

## 10.0 Lowman, Idaho, Disposal Site

### 10.1 Compliance Summary

The Lowman, Idaho, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on July 18, 2011. The disposal cell and site features were in excellent condition and functioning as designed. Vegetation continues to encroach on the top and side slopes of the disposal cell. To prevent potential cover degradation from tree blowdown, and as a best management practice, pine trees were removed from the western slope of the cell after the inspection. Steep areas to the north and west of the disposal cell remain stable and vegetated. No cause for a follow-up inspection was identified.

### 10.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site* (DOE-LM/GJ771-2005, Revision 2, U.S. Department of Energy [DOE], January 2005; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 10-1.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 10.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 10.3.2
Routine Maintenance and Repairs	Section 3.5	Section 10.3.3
Corrective Action	Section 3.6	Section 10.3.4

**Institutional Controls**—The 18-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) in 1994. 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 at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, warning/no-trespassing signs along the property boundary, and a locked gate across the access road that leads to the site. The site is not fenced. Verification of these institutional controls is part of the annual inspection.

Inspectors found no evidence that these institutional controls were ineffective or violated.

### 10.3 Compliance Review

#### 10.3.1 Annual Inspection and Report

The site, approximately ½ mile northeast of Lowman, Idaho, was inspected on July 18, 2011. The results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 10-1. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

### 10.3.1.1 *Specific Site-Surveillance Features*

**Access Road, Entrance Gate, and Signs**—The site is at the end of a hard-packed gravel road about 650 feet north of Idaho State Highway 21. The road, which crosses U.S. Forest Service land, was in excellent condition. A locked gate spans the road about 150 feet from the State highway and was in excellent condition.

10A One entrance sign and 18 perimeter signs delineate the unfenced site boundary. The entrance sign is just inside the site boundary near site marker SMK-1 (PL-1). Although the sign has several bullet holes, it was still legible and does not need to be replaced. The 18 perimeter signs are on steel posts along the site boundary. Four signs (P2, P3, P13, and P15) have bullet holes or dents, but they were legible and do not need to be replaced. The other perimeter signs were in excellent condition. At the time of the inspection, ponderosa pine saplings were encroaching on perimeter sign P1, making it less visible. Inspectors cut down several of the trees to create a cleared buffer area around the sign. A fallen tree had dislodged another perimeter sign from the top of its post; the sign was repaired during the inspection.

**Site Markers and Monuments**—There are two site markers, four boundary monuments, and three combination survey/boundary monuments (Figure 10-1). All were in excellent condition.

**Monitoring Wells**—Groundwater monitoring is not required at the site. All monitoring wells were decommissioned in 2006.

### 10.3.1.2 *Transects*

To ensure a thorough and efficient inspection, the site is divided into three “transects”: (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.

Within each transect, the inspectors examined specific site-surveillance features, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect the site’s integrity or long-term performance.

**Top and Side Slope of the Disposal Cell**—The 8-acre disposal cell was completed in 1991. Basalt riprap armors the top and west-facing side slope of the disposal cell. An apron of larger riprap surrounds the disposal cell on all sides. The riprap was in excellent condition, and no evidence of instability, such as subsidence, slumping, or cracking, was observed on any of the cell surfaces (PL-2).

10B Vegetation encroachment by tree, shrub, and wildflower species continues on the top and side slopes of the disposal cell. Encroachment is a natural process operating at these locations and is allowed to continue in accordance with the LTSP. Although DOE is not required to remove ponderosa pine trees as they mature, the LTSP states that DOE will repair any damage that occurs to the riprap cover and underlying cover layers caused by blowdown or other processes to maintain protection from erosion and possible consequent dispersion of cell contents. At the time of the inspection, the largest ponderosa pine trees on the cover were approximately 13 feet tall and had trunk diameters of 7 to 8 inches (based on growth rings, the trees were probably 12 years old). Due to the increasing potential for blowdown, and the consequent potential for disposal cell damage, most of the larger ponderosa pine trees were cut down this year (PL-3, PL-4).

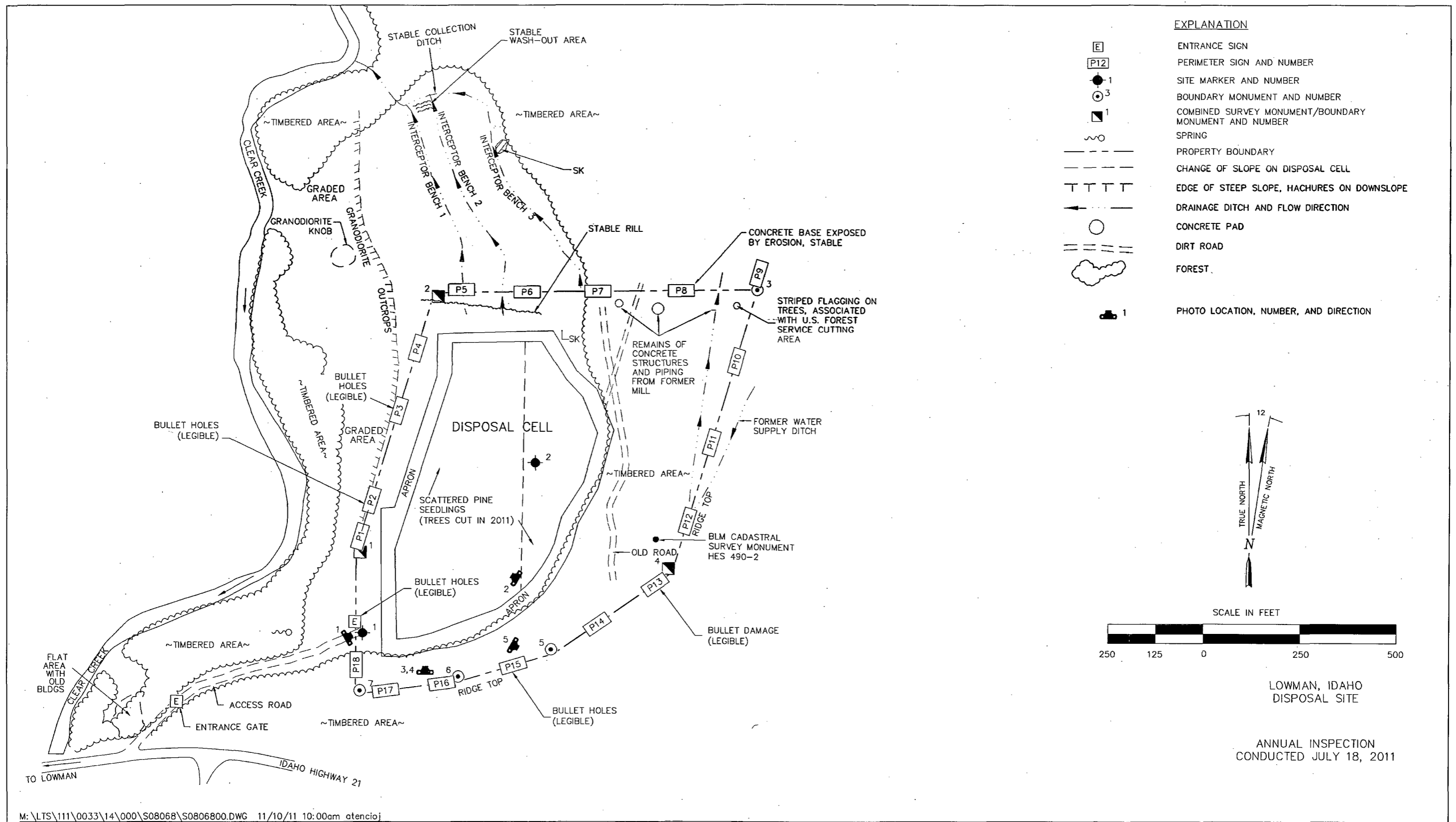


Figure 10-1. 2011 Annual Compliance Drawing for the Lowman Disposal Site

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**Area Between the Disposal Cell and the Site Boundary**—The steep slopes east and south of the site are stable and vegetated with well-established grasses and ponderosa pine trees. The slopes north and west of the site, which were highly disturbed during site remediation, are currently stable and becoming more vegetated. Concrete structures and metal pipes from the former mill remain in an area northeast of the disposal cell and were undisturbed. There was no evidence of intrusion along the site boundary.

**Outlying Area**—An area within 0.25 mile of the site was visually inspected for evidence of construction, development, logging, or change in land use that might affect the site. No changes were noted in the area across Clear Creek to the west, where several summer cabins and campsites are located.

The areas east and south of the site are managed by the U.S. Forest Service (USFS) and remain relatively unchanged. During the 2011 inspection, several new USFS benchmarks were found, most slightly within the DOE site boundary (PL-5). Although the area in question is on a ridge east of the cell unlikely to create an issue, USFS was contacted to determine why their monuments are within the DOE boundary. The survey discrepancy was discussed with USFS staff in Boise after the inspection. The discrepancy between boundary lines may be due to the two agencies' using different survey coordinate systems.

The State of Idaho and USFS own the reclaimed area north of the disposal cell. The area is stable and slowly becoming more vegetated. If significant erosion is observed on this parcel, DOE will notify the State. No significant erosion issues were identified during the inspection.

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

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### **10.3.3 Routine Maintenance and Repairs**

Numerous pine trees that had established on the top of the cell were cut and removed after the inspection to prevent potential cover degradation that could result from tree blowdown. A perimeter sign dislodged by a fallen tree was repaired. No other routine maintenance or repairs were required in 2011.

### **10.3.4 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 corrective action was required in 2011.

### 10.3.5 Photographs

Table 10-2. Photographs Taken at the Lowman, Idaho, Disposal Site

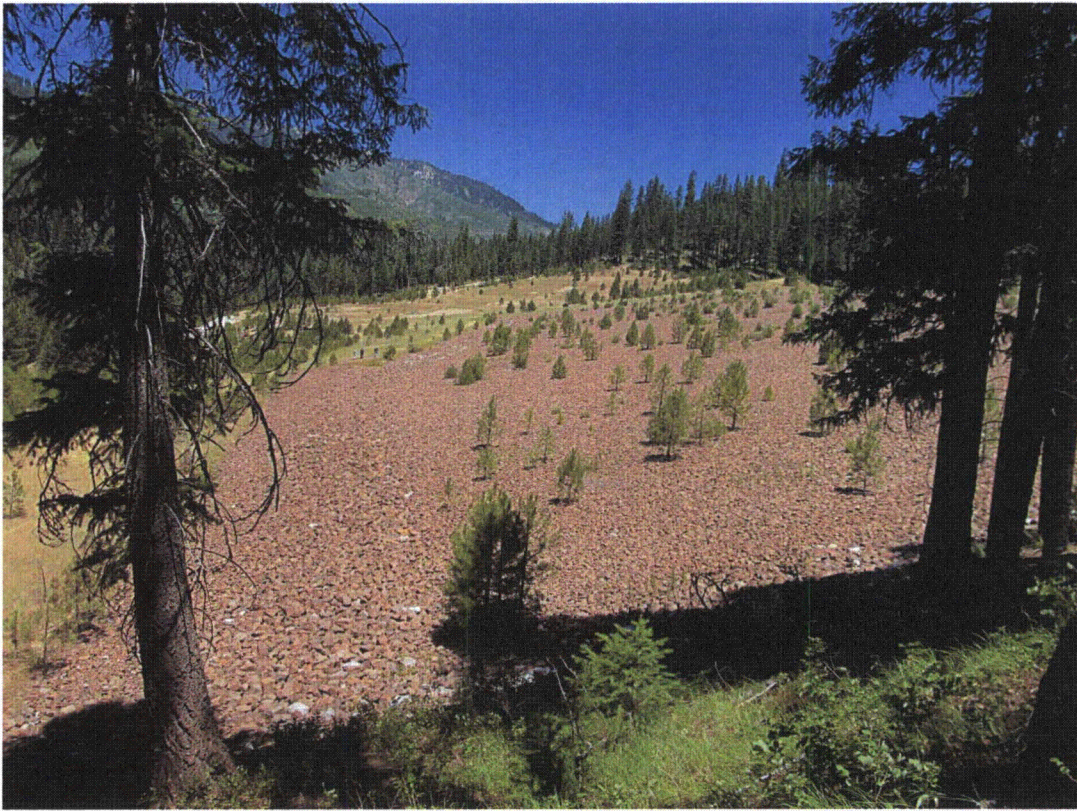
Photograph Location Number	Azimuth	Description
PL-1	60	Entrance sign and site marker SMK-1 (cut trees in background).
PL-2	300	View of riprap on southwest slope (cut trees in foreground).
PL-3	0	View of south slope of cell before pine trees were cut.
PL-4	0	View of south slope of cell after trees were cut.
PL-5	120	U.S. Forest Service monument found within site boundary (~15 feet north of P15).



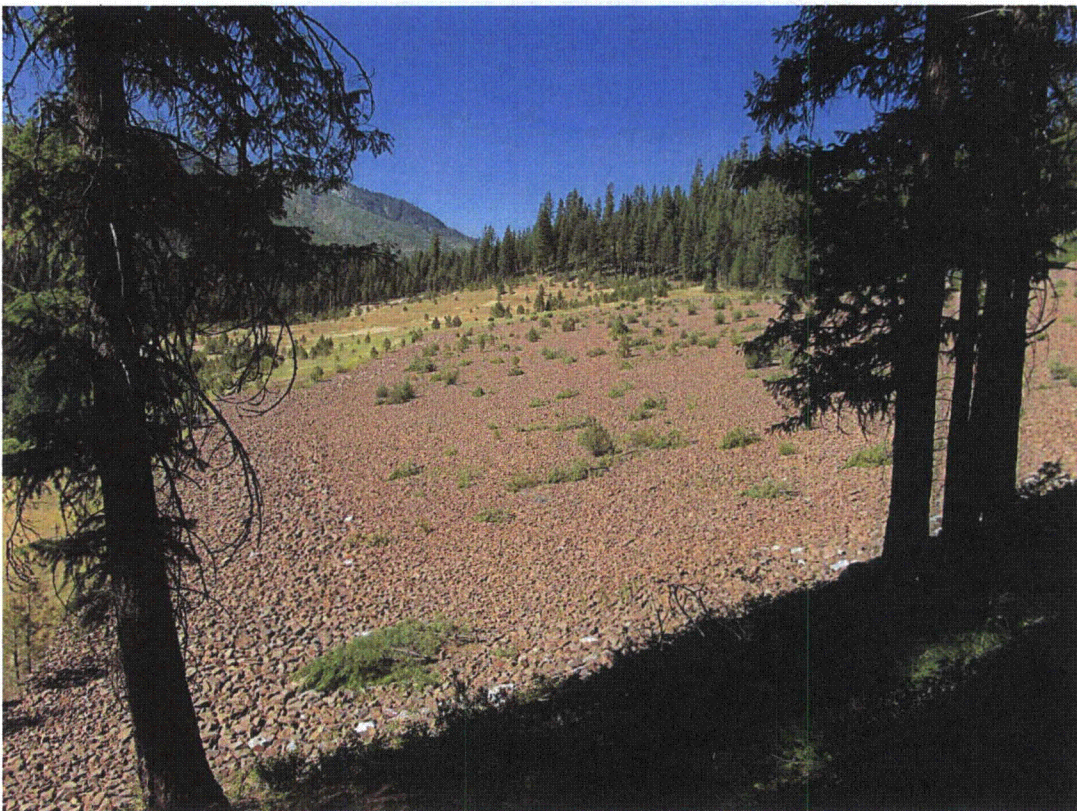
LOW 7/2011. PL-1. Entrance sign and site marker SMK-1 (cut trees in background).



