

## 4.0 Durango, Colorado, Disposal Site

### 4.1 Compliance Summary

The Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on May 24, 2017. Inspectors identified minor maintenance needs, but found no cause for a follow-up inspection.

Monitoring of the minor linear depression on the toe of the northeast side slope continues; however, no change in depth or length of the feature was noted. The U.S Department of Energy (DOE) has consulted with a Colorado Professional Engineer to better understand this anomaly. No changes were observed on the top of the disposal cell or in the associated drainage features. DOE contractors were conducting construction activities associated with the removal of the holding pond (evaporation pond) during the inspection. The holding pond was removed and the surrounding area was restored during the summer of 2017.

DOE conducts annual groundwater monitoring to verify the disposal cell performance. The most recent annual sampling event occurred in June 2017. One best management practice monitoring well (0618) continues to be sampled more frequently in response to variable uranium concentrations typically above site-specific thresholds but does not pose a risk to human health and the environment. Groundwater monitoring results indicate no unexpected changes from previous years.

### 4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific DOE Long-Term Surveillance Plan (LTSP) (DOE 2015) and in procedures DOE 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 May 24, 2017. The inspection was conducted by M. Kastens and A. Kuhlman of the DOE Legacy Management Support (LMS) contractor. J. Dayvault (DOE site manager), M. Cosby and J. Doebele (Colorado Department of Public Health and Environment), and D. Miller and T. Thoele (LMS) 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 LTSP, and to determine the need, if any, for maintenance or additional inspection and monitoring.

### **4.4.1 Site Surveillance Features**

Figure 4-1 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 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 from 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. Both entrance gates had recently been painted and vegetation along the onsite access road mowed (PL-1). The entrance sign is at the original entrance gate within the property boundary. The entrance sign was recently replaced (PL-2). No maintenance needs were identified.

#### **4.4.1.2 Perimeter Signs**

There are 82 perimeter signs, attached to steel posts set in concrete, positioned along the unfenced property boundary, cutting in at the southwest corner. Two additional perimeter signs (P83 and P84), also attached to steel posts, were installed more recently inside the property boundary along the east perimeter of Ditch No. 1. With the addition of signs P83 and P84, four perimeter signs (P40–P43) located in steep, wooded terrain are not required to be inspected as part of the annual inspection unless the dense vegetation recedes. Perimeter signs identified during the 2016 annual inspection as needing replacement were replaced before the 2017 annual inspection. During the 2017 annual inspection, inspectors applied adhesive sign identification labels to 10 of the 11 replaced perimeter signs; the last adhesive label was added during a later site visit.

