

## 10.0 Lowman, Idaho, Disposal Site

### 10.1 Compliance Summary

The Lowman, Idaho, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on June 13, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified a minor maintenance need but found no cause for a follow-up inspection. Groundwater monitoring is not required and was discontinued in 2004.

### 10.2 Compliance Requirements

Requirements for long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 2005) 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 10-1 lists these requirements.

*Table 10-1. License Requirements for the Lowman, Idaho, Disposal Site*

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 10.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 10.5	(b)(4)
Maintenance	Section 3.5	Section 10.6	(b)(5)
Emergency Response	Section 3.6	Section 10.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 10.8	(b)(2)

### 10.3 Institutional Controls

The 18-acre site, identified by the property boundary shown in Figure 10-1, is owned by the United States and was accepted under the NRC general license in 1994. The U.S. Department of Energy (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 gate and sign, perimeter signs, site markers, and survey and boundary monuments.

### 10.4 Inspection Results

The site, 0.5 mile east of Lowman, Idaho, was inspected on June 13, 2019. The inspection was conducted by C. Boger, D. Johnson, and D. Marshall of the Office of Legacy Management (LM) Support contractor. T. Jasso (LM site manager), D. Nygard (Idaho Department of Environmental Quality), and P. Rekow (vegetation control subcontractor) 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 the need, if any, for maintenance or additional inspection and monitoring.

### **10.4.1 Site Surveillance Features**

Figure 10-1 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, and new observations identified during the 2019 annual inspection are shown in red. Observations from previous inspections that are currently monitored are shown in blue text. There were no new observations in 2019. 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 10-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 10.10.

#### ***10.4.1.1 Access Road, Entrance Gate, and Entrance Sign***

Access to the site is at the end of a gravel road about 650 feet (ft) north of Idaho Highway 21. Entrance to the site is through a locked steel gate on the site access road about 150 ft from the highway. The site is not fenced, but the topography and forest vegetation prevent vehicle access around the entrance gate and along the property boundary. The entrance gate was locked and functional, the access road was passable, and the entrance sign was present and legible (PL-1). No maintenance needs were identified.

#### ***10.4.1.2 Perimeter Signs***

There are 18 perimeter signs, attached to steel posts set in concrete, positioned along the unfenced property boundary. Several perimeter signs (P2, P3, P4, P13, and P15) have bullet damage but remain legible. Perimeter sign P3 is rotated about 90 degrees from its original position, but it continues to be legible and noticeable. Perimeter sign P7 is slightly bent from tree fall but remains legible. No maintenance needs were identified.

#### ***10.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the southwest property boundary, and site marker SMK-2 (PL-2) is on the top slope of the disposal cell. Lichen is growing on the surface of both site markers, but it is easily removable by hand and does not detract from the legibility of the markers. No maintenance needs were identified.

#### ***10.4.1.4 Survey and Boundary Monuments***

Three combined survey and boundary monuments and four boundary monuments delineate the property boundary. Steel T-posts are installed next to the survey and boundary monuments to help inspectors find the monuments. Several years ago, the U.S. Department of Agriculture (USDA) conducted a survey of its lands and placed its own boundary monuments along the shared DOE-USDA border, and inspectors noted that the USDA survey monuments were about 5 to 15 ft outside the DOE survey monuments. No maintenance needs were identified.



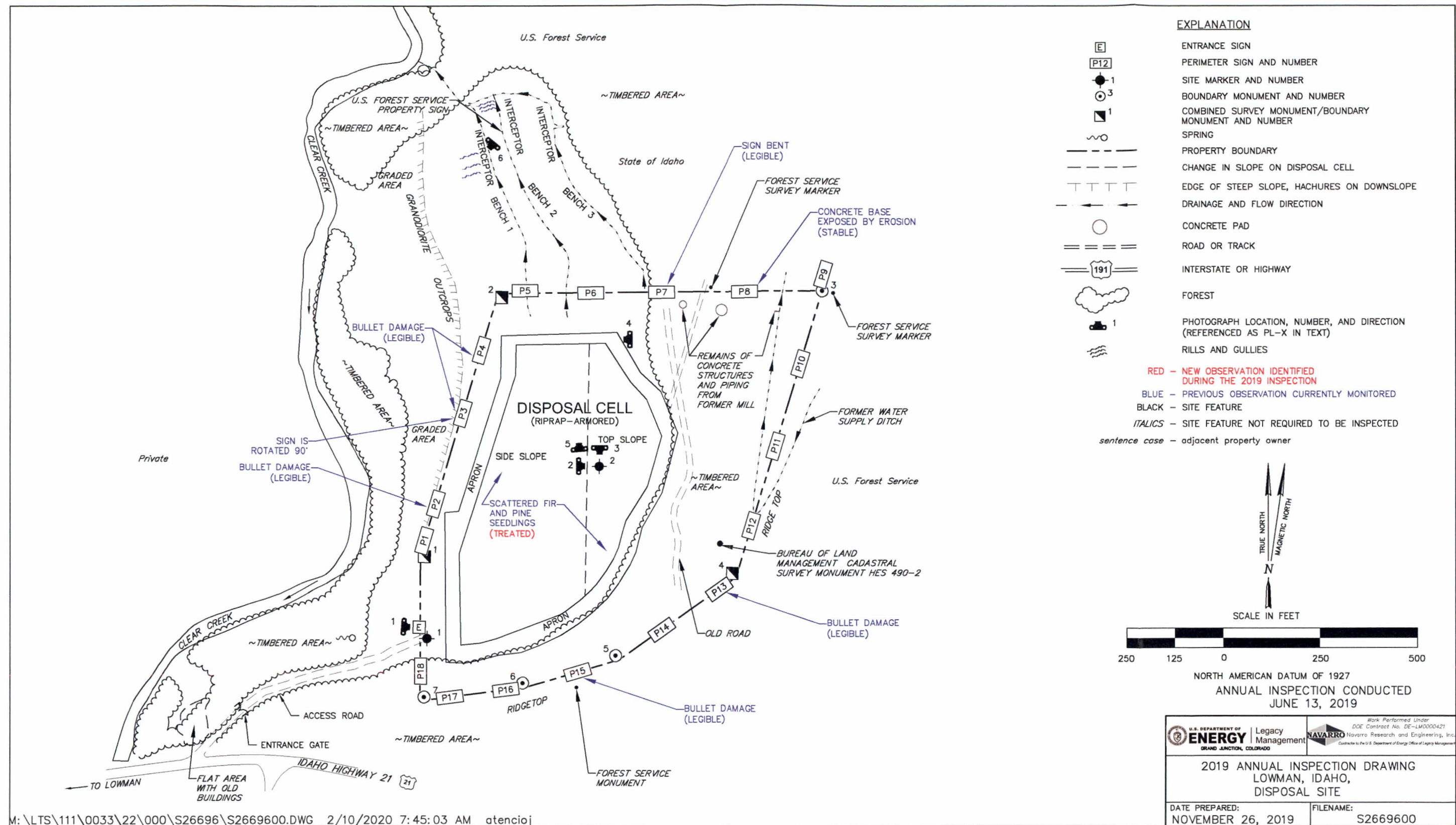


Figure 10-1. 2019 Annual Inspection Drawing for the Lowman, Idaho, Disposal Site

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## 10.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the top and side slope of the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area. Inspectors examined the 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.

### *10.4.2.1 Top and Side Slope of the Disposal Cell*

The disposal cell, completed in 1991, occupies 8.29 acres. The disposal cell top and side slope are armored with basalt riprap to control erosion (PL-3). An apron of larger riprap surrounds the disposal cell on all sides (PL-4). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell.

Natural vegetation continues to encroach on the top and side slopes of the disposal cell. Although the LTSP states that control of vegetation growth on the cell is not needed, LM concluded that controlling the growth of conifers—primarily ponderosa pine—would be a best management practice. Unlike the shrubs and other vegetation growing on the disposal cell, mature conifers could potentially become uprooted during windstorms and damage the surface of the disposal cell. Numerous ponderosa pine trees were observed on the disposal cell top and side slopes and were cut down and left in place in September 2018 following the inspection (PL-5). Other plants growing on the disposal cell were not removed, as they do not present a physical threat to the integrity of the disposal cell. Additional ponderosa pine seedlings that were not eradicated in 2018 were identified during the inspection and treated in 2019 following the inspection. No other maintenance needs were identified.

### *10.4.2.2 Area Between the Disposal Cell and the Site Boundary*

The steep slopes east and south of the disposal cell are stable and vegetated with well-established ponderosa pines, shrubs, and grasses. Several features from the historical mining operations remain on the steep hillside east of the disposal cell, including a water-supply ditch and the remains of a water piping system. The slopes north and west of the disposal cell were highly disturbed during site remediation, but they are now stable and vegetated. No maintenance needs were identified.

### *10.4.2.3 Outlying Area*

The area within 0.25 mile of the site boundary was inspected for evidence of construction, development, logging, or changes in land use that might affect the site. No changes were observed in the area across Clear Creek to the west, where there are several summer cabins and campsites. The U.S. Forest Service, an office of USDA, manages the areas east and south of the site, and those areas remain visually unchanged from previous inspections. The area along Highway 21 east of the site does not show evidence of new development.

The reclaimed area north of the disposal cell and outside the site boundary is owned by the State of Idaho. The area is steep and was once highly eroded; today it is slowly becoming



revegetated. LM installed three interceptor benches across the steep slope in this area in 1998 to intercept runoff, collect it in an armored collection ditch, and route it offsite into Clear Creek. Over the years, minor erosion has breached the benches in several locations, and LM has conducted repairs on numerous occasions, most recently in October 2016. The three interceptor benches (PL-6) and a collection ditch are inspected annually to ensure that erosion in this area does not affect overall site stability. In 2019, inspection of the 2016 repairs showed they remain intact, and LM will continue to inspect as the vegetation continues to establish.

## **10.5 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 have substantially changed. No need for a follow-up inspection was identified.

## **10.6 Maintenance**

Ponderosa pine seedlings on the disposal cell that were not eradicated by 2018 treatment were retreated in 2019 during routine noxious weed treatment activities following the annual inspection. No other maintenance needs were identified.

## **10.7 Emergency Response**

Emergency response is action LM 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. No need for an emergency response was identified.

## **10.8 Environmental Monitoring**

In accordance with the LTSP, groundwater monitoring is not required and was discontinued in 2004. Groundwater monitoring is not required because (1) the disposal cell is performing as designed, and (2) the groundwater monitoring program demonstrated that the site is in compliance with groundwater protection standards and that no site-related contamination exists in groundwater near the site. All monitoring wells at the site were decommissioned in 2006.

## **10.9 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), 2005. *Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site*, DOE-LM/GJ771-2005, Rev. 2, January.

## 10.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	95	Entrance Sign
PL-2	—	Site Marker SMK-2
PL-3	180	Disposal Cell Top Slope, View South
PL-4	270	North Apron of Disposal Cell
PL-5	355	Treated and Fallen Ponderosa Pine
PL-6	220	Bench 1 Erosion

**Note:**

— = Photograph taken vertically from above.





*PL-1. Entrance Sign*



*PL-2. Site Marker SMK-2*





*PL-3. Disposal Cell Top Slope, View South*



*PL-4. North Apron of Disposal Cell*





*PL-5. Treated and Fallen Ponderosa Pine*



*PL-6. Bench 1 Erosion*



## 11.0 Maybell, Colorado, Disposal Site

### 11.1 Compliance Summary

The Maybell, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on September 4, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection. Groundwater monitoring is not required.

### 11.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 2008) 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 11-1 lists these requirements.

*Table 11-1. License Requirements for the Maybell, Colorado, Disposal Site*

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.3 and 3.4	Section 11.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 11.5	(b)(4)
Maintenance	Section 3.6	Section 11.6	(b)(5)
Emergency Measures	Section 3.6	Section 11.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 11.8	(b)(2)

### 11.3 Institutional Controls

The 251-acre site, identified by the property boundary shown in Figure 11-1, is owned by the United States and was accepted under the NRC general license in 1999. The U.S. Department of Energy (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 gate and sign, perimeter fence and perimeter (warning) signs, site markers, and survey and boundary monuments.

### 11.4 Inspection Results

The site, 25 miles west of Craig, Colorado, was inspected on September 4, 2019. The inspection was conducted by J. Cario and S. Hall, of the Office of Legacy Management (LM) Support contractor. J. Nguyen (LM site manager), J. Doebele (Colorado Department of Public Health and Environment), and R. Evans (NRC) 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 the need, if any, for maintenance or additional inspection and monitoring.



### **11.4.1 Site Surveillance Features**

Figure 11-1 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 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 11-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 11.10.

#### ***11.4.1.1 Access Road, Entrance Gate, and Entrance Sign***

Access to the site is from the gravel-surfaced Moffat County Road 53, which runs north from U.S. Highway 40 approximately 8 miles east of Maybell, Colorado. County Road 53 ends at an unlocked gate near the northeast corner of the site (approximately 3 miles from the highway). The road continues west as a dirt two-track road directly north of the site. From the end of County Road 53 to the site entrance gate (and beyond, to the UMRCA Title II Maybell West, Colorado, Disposal Site), LM is responsible for road maintenance under a U.S. Bureau of Land Management right-of-way permit. Entrance to the site is through two locked, metal stock gates in the perimeter fence. One is the entrance gate, which is adjacent to the site marker and entrance sign (PL-1). The second gate is between perimeter signs P3 and P4 in the northwest corner of the property. Both gates were locked and functional. The entrance sign is near the entrance gate and is mounted on a T-post in the perimeter fence. The entrance sign has bullet damage but remains legible. No maintenance needs were identified.

#### ***11.4.1.2 Perimeter Fence and Signs***

To facilitate land management by LM, a four-strand barbed-wire perimeter fence encloses the disposal cell, drainage structures, and much of the site. The site is in wintering grounds frequented by big-game animals (primarily pronghorn, deer, and elk) and is also surrounded by open range used to graze cattle. As a result, minor damage to the perimeter fence periodically occurs. Perimeter fence strands were twisted in one location (PL-2) and were repaired following the inspection.

There are 26 perimeter signs. On the north, west, and south sides of the site, perimeter signs are attached to T-posts in the perimeter fence. On the east side of the site, perimeter signs are attached to steel posts set in concrete and are inside the property boundary approximately midway between the disposal cell and the perimeter fence (PL-3). Several of the perimeter signs along the dirt road north and west of the site (P5, P6, P8, P11, P25, and P26) have bullet damage but remain legible. No other maintenance needs were identified.

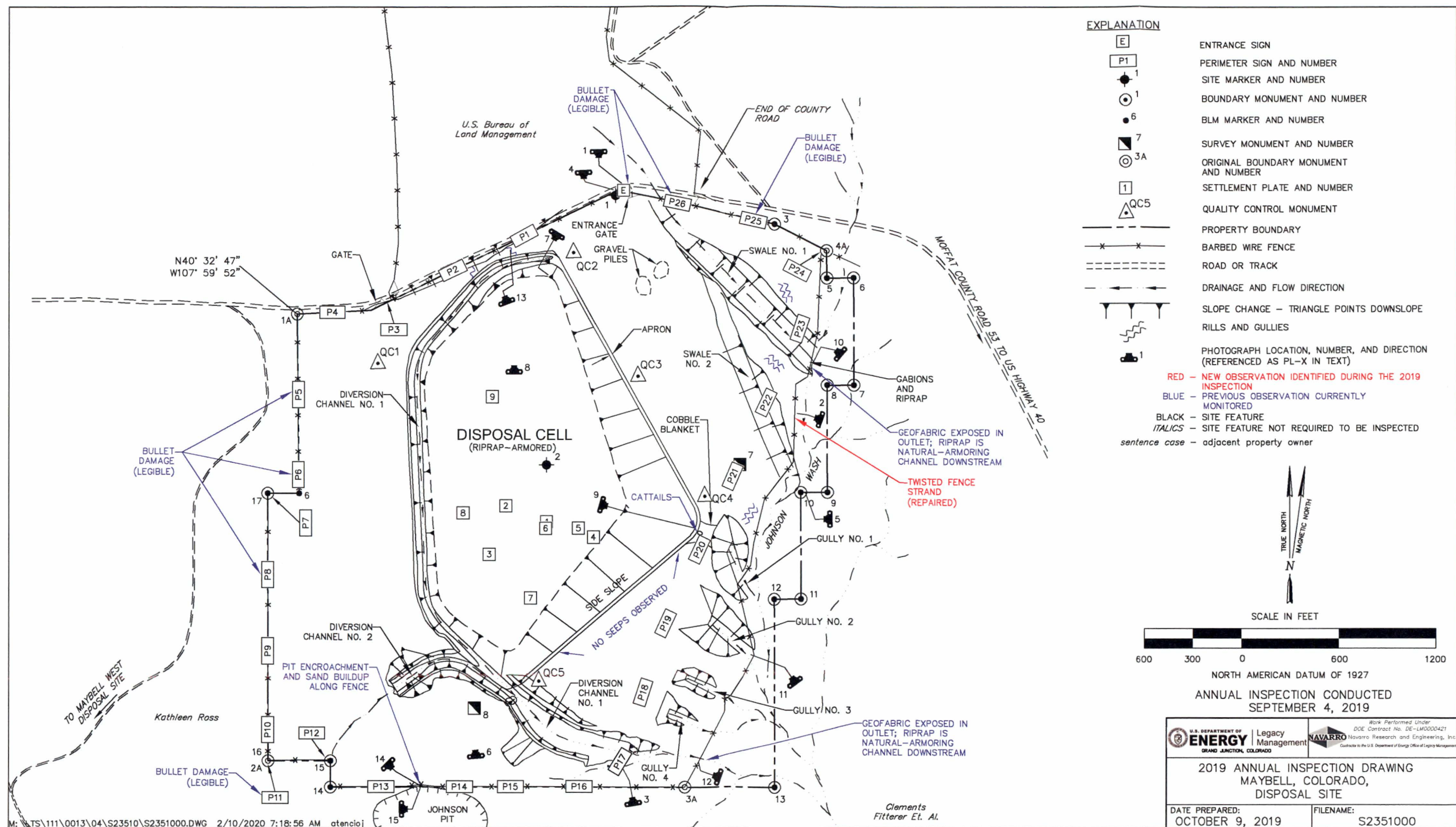


Figure 11-1. 2019 Annual Inspection Drawing for the Maybell, Colorado, Disposal Site

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#### ***11.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate (PL-4), and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***11.4.1.4 Survey and Boundary Monuments***

The site has two survey monuments. Survey monument SM-7 is on the bench above Johnson Wash just north of perimeter sign P21, and survey monument SM-8 is south of the disposal cell on the bench above Diversion Channel No. 2. The two survey monuments were not inspected during the inspection but were confirmed to be present and intact during a subsequent site visit. Seventeen boundary monuments delineate the property boundary (PL-5). No maintenance needs were identified.

### **11.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) other areas inside the site boundary, and (3) the outlying area. Inspectors examined the 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.

#### ***11.4.2.1 Disposal Cell***

The disposal cell, completed in 1998, occupies 66 acres. The disposal cell is armored with riprap to control erosion and deter animal and human intrusion (PL-6 and PL-7). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. Scattered shallow-rooted plants continue to establish on the disposal cell top and side slopes (PL-8); these plants do not affect the integrity of the cell. Deep-rooted plants and noxious weeds are controlled as required by the LTSP.

In accordance with the LTSP, inspectors looked for seeps on the east and southeast side slopes of the disposal cell because slimes were encapsulated in this portion of the cell. No seeps were observed at the toe of the disposal cell in these areas. Cattails continue to grow at the toe of the east corner of the disposal cell, indicating the presence of moisture (PL-9). Surface runoff from the disposal cell discharges at this location, and standing water has been observed in this area during past inspections; no standing water was noted during the 2019 inspection. A 2003 laboratory analysis of evaporite minerals from this location confirmed that no constituents attributable to the disposal cell contents were present. No other maintenance needs were identified.

#### ***11.4.2.2 Other Areas Inside the Site Boundary***

The surface conditions at the site are a combination of rock-armored drainage and diversion channels, along with contouring of soil surfaces to achieve the necessary surface water drainage control to protect the disposal cell from erosion. The rock-armored diversion channels, swales, and gullies are performing as designed (PL-10 and PL-11). Erosion directly downgradient of the

outlets of Diversion Channel No. 1 and Swale No. 1 that has exposed the underlying geofabric had not changed significantly (PL-12 and PL-10). Riprap placed within the outlets continues to provide protection against headcutting. Minor rills adjacent to Swale No. 1 and Gully No. 1 continue to stabilize due to natural-armoring and increased vegetation growth. Minor erosion on the northern portion of the site directly downslope of the perimeter fence (between perimeter signs P1 and P2) continues to stabilize (PL-13). These occurrences of erosion do not threaten the disposal cell, and there was no evidence of sediment moving offsite into Johnson Wash. No maintenance needs were identified.

#### ***11.4.2.3 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 impacts were observed. Directly south of the site is a former open-pit uranium mine referred to as the Johnson Pit (PL-14). Over time, slumping of the pit wall resulted in the pit encroaching several feet onto what is now DOE property. This encroachment presents no threat to the integrity of the disposal cell and occurred before reclamation and transfer of the site to DOE for long-term surveillance and maintenance. This encroachment is visually monitored annually; it is periodically documented with photographs to assess whether there is any further slumping of the pit wall and to verify the integrity and functionality of the perimeter fence. There was no evidence of any additional encroachment of the pit onto the site at the time of the inspection. However, windblown sand continues to accumulate along the northern crest of the pit wall along the perimeter fence line (PL-15); the perimeter fence remains functional, but continued accumulation of sand will require vertically extending the fence or removing the sand. Inspectors will continue to monitor this area. No immediate maintenance needs were identified.

### **11.5 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.

### **11.6 Maintenance**

Inspectors documented minor maintenance needs that were completed following the inspection, including:

- Spraying noxious weeds and deep-rooted plants on the disposal cell
- Minor repairs to the perimeter fence (twisted fence strand)

No other immediate maintenance needs were identified.

### **11.7 Emergency Measures**

In compliance with the LTSP, 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. No need for emergency measures was identified.



## 11.8 Environmental Monitoring

### 11.8.1 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required. Supplemental standards have been applied to site groundwater 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 it contains widespread ambient contamination that cannot be cleaned up by treatment methods reasonably employed in public water systems (40 CFR 192.11[e]). There are no current or future uses of the uppermost aquifer in the area. Water level monitoring did not detect disposal cell-related impacts to the groundwater system, such as transient drainage downgradient of the cell, and NRC concurred that stipulated groundwater level monitoring requirements had been satisfied (Janosko 2005). Therefore, no further groundwater monitoring was required.

### 11.8.2 Vegetation Monitoring

In accordance with the LTSP, annual visual inspections are conducted to verify the continued health of the onsite vegetation and to ensure that undesirable plant species (deep-rooted plants on the disposal cell cover and noxious weeds) do not proliferate on the site. Minor occurrences of noxious weeds and deep-rooted plants were noted on the disposal cell during the inspection. Annual noxious weed treatment will continue. Following reclamation, the disturbed soil surfaces on the site were revegetated with a mix of native and adaptive grasses to provide soil stability. These revegetated areas appeared to be healthy, with continued increases in diversity and density.

## 11.9 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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance Plan for the Maybell, Colorado (UMTRCA Title I) Disposal Site, Moffat County, Colorado*, DOE-LM/1605-2008, Revision 4, April.

Janosko, G.S., 2005. Gary S. Janosko, Chief of Fuel Cycle Facilities Branch, U.S. Nuclear Regulatory Commission, letter (about decommissioning of monitor wells at the Maybell, Colorado, Uranium Mill Tailings Radiation Control Act [UMTRCA] Title I Disposal Site) to Michael Tucker, Site Manager, U.S. Department of Energy Grand Junction Office, January 5.

## 11.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	180	Entrance Gate and Sign with Disposal Cell in Background
PL-2	290	Twisted Perimeter Fence Strands (Repaired)
PL-3	350	Perimeter Sign P17
PL-4	—	Site Marker SMK-1
PL-5	270	Boundary Monument BM-10 with Outlet to Swale No. 2 and Disposal Cell in Background
PL-6	355	Disposal Cell with Diversion Channel No. 1 in Foreground
PL-7	210	Top Slope of Disposal Cell
PL-8	—	Milkweed Plant on Top Slope of Disposal Cell
PL-9	105	Southeast Side Slope of Disposal Cell Side with Cobble Blanket in Background
PL-10	310	Exposed Geotextile at Outlet to Swale No. 1
PL-11	325	Outlet to Gully No. 2
PL-12	290	Perimeter Fence near Outlet to Diversion Channel No. 1
PL-13	340	Minor Erosion Along Northern Perimeter Fence
PL-14	135	East Portion of Johnson Pit
PL-15	90	Sand Buildup Around Perimeter Fence near Johnson Pit

**Note:**

— = Photograph taken vertically from above.





*PL-1. Entrance Gate and Sign with Disposal Cell in Background*



*PL-2. Twisted Perimeter Fence Strands (Repaired)*





*PL-3. Perimeter Sign P17*



*PL-4. Site Marker SMK-1*





*PL-5. Boundary Monument BM-10 with Outlet to Swale No. 2 and Disposal Cell in Background*



*PL-6. Disposal Cell with Diversion Channel No. 1 in Foreground*





*PL-7. Top Slope of Disposal Cell*



*PL-8. Milkweed Plant on Top Slope of Disposal Cell*





*PL-9. Southeast Side Slope of Disposal Cell Side with Cobble Blanket in Background*



*PL-10. Exposed Geotextile at Outlet to Swale No. 1*





*PL-11. Outlet to Gully No. 2*



*PL-12. Perimeter Fence near Outlet to Diversion Channel No. 1*





*PL-13. Minor Erosion Along Northern Perimeter Fence*



*PL-14. East Portion of Johnson Pit*





*PL-15. Sand Buildup Around Perimeter Fence near Johnson Pit*



## **12.0 Mexican Hat, Utah, Disposal Site**

### **12.1 Compliance Summary**

The Mexican Hat, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on April 30, 2019. Depressions in the riprap cover identified during the 2016 annual site inspection continue to be observed along lower portions of the disposal cell's northeast side slope and north side slope (as identified in 2018 inspections). Inspectors identified several minor maintenance needs and conducted follow-up inspections.

In response to the observed depressions, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) has continued investigations and performed geotechnical sampling and materials testing (GSMT) on the disposal cell side slope cover components in April 2019. Data obtained through the GSMT will be used to identify possible causes for the cover degradation features that have been observed at the site. Additionally, interim radon barrier protection (IRBP) was implemented at GSMT sampling areas that had radon barrier degradation. A series of test pits and one test strip were mechanically excavated and supplemented with a moisture-conditioned, bentonite-amended granular material to reconstruct the areas where radon barrier material had been eroded. All test areas were systematically screened for gamma radiation, and no elevated readings were observed.

No evidence of a breach through the radon barrier has been identified, and the site remains protective of human health and the environment. Efforts to evaluate the cause(s) of the erosional features are in progress, and an interim cover protection (ICP) action was completed in September 2019.

LM conducted annual observational monitoring consisting of photographic documentation and observational description of seven designated seeps during the annual inspection. Seeps 0251 and 0264 were damp, and Seep 0248 exhibited typical conditions and was dripping. Upgradient (background) Seep 0261 was flowing; the remaining seeps were dry. Ephemeral drainages along the perimeter of the site were wet. Gypsum Creek had some areas of flowing surface water and contained evaporites throughout dry areas within and leading to its flow path. Groundwater monitoring is not required.

### **12.2 Compliance Requirements**

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 2007) 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 12-1 lists these requirements.

Table 12-1. License Requirements for the Mexican Hat, Utah, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.3 and 3.4	Section 12.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 12.5	(b)(4)
Maintenance	Section 3.6	Section 12.6	(b)(5)
Emergency Measures	Section 3.6	Section 12.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 12.8	(b)(2)

## 12.3 Institutional Controls

The 119-acre disposal site, identified by the property boundary shown in Figure 12-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized DOE to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation to perform remedial actions at the former uranium processing sites. DOE and the Navajo Nation executed a Custodial Access Agreement that provides perpetual access to DOE for custody and long-term care at the site.

The site was accepted under the NRC general license in 1997. 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 custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, fence, perimeter signs, site markers, and survey and boundary monuments.

## 12.4 Inspection Results

The site, 1.5 miles south of the town of Mexican Hat, Utah, and 0.5-mile northeast of the Navajo community of Halchita, was inspected on April 30, 2019. The inspection was conducted by S. Hall, K. Lott, J. Manée, and D. Miller of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager), and J. Tallbull (Navajo Nation Abandoned Mine Lands/Uranium Mill Tailings Remedial Action) 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 the need, if any, for maintenance or additional inspection and monitoring.

### 12.4.1 Site Surveillance Features

Figure 12-1 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 italics. Observations from previous inspections that are currently monitored are shown in blue text, and new observations identified during the 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 12-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 12.10.



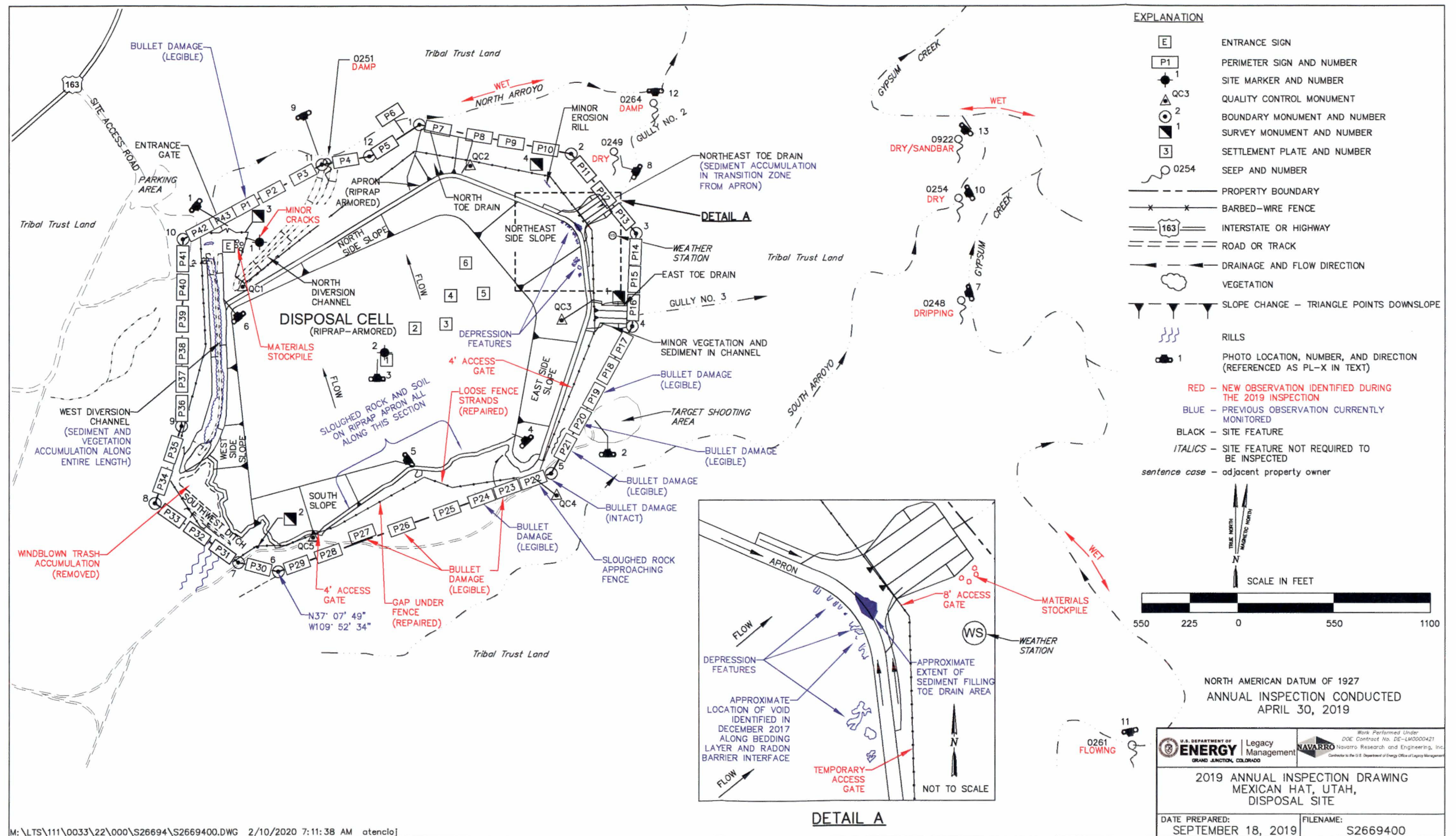


Figure 12-1. 2019 Annual Inspection Drawing for the Mexican Hat, Utah, Disposal Site

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#### ***12.4.1.1 Site Access, Entrance Gate, and Entrance Sign***

Access to the site is from a short, unmarked dirt road off U.S. Highway 163 that ends at a graded parking area. Minor erosion continues to occur along the dirt access road, but the site remains accessible. Entrance to the site is through a locked steel entrance gate at the northwest corner of the site (PL-1). The entrance gate was locked and functional. The entrance sign is affixed to a steel post immediately behind the entrance gate (PL-1). Before the inspection, two 4-foot access gates and one 8-foot access gate were permanently installed in the perimeter barbed-wire fence to support ongoing disposal cell cover evaluations and maintenance activities, including one temporary access gate within the fence line. No maintenance needs were identified.

#### ***12.4.1.2 Fence and Perimeter Signs***

A barbed-wire fence encloses the disposal cell. Periodically, the fence is damaged by livestock, erosion, or vandalism and requires repair. Loose fence strands were identified at a few locations across the site. Two small areas of fence line had loose fence strands and were repaired following the inspection.

There are 43 pairs of perimeter signs, designated P1 through P43 (each pair consisting of a higher sign indicating property ownership and barring trespassing and a lower sign identifying the site as a radioactive materials disposal site), positioned along the property boundary. Each paired perimeter sign is attached to a single steel post set in concrete. Perimeter signs are typically outside the fence that encloses the disposal cell (PL-2), but some are affixed directly to the fence or immediately inside the fence. Several perimeter signs (P19, P20, P21, P23, P24, P26, and P27) have bullet damage but remain legible. Additionally, several perimeter signs are bent (presumably from animal contact) or are becoming faded and cracked (P14, P15, P19, P21, P27, P33, P34, P37, and P42) but do not require replacement. A gap was evident under the southern boundary fence and was fixed following the inspection. No other maintenance needs were identified.

#### ***12.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the fence near the entrance gate (PL-3); 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. Site marker SMK-2 is on the top slope of the disposal cell. No immediate maintenance needs were identified.

#### ***12.4.1.4 Survey and Boundary Monuments***

Four survey monuments were installed during construction of the disposal cell for survey control. Twelve boundary monuments delineate the property boundary. Bullet damage remains at boundary monument BM-5, but repairs are not necessary at this time, as the boundary monument remains legible and intact. No immediate maintenance needs were identified.

### ***12.4.2 Inspection Areas***

In accordance with the LTSP, the site is divided into four inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the toe drains and diversion channels, (3) the balance of the site and the

site perimeter, and (4) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

#### ***12.4.2.1 Disposal Cell***

The disposal cell, completed in 1994, occupies 68 acres. The disposal cell is armored with riprap to control erosion. No erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell were evident on the top slope of the disposal cell (PL-4).

Depressions in the riprap cover along the toe and lower portions of the northeast side slope of the disposal cell were identified during the 2016 annual inspection and a follow-up inspection on April 8, 2016 (DOE 2017). Additional site visits to further characterize the depression features have been completed every year since in 2016 and are detailed in the *Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report Mexican Hat, Utah* (DOE 2019b), also known as the Depressions Evaluation Report.

There was no noticeable increase of sloughed red rock and soil along the south apron of the disposal cell (PL-5). Because the apron is adjacent to the base of a steep, rocky cliff, it is expected that sediment and rock from the cliff will continue to fall onto the apron. The accumulated material is not currently affecting the function of the apron, and this area will continue to be monitored.

#### ***12.4.2.2 Toe Drains and Diversion Channels***

Upgradient offsite areas continue to erode, resulting in the transport of sediment onto the site and into the west diversion channel. Sediment accumulation has promoted the growth of vegetation, including perennial grasses and annual weeds, in the west diversion channel (PL-6). However, sediment accumulation and associated vegetation growth have not adversely affected the performance of the west diversion channel.

Sediment accumulation has also been observed along the transition zone from the apron to the northeast toe drain. The origin of this material has not been evaluated but may be a result of the observed radon barrier erosion associated with the depression features in this area. Visual observations during the inspection did not identify any apparent increases in the sediment accumulation in this area compared to previous visual observations. Inspectors will continue to monitor this area concurrently with the observed depression features on the northeast side slope. Conversely, no sediment accumulation has been observed below the north side slope where depressions and radon barrier erosion have been identified. No maintenance needs were identified.

#### ***12.4.2.3 Balance of the Site and Site Perimeter***

Minor erosion continues in upgradient areas along the southwest portions of the site. This is an expected natural process, as the exposed geology at the site is brittle and subject to weathering. Inspectors will continue to monitor erosion in these areas, but erosion is not a concern unless it



damages the fence or affects the performance of site drainage and diversion features such as the west diversion channel.

Sloughed rock from an overhanging shelf continues to be observed along the southern perimeter of the site. Although no visual changes were evident, and this material currently appears to be stable, this rock is approaching the barbed-wire fence between perimeter signs P22 and P23 and will likely need to be removed or secured in the future to protect the fence from damage or a potential breach.

Scattered trash (broken glass, bottles, cans, cardboard, and paper containers) continues to accumulate in areas of the site that are accessible to vehicles (e.g., outside the perimeter of the barbed-wire fence). The most noticeable accumulations of trash are along the access road and in the parking area, the areas on the site outside of the fence between perimeter signs P31 and P42, and the southern portion of the site between perimeter signs P22 and P27. Trespassing just inside the site boundary (outside the fence), as evidenced by vehicle and all-terrain vehicle tracks, occurs in the same areas where trash accumulations are present. One smaller area starting to accumulate trash is inside the barbed-wire fence, between perimeter signs P31 and P35; however, this trash is likely being transported onto the site by wind. The trash was removed as part of regular maintenance following the inspection.

Minor vandalism continues to occur, as indicated by bullet damage in several perimeter signs (P19, P20, P21, P23, P24, P26, and P27), but this is expected to be an ongoing problem because of the site's remote location and because access to these areas cannot be restricted. Damaged perimeter signs are replaced when they become illegible. No other maintenance needs were identified.

#### ***12.4.2.4 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 impacts were identified.

### **12.5 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 have substantially changed. Several follow-up inspections have been performed to further evaluate the depression features since they were first identified in 2016. LM has provided NRC with a series of updates and details associated with follow-up inspections. Follow-up inspections performed through January 2018 are detailed in the Depressions Evaluation Report (DOE 2019b). Follow-up inspections, evaluations, and work performed and completed in 2019 will be detailed in a subsequent report.

## 12.6 Maintenance

In April 2019, before the annual inspection, LM performed the following maintenance items:

- GSMT on the disposal cell side slope cover components. Data obtained through the GSMT will be used to identify possible causes for the cover degradation features that have been observed at the site. Additionally, an IRBP was implemented in GSMT sampling areas that had radon barrier degradation as detailed in the *Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site* (DOE 2019a). A series of test pits and one test strip were mechanically excavated and supplemented with a moisture-conditioned, bentonite-amended granular material to reconstruct the areas where radon barrier material had been eroded. All test areas were systematically screened for gamma radiation, and no elevated readings were observed.
- A new perimeter chainlink fence was installed around the existing System Operation and Analysis at Remote Sites (SOARS) weather monitoring station. Approximately 260 linear feet of 6-foot-tall chainlink fence and a lockable double swing gate were installed on existing dirt and rock surfaces around the SOARS station.

Two 4-foot access gates, and one 8-foot access gate were permanently installed in the perimeter barbed-wire fence to support ongoing disposal cell cover evaluations and maintenance activities, including one temporary access gate within the fence line (Figure 12-1).

During the annual inspection, inspectors documented several minor maintenance needs that were addressed following the inspection, including:

- Repairing loose fence strands
- Repairing a gap under the fence on the south side of the site
- Removing accumulated trash

The ICP project was performed in late summer 2019 as a temporary measure to replace and restore the depressional features back to the original design specifications until a long-term solution can be assessed. The entire ICP work area was systematically screened for gamma radiation, and no elevated readings were observed.

- As part of the ICP project, front-end road repairs were performed along the dirt access road to allow for safe transportation of haul trucks and delivery trucks. Road repairs included grading the entire access road, and two areas damaged from rain events were corrected by installing geocell with standard U.S. Department of Transportation-specific rock type to stabilize these areas, which will also allow for proper drainage from rain events.

## 12.7 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 10 CFR 40 Appendix A Criterion 12. The depression features identified along the disposal cell's northeast side slope do not meet the criteria for implementing an emergency action; therefore, no need for emergency measures was identified.



## **12.8 Environmental Monitoring**

### **12.8.1 Groundwater Monitoring**

In accordance with the LTSP, groundwater monitoring is not required because the uppermost aquifer is hydrogeologically isolated from contamination in the overlying formation.

### **12.8.2 Seep Monitoring**

In accordance with Section 3.7.2 of the LTSP, LM conducts observational monitoring of seven designated seeps during annual inspections as specified in an approved monitoring plan (DOE 2006). Observational monitoring consists of visual observations and photographic documentation of the seven seep locations specified in the LTSP. The observed seep locations, shown in Figure 12-2, are primarily the result of the infiltration of precipitation into the surrounding formation or perched water that leaked from the former processing site tailings pond. The majority of seeps have exhibited dry conditions over the past 11 years of observational monitoring.

The LTSP required annual visual monitoring of the seven designated seep locations through 2016, at which time an evaluation was to be conducted whether to continue or discontinue visual seep monitoring; this report is in development. In the interim, observational seep monitoring has been performed in accordance with the LTSP during annual site inspections.

Since 2010, groundwater discharge from seeps had only been observed at cross-gradient Seep 0248, which typically exhibits dripping conditions. During the inspection, Seep 0248 was observed dripping; since the seep was only dripping and did not exhibit steady flow, an estimated flow rate was not evaluated. Additionally, Seeps 0251 and 0264 were damp, and upgradient (background) Seep 0261 was observed to be flowing during the inspection. Seep 0261 is approximately 0.50 mile upstream of Seep 0248 in Gypsum Creek.

The remaining seeps on the annual monitoring plan exhibited dry conditions during the inspection. Table 12-2 documents the conditions of each monitored seep that was observed during the inspection, including the respective drainage in which each seep occurs and a reference to photographic documentation.



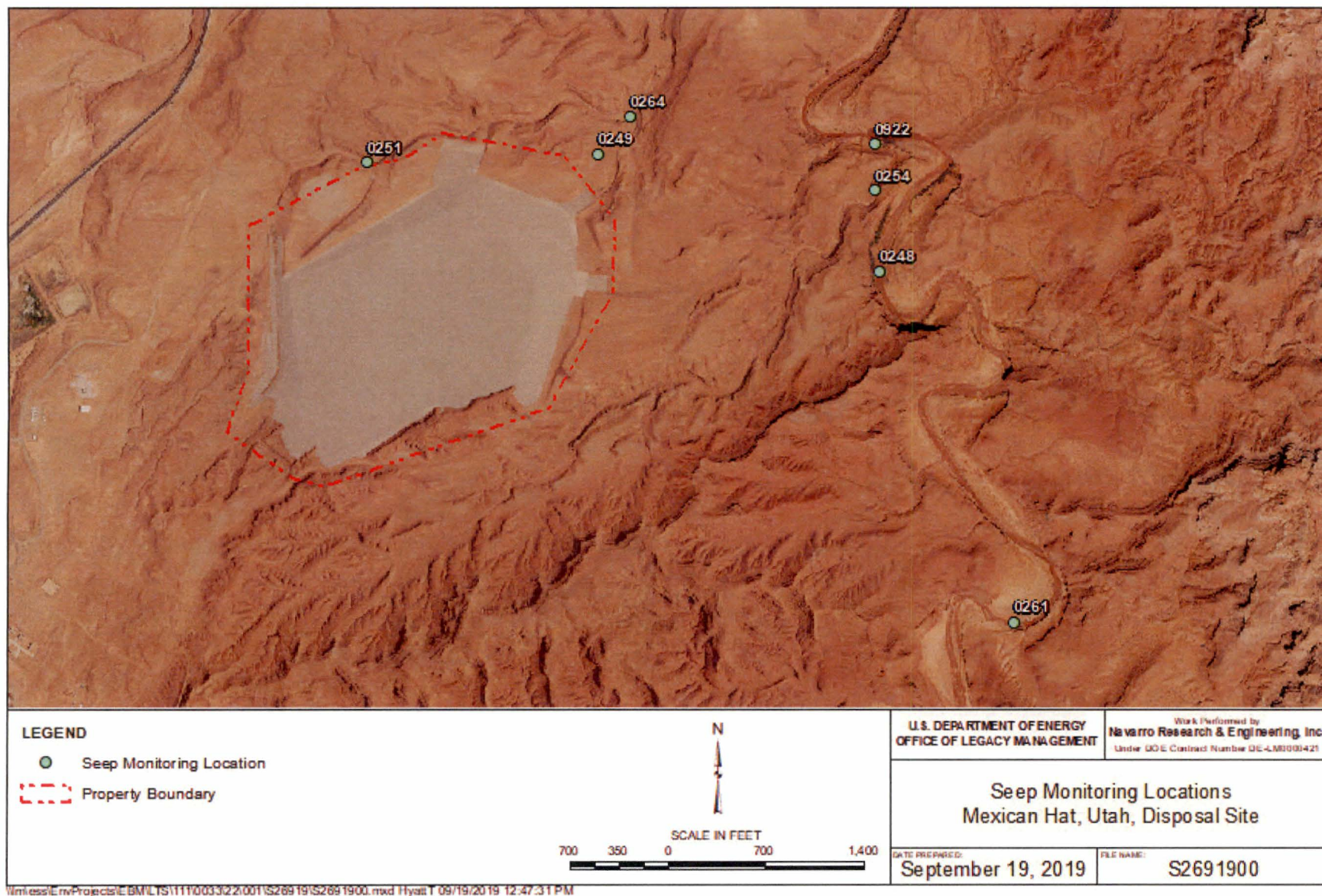


Figure 12-2. Seep Monitoring Locations at the Mexican Hat, Utah, Disposal Site



Table 12-2. Observations of Seeps near the Mexican Hat, Utah, Disposal Site

Seep Location Number	Drainage	Location Relative to Disposal Cell	Photograph Location Number	Observed Seep Conditions
0248	Gypsum Creek	Cross gradient	PL-7	Seep was dripping at a much slower rate compared to previous visual observations (no flow rate measured).
0249	Gully No. 2	Downgradient	PL-8	Dry conditions (no evaporites present); seep area is covered with gray limestone that presumably is extra riprap apron material from disposal cell construction. Warning sign not posted at this location since this seep has never been documented to be discharging water.
0251	North Arroyo	Downgradient	PL-9	Damp conditions (no evaporites present).
0254	South Arroyo	Downgradient	PL-10	Dry conditions (no evaporites present). Warning sign not posted at this location due to seasonal flash flood conditions in the ephemeral drainage.
0261	Gypsum Creek	Upgradient (background)	PL-11	Flowing conditions. This seep discharges directly into Gypsum Creek, which had surface water flow during the inspection. Warning sign not posted at this location since this seep is a background location.
0264	North Arroyo	Downgradient	PL-12	Damp conditions. Ephemeral wash near seep location was wet with no evidence of evaporites in the areas observed during the inspection.
0922	Gypsum Creek	Downgradient	PL-13	Dry conditions (no evaporites present in immediate area). Seep is along the south side of Gypsum Creek, and the seep location is still covered entirely by a sandbar that has formed along this section of Gypsum Creek.

Gypsum Creek had areas of flowing surface water during the inspection, including the North Arroyo.

### 12.8.3 Vegetation Monitoring

In accordance with the LTSP, vegetation conditions are observed during annual inspections to ensure that undesirable plant species, including deep-rooted plants on the disposal cell cover and noxious weeds, do not proliferate at the site. With the exception of deep-rooted vegetation, natural plant community succession is expected and will not adversely impact the performance of the disposal cell. Vegetation growth in the west diversion channel will continue to be monitored during annual inspections to ensure that it does not negatively affect the performance of this surface water diversion structure. No maintenance needs were identified.

## 12.9 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), 2006. *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*, DOE-LM/GJ1139-2006, March.

DOE (U.S. Department of Energy), 2007. *Long-Term Surveillance Plan for the Mexican Hat, Utah (UMTRCA Title I), Disposal Site, San Juan County, Utah*, DOE-LM/1530-2007, Rev. 3, October.

DOE (U.S. Department of Energy), 2017. *2016 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S15036, Office of Legacy Management, March.

DOE (U.S. Department of Energy), 2019a. *Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site*, LMS/HAT/S20483, Rev. 1, Office of Legacy Management, January.

DOE (U.S. Department of Energy), 2019b. *Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report Mexican Hat, Utah*, LMS/HAT/S14765, Office of Legacy Management, January.

## 12.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	130	Entrance Gate; Entrance Sign and Disposal Cell in Background
PL-2	—	Perimeter Sign P20
PL-3	—	Site Marker SMK-1
PL-4	315	Central Portion of Top Slope of Disposal Cell
PL-5	235	Sloughed Rock on South Apron of Disposal Cell
PL-6	320	West Diversion Channel
PL-7	255	Seep 0248 (Limited Dripping)
PL-8	300	Seep 0249 (Dry)
PL-9	155	Seep 0251 (Damp)
PL-10	245	Seep 0254 (Dry)
PL-11	170	Background Seep 0261 (Flowing)
PL-12	180	Seep 0264 (Damp)
PL-13	225	Seep 0922 (Dry/Sandbar)

**Note:**

— = Photograph taken vertically from above.





*PL-1. Entrance Gate; Entrance Sign and Disposal Cell in Background*



*PL-2. Perimeter Sign P20*





*PL-3. Site Marker SMK-1*



*PL-4. Central Portion of Top Slope of Disposal Cell*





*PL-5. Sloughed Rock on South Apron of Disposal Cell*



*PL-6. West Diversion Channel*





*PL-7. Seep 0248 (Limited Dripping)*



*PL-8. Seep 0249 (Dry)*





*PL-9. Seep 0251 (Damp)*



*PL-10. Seep 0254 (Dry)*





*PL-11. Background Seep 0261 (Flowing)*



*PL-12. Seep 0264 (Damp)*





*PL-13. Seep 0922 (Dry/Sandbar)*

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## 13.0 Naturita, Colorado, Disposal Site

### 13.1 Compliance Summary

The Naturita, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on June 17, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection.

Groundwater monitoring is not required and was discontinued in 2014. The site-specific U.S. Department of Energy (DOE) Long-Term Surveillance Plan (LTSP) (DOE 2019b) was revised to exclude the groundwater monitoring requirement. The revised LTSP was sent to the U.S. Nuclear Regulatory Commission (NRC) in September 2019 and finalized in December 2019.

### 13.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the LTSP in accordance with procedures established to comply with the requirements of the NRC general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 13-1 lists these requirements.

Table 13-1. License Requirements for the Naturita, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.0 and 6.2	Section 13.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 13.5	(b)(4)
Maintenance and Repair	Section 4.0	Section 13.6	(b)(5)
Groundwater Monitoring	Section 2.6	Section 13.7	(b)(2)
Corrective Action	Section 5.0	Section 13.8	--

### 13.3 Institutional Controls

The 26.65-acre site, identified by the property boundary shown in Figure 13-1, is owned by the United States and was accepted under the NRC general license in 1999. 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 gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

## 13.4 Inspection Results

The site, 13 miles northwest of Naturita, Colorado, was inspected on June 17, 2019. The inspection was conducted by A. Kuhlman and C. Wentz of the Office of Legacy Management Support (LMS) contractor. A. Denny (Office of Legacy Management [LM] site manager), J. Doebele (Colorado Department of Public Health and Environment), K. Meadows (LMS), K. Speights and A. Renteria (both of LM) 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 the need, if any, for maintenance or additional inspection and monitoring.

### 13.4.1 Site Surveillance Features

Figure 13-1 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 2019 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 13-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 13.10.

#### *13.4.1.1 Site Access, Entrance Gate, and Entrance Sign*

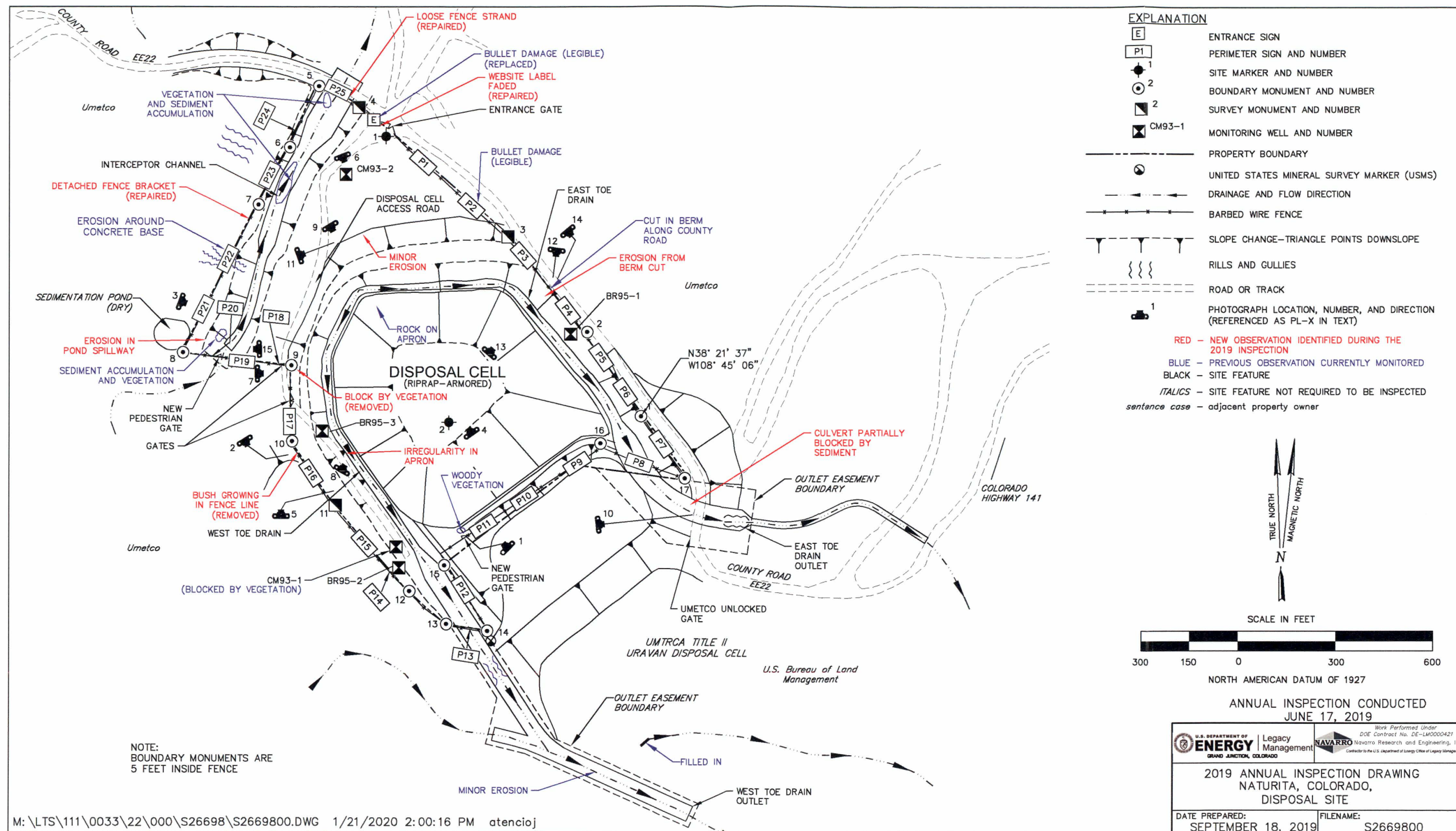
Access to the site is from Colorado Highway 141 to Montrose County Road EE22, which borders the northeast side of the site. Entrance to the site is through a locked steel gate directly off County Road EE22. The entrance gate was locked and functional. The entrance sign, next to the entrance gate, has bullet damage but remains legible. The website listed on the entrance sign has faded and was replaced following the inspection. No other maintenance needs were identified.

#### *13.4.1.2 Perimeter Fence and Signs*

A barbed-wire perimeter fence encloses the site. Three aging wooden stiles identified in the 2018 inspection (DOE 2019a) were replaced with two pedestrian gates following the 2019 inspection (PL-1). A large bush growing in the western perimeter fence line was removed to prevent damage to the fence (PL-2). Inspectors identified a loose fence strand and a detached fence bracket; both were repaired following the inspection.

There are 25 perimeter signs positioned along the perimeter fence attached to steel posts set in concrete and set back 5 feet (PL-3). Several perimeter signs identified with "Uravan" as the site name were replaced with "Naturita" following the inspection. Perimeter sign P2 has bullet damage but remains legible. Erosion is occurring around the base of perimeter sign P22, but the perimeter sign is stable. Perimeter sign P18 was facing away from the disposal cell access road and was turned to face the road following the inspection. No other maintenance needs were identified.





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#### ***13.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 (PL-4) is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***13.4.1.4 Survey and Boundary Monuments***

Three survey monuments and 14 boundary monuments delineate the property boundary. Boundary monuments BM-1 through BM-17 mark the property corners. Survey monuments SM-3, SM-4, and SM-11 represent boundary monuments BM-3, BM-4, and BM-11, respectively (PL-5). Boundary monument BM-9 was obstructed by woody vegetation, which was removed following the inspection. No other maintenance needs were identified.

#### ***13.4.1.5 Monitoring Wells***

The site has five groundwater monitoring wells. The wellhead protectors were undamaged and locked (PL-6). Monitoring well CM93-1 remains completely surrounded by woody vegetation. Monitoring of the wells is not required, and the vegetation will be removed upon well abandonment. No immediate maintenance needs were identified.

### **13.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the remainder of the site, and (3) 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 LTSP requirements.

#### ***13.4.2.1 Disposal Cell***

The disposal cell, completed in 1998, occupies 10 acres (PL-7). The disposal cell is armored with riprap to control erosion. The riprap is rounded, with larger diameter rock on the side slopes than on the top slope. There was no evidence of settling, slumping, erosion, rock degradation, or other modifying processes that might affect the integrity of the disposal cell.

Irregularities in the riprap on the top slope of the disposal cell continue to be observed. The irregularities consist of slightly darker rock at differing angles than the rest of the top slope. The irregularities are not lower than surrounding areas and have not changed over time. They are believed to be a construction artifact. Another irregularity exists in the apron area on the west side of the disposal cell (PL-8) appearing to be old vehicle tracks. The irregularity does not present a hazard to the disposal cell or surrounding area. Inspectors will continue to monitor this area. A large boulder was observed on the northeast side of the disposal cell apron, a presumed result of erosion on the steep cliff above the disposal cell (PL-9). The apron around the boulder remains intact, and the boulder does not currently pose a hazard to the disposal cell. Inspectors will continue to monitor for potential impacts. A rabbitbrush plant (a deep-rooted woody species) growing at the base of the north side slope identified during the previous inspection was successfully treated with herbicide and was not apparent during the 2019 inspection. Additional

rabbitbrush plants growing on the south apron of the disposal cell were treated with herbicide in June before the inspection. Herbicide treatment of the rabbitbrush plants will continue. No other maintenance needs were identified.

#### ***13.4.2.2 Remainder of the Site***

Two riprap-armored toe drains (the west and east toe drains) collect water from the disposal cell side slopes and divert it to the southeast. The west toe drain outlet is south of the site in an easement. Soft bedrock is being eroded near the west toe drain outlet, but that erosion does not threaten the performance of the toe drain, and repairs are not necessary. The east toe drain outlet is southeast of the site in an easement. Water is conveyed to the east toe drain outlet through the east toe drain and five culverts under Montrose County Road EE22. Vegetation continues to grow in the accumulating sediment just outside of the culverts, potentially blocking storm water flow through the culverts (PL-10). The vegetation will be removed before the 2020 annual inspection. Erosion has exposed resistant bedrock near the east toe drain outlet but does not threaten the performance of the toe drain, and repairs are not necessary. Some sediment has accumulated in the upper end of the east and west toe drains, allowing scattered vegetation to grow, but this has not adversely affected the performance of the toe drains.

A riprap-armored interceptor channel, upgradient and northwest of the disposal cell, diverts storm water and snowmelt runoff to the northeast under County Road EE22. Some sediment has eroded from the offsite area upslope from perimeter signs P22 and P23 and is deposited in the channel. Sediment accumulation and associated vegetation have not adversely affected the performance of the interceptor channel. No new erosion was noted during the inspection.

An area south of monitoring well CM93-2 next to a large boulder upgradient of the disposal cell is beginning to show signs of erosion (PL-11). Rills leading in the boulder's direction are becoming apparent. The erosion does not present a hazard to the disposal cell or to any site features, so repairs are not warranted. Inspectors will continue to monitor this area for ongoing erosion.

The disposal cell access road along the northwest side of the site descends through shale and sandstone units of the Salt Wash Member of the Morrison Formation. The road provides access to the disposal cell and monitoring wells on the west side of the site. Minor new rockfall was observed on the disposal cell access road. The access road remains passable. Inspectors will continue to monitor this area for ongoing erosion. No other maintenance needs were identified.

A cut in the berm and resulting erosion alongside County Road EE22 (between perimeter signs P3 and P4) has been observed since 2017 and appeared to have increased in size and depth (PL-12). Erosion in the steep cliff below the berm cut was observed (PL-13), but does not pose a current threat to the integrity of the disposal cell or site features. Following the inspection, the Montrose County maintenance crew repaired the berm cut (PL-14). Inspectors will continue to monitor this area for ongoing erosion. No other maintenance needs were identified.

#### ***13.4.2.3 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. The area has been highly disturbed by mining, quarrying, reclamation, and road building.



Headcutting erosion was identified within the spillway channel below the sedimentation pond on the outlying area northwest of the site (PL-15). Inspectors will continue to monitor this area for ongoing erosion.

### **13.5 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.

### **13.6 Maintenance and Repair**

Several maintenance items identified in the 2018 annual inspection (DOE 2019a) were completed in 2019, including:

- Removal of three pedestrian wooden stiles and installation of two pedestrian gates
- Repair of the berm cut by Montrose County

Inspectors documented minor maintenance needs that were completed in 2019 following the inspection, including:

- Repairs to the perimeter fence (tightened loose fence strand and repaired detached fence bracket)
- Treatment of vegetation growing in the disposal cell apron
- Replacing “Uravan” perimeter signs with “Naturita”
- Turning perimeter sign P18 to face the disposal cell access road
- Removal of the bush in the fence line between perimeter signs P16 and P17
- Replacing the entrance sign

Inspectors also documented minor maintenance needs that have not been addressed but will be before the 2020 inspection, including:

- Removing sedimentation or vegetation blocking the culverts

No other immediate maintenance needs were identified.

### **13.7 Groundwater Monitoring**

Groundwater monitoring was discontinued in 2014 because (1) the groundwater monitoring program demonstrated that transient drainage from the disposal cell is not impacting the uppermost aquifer and (2) site geology prevents impact to the uppermost aquifer. NRC concurrence with the change (discontinuation) of groundwater monitoring is documented in an April 15, 2014, letter from NRC to LM (Orlando 2014). The LTSP was revised to exclude the groundwater monitoring requirement and submitted to NRC for acceptance in 2018. The revised LTSP was finalized in December 2019 (DOE 2019b).

## 13.8 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.

## 13.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2019a. *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S22053, March.

DOE (U.S. Department of Energy), 2019b. *Long-Term Surveillance Plan for the Naturita, Colorado Disposal site*, LMS/NAD/S13227, December.

Orlando, 2014. Dominick A. Orlando, Senior Project Manager, Materials Decommissioning Branch, U.S. Nuclear Regulatory Commission, letter (about U.S. Department of Energy proposal to terminate groundwater monitoring at the Naturita, Colorado, site) to Mark Kautsky, Office of Legacy Management, U.S. Department of Energy, April 15.

## 13.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	315	New Pedestrian Gate on Disposal Cell
PL-2	150	Vegetation Growing in Fence Line
PL-3	110	Perimeter Sign P21
PL-4	325	Site Marker SMK-1
PL-5	—	Survey Monument SM-11
PL-6	160	Monitoring Well CM93-2
PL-7	90	Disposal Cell
PL-8	30	Area of Irregularity on Disposal Cell Apron and Interface with Disposal Cell Access Road
PL-9	150	Boulder on Disposal Cell Apron
PL-10	85	Culvert Inlet Partially Blocked by Sediment
PL-11	70	Erosion Along Cliff Edge Above Disposal Cell
PL-12	189	Berm Cut off County Road EE22 (Repaired Following Inspection)
PL-13	40	Erosion Along Cliff from Cut in County Road EE22 Berm
PL-14	142	Berm Cut Repaired by Montrose County
PL-15	270	Sedimentation Pond Spillway Area

**Note:**

— = Photograph taken vertically from above.





*PL-1. New Pedestrian Gate on Disposal Cell*

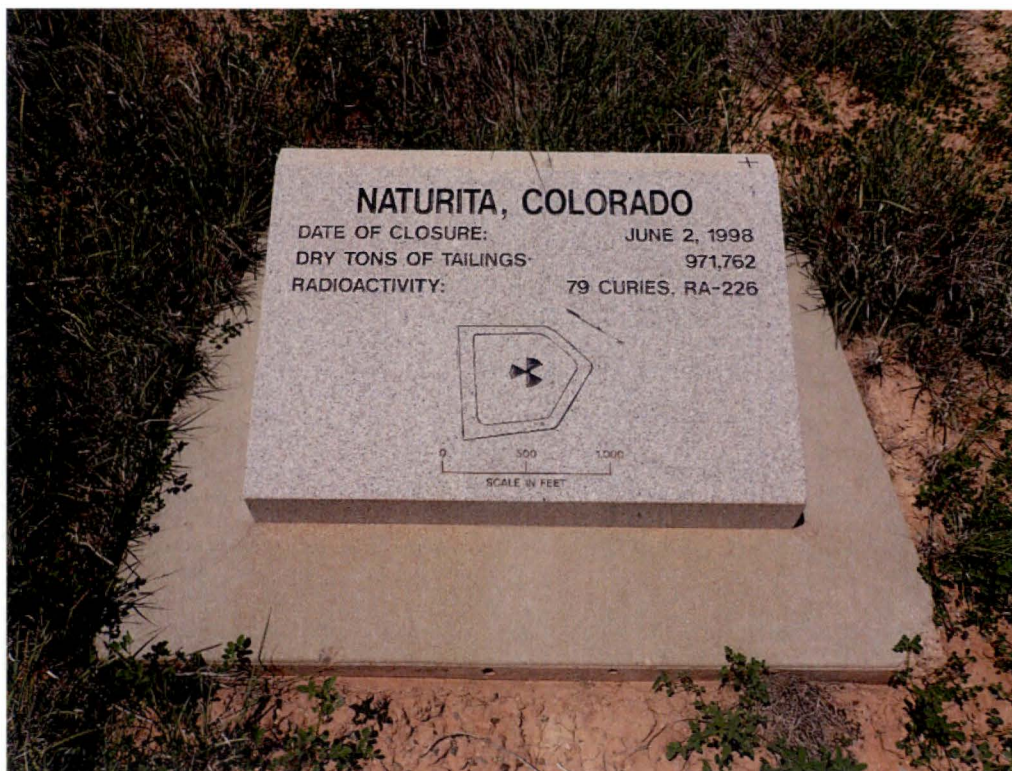


*PL-2. Vegetation Growing in Fence Line*





PL-3. Perimeter Sign P21



PL-4. Site Marker SMK-1





*PL-5. Survey Monument SM-11*

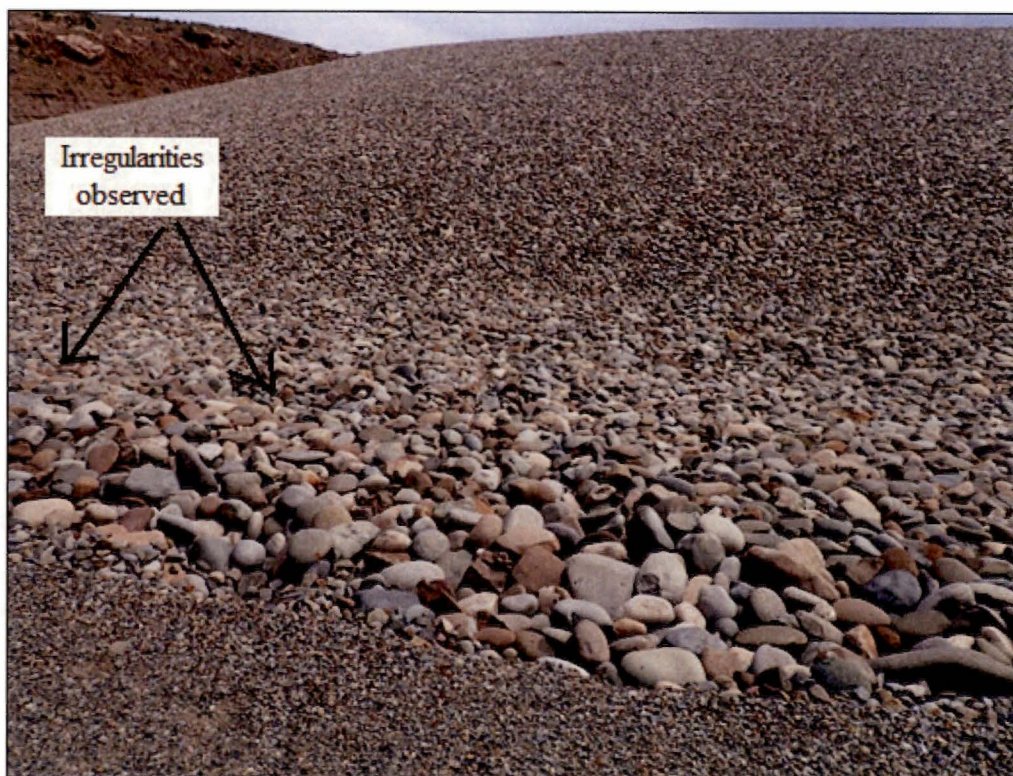


*PL-6. Monitoring Well CM93-2*





*PL-7. Disposal Cell*



*PL-8. Area of Irregularity on Disposal Cell Apron and Interface with Disposal Cell Access Road*





*PL-9. Boulder on Disposal Cell Apron*



*PL-10. Culvert Inlet Partially Blocked by Sediment*





*PL-11. Erosion Along Cliff Edge Above Disposal Cell*



*PL-12. Berm Cut off County Road EE22 (Repaired Following Inspection)*

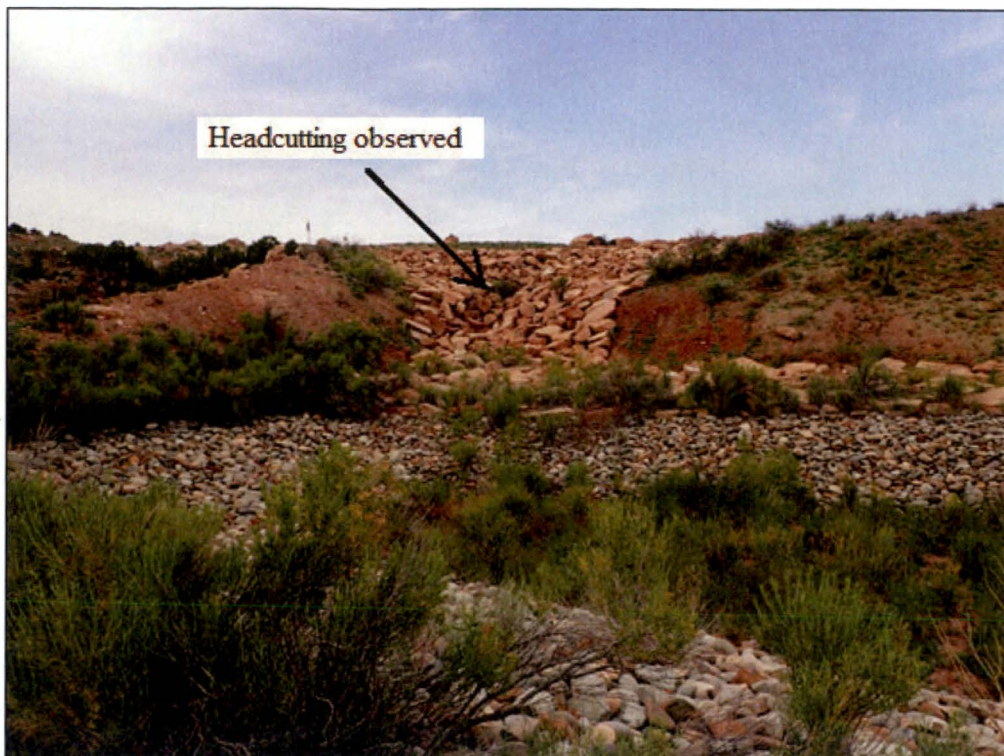




*PL-13. Erosion Along Cliff from Cut in County Road EE22 Berm*



*PL-14. Berm Cut Repaired by Montrose County*



*PL-15. Sedimentation Pond Spillway Area*



## 14.0 Rifle, Colorado, Disposal Site

### 14.1 Compliance Summary

The Rifle, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on August 20, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection.

The disposal cell dewatering system is activated when the interior water elevation reaches 6016 feet (ft); this is called the pump trigger level. This level has been exceeded during (1) nonoperational conditions of solar-powered pumps (night and insufficient sunlight); (2) below-freezing temperatures; and (3) periods of maintenance. However, pore-water levels in standpipes 2 and 3 have remained below the geotextile liner at 6020 ft, preventing water from overtopping the disposal cell liner. Groundwater quality monitoring is not required.

### 14.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1997) 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 14-1 lists these requirements.

Table 14-1. License Requirements for the Rifle, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 14.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 14.5	(b)(4)
Maintenance and Repairs	Section 4.0	Section 14.6	(b)(5)
Groundwater Monitoring	Section 2.6	Section 14.7	(b)(2)
Disposal Cell Pore-Water Level Monitoring	Appendix	Section 14.8	--
Corrective Action	Section 5.0	Section 14.9	--

### 14.3 Institutional Controls

The 205-acre site, identified by the property boundary shown in Figure 14-1, is owned by the United States and was accepted under the general license in 1998. The U.S. Department of Energy (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 and sign, stock fence, perimeter signs, site markers, survey and boundary monuments, standpipes, and evaporation pond.

## 14.4 Inspection Results

The site, 6 miles north of Rifle, Colorado, was inspected on August 20, 2019. The inspection was conducted by M. Kastens, K. Lott, and D. Holbrook of the Office of Legacy Management Support (LMS) contractor. T. Jasso (Office of Legacy Management [LM] site manager), C. Spalding (City of Rifle), I. Pittman (U.S. Bureau of Land Management [BLM]), and M. Cosby (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, identify changes in conditions that might affect conformance with the LTSP, and evaluate the need, if any, for maintenance or additional inspection and monitoring.

### 14.4.1 Site Surveillance Features

Figure 14-1 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 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are identified in the following subsections. Photographs to support specific observations are identified in the text and in Figure 14-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 14.11.

#### 14.4.1.1 Access Road, Entrance Gates, and Entrance Sign

Access to the site is from an improved gravel road northeast of Colorado Highway 13. A perpetual right-of-way across BLM property provides access to the site. Entrance to the site is through two locked gates on the access road: an outer reinforced metal gate about 1700 ft south of the site that limits public access to the site and an inner metal gate at the stock fence. While both gates were locked and functional, graffiti (PL-1) and bullet holes (PL-2) were found on the outer gate cover. The graffiti was removed following the inspection. The entrance sign is next to the inner gate. The entrance sign had minor cracks but remained legible. No other maintenance needs were identified.

#### 14.4.1.2 Stock Fence and Perimeter Signs

A four-strand barbed-wire stock fence at the south end of the site extends to the edge of steep-sided arroyos that bound the site on the east and west. In previous years, livestock associated with an adjacent BLM grazing allotment would go around the fence to graze onsite vegetation. Results from the 2019 inspection showed vegetation regrowth in the livestock trails that were identified in the 2018 inspection (PL-3). One T-post near survey monument SM-1 was broken at the base of the ground surface; however, it is unclear if this was caused by livestock. The T-post was repaired following the 2019 inspection. Two barbed-wire personnel gates are at the southeast corner of the site. The northern gate, which provides access to DOE property, was locked with a chain and padlock. The southern gate is left open to allow livestock on the adjacent BLM allotment to pass through the fence.



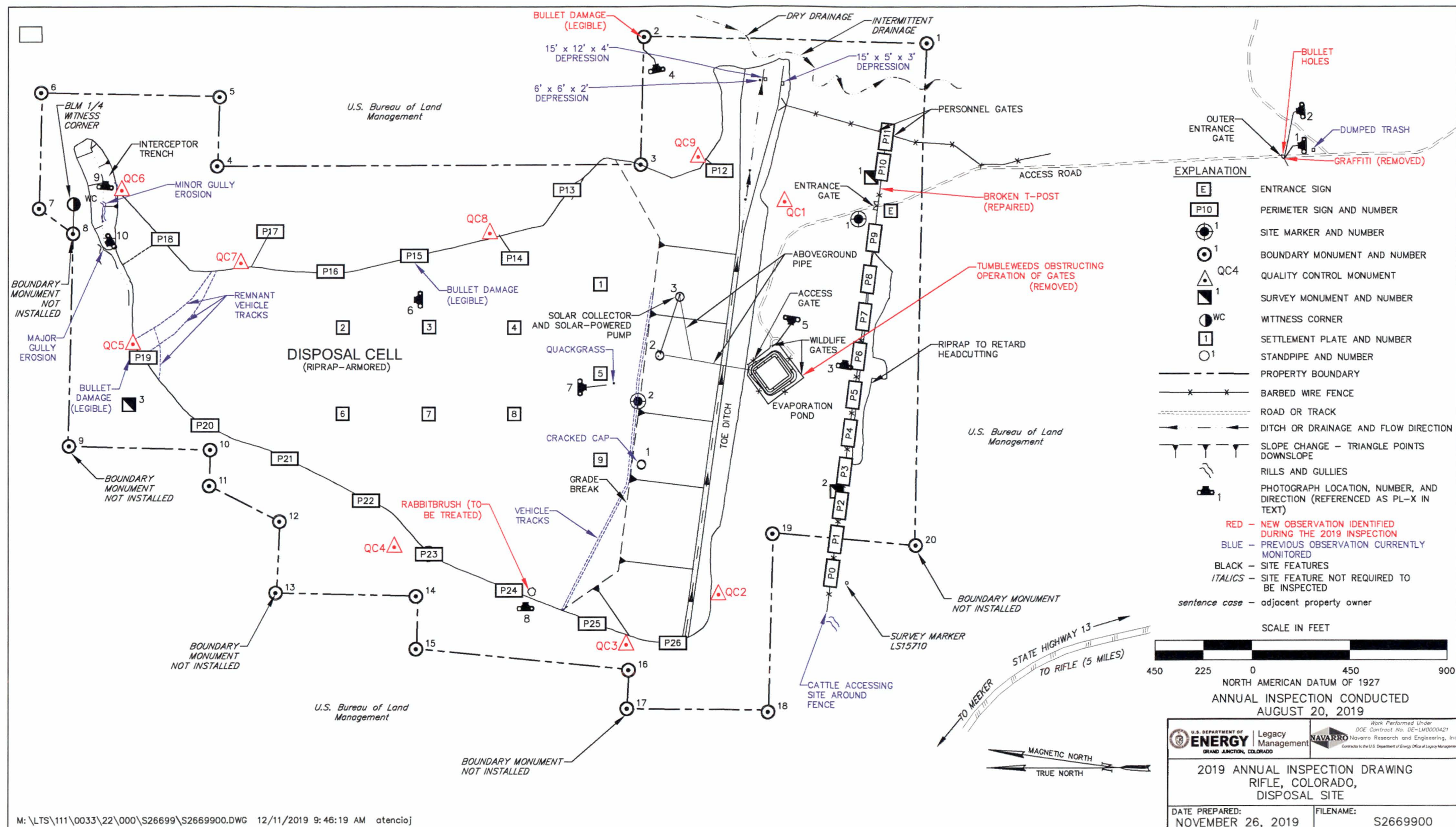


Figure 14-1. 2019 Annual Inspection Drawing for the Rifle, Colorado, Disposal Site

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There are 25 perimeter signs positioned along the perimeter fence, attached to steel posts set in concrete and set back 5 ft. Signs are numbered from P0 through P7 and P10 through P26. Following the inspection, perimeter signs P8 and P9 were added to complete the consecutive ordering. Inspectors noted that perimeter signs P15 and P19 had bullet damage, but they remain legible and do not need to be replaced at this time. No other maintenance needs were identified.

#### ***14.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the inner entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***14.4.1.4 Survey and Boundary Monuments***

Three survey monuments and 15 boundary monuments delineate the property boundary. The boundary monuments are set at the corners of the irregular site boundary. Although the site boundary has 20 corners, only 15 are marked by boundary monuments because 5 of the corners are on extremely steep terrain that is not safely accessible. Consequently, boundary monuments BM-8, BM-9, BM-13, BM-17, and BM-20 were never installed. Several of the existing boundary monuments are difficult to locate because they are installed in steep, hard-to-access areas. Inspectors located all boundary monuments with a GPS unit with the exception of boundary monument BM-18, which is on steep terrain. Inspectors plan to confirm the location of boundary monument BM-18 during the 2020 annual inspection. Boundary monument BM-2 has several bullet holes but remains intact (PL-4). No maintenance needs were identified.

#### ***14.4.1.5 Standpipes***

Three standpipes (1–3) on the south side slope of the disposal cell are used to monitor pore-water levels in the disposal cell. At the time of the inspection, disposal cell pore water was being pumped from standpipes 2 and 3 (also known as monitoring wells MW02 and MW03, respectively) into the evaporation pond. No maintenance needs were identified.

#### ***14.4.1.6 Evaporation Pond***

A lined evaporation pond was constructed adjacent to the disposal cell in 2001 to receive water pumped from standpipes 2 and 3. It contained water at the time of the inspection. The chainlink security fence around the pond was intact and effectively prevents livestock from entering the area. The vehicular access gate on the north corner of the fence was closed and locked at the time of the inspection. Inspectors noted that tumbleweeds obstructed the proper functioning of the two wildlife gates on the south and east corners of the fence (PL-5). These were removed following the inspection. A meteorological station alongside the pond was functioning normally. No other maintenance needs were identified.

### **14.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into four areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) onsite reclaimed areas, and (4) the outlying area. Inspectors examined

specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

#### ***14.4.2.1 Disposal Cell and Interceptor Trench***

The disposal cell, completed in 1996, occupies 71 acres and is armored with riprap consisting of river cobbles and boulders to control erosion and deter animal and human intrusion. There was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell. As in the past several inspections, inspectors noticed minor rock degradation on the disposal cell top slope, primarily in the form of cracking and spalling (PL-6). This phenomenon is not a significant concern, as less than 0.01% of the surface rocks have been affected by breakage.

Remnant vehicle tracks, which formed on the cover during well decommissioning activities in 2002, remain evident in the north portion of the disposal cell. Additional vehicle tracks continue to be visible in the south portion of the disposal cell; these were made during installation of solar panels and pumps at standpipes 2 and 3.

In the early 2000s, inspectors became concerned that the steep slopes of the disposal cell cover, particularly in the north portion, could lead to slope instability. In response, LM conducted annual three-dimensional surveys of the rock cover between 2006 and 2011. The surveys confirmed that the rock cover was stable.

Inspectors examined the infestation of quackgrass (a state-listed noxious weed) that had been discovered on the cell top last year and noticed that it had been treated recently with herbicide (PL-7). A single deep-rooted plant, rubber rabbitbrush, was found on the cell top (PL-8). The plant will be treated with herbicide before the 2020 inspection. Small, isolated patches of other grasses and annual weeds also were present on the disposal cell cover and side slope, but they do not present a concern.

A vegetated interceptor trench was constructed at the top of the disposal cell to protect the disposal cell from storm water and snowmelt runoff. The trench appeared to be functioning as designed, although minor gully erosion has been occurring in the lower portion of the trench. The gully did not appear to be increasing in depth or width (PL-9); the deepest downcut was approximately 18 inches deep and 24 inches wide. In the outfall area below the trench (down the steep-sided natural slope), runoff has formed a gully to the north of the armoring riprap placed in this area in the early 2000s. The gully did not appear to be increasing in depth or width (PL-10). The outfall area will continue to be monitored to assess if additional riprap will need to be placed on the slope to prevent upstream gully migration. No maintenance needs were identified.

#### ***14.4.2.2 Toe Ditch and Toe Ditch Outlet***

A toe ditch runs along the downslope (south) edge of the disposal cell and is armored with the same rock that protects the disposal cell. The toe ditch diverts surface runoff from the disposal cell offsite to the east. The ditch was stable and functioning as designed.



Minor erosion, anticipated in the design, remains evident in the channel at the toe ditch outlet. Rock previously placed in the outlet to stabilize the erosion has dropped into and armored the eroded areas. Inspectors found two depressions in the rock during the 2017 annual inspection (one about 15 × 12 ft in area and 4 ft deep and one about 6 × 6 ft in area and 2 ft deep) and another depression during the 2018 annual inspection (about 15 × 5 ft in area and 3 ft deep). These depressions were formed after the underlying soil eroded away. They are not a concern at this time but will continue to be monitored. No maintenance needs were identified.

#### ***14.4.2.3 Onsite Reclaimed Areas***

Disturbed areas around the edges and south of the disposal cell were reseeded in 1996 and, overall, have been successfully reclaimed. Before 2012, there was little evidence of cattle or sheep grazing within the site boundaries. Since 2012, however, heavy grazing by cattle has been observed regularly. Because the site was deemed unsuitable for livestock grazing, LM contacted BLM in 2018 to address this issue. The 2019 inspection showed less impact from livestock trespass and grazing. However, because 2019 was an above-average precipitation year, evidence of livestock trespass and resultant heavy grazing should continue to be monitored. LM plans to continue communications with BLM and also has offered to meet with the grazing lessee.

Three arroyos are present in the reclaimed area south of the disposal cell and outside the stock fence. A rock apron was placed between the stock fence and the headcuts in these arroyos to prevent headward migration toward the disposal cell. As erosion has migrated into the rock apron, the rock has naturally armored the arroyos and effectively stabilized them from further erosion. Inspectors will continue to monitor this area. No maintenance needs were identified.

#### ***14.4.2.4 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. The primary land uses in the area are grazing, hunting, recreation, and wildlife habitat. Historically, trash has been dumped along the access road between Highway 13 and the outer entrance gate, and BLM has periodically removed it. During the 2019 inspection, a new pile of trash was observed near the outer entrance gate. No other changes to the outlying area were observed.

### **14.5 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.

### **14.6 Maintenance and Repairs**

Inspectors documented minor maintenance and repair needs that were completed following the inspection:

- Removal of graffiti from the outer access gate cover
- Repair of a broken T-post near survey monument SM-1

- Addition of perimeter signs P8 and P9
- Removal of tumbleweeds from wildlife gates on evaporation pond fencing

In August 2019, nine 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 14-1. The rabbitbrush on top of disposal cell will be treated with herbicide before the next inspection in 2020. No other maintenance needs were identified.

## 14.7 Groundwater Monitoring

Groundwater quality monitoring is not required by the LTSP. Transient drainage from the disposal cell enters the Wasatch Formation, a 3800-foot-thick sequence of shales, siltstones, and fine-grained sandstones. The Wasatch separates the disposal cell from the uppermost useable aquifer (the Mesaverde Group). Groundwater in the Wasatch Formation is classified as limited use due to naturally occurring concentrations of total dissolved solids that exceed 10,000 milligrams per liter. Additionally, this unit produces very little water and is not considered to be an aquifer. Ambient levels of barium, cadmium, chromium, lead, molybdenum, selenium, and combined radium-226 and radium-228 exceed maximum concentration limits. The Wasatch Formation does not represent a useable source of water, and no exposure pathways to site-related groundwater exist at the site. Further groundwater monitoring is not required. All monitoring wells at the site were decommissioned in 2002.

## 14.8 Disposal Cell Pore-Water Level Monitoring

In accordance with the LTSP, LM monitors pore-water levels from transient drainage in the disposal cell at standpipes 2 and 3, installed at the downgradient end of the disposal cell on the south side slope (Figure 14-1). This monitoring is performed to ensure that water in the disposal cell does not rise above a geotextile liner that was installed in the toe of the disposal cell at an elevation of 6020 ft. The bottom of standpipe 1 is at an elevation of 6021.4 ft; as such, it continues to be dry and does not require continuous monitoring.

A contingency plan for control of water levels at the toe of the disposal cell was appended to the LTSP. The plan required installation of a dewatering system and evaporation pond when the water level reached an elevation of 6014 ft and initiation of dewatering at an elevation of 6016 ft. The 6014 ft action level was reached in 2001, and the 6016 ft action level was reached in 2003. As required by the contingency plan, the evaporation pond was constructed in 2001. Pumping water from standpipes 2 and 3 to the evaporation pond began in 2003 and continued until September 2006, when it was concluded that standpipe 2 could not sustain prolonged pumping due to consistent lack of sufficient recharge. Although pumping at standpipe 2 was discontinued at that time, the datalogger remained, and water-level monitoring continued at this standpipe. Pumping at standpipe 2 was restarted in June 2018, with the objective of more effectively dewatering the disposal cell toe. Water pumped from the standpipes was discharged through an aboveground plastic line to the evaporation pond.

Pore-water levels in standpipes 2 and 3 have shown a rising trend since 2011 but remained below the 6016 ft pump trigger level until 2016 for standpipe 3 and 2017 for standpipe 2 (Figure 14-2). While the 6016 ft pump trigger level has been exceeded, pore-water levels in both standpipes 2 and 3 have been reduced by pumping to remain below the geotextile liner at 6020 ft, preventing



water from overtopping the disposal cell liner. In compliance with requirements of the LTSP, pumping will continue until water levels in the standpipes stabilize at an elevation of 6014 ft or lower.

Due to insufficient recharge, water levels in standpipe 2 did not reach the pump trigger level until 2018. Real-time disposal cell water elevations collected in 2018 (using pressure transducers and dataloggers) continued to indicate that pore-water levels in standpipes 2 and 3 exceed the 6016 ft pump trigger level (Figure 14-2). In 2019, LM modified the seasonal pumping regimen to pump year-round while a long-term solution is evaluated and implemented.

Data fluctuations in standpipe 2 observed in 2018 and 2019 are due to the restart of pumping and various equipment and instrumentation maintenance repairs. Downhole video in both standpipes revealed significant fouling in the screened interval. Redevelopment of the standpipe 2 to remove mineral scale and biogrowth is planned for 2020. LM will investigate the cause of the rising trend and will develop mitigation actions as appropriate.

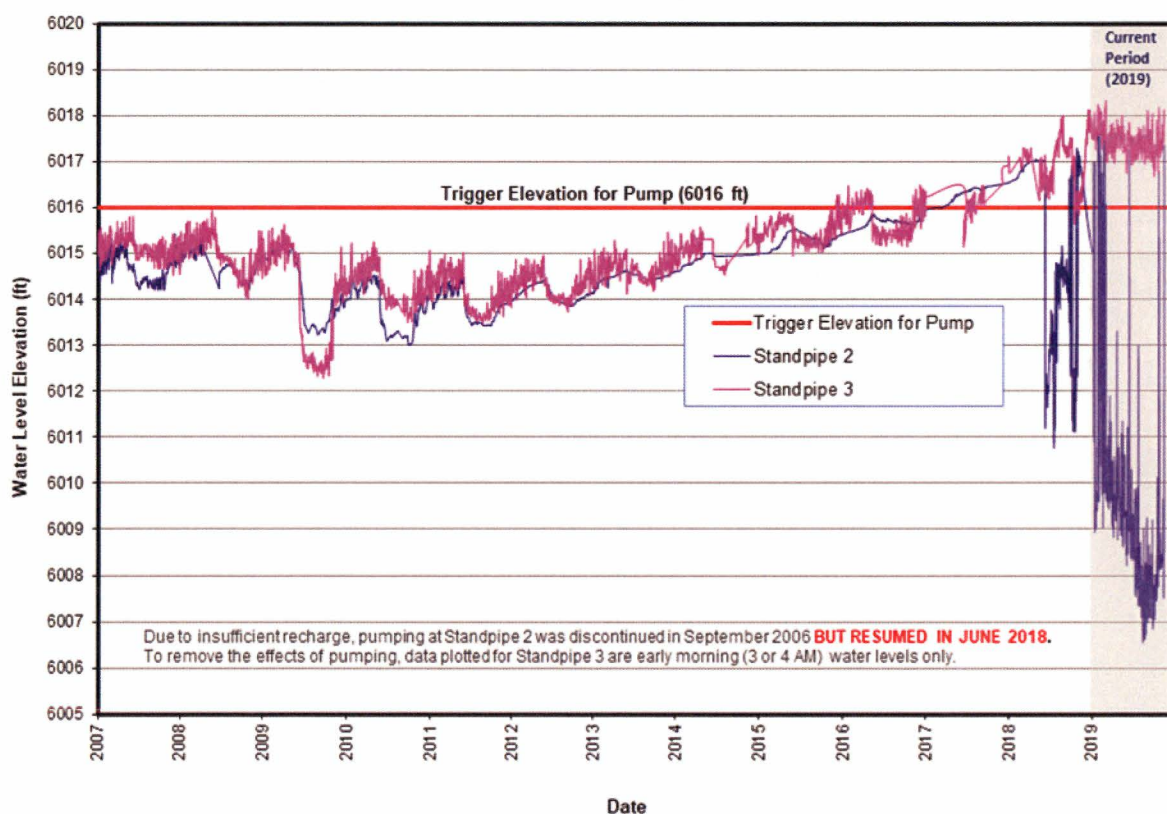


Figure 14-2. Disposal Cell Pore-Water Levels in Standpipes 2 and 3 at the Rifle, Colorado, Disposal Site

## 14.9 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.

## 14.10 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the Estes Gulch Disposal Site near Rifle, Colorado*, DOE/AL/62350-235, Rev. 1, November.

## 14.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	—	Recent Graffiti on Gate Cover at Outer Entrance Gate (Text Blurred Due to Nature of Content) (Removed)
PL-2	355	Bullet Holes in Gate Cover at Outer Entrance Gate
PL-3	100	Regrowth on Last Year's Livestock Trails on Both Sides of Fence East of Reclaimed Area
PL-4	90	Bullet Damage (Legible) in Boundary Monument BM-2
PL-5	280	Tumbleweed Buildup in Wildlife Gates (Removed Following Inspection)
PL-6	—	Fractured Rock on Disposal Cell Top
PL-7	180	Treated Quackgrass, a State-Listed Noxious Weed
PL-8	90	One Deep-Rooted Woody Plant—Rubber Rabbitbrush—on Disposal Cell Top Slope
PL-9	95	Upslope of Interceptor Trench Erosion
PL-10	330	(a) Erosion in Interceptor Trench Outfall Channel—2019 (b) Erosion in Interceptor Trench Outfall Channel—2016 Photo for Comparison

**Note:**

— = Photograph taken vertically from above.





*PL-1. Recent Graffiti on Gate Cover at Outer Entrance Gate  
(Text Blurred Due to Nature of Content) (Removed)*



*PL-2. Bullet Holes in Gate Cover at Outer Entrance Gate*





*PL-3. Regrowth on Last Year's Livestock Trails on Both Sides of Fence East of Reclaimed Area*

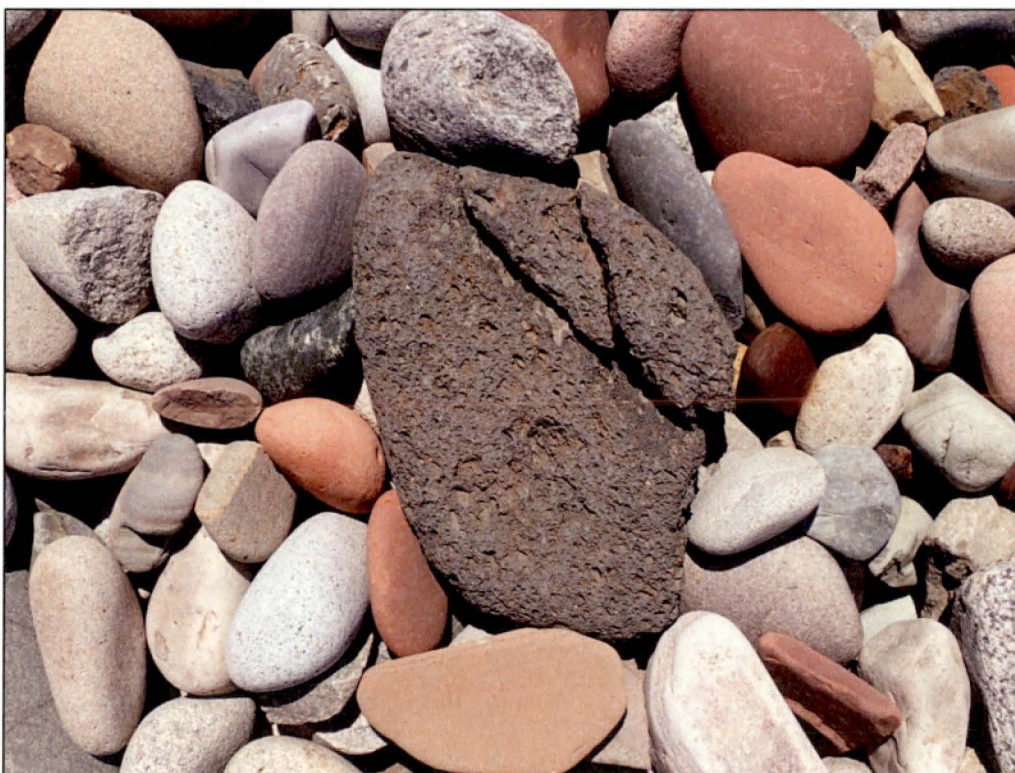


*PL-4. Bullet Damage (Legible) in Boundary Monument BM-2*





*PL-5. Tumbleweed Buildup in Wildlife Gates (Removed Following Inspection)*



*PL-6. Fractured Rock on Disposal Cell Top*





*PL-7. Treated Quackgrass, a State-Listed Noxious Weed*



*PL-8. One Deep-Rooted Woody Plant—Rubber Rabbitbrush—on Disposal Cell Top Slope*





*PL-9. Upslope of Interceptor Trench Erosion*

Photos continue on the next page.





*PL-10. (a) Erosion in Interceptor Trench Outfall Channel—2019*



*PL-10. (b) Erosion in Interceptor Trench Outfall Channel—2016 Photo for Comparison*



## 15.0 Salt Lake City, Utah, Disposal Site

### 15.1 Compliance Summary

The Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on April 30, 2019. No changes were observed on the disposal cell or in associated drainage features. Observations of rock-quality monitoring plots indicated no significant change from the previous year. Inspectors identified two routine maintenance needs but found no cause for a follow-up inspection. Groundwater monitoring is not required.

### 15.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1997) 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 15-1 lists these requirements.

*Table 15-1. License Requirements for the Salt Lake City, Utah, Disposal Site*

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 15.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 15.5	(b)(4)
Maintenance and Repairs	Section 5.0	Section 15.6	(b)(5)
Groundwater Monitoring	Section 4.0	Section 15.7	(b)(2)
Corrective Action	Section 6.0	Section 15.8	--

### 15.3 Institutional Controls

The 100-acre site, identified by the property boundary shown in Figure 15-1, is owned by the United States and was accepted under the NRC general license in 1997. The U.S. Department of Energy (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 and sign, fences, perimeter (warning) signs, site markers, and boundary monuments.

### 15.4 Inspection Results

The site, 81 miles west of Salt Lake City, Utah, was inspected on April 30, 2019. The inspection was conducted by J. Lobato and D. Traub of the Office of Legacy Management Support (LMS) contractor. J. Nguyen (Office of Legacy Management [LM] site manager) and C. Bishop (Utah Department of Environmental Quality) attended the inspection. T. Orton (EnergySolutions) escorted the inspection group, and S. Stanley (EnergySolutions) provided support as a radiation control technician (RCT). 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 the need, if any, for maintenance or additional inspection and monitoring.

#### **15.4.1 Site Surveillance Features**

Figure 15-1 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 2019 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 15-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 15.10.

##### ***15.4.1.1 Site Access, Entrance Gates, and Entrance Sign***

The site is completely surrounded by an active radioactive waste disposal facility operated by EnergySolutions. A perpetual right-of-way easement ensures that LM and its representatives have continued access across the EnergySolutions property to the site. LM provides EnergySolutions access to the site to perform periodic maintenance activities, as needed, through a signed access agreement. In accordance with the agreement, EnergySolutions is required to provide a minimum 48-hour notice to LM before accessing or conducting maintenance activities at the site.

All personnel entering the EnergySolutions facility must sign in at the security building. Because of the surrounding radioactive waste disposal facility, posted radiological control areas must be crossed to access the site. Therefore, EnergySolutions requires that inspectors and other site visitors receive a radiological hazard awareness briefing, sign a *Radiological Work Permit*, wear a dosimeter, and be escorted to and from the site. Hard hats, safety glasses, high-visibility vests, and steel-toed boots are also required on the EnergySolutions property. Following the inspection and before exiting the radiological control area, personnel and equipment are scanned for radiological contamination using a personal contamination monitor.

A route across the EnergySolutions property provides access to the southwest corner of the site. Six locked gates around the site limit access to the site and disposal cell. Two gates (Gate 61 and Gate 64) are in the southwest corner of the property, and one gate (Gate 87) is in the northwest corner of the property; these property boundary gates are maintained by EnergySolutions. The remaining three gates (Gate 65 in the northwest corner and Gate 60 and Gate 62 in the southwest corner) are along the interior chainlink security fence that surrounds the disposal cell; these interior gates are maintained by LM. Gates 60, 61, and 64 are considered site entrance gates. The gates were locked and functional. The entrance sign is on Gate 61 at the southwest corner of the site. No maintenance needs were identified.



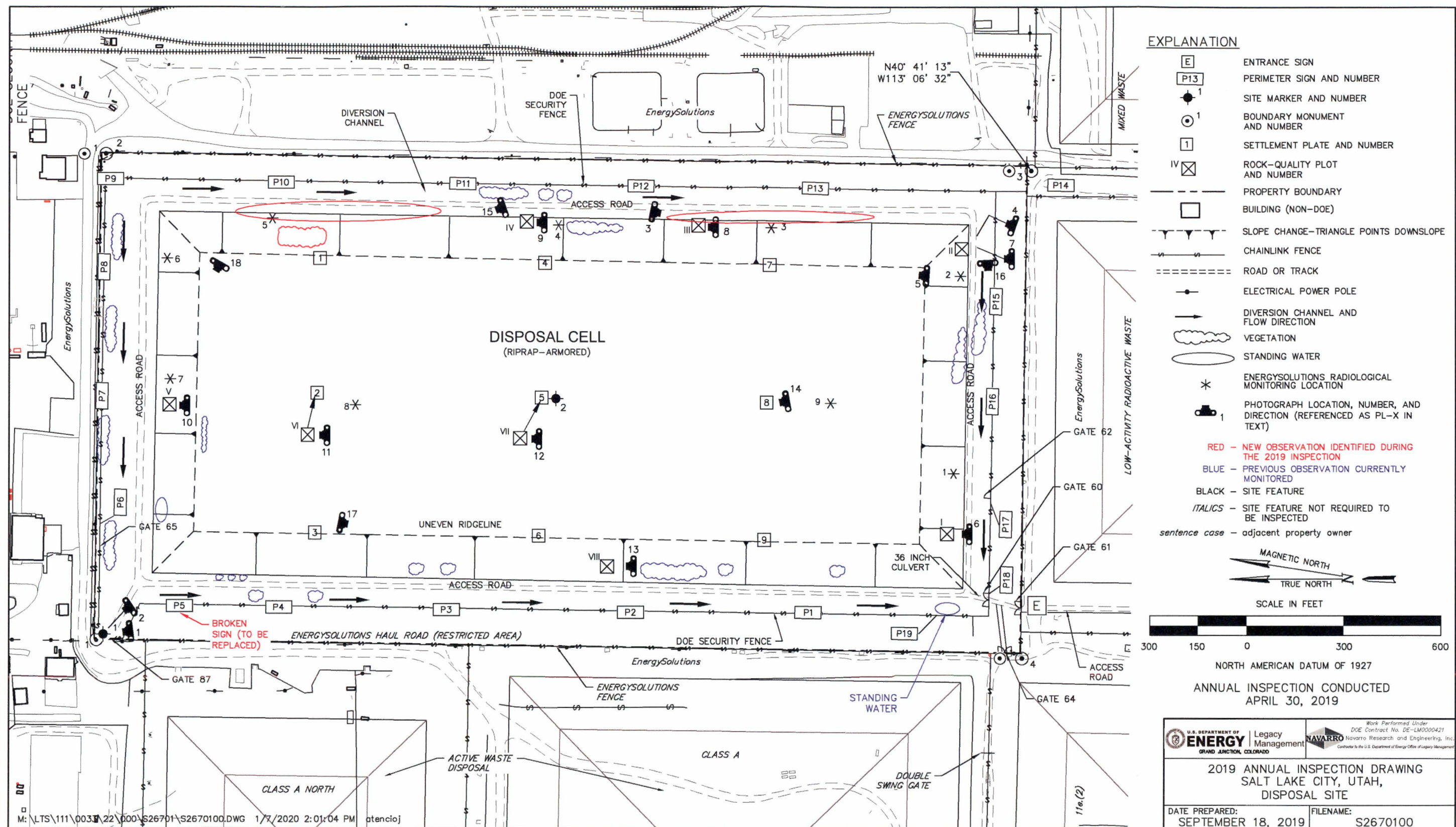


Figure 15-1. 2019 Annual Inspection Drawing for the Salt Lake City, Utah, Disposal Site

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#### ***15.4.1.2 Fences and Perimeter Signs***

There are two chainlink fences at the site: the exterior EnergySolutions perimeter fence along the property boundary and the interior LM security fence that encloses the disposal cell and surface water diversion channels. There are 19 perimeter signs attached to the LM security fence. Perimeter sign P5 was observed to be damaged and broken and will be replaced during the 2020 annual inspection.

#### ***15.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside Gate 87 in the northwest corner of the site (PL-1). Site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***15.4.1.4 Boundary Monuments***

Four boundary monuments delineate the corners of the property boundary (boundary monuments BM-1 to BM-4). Protective casings that EnergySolutions installed over each boundary monument continue to protect the boundary monuments from damage by surrounding earthmoving activities (PL-2). No maintenance needs were identified.

### **15.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area between the disposal cell and the site perimeter, and (3) 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 LTSP requirements.

#### ***15.4.2.1 Disposal Cell***

The disposal cell, completed in 1988, occupies 54 acres. The disposal cell is armored with riprap to control erosion. There were noticeable vehicle tracks on the east side slope of the disposal cell, but there was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell (PL-3, PL-4, and PL-5).

One of several types of rock used for the disposal cell erosion-protection riprap layer has exhibited minor degradation since the disposal cell was constructed. As a result, eight rock-quality monitoring plots, each measuring 1 square meter (indicated by Roman numerals I–VIII in Figure 15-1), were established in 2010 to monitor for continued rock degradation. The rock type exhibiting degradation constitutes approximately 1%–10% of the riprap material; degradation of this less competent rock is thought to result from freeze-thaw weathering. Rock-quality monitoring plots are visually monitored and documented annually with photographs.

Approximately 1%–10% of the rock in the plots exhibited signs of weathering during the 2019 annual inspection (PL-6 through PL-13), with no significant changes from the 2018 annual inspection. Comparisons to the initial 2010 rock-quality plot photographs indicate very little (if any) additional rock degradation since monitoring began. The minimal rock degradation

observed to date has not reduced the effectiveness of the riprap cover. Rock-quality monitoring plots will continue to be visually monitored and documented annually with photographs to ensure that the riprap continues to protect the integrity of the disposal cell.

There are nine settlement plates on the top slope of the disposal cell (PL-14); several outer casings associated with the settlement plates were visually inspected. Surveying of the settlement plates is not required unless settlement appears to be occurring. Every year, EnergySolutions performs light detection and ranging (LIDAR) surveys of the area, including this disposal cell; these LIDAR survey results are available on request.

Although areas of the disposal cell have continued to have minor perennial grass growth, no deep-rooted plants were growing on the disposal cell. Standing water from precipitation runoff was observed in the apron at the base of the east side slope of the disposal cell toe drainage (PL-15); no adverse impacts to the disposal cell were noted or expected as a result of this water. No maintenance needs were identified.

#### ***15.4.2.2 Area Between Disposal Cell and Site Perimeter***

The inspectors examined the area between the toe of the disposal cell and the EnergySolutions security fence on the property boundary. No evidence of erosion was observed. Vegetation continues to encroach along the access road (PL-16), but the road remains functional, and no maintenance is currently required.

The surface water diversion channels were functioning as designed. Although minor areas of ponded water were observed, vegetation growth in these diversion channels is not impeding surface water runoff.

Radiological surveys are performed every 2 years on the site by EnergySolutions personnel to confirm the absence of spillover or windblown radioactive contamination from surrounding radioactive waste disposal operations. Survey measurements include taking dose rate measurements at random locations across the site and collecting wipe samples that are analyzed for gross alpha and beta radiation contamination.

Dose rate measurements and wipe samples were collected at various locations around the base of the disposal cell, including on the disposal cell top slope, during the 2019 annual inspection. Nine wipe samples were collected by the EnergySolutions RCT at the specific radiological monitoring locations depicted in Figure 15-1. The RCT also collected dose rate measurements at random locations throughout the duration of the inspection using a handheld meter capable of detecting radiation doses greater than 20 microrem per hour ( $\mu\text{rem/h}$ ).

Results from the radiological surveys conducted at the site to date have been below the applicable exposure limits established in LM's *Radiological Control Manual* (LMS/POL/S04322). Therefore, both spillover and windblown radiological contamination from the surrounding radioactive waste disposal operation are not evident. All results from the 2019 wipe samples collected by EnergySolutions were below the minimum detectable activities (i.e., nondetect) for removable alpha and beta radiation contamination. Additionally, no dose rate measurements exceeding the detection limit of 20  $\mu\text{rem/h}$  were detected during the inspection. The next radiological survey will occur during the 2021 annual site inspection.



EnergySolutions conducts periodic walkthroughs of the site to remove any windblown debris, and the company reported no debris on the site in 2019. No maintenance needs were identified.

#### **15.4.2.3 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 impacts were observed. A variety of features and ongoing waste disposal activities that are managed by EnergySolutions surround the site. The most obvious waste disposal activities are occurring directly west of the site where a Class A (i.e., low-level radioactive waste) disposal cell is being capped (PL-17). On the northeast and east sides of the site, incoming wastes are unloaded from railcars and transferred to haul trucks; decontamination facilities are also present. Directly to the south is a completed low-level radioactive waste disposal cell, to the southwest is a waste disposal cell containing Atomic Energy Act Section 11e.(2) byproduct material, and to the southeast is an operating mixed-waste treatment and disposal facility. Administration, security, and maintenance buildings lie directly north-northwest of the site (PL-18). A shredding facility, rotary dump, and railroad spur delivery loop are northwest of the site. These adjacent operations and facilities are not affecting the site.

### **15.5 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 have substantially changed. No need for a follow-up inspection was identified.

### **15.6 Maintenance and Repairs**

Inspectors documented minor maintenance needs that have not been addressed but will be during the 2020 inspection, including:

- Replacing broken perimeter sign P5

No other maintenance needs were identified.

### **15.7 Groundwater Monitoring**

In accordance with the LTSP, groundwater monitoring is not required. Supplemental standards have been applied as the site standards because (1) the uppermost aquifer is classified as limited use due to naturally occurring concentrations of total dissolved solids that exceed 10,000 milligrams per liter, and (2) the site is not contributing to the contamination of any current or potentially useful aquifer. EnergySolutions owns and maintains several groundwater monitoring wells throughout its licensed radioactive waste facility.

### **15.8 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.

## 15.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the South Clive Disposal Site, Clive, Utah*, DOE/AL/62350-228, Rev. 2, September.

*Radiological Control Manual*, LMS/POL/S04322, continually updated, prepared by Navarro Research and Engineering, Inc., for the U.S. Department of Energy Office of Legacy Management.

## 15.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	350	Site Marker SMK-1
PL-2	325	Boundary Monument BM-1
PL-3	190	Tracks Observed on East Side Slope of Disposal Cell
PL-4	20	Southeast Corner of Disposal Cell and Apron
PL-5	5	View North from Southeast Corner of Disposal Cell
PL-6	—	(a) Rock Quality Plot No. I—2019 (b) Rock Quality Plot No. I—2010 Photo for Comparison
PL-7	—	(a) Rock Quality Plot No. II—2019 (b) Rock Quality Plot No. II—2010 Photo for Comparison
PL-8	—	(a) Rock Quality Plot No. III—2019 (b) Rock Quality Plot No. III—2010 Photo for Comparison
PL-9	—	(a) Rock Quality Plot No. IV—2019 (b) Rock Quality Plot No. IV—2010 Photo for Comparison
PL-10	—	(a) Rock Quality Plot No. V—2019 (b) Rock Quality Plot No. V—2010 Photo for Comparison
PL-11	—	(a) Rock Quality Plot No. VI—2019 (b) Rock Quality Plot No. VI—2010 Photo for Comparison
PL-12	—	(a) Rock Quality Plot No. VII—2019 (b) Rock Quality Plot No. VII—2010 Photo for Comparison
PL-13	—	(a) Rock Quality Plot No. VIII—2019 (b) Rock Quality Plot No. VIII—2010 Photo for Comparison
PL-14	350	Settlement Plate 8
PL-15	340	Standing Water in Disposal Cell Toe Drainage
PL-16	270	Saltbush Growing on Disposal Cell Access Road
PL-17	190	Intersection of Disposal Cell Top with West Side Slope of Disposal Cell; EnergySolutions Disposal Cell in Background
PL-18	300	EnergySolutions Facility on North Side of Cell

**Note:**

— = Photograph taken vertically from above.





*PL-1. Site Marker SMK-1*



*PL-2. Boundary Monument BM-1*





*PL-3. Tracks Observed on East Side Slope of Disposal Cell*



*PL-4. Southeast Corner of Disposal Cell and Apron*





*PL-5. View North from Southeast Corner of Disposal Cell*

*Photographs continue on next page.*





PL-6. (a) Rock Quality Plot No. I—2019



PL-6. (b) Rock Quality Plot No. I—2010 Photo for Comparison





*PL-7. (a) Rock Quality Plot No. II—2019*



*PL-7. (b) Rock Quality Plot No. II—2010 Photo for Comparison*





*PL-8. (a) Rock Quality Plot No. III—2019*

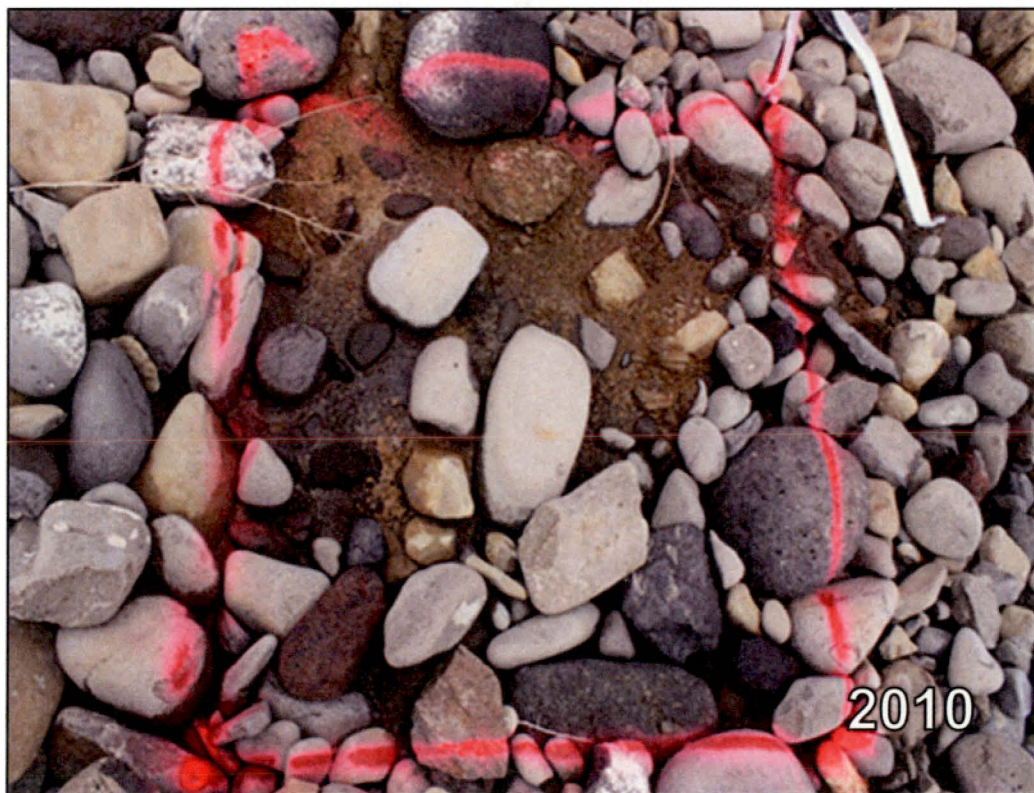


*PL-8. (b) Rock Quality Plot No. III—2010 Photo for Comparison*





*PL-9. (a) Rock Quality Plot No. IV—2019*



*PL-9. (b) Rock Quality Plot No. IV—2010 Photo for Comparison*





*PL-10. (a) Rock Quality Plot No. V—2019*



*PL-10. (b) Rock Quality Plot No. V—2010 Photo for Comparison*





*PL-11. (a) Rock Quality Plot No. VI—2019*



*PL-11. (b) Rock Quality Plot No. VI—2010 Photo for Comparison*





*PL-12. (a) Rock Quality Plot No. VII—2019*



*PL-12. (b) Rock Quality Plot No. VII—2010 Photo for Comparison*





*PL-13. (a) Rock Quality Plot No. VIII—2019*



*PL-13. (b) Rock Quality Plot No. VIII—2010 Photo for Comparison*





*PL-14. Settlement Plate 8*



*PL-15. Standing Water in Disposal Cell Toe Drainage*





*PL-16. Saltbush Growing on Disposal Cell Access Road*



*PL-17. Intersection of Disposal Cell Top with West Side Slope of Disposal Cell;  
EnergySolutions Disposal Cell in Background*





*PL-18. EnergySolutions Facility on North Side of Cell*



## 16.0 Shiprock, New Mexico, Disposal Site

### 16.1 Compliance Summary

The Shiprock, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on June 12, 2019. No changes were observed on the disposal cell or in the associated diversion channels. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection. Groundwater monitoring to evaluate disposal cell performance is not required.

### 16.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1994) and 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 16-1 lists these requirements.

Table 16-1. License Requirements for the Shiprock, New Mexico, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 16.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 16.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 16.6	(b)(5)
Environmental Monitoring	Sections 5.0 and 6.4	Section 16.7	(b)(2)
Corrective Action	Section 9.0	Section 16.8	--

### 16.3 Institutional Controls

The 105-acre site, identified by the property boundary shown in Figure 16-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized the U.S. Department of Energy (DOE) to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation and required it to be in place before bringing the site under the general license. DOE and the Navajo Nation executed a Custodial Access Agreement that conveys to the federal government title to the residual radioactive materials stabilized at the repository site and ensures that DOE has perpetual access to the site.

The site was accepted under the NRC 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 custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gates and signs, perimeter fence and signs, site markers, survey and boundary monuments, and erosion control markers.

## 16.4 Inspection Results

The site, 1 mile south of Shiprock, New Mexico, was inspected on June 12, 2019. The inspection was conducted by M. Kastens, K. Whysner, D. Miller, and J. Bailey of the Office of Legacy Management Support (LMS) contractor. M. Kautsky (Office of Legacy Management [LM] site manager), M. Poston-Brown (NRC), G. Jay (LMS), and J. Tallbull (Navajo Nation Abandoned Mine Lands [AML] Program) attended the inspection. The purposes of the inspection were to confirm the integrity of the visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate the need, if any, for maintenance or additional inspection and monitoring.

### 16.4.1 Site Surveillance Features

Figure 16-1 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 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 16-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 16.10.

#### 16.4.1.1 Access Roads, Entrance Gates, and Entrance Signs

Access to the site is from a gravel road off U.S. Highway 491. Three gates allow access to the site through the perimeter fence: the east gate (the current main entrance gate near the terrace escarpment), the north gate (an auxiliary access gate), and the west gate (the former main entrance gate). Access to the main entrance gate is through a gravel pit. The three gates were locked and functional. Pairs of entrance signs—one pictorial and one textual—are present near each gate. One pair is present at the east and north gates, and two pairs are present at the west gate. The pictorial sign next to the entrance sign was faded and replaced after the inspection. No other maintenance needs were identified.

#### 16.4.1.2 Perimeter Fence and Signs

A chainlink perimeter fence encloses the disposal cell and drainage features. A gap was observed under the fence near perimeter sign P3. The 8-inch gap under the perimeter fence identified in 2018 was still present near perimeter sign P15. Maintenance to repair both gaps was completed in 2019 following the inspection. One perimeter fence post near perimeter sign P15 was disconnected, and a barbed-wire stanchion was damaged. These items were repaired following the inspection in 2019. Near perimeter sign P15, construction materials were again observed leaning against the perimeter fence in several locations on the Navajo Engineering and Construction Authority (NECA) side (PL-1). Dirt accumulation against the perimeter fence has bent the fence fabric between perimeter signs P11 and P12 (PL-2). NECA management was contacted following the inspection and requested to address both these maintenance needs.



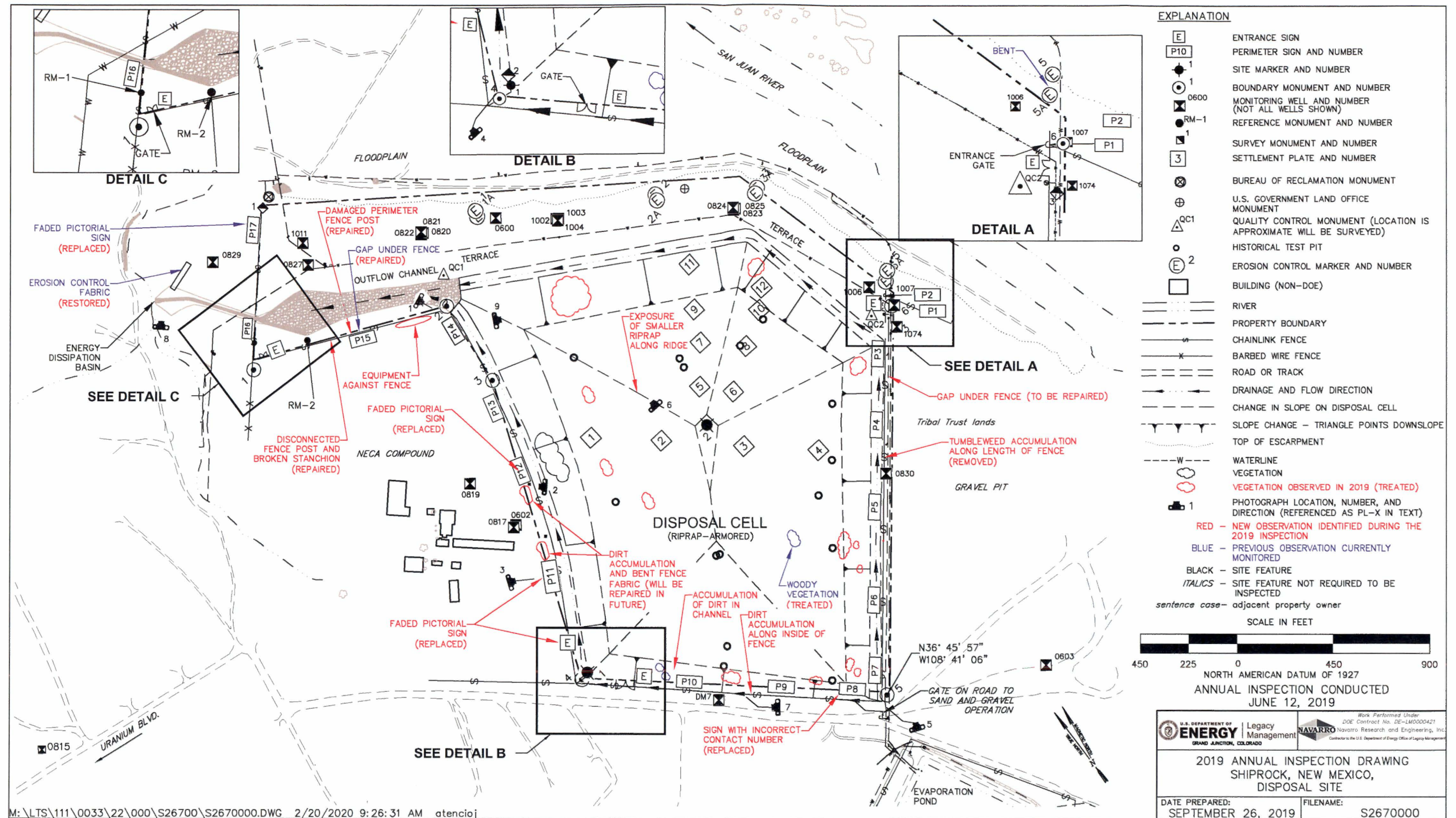


Figure 16-1. 2019 Annual Inspection Drawing for the Shiprock, New Mexico, Disposal Site

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Dirt accumulation was also observed along the inside of the perimeter fence between perimeter signs P9 and P10. No maintenance is needed at this time. Inspectors will continue to monitor these areas. Regular maintenance continues to mitigate the accumulation of trash and tumbleweeds along the fence, although some minor tumbleweed accumulation was observed along the southeastern perimeter fence between perimeter signs P3 and P7. Maintenance to keep the perimeter fence lines free of debris will continue.

There are 17 pairs of perimeter signs, designated P1 through P17 (each pair consisting of one pictorial and one textual sign), positioned along the perimeter fence.<sup>1</sup> The pictorial signs near the southwestern entrance sign and perimeter signs P11, P12, and P17 were faded (PL-3) and were replaced following the inspection. The phone number on perimeter sign P8 was updated following the inspection. No other maintenance needs were identified.

#### ***16.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the west gate; minor cracks in its concrete base were resealed in 2018 (PL-4). Site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***16.4.1.4 Survey and Boundary Monuments***

Three survey monuments and six boundary monuments delineate the property boundary. Two additional boundary monuments are offsite; monitoring of these monuments was discontinued in 1999 and 2003. Steel T-posts were installed next to all boundary monuments to help inspectors locate the monuments. The site map was updated with the more recent coordinates for boundary marker BM-6, as resurveyed in 2018. Boundary marker BM-1 was identified within the NECA yard, and the location was added to the site map following the inspection. The GPS coordinates were resurveyed in 2019 following the inspection. The concrete at survey monument SM-1 is cracked, but the crack does not threaten the integrity of the marker. All boundary monuments were observed to be clear of vegetation and visible during the inspection. No maintenance needs were identified.

#### ***16.4.1.5 Erosion Control Markers***

The site has four pairs of erosion control markers along the edge of the terrace escarpment (1/1A; 2/2A; 3/3A; and 5/5A). Erosion control markers 4 and 4A are not inspected; they were installed on the terrace, east of the site, in the gravel pit. Erosion control marker 5A, near the east entrance gate, was previously bent by a vehicle, but it is still functional and does not require repair. No maintenance needs were identified.

### **16.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, diversion channels at the base of the disposal cell, and the outflow channel; (2) the terrace area north and northeast of the

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<sup>1</sup> Plate 1 of the LTSP shows six sets of perimeter signs on fence fabric along the terrace escarpment. These were never installed because a fence was never installed in this area. As the escarpment itself prohibits access to the site, a fence was not needed.

disposal cell; and (3) the outlying area, which includes the fenced evaporation pond south of the disposal cell and the gravel pit southeast of the disposal cell. 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.

#### ***16.4.2.1 Disposal Cell, Diversion Channels, and Outflow Channel***

The disposal cell, completed in 1986, occupies 77 acres and is armored in riprap to control erosion and deter animal and human intrusion (PL-5). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. Piezocones associated with a research project were installed on the disposal cell cover in the past and are no longer in use. Some of the filled piezocone pits have subsided slightly or were never completely backfilled, which resulted in shallow conical depressions in the cover. As reported in previous site inspection reports, the surface of the disposal cell contains numerous ruts associated with past vehicle traffic. An area where smaller riprap has been exposed was identified along the northern ridge of the disposal cell (PL-6). This area will be monitored for further changes that might indicate erosion or degradation of the cover. The condition of other depressions and vehicle ruts is monitored annually and has not changed significantly since the 2014 inspection.

Windblown sediment has accumulated in the rock cover in several places. In accordance with the LTSP, woody, deep-rooted shrubs are controlled. Numerous woody shrubs were growing on the top and side slopes of the disposal cell; these were treated in 2019 following the inspection.

Diversion channels around the base of the disposal cell contained scattered vegetation, including several woody shrubs. The channel along the southwestern side of the disposal cell has accumulated sediment, and a significant amount of vegetation has grown (PL-7). It is possible that the sediment was generated from the maintenance of the road adjacent to the perimeter fence and has settled in the bottom of the channel. These shrubs do not adversely affect the performance of the diversion channel at this time and are not a concern, but they will continue to be monitored. Nonwoody plants were growing within the outflow channel, and woody vegetation was growing on the banks of the channel. No other maintenance needs were identified.

#### ***16.4.2.2 Terrace Area***

The terrace area is north and northeast of the disposal cell along the top of a steep escarpment. Other than annual weeds, little vegetation grows on the terrace. The edge of the escarpment varies between 175 and 345 feet from the base of the disposal cell and is prone to slumping. No new significant erosion was evident in 2019. The LTSP states that the base of the terrace escarpment should be inspected for signs of seepage, and seeps were identified during early site inspections. However, this is no longer part of annual inspection procedures because the seeps are now being monitored as part of the groundwater compliance strategy for the site. No maintenance needs were identified.

#### ***16.4.2.3 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 impacts were observed. A former gravel pit that is no longer actively extracting aggregate is immediately southeast of the disposal cell. Inspectors identified no significant changes in land use associated with the gravel pit or with other outlying areas near the disposal cell.

In 2002, LM constructed an 11-acre lined evaporation pond near the disposal cell as part of the groundwater compliance strategy. The pond, surrounded by a chainlink security fence, is maintained under the groundwater compliance strategy. Both the security fence and pond were intact and functional at the time of the inspection. Inspectors noted that the offsite portion of the outflow channel was functional and clear of debris. The degraded portion of the erosion control fabric on the south-facing bank of the energy dissipation basin identified during the 2018 inspection has been repaired and is functioning as intended (PL-8).

Fences and warning signs posted in Bob Lee Wash are maintained under the groundwater compliance strategy and are not examined during the annual inspection. No other maintenance needs were identified.

## **16.5 Follow-Up or Contingency Inspections**

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

## **16.6 Maintenance and Repairs**

Minor maintenance needs identified by the inspectors during the 2018 annual inspection and completed in 2019, include the following:

- Replacing the pictorial perimeter sign P17
- Repairing the gap under the perimeter fence near perimeter sign P15
- Treating woody vegetation on the disposal cell top and side slopes
- Repairing the degraded portion of the erosion control fabric on the south-facing bank of the energy dissipation basin

Inspectors documented minor maintenance needs that were addressed following the inspection, including the following:

- Replacing the faded pictorial sign next to the entrance sign
- Repairing a fence post and stanchion near perimeter sign P15
- Contacting NECA management to request removal of construction material leaning against the perimeter fence near perimeter sign P15, repair of the fence fabric between perimeter signs P11 and P12, and assistance in fence repairs along the common fence
- Removing accumulating tumbleweeds on the southeast side of the perimeter fence
- Replacing the pictorial signs next to the southwest entrance sign and perimeter signs P11 and P12
- Treating new woody vegetation on the disposal cell top and side slopes

Ongoing maintenance conducted at the site includes removal of trash and debris (including tumbleweeds) along the perimeter fence.

## **16.7 Environmental Monitoring**

### **16.7.1 Groundwater Monitoring**

In accordance with the LTSP, groundwater monitoring to evaluate disposal cell performance is not required. However, groundwater monitoring is conducted in accordance with a groundwater compliance strategy. The monitoring wells associated with the groundwater compliance strategy (along the terrace and at offsite locations) are not included in the annual inspection process. All wells encountered during the inspection were locked, and no maintenance needs were observed.

### **16.7.2 Vegetation Monitoring**

In a 1999 letter to the Navajo AML Reclamation/Uraniun Mill Tailings Remedial Action Department (Bergman-Tabbert 1999), LM committed to spraying annual weeds on the disposal cell top slope. During the inspection, annual weeds were observed growing on less than 1% of the top slope. After discussion among LM, Navajo AML, and LMS ecologists, LM recommended that it cease treatment of nonnoxious weeds on the cell and allow natural plant succession to progress. LM wrote a new letter to Navajo AML outlining its proposed vegetation management plan. Under the plan, LM would continue to treat State of New Mexico- and Navajo Nation-listed noxious weeds (primarily *Halogeton glomeratus*) in accordance with applicable laws and deep-rooted woody species in accordance with the LTSP (Kautsky 2019). Vegetation will continue to be monitored to inform future management decisions (PL-9).

## **16.8 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.

## **16.9 References**

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

Bergman-Tabbert, 1999. D. Bergman-Tabbert, Site Manager, U.S. Department of Energy Office of Legacy Management, letter (about Shiprock Uranium Mill Tailings Remedial Action site) to M. Roanhorse, Division of Natural Resources, Navajo Uranium Mill Tailings Remedial Action Program, May 13.

DOE (U.S. Department of Energy), 1994. *Long-Term Surveillance Plan for the Shiprock Disposal Site, Shiprock, New Mexico*, DOE/AL/62350-60F, Rev. 1, September.



Kautsky, M., 2019. Mark Kautsky, Title I Manager, U.S. Department of Energy Office of Legacy Management, letter (on Proposed Revision to Vegetation Control on the Shiprock Disposal Cell) to Madeline Roanhorse, Director Navajo Nation UMTRA Program Division of Natural Resources, October 10, 2019.

## 16.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	160	NECA Equipment Against Perimeter Fence Between Perimeter Signs P14 and P15
PL-2	315	Dirt Accumulation Against Perimeter Fence Between Perimeter Signs P11 and P12
PL-3	115	Faded Pictorial Perimeter Sign P11 at NECA Yard
PL-4	—	Site Marker SMK-1
PL-5	25	Perimeter Fence and Southern Corner of Disposal Cell
PL-6	—	Exposure of Smaller Cobbles and Gravels Along Ridge of Disposal Cell
PL-7	310	Sediment Accumulation in Diversion Channel Along Southwest Slope of Disposal Cell
PL-8	45	Revegetated Slopes at Energy Dissipation Basin
PL-9	120	Vegetation on Northeast Side Slope of Disposal Cell (Treated)

**Note:**

— = Photograph taken vertically from above.



*PL-1. NECA Equipment Against Perimeter Fence Between Perimeter Signs P14 and P15*



*PL-2. Dirt Accumulation Against Perimeter Fence Between Perimeter Signs P11 and P12*





PL-3. Faded Pictorial Perimeter Sign P11 at NECA Yard



PL-4. Site Marker SMK-1





*PL-5. Perimeter Fence and Southern Corner of Disposal Cell*



*PL-6. Exposure of Smaller Cobbles and Gravels Along Ridge of Disposal Cell*





*PL-7. Sediment Accumulation in Diversion Channel Along Southwest Slope of Disposal Cell*



*PL-8. Revegetated Slopes at Energy Dissipation Basin*





*PL-9. Vegetation on Northeast Side Slope of Disposal Cell (Treated)*



## 17.0 Slick Rock, Colorado, Disposal Site

### 17.1 Compliance Summary

The Slick Rock, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on May 29, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several routine maintenance needs but found no cause for a follow-up or contingency inspection. Groundwater monitoring is not required.

### 17.2 Compliance Requirements

Requirements for long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1998) 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 17-1 lists these requirements.

*Table 17-1. License Requirements for the Slick Rock, Colorado, Disposal Site*

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.0 and 6.2	Section 17.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 17.5	(b)(4)
Maintenance and Repairs	Section 4.0	Section 17.6	(b)(5)
Groundwater Monitoring	Section 2.5	Section 17.7	(b)(2)
Corrective Action	Section 5.0	Section 17.8	--

### 17.3 Institutional Controls

The 62-acre site, defined by the property boundary shown in Figure 17-1, is owned by the United States and was accepted under the NRC general license in 1998. The U.S. Department of Energy (DOE) is the licensee and, in accordance with 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 gate and sign, perimeter fence and signs, site markers, and survey and boundary monuments.

### 17.4 Inspection Results

The site, 5 miles northeast of Slick Rock, Colorado, was inspected on May 29, 2019. The inspection was conducted by D. Traub and D. Marshall of the Office of Legacy Management Support (LMS) contractor. J. Nguyen (Office of Legacy Management [LM] site manager), M. Cosby (Colorado Department of Public Health and Environment), L. Gersey and A. Roberts (NRC), and K. Whysner and K. Meadows (both of 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 the need, if any, for maintenance or additional inspection and monitoring.

### **17.4.1 Site Surveillance Features**

Figure 17-1 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 2019 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 17-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 17.10.

#### ***17.4.1.1 Entrance Gate and Sign***

Access to the site is from San Miguel County Road T11. Entrance to the site is through a chained and locked gate. The wire entrance gate was locked and is worn but remains functional. The entrance sign is next to the gate. No maintenance needs were identified.

#### ***17.4.1.2 Perimeter Fence and Signs***

A four-strand barbed-wire perimeter fence encloses the disposal cell, drainage structures, and much of the site. The top and bottom strands are smooth wire to allow wildlife to pass over and under, and the middle two strands are barbed wire. A T-post along the northeast perimeter fence was broken and will be repaired before the next inspection. Woody vegetation was growing in the perimeter fence, including a rabbitbrush near the entrance sign (PL-7). Following the inspection, the rabbitbrush was removed and the vegetation sprayed with herbicide.

There are 32 perimeter signs, attached to steel posts set in concrete, positioned along the property boundary; they are set back 5 feet (ft) and cut in at the southwest corner. Some cracking of the printed overlay is beginning to appear on several signs, and several signs have bullet damage, but all remain legible (PL-1). The concrete bases on two perimeter signs (P14 and P15) are slightly undercut by erosion but remain stable. No other maintenance needs were identified.

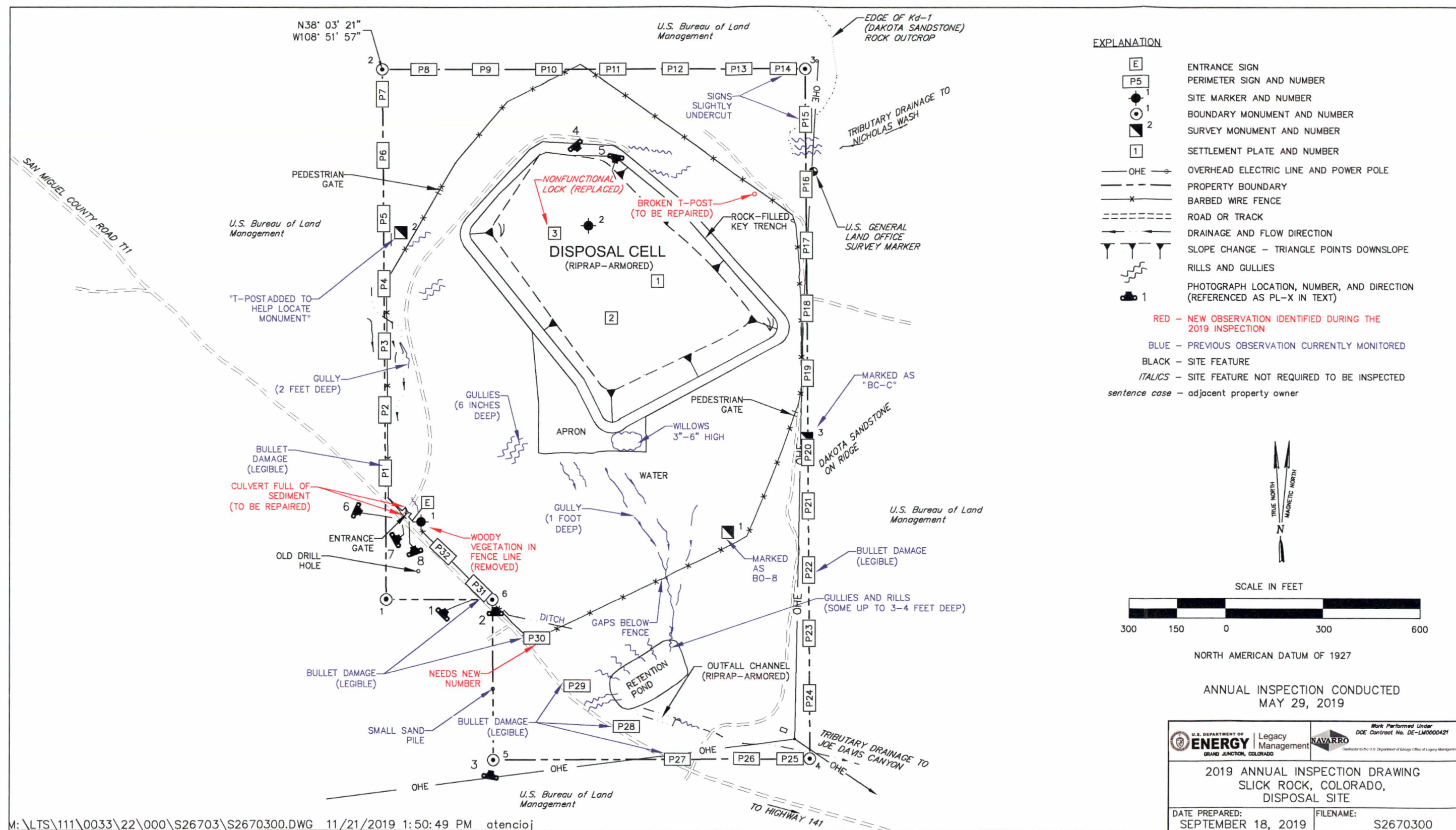
#### ***17.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. Erosion near site marker SMK-1 is being monitored and will be repaired if it threatens the integrity of the marker. No immediate maintenance needs were identified.

#### ***17.4.1.4 Survey and Boundary Monuments***

The site has three survey monuments. Survey monument SM-2 was set in a low area and is frequently covered by several inches of soil. A T-post and rocks have been placed next to the monument to assist in locating this feature. Six boundary monuments delineate the corners of the site boundary (PL-2). No maintenance needs were identified.





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## **17.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, including side slopes, key trench, and apron; (2) the area between the disposal cell and the site boundary; and (3) 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 LTSP requirements.

### ***17.4.2.1 Disposal Cell, Key Trench, and Apron***

The disposal cell, completed in 1996, occupies 12.9 acres and is armored with riprap, consisting of rounded, cobble-sized river rock to control erosion and deter animal and human intrusion (PL-3 and PL-4). The inspection found no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. During the 2016 annual inspection, inspectors observed a small area below the grade break with the top slope where the rock surface appears lower than the surrounding rock. This was inspected in 2017, 2018, and 2019 and could not be located. Inspectors will continue to monitor the area.

At the toe of the disposal cell side slopes is a key trench that encloses the disposal cell. The key trench, designed to convey runoff water away from the disposal cell, is as much as 5 ft deep and 20 ft wide and filled with rock. Runoff water from the key trench discharges to an apron at the south (downslope) corner of the disposal cell. The apron extends 50 to 200 ft beyond the key trench. The key trench and apron are covered with rounded cobble- and pebble-sized river rock. Willow brush (a deep-rooted species) is growing on a portion of the apron but is not considered to be detrimental to the integrity of the disposal cell. The settlement plate SP-3 lock was not functional and was replaced during the inspection. No other maintenance needs were identified.

### ***17.4.2.2 Area Between the Disposal Cell and the Site Boundary***

The area around the disposal cell includes the retention pond. Surface drainage from the disposal cell flows south from the apron into the retention pond, which is constructed in a channel tributary to Joe Davis Canyon. An outflow channel below the pond is lined with rounded riprap for a short distance. The pond was dry at the time of inspection.

The site was graded for sheet flow from the apron to the retention pond. Rills have been developing since 1998 on the northwest side of the retention pond and now are as much as 3 ft deep adjacent to the pond and shallower farther upslope. The rills are stabilizing. Abundant rock is naturally present in the soil, and additional rock was added to the deeper rills to arrest or slow erosion. Beneficial vegetation is also establishing in the bottoms of the rills. The erosion does not present a hazard to the disposal cell or to any site features, so repairs are not warranted. Instead, the rills should be allowed to further stabilize. Inspectors will continue to monitor these erosional features.

Erosion rills and gullies are present in several other areas of the site but do not affect the disposal cell or any site features. They appear to be stabilizing with the establishment of vegetation but will continue to be monitored. Vegetation in the reclaimed areas was healthy. Noxious weeds are controlled to comply with State of Colorado and San Miguel County requirements.

Two culverts are present (1) beneath the site access road outside of the entrance gate and (2) beneath the access road inside the entrance gate. Both culverts are approximately 80% to 90% full of sediment (PL-5 and PL-6). Vegetation growing in the drainage channel has stabilized the sediment. Before the next inspection, maintenance will be conducted to clear established vegetation from the drainage channel and clear the culverts so they perform as designed. No other maintenance needs were identified.

#### **17.4.2.3 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 impacts were observed. The natural, undisturbed areas outside the site support grass and scattered pinyon and juniper trees. Steep hillsides north and northeast of the site slope eastward into Nicholas Wash. The primary land use is grazing. The areas north and northeast of the site also are routinely used for firewood cutting and recreation, such as hunting and off-road use by all-terrain vehicles.

### **17.5 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) a citizen or outside agency notifies LM that conditions at the site are substantially changed. No need for a follow-up inspection was identified.

### **17.6 Maintenance and Repairs**

Inspectors documented minor maintenance needs that were completed in 2019 following the inspection. They include:

- Removal of rabbitbrush growing at the fence post near the entrance sign
- Herbicide spraying of woody vegetation growing at fence T-posts
- Replacement of the lock on settlement plate SP-3

Remaining site maintenance will be completed before the next inspection in 2020, which includes:

- Clearing accumulated sediment from culverts near the site entrance
- Minor fence repair to replace a broken T-post along the northeast boundary of the site

### **17.7 Groundwater Monitoring**

In accordance with the LTSP, groundwater monitoring at this site is not required. 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 of low yield. The aquifer does not yield a large enough quantity of water to be used for beneficial purposes; with no complete exposure pathways at the site, monitoring is not required. All monitoring wells were abandoned in 2001, and the standpipes in the disposal cell were abandoned in 2002.



## 17.8 Corrective Action

In accordance with the LTSP, corrective action is taken to correct conditions that threaten the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

## 17.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1998. *Long-Term Surveillance Plan for the Burro Canyon Disposal Cell, Slick Rock, Colorado*, DOE/AL/62350-236, Rev. 0, Ver. 4, May.

## 17.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	45	Perimeter Sign P31
PL-2	—	Boundary Monument BM-5
PL-3	140	View Southeast to Eastern Corner of Disposal Cell
PL-4	250	View to Southwest Along East Edge of Disposal Cell
PL-5	190	North Roadside Culvert
PL-6	60	South Roadside Culvert
PL-7	340	Woody Vegetation Next to Fence Post with Culvert at Gate Entrance

**Note:**

— = Photograph taken vertically from above.



*PL-1. Perimeter Sign P31*



*PL-2. Boundary Monument BM-5*





*PL-3. View Southeast to Eastern Corner of Disposal Cell*



*PL-4. View to Southwest Along East Edge of Disposal Cell*





*PL-5. North Roadside Culvert*



*PL-6. South Roadside Culvert*





*PL-7. Woody Vegetation Next to Fence Post with Culvert at Gate Entrance*

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## 18.0 Spook, Wyoming, Disposal Site

### 18.1 Compliance Summary

The Spook, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on July 17, 2019. No changes were observed on the land surface of the disposal cell. Inspectors identified no maintenance needs and found no cause for a follow-up or contingency inspection. Groundwater monitoring is not required.

### 18.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1993) 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 18-1 lists these requirements.

*Table 18-1. License Requirements for the Spook, Wyoming, Disposal Site*

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 18.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 18.5	(b)(4)
Maintenance	Section 8.0	Section 18.6	(b)(5)
Groundwater Monitoring	Section 5.0	Section 18.7	(b)(2)
Corrective Action	Section 9.0	Section 18.8	--

### 18.3 Institutional Controls

The 14-acre site, identified by the property boundary shown in Figure 18-1, is owned by the United States and was accepted under the NRC general license in 1993. The U.S. Department of Energy (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, entrance sign, perimeter signs, site markers, and survey and boundary monuments.

### 18.4 Inspection Results

The site, 48 miles northeast of Casper, Wyoming, was inspected on July 17, 2019. The inspection was conducted by C. Boger, R. Johnson, B. Mays, and N. Keller of the Office of Legacy Management Support contractor. T. Jasso (Office of Legacy Management [LM] site manager) 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 the need, if any, for maintenance or additional inspection and monitoring.

### **18.4.1 Site Surveillance Features**

Figure 18-1 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. There were no new observations in 2019. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 18-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 18.10.

#### ***18.4.1.1 Access Road and Entrance Sign***

Access to the site is from Wyoming Highway 95 from Glenrock or Wyoming Highway 93 from Douglas to Converse County Road 31 and onto the Hornbuckle Ranch Road. Site access is maintained through perpetual easements across the Hornbuckle ranch. The road to the site is graded and hard packed and is maintained by the ranch. The entrance sign is mounted on a steel post set in concrete (PL-1). No maintenance needs were identified.

#### ***18.4.1.2 Perimeter Signs***

There are 10 perimeter signs, attached to steel posts set in concrete, positioned around the site outside the unfenced property boundary (PL-2). The DOE 24-hour telephone number was updated on perimeter sign P10 during the inspection. No maintenance needs were identified.

#### ***18.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 is at the south side of the disposal cell. Its concrete base is damaged due to spalling but is stable; there were no apparent changes from the previous year. Site marker SMK-2 is at the north side of the disposal cell (PL-3). No maintenance needs were identified.

#### ***18.4.1.4 Survey and Boundary Monuments***

The site has three survey monuments and eight boundary monuments (PL-4). Boundary monument BM-6 is bent but stable. The boundary monuments and a survey monument, as well as the perimeter signs, are outside the property boundary. The owner of the surrounding property (Hornbuckle ranch) is aware they are on his property but is not concerned. Therefore, the survey and boundary monuments and perimeter signs will remain at their current locations.



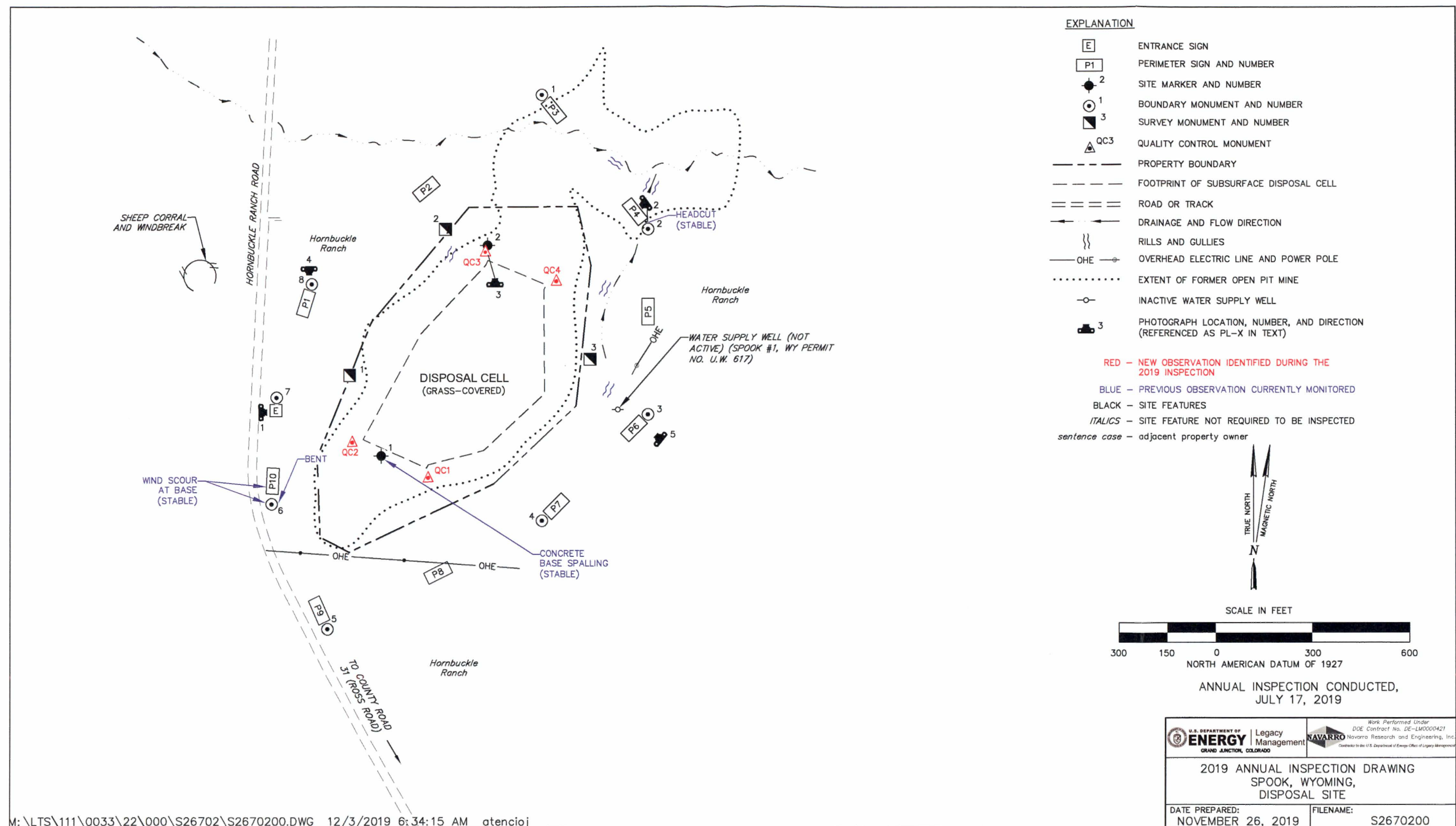


Figure 18-1. 2019 Annual Inspection Drawing for the Spook, Wyoming, Disposal Site

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## **18.4.2 Inspection Areas**

The site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the site perimeter, and (3) the outlying area. Inspectors examined specific site surveillance features within each area, observed the condition of site vegetation, and looked for evidence of erosion, settling, slumping, or other modifying processes that might affect the site's conformance with LTSP requirements.

### ***18.4.2.1 Disposal Cell***

The site is unique among Title I sites in that tailings were placed in the bottom of an open pit mine and covered with 40–60 feet of clean fill and topsoil. Therefore, many of the observations and concerns routinely associated with above-grade disposal cells—such as the quality of the riprap and the stability of side slopes—do not apply to this site. The ground surface over the 5-acre disposal cell, completed in 1989, showed no evidence of settling. Vegetation on the ground surface, consisting of grasses and forbs, was healthy and indistinguishable from that growing on the remainder of the site and on the surrounding ranch land (PL-5). No maintenance needs were identified.

### ***18.4.2.2 Site Perimeter***

There is no perimeter fence at the site. The area between the disposal cell and the site perimeter showed no evidence of settling or active erosion. No maintenance needs were identified.

### ***18.4.2.3 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 impacts were observed. Several minor rills and gullies are near the site, and they appeared to be stable. The erosion is not harming the function of the disposal cell cover or other site features, and it is not a concern at this time. Inspectors will continue to monitor this area.

The access road has frequent truck traffic to service and maintain oil wells in the area. Even though oil field activity has greatly increased near the site, inspectors found no evidence of trespassing or vandalism on the site.

## **18.5 Follow-Up or Contingency Inspections**

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

## **18.6 Maintenance**

In July 2019, following the inspection, four 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 18-1. No maintenance needs were identified.

## 18.7 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required due to the application of supplemental standards. 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 it contains contamination from widespread, naturally occurring uranium mineralization and is of limited yield. Therefore, monitoring of the groundwater is not required.

## 18.8 Corrective Action

In accordance with the LTSP, corrective action is taken to correct conditions that threaten the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

## 18.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1993. *Final Long-Term Surveillance Plan for the Spook, Wyoming, Disposal Site*, UMTRA-DOE/AL-350215.0000, January.

## 18.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	90	Entrance Sign Before Update
PL-2	235	Perimeter Sign P4
PL-3	—	Site Marker SMK-2
PL-4	—	Boundary Monument BM-8
PL-5	310	View Northwest of Perimeter Sign P6 and Vegetated Ground Surface

**Note:**

— = Photograph taken vertically from above.





*PL-1. Entrance Sign Before Update*



*PL-2. Perimeter Sign P4*





*PL-3. Site Marker SMK-2*



*PL-4. Boundary Monument BM-8*





*PL-5. View Northwest of Perimeter Sign P6 and Vegetated Ground Surface*

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## 19.0 Tuba City, Arizona, Disposal Site

### 19.1 Compliance Summary

The Tuba City, Arizona, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on April 9, 2019. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several maintenance needs but found no cause for a follow-up inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts semiannual groundwater monitoring to compare current conditions to baseline postconstruction groundwater quality at the site. Evaluative groundwater monitoring is performed in lieu of normal point-of-compliance (POC) monitoring, as preexisting milling-related groundwater contamination may mask contamination leaching from the disposal cell. Evaluative groundwater results from monitoring conducted in February and August 2019 indicate that groundwater quality immediately downgradient of the former mill site is still degraded relative to concentrations of molybdenum, nitrate, selenium, and uranium in the background well. Periodically throughout the year, contaminated groundwater is extracted and placed in the onsite evaporation pond to help prevent further downgradient movement of the contaminants. The progress of groundwater remediation is evaluated and reported annually, separately from this compliance evaluation.

### 19.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1996) 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 19-1 lists these requirements.

Table 19-1. License Requirements for the Tuba City, Arizona, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 19.4	(b)(3)
Follow-Up Inspections	Section 7.0	Section 19.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 19.6	(b)(5)
Environmental Monitoring	Section 5.2	Section 19.7	(b)(2)
Corrective Action	Section 9.0	Section 19.8	--

### 19.3 Institutional Controls

The 145-acre disposal site, identified by the property boundary shown in Figure 19-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized DOE to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation to perform remedial actions at the former uranium processing sites. DOE and the Navajo Nation executed a Custodial Access Agreement that conveys to the federal government

title to the residual radioactive materials stabilized at the disposal site and ensures that DOE has perpetual access to the site.

The site was accepted under the NRC 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 custody of the disposal cell and its engineered features, 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, site markers, survey and boundary monuments, and wellhead protectors.

## 19.4 Inspection Results

The site, 5 miles northeast of Tuba City, Arizona, was inspected on April 9, 2019. The inspection was conducted by M. Kastens and P. Lemke of the Legacy Management Support contractor. J. Tallbull (Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action) and N. Honie and L. Leslie (Hopi Tribe's Office of Mining and Mineral Resources) 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 the need, if any, for maintenance or additional inspection and monitoring.

### 19.4.1 Site Surveillance Features

Figure 19-1 shows the locations of site features, including site surveillance features and inspection areas, in black. 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 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 19-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 19.10.

Many structures and features at the site are associated with the former groundwater treatment system. Beginning in 2002, contaminated groundwater was extracted from the affected aquifer, circulated through ion exchange and distillation units, and then reinjected into the affected aquifer upgradient of the disposal cell. This system was shut down in September 2014. Since that time, contaminated groundwater has continued to be extracted from the aquifer periodically throughout the year but has been placed in the onsite evaporation pond instead of being actively treated. The structures associated with the original treatment system remain onsite and include a control building; a shop and laboratory building; a water-treatment plant that includes an ion exchange building, external tanks, and a distillation skid; a solar water-heating (thermal) system; solar panels; evaporation ponds; an extensive network of extraction, injection, and monitoring wells; and a treated water infiltration system. The purpose of groundwater treatments has been to mitigate contamination that resulted from past uranium-ore processing at the site. Groundwater remediation activities are not addressed in the LTSP, because they are not related to the long-term disposal and stabilization of encapsulated contaminated materials. Therefore, the features associated with groundwater treatment are not included in the annual inspection and are only addressed in this report as they relate to site integrity or safety concerns.



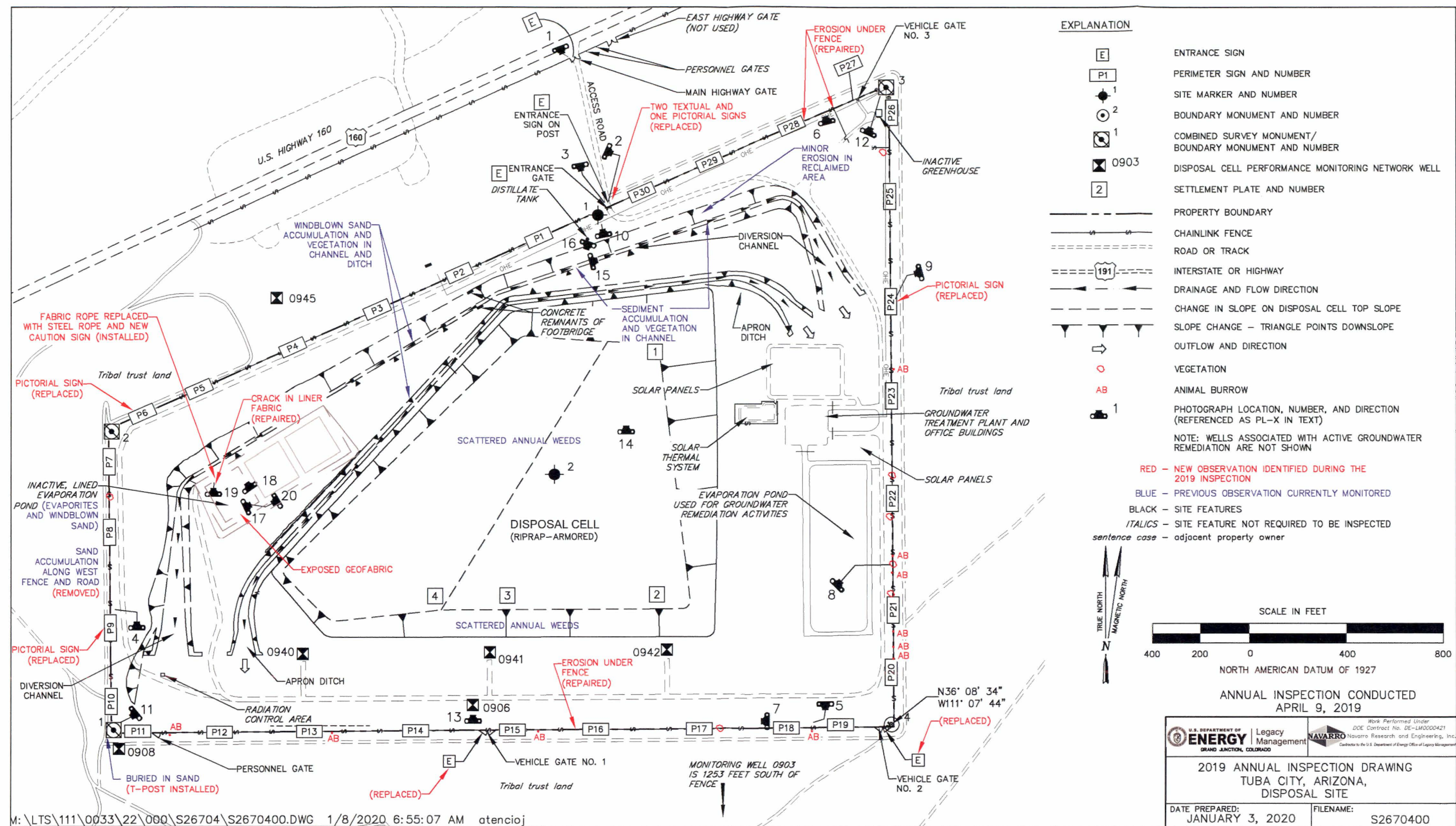


Figure 19-1. 2019 Annual Inspection Drawing for the Tuba City, Arizona, Disposal Site

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#### ***19.4.1.1 Access Road, Entrance Gates, and Entrance Signs***

Access to the site is from U.S. Highway 160. Perpetual access to the site is granted by the Custodial Access Agreement. A gate in a chainlink fence on the highway right-of-way (“main highway gate” in Figure 19-1) allows access to the site via a gravel road. The entrance gate is in the inner chainlink perimeter fence between perimeter signs P1 and P30. Both gates were open at the time of the inspection because of ongoing site activities. Vehicle gates are also present in the northeast corner of the site (to allow access to Diné College’s greenhouse) and along the southern fence line to facilitate access for offsite activities.

Entrance signs are posted on the main highway gate (PL-1) and vehicle entrance gates No. 1 and No. 2. The phone number for the Hopi Tribe on the two textual signs at the entrance gate (PL-2) was outdated, and the textual sign on the entrance gate was cracked and missing the Navajo Nation phone number. A pictorial sign on the entrance gate is cracked and peeling (PL-3); all three signs at the entrance gate were replaced following the inspection. Additional entrance signs are attached to vehicle gate No. 1 and vehicle gate No. 2 along the southern fence line; these signs have bullet damage and were replaced following the inspection. Vehicle gate No. 3, in the northeast corner of the site, purposefully does not have a sign. No other maintenance needs were identified.

#### ***19.4.1.2 Perimeter Fence and Signs***

A chainlink perimeter fence encloses the site. Windblown sand continues to accumulate along the western perimeter fence, the associated road (PL-4), and in a few areas along the western end of the north perimeter fence. In one area, sand accumulation is so high that people or animals could step or jump over the fence. Inspectors found numerous animal burrows (PL-5) and several areas of erosion beneath the fence (PL-6). Woody vegetation continues to grow along portions of the fence (PL-7 and PL-8) and may eventually affect its function. As a result of these observations, fence maintenance was completed in 2019: Sand was removed from accumulated areas and from the western perimeter road, gaps beneath the fence were filled with rock, accumulated tumbleweeds were cleared from the fence, and woody vegetation was removed from the fence fabric (and their remnant stumps treated with herbicide).

Thirty pairs of perimeter signs, designated P1 through P30, are attached to steel posts set in concrete directly inside and along the perimeter fence. One of the sign pairs is textual, and the other is pictorial. All were legible and stable, with the exception of three pictorial signs becoming faded at the P6, P9, and P24 locations (PL-9); these signs were replaced following the inspection. No other maintenance needs were identified.

#### ***19.4.1.3 Site Markers***

The site has two granite site markers. Site marker SMK-1 (PL-10) is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

#### ***19.4.1.4 Survey and Boundary Monuments***

One boundary monument and three combined survey and boundary monuments delineate the corners of the site. Combined survey and boundary monuments SM/BM-1 and SM/BM-3 tend to

get covered with windblown sand and were found in this condition during the inspection. Survey and boundary monument SM/BM-1 could not be found with a shovel (PL-11) but finally was located and a T-post was installed to mark its location permanently. Survey and boundary monument SM/BM-3, marked with a steel T-post, was uncovered during the inspection (PL-12). No other maintenance needs were identified.

#### ***19.4.1.5 Monitoring Wells***

Seven monitoring wells (0903, 0906, 0908, 0940, 0941, 0942, and 0945) constitute the disposal cell performance monitoring network. Monitoring wells 0906, 0908, 0940, 0941, and 0942 are inside or immediately outside the perimeter fence. Inspectors checked the wellhead protectors (with the exception of distal downgradient well 0903, which is offsite), and all were found to be undamaged and locked, with one exception: The wellhead protector for well 0906 was removed because an electronic datalogger was collecting data from the well at the time of the inspection (PL-13). Monitoring wells are also inspected during semiannual groundwater sampling events; their condition and maintenance needs, if any, are reported. No maintenance needs were identified.

#### **19.4.2 Inspection Areas**

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) 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 LTSP requirements.

##### ***19.4.2.1 Disposal Cell***

The disposal cell, completed in 1989, occupies 50 acres. The disposal cell is armored with riprap to control erosion and deter animal and human intrusion. There was no evidence of erosion, settling, slumping, or other modifying processes on the disposal cell.

In accordance with the LTSP, deep-rooted vegetation is controlled to prevent potential penetration of the radon barrier. Periodic spot-application of herbicide has been effective in controlling deep-rooted vegetation growth on the disposal cell cover. No deep-rooted shrubs were observed on the cell top or side slopes during the inspection. Scattered patches of annual weeds grow on the disposal cell top and side slopes (PL-14), but these shallow-rooted plants are not a concern. Windblown sand and dirt continue to accumulate on the rock-covered surfaces, providing a favorable environment for plant growth. No maintenance needs were identified.

##### ***19.4.2.2 Area Between the Disposal Cell and the Site Boundary***

The disposal cell is protected from surface water runoff by a disposal cell apron ditch and a diversion channel, both armored with riprap and located along the north and northwest sides of the disposal cell. Windblown sand and vegetation accumulate in the apron ditch and the diversion channel (PL-15) along the north and northwest sides of the disposal cell. This sand deposition and associated vegetation establishment have not adversely affected the performance



of these structures. No evidence of recent or past water flows was observed in the apron ditch or the diversion channel.

The north slope above the diversion channel, consisting of noncohesive sandy soil, is subject to erosion from storm runoff. Erosion repair conducted in this area in 2013 was successful in reducing the rate of erosion and subsequent soil deposition in the channel. Some erosion and deposition continue (PL-16), however, and erosion control repairs are performed as needed. No repairs are necessary at this time.

Two of the three evaporation ponds near the northwest side of the disposal cell were removed in 2007. The area was reclaimed and seeded with a native seed in 2007 and again in 2013. Because the area is often scoured by wind, perennial vegetation is establishing extremely slowly (PL-17), and most of the plants are early successional annual species.

The remaining evaporation pond, filled minimally with windblown sand and evaporites, is retained as a backup for the main evaporation pond on the east side of the site. Inspectors noted several maintenance needs associated with the pond. First, the fabric safety rope and caution signs surrounding the pond were deteriorated and found on the ground, (PL-18) likely due to consistent high winds. The fabric rope was replaced with a steel rope, and new caution signs were hung. Secondly, the high-density polyethylene (HDPE) liner contained a small crack on the surface (PL-19) and was repaired. Lastly, the plastic geofabric that stabilizes the south-facing slope of the pond was exposed (PL-20), probably due to wind erosion. No repairs of the geofabric are needed at this time, as it remains mostly buried and continues to stabilize the slope. Inspectors will continue to monitor this area. No other maintenance needs were identified.

#### ***19.4.2.3 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 impacts were identified.

### **19.5 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.

### **19.6 Maintenance and Repairs**

Inspectors observed and reported numerous maintenance and repair items that were completed following the 2019 inspection, including:

- Replacement of two textual and one pictorial sign on the entrance gate
- Updating phone numbers for the Hopi Tribe Department of Natural Resources on two textual signs
- Replacement of entrance signs on vehicle gate No. 1 and vehicle gate No. 2

- Removal of accumulated sand from the western perimeter fence, perimeter road, and along the northern perimeter fence
- Repair of gaps beneath the fence created by animals and soil erosion
- Replacement of three pictorial perimeter signs at the P6, P9, and P24 locations
- Location of survey and boundary monument SM/BM-1, with installation of a steel T-post to permanently mark its location
- Replacement of the evaporation pond fabric safety rope with steel rope
- Installation of new caution signs surrounding the northwestern evaporation pond
- Repair of the surficial crack in the HDPE liner of the northwestern evaporation pond
- Removal and treatment of vegetation

No other maintenance needs were identified.

## 19.7 Environmental Monitoring

In accordance with the LTSP, semiannual groundwater monitoring is conducted to compare current conditions to baseline postconstruction groundwater quality at the site. Groundwater quality beneath and downgradient of the disposal cell has been degraded by contamination from former uranium-processing activities. This preexisting milling-related contamination might mask contamination leaching from the disposal cell and limits the effectiveness of normal POC groundwater monitoring as a reliable indicator of disposal cell performance (40 CFR 192 Subpart A). In lieu of POC monitoring, groundwater monitoring is performed in accordance with Section 5.2.2 of the LTSP and is defined as evaluative monitoring. The purpose of this evaluative monitoring is to (1) assess trends in groundwater quality in the uppermost aquifer, (2) monitor the downgradient extent of contamination in groundwater, and (3) analyze the impacts of transient drainage and surface runoff on groundwater quality. Evaluative groundwater monitoring was conducted twice in 2019, in February and August. The progress of groundwater remediation is evaluated and reported annually, separately from this compliance evaluation.

Seven wells (Figure 19-2 and Table 19-2) as identified in the LTSP, are monitored for four target analytes: molybdenum, nitrate, selenium, and uranium (DOE 1996). Evaluative monitoring is considered indicative of disposal cell performance because these analytes: are present in tailings fluid; are present in the contaminant plume at higher than background concentrations; and are mobile in the aquifer. As a baseline for cell performance evaluation, provisional upper baseline limits (UBLs) for the target analytes were calculated in accordance with *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities—Interim Final Guidance* (EPA 1989) and documented in the LTSP (Table 19-3). UBLs are concentrations that, with 95% confidence, would be exceeded less than 5% of the time during long-term monitoring if groundwater conditions near the monitoring well did not change. Exceedance of UBLs in more than 5% sampling events over the long term could indicate that the disposal cell is not performing to design standards. However, the LTSP also notes that elevated concentrations could result from transient drainage of tailings fluid into the subsurface (directly beneath the cell) or from rainfall infiltrating through contamination in the unsaturated zone, in the area of the mill ponds (not covered by the disposal cell). Elevated concentrations attributed to transient drainage or infiltration would not be indicative of substandard performance for the cell.



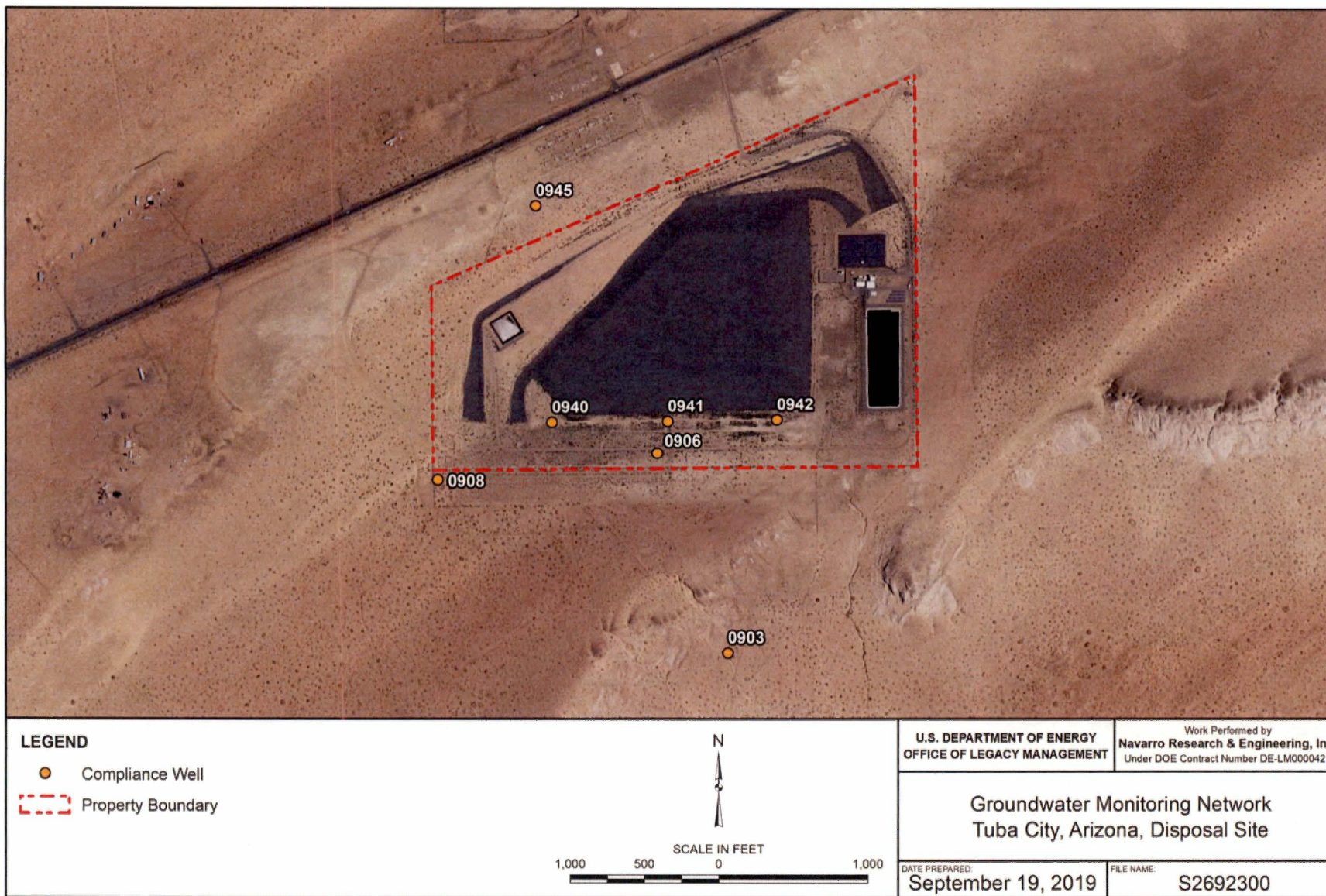


Figure 19-2. Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Table 19-2. Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Monitoring Well	Hydrologic Relationship	Monitoring Frequency
0903	Downgradient (offsite)	Annually
0906	Downgradient	Semiannually
0908	Downgradient	Semiannually
0940 <sup>a</sup>	Downgradient	Semiannually
0941	Downgradient	Semiannually
0942 <sup>b</sup>	Downgradient	Semiannually
0945	Upgradient (background)	Annually

**Notes:**

<sup>a</sup> Between August 2004 and February 2010, samples from well 0940 could not be obtained because of an insufficient volume of water. This accounts for the data gaps in Figure 19-3 through Figure 19-6.

<sup>b</sup> Well 0942 was converted from a monitoring well to an extraction well in 2015.

Table 19-3. Provisional Upper Baseline Limits for Groundwater at the Tuba City, Arizona, Disposal Site

Constituent	Provisional UBL (mg/L) <sup>a</sup>	MCL (mg/L) <sup>b</sup>
Molybdenum	0.14	0.10
Nitrate (as nitrogen)	311	10
Selenium	0.05	0.01
Uranium	1.17	0.044

**Notes:**

<sup>a</sup> As documented in the 1996 LTSP.

<sup>b</sup> MCLs as listed in 40 CFR 192 Table 1 Subpart A.

**Abbreviation:**

mg/L = milligrams per liter

Active groundwater remediation was anticipated when the LTSP was prepared in 1996, and it was expected that deviations from anticipated disposal cell performance could be detected even with groundwater remediation ongoing. However, the LTSP also noted that POC sampling and analysis protocol to monitor cell performance could not be established until groundwater restoration was complete, and that the LTSP would be revised at that time.

As noted in the definition of UBLs above, the UBL value should not be exceeded more than 5% of the time as long as conditions near the monitoring well do not change. Due to implementation of active remediation (2000–2014) and interim treatment (2015 to present) the conditions near the LTSP evaluative wells have constantly been affected and exceedance of UBLs cannot be attributed to disposal cell performance. Recent operation of the interim treatment system, potentially affecting concentrations of target analytes in the LTSP-specified evaluative monitoring wells, is described in the following paragraphs.

Throughout the period of interim treatment (2015 to present) active remediation has been performed by pumping contaminated groundwater directly to the onsite evaporation pond (DOE 2015). The volume of contaminated groundwater that can be extracted is limited to the pond's evaporation rate, at approximately 5 million gallons annually. From 2015 through 2017



groundwater extraction was operated year-round and the extraction flow rate was adjusted seasonally, operating at a relatively high rate in warm weather and at a lower rate in cold weather. In these years, three extraction wells were typically operated at flow rates ranging from 5 gallons per minute (gpm) to 30 gpm, dependent on seasonal changes in evaporation. The wells were used because of their consistent productivity and for maximum contaminant mass removal.

In 2018 and 2019 extraction pumping was conducted in high-intensity/short-duration campaigns, with the objective of evaluating the effects on plume capture and maximum groundwater drawdown achievable under the interim treatment regime. In 2018, the high-intensity/short-duration pumping campaign used 11 extraction wells operating at a cumulative flow rate of 44 gpm for 76 days. In 2019, the pumping campaign used 9 extraction wells at a cumulative pumping rate of 33 gpm for 99 days. Groundwater levels were constantly measured in a surrounding network of monitoring wells. Results and evaluation of the recent pumping campaigns will be reported in a groundwater performance report.

Figure 19-3 through Figure 19-6 show time-concentration plots for the four target analytes, along with corresponding UBLs and MCLs. 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=TUB>). MCLs are presented as information only. The LTSP requirement related to disposal cell performance is for evaluative monitoring over time, in comparison with UBLs.

Since 2004, molybdenum concentrations have been below both the 0.10 milligram per liter (mg/L) MCL and the 0.14 mg/L UBL in all LTSP evaluative wells except well 0906 in August 2019 (Figure 19-3). Molybdenum concentrations in the westernmost downgradient well 0908 and in distal downgradient well 0903 (approximately 1250 feet south of the site perimeter) continue to be comparable to concentrations in background well 0945. Well 0906 exceeded the UBL for molybdenum in August 2019 for the first time since 1999. The UBL exceedance in well 906 was measured during the 2019 pumping campaign.

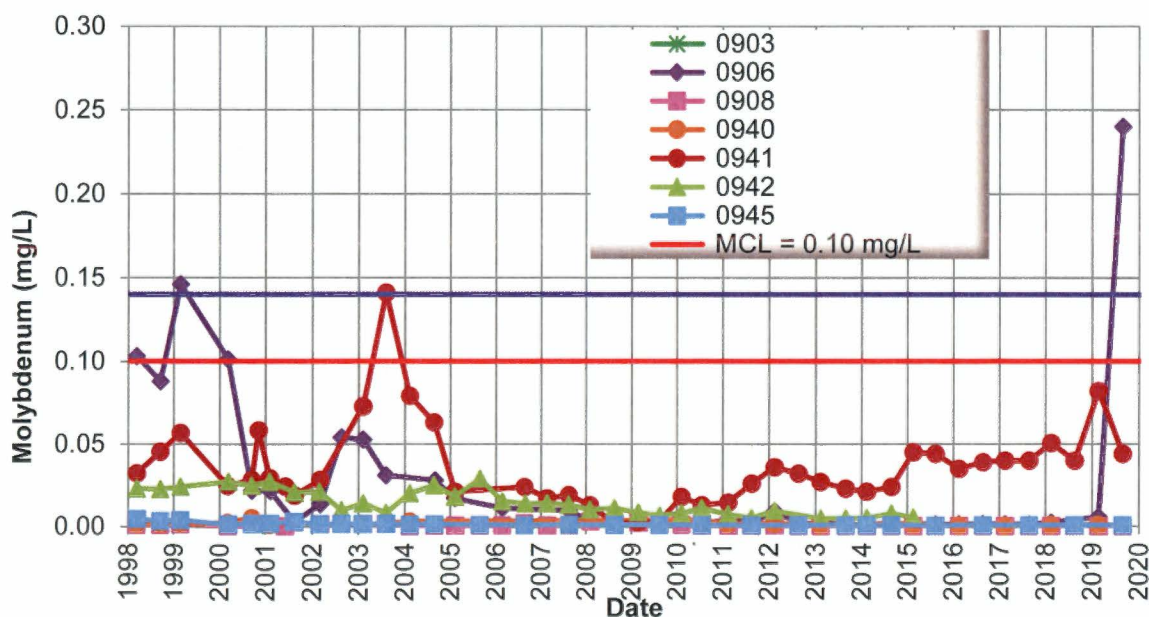


Figure 19-3. Molybdenum in Groundwater at the Tuba City, Arizona, Disposal Site

Nitrate concentrations have historically exceeded the 10 mg/L MCL in all LTSP evaluative wells, except background well 0945 (Figure 19-4). Exceedances of the 311 mg/L UBL were observed at compliance wells 0906 (340 mg/L), 0908 (340 mg/L), and 0940 (620 mg/L) in August 2019, during high-intensity pumping. This was the first historical exceedance in well 0908. LTSP evaluative well 0941 dropped below the UBL in February 2019 after exceeding it for the first time in August 2018. Nitrate concentrations in distal downgradient well 0903 regularly exceeded the MCL since 2004 but remain below the UBL.

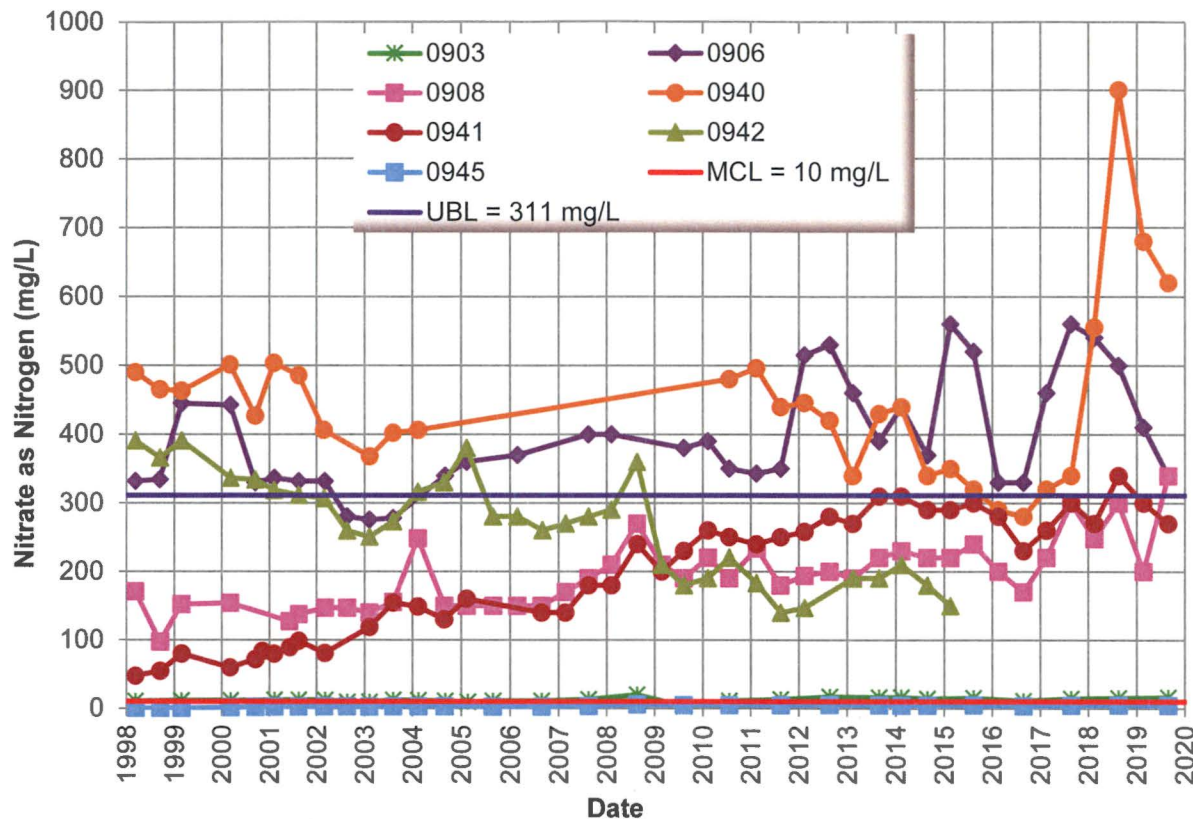


Figure 19-4. Nitrate in Groundwater at the Tuba City, Arizona, Disposal Site



Selenium concentrations have historically exceeded the 0.01 mg/L MCL in all LTSP evaluative wells except background well 0945 and distal well 0903 (Figure 19-5). Concentrations in well 0908 exceeded the UBL for selenium in 1997 and have since remained at the 0.01 mg/L MCL since August 2018. Selenium concentrations in well 0942 exceeded the UBL in February 2015, and that well has not been sampled since. Concentrations continued to exceed the 0.05 mg/L UBL in wells 0906, 0940, and 0941, all of which are immediately downgradient of the disposal cell. Selenium increased in well 0906 to 0.16 mg/L during the high-intensity pumping campaign in August 2019, the highest level since 1997. Selenium concentrations have increased in well 0941 from 0.018 mg/L in 1998 to 0.08 mg/L in 2019. Selenium concentrations in distal downgradient well 0903 have consistently been below both the UBL and the MCL and, since late 2004, below levels measured in background well 0945.

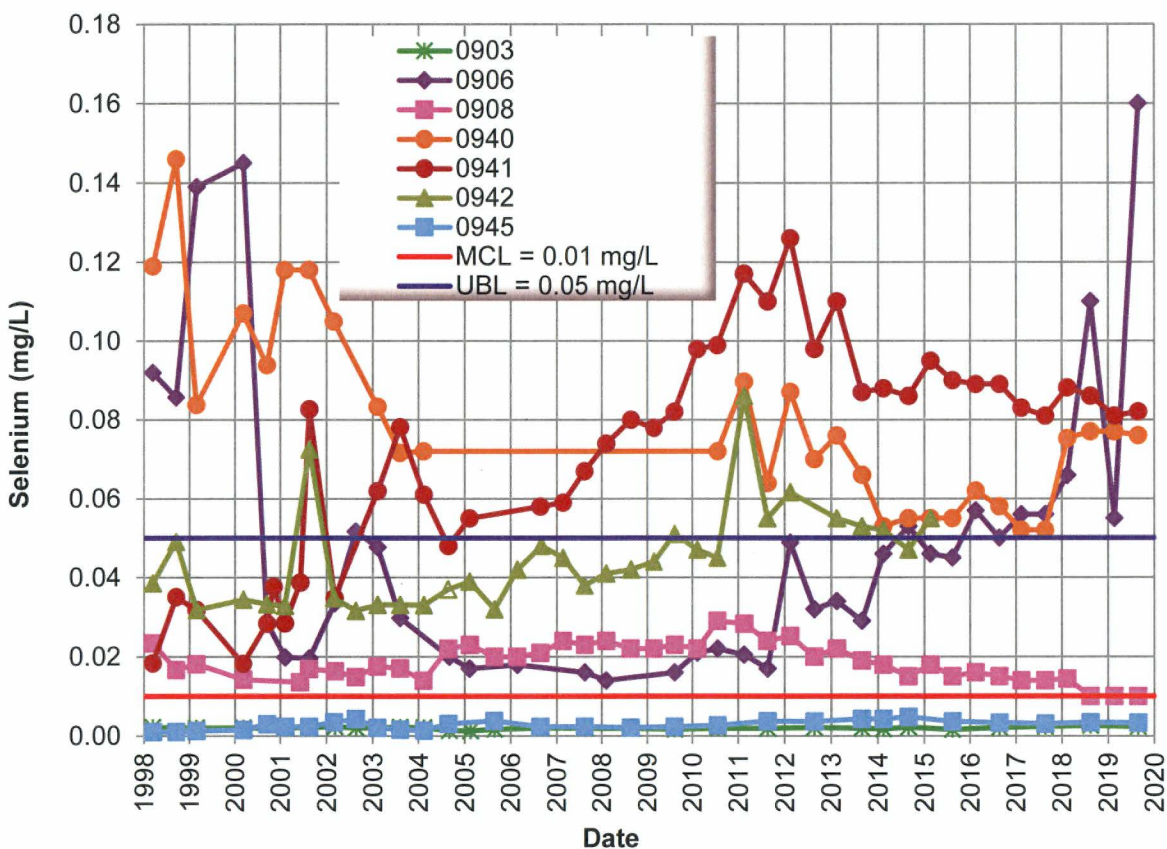


Figure 19-5. Selenium in Groundwater at the Tuba City, Arizona, Disposal Site

Uranium concentrations have historically exceeded the 0.044 mg/L MCL but remained below the 1.17 mg/L UBL in all compliance wells except for distal downgradient well 0903 and background well 0945, both of which have always been below the MCL (Figure 19-6).

Uranium concentrations in central downgradient well 0941 gradually increased since 2005 from 0.05 mg/L to 0.24 mg/L. Concentrations in well 0906 more recently increased from 0.36 mg/L in February 2017 to 1.0 mg/L in August 2019.

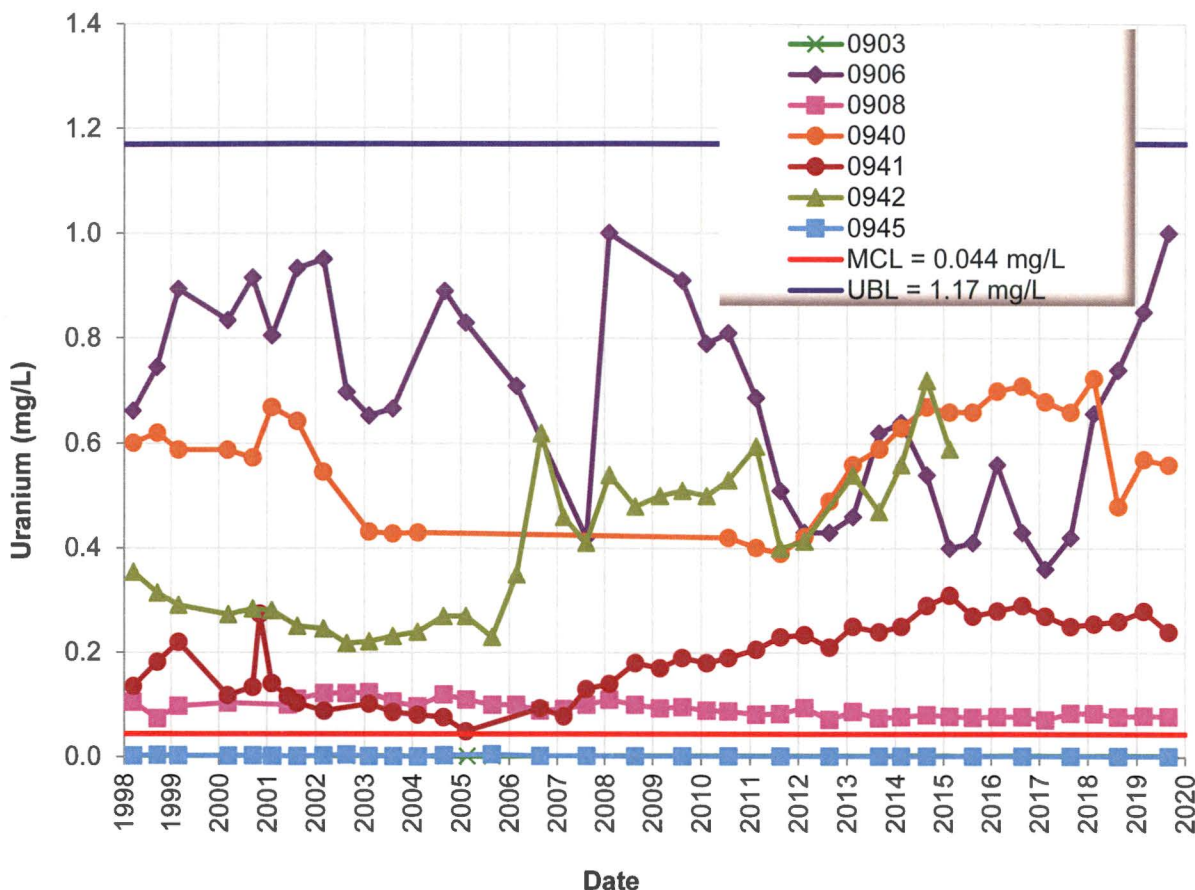


Figure 19-6. Uranium in Groundwater at the Tuba City, Arizona, Disposal Site

Sample results from the 2019 evaluative monitoring indicate that groundwater quality immediately downgradient of the former mill site (in wells 0906, 0908, 0940, 0941, and 0942) is still degraded relative to concentrations of molybdenum, nitrate, selenium, and uranium in background well 0945. Concentrations of all four analytes in distal downgradient well 0903 are comparable with those measured in background well 0945 and below corresponding UBLs, although nitrate concentrations continue to be slightly above the MCL. Analysis of water quality trending and progress of the groundwater remedy are reported in the site-specific annual groundwater report for the Tuba City site. No concerns about disposal cell performance are identified in the evaluative monitoring results.



## 19.8 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.

## 19.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

40 CFR 192 Subpart A. U.S. Environmental Protection Agency, "Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites," *Code of Federal Regulations*.

40 CFR 192 Subpart B. U.S. Environmental Protection Agency, "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1984. *Cooperative Agreement Between the United States Department of Energy, the Navajo Tribe of Indians and the Hopi Tribe of Indians*, DE-FC04-85AL26731, December.

DOE (U.S. Department of Energy), 1996. *Long-Term Surveillance Plan for the Tuba City, Arizona, Disposal Site*, DOE/AL/62350-182, Rev. 0, Office of Legacy Management, October.

DOE (U.S. Department of Energy), 2015. *Plan for Interim Treatment During Distillation Shutdown for the Tuba City, Arizona, Disposal Site*, LMS/TUB/S12431.

EPA (U.S. Environmental Protection Agency), 1989. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Interim Final Guidance*, EPA/530-SW-89-026, Office of Solid Waste, Waste Management Division, Washington, D.C.

## 19.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	160	Entrance Sign at Main Highway Gate
PL-2	115	Entrance Sign on Post at Entrance Gate (Replaced Following Inspection)
PL-3	170	Pictorial Entrance Sign on Entrance Gate (Replaced Following Inspection)
PL-4	0	Sand Accumulation Along Western Perimeter Fence and Road (Removed Following Inspection)
PL-5	180	Animal Burrow Under Perimeter Fence (Repaired Following Inspection)
PL-6	345	Soil Erosion Under Perimeter Fence Between Perimeter Signs P27 and P28 (Repaired Following Inspection)
PL-7	270	Dense Shrub Growth on Perimeter Fence (Removed Following Inspection)
PL-8	45	Shrubs Growing in Perimeter Fence Fabric (Removed Following Inspection)
PL-9	255	Perimeter Sign P24; Pictorial Sign Faded (Replaced Following Inspection)
PL-10	350	Site Marker SMK-1
PL-11	230	Survey and Boundary Monument SM/BM-1 Buried in Sand (Found Following Inspection and Permanent T-Post Installed)
PL-12	25	Survey and Boundary Monument SM/BM-3
PL-13	—	Datalogger in Monitoring Well 0906
PL-14	0	Annual Weeds on Disposal Cell Cover
PL-15	75	Sediment Accumulation and Vegetation in Diversion Channel
PL-16	200	Soil Erosion in Reclaimed Area
PL-17	65	Reclaimed Evaporation Pond Area
PL-18	325	Downed Safety Rope and Caution Sign (Replaced with Steel Rope and New Caution Sign Following Inspection)
PL-19	—	Crack in Evaporation Pond Liner (Repaired)
PL-20	240	Exposed Geofabric

**Note:**

— = Photograph taken vertically from above.





PL-1. Entrance Sign at Main Highway Gate



PL-2. Entrance Sign on Post at Entrance Gate (Replaced Following Inspection)





*PL-3. Pictorial Entrance Sign on Entrance Gate (Replaced Following Inspection)*



*PL-4. Sand Accumulation Along Western Perimeter Fence and Road (Removed Following Inspection)*





*PL-5. Animal Burrow Under Perimeter Fence (Repaired Following Inspection)*



*PL-6. Soil Erosion Under Perimeter Fence Between Perimeter Signs P27 and P28 (Repaired Following Inspection)*





*PL-7. Dense Shrub Growth on Perimeter Fence (Removed Following Inspection)*



*PL-8. Shrubs Growing in Perimeter Fence Fabric (Removed Following Inspection)*





*PL-9. Perimeter Sign P24; Pictorial Sign Faded (Replaced Following Inspection)*



*PL-10. Site Marker SMK-1*





*PL-11. Survey and Boundary Monument SM/BM-1 Buried in Sand  
(Found Following Inspection and Permanent T-Post Installed)*



*PL-12. Survey and Boundary Monument SM/BM-3*





*PL-13. Datalogger in Monitoring Well 0906*



*PL-14. Annual Weeds on Disposal Cell Cover*





*PL-15. Sediment Accumulation and Vegetation in Diversion Channel*

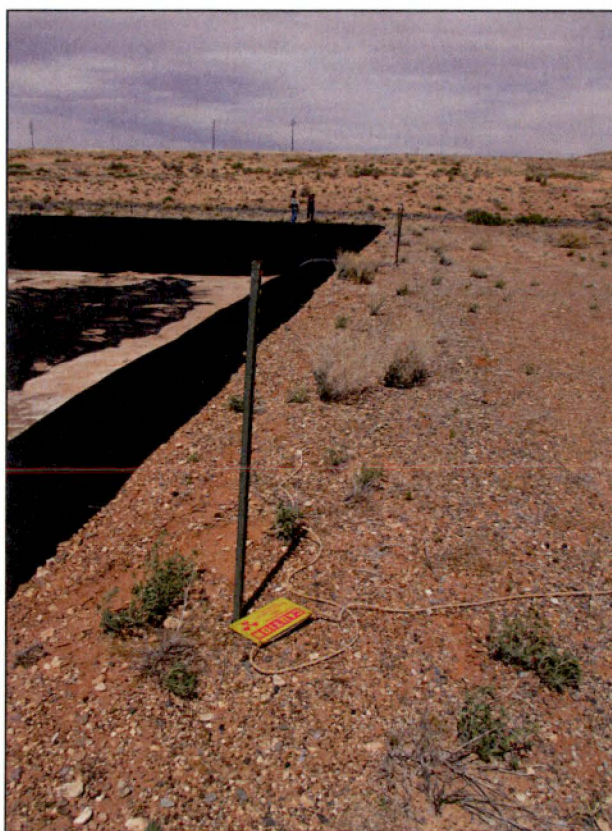


*PL-16. Soil Erosion in Reclaimed Area*





*PL-17. Reclaimed Evaporation Pond Area*



*PL-18. Downed Safety Rope and Caution Sign  
(Replaced with Steel Rope and New Caution Sign Following Inspection)*





*PL-19. Crack in Evaporation Pond Liner (Repaired)*



*PL-20. Exposed Geofabric*