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 May 15, 2024, and the annual groundwater monitoring event in June 2024. No cause for a follow-up inspection was identified.

No changes were observed to the disposal cell or to its associated drainage features. Inspectors identified minor maintenance items listed in Section 4.6.

The 2024 annual groundwater sampling event identified concentrations of molybdenum, selenium, and uranium at the three point of compliance (POC) wells (wells 0607, 0612, and 0621) below site-specific thresholds. In addition to the annual sampling event, LM samples monitoring wells 0608 and 0618 and POC well 0621 monthly (weather permitting) as a best management practice to monitor variable uranium concentrations. Concentrations are typically above site-specific thresholds in well 0618.

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 for the Durango, Colorado, Disposal Site* (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.

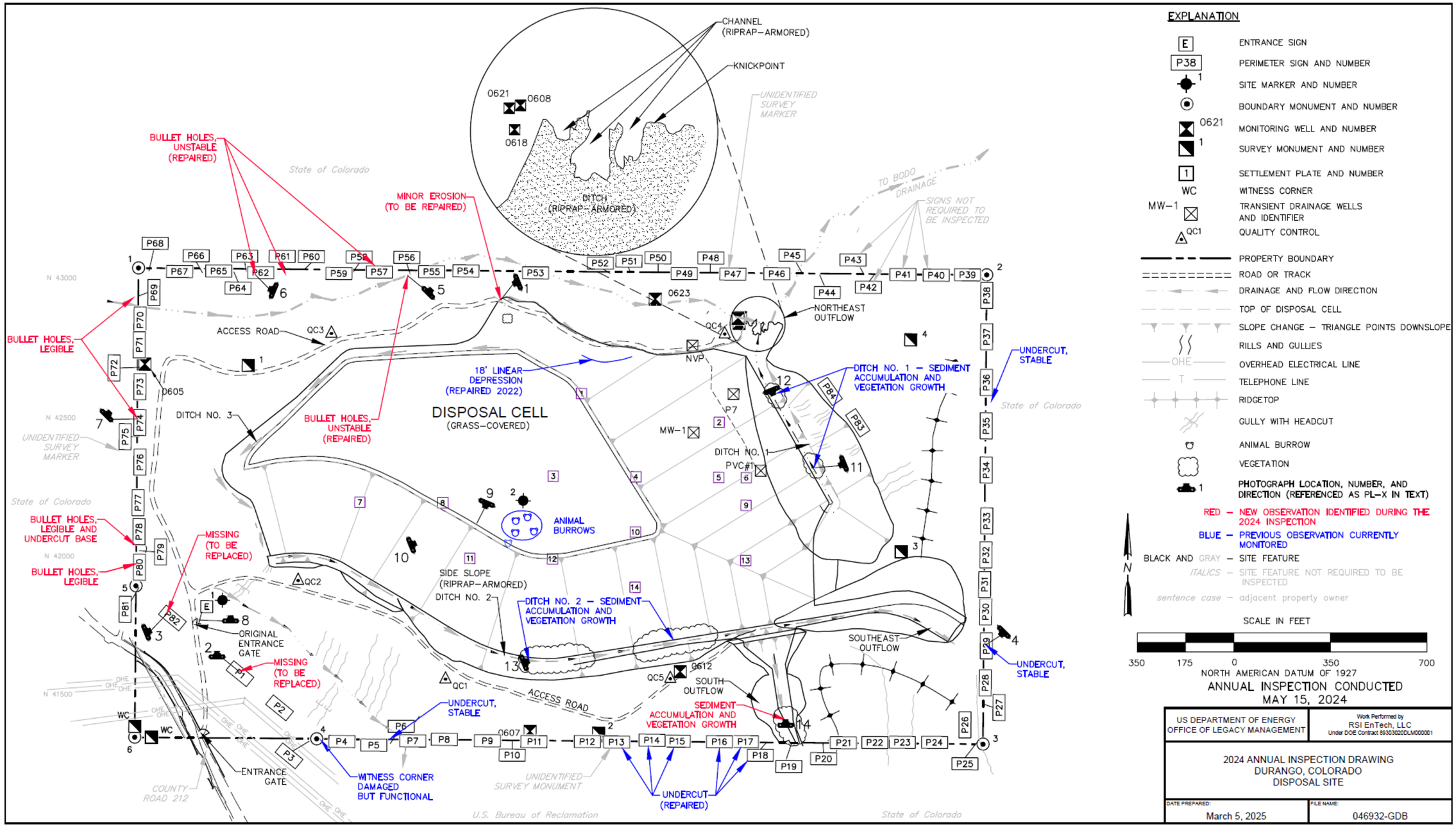


Figure 4-1. 2024 Annual Inspection Drawing for the Durango, Colorado, Disposal Site

4.4 Inspection Results

The site, 3.5 miles southwest of Durango, Colorado, was inspected on May 15, 2024. The inspection was conducted by D. Atkinson and E. Garcia of the Legacy Management Support contractor. J. Dayvault (LM) and M. Cosby and A. Lawrence (Colorado Department of Public Health and Environment) also 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 follow-up 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. Some 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, and new observations identified during the 2024 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 noted 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 La Plata County Road 212 and an older, original entrance gate. All gates were locked and functional. The entrance sign is at the older entrance gate inside the property boundary. A minor erosional feature is forming on the northern portion of the access road within the site boundary (PL-1), and maintenance will be conducted before the next site inspection.

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 that they are functioning as intended. 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 locations and the surrounding vegetation.

Inspectors noted that perimeter signs P1 (PL-2) and P82 (PL-3) were missing and will be replaced before the next inspection. Before the 2024 annual inspection, perimeter signs P13–P18 were chosen to be the test subjects for the water diversions installed above the signs to try to prevent undercutting. This maintenance effort was successful, and new erosion was minimal. The concrete bases of perimeter signs P6, P29 (PL-4) and P35 are undercut but stable. The undercutting at perimeter signs P56 (PL-5), P61, P62 (PL-6), and P79 is advanced enough that the signs require repair. Perimeter sign P57 was previously fixed for erosional issues and will need further repair. Maintenance will be done before the next inspection.

Perimeter signs P69, P74 (PL-7), P79, and P80 have new bullet holes but are still legible. No other maintenance needs were identified.

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 (PL-8). Site marker SMK-2 is on the top slope of the disposal cell and was also in good condition. No 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. All boundary monuments and survey monuments were inspected during 2024. The southeast witness corner for boundary monument BM-4 is damaged but remains intact. All other monuments are in good condition, and no maintenance needs were identified.

4.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments were inspected during the 2024 annual inspection. No maintenance needs were identified.

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. 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. Animal burrows were noted in previous inspections, but there was no evidence of new animal burrows. No maintenance needs on the disposal cell top slope were identified.

4.4.2.2 Side Slopes of Disposal Cell

The side slopes of the disposal cell are armored with rock riprap (PL-9). A linear depression, approximately 18 feet long, was first observed along the north toe of the disposal cell in 2015. The depression was repaired in October 2022, and inspectors have been unable to detect any settling or other changes since the repair.

A subtle topographic variation in the surface of the northeast side slope, first observed during the 2018 annual inspection, was observed again in 2022. Inspectors were unable to discern the variations during the 2024 inspection. Inspectors will continue to monitor the variation.

Inspectors found several new young woody plants growing on side slopes of the disposal cell (PL-10). The plants will be cut or treated, or both, before the next inspection. Sediment accumulation and nonwoody vegetation growth was observed on the east side slope and will be monitored (PL-11). 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. 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 affect the performance of the ditches, so maintenance is not required. The riprap-covered outflows of the drainage ditches were designed to self-armor over time.

Inspectors observed silt accumulation and vegetation growth along Ditch No. 1 (PL-12), but no more than in previous years. Inspectors observed silt accumulation and vegetation growth (PL-13) along Ditch No. 2, but no more than previous years. A large boxelder tree is still growing along the edge of the south outflow channel but does not affect the stability or effectiveness of the channel. Grass and other plants are growing in the south outflow, and sediment accumulation was observed (PL-14). Ditch No. 3 was inspected, and no new findings were observed.

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. No 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 0.25-mile area beyond the site boundary 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 the U.S. Bureau of Reclamation manages land to the south. The primary land uses are wildlife habitat and recreation. Mountain bikers, hikers, and other recreational users commonly use La Plata 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 in the 2024 annual inspection.

4.6 Maintenance

Maintenance identified in the 2023 inspection was performed on the following areas before the 2024 inspection:

- All tree seedlings on disposal cell side slopes were cut or treated, or both.
- Perimeters signs P13–P18 were chosen to be the test subjects for the water diversions installed above the signs to try to prevent undercutting. Undercut bases were restored.

Inspectors noted the following maintenance needs that will be completed before the next inspection:

- Replace perimeter signs P1 and P82
- Treat new woody vegetation on the side slopes of the disposal cell
- Repair undercut perimeter signs P56, P57, P61, P62, and P79

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

LM conducts annual groundwater sampling and analysis to monitor disposal cell performance. The monitoring network consists of seven wells, including three POC wells, three wells monitored as a best management practice, and one background well (Figure 4-2). The most recent annual sampling event occurred at the site in June 2024.

The LTSP (DOE 2019) establishes three POC wells at the site: wells 0607, 0612, and 0621. These 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 (well 0605) is also completed in the uppermost bedrock aquifer. Monitoring wells 0608, 0618, and 0623 are completed in the overlying alluvium.

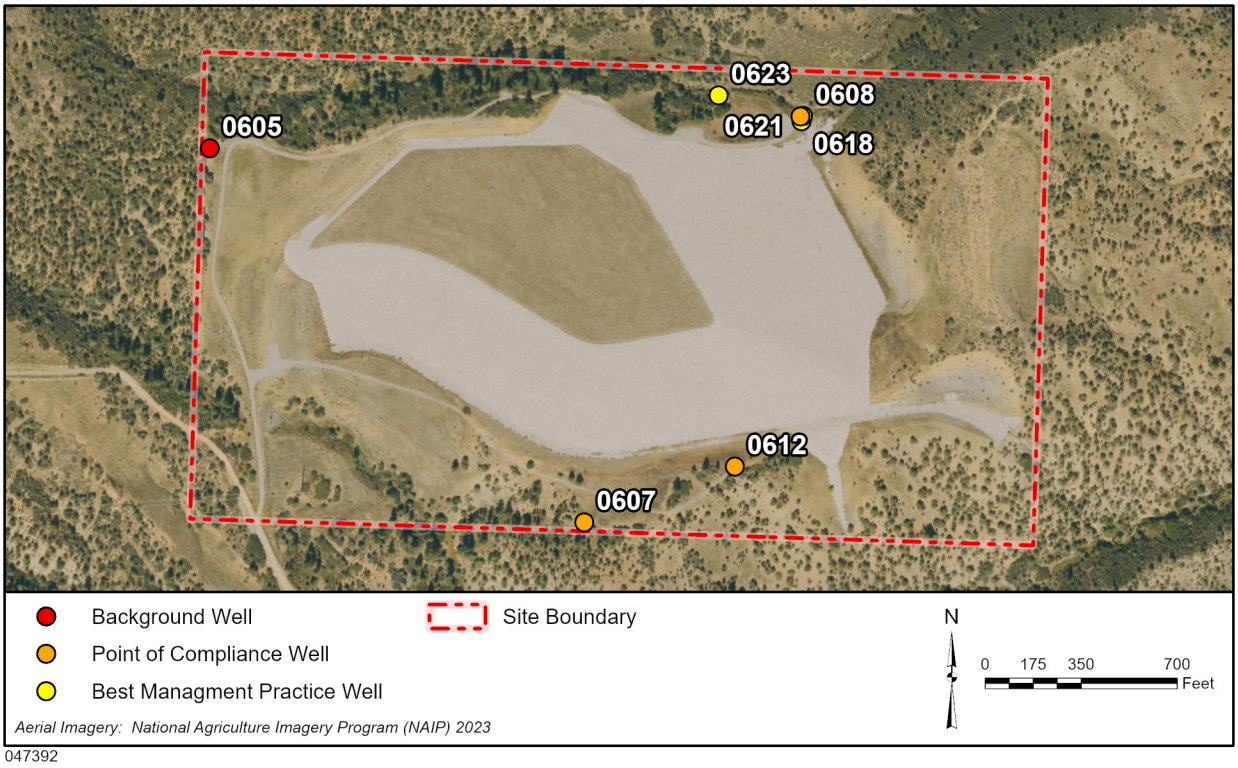


Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

In addition to the annual sampling event and as a best management practice, LM samples monitoring wells 0608 and 0618 and POC well 0621 on a monthly basis (weather permitting) to monitor variable uranium concentrations in well 0618 that are typically above site-specific thresholds. Table 4-2 presents the current groundwater monitoring network.

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

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

Note:
Monitoring wells sampled as a best management practice have no compliance type and are indicated as NA.

Abbreviation:
NA = not applicable

Groundwater is sampled annually for three constituents: molybdenum, selenium, and uranium. The site-specific concentration thresholds 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 (DOE 2019). Table 4-3 provides these site-specific standards.

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

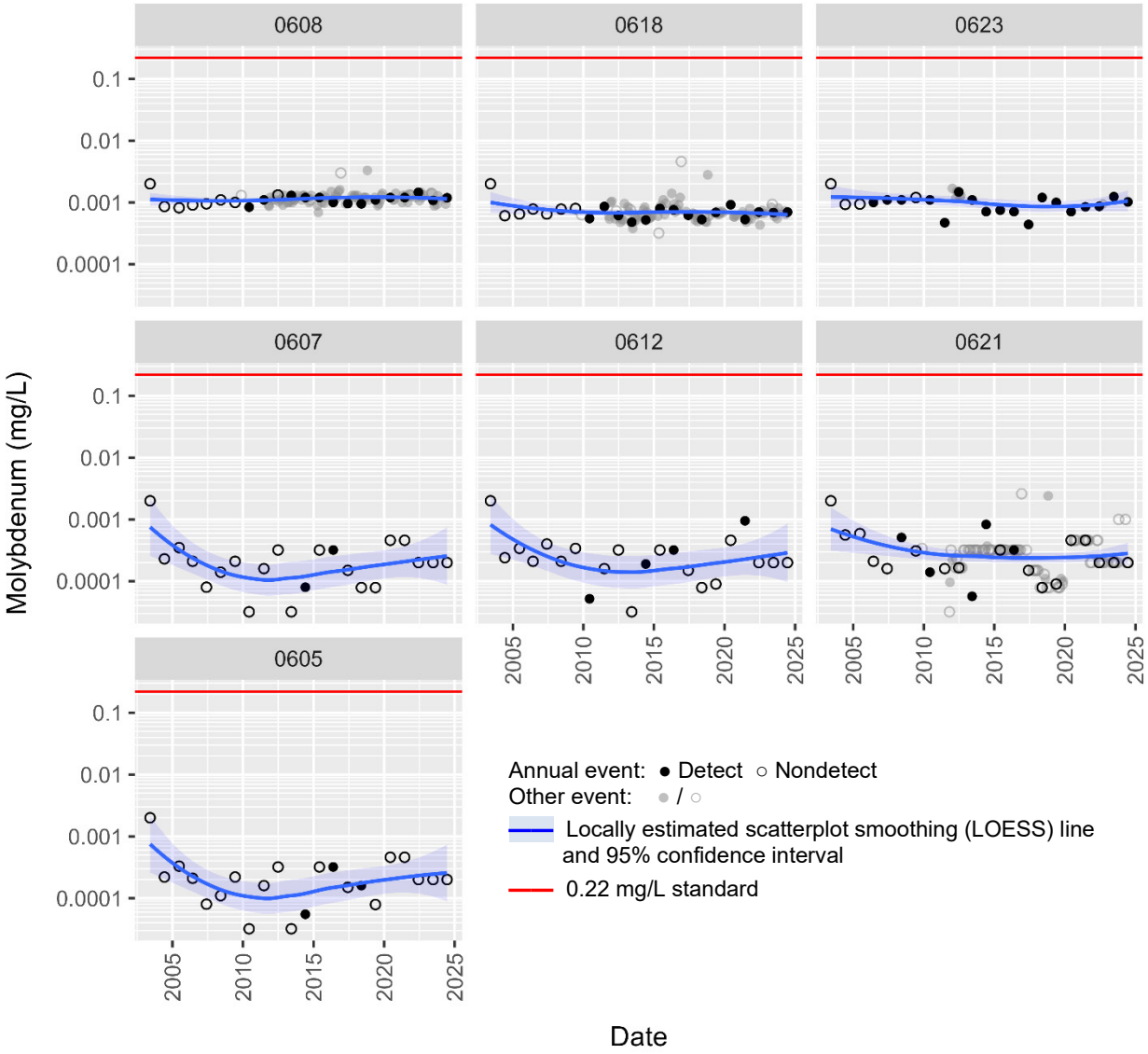
Constituent	Standard (mg/L)
Molybdenum	0.22
Selenium	0.042
Uranium	0.077

Abbreviation:
mg/L = milligrams per liter

Figure 4-3 through Figure 4-5 show the time-concentration plots for the three constituents, along with corresponding site-specific standards. These figures were developed using a faceting approach, whereby data are partitioned into a matrix of panels, with each panel plotting data for a single well. In each facet plot, a nonparametric smoothing method—locally estimated scatterplot smoothing (LOESS)—is used. The surrounding shaded area represents the 95% pointwise confidence interval. Because of the wide range in indicator parameter concentrations measured in site wells, a semilogarithmic scale is used.[1] All groundwater monitoring results plotted in the following figures are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (https://gems.lm.doe.gov).

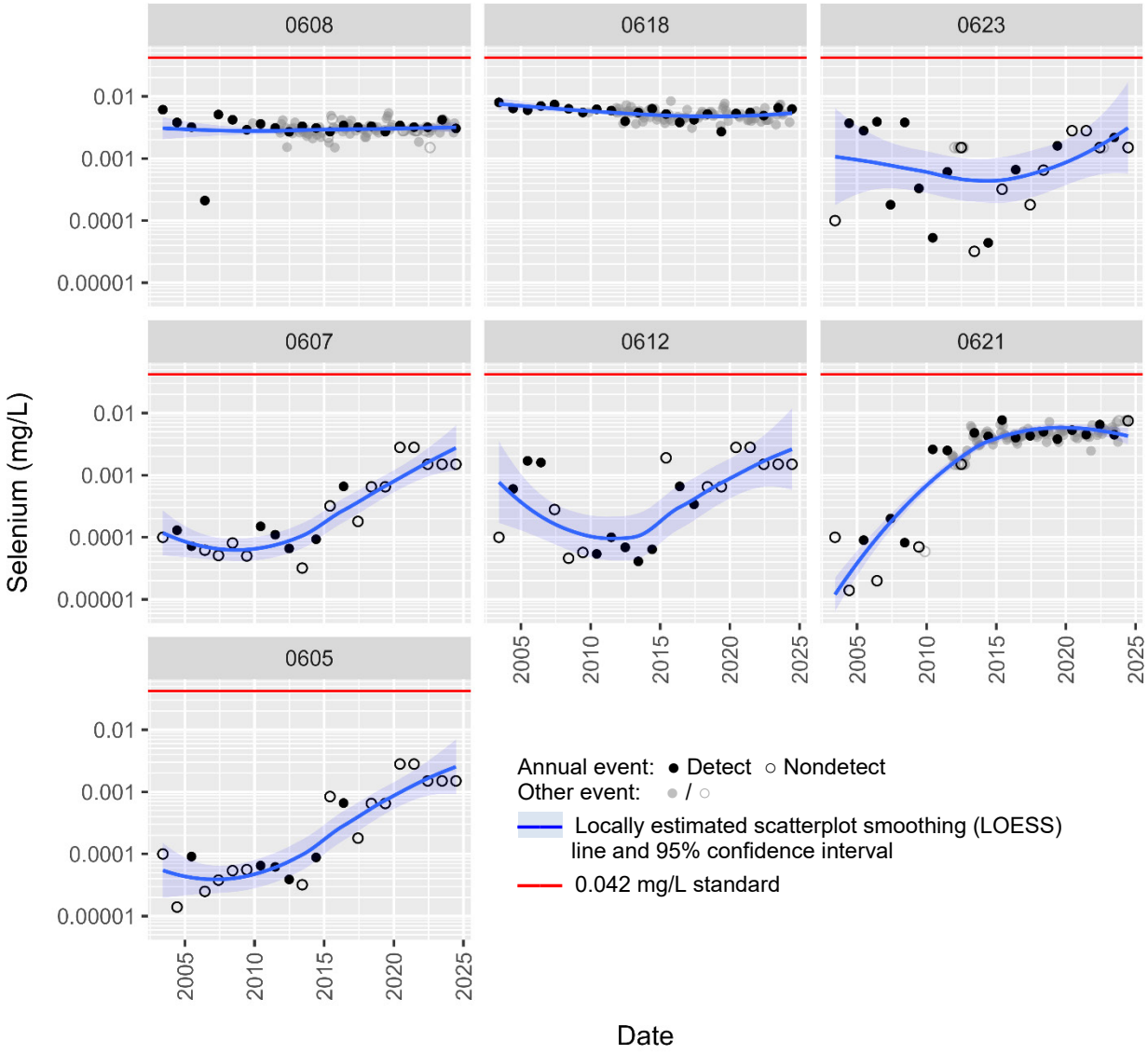
[1] These figures were developed using R, version 4.3.3 (R Core Team 2024), and the ggplot2 package, version 3.5.1 (Wickham 2016).

As shown in Figure 4-3 through Figure 4-5, concentrations of indicator parameters (molybdenum, selenium, and uranium) in POC wells 0607, 0612, and 0621 in the uppermost aquifer continue to be below respective standards. Uranium concentrations in well 0618 have consistently been variable and typically higher than concentrations in the other onsite wells.



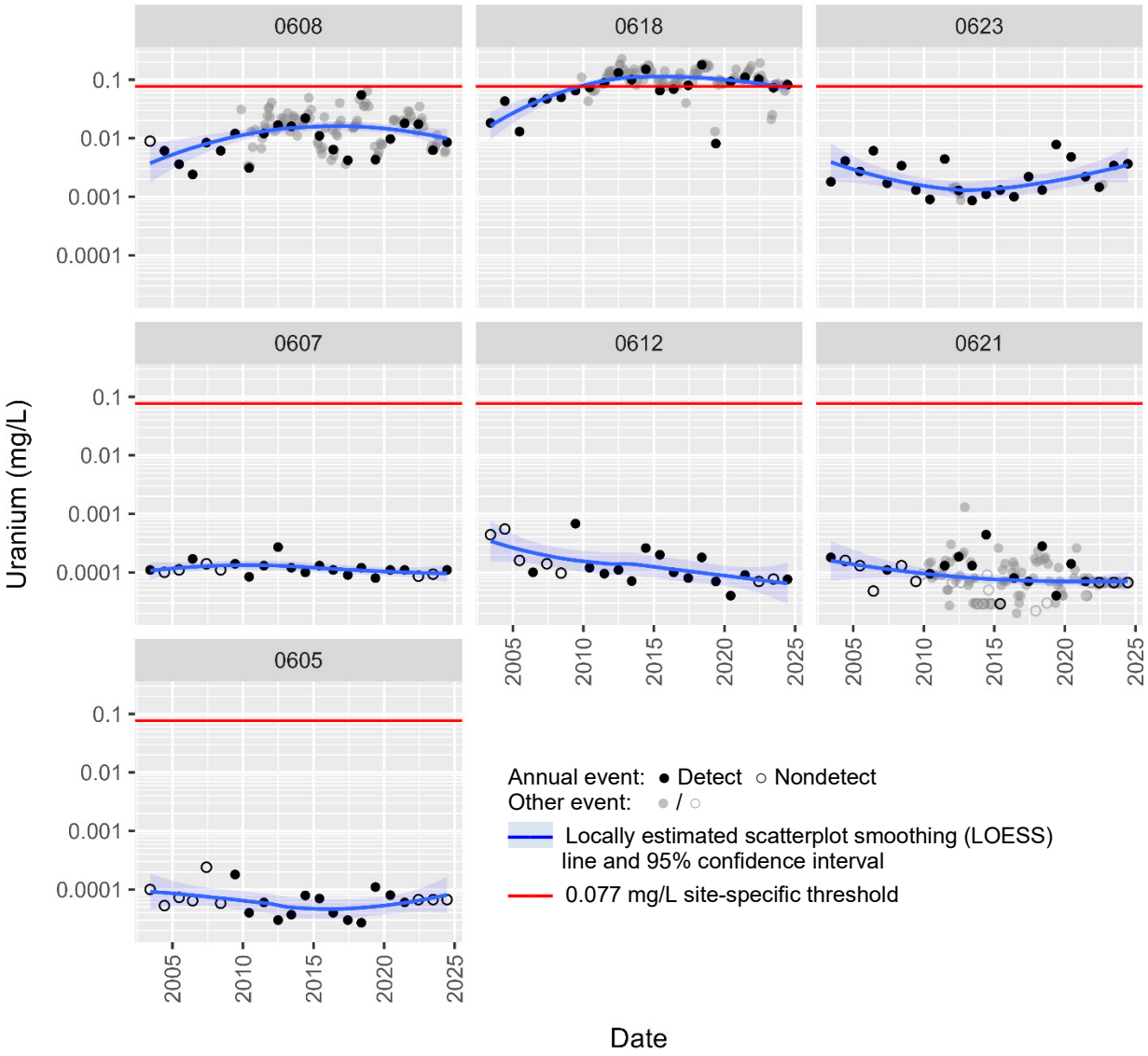
Notes: Wells are ordered by purpose: alluvial monitoring wells are listed in the top row, followed by POC wells (second row). Data for background well 0605 are plotted last.
Abbreviation: mg/L = milligrams per liter

Figure 4-3. Molybdenum Concentrations in Groundwater at the Durango, Colorado, Disposal Site, 2003–2024



Notes: Wells are ordered by purpose: alluvial monitoring wells are listed in the top row, followed by POC wells (second row). Data for background well 0605 are plotted last.
Abbreviation: mg/L = milligrams per liter

Figure 4-4. Selenium Concentrations in Groundwater at the Durango, Colorado, Disposal Site, 2003–2024



Notes: Wells are ordered by purpose: alluvial monitoring wells are listed in the top row, followed by POC wells (second row). Data for background well 0605 are plotted last.
Abbreviation: mg/L = milligrams per liter

Figure 4-5. Uranium Concentrations in Groundwater at the Durango, Colorado, Disposal Site, 2003–2024

4.8.2 Vegetation Monitoring

Several noxious weeds were identified at the time of the inspection and will be treated before the next year's inspection.

4.9 Corrective Action

The LTSP, Section 3.6, describes the criteria for corrective action. No need for corrective action was identified.

4.10 References

Note

Site-related documents are available on the LM public webpages at https://lmpublicsearch.lm.doe.gov/SitePages.

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, Office of Legacy Management, May.

R Core Team, 2024. "R: A Language and Environment for Statistical Computing," The R Foundation for Statistical Computing, version 4.3.3, https://www.R-project.org, accessed October 31, 2024.

Wickham, H., 2016. "ggplot2: Elegant Graphics for Data Analysis," Springer-Verlag, New York, https://ggplot2.tidyverse.org, accessed October 31, 2024.

4.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	247	Access Road Erosion
PL-2	0	Perimeter Sign P1 Missing
PL-3	67	Perimeter Sign P82 Missing
PL-4	225	Perimeter Sign P29 with Undercut Base but Stable
PL-5	45	Perimeter Sign P56 with Undercut Base and Unstable
PL-6	292	Perimeter Sign P62 with Undercut Base and Unstable
PL-7	45	Perimeter Sign P74 with Bullet Holes
PL-8	0	Site Marker SMK-1 at Entrance Gate
PL-9	202	South Side Slope
PL-10	67	Woody Plant Growing in Riprap
PL-11	247	East Side Slope—Sediment Accumulation and Vegetation Growth
PL-12	157	Ditch No. 1—Silt Accumulation and Vegetation Growth
PL-13	67	Ditch No. 2—Nonwoody Vegetation
PL-14	0	South Outflow—Vegetation Growth

PL-1. Access Road Erosion

PL-2. Perimeter Sign P1 Missing

PL-3. Perimeter Sign P82 Missing

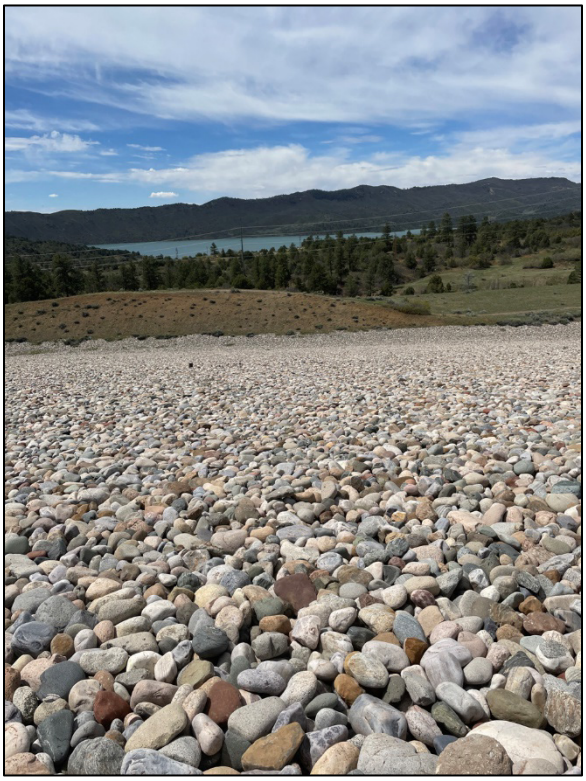
PL-4. Perimeter Sign P29 with Undercut Base but Stable

PL-5. Perimeter Sign P56 with Undercut Base and Unstable

PL-6. Perimeter Sign P62 with Undercut Base and Unstable

PL-7. Perimeter Sign P74 with Bullet Holes

PL-8. Site Marker SMK-1 at Entrance Gate



PL-9. South Side Slope

PL-10. Woody Plant Growing in Riprap

PL-11. East Side Slope—Sediment Accumulation and Vegetation Growth

PL-12. Ditch No. 1—Silt Accumulation and Vegetation Growth

PL-13. Ditch No. 2—Nonwoody Vegetation

PL-14. South Outflow—Vegetation Growth