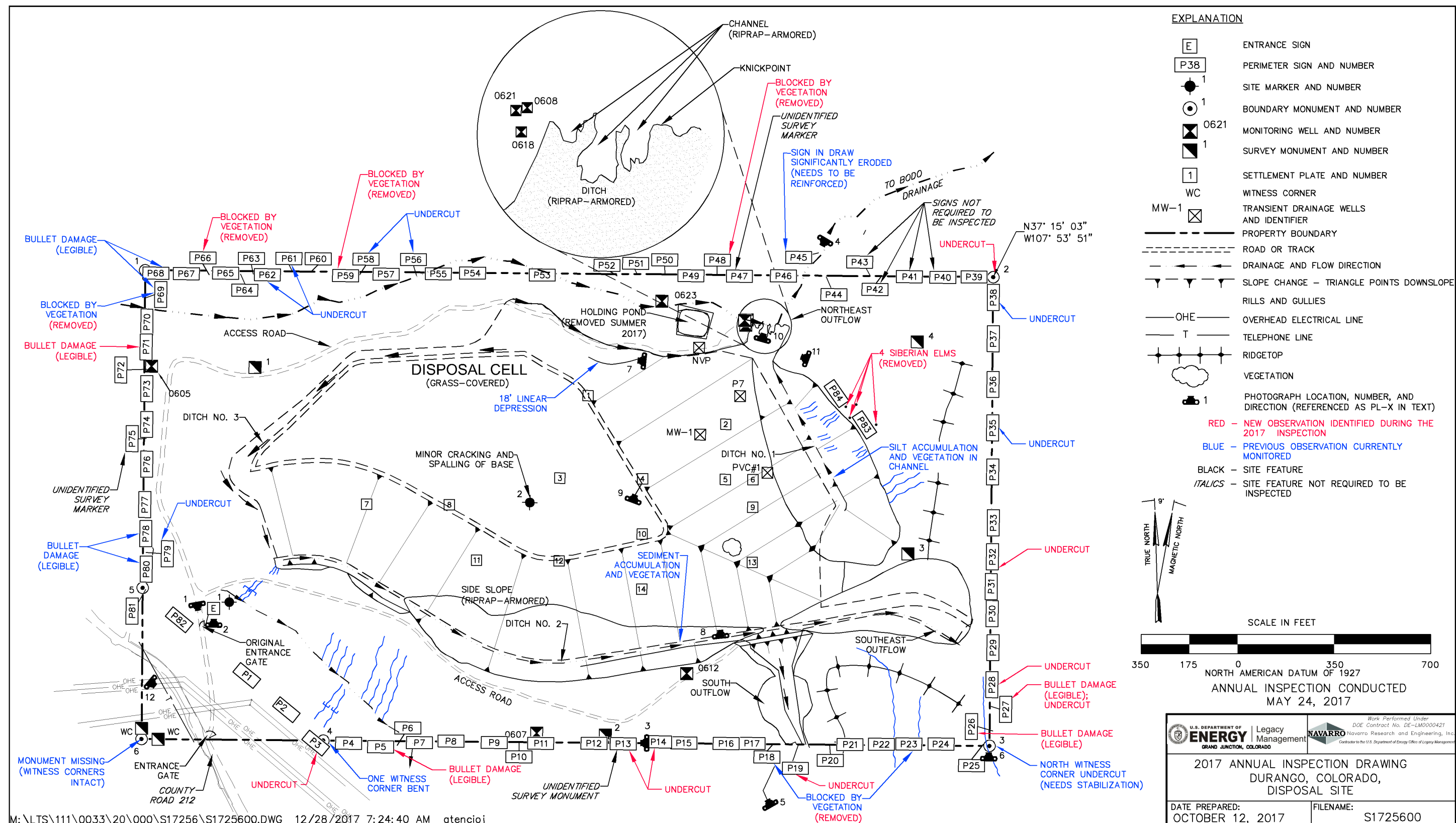


Figure 4-1. 2017 Annual Inspection Drawing for the Durango, Colorado, Disposal Site

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The concrete bases of several perimeter signs have been and continue to be undercut by erosion (PL-3). The concrete base of perimeter sign P45, located in the natural drainage on the north end of the site, is almost entirely free-standing (PL-4), and maintenance is required to protect against further erosion. DOE will reinforce the base of perimeter sign P45 before the 2018 annual inspection. Several perimeter signs have new bullet damage (P5, P26, P27, and P71) but remain legible. Several perimeter signs (P68, P69, P79, and P80) have bullet damage as identified in previous annual inspections but remain legible. Several perimeter signs (P18, P23, P48, P59, P66, and P69) were blocked from view by vegetation (PL-5) during the inspection; the vegetation was removed during a later site visit. No other maintenance needs were identified.

#### **4.4.1.3     *Site Markers***

The site has two granite 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 has several minor cracks, but they do not compromise the integrity of the base, and repairs are not necessary at this time. No immediate 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. The north witness corner for boundary monument BM-3 is undercut by erosion and in need of stabilization (PL-6). Boundary monument BM-3 also was undercut, although not as significantly. Both will be stabilized before the 2018 annual inspection. One of the witness corners for boundary monument BM-4 was bent to the ground, and its cap was missing (as it has been for years), but boundary monument BM-4 was stable. Boundary monument BM-6 has been missing since the adjacent U.S. Bureau of Reclamation pipeline was installed, but both witness corners were present, although they were somewhat hidden by vegetation. Replacement of these features is not warranted at this time. The vegetation was removed during a later site visit; no other maintenance needs were identified.

#### **4.4.1.5     *Monitoring Wells***

The site has seven monitoring wells. The LTSP does not require inspection of monitoring wells during the annual inspection. 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. Its vegetated cover consists 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 on the top of the disposal cell; however, none were observed in 2017.

#### **4.4.2.2     *Side Slopes of Disposal Cell***

The side slopes of the disposal cell are armored with riprap. Along the north toe of the disposal cell, rock has moved, resulting in a linear depression approximately 18 feet long. The depression was first observed in 2015. No significant change was observed in 2016 or 2017 (PL-7). Inspectors will continue to monitor this area.

Inspectors observed subtle topographic variations in the surface of the south side slope that had not been noticed during previous inspections (PL-8). The variations, while barely perceptible, appeared as a wavelike series of gentle ridges and swales across and parallel to the slope. It was hypothesized that the variations had not previously been noted because past inspections were typically conducted in afternoons, when the light was flatter, rather than in morning light, as in 2017, when shadows provided additional contrast and revealed topographic variations. The cause of the variations is unknown, but because of their subtle nature, they likely did not form abruptly between the 2016 and 2017 inspections and have been present for some time. Inspectors found no evidence that the side slope was eroding, which would prompt concern, and determined that the observed variations did not pose concerns about disposal cell integrity. Inspectors will continue to monitor this side slope during future inspections.

A dug-out hole was observed around settlement plate 4 on the east-facing side slope (PL-9). It was likely dug out by a large animal. Inspectors replaced the rock around the settlement plate. 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 the drainage ditches and conveyed away from the site into natural drainages. The drainage 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 drainage ditches, depositing sediment into 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-10). 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**

A holding pond (evaporation pond) associated with the site's transient drainage system is in the northeast corner of the site. The pond, fence, and associated structures were removed during summer 2017. At the time of the inspection, construction personnel were onsite conducting activities in preparation for the holding pond decommissioning (PL-11).

#### **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). There was no evidence of vandalism or changes to the area along or within the site boundary, with the exception of recent trash dumps near boundary monument BM-6 (PL-12). The trash was removed during a later site visit. 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**

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.

### **4.6 Maintenance**

The perimeter signs identified during the 2016 annual inspection as needing to be replaced were replaced before the 2017 annual inspection. Adhesive sign identification labels were applied to 10 of the 11 signs during the 2017 annual inspection; the last adhesive label was added during a later site visit. During the 2017 annual inspection several perimeter signs (P18, P23, P48, P59, P66, P69) and the witness corners of boundary monument BM-6 were blocked from view by vegetation; the vegetation was removed during a later site visit. Trash discovered in the area near boundary monument BM-6 was also removed during a later site visit.

The concrete base of perimeter sign P45 is significantly eroded and will be reinforced before the 2018 annual inspection. Boundary monument BM-3 and its north witness corner are undercut; both will be stabilized before the 2018 annual inspection. No other maintenance needs were identified.

## 4.7 Emergency Measures

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

## 4.8 Environmental Monitoring

### 4.8.1 Groundwater Monitoring

In accordance with the LTSP, DOE conducts annual groundwater monitoring to verify the performance of the disposal cell. Several monitoring wells are sampled more frequently to evaluate variable uranium concentrations in best management practice well 0618. The most recent annual sampling event occurred at the site in June 2017.

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 alluvium and the groundwater it contains are of very limited extent, so the alluvium is not considered an aquifer. There are no discharge points of alluvial groundwater to the surface. Table 4-2 and Figure 4-2 show the current groundwater monitoring network at the site. The original monitoring network did not include monitoring well 0618, but monitoring was initiated in 2002 because the well intercepts the full, saturated thickness of the alluvium.

*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)

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 monitoring 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.



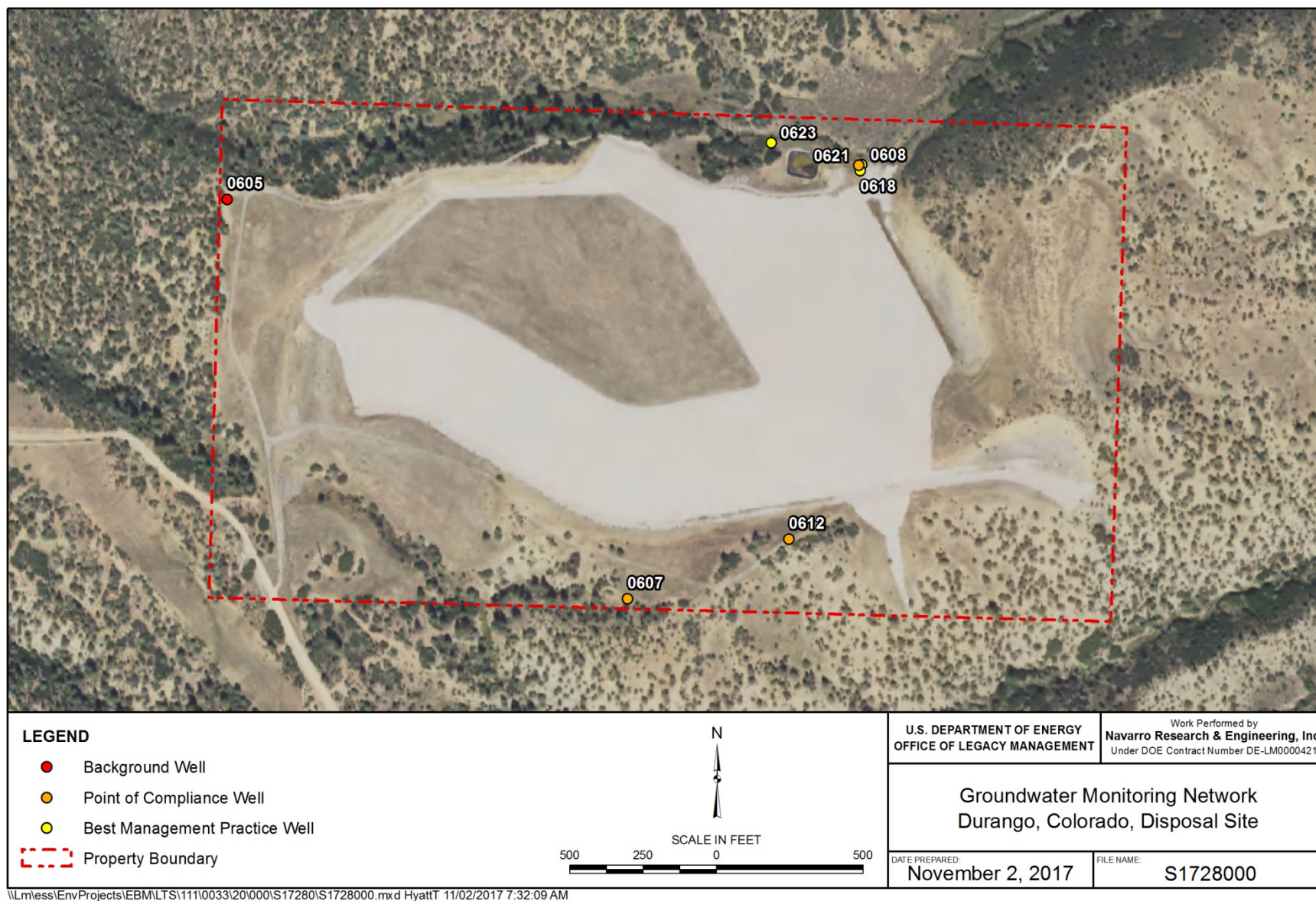


Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

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

Selenium, molybdenum, and uranium concentrations in POC wells (0607, 0612, 0621) in the uppermost aquifer are below the respective standards. Therefore, the uppermost aquifer is in compliance with the LTSP groundwater monitoring requirements.

Though not required for compliance, monitoring wells completed in the alluvium are monitored as a best management practice. Uranium concentrations in monitoring well 0618 have consistently been higher than concentrations in the other wells onsite. To monitor the elevated and variable uranium concentrations observed in monitoring well 0618, monitoring wells 0608, 0618, and 0621 are sampled monthly as weather permits. Monthly monitoring was not conducted during summer 2017 while the evaporation pond removal was in progress. Sampling resumed in October 2017. Figure 4-5 shows an overall decreasing trend in uranium concentrations in well 0618 since 2014, with concentrations varying around 0.08 mg/L since 2016. Because well 0618 is not a POC well and not screened in the uppermost aquifer, the concentrations in this well do not affect compliance with the LTSP and do not pose a risk to human health and the environment. The potential cause of variability in this well continues to be investigated.

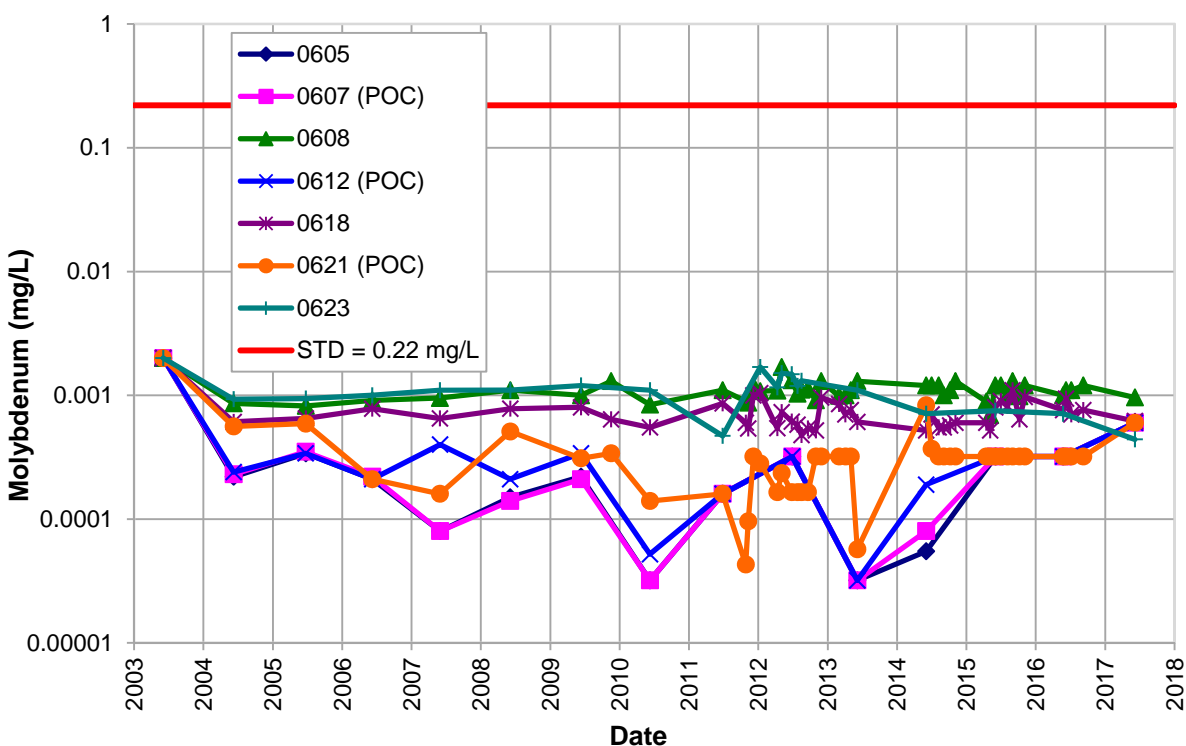


Figure 4-3. Molybdenum in Groundwater at the Durango, Colorado, Disposal Site

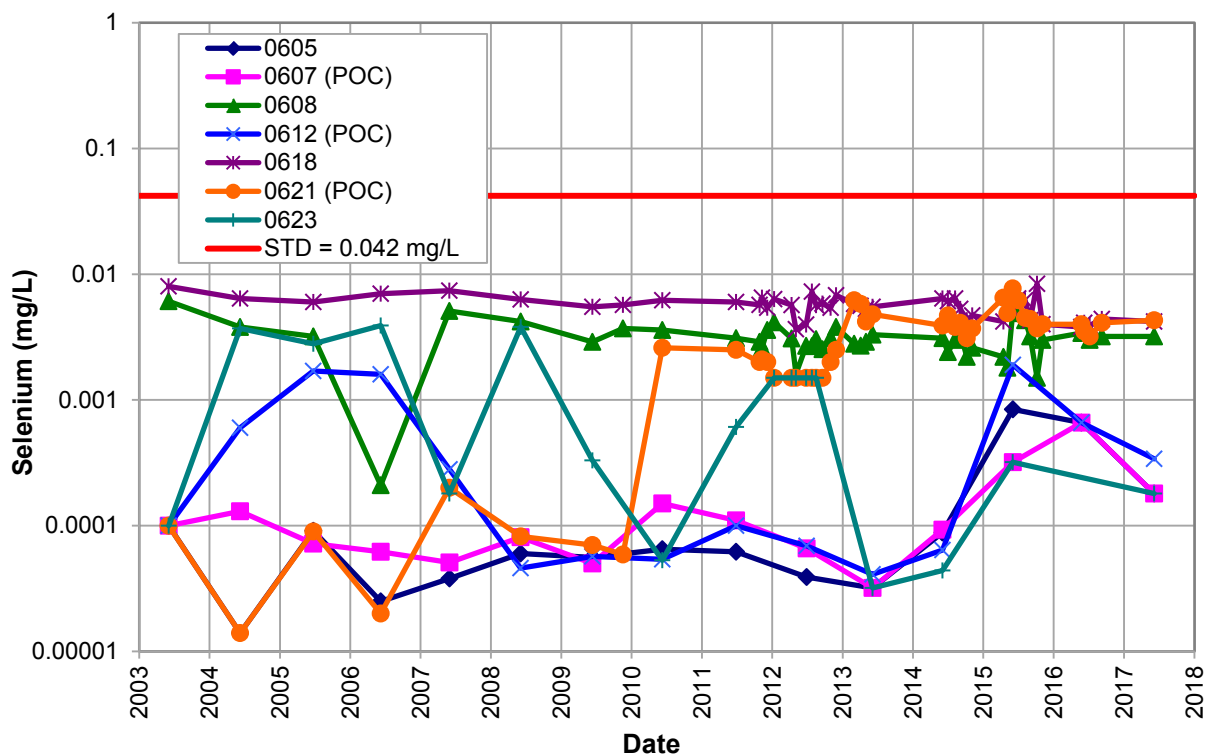


Figure 4-4. Selenium in Groundwater at the Durango, Colorado, Disposal Site

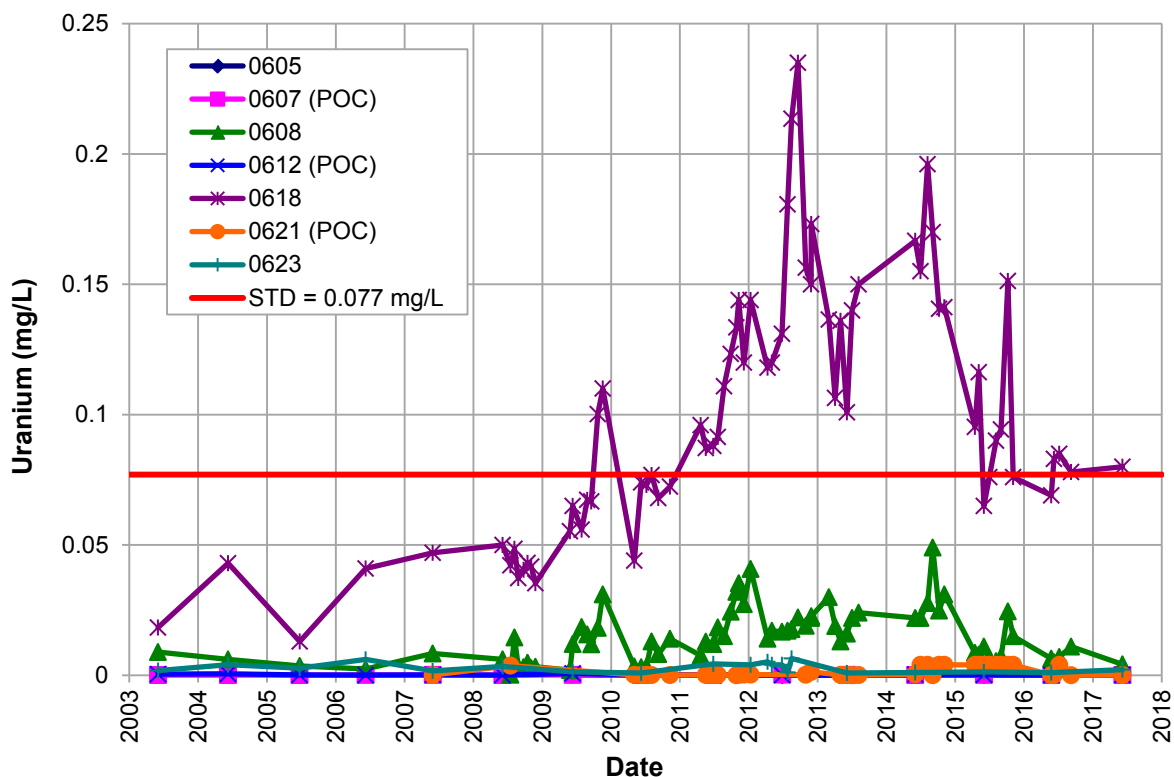


Figure 4-5. Uranium in Groundwater at the Durango, Colorado, Disposal Site

#### **4.8.2 Vegetation Monitoring**

Vegetation on top of the disposal cell remains healthy. The LTSP requires that plants on the disposal cell cover are to be removed by either selective spraying or mechanical removal when their shoot height equals or exceeds 3.5 feet. 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 shrubs approaching 3 feet in height were found on the disposal cell side slopes and were treated with herbicide following the inspection. Although weed control is not included in the annual inspection, inspectors make note of any large infestations of noxious weeds. Only scattered weeds were observed in 2017. Siberian elm, an invasive species, was identified in the northeast corner of the site.

#### **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	170	Access Road, Recently Mowed, and Original Entrance Gate Post, Newly Painted
PL-2	0	Entrance Sign Showing New Office of Legacy Management Website Address
PL-3	270	Perimeter Sign P13, Undercut by Erosion
PL-4	210	Perimeter Sign P45 in Drainage, Entire Base Nearly Standing Free
PL-5	330	Perimeter Sign P18, Blocked by Vegetation (Removed)
PL-6	0	North Reference Marker at Boundary Monument BM-3, Erosion at Base; Needs Stabilization
PL-7	275	View Uphill of 18-Foot Linear Depression on Toe of Northeast Disposal Cell Side Slope (Yellow Paint Marks Centerline of the Depression)
PL-8	355	Slight Topographic Irregularities on the South Side Slope of the Disposal Cell
PL-9	20	Rocks Dug Out Around Settlement Plate 4, Likely by a Large Animal
PL-10	15	(a) Northeast Outflow Channel Bottom Is Stable, Whereas Upland Area on Right Is Slowly Eroding, 2017 (b) Northeast Outflow Channel, 2006 Photo for Comparison
PL-11	290	Holding Pond Area Showing Construction Activities
PL-12	120	Trash Near Boundary Monument BM-6





*PL-1. Access Road, Recently Mowed, and Original Entrance Gate Post, Newly Painted*



*PL-2. Entrance Sign Showing New Office of Legacy Management Website Address*



*PL-3. Perimeter Sign P13, Undercut by Erosion*



*PL-4. Perimeter Sign P45 in Drainage, Entire Base Nearly Standing Free*





*PL-5. Perimeter Sign P18, Blocked by Vegetation (Removed)*



*PL-6. North Reference Marker at Boundary Monument BM-3, Erosion at Base; Needs Stabilization*





*PL-7. View Uphill of 18-Foot Linear Depression on Toe of Northeast Disposal Cell Side Slope  
(Yellow Paint Marks Centerline of the Depression)*



*PL-8. Slight Topographic Irregularities on the South Side Slope of the Disposal Cell*



*PL-9. Rocks Dug Out Around Settlement Plate 4, Likely by a Large Animal*





*PL-10. (a) Northeast Outflow Channel Bottom Is Stable, Whereas Upland Area on Right Is Slowly Eroding, 2017*



*PL-10. (b) Northeast Outflow Channel, 2006 Photo for Comparison*





*PL-11. Holding Pond Area Showing Construction Activities*



*PL-12. Trash Near Boundary Monument BM-6*