LOW 7/2011. PL-2. View of riprap on southwest slope (cut trees in foreground).



*LOW 7/2011. PL-3. View of south slope of cell before pine trees were cut.*



*LOW 7/2011. PL-4. View of south slope of cell after trees were cut.*





*LOW 7/2011. PL-5. U.S. Forest Service monument found within site boundary (~15 feet north of P15).*

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## 11.0 Maybell, Colorado, Disposal Site

### 11.1 Compliance Summary

The Maybell, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Disposal Site was inspected on August 10, 2011. The disposal cell and all associated diversion and drainage structures were in good condition and functioning as designed. No significant change was observed to the washout that occurred in the outlet of Swale No. 1 and Diversion Channel No. 1; riprap continues to armor the downstream channel created. Missing perimeter signs were replaced, and damaged strands of the perimeter fence were repaired. Deep-rooted plants growing on the disposal cell and noxious weeds present on the site were treated with herbicide. Three boundary monuments are needed to correct an error discovered in the property boundary along the north and northwest portion of the site; the perimeter fence currently serves to delineate the boundary at this portion of the site. No cause for a follow-up inspection was identified.

New lode mining claim locator stakes were found on site, including on the disposal cell. The U.S. Bureau of Land Management (BLM) notified the claimant that those stakes located on the withdrawn portion of the site were placed in error. Title information indicates that the complete mineral estates were not acquired for the two private parcels that make up the balance of the site. However, protection of the disposal system from third-party surface and subsurface activities is provided under the general license.

### 11.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Maybell, Colorado (UMTRCA Title I) Disposal Site, Moffat County, Colorado* (DOE-LM/1605-2008, U.S. Department of Energy [DOE], April 2008; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 11-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 11.3.1
Follow-Up or Contingency Inspections	Section 3.5	Section 11.3.2
Routine Maintenance and Repairs	Section 3.6	Section 11.3.3
Groundwater Conditions	Section 2.5	Section 11.3.4
Corrective Action	Section 3.6	Section 11.3.5

**Institutional Controls**—The 251-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. 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 at the site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing (perimeter) signs along the property boundary, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual

inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 11.3 Compliance Review

### 11.3.1 Annual Inspection and Report

The site, northeast of Maybell, Colorado, was inspected on August 10, 2011. The results of the inspection are described below. Figure 11–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

#### 11.3.1.1 Specific Site-Surveillance Features

**Access, Gates, Fence, and Signs**—Access to the site is via County Road 53, which runs north off of U.S. Highway 40 approximately 8 miles east of Maybell. The road is graveled, hard-packed, and in good condition. County Road 53 ends at an unlocked gate near the northeast corner of the site (approximately 3 miles from U.S. Highway 40). From that point, the road continues west as a dirt two-track road directly north of the site. This road continues through a second unlocked gate and past an abandoned open-pit mine, known as the Robb Pit, to the site.

Because the access road to the site is a County road, maintenance up to that point is performed by Moffat County. Beyond that point, DOE is responsible for road maintenance under a BLM right-of-way permit.

Two gates are installed in the site perimeter fence and provide access to the site. The first gate is the entrance gate on the north end of the site, adjacent to the site marker and entrance sign. The second gate is in the northwest corner of the property, directly west of perimeter sign P3. Both gates are standard tubular metal stock gates and were locked and in good condition.

11A A standard four-strand barbed-wire stock fence surrounds the disposal cell and drainage structures. The site is located on wintering grounds frequented by big-game animals (e.g., deer, elk, antelope) and is also surrounded by open rangeland used to graze cattle. As a result, periodic damage to the perimeter fence is to be expected. The last significant maintenance to the fence was performed in 2009. In 2011, broken top strands were repaired near perimeter sign P26 and Gully No. 3. The remainder of the fence was in good condition.

The entrance sign, located next to the entrance gate and mounted on a t-post in the fence line, had a couple of bullet holes but remains legible (PL–1).

11B A total of 27 perimeter signs are located at the site. On the north, west, and south sides of the site, perimeter signs are mounted on t-posts in the perimeter fence. On the east side of the site perimeter signs are mounted on steel posts set in concrete and are located inside the property boundary approximately midway between the disposal cell and Johnson Wash. Several of the perimeter signs along the dirt road north and west of the site have bullet holes, but they remain legible. However, perimeter sign P26 was illegible, and perimeter sign P1 was missing; both were replaced. The remaining signs were in good condition.

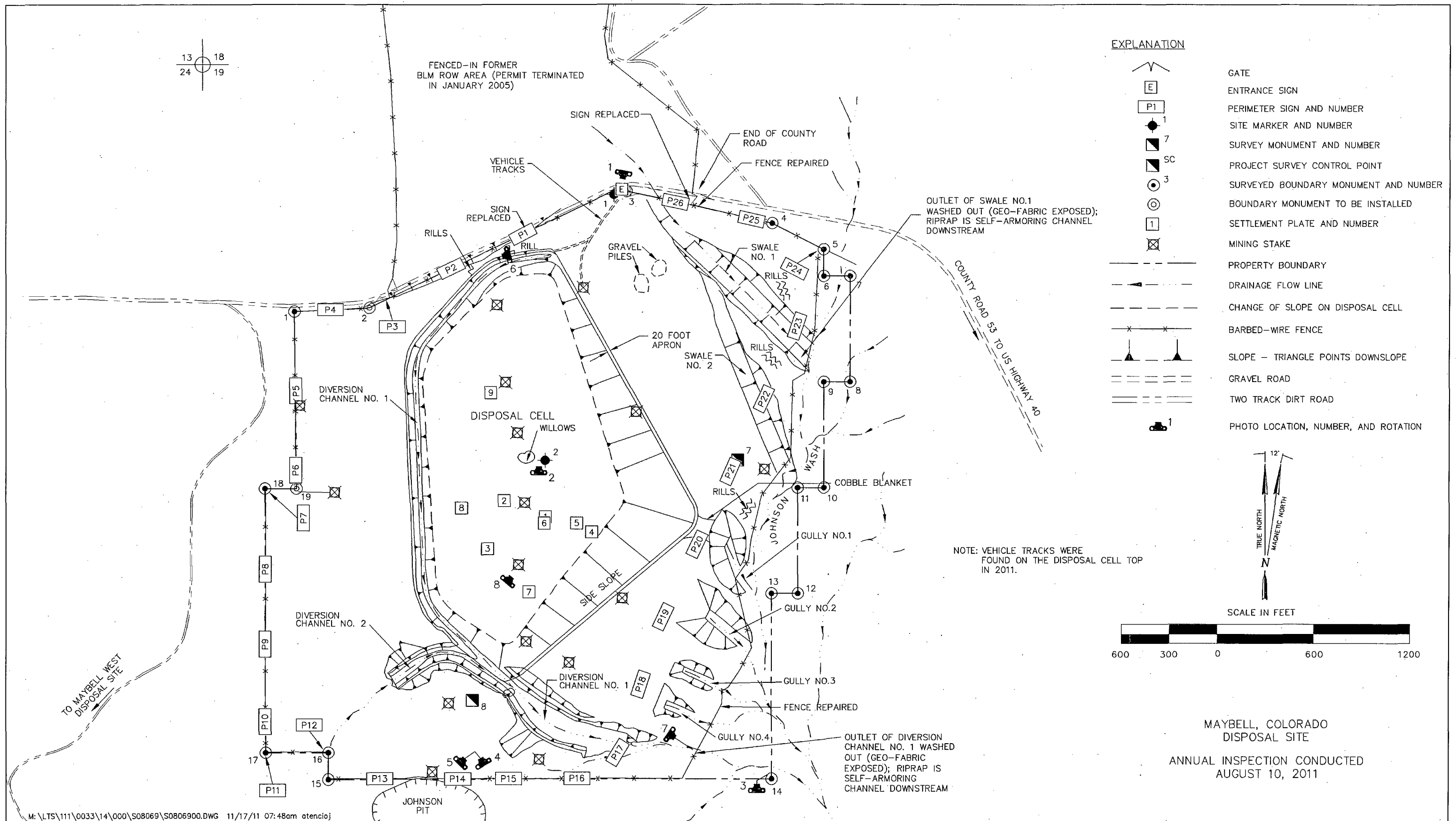


Figure 11-1. 2011 Annual Compliance Drawing for the Maybell Disposal Site

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**Site Markers and Monuments**—The site has 2 granite site markers (PL-2), 19 boundary monuments, and 2 survey monuments. All markers and monuments inspected were in good condition.

Originally, four boundary monuments were used to define the site property. Because these four monuments did not adequately represent the property boundary, 19 additional monuments were installed in September 2002 to better define the boundary. In 2008, during a real property assessment, an error was discovered in the property boundary along the north and northwest portion of the site. It was determined that the property boundary in this area, as it was depicted following the 2002 land survey, did not match the legal description included in the BLM permanent withdrawal for the site as posted in the *Federal Register* (April 13, 1995, vol. 60, no. 71, p. 18,778). The correct property boundary along the north and northwest portion of the site was determined to follow the perimeter fence line, as shown in Figure 11-1. As a result, the site base map was corrected and the LTSP was revised and submitted to NRC (Revision 4, April 2008). Because of this error, nine boundary monuments need to be removed north of the site, and three new monuments need to be installed along the correct property line (Nos. 2, 3, and 19 on Figure 11-1). All boundary monuments checked during the inspection were observed to be in good condition (PL-3).

**Settlement Plates**—The nine settlement plates located on top of the disposal cell were installed during construction to detect any significant settlement that might result, particularly because of the “slimes” (i.e., wet, fine-grained tailings) that were placed in the south-central part of the disposal cell. The former mill slimes were compacted before the completion of the radon barrier, but the potential for additional consolidation and possible stress to the radon barrier still existed. All of the settlement plates inspected were secure and in good condition. No evidence of settlement on the disposal cell cover was observed.

Surveying these settlement plates is no longer required. The elevations of the nine settlement plates on top of the disposal cell were last surveyed in July 2004. This survey concluded the 5-year post-construction annual settlement survey requirement stipulated in the LTSP. These land surveys confirmed that no significant settlement had occurred on the disposal cell top. Variation from baseline measurements ranged from 0.04 to 0.19 foot. Visual observation of the area surrounding the settlement plates continues during annual inspections. If settlement is observed, the settlement plates will be resurveyed.

#### **11.3.1.2 Transects**

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called “transects”: (1) the disposal cell, (2) other areas inside the site boundary, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

**Disposal Cell**—The disposal cell covers approximately 66 acres of the approximately 251-acre site property (PL-4 and PL-5). The roughly pentagonal disposal cell measures approximately

1,600 feet by 2,400 feet and is located in the center of the site. The above-grade disposal cell rises to a height of approximately 30 feet and is capped with a multiple-component cover that is approximately 7 feet thick. The cover consists of a 1.5-foot-thick radon/infiltration barrier, a 4-foot-thick compacted soil layer for protection from freeze-thaw cycles, a 0.5-foot-thick bedding layer to promote drainage, and an 8- to 12-inch-thick layer of riprap to prevent erosion of the underlying materials. The side slopes of the disposal cell are at a 20 percent grade to create a stable slope, and the top of the disposal cell has a 3 percent grade to promote drainage toward the west.

The disposal cell displayed no evidence of settlement, slumping, erosion, or rock degradation. In 2008, two slight depressions were thought to have been noted on the disposal cell top between Settlement Plates Nos. 6 and 7; these depressions could not be identified in subsequent years, including 2011. When first noted, these areas were thought to be a result of inconsistencies in grade that occurred during cell construction and not from the settlement of the underlying materials. Continued visual monitoring of this area will be performed during inspections to ensure that the disposal cell is not settling.

In 2011, vehicle tracks were observed on top of the disposal cell. The tracks are believed to be from recent activity, but their origin could not be determined. The imprint made from the tracks on the riprap was minor, and no damage to the cell cover occurred.

In accordance with the LTSP, inspectors looked for seeps on the east and southeast side slopes of the disposal cell because large quantities of slimes were encapsulated in this portion of the cell. No seeps were observed on the side slopes, nor were any seeps observed at the toe of the disposal cell in this area. However, a line of vegetation continues to be observed growing just above the apron that runs along the base of the southeast side slope. The accumulation of water in the apron (a result of runoff from the cell) is likely the cause of this vegetation growth rather than any seepage from within the cell. Standing water from recent precipitation was observed on the cobble blanket at the toe of the east corner of the cell. Additionally, cattails continue to be observed growing at this location, indicating the presence of moisture that is likely the result of repeated surface runoff from the east side slope of the cell rather than any seepage from within the cell. In 2003, in an effort to demonstrate that no contamination was seeping from the cell, a sample of the evaporite minerals from this location was collected for laboratory analysis, and no contamination from the cell was reported. Observation of this area for seeps will continue.

Minor accumulations of various shallow-rooted plants were observed on the cell top and side slopes. Species include thistle, yellow sweet clover, dogbane, and various grasses and annual weeds. Occasionally, deep-rooted woody plants, such as sagebrush, rabbitbrush, boxelder, and willows, are found growing on the disposal cell and are cut and treated with herbicide. In 2011, a small cluster of willows found growing on the top of the cell and boxelder found on the top and east side slope of the cell were cut and treated. Canada thistle, a noxious weed observed growing on the disposal cell cover in recent years, continues to reemerge, but to a much lesser degree. This noxious weed was again treated with herbicide.

**Other Areas Inside the Site Boundary**—Two diversion channels, three rock-armored gullies, and two rock-armored swales, along with a combination of other rock armoring and contouring, provide the surface water drainage control and erosion protection necessary to satisfy the site's

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design longevity requirements. Other surfaces at the site have been revegetated with a mix of native and adaptive grasses to stabilize the soil and minimize erosion.

The rock-armored diversion channels, swales, and gullies were in good condition (PL-6). Erosion that has occurred directly downgradient of the outlet to Diversion Channel No. 1 remains protected by the rock armoring within the channel. Exposed geo-fabric just upgradient of the outlet is not currently compromising the performance of the channel (PL-7). Additionally, the washout in the outlet to Swale No. 1 had not changed significantly, and the riprap placed within the swale remains protective and continues to provide armoring against downgradient erosion, as designed. Exposed geo-fabric was also observed at the outlet to Swale No. 1. Small rills observed adjacent to Swale No. 1 and Gully No. 1 continue to stabilize. None of these areas of erosion currently threaten the integrity of the disposal cell, but they will continue to be monitored.

There was no evidence of new erosion or sediment moving off site into Johnson Wash, and formerly active rills and gullies continue to stabilize through self-armoring and increased vegetation. No significant head-cutting was observed. Gabions and riprap installed to control erosion in drainage structures east of the cell in 2000 (and reinforced in 2001 and 2002) continue to perform as design.

