

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 was inspected on August 8, 2023.

In response to the cell depressions identified in 2016, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) continued investigations and performed geotechnical sampling and materials testing (GSMT) on the disposal cell side slope cover components in April 2019 (DOE 2019a). Data obtained through the GSMT were used to identify causes for cover degradation features observed at the site, and these causes are highlighted in the *Erosional Piping Characterization and Data Report, Mexican Hat, Utah, Disposal Cell* (DOE 2020).

The interim cover protection (ICP) project was conducted in 2019 as a temporary measure to replace and restore the cover to the original design specifications until a long-term solution can be assessed. The ICP project focused on the degradation associated with the lower portions of the northeast side slope.

Changes in the cover have since been observed in other locations on the northeast side slope, but no new major erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell were evident during the 2023 inspection. Minor surface rilling was observed in the riprap cover on the north side slope earlier in 2023. During the 2023 inspection, no evidence of sediment discharge was observed in this localized area or within the drainage apron, so no evidence of breach through the radon barrier was or has been identified. No other modifying processes that might affect the integrity of the disposal cell were evident on the cover during the 2023 inspection, and the site remains protective of human health and the environment. Collaborative efforts continue to improve understanding of internal erosion processes and impacts and are focused on developing corrective action concepts for mitigating continued erosion and establishing the long-term performance design for the disposal cell cover.

During the annual inspection, LM also conducted annual observational seep monitoring. The results are described in Section 12.8.2. 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 (DOE 2007) (LTSP) in accordance with procedures established to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC) general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 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 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, LM 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 was inspected on August 8, 2023. The inspection was conducted by E. Garcia, K. Lott, C. Mueller, and N. Lind of the Legacy Management Support contractor. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate whether maintenance or follow-up inspection and monitoring are needed.

12.4.1 Site Surveillance Features

Figure 12-1 shows the locations of site features, including site surveillance features and inspection areas, in black and gray font. Some site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue, and new observations identified during the 2023 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are described in the following subsections. Photographs to support specific observations are noted in the text and in Figure 12-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 12.10.

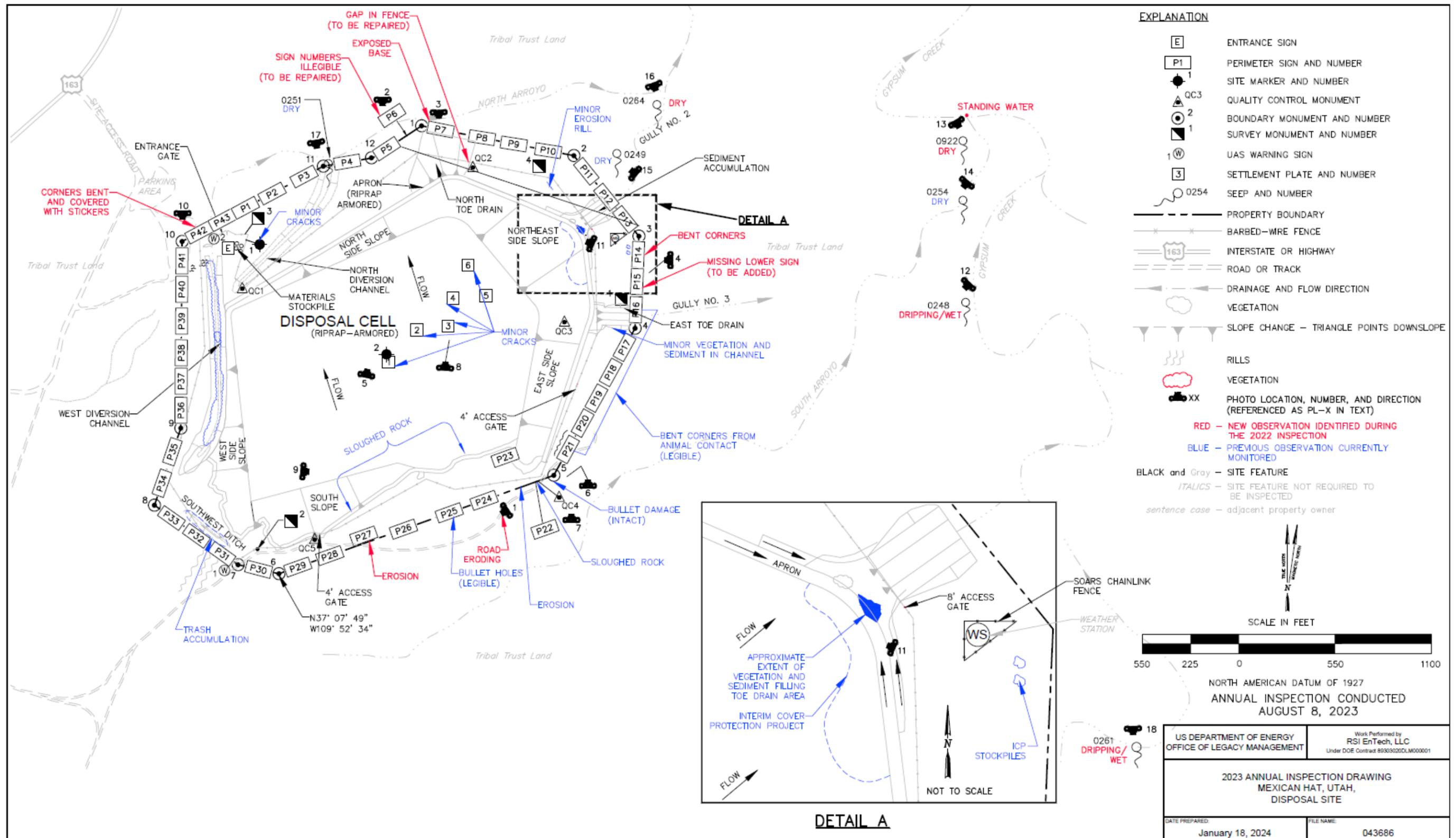


Figure 12-1. 2023 Annual Inspection Drawing for the Mexican Hat, Utah, Disposal Site

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 along the dirt access road, but the site remains accessible (PL-1). The steel entrance gate at the northwest corner of the site was locked and functional. The entrance sign is affixed to a steel post immediately behind the entrance gate. No maintenance needs were identified.

12.4.1.2 Fence and Perimeter Signs

A barbed-wire fence encloses the disposal cell. One gap that could be large enough for a person or wildlife to move under was identified under the fence at the north toe drain. Improvements to this section of fence are planned in the next year. Minor erosion is occurring under the south fence line in two different areas and will continue to be monitored. Two 4-foot access gates and one 8-foot access gate were permanently installed in 2018 to the perimeter barbed-wire fence to support past disposal cell cover evaluations and maintenance activities. These gates were all locked and functional.

A perimeter chainlink fence was installed in 2019 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. The fence, equipment, and gates were all in good condition.

There are 43 pairs of perimeter signs, designated P1 through P43 (each pair consisting of an upper 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, but some are affixed directly to the fence or immediately inside the fence. The lower perimeter sign on P6 was pushed up and covering the phone numbers on the upper sign and will be repaired following the inspection (PL-2). The base of perimeter sign P7 is more exposed than on previous inspections (PL-3). The corners of the lower perimeter sign on P14 are bent, possibly from burro contact. The signpost at perimeter sign P15 had been repaired following the 2022 inspection but is missing the lower sign (PL-4). The lower sign will be added before the next inspection. The corners of the lower southeastern perimeter signs (perimeter signs P16 through P21) are bent, possibly from burro contact. Perimeter sign P25 has bullet holes but is legible. Perimeter sign P42 has bent corners and is covered in stickers but is legible. These signs will be repaired before the next inspection. All remaining perimeter signs are in good condition.

Two signs prohibiting unauthorized unmanned aircraft system flights are in good condition. One sign was installed by the entrance gate at the northwest corner of the site, and one sign was installed on the southwest corner between perimeter sign P31 and boundary monument BM-5. 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; the concrete base has several minor cracks, which have been noted during previous inspections. This does not compromise the integrity of the base, and repairs are unnecessary. Site marker SMK-2 is on the top slope of the disposal cell (PL-5) and is in good condition. No maintenance needs were identified.

12.4.1.4 Survey and Boundary Monuments

During construction of the disposal cell, four survey monuments were installed. Twelve boundary monuments delineate the property boundary. As noted previously, vandalism has resulted in bullet damage to boundary monument BM-5, but the monument remains legible and intact (PL-6). No maintenance needs were identified.

12.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments were inspected during the 2023 annual inspection (PL-7). No maintenance needs were identified.

12.4.1.6 Settlement Plates

Six settlement plates were inspected during the 2023 annual inspection. All settlement plates have minor cracking in the concrete bases, but the integrity of the bases is not compromised (PL-8). No 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 and is armored with riprap to control erosion. 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 2016 and are detailed in the *Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report, Mexican Hat, Utah* (DOE 2019b). The ICP project was conducted in 2019 as a temporary measure to replace and restore the cover to the original design specifications until a long-term solution to the degradation associated with the lower portions of the northeast side slope can be assessed.

Changes in the cover have since been observed in other locations on the northeast side slope, but no new major erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell were evident during the 2023 inspection. Minor surface rilling was observed in the riprap cover on the north side slope earlier in 2023. During the 2023 inspection, no sediment discharge could be observed in this localized area or within the drainage apron. No other modifying processes that might affect the integrity of the disposal cell were evident on the rest of the cover during the 2023 inspection, and the site remains protective of human health and the environment.

There was no noticeable increase of sloughed rock or soil along the south apron of the disposal cell (PL-9). Because the apron is adjacent to the base of a steep exposure of Halgaito Shale, it is expected that occasional sloughing of rock and soil associated with this exposure will continue. The accumulated material is not affecting the function of the apron, and this area will continue to be monitored. No maintenance needs were identified.

12.4.2.2 Toe Drains and Diversion Channels

Erosion continues in upgradient offsite areas resulting in sediment being transported onto the site and into the west diversion channel. Sediment accumulation has promoted the growth of vegetation in the west diversion channel, although no more than in previous inspections (PL-10).

Sediment accumulation has also been observed along the transition zone from the apron to the northeast toe drain. The origin of this material is being evaluated as part of the ongoing cover degradation assessment. Possible sources of this material include a windblown material that originates offsite or radon barrier material associated with the depression features on the northeast side slope of the disposal cell, or both. Visual observations during the inspection did not identify any apparent increases in the sediment accumulation or vegetation growth in this area compared to previous visual observations (PL-11). 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 composed of interbedded silty sandstone, siltstone, and shale with varying degrees of cementation and susceptibility to erosion. Inspectors will continue to monitor erosion in these areas.

Sloughed rock from an overhanging exposure of Halgaito Shale continues to be observed along the southern perimeter of the site. Although no visual changes were evident and this material appears to be stable, the sloughed 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) was picked up from the site and surrounding areas before the inspection, but trash 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 accumulation of trash is in the southwest ditch, inside the barbed-wire fence; however, this trash is likely transported onto the site by wind.

As part of the 2019 ICP project, road repairs were performed along the dirt access road to provide site access to haul trucks, delivery trucks, and other vehicles. Road repairs included grading the entire access road. Two incised areas were stabilized by installing geocell with standard U.S. Department of Transportation-specific rock types that allow proper drainage. The repaired areas were examined during the inspection and appeared to be performing as designed, except for minimal degradation of the access road and minor erosion to one of the drainages armored with geocell. Inspectors will continue to monitor the area.

The revegetated material and equipment storage areas used during the ICP project were inspected in 2023. Vegetation growth has increased since 2022. The straw wattles installed to provide stormwater run-on and runoff protection were intact and performing as designed.

Old bedding material removed during the ICP project and excess new bedding material were stockpiled near the SOARS perimeter chainlink fence. Straw wattles were installed around this material for stormwater runoff protection. This area was evaluated during the inspection and is performing as designed. No maintenance needs were identified.

12.4.2.4 Outlying Area

The area 0.25 mile beyond the site boundary was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. Headcutting at a northwest arroyo has been observed to be growing closer to the access road, but no action is needed at this time. No other 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. No other follow-up inspections or evaluations are needed based on the inspection results.

12.6 Maintenance

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

- Repair the gap in the fence near perimeter sign P8
- Replace the lower sign on perimeter sign P15
- Replace the illegible sign numbers on perimeter sign P6

Improvements to the fence and perimeter signs are planned before the next inspection. No other maintenance needs were identified.

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 in 2016 along the disposal cell's northeast side slope, and any other erosional features observed since, 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 2019c). 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. Most seeps have exhibited dry conditions during the previous years of observational monitoring.

The LTSP required annual visual monitoring of the seven designated seeps through 2016, when an evaluation was to be conducted and a decision was to be made about whether to continue or discontinue visual seep monitoring. The evaluation has been completed and, as described in the *Seep Monitoring Evaluation Report, Mexican Hat, Utah, UMTCA Title I Disposal Site* (DOE 2019c), visual monitoring will continue to be performed during the annual site inspections.

Observational documentation consists of photographing seeps (PL-12 through PL-18) and providing descriptions of the conditions observed at the seven designated seeps. Since 2010, groundwater discharge has been observed at cross-gradient seep 0248, which typically exhibits dripping conditions; during the 2023 inspection, seep 0248 was dripping and showed thick, flowering vegetation growth (PL-12). Seeps 0922 (PL-13) and 0254 (PL-14) were dry, but the ephemeral drainage nearby had standing water. Seeps 0249 (PL-15), 0264 (PL-16), and 0251 (PL-17) were dry, and ephemeral drainages near these seeps were dry.

Upgradient (background) seep 0261 (PL-18), approximately 0.5 mile upstream of seep 0248 in Gypsum Creek, was observed to be dripping during the inspection.

Table 12-2 documents the conditions of each monitored seep observed during the inspection with the respective drainage in which each seep occurs and a reference to photographic documentation.

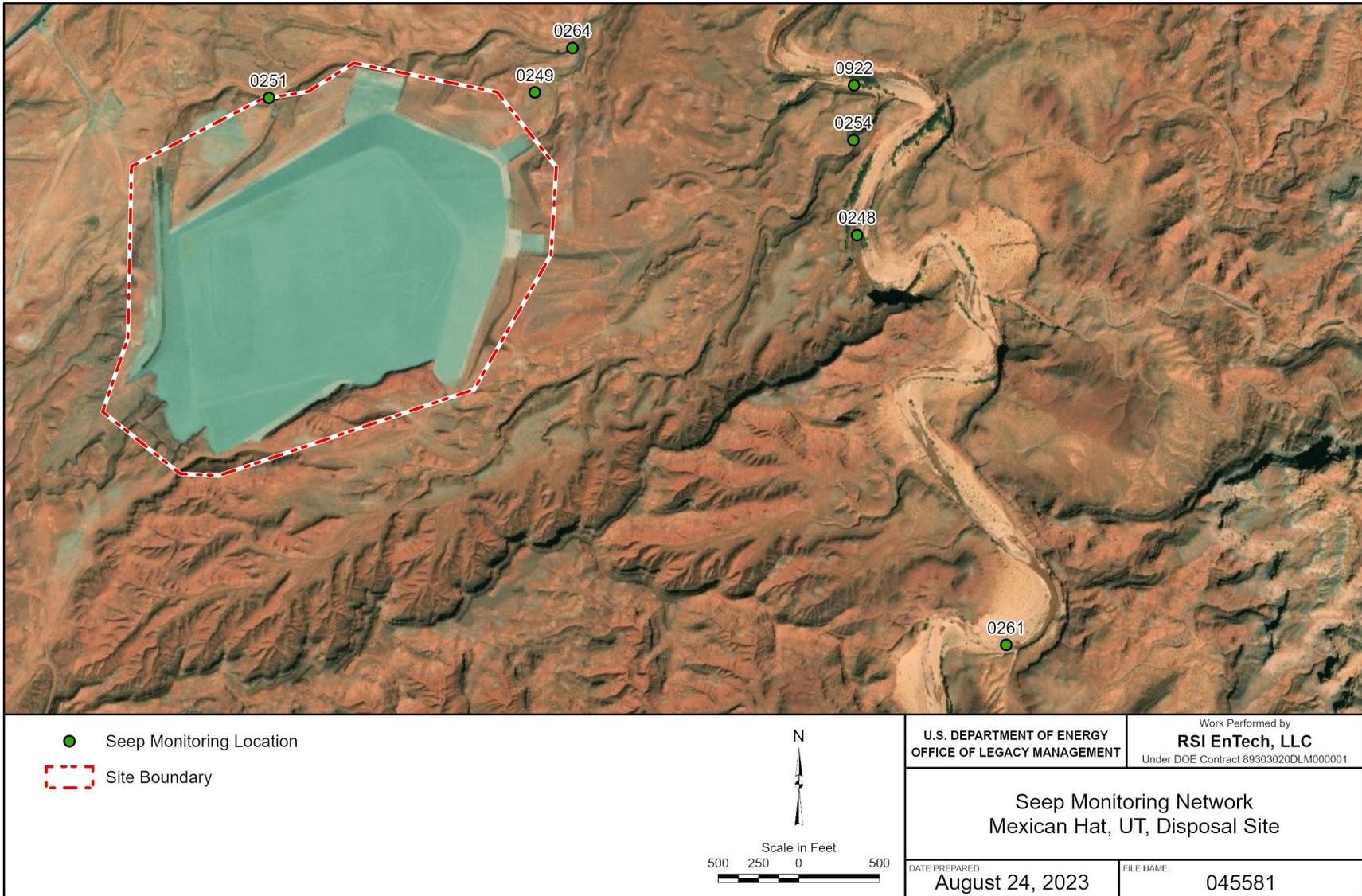


Figure 12-2. Seep Monitoring Locations at the Mexican Hat, Utah, Disposal Site

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-12	Dripping (no flow rate measured). Thick, flowering vegetation growth was noted.
0249	Gully No. 2	Downgradient	PL-15	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-17	Dry conditions (no evaporites present).
0254	South Arroyo	Downgradient	PL-14	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-18	Seep was dripping. This seep discharges directly into Gypsum Creek, which has standing water outside the immediate seep discharge area. Warning sign not posted since this seep is a background location.
0264	North Arroyo	Downgradient	PL-16	Dry (no evaporites present in immediate area).
0922	Gypsum Creek	Downgradient	PL-13	Dry conditions (no evaporites present). Seep is along the south side of Gypsum Creek, which was noted to have standing water present.

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. Except for deep-rooted vegetation, natural plant community succession is expected and will not adversely impact the performance of the disposal cell. During the 2023 inspection, three shallow-rooted plants were pulled from the top slope of the disposal cell. Vegetation is continuing to grow in the west diversion channel and will be monitored during annual inspections to ensure that it does not negatively affect the performance of this surface water diversion structure (PL-10). No other 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), 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.

DOE (U.S. Department of Energy), 2019c. *Seep Monitoring Evaluation Report, Mexican Hat, Utah, UMTRCA Title I Disposal Site*, LMS/HAT/S15190, Office of Legacy Management, December.

DOE (U.S. Department of Energy), 2020. *Erosional Piping Characterization and Data Report, Mexican Hat, Utah, Disposal Cell*, LMS/HAT/S29391, Office of Legacy Management, December.

12.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	236	Exposed Geocell on Access Road
PL-2	180	Perimeter Sign P6 with Blocked Numbers
PL-3	178	Perimeter Sign P7 with Exposed Base
PL-4	270	Perimeter Sign P15 Missing Lower Sign
PL-5	11	Site Marker SMK-2
PL-6	—	Boundary Monument BM-5
PL-7	—	Quality Control Monument QC-4
PL-8	3	Settlement Plate SP-3
PL-9	95	Sloughing Rock Along South Apron
PL-10	180	Vegetation in West Diversion Channel
PL-11	293	Vegetation in Northeast Toe Drain
PL-12	223	Seep 0248 (Dripping/Wet)
PL-13	150	Seep 0922 (Dry)
PL-14	219	Seep 0254 (Dry)
PL-15	309	Seep 0249 (Dry)
PL-16	160	Seep 0264 (Dry)
PL-17	171	Seep 0251 (Dry)
PL-18	178	Seep 0261 (Background—Dripping/Wet)

Note:

— = Photograph taken vertically from above.



PL-1. Exposed Geocell on Access Road



PL-2. Perimeter Sign P6 with Blocked Numbers



PL-3. Perimeter Sign P7 with Exposed Base



PL-4. Perimeter Sign P15 Missing Lower Sign



PL-5. Site Marker SMK-2



PL-6. Boundary Monument BM-5



PL-7. Quality Control Monument QC-4



PL-8. Settlement Plate SP-3



PL-9. Sloughing Rock Along South Apron



PL-10. Vegetation in West Diversion Channel



PL-11. Vegetation in Northeast Toe Drain



PL-12. Seep 0248 (Dripping/Wet)



PL-13. Seep 0922 (Dry)



PL-14. Seep 0254 (Dry)



PL-15. Seep 0249 (Dry)



PL-16. Seep 0264 (Dry)



PL-17. Seep 0251 (Dry)



PL-18. Seep 0261 (Background—Dripping/Wet)