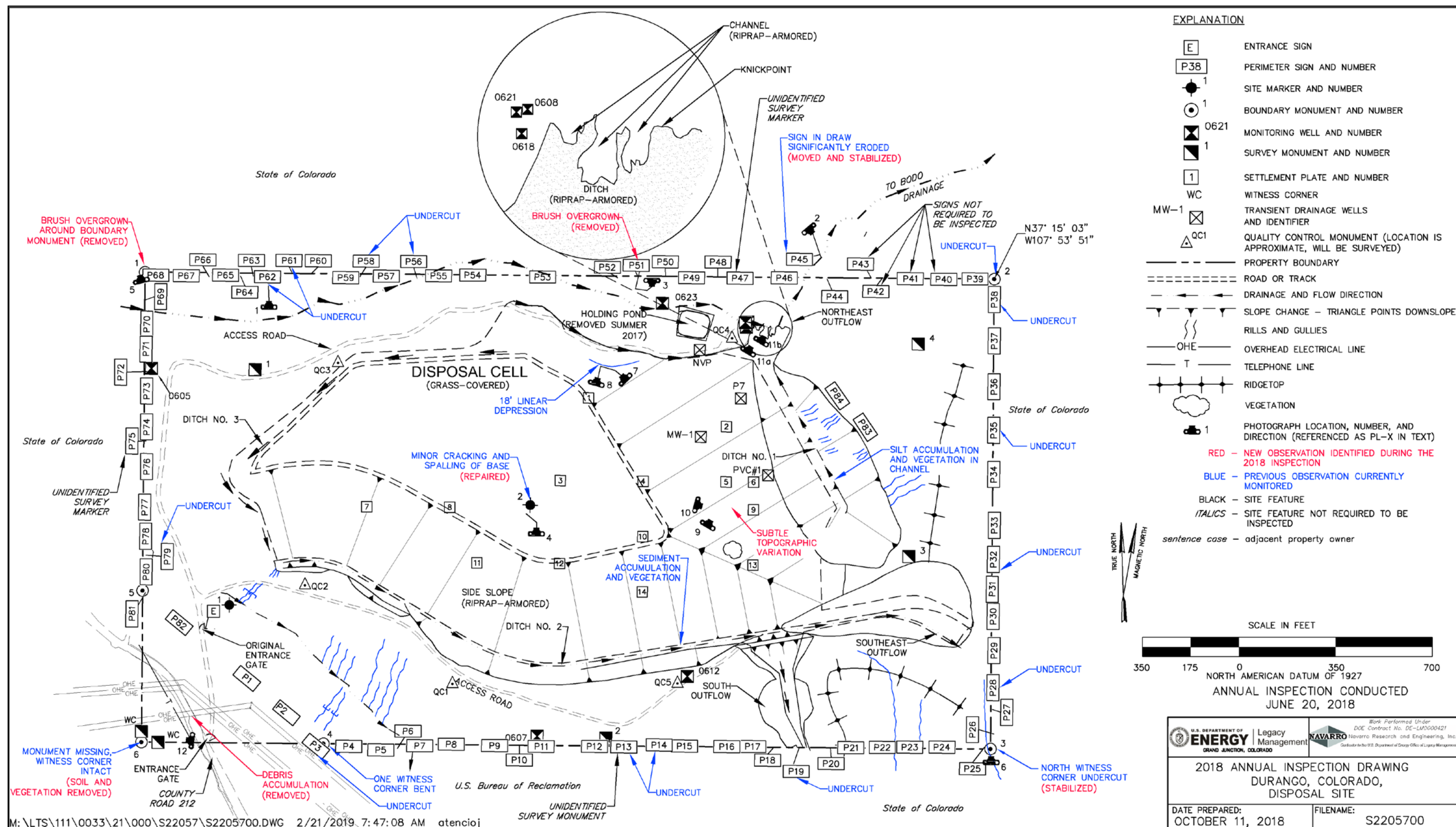


Figure 4-1. 2018 Annual Inspection Drawing for the Durango, Colorado, Disposal Site

This page intentionally left blank

4.4.1.3 Site Markers

The site has two site markers. Site marker SMK-1 is just inside the original entrance gate. Site marker SMK-2 is on the top slope of the disposal cell; its concrete base exhibited minor cracking and spalling along its edges (PL-4) and soil had eroded or subsided approximately 1–3 inches around the base. Following the inspection, LM repaired and stabilized the site marker SMK-2 base. No other 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 pipeline was installed, bringing the current number of boundary monuments to five. However both witness corners were present, although the southeast witness corner was beginning to be covered with soil and the northwest witness corner was blocked by vegetation. Replacement of boundary monument BM-6 is not warranted at this time. Boundary monument BM-1 was almost completely covered by vegetation (PL-5). The north witness corner for boundary monument BM-3 had been undercut by erosion (PL-6) and needed stabilization. Boundary monument BM-3 also was undercut, although not as significantly. Following the inspection, LM removed soil from the southeast witness corner to boundary monument BM-6, removed vegetation from boundary monument BM-1 and the northwest witness corner to boundary monument BM-6, and stabilized boundary monument BM-3 and its north witness corner. No other maintenance needs were identified.

4.4.1.5 Monitoring Wells

The site has seven monitoring 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. 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 the top of the disposal cell. In the past, inspectors have observed small animal burrows in several areas throughout the top; however, none were observed in 2018. No 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. Along the north toe of the disposal cell, rock has moved, resulting in a linear depression approximately 18 ft long, first observed in 2015. Inspectors noted that some of the rocks in the interior of the depression that were previously marked appeared to have rotated inward (PL-7 and PL-8). Inspectors will continue to monitor this area.

Inspectors observed a subtle topographic variation in the surface of the northeast side slope (PL-9 and PL-10). Inspectors found no evidence of significant erosion around the variation, which would prompt concern, and determined that the variation did not pose a concern regarding disposal cell integrity. Inspectors will continue to monitor the variation.

Subtle topographic variations observed on the disposal cell south side slope during the 2017 annual inspection were observed again during the 2018 annual inspection. The variations were determined to be artifacts of disposal cell construction. No maintenance needs were identified.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed beneath the toe of the side slope on the east (Ditch No. 1), south (Ditch No. 2), and northwest and west (Ditch No. 3) sides of the disposal cell. Storm water is directed into these ditches and conveyed away from the site into natural drainages. The ditches have sufficient depth and rock protection to carry 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 process creates locales that favor plant establishment and wildlife habitat enhancement. Sediment accumulation and associated vegetation have not adversely affected the performance of the channel.

The riprap-covered outflows of the drainage ditches were designed to self-armor. The outflows and drainage ditches below them are monitored annually. The uplands above the northeast outflow are steadily eroding over time (PL-11). Erosion of the uplands does not affect the stability or effectiveness of the outflow area. No maintenance needs were identified.

4.4.2.4 Holding Pond

The holding pond and fence associated with the site's transient drainage system in the northeast corner of the site were removed in 2017. Inspectors noted that the former holding pond area was revegetated; no evidence of erosion or damage to the newly vegetated area was observed. No maintenance needs were identified.

4.4.2.5 Site Boundary

Boundary monuments and perimeter signs delineate the site boundary (property 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, with the exception of debris accumulation near the southwest corner of the site near boundary monument BM-6 (PL-12). The debris was removed following the inspection. 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 other 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 such impacts were identified. Colorado Parks and Wildlife manages land to the north, west, and east of the site, and the U.S. Bureau of Reclamation manages land to the south. The primary land uses are wildlife habitat and recreation. Mountain bikers 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 documented minor maintenance needs that were addressed following the inspection, including:

- Moving perimeter sign P45 from the arroyo in the northeast drainage to a location approximately 25 ft to the east
- Removing vegetation from around perimeter sign P51 and boundary monument BM-1
- Repairing cracks in the concrete base of site marker SMK-2 and stabilizing the surrounding soil
- Reinforcing and stabilizing the bases of boundary monument BM-3 and its north witness corner
- Removing brush and soil from around the witness corners of boundary monument BM-6
- Removing trash from the southwest corner of the site, near boundary monument BM-6
- Treating woody species on the side slopes

In August 2018, following the inspection, five permanent quality-control monuments were installed at the site in preparation for a baseline aerial survey of the disposal cell. The quality control monument locations are shown in Figure 4-1. No other maintenance needs were identified.

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. Several best management monitoring wells are sampled more frequently to evaluate variable uranium concentrations, such as best management practice well 0618. The most recent annual sampling event occurred at the site in May 2018. 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) underlying the site. A background well is also completed in the uppermost aquifer. Three additional monitoring wells are completed in the alluvium and monitored as a best management practice. The LTSP describes the Cliff House/Menefee aquifer as the uppermost aquifer because of the limited area of the alluvial system saturation under natural conditions beneath the disposal cell. Previous annual site inspections have not identified any discharge of alluvial groundwater to the surface, and discharge of alluvial groundwater to the surface was not detected in 2018. 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
0605	Background	Upgradient (uppermost aquifer)
0607	Point of compliance	Downgradient (uppermost aquifer)
0608	Best management practice	Downgradient (alluvium)
0612	Point of compliance	Downgradient (uppermost aquifer)
0618	Best management practice	Downgradient (alluvium)
0621	Point of compliance	Downgradient (uppermost aquifer)
0623	Best management practice	Upgradient (alluvium)

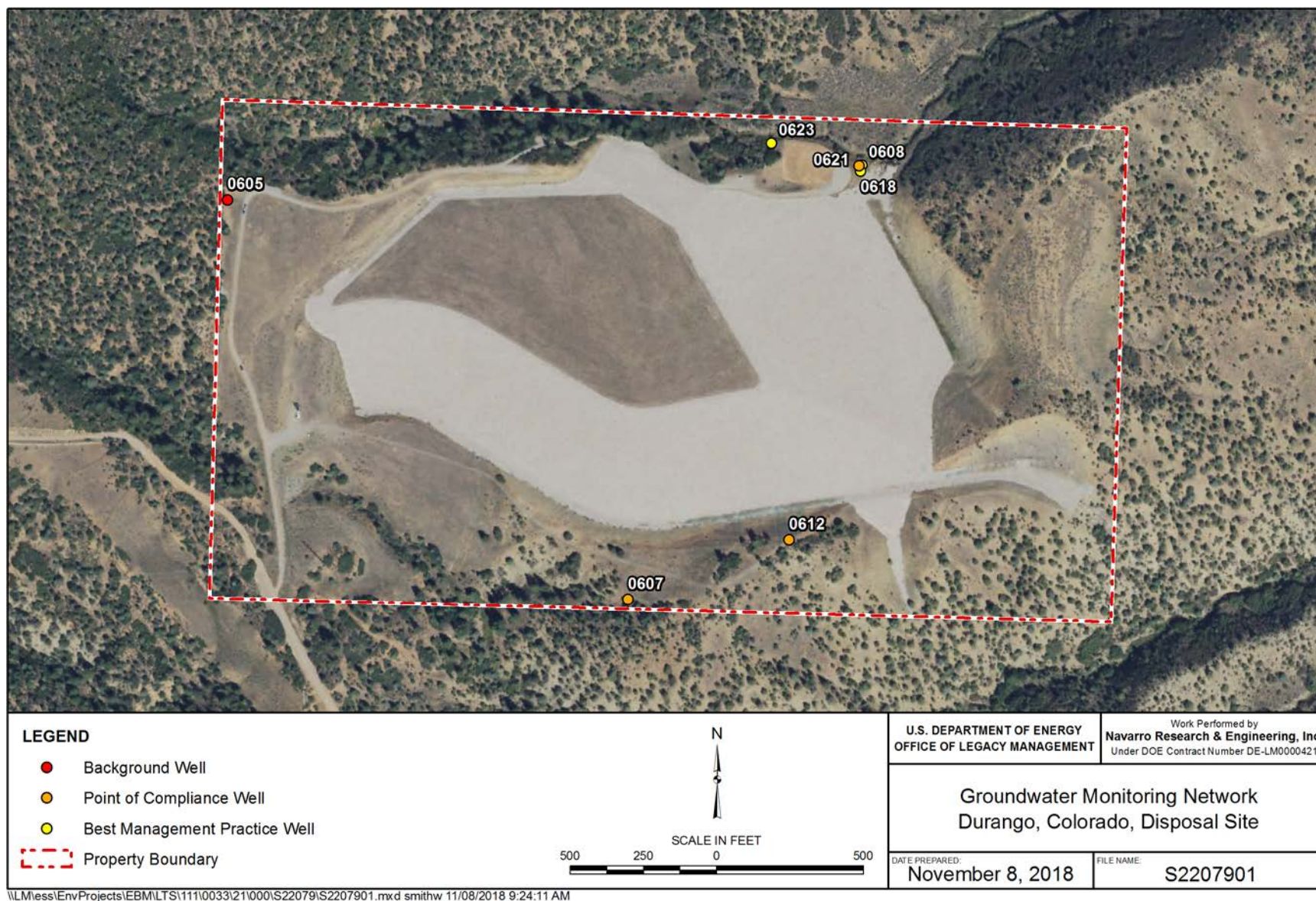


Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

Groundwater is sampled annually for three indicator parameters: molybdenum, selenium, and uranium. The site-specific standards used for the three indicator parameters are the respective maximum observed background concentrations reported in groundwater samples collected from wells completed in the bedrock aquifer, as identified in Table 2-3 of the LTSP. These site-specific standards are provided in Table 4-3. Figure 4-3 through Figure 4-5 show the time-concentration plots for the three indicator parameters, along with corresponding site-specific standards. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System website (<http://gems.lm.doe.gov/#site=DUD>).

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

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

Abbreviation:
mg/L = milligrams per liter

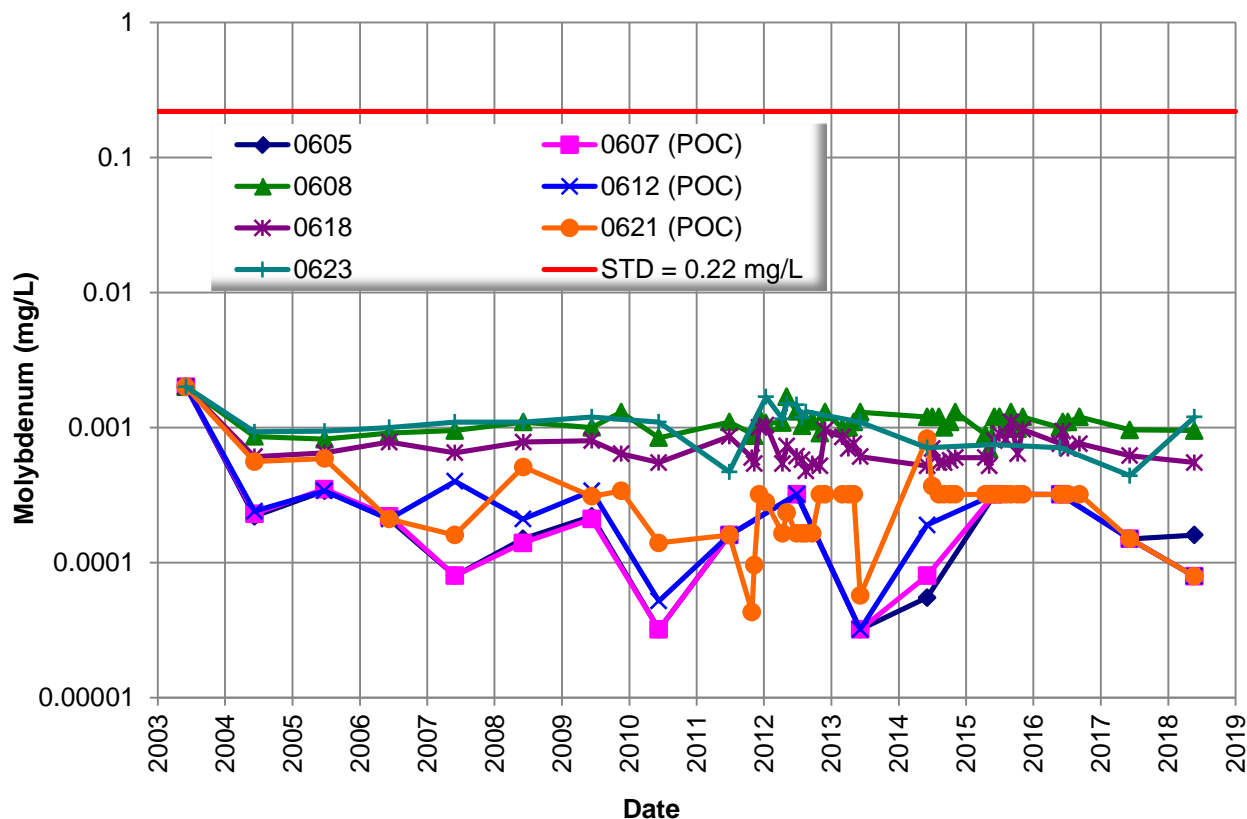


Figure 4-3. Molybdenum in Groundwater at the Durango, Colorado, Disposal Site

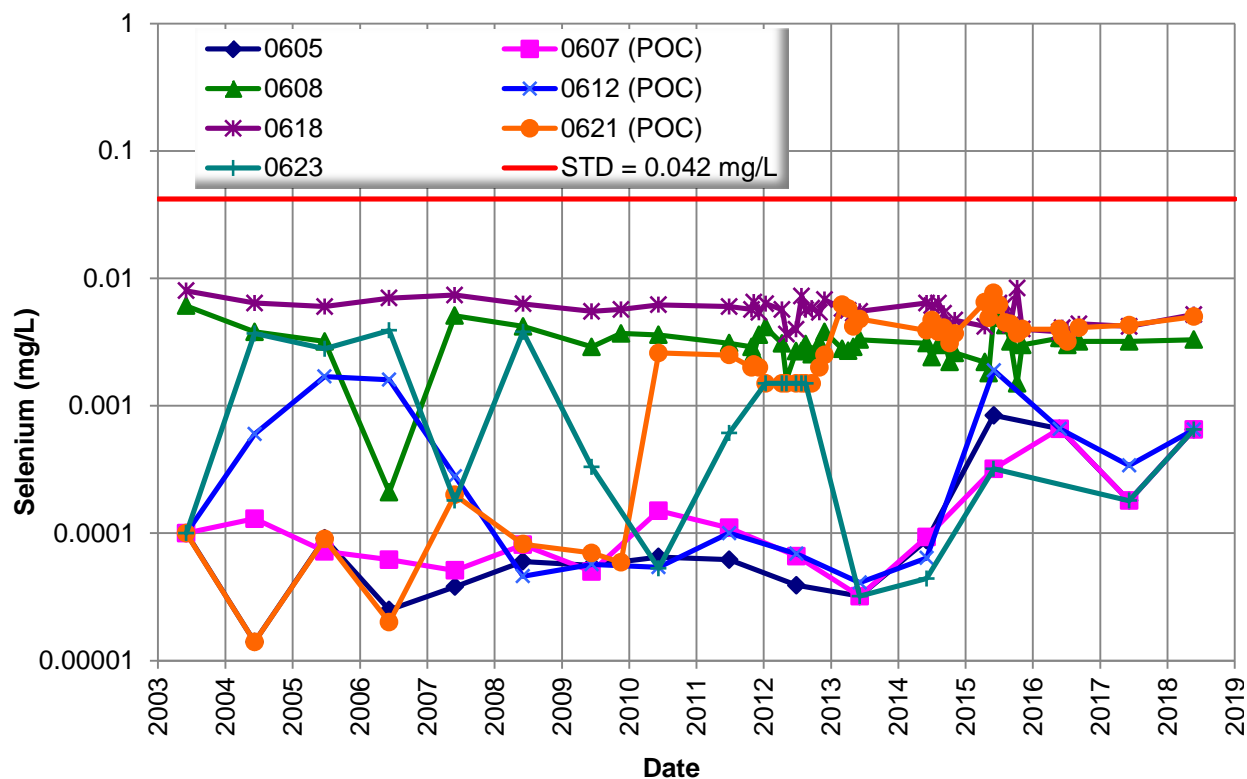


Figure 4-4. Selenium in Groundwater at the Durango, Colorado, Disposal Site

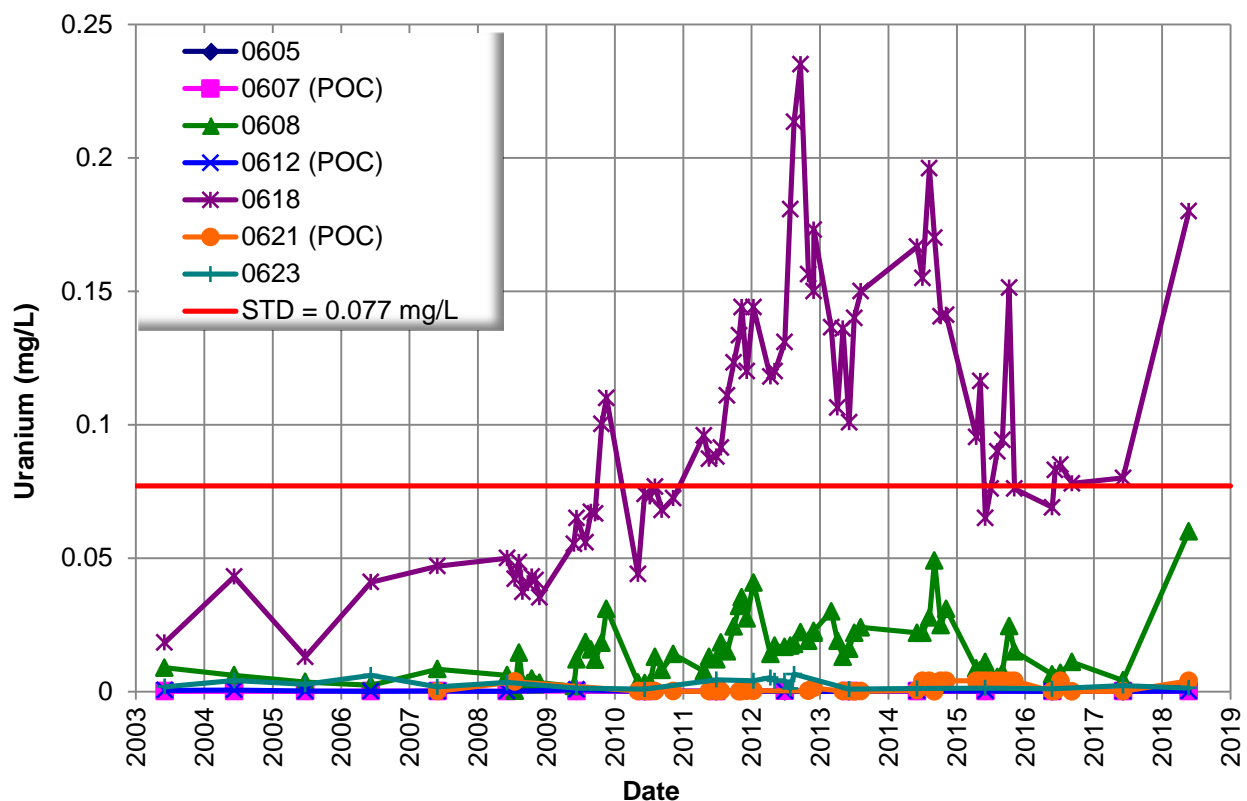


Figure 4-5. Uranium in Groundwater at the Durango, Colorado, Disposal Site

Molybdenum, selenium, and uranium concentrations in POC wells (0607, 0612, and 0621) in the uppermost aquifer are below the respective standards. Therefore, disposal cell performance remains unaffected.

Wells completed in the alluvium are sampled as a best management practice. Uranium concentrations in well 0618 have consistently been higher than concentrations in the other wells onsite. To monitor and compare the elevated and variable uranium concentrations observed in this well, wells 0608, 0618, and 0621 are sampled monthly as weather permits. Figure 4-5 shows an overall decreasing trend in uranium concentrations in well 0618 from 2014 to 2017, with concentrations varying around 0.08 milligrams per liter (mg/L). In 2018, uranium concentrations in well 0618 increased from 0.08 mg/L to 0.18 mg/L, which is within the range of measured historical concentrations. Compliance with the LTSP is not affected by this increase or exceedance of the site-specific standard because well 0618 is not a POC well. Investigating the cause of this variability continues.

4.8.2 Vegetation Monitoring

Vegetation on top of the disposal cell remains healthy. The LTSP requires plants on the disposal cell cover to be removed by either selective spraying or mechanical removal when their shoot height equals or exceeds 3.5 ft. Although the aboveground height of dryland alfalfa will never exceed the height criterion, it is known to be a deep-rooted plant; therefore, this species is also controlled on the disposal cell cover. Several shoots for woody species were found on the side slopes and will be treated with herbicide before the 2019 annual 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), 2015. *Long-Term Surveillance Plan for the Durango, Colorado, Disposal Site*, LMS/DUD/S06297, April.

4.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	Base of Perimeter Sign P62 (Undercut)
PL-2	140	Perimeter Sign P45 in Arroyo (Sign Moved Following Inspection)
PL-3	180	Vegetation Encroaching on Perimeter Sign P51 (Removed Following Inspection)
PL-4	0	Site Marker SMK-2 on Top of Disposal Cell (Repaired and Stabilized Following Inspection)
PL-5	345	Brush Overgrown Around Boundary Monument BM-1 (Removed Following Inspection)
PL-6	0	Erosion of North Witness Corner of Boundary Monument BM-3 (Addressed Following Inspection)
PL-7	315	18-Foot Linear Depression (Rocks Have Rotated Inward and Downward)
PL-8	15	18-Foot Linear Depression (Rocks Have Rotated Inward and Downward)
PL-9	30	Topographic Variation on Northeast Side Slope of Disposal Cell
PL-10	105	Topographic Variation on Northeast Side Slope of Disposal Cell
PL-11	30	(a) Northeast Outflow, 2018 (b) Northeast Outflow, 2006 Photo for Comparison
PL-12	275	Debris near Site Entrance Gate (Removed Following Inspection)



PL-1. Base of Perimeter Sign P62 (Undercut)



*PL-2. Perimeter Sign P45 in Arroyo
(Sign Moved Following Inspection)*



*PL-3. Vegetation Encroaching on Perimeter Sign P51
(Removed Following Inspection)*



*PL-4. Site Marker SMK-2 on Top of Disposal Cell
(Repaired and Stabilized Following Inspection)*



*PL-5. Brush Overgrown Around Boundary Monument BM-1
(Removed Following Inspection)*



*PL-6. Erosion of North Witness Corner of Boundary Monument BM-3
(Addressed Following Inspection)*



PL-7. 18-Foot Linear Depression (Rocks Have Rotated Inward and Downward)



PL-8. 18-Foot Linear Depression (Rocks Have Rotated Inward and Downward)



PL-9. Topographic Variation on Northeast Side Slope of Disposal Cell



PL-10. Topographic Variation on Northeast Side Slope of Disposal Cell



PL-11 (a). Northeast Outflow, 2018



PL-11 (b). Northeast Outflow, 2006 Photo for Comparison



*PL-12. Debris near Site Entrance Gate
(Removed Following Inspection)*