There were abundant signs of wildlife on site and in the surrounding area. Vegetation diversity and density in graded and disturbed areas between the disposal cell and the site boundary continue to progress.

In 2011, new lode mining claim locator stakes were found on site, including on the disposal cell (PL-8). BLM notified the claimant that those stakes located on the withdrawn portion of the site were placed in error. Title information indicates that the complete mineral estates were not acquired for the two private parcels that make up the balance of the site. However, protection of the disposal system from third-party surface and subsurface activities is provided under the NRC general license at 10 CFR 40.27(d). This regulation requires that any activity allowed by NRC should not disturb the residual radioactive materials that have been disposed of, or—if an activity does disturb the materials—ensures that the materials be restored to a safe and environmentally sound condition. DOE has not been contacted in regard to any of the previous uranium exploration locator stakes found on site in 2006, 2008, and 2009 (no stakes were found in 2010).

**Outlying Area**—The area outside the site boundary for 0.25 mile was visually inspected. There was no evidence of erosion, development, change in land use, or other activities that might affect the site's long-term performance. As previously discussed, the recent lode mining claim locator stakes found on and around the site do not threaten the disposal structures because of protections provided under the general license.

A former open-pit uranium mine, referred to as the Johnson Pit, is located directly south of the site. Over time, slumping of the pit wall resulted in the pit encroaching approximately 5 feet onto what is now DOE property. This encroachment presents no threat to the integrity of the disposal cell and occurred prior to site reclamation. Continued observation will be performed to ensure that any additional sloughing of the pit wall does not damage the perimeter fence that runs along the south property line. This encroachment is visually monitored annually, and it is documented

periodically with photographs to determine if continued slumping of the pit wall is occurring. In 2011, there was no evidence of any additional encroachment of the pit onto the site.

In September 2004, DOE received written concurrence from BLM that the right-of-way reservation located directly north of the site was relinquished, as that area has been revegetated successfully with no significant erosion occurring. Revegetation continues to progress in this area.

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

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### **11.3.3 Routine Maintenance and Repairs**

In 2011, deep-rooted vegetation and noxious weeds found growing on the disposal cell were cut and treated with herbicide, two perimeter signs were replaced, and minor repairs were made to the perimeter fence.

### **11.3.4 Groundwater Conditions**

Groundwater at this site is contaminated as a result of widespread, naturally occurring uranium mineralization and mining activities not related to on-site legacy uranium-processing operations. The groundwater in the area is designated "limited use." "Limited use" is a designation given to groundwater that is not a current or potential source of drinking water because it contains widespread ambient contamination that cannot be cleaned up by methods reasonably employed in public water systems. Narrative supplemental standards, in accordance with 40 CFR 192.21 (g), have been applied to groundwater at the site. Therefore, groundwater quality monitoring is not required at the site.

Groundwater-level monitoring was conducted in accordance with the LTSP from November 1995 through March 2004 to determine if transient drainage from the disposal cell was interacting with the local groundwater system. In 2004, following the required 5-year monitoring period, water-level measurements were discontinued because there was no evidence that transient drainage was interacting with the local groundwater system near the disposal cell. In January 2005, NRC concurred on this conclusion. In May 2006, the four remaining monitoring wells at the site were decommissioned in accordance with State of Colorado requirements. In November 2007, the LTSP was revised to reflect regulatory concurrence to discontinue water-level monitoring and submitted to NRC.

### **11.3.5 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 corrective action was required in 2011.

### 11.3.6 Photographs

Table 11-2. Photographs Taken at the Maybell Disposal Site

Photograph Location Number	Azimuth	Description
PL-1	180	Entrance gate and sign; disposal cell in background.
PL-2	NA	Site marker on top of the disposal cell.
PL-3	NA	Boundary Monument No. 14 in the southeast corner of the site.
PL-4	330	Western portion of the disposal cell and confluence of Diversion Channels Nos. 1 and 2.
PL-5	45	Eastern portion of the disposal cell; Diversion Channel No. 2 in foreground.
PL-6	255	Diversion Channel No. 1; rock-covered slope west of cell in background.
PL-7	125	Exposed geo-fabric and erosion at the discharge point of Diversion Channel No. 1.
PL-8	40	Mining lode claim stake found on the top of the disposal cell.



MAY 8/2011. PL-1. Entrance gate and sign; disposal cell in background.



MAY 8/2011. PL-2. Site marker on top of the disposal cell.



*MAY 8/2011. PL-3. Boundary Monument No. 14 in the southeast corner of the site.*



*MAY 8/2011. PL-4. Western portion of the disposal cell and confluence of Diversion Channels Nos. 1 and 2.*



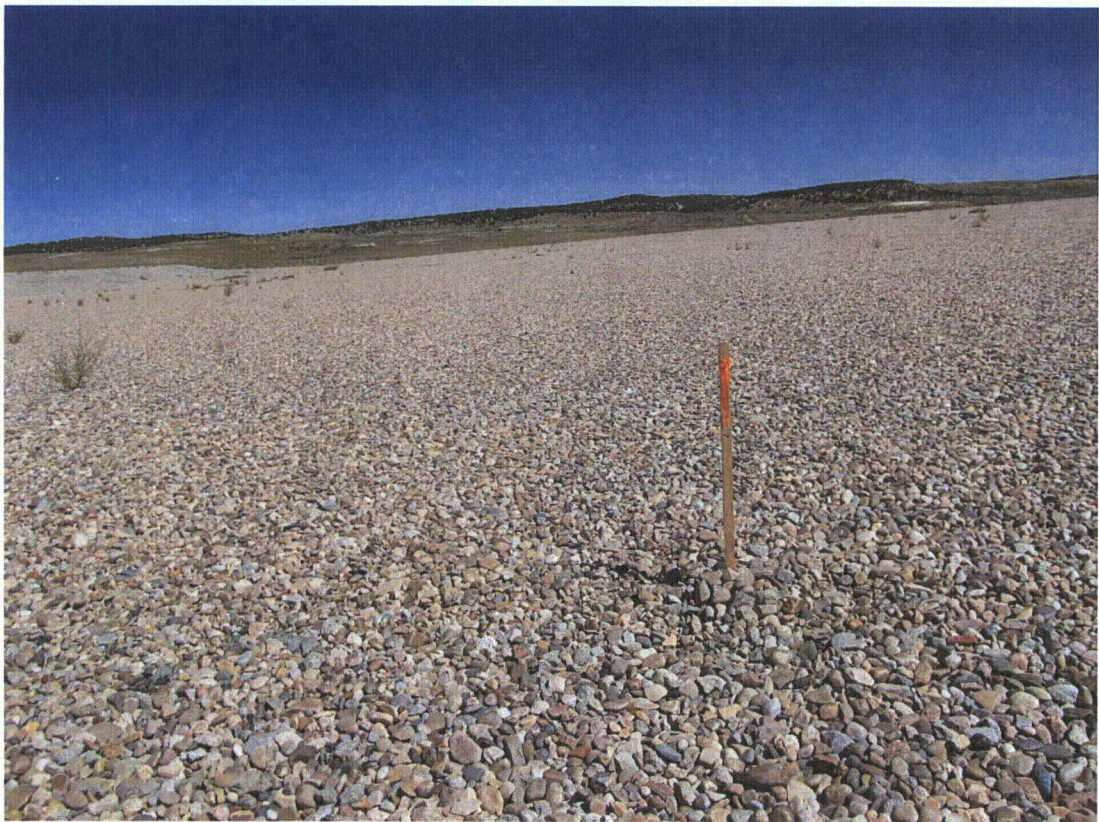
*MAY 8/2011. PL-5. Eastern portion of the disposal cell; Diversion Channel No. 2 in foreground.*



*MAY 8/2011. PL-6. Diversion Channel No. 1; rock-covered slope west of cell in background.*



MAY 8/2011. PL-7. Exposed geo-fabric and erosion at the discharge point of Diversion Channel No. 1.



MAY 8/2011. PL-8. Mining lode claim stake found on the top of the disposal cell.

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## 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 April 5, 2011. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. Runoff from storm events continues to transport sediment into the west diversion channel, resulting in low-density vegetation growth within the entire length of the channel; however, the performance of the diversion channel has not been impaired. New bullet holes in several perimeter signs indicate that vandalism continues at the site.

In accordance with approved recommendations presented in the seep monitoring evaluation report (*Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site* [DOE-LM/GJ1139-2006, U.S. Department of Energy (DOE), March 2006]), annual observation of six designated seeps (0248, 0249, 0251, 0254, 0264, and 0922) was conducted during the inspection. No significant change from the previous year was noted; one of the seeps was dripping, and the other five were dry.

### 12.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Mexican Hat Disposal Site are specified in the *Long-Term Surveillance Plan for the Mexican Hat, Utah (UMTRCA Title I) Disposal Site, San Juan County, Utah* (DOE-LM/1530-2007, October 2007; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 12-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 12.3.1
Follow-Up or Contingency Inspections	Section 3.5	Section 12.3.2
Routine Maintenance and Repairs	Section 3.6	Section 12.3.3
Groundwater Monitoring	Section 3.7	Section 12.3.4
Corrective Action	Section 3.6	Section 12.3.6

**Institutional Controls**—The U.S. Bureau of Indian Affairs holds the 119-acre site in trust. The Navajo Nation retains title to the land. 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 site and ensures that DOE has perpetual access to the site. UMTRCA authorized DOE to enter into Cooperative Agreement DE-FC04-85AL26731 with the Navajo Nation, and the U.S. Nuclear Regulatory Commission (NRC) required it prior to bringing the site under the general license. The purpose of the Cooperative Agreement was to facilitate remedial actions at the former processing site. The site was accepted under the NRC general license (10 CFR 40.27) 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 at the site, as defined by DOE Policy 454.1, consist of federal control of the property, a site perimeter

fence, warning/no-trespassing signs placed along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 12.3 Compliance Review

### 12.3.1 Annual Inspection and Report

The site, south of Mexican Hat, Utah, was inspected on April 5, 2011. The results of the inspection are described below. Figure 12–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

#### 12.3.1.1 *Specific Site-Surveillance Features*

**Access, Fence, Gate, and Signs**—The site is accessed via a short, unmarked dirt road off U.S. Highway 163, approximately 1 mile south of the San Juan River. The dirt road heads east and ends at a graded parking area. The access road crosses Navajo Nation land, and access is granted under the Custodial Access Agreement. Erosion continues to occur along the dirt road, but the site is still accessible; no repairs are necessary at this time. Trash, including substantial quantities of broken glass, accumulates along the entrance road and in the parking area.

A barbed-wire perimeter fence is located between the disposal cell features and the site boundary. Other than erosion of soil down to rock at a couple of locations near the south and southwest diversion channel, the perimeter fence is in excellent condition. Periodically, the fence is damaged by livestock or erosion and requires repair. Erosion has increased the spacing between the lowest strand and the ground surface between perimeter signs P37 and P40. An additional strand of non-barbed (wildlife-friendly) wire was added in 2010 (PL–1). Erosion continues to migrate up to the end of the west diversion channel at perimeter signs P42 and P43 but is not a concern at this time.

The entrance sign located at the gate is in excellent condition. There are 43 perimeter sign locations, and each location has a pair of signs: an upper property ownership sign and a lower radioactive materials disposal site warning sign. The perimeter signs were present and legible although several are bent or damaged by bullet holes. Several signs on the south boundary, including the replaced perimeter sign P23, which was moved inside the perimeter fence, have new bullet holes after being replaced in October 2010.

**Site Markers and Monuments**—The 2 site markers, 4 survey monuments, and 12 boundary monuments were inspected. All were in good condition. Boundary monument BM–11 is in an area subject to erosion but remains stable.

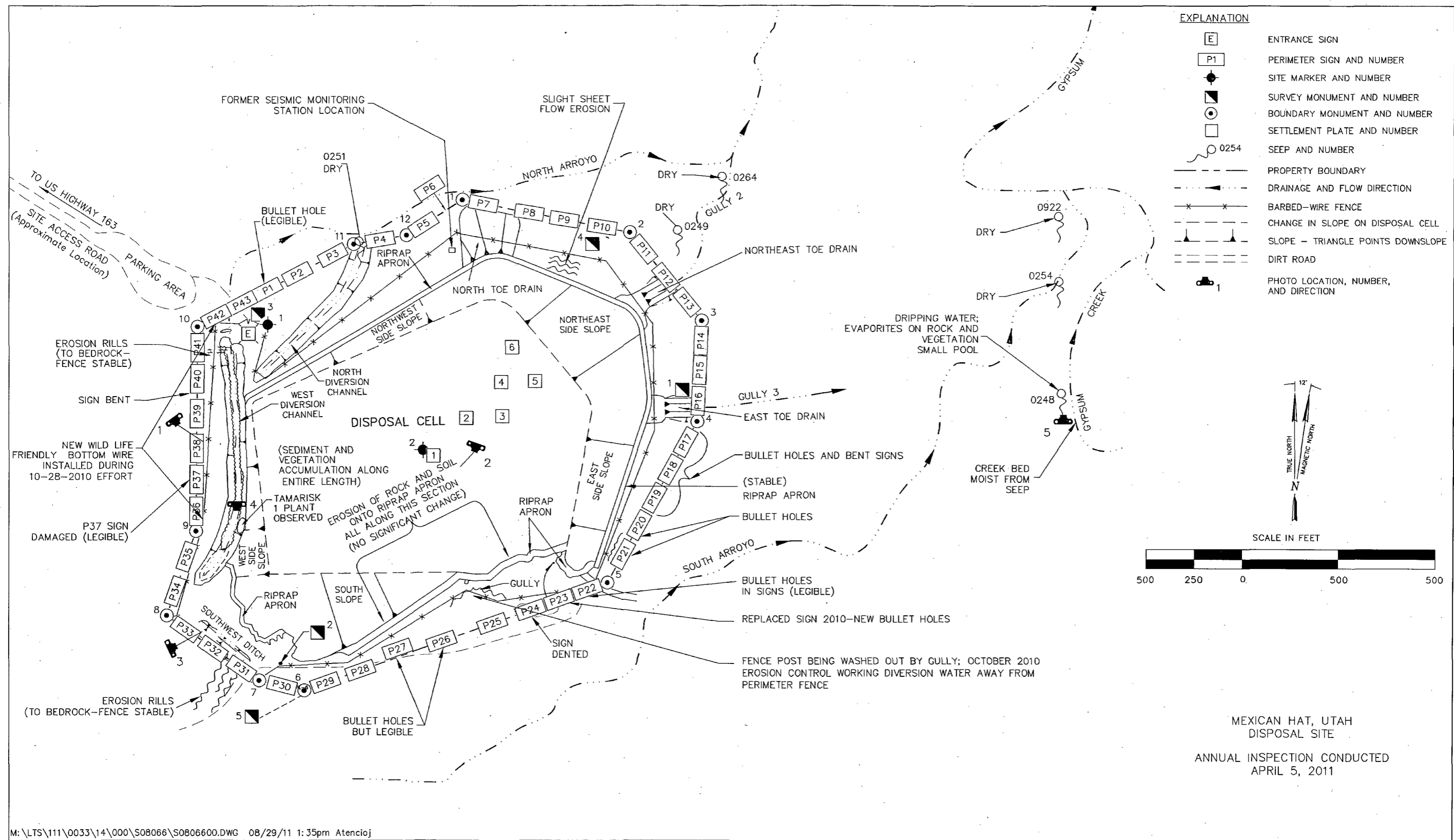


Figure 12-1. 2011 Annual Compliance Drawing for the Mexican Hat Disposal Site

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**Settlement Plates**—There are six settlement plates on top of the disposal cell. All were secure and in good condition. No evidence of settlement on the disposal cell cover was observed. The settlement plates were surveyed for several years following cell construction, but the surveying is no longer required.

**Monitoring Wells**—In 2007, the four remaining monitoring wells (0899, 0934, 0935, and 0909) at the site were decommissioned following the Navajo Nation concurrence that groundwater monitoring is not required to maintain protectiveness.

### **12.3.1.2 Transects**

To ensure a thorough and efficient inspection, inspectors divided the site into four areas called “transects”: (1) the riprap-covered disposal cell top slope, (2) the riprap-covered side slopes and diversion ditches, (3) the area between the disposal cell and the site boundary, and (4) the outlying area.

Within each transect, inspectors examined specific site-surveillance features, such as the entrance gate and sign, survey and boundary monuments, perimeter signs and fences, and site markers. Inspectors examined each transect for evidence of erosion, settling, slumping, and other disturbances that might harm the site’s integrity or long-term performance.

**Top of the Disposal Cell**—The top of the disposal cell was in excellent condition. There was no evidence of differential settling, cracking, erosion, or burrowing. All visible components of the disposal cell and cover were functioning as designed. No vegetation was observed to be growing on top of the disposal cell (PL-2).

**Side Slopes, Toe Drains, Aprons, and Diversion Channels**—The disposal cell side slopes, toe drains, aprons, and diversion channels were in excellent condition and functioning as designed (PL-3).

The sloughing of red country rock and soil along the south apron does not appear to have increased significantly during the past year. Because the apron in this area is immediately adjacent to the steep rocky cliff face along the southern edge of the disposal cell cover, it is anticipated that a certain amount of sediment and unstable rock from the cliff face will, over time, continue to fall onto the apron. This area has been inspected for several years, with little or no change being observed from year to year. As a best management practice, inspectors will continue to monitor this area; however, this fallen material is not expected to impact the performance of the disposal cell.

Areas off site and upgradient continue to erode and transport sediment onto the site and into the west diversion channel. The sediment accumulation has promoted the growth of vegetation in the channel, including perennial grasses and annual weeds; however, the sediment and vegetation are not affecting the performance of these drainage structures.

A tamarisk plant was observed on the site during the inspection in the west diversion channel outside of the cap (PL-3). Its growth will be monitored, and it may be removed during the next scheduled maintenance effort. Though present in arroyos outside the site, tamarisk will continue to be controlled on the site.

**Area Between the Disposal Cell and the Site Boundary**—Erosional rills and gullies continue forming along the western edge of the site boundary, primarily upgradient of, and between, boundary monuments BM-7 and BM-8. This is an expected natural process and a result of the site's stabilizing and coming to equilibrium with the outlying areas. Erosion in these areas will continue to be monitored, but it is not a concern unless it damages the perimeter fence or impacts the performance of the west diversion channel.

Scattered trash (broken glass, bottles, cans, cardboard, and paper containers) is accumulating in the more accessible portions of the site where vehicular access is available. The most noticeable accumulations of trash were along the entrance road and in the parking area, along the perimeter fence between perimeter signs P31 and P42, and in the southern portion of the site between perimeter signs P22 and P27. Periodic removal of trash may be required to maintain the integrity of the perimeter fence and to keep the trash from entering the fenced area.

Tumbleweeds as well as trash continue to accumulate along the west and southwest sections of the perimeter fence, primarily between perimeter signs P31 and P42. However, the accumulation does not appear to be impacting the fence.

Trespassing just inside the site property boundary (outside the perimeter fence) occurs in the same areas where trash accumulations are noted, as evidenced by vehicle (e.g., all-terrain vehicle [ATV]) tracks. Vandalism has increased, as indicated by new bullet holes in several perimeter signs. This is anticipated to be an ongoing problem at the site.

**Outlying Area**—The area surrounding the site was visually inspected for signs of erosion, development, or other disturbances that might affect site integrity or security. As discussed above, trash continues to accumulate primarily in areas immediately adjacent to the site property boundary. The area within 0.25 mile of the site boundary appears to be popular with ATV and four-wheel-driving enthusiasts. No other changes were observed that would impact the integrity of the site.

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

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### **12.3.3 Routine Maintenance and Repairs**

A new sign will be installed during the next inspection at seep location 254.

### **12.3.4 Groundwater Monitoring**

An effective aquitard and an upward hydraulic gradient prevent any overlying water from migrating downward into the uppermost aquifer. Therefore, contamination from either the disposal cell or the former uranium-processing-site activities has not impacted groundwater in

the uppermost aquifer, and the LTSP does not require that groundwater in the uppermost aquifer be monitored.

However, due to concerns raised by the Navajo Nation, groundwater was monitored at the site from November 2000 to August 2002, as a best management practice. This monitoring was performed to demonstrate that no site-related contamination had entered the uppermost aquifer and that the upward hydraulic gradient was present. The groundwater monitoring results from this 2-year period confirmed these conditions, and the results were presented in the report *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*. This report was submitted to the Navajo Nation in March 2006. In July 2006, the Navajo Nation concurred that continued groundwater monitoring of the uppermost aquifer at the site was not necessary. As a result, DOE decommissioned the remaining four monitoring wells at the site in April 2007.

### 12.3.5 Seep Monitoring

12A From 1998 through 2005, in accordance with the LTSP, and when sufficient flows have allowed, seep water quality monitoring was performed as a best management practice due to concerns raised by the Navajo Nation over cell performance and historical processing-site-related contamination. In 2006, an evaluation of the Seep-Monitoring Program was conducted and presented in the report *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*. Based on the monitoring results, the hydrogeological conditions at the site, the continued low flows from the seeps, and the absence of any receptors, a recommendation was made to discontinue water quality monitoring of the seeps in lieu of annual observation of seep flow rates during site inspections. The recommendation stated that if a significant increase in seep flows was observed, an evaluation would be performed to determine if water quality monitoring should resume. In July 2006, the Navajo Nation conditionally concurred on these recommendations. The report was submitted to NRC in August 2006.

The site LTSP was revised and submitted to NRC in October 2007 to reflect the Navajo Nation's concurrence on discontinuing water quality monitoring of the seeps in lieu of continuing annual observations of seep flows, and to present the results of the best-management-practice groundwater monitoring performed, as discussed previously. The revised LTSP states that the annual observation of seep flows will continue for a minimum of 10 years, at which time an evaluation will be performed to determine the need to continue seep-flow monitoring. The revised LTSP states that if the seep flows significantly increase, the need to resume water quality monitoring would be reevaluated.

In accordance with the revised LTSP, visual monitoring of seep flows was conducted during the 2011 annual inspection. The flows of six seeps were observed and documented to be negligible or nonexistent. The seeps are primarily the result of perched water that leaked from the former-processing-site tailings pond for many years. To a lesser degree, they are also the result of transient drainage from the wet tailings placed in the disposal cell. Seep flows are expected to diminish over time; however, a minor amount of recharge does occur, as evidenced by the presence of seeps upgradient of the former processing site and disposal cell. Historical documentation and records also indicate the presence of seeps prior to former-processing-site operations. Warning signs advising the public to not drink the water remain posted at the seep locations.

The flow and small pool observed in seep 0248, located in Gypsum Creek and cross-gradient from the disposal cell, were similar to those observed during previous years (PL-4). The remaining five seeps were dry.

Table 12-2. Description of Seep Flows at the Mexican Hat Disposal Site

Seep Location Number	Drainage	Hydrological Relationship to Disposal Cell	Observations and Descriptions of Seep Flow (Qualitative)
0248	Gypsum Creek	Downgradient	Minimal flow and dripping from adjacent rock face; no flow from the pool or the immediate area. Soils moist in immediate area surrounding the seep.
0249	Gully 2	Downgradient	Dry; no evidence of a seep (i.e., no moist soils or riparian vegetation were present).
0251	North Arroyo	Downgradient	Dry; no observed flow. Minimal vegetation, primarily tamarisk (very little other riparian vegetation).
0254	South Arroyo	Downgradient	Dry; no flow or moist soil present where standing pool of water usually exists from recent rain events. Very little riparian vegetation besides tamarisk. Location not posted.
0264	North Arroyo	Downgradient	Dry; no flow.
0922	South Arroyo	Downgradient	Dry; no change from previous year's inspection.

### 12.3.6 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 corrective action was required in 2011.

### 12.3.7 Photographs

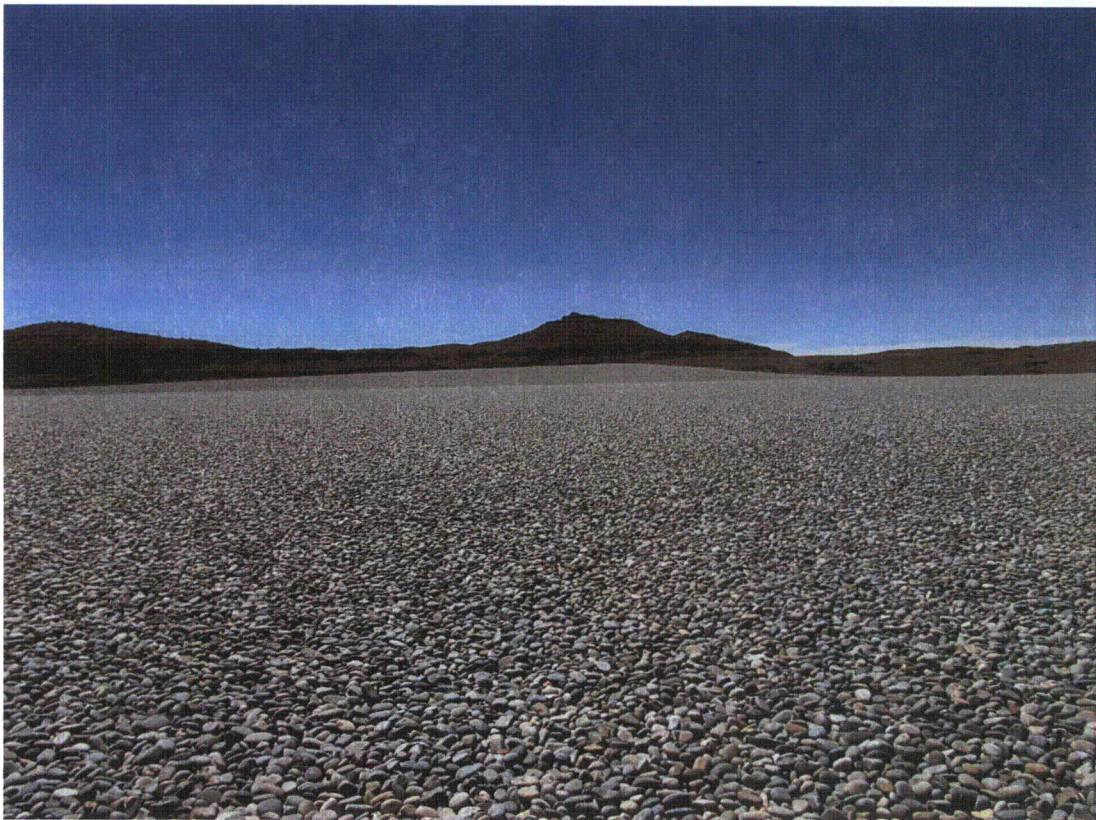
Table 12-3. Photographs Taken at the Mexican Hat Disposal Site

Photograph Location Number	Azimuth	Description
PL-1	145	New fence strand added to the bottom of the fence in October 2010.
PL-2	200	Top of disposal cell.
PL-3	65	Inspectors along the northwest side of the disposal cell.
PL-4	180	Tamarisk in west diversion channel.
PL-5	0	Seep 0248 dripping with small pool.





*HAT 4/2011. PL-1. New fence strand added to the bottom of the fence in October 2010.*



*HAT 4/2011. PL-2. Top of disposal cell.*



*HAT 4/2011. PL-3. Inspectors along the northwest side of the disposal cell.*



*HAT 4/2011. PL-4. Tamarisk in west diversion channel.*



*HAT 4/2011. PL-5. Seep 0248 dripping with small pool.*

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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 was inspected on May 17, 2011. The site was in excellent condition, and the disposal cell and all associated surface water diversion and drainage structures were functioning as designed. The only maintenance needs identified were several loose perimeter fence wires, which were repaired in September 2011. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

### 13.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Upper Burbank Disposal Cell, Uravan, Colorado* (DOE/AL/62350-250, Rev. 1, U.S. Department of Energy [DOE], July 1999; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 13-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.1 and 6.2	Section 13.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 13.3.2
Routine Maintenance and Repairs	Section 4.0	Section 13.3.3
Groundwater Monitoring	Section 2.6.2	Section 13.3.4
Corrective Action	Section 5.0	Section 13.3.5

**Institutional Controls**—The 26.65-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) 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 at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site access road. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

### 13.3 Compliance Review

#### 13.3.1 Annual Inspection and Report

The site, approximately 1 mile west-southwest of the former community of Uravan, Colorado, was inspected on May 17, 2011. Results of the inspection are described below. Figure 13-1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

### 13.3.1.1 Specific Site-Surveillance Features

**Access Roads, Gates, Fence, and Signs**—Access to the site is from Montrose County Road EE22, which intersects State Highway 141 at Uravan. County Road EE22 approaches the site from the southeast and continues (off site) along the northeast side of the disposal cell. The paved or graveled County road was in good condition.

The site entrance gate, north of the disposal cell off of County Road EE22, consists of a locked pair of tubular metal gates suspended from galvanized steel gateposts. The gates are in good condition. The road through the entrance gate provides access to monitoring wells adjacent to the north and west sides of the cell. Two additional metal gates along this access road were also secure and in good condition. During the previous (June 2010) inspection, boulders had fallen onto the access road near perimeter sign P17; the boulders were removed in July 2010. Although occasional rock fall is a continuing maintenance issue at the site, due to the surrounding terrain, the access road was generally in good condition at the time of the 2011 inspection.

13A

A barbed-wire stock fence encloses the site. The fence is in good condition except for a section with loose top strands south of perimeter sign P21. This section of the fence was repaired in September 2011. Although cattle grazing should be of little concern because forage within the site or in the immediate area is minimal, cattle have been observed near the adjacent Umetco Minerals Corporation's Uravan UMTRCA Title II Disposal Site. Therefore, the condition of the stock fence will continue to be regularly monitored.

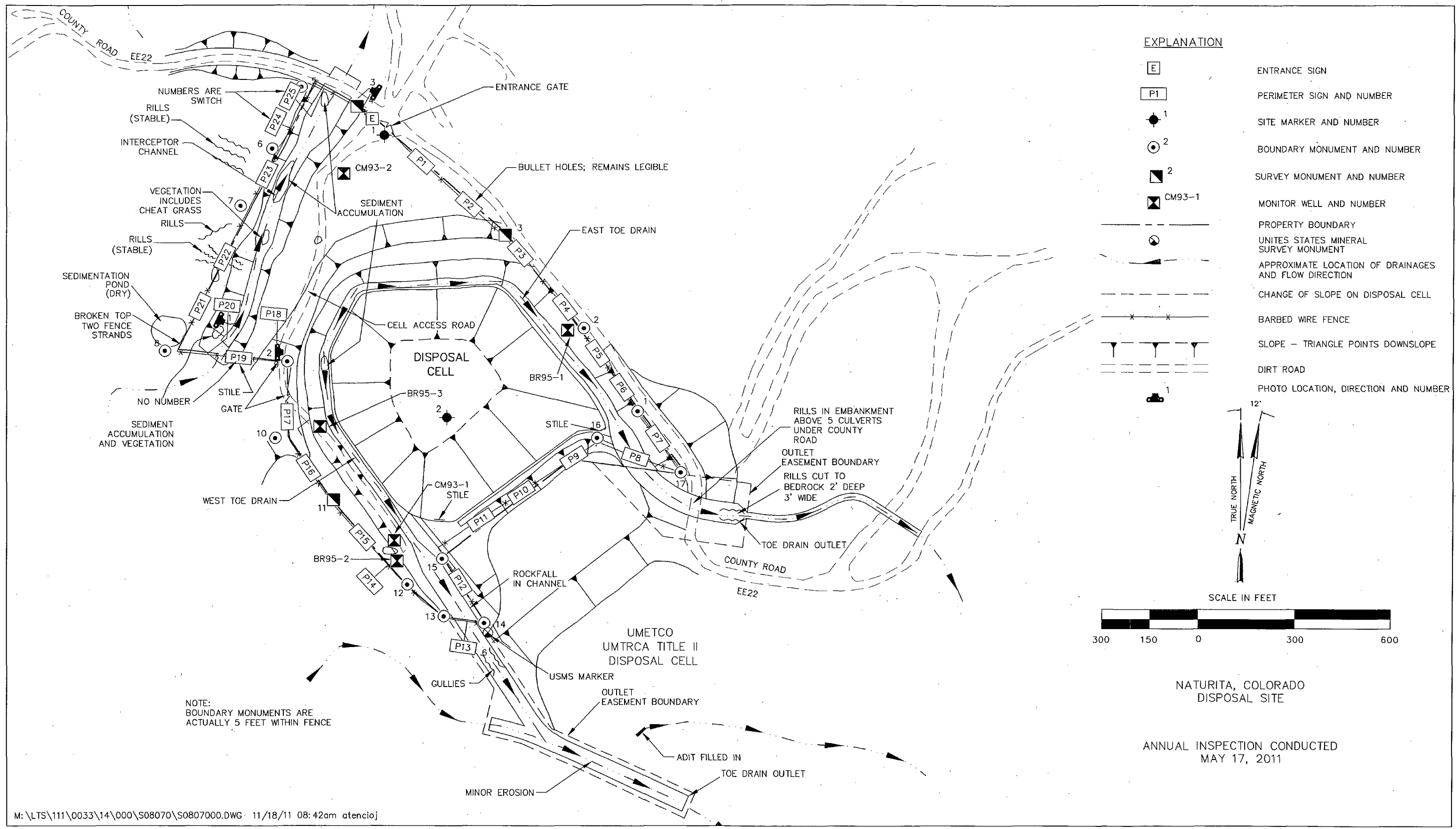
The site has 25 perimeter signs and one entrance sign. Perimeter signs, mounted on steel posts, are set approximately 5 feet inside the perimeter fence. One perimeter sign (P2) has had three bullet holes for the past several years but remains legible. The other 24 perimeter signs and the entrance sign were in good condition. In 2009, three stiles were installed over the perimeter fence at three locations to allow safe crossings during inspections. The three stiles, two near boundary monuments BM-15 and BM-16, and one near perimeter sign P19 (see Figure 13-1), were in good condition at the time of the inspection.

**Site Markers and Monuments**—The two granite site markers, SMK-1 and SMK-2, were undisturbed and in good condition. As first observed during the 2008 inspection, SMK-1 has a chip off the northeast corner of the concrete pad on which it is placed.

The site property boundary has 17 corners, which are marked by either boundary monuments or survey monuments. Boundary monuments are designated BM-1 through BM-17. Three survey monuments, SM-3, SM-4, and SM-11, are used in lieu of boundary monuments BM-3, BM-4, and BM-11.

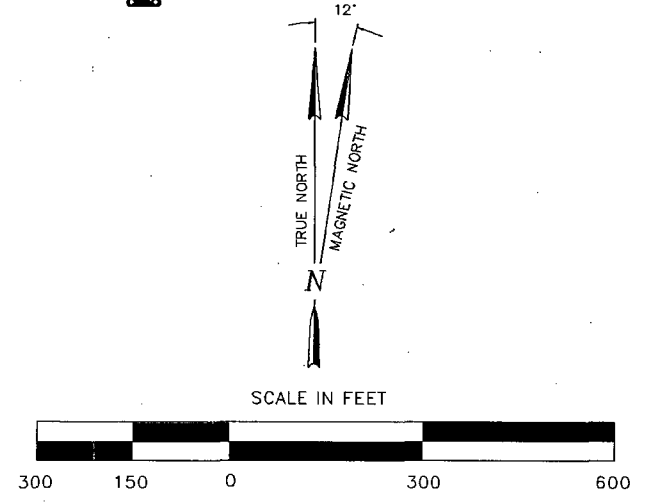
Survey monuments were installed during site construction for survey control; boundary monuments were installed after construction was completed to delineate the final property boundary. Both types of monuments are located with the same precision. All boundary and survey monuments were undisturbed and in good condition.

**Monitoring Wells**—The groundwater monitoring network has five wells: BR95-1, BR95-2, BR95-3, CM93-1, and CM93-2. Monitoring wells BR95-1, BR95-2, and BR95-3 were completed at the top of the Summerville Formation, which forms an aquitard above the Wingate Sandstone. Wells CM93-1 and CM93-2 were completed in the Wingate Sandstone, which is the uppermost aquifer at the site. All monitoring wells were secure and in good condition.



**EXPLANATION**

[E]	ENTRANCE SIGN
[P1]	PERIMETER SIGN AND NUMBER
● 1	SITE MARKER AND NUMBER
⊙ 2	BOUNDARY MONUMENT AND NUMBER
◻ 2	SURVEY MONUMENT AND NUMBER
⊠ CM93-1	MONITOR WELL AND NUMBER
---	PROPERTY BOUNDARY
○	UNITES STATES MINERAL SURVEY MONUMENT
---	APPROXIMATE LOCATION OF DRAINAGES AND FLOW DIRECTION
---	CHANGE OF SLOPE ON DISPOSAL CELL
---	BARBED WIRE FENCE
---	SLOPE - TRIANGLE POINTS DOWNSLOPE
---	DIRT ROAD
1	PHOTO LOCATION, DIRECTION AND NUMBER



NATURITA, COLORADO  
DISPOSAL SITE

ANNUAL INSPECTION CONDUCTED  
MAY 17, 2011

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Figure 13-1. 2011 Annual Compliance Drawing for the Naturita Disposal Site

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### 13.3.1.2 *Transects*

To ensure a thorough and efficient inspection, inspectors divided the site into four areas called “transects”: (1) the riprap-covered top slope and side slopes of the disposal cell, (2) the riprap-covered toe drains and toe drain outlets, (3) the riprap-covered interceptor channel, and (4) the outlying area. Within each transect, inspectors examined specific site-surveillance features, such as monitoring wells, survey and boundary monuments, signs, and site markers. Inspectors examined each transect for evidence of erosion, settling, slumping, or any other disturbance that might affect the site’s integrity or long-term performance.

The LTSP identified a fifth transect, no longer applicable, consisting of the reclaimed areas surrounding the disposal cell. Vegetation cover in this area is well established, and a storm water discharge permit that previously addressed this area was terminated by the State of Colorado in November 2001. Therefore, this transect is no longer formally inspected.

**Top Slope and Side Slopes of Disposal Cell**—The disposal cell was completed in 1998. Rock riprap covers the 2-acre top of the disposal cell and the approximate 8 acres of side slopes. The rock is rounded and is larger on the side slopes than on the top of the cell. The rock-covered surfaces were in excellent condition (PL-1) and showed no signs of disturbance. As observed during the last two (2009 and 2010) inspections, the only exception is a small area on the southwest side of the cell, which exhibits a slightly irregular surface because a standpipe was removed from there several years ago. The remaining portions of the top and side slopes of the disposal cell were in excellent condition. No evidence of subsidence, differential settlement, slumping, or other modifying process was noted, and no vegetation was evident on the cell.

**Toe Drains and Toe Drain Outlets**—Two riprap-armored toe drains collect water from the cell side slopes and divert it to the southeast. The toe drain on the west and southwest sides of the cell exits through a channel quarried through the wall of the Burbank Pit, into Hieroglyphic Canyon, and finally to the San Miguel River. Although some sediment has accumulated in the upper end of the western toe drain, allowing scattered weeds and grasses to grow (PL-2), the drain is still functioning as designed. As noted in previous inspections, farther down this drain, beyond the lined and armored portion, water is beginning to erode softer bedrock. A knickpoint has formed at the intersection of shale and overlying sandstone units within the Salt Wash Member of the Morrison Formation. This erosion does not affect the performance of the toe drain but will continue to be monitored.

The east toe drain extends through the adjacent Umetco Title II site and crosses beneath County Road EE22 through five culverts. Rills are present in the road embankment over the culvert outlets but are not affecting the road surface at this time. Minor erosion of loose material has occurred in the drain outlet area, but the underlying sandstone bedrock limits further erosion. During the 2011 inspection, a boulder that had apparently rolled off the slope from County Road EE22 was noted in the east toe drain near perimeter sign P4. Although the boulder is not considered a threat to cell performance, this area will be monitored in future inspections for additional rock movement. Water was not observed in the drain during the inspection.

**Interceptor Channel**—A riprap-armored interceptor channel, upgradient and northwest of the disposal cell, diverts storm water and snowmelt to the northeast across County Road EE22. As was the case in 2010, minor erosion is still apparent outside the property, uphill from perimeter

sign P23 and between perimeter signs P22 and P23, resulting in sediment deposition in the channel (PL-3). Otherwise, the channel was in excellent condition, and the sediment and vegetation do not impair the function of the channel.

No noxious weeds were observed in the interceptor channel (or elsewhere on the site) during the 2011 inspection.

**Outlying Area**—The site boundary and the area within 0.25 mile of the site boundary have been highly disturbed by mining, quarrying, and road-building activities. As noted last year, the most significant disturbance in an outlying area is the Umetco reclamation of a large borrow area northwest of the DOE disposal site. Sediment could erode off of this disturbed region if heavy rains occur, and the area could be a source of new, possibly noxious, weed growth. (Numerous weeds were observed on the Title II area during the 2010 inspection.)

Umetco (Dow Chemical) has recently completed remedial activities on the main Uravan UMTRCA Title II disposal cell (across County Road EE22 and east of the Title I site) and is preparing for the transfer of the site to DOE's Office of Legacy Management for long-term care. A separate Umetco UMTRCA Title II disposal cell abuts the Naturita disposal cell on the southeast cell boundary.

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

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed. No follow-up or contingency inspections were required in 2011.

### **13.3.3 Routine Maintenance and Repairs**

The only maintenance issue identified during the 2011 inspection was the need for minor repair (loose top strands) of the perimeter fence south of perimeter sign P21. This section of the fence was repaired in September 2011.

### **13.3.4 Groundwater Monitoring**

Groundwater monitoring was not conducted in 2011. Groundwater monitoring was last performed in July 2010 and will be conducted again in 2012.

**Groundwater Monitoring Strategy**—In accordance with the LTSP (beginning in 2000), DOE has monitored groundwater at the site every 2 years as a best management practice to demonstrate the initial performance of the disposal cell; the last sampling event was in July 2010. The compliance strategy is to not exceed maximum concentration limits (MCLs) established in Table 1 to Subpart A of 40 CFR 192 or background levels in a point-of-compliance (POC) well (CM93-2) in the uppermost aquifer (Wingate Sandstone) downgradient of the disposal cell. The Wingate Sandstone lies approximately 600 feet beneath the disposal cell and is hydrologically isolated from the surface by unsaturated sandstone of the Salt Wash Member of the Morrison Formation and relatively impermeable shale layers (aquitard) of the Summerville Formation.

Groundwater monitoring is performed in three shallower monitoring wells (BR95-1, BR95-2, and BR95-3), completed at the contact between the Salt Wash Member and the Summerville Formation, to provide early warning of possible migration of contaminants. If contamination suspected to be related to the disposal cell is observed at this horizon, DOE will sample two deeper wells (CM93-1 and CM93-2) screened in the uppermost aquifer (Wingate Sandstone). Indicator analytes are arsenic, molybdenum, and uranium. Monitoring wells CM93-1 and CM93-2 in the uppermost aquifer (Wingate Sandstone) were last sampled in May 1997 with concentrations of all indicator analytes at or near detection limits and, thus, well below the respective MCLs.

13B

**Groundwater Monitoring Evaluation**—In the last several annual compliance reports, DOE has reported the following four major findings based on the historical groundwater monitoring results. First, the uppermost aquifer is hydrologically isolated from the surface by an aquitard consisting of unsaturated sandstone and relatively impermeable shale layers. Second, historical monitoring has demonstrated that contamination does not occur within the uppermost aquifer. Third, naturally occurring uranium mineralization affects water quality within the surface formation on which the disposal cell is constructed. And finally, concentrations of indicator compounds have remained essentially static since the onset of sampling (arsenic and molybdenum concentrations remain one to two orders of magnitude less than their respective MCLs). Based on these findings, initially documented in 2006,<sup>1</sup> DOE concluded that continued sampling and analysis of the BR-series wells would provide little useful data for evaluating cell performance and that, in accordance with the LTSP, the groundwater monitoring program at the site could be terminated.

Although no groundwater sampling was conducted this year, as a best management practice, and given the impending transfer of the adjacent Umetco (Uravan) Title II cell, DOE is postponing any revisions to the existing groundwater monitoring program at the Naturita site. DOE will continue to monitor groundwater every 2 years to evaluate cell performance.

### 13.3.5 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 corrective action was required in 2011.

### 13.3.6 Photographs

Table 13-2. Photographs Taken at the Naturita Disposal Site

Photograph Location Number	Azimuth	Description of Photograph
PL-1	115	Top of disposal cell, view to southeast.
PL-2	90	Vegetation in toe drain east of perimeter sign P-19.
PL-3	315	View of interceptor channel area from County road (view to northwest).

<sup>1</sup> On March 14, 2006, DOE submitted the document entitled *Termination of Monitoring for the Naturita Disposal Site* to NRC.



NAT 5/2011. PL-1. Top of disposal cell, view to southeast.



NAT 5/2011. PL-2. Vegetation in toe drain east of perimeter sign P-19.



*NAT 5/2011. PL-3. View of interceptor channel area from Country road (view to northwest).*

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## 14.0 Rifle, Colorado, Disposal Site

### 14.1 Compliance Summary

The Rifle, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on August 10, 2011. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. River-derived rock covering the disposal cell and toe ditch is in excellent condition although isolated cobbles and boulders show incipient weathering. Minor erosional rills were observed in several locations, but they do not immediately threaten the cell and will be monitored during future inspections. Minor new erosion also was noted in the upper portion of the interceptor trench at the top of the cell. Vegetation on the cell is minimal, consisting of small patches of weeds, mostly prickly lettuce, and two small piñon saplings. Several tamarisk plants were noted in the drainage along the southeast side of the site and were removed in fall 2011.

Pore water continues to be removed from the disposal cell to maintain the water level below the action level (6,016 feet). This water is removed from one standpipe, MW-03, in the toe of the cell and sent to the evaporation pond. Standpipe MW-02, which was pumped in previous years, contains little water and is no longer being pumped. Monitoring conducted for this reporting period indicates that pore water levels in both standpipes were consistently below the action level. As observed historically, levels are highest during the late fall and winter, when pumping is discontinued and the water level in the toe of the disposal cell rebounds to about 6,015 feet. To date, approximately 5.1 million gallons of water have been pumped from the toe of the disposal cell.

The fifth (and final) annual survey of settlement plates and standpipes was conducted during fall 2010. Consistent with survey results conducted in previous years, the 2010 survey indicated no significant changes in locations or elevations of both settlement plates and standpipes. Based on these results, which, overall, indicated negligible movement in the disposal cell cover (and not in any particular direction), the survey work was terminated in 2011.

No cause for a follow-up or contingency inspection was identified.

### 14.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Estes Gulch Disposal Site near Rifle, Colorado* (DOE/AL/62350-235, Rev. 1, U.S. Department of Energy [DOE], November 1997; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 14-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 14.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 14.3.2
Routine Maintenance and Repairs	Section 4.0	Section 14.3.3
Groundwater Monitoring	Section 2.6 and Appendix	Section 14.3.4
Corrective Action	Section 5.0	Section 14.3.6

**Institutional Controls**—The 205-acre site is owned by the United States of America and was accepted under U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. 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 at the site, as defined by DOE Policy 454.1, consist of federal ownership of the property, access-control fencing, warning/no-trespassing signs along the disposal cell boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. During the 2011 inspection, inspectors found no evidence that these institutional controls were ineffective or violated.

## 14.3 Compliance Review

### 14.3.1 Annual Inspection and Report

The site, located 5 miles north of Rifle, Colorado, was inspected on August 10, 2011. Results of the inspection are described below. Figure 14–1 shows the features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

#### 14.3.1.1 *Specific Site-Surveillance Features*

**Access Road, Gates, Fence, and Signs**—The site is accessed by driving northwest of Rifle for 5 miles on State Highway 13 and turning northeast on an improved gravel road. PL–1 shows an aerial photograph of the site and disposal cell taken in 2008. Although this photograph was taken before this reporting year, it is included because it provides a comprehensive perspective of the disposal cell and interceptor trench that is not apparent in Figure 14–1 or in the site inspection photographs. A perpetual right-of-way across U.S. Bureau of Land Management (BLM) property provides access to the site. Two locked gates are installed on the access road—a lower gate closer to State Highway 13 and, farther up the hill, a second tubular metal gate at the site perimeter, which limits access to the site proper. The access road and gates were in good condition.

The barbed-wire perimeter fence that limits access to the site was in good condition. The fence extends to the edge of steep-sided arroyos that bound the site on the east and west to prevent livestock from entering and grazing near the cell. No evidence of cattle or sheep grazing inside the site boundary was apparent. However, signs of deer and elk grazing in the revegetated areas adjacent to and inside the disposal cell site boundary were identified, as has been the case historically.

One entrance sign and 26 perimeter signs were placed at the site. Perimeter signs P8 and P9, located on either side of the entrance gate, are missing but will not be replaced, as the remaining signs adequately delineate the perimeter. All perimeter signs are legible although a few have bullet holes; they will continue to be monitored for signs of further vandalism.

Two personnel gates, located at the southeast corner of the inner fence, were partly blocked by tumbleweeds (Russian thistle) even though they were removed the previous fall. Tumbleweed buildup against fences is a constant problem and will continue to be monitored.



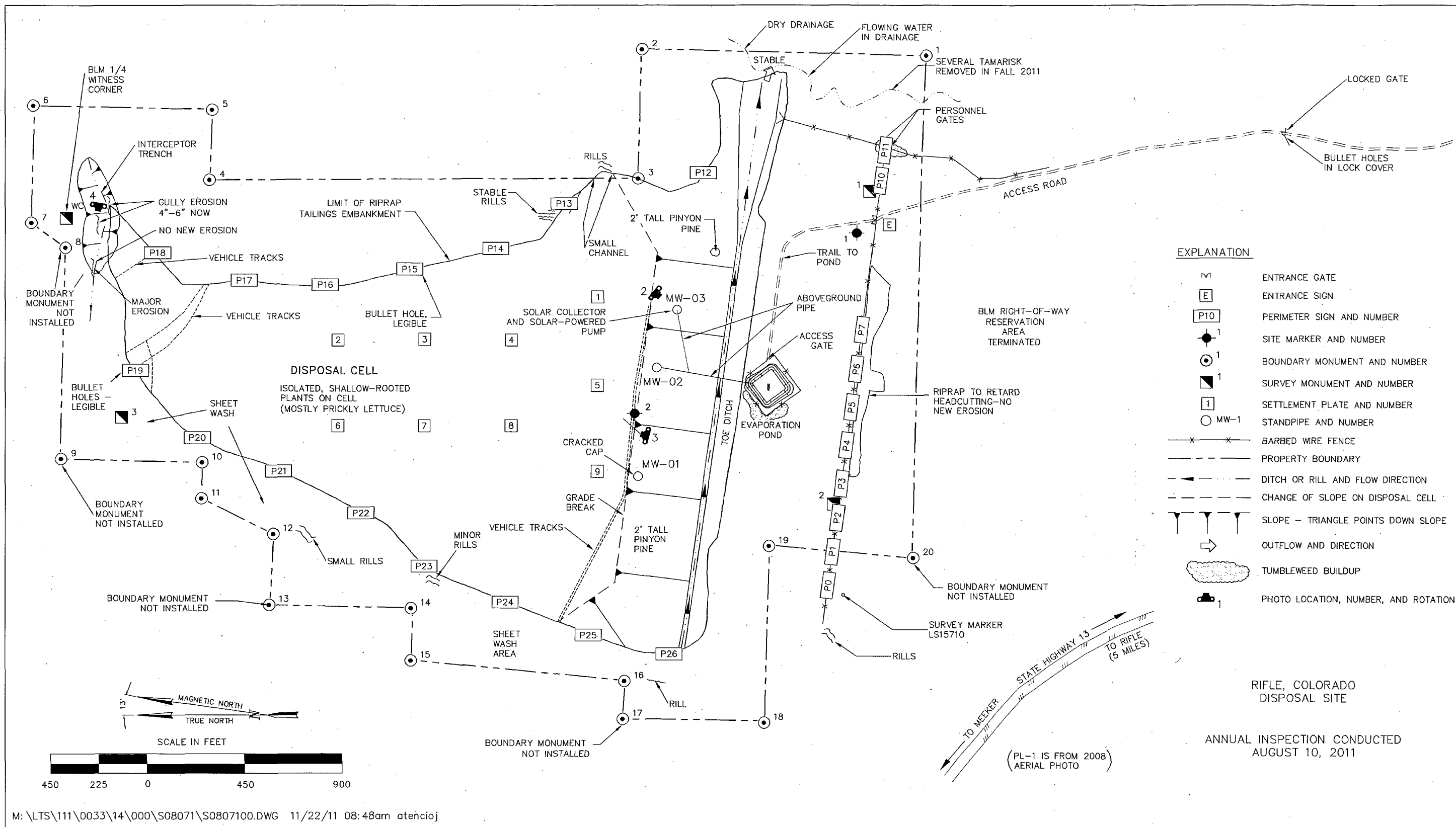


Figure 14-1. 2011 Annual Compliance Drawing for the Rifle Disposal Site

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**Markers and Monuments**—Two granite site markers, one just inside and left of the entrance gate (SMK-1) and the other on the disposal cell (SMK-2), were in good condition.

There are three survey monuments and 15 boundary monuments at this site. Boundary monuments are set at corners along an irregular site boundary. According to the LTSP, 20 corner monuments were set along the site boundary; however, previous field investigations indicated that only 15 monuments were actually set because of the rough terrain. Consequently, boundary monument locations BM-8, BM-9, BM-13, BM-17, and BM-20 were only marked with wooden laths and are not included as part of the annual inspection. Several of the survey and boundary monuments at this site are difficult to locate because deadfall and underbrush obscure them, or rough terrain makes them inaccessible. All survey and boundary monuments inspected were in good condition.

**Standpipes**—Three standpipes (MW-01, MW-02, and MW-03) are located on the south side slope of the disposal cell and were in good condition. These standpipes were installed during cell construction to monitor water levels in the toe of the cell. Dataloggers with remote data transfer systems (i.e., telemetry) powered by solar panels were installed in MW-02 and MW-03 to measure water level fluctuations. Standpipe MW-03 is equipped with a solar-powered pump so that water may be removed and discharged to a lined evaporation pond directly south of the cell (PL-2).<sup>1</sup> Water level data for MW-02 and MW-03 are discussed in Section 14.3.5 and plotted in Figure 14-2.

The small-diameter, plastic, surficial water line from MW-03 to the pond was in good condition. Before pumping resumed in the spring, personnel noted that small animals had gnawed on electrical lines connecting the solar panels. These electrical lines were replaced in May 2011 and were placed in PVC conduit for protection from future damage by small animals.

**Evaporation Pond**—An evaporation pond was constructed adjacent to the cell in 2001 to receive water pumped from standpipes MW-02 and MW-03 (PL-2). A datalogger, also with a remote data transfer system, measures water-level fluctuations in the evaporation pond. The evaporation pond continues to function as designed because water in the pond is evaporating as fast as, or faster than, influent arrives. The lined pond, surrounding security fence, and locked gate were in excellent condition.

#### **14.3.1.2 Transects**

To ensure a thorough and efficient inspection, inspectors divided the site into four areas or “transects”: (1) the top of the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) on-site reclaimed areas, and (4) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect the site’s integrity or long-term performance.

<sup>1</sup> For a time, water from both MW-02 and MW-03 was pumped into the pond, but because of subsequent low production in MW-02, only water from MW-03 is currently pumped. There is no datalogger or pump in MW-01 because it is too shallow to intercept water that accumulates at the base of the cell. Also, the bottom elevation for MW-01 is above the 6,016-foot elevation that constitutes the LTSP action level for pumping.

**Disposal Cell and Interceptor Trench**—Rock armor covers the 71-acre disposal cell, which was in excellent condition at the time of the inspection. No evidence of subsidence, differential settling, or slumping was found. As observed in 2010, only small, isolated patches of annual weeds or annual grasses were found on the cell top; no deep-rooted plants or noxious weeds were observed (PL-3). The river-derived cover rock generally remains in excellent condition. However, during the 2010 inspection, it was noted (for the first time) that a few cobbles or boulders showed signs of frost action and had begun to crack. Degradation of a few cobbles and boulders was also noted during the 2011 inspection and will continue to be monitored. This is not considered a major concern because most of the rock on the cell consists of very tough igneous and metamorphic river cobbles and boulders that should last for the expected life of the cell. However, if increased rock degradation becomes apparent, one or more study plots will be established.

14A

The fifth (and final) annual survey of settlement plates and standpipes was conducted in November 2010. Surveys were initiated in December 2005, when inspectors noted that standpipes MW-02 and MW-03 were not vertical and were tilting slightly downhill. However, subsequent surveys (from 2007 through 2010) indicated no significant changes in locations or elevations of both settlement plates and standpipes, which in turn indicates negligible movement in the disposal cell cover. Based on these results, this survey work was terminated in 2011. This decision was corroborated by a recent engineering evaluation, which concluded that the disposal cell cover and side slopes are expected to remain stable based on current and projected future site conditions.<sup>2</sup>

A revegetated interceptor trench was constructed at the top of the disposal cell to protect the cell from storm-water and snowmelt run-on. The trench diverts water to the arroyo west of the site. Significant erosion occurred during a major rain event in 2005, and repairs to the lower section of the interceptor trench were undertaken later that year. In November 2005, rocks were moved into the eroded channel (directly above the drop-off into a major drainage), and the erosion was stabilized. During the 2011 inspection, no new erosion was evident in this repair zone. However, in the upper section of the interceptor trench, new gully erosion was evident, as characterized by up to 6 inches of downcutting (PL-4). This trench will continue to be monitored.

**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 off site to the east. As observed during previous inspections, small trees, large shrubs, and large weeds are still growing around the perimeter of the rock-covered cell. For example, two small piñon trees are growing on the lower part of the cell near the toe drain ditch but are not large enough to be of concern. This vegetation will be monitored in the future.

Tumbleweeds continually collect in the southeastern end of the toe ditch. Because tumbleweeds were removed from this area in November 2010, little accumulation was evident during the 2011 inspection. This area will continue to be monitored next year to determine the need for removal.

Minor erosion, anticipated in the design, is still evident in the channel at the outlet below the toe ditch. Bedrock is now exposed in this area. Rock previously placed in the outlet to stabilize the

<sup>2</sup> See Section 14.3.5 of the report entitled *Rifle Disposal Site Transient Drainage and Slope Stability Evaluation* (DOE, March 2010).

erosion continues to drop into the eroded area (self-armoring). Comparisons with a photograph taken during the 2003 inspection indicate that no new erosion has occurred during the past several years. Although this was still the case in 2011 (no new significant erosion was found), clear, odorless, flowing water was observed in the lower part of the drainage below the toe drain, which continued flowing downstream. This is the first time flowing water has been noted in this area for at least 7 years. Moisture was abundant last winter and during the spring, and a summer storm brought considerable moisture to the area about a week before the inspection. The flowing water in the drainage is thought to represent surface drainage from the disposal cell. This area will continue to be monitored. Several tamarisk, observed downstream of the toe drain, were removed later in the year.

**On-Site Reclaimed Areas**—Disturbed areas around the edges and south of the disposal cell were reseeded in 1996 and, overall, have been successfully reclaimed. The vegetation, mainly grasses, is composed primarily of desirable grasses and shrubs. Over time, the number of undesirable species (e.g., cheatgrass) has steadily decreased. As has been the case for the last several years, inspectors found no evidence of cattle or sheep grazing within the site boundaries, but evidence of deer and elk grazing was commonly observed.

Three arroyos are present in the reclaimed area south of the disposal cell. 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 self-armored the arroyos and effectively stabilized them from further erosion. This process, which has been ongoing for a number of years, continued in 2011. This area will continue to be monitored.

Rills noted during previous inspections in the vicinity of perimeter sign P13 were still stable in 2011. The runoff collected by the rills flows along the interface between the riprap and the adjacent reclaimed soil area. The runoff has scoured a small channel that currently averages about 1 foot wide and less than 1 foot deep, exposing some of the gravel bedding material. A comparison with photographs taken the last several years at this location indicates that the channel has not changed. While this feature is not threatening the integrity of the disposal cell at this time, continued observation during subsequent site inspections is warranted.

During the 2010 inspection, a new rill was noted along the southwest side of the property, extending from about perimeter sign P1 and then down a hill. This feature is not currently affecting the integrity of the cell, and no new erosion was evident in 2011. This area will continue to be examined during future inspections.

**Outlying Area**—The area beyond the site for a distance of 0.25 mile was visually inspected for signs of erosion, development, or other disturbance. The primary land use in the area is grazing and wildlife habitat. No activity or development was observed that might affect site integrity or the long-term performance of the disposal cell.

The 16-acre revegetated area directly south of the disposal cell on BLM-managed land was inspected. During the construction of the cell, BLM granted DOE a Right-of-Way Reservation Permit to use this area for topsoil storage and other purposes. This reclamation area was seeded at the same time as the disturbed areas adjacent to the cell on DOE-owned land. Because it did not successfully revegetate, it was reseeded in 2000 and again in 2005. Despite these reseeding efforts, plant cover is still less than desirable, as it is composed primarily of non-noxious annual

weeds. The BLM office responsible for oversight of the Right-of-Way Reservation Permit was contacted to recommend terminating the reseeding efforts. Upon learning that BLM had terminated the permit several years ago without notification, DOE elected to discontinue the 16-acre revegetation effort. BLM transmitted a copy of the terminated agreement to DOE.

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

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

#### **14.3.3 Routine Maintenance and Repairs**

Electrical lines that connect the solar panels were replaced in May 2011 after being damaged by small animals. Several tamarisk plants observed downstream of the toe drain were removed later in the year.

#### **14.3.4 Groundwater Quality Monitoring**

Monitoring of groundwater quality is not required at this site because groundwater in the uppermost aquifer is of limited use and the disposal cell is geologically isolated from the first usable aquifer by approximately 3,800 feet of low-permeability siltstones, shales, and sandstones. The nine monitoring wells that had been at the site were decommissioned in 2002.

#### **14.3.5 Disposal Cell Pore Water Monitoring**

**Disposal Cell Pore-Water-Level Monitoring**—In accordance with the LTSP, DOE continues to monitor pore water levels from transient drainage in the disposal cell at standpipes MW-02 and MW-03, installed at the downgradient end of the cell on the south side slope. An action level elevation of 6,016 feet was established in the LTSP for pumping the pore water from the cell to a lined evaporation pond. This monitoring is performed to ensure that water does not rise above a geotextile liner that was installed in the toe of the cell at an elevation of 6,020 feet.

14B

Pumping from standpipes MW-02 and MW-03 was initiated when water levels reached an action level of 6,016 feet above sea level in 2001. In December 2003, a solar-powered pump (similar to the one in MW-02) was installed in MW-03, and a plastic aboveground water line was plumbed into the existing water line to increase the amount of water being removed from the disposal cell. Pumping from both standpipes continued until September 2006, when it was determined that MW-02 could not sustain prolonged pumping due to consistent lack of sufficient recharge. Although pumping at MW-02 was discontinued at that time, the datalogger remains, and water-level monitoring at this standpipe continues. After cessation of pumping at MW-02, the pump in MW-03 was lowered about 9 feet to near the bottom of the well so that it could pump for longer periods and produce more water. The pump from MW-02 was removed and installed in MW-03 in August 2008. This pump was later replaced with a new submersible pump in June 2009.

At the time of the 2011 inspection, MW-03 was pumping at about 2 to 3 gallons per minute, which is generally consistent with active pumping rates recorded the last several years. Only one pump was operating during the 2011 season (installation of a second pump is planned for 2012). About 180,000 gallons<sup>3</sup> of water were produced (i.e., pumped from the toe of the disposal cell) during the 2011 season; to date, approximately 5.1 million gallons of water have been pumped from the disposal cell. This includes the volume pumped during the construction of the disposal cell and the volume pumped since dewatering was initiated again in 2001.

Datalogger information for the 2011 reporting period indicates that pore water levels in both standpipes were consistently below the 6,016-foot action level (Figure 14-2). As observed historically, levels were highest during late fall and winter, when pumping is discontinued (in 2011, maximum water levels in MW-02 and MW-03 were 6,014.5 feet and 6,015.0 feet, respectively). Water levels then declined to between 6,013 feet and 6,014 feet in the summer during pumping. For the 2011 pumping season, pumping started on May 31, 2011, and ceased on October 11, 2011. According to the LTSP requirement, pumping will continue until the water levels in the standpipes stabilize at an elevation of 6,014 feet or lower.

14C

Previous reports included a discussion of MW-03 water quality monitoring that concluded Section 14.3.5. Effluent samples from MW-03 were analyzed for uranium and vanadium to assess if any trends were evident that might indicate that clean meteoric water was diluting the residual tailings pore water. Based on the results of seven samples that were collected between 2001 and 2010, no trends were evident for either constituent, and no conclusions could be drawn based on the data. Therefore, this water quality monitoring was discontinued in 2011.

#### 14.3.6 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.

The LTSP establishes that corrective action will be taken if the water level in the disposal cell reaches 6,016 feet in elevation. In 2001, when the action level of 6,016 feet was reached, corrective action was initiated with the installation of the cell dewatering system and associated evaporation pond. This continued corrective action has maintained the water level at an acceptable elevation (below the action level) and prevents water from overtopping the disposal cell liner. Dewatering of the cell continued in 2011 and will continue in 2012.

No other corrective action was required in 2011.

<sup>3</sup> Due to periodic maintenance problems with transducers and flowmeters, the 180,000-gallon annual (2011) volume was estimated assuming the following: 134 pumping days (a May 31, 2011, startup through an October 11, 2011, fall/winter shutdown); an average pumping rate of 2.5 gallons per minute; and an average of 9 sunlit hours per day (accounting for rain and clouds, and shorter days later in the season).

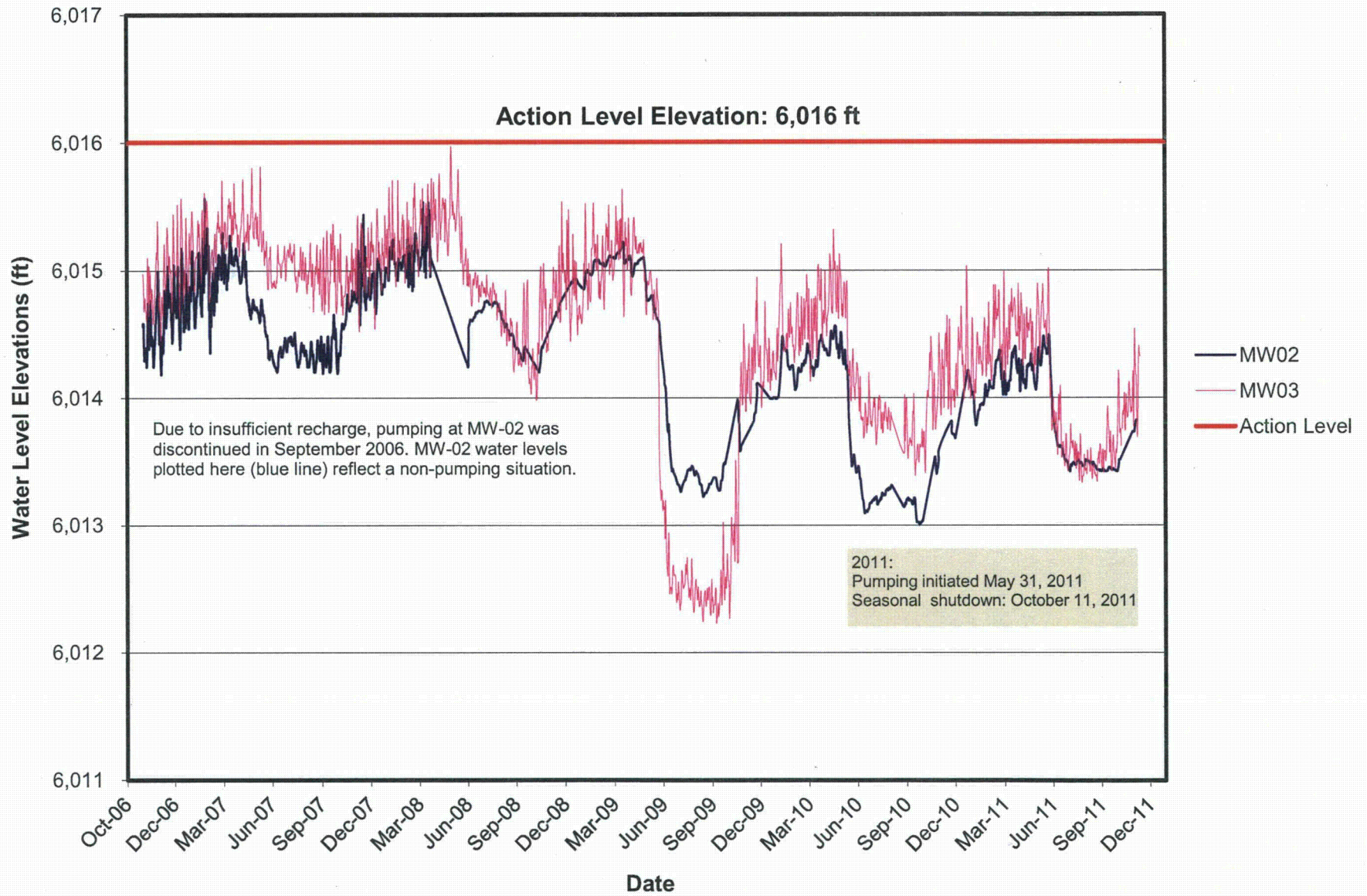


Figure 14-2. Disposal Cell Pore Water Levels in Standpipes MW-02 and MW-03 at the Rifle Disposal Site



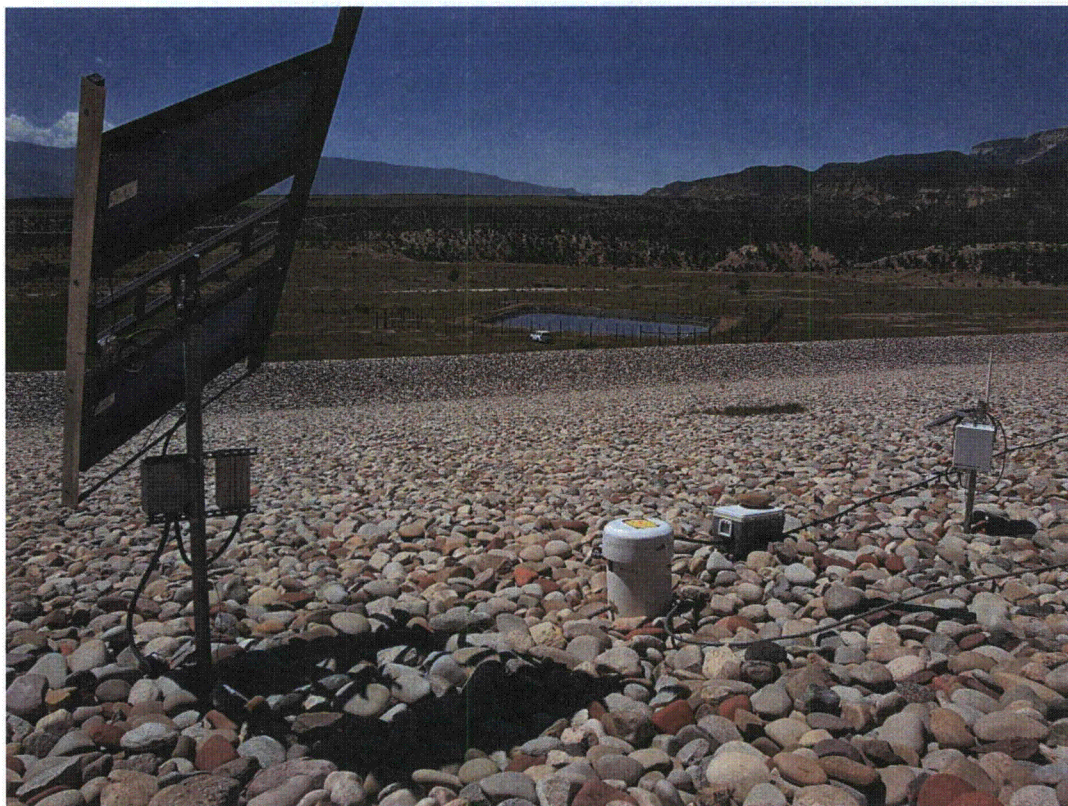
### 14.3.7 Photographs

Table 14-2. Photographs Taken at the Rifle Disposal Site

Photograph Location Number	Azimuth	Description
PI-1	NA	2008 oblique aerial photograph of the site.
PL-2	220	View (to southwest) of MW-03, toe of disposal cell, and evaporation pond.
PL-3	15	View (to northeast) of isolated shallow-rooted weeds on cell.
PL-4	280	New gully erosion (4 to 6 inches) in upper section of inceptor trench.



*RFL 2008. PL-1. 2008 oblique aerial photograph of the site.*



*RFL 8/2011. PL-2. View (to southwest) of MW-03, toe of disposal cell, and evaporation pond.*



*RFL 8/2011. PL-3. View (to northeast) of isolated shallow-rooted weeds on cell.*



*RFL 8/2011. PL-4. New gully erosion (4 to 6 inches) in upper section of inceptor trench.*

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## 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 was inspected on June 7, 2011. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. No change was observed in the three slight depressions on the disposal cell top; monitoring for settlement will continue. A minor amount of weathered riprap was noted (less than 1 percent); there is no current impact to cell performance, and monitoring will continue at eight designated locations on the cell top and side slopes. Radiological survey measurements were performed during the May 2010 inspection, showing no indication of windblown radiological contamination. Corner boundary monuments were protected with PVC pipe by EnergySolutions and were observed to be in good condition. EnergySolutions continued to perform minor maintenance work, such as removing greasewood from around site marker SMK-1 and removing tumbleweeds from the inside perimeter. No cause for a follow-up or contingency inspection was identified.

### 15.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Salt Lake City Disposal Site are specified in the *Long-Term Surveillance Plan for the South Clive Disposal Site, Clive, Utah* (DOE/AL/62350-228, Rev. 2, U.S. Department of Energy [DOE], September 1997; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 15-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 15.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 15.3.2
Routine Maintenance and Repairs	Section 5.0	Section 15.3.3
Groundwater Monitoring	Section 4.0	Section 15.3.4
Corrective Action	Section 6.0	Section 15.3.5

**Institutional Controls**—The 100-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) 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 at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the perimeter fence, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 15.3 Compliance Review

### 15.3.1 Annual Inspection and Report

The site, 85 miles west of Salt Lake City, Utah, was inspected on June 7, 2011. The results of the inspection are described below. Figure 15–1 shows features and photograph locations (PL) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

#### 15.3.1.1 *Specific Site-Surveillance Features*

**Access Road, Gates, Fences, and Signs**—Access to the site is attained by following paved and graded roads to the EnergySolutions facility in Clive, Utah. The DOE site is completely surrounded by EnergySolutions’ active radioactive-waste-disposal operations. A perpetual right-of-way easement is in place and ensures DOE (and its representatives) continued access across EnergySolutions’ property to the DOE site. Access to the DOE disposal cell is via a route across EnergySolutions’ property to the southwest corner of the disposal site. All personnel entering the EnergySolutions facility must sign in at the security building.

Because EnergySolutions’ radioactive-waste-disposal activities surround the DOE site, posted radiological control areas have to be crossed to access the site. Therefore, EnergySolutions requires inspectors and other site visitors to receive a radiological hazard awareness briefing, sign in on a Radiological Work Permit, and wear a dosimeter before entering the site. In addition, an escort, typically a health physics technician, is provided by EnergySolutions. Upon leaving the radiological control area after the inspection, all personnel and equipment are scanned. Before leaving EnergySolutions’ facility, inspectors and other visitors are again monitored with a personnel contamination monitor for any radiological surface contamination. Hard hats, safety glasses, and steel-toed shoes are required on EnergySolutions’ property.

Four locked gates provide access to the DOE disposal cell. One is in the southwest corner of the chain-link perimeter fence that EnergySolutions maintains around the entire DOE property, and three are in the interior security fence that DOE maintains around the disposal cell (two in the northwest corner and one in the southwest corner). The EnergySolutions escort provides inspectors access through their perimeter gate. DOE provides EnergySolutions access to the entire disposal site to perform periodic maintenance through a signed access agreement. EnergySolutions is to notify DOE anytime access to the site is needed. All gates were locked, and the fence and gates were in good condition.

Tumbleweeds had accumulated against the fence in the northeast corner. EnergySolutions will remove the tumbleweeds and a greasewood bush.

The site entrance sign and all perimeter warning signs were in good condition. Decal number designations (1 through 18) have been placed on all perimeter signs to correspond with the numbered designations on the site map.

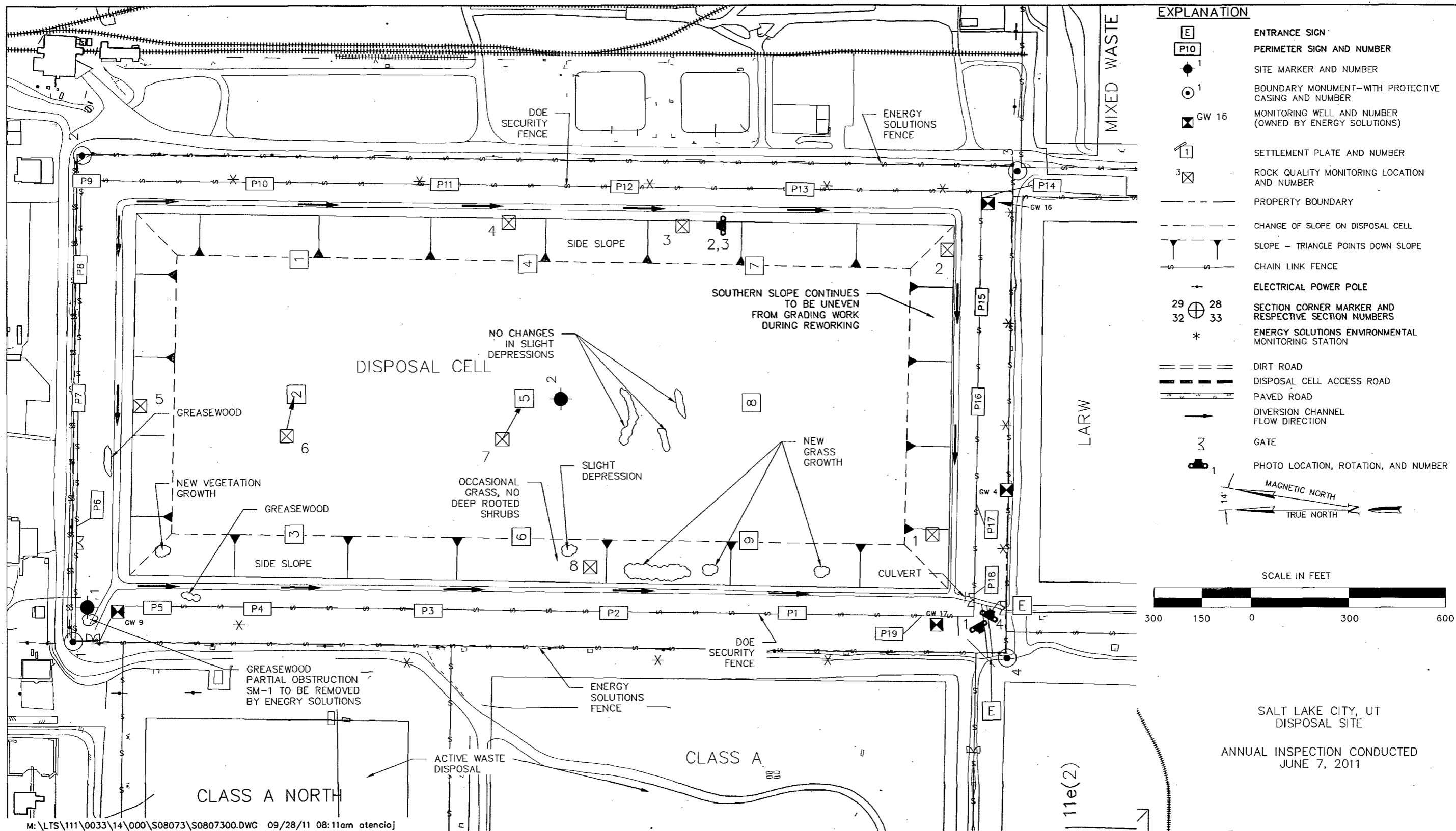


Figure 15-1. 2011 Annual Compliance Drawing for the Salt Lake City Disposal Site

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**Site Markers and Monuments**—After the 2009 inspection, three of the four boundary monuments were found covered with soil as a result of road grading performed by EnergySolutions. EnergySolutions has uncovered boundary monuments BM-2, BM-3, and BM-4, and installed protective casings at all four of the locations (PL-1). All boundary monuments were in good condition.

**Settlement Plates**—All nine settlement plates on top of the disposal cell were secure and in good condition. Surveying of the settlement plates was conducted for several years following cell construction but is no longer required.

**Monitoring Wells**—In accordance with the LTSP, groundwater monitoring is not required at the site (see Section 15.3.4). However, four groundwater monitoring wells belonging to EnergySolutions are located on DOE's disposal site. These wells, originally owned by DOE, were transferred to EnergySolutions in 2000. EnergySolutions informed DOE that the four wells are no longer needed as part of its monitoring network and likely will be decommissioned by the end of fiscal year 2011. DOE and EnergySolutions signed a revised access agreement in 2010. It outlines the necessary requirements for access to the Vitro Cell. It will provide the necessary requirements for access to subcontractors for well decommissioning. All four wells were properly secured and in good condition at the time of the inspection.

#### *15.3.1.2 Transects*

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the top and side slopes of the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, and vegetation, along with other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect the site's integrity or long-term performance.

**Top and Side Slopes of the Disposal Cell**—The top and side slopes of the disposal cell are armored with riprap. The riprap was in good condition, and no evidence of erosion or slumping of the side slopes was observed. Several slight depressions in the riprap were observed along the slopes of the cell; they appeared to have been created by the heavy equipment during the riprap's installation. These depressions currently do not present a problem and will continue to be visually monitored to ensure that settlement is not occurring. There was no evidence of surface water ponding in any of the depressions (that is, no evaporites were observed).

15A During the 2010 inspection, it was noted that a minor portion of the riprap was beginning to weather. It was estimated to be less than 1 percent (approximately one occurrence per square-meter grid). The rock type was consistent, and the weathering effects were all similar. During the 2010 inspection, eight square-meter grids were installed to help in the evaluation and monitoring of riprap weathering. The eight grids were installed at random locations to cover the cell, and each grid was located using GPS and marked by a 0.5-inch rebar located in the northeast corner of each grid. The grids are permanently located as shown in Figure 15-1. The locations showed similar amounts of weathering as compared to the 2010 photos (PL-2, PL-3) and will continue

to be monitored in future inspections. The weathering does not pose a problem at this time, due to the low occurrence observed.

No deep-rooted plants were found growing on the top or side slopes of the cell. New growth was observed on the northwest corner of the cell; however, it does not pose a threat at this time.

**Area Between the Disposal Cell and the Site Boundary**—The principal features examined in the area between the toe of the disposal cell and the security fence are the toe drain, surface water diversion channels, and the perimeter road. All were in good condition.

EnergySolutions personnel have indicated that a considerable amount of water drains off the disposal cell during storm events and is routed off site via the diversion channels to an evaporation pond southwest of the site. Some standing water was noticed in the diversion channels (PL-4). A few scattered greasewood plants are growing along the top edge of the diversion channels, but this vegetation does not interfere with the channels' performance.

Cursory radiological surveys for spillover and windblown radioactive contamination are periodically performed on site during the inspection due to concerns regarding the ongoing radioactive-waste-disposal activities being conducted by EnergySolutions surrounding the site. Survey measurements include (1) taking dose rate measurements at random locations across the site and (2) collecting smears that are later analyzed for removable alpha/beta contamination. In addition, EnergySolutions maintains several surface soil radiological monitoring and sampling stations, and performs routine scanning, on DOE's site just inside the property boundary.

A radiological survey was performed in 2010 as part of the inspection by an EnergySolutions health physics technician. All radiological survey measurements were below the DOE *RadCon Manual* limits. Prior radiological inspections (last performed in 2007) also resulted in measurements below DOE *RadCon Manual* limits, indicating that spillover and windblown radiological contamination does not currently appear to be an issue on site. EnergySolutions performs periodic walkthroughs of the DOE site to remove any windblown debris. No radiological waste items were found on the site in 2011.

**Outlying Area**—The site perimeter transect extends from the security fence to 0.25 mile beyond the site boundary. This transect includes the EnergySolutions perimeter fence, the enclosed area between the two fences, the outflow channel, and monitoring wells. All features were in good condition.

A variety of features and ongoing waste-disposal activities managed by EnergySolutions surround the DOE site. The most obvious waste-disposal activities are directly west of the site, where a Class A (low-level radioactive waste) disposal cell is being filled. On the northeast and east sides of the site, incoming wastes are unloaded from rail cars and transferred to haul trucks. Decontamination facilities are also present. Directly to the south is a completed disposal cell for low-level radioactive waste, to the southwest is an 11e(2) waste disposal cell, and to the southeast is an operating mixed-waste treatment and disposal facility. Administration, security, and maintenance buildings lie to the north-northwest. A shredding facility, rotary dump, and railroad spur delivery loop are also located to the northwest.

All areas surrounding DOE's property are restricted due to radiological hazards resulting from EnergySolutions' waste-disposal activities. However, EnergySolutions ensures perpetual access to the DOE site, and radiological protection procedures are enforced, as discussed in Section 15.3.1.1.

### 15.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### 15.3.3 Routine Maintenance and Repairs

In 2011, routine maintenance and repairs included the removal of tumbleweeds along the perimeter security fence and a large greasewood plant encroaching on site marker SMK-1. EnergySolutions will perform these activities before the next inspection.

### 15.3.4 Groundwater Monitoring

In accordance with 40 CFR 192.21(g), groundwater at the site qualifies for narrative supplemental standards. Groundwater was determined to be of limited use due to naturally occurring concentrations of total dissolved solids in the uppermost aquifer, which exceed 10,000 milligrams per liter. Consequently, the LTSP does not require groundwater monitoring at the site.

### 15.3.5 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 corrective action was required in 2011.

### 15.3.6 Photographs

*Table 15-2. Photographs Taken at the Salt Lake City Disposal Site*

Photograph Location Number	Azimuth	Description
PL-1	240	Survey marker, southwest corner #4.
PL-2	0	2010 Rock Quality Monitoring Grid #3.
PL-3	0	2011 Rock Quality Monitoring Grid #3.
PL-4	120	South drainage and slope.



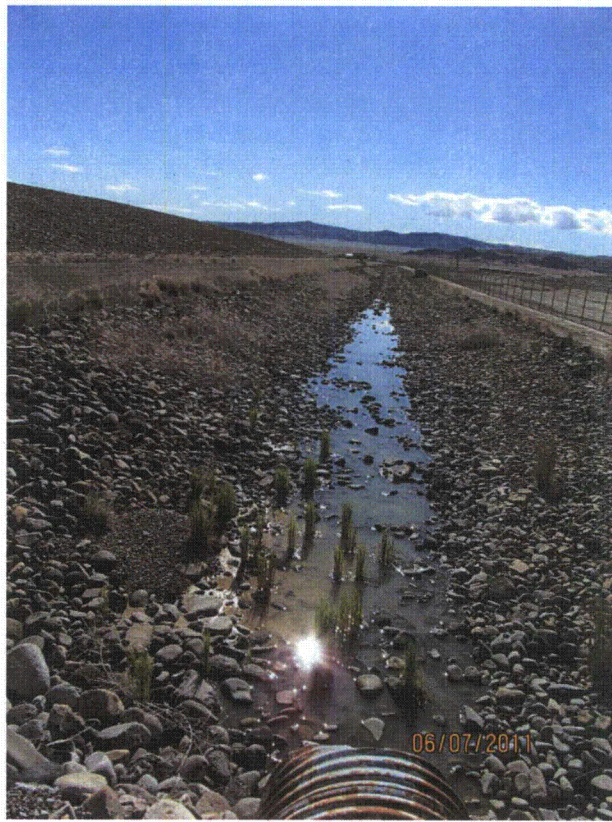
SLC 6/2011.PL-1. Survey marker, southwest corner #4.



SLC 6/2010. PL-2. 2010 Rock Quality Monitoring Grid #3.



SLC 6/2011. PL-3. 2011 Rock Quality Monitoring Grid #3.



SLC 6/2011. PL-4. South drainage and slope.

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## 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 was inspected on June 1, 2011. The disposal cell and all associated surface water diversion and drainage structures remain in good condition and were functioning as designed.

In 2009, a conical depression was discovered on the disposal cell cover, and investigation revealed it to be a historical test pit. Since then, several similar conical depressions have been found and were mapped during the 2010 inspection. Although no displacement of materials is apparent in these areas, these depressions will be monitored in the future. Vehicle ruts, probably the result of herbicide application in 2008, are not deep enough to warrant concern but will also continue to be monitored. The condition of vehicle ruts, historical test pits, and research pits on the cell cover were unchanged in 2011.

With a few minor exceptions, all structures, including access roads, gates, entrance signs, fences, monitoring wells, site markers, perimeter signs, survey monuments, and erosion control markers, were in good condition. Several maintenance issues, unrelated to cell performance, were identified—a gap in the northwest gate, three missing pictorial signs, tumbleweed and trash accumulations along the perimeter and evaporation pond fences, outdated information on the sign at the entrance to the evaporation pond, and a section of broken fence and a broken warning sign in Bob Lee Wash. A dense stand of saltcedar, located near the dissipation basin at the end of the outflow channel, requires treatment. The planned 2012 inspection will include an attempt to identify missing survey and boundary monuments using a metal detector. No other maintenance needs or causes for a follow-up or contingency inspection were identified.

### 16.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Shiprock Disposal Site, Shiprock, New Mexico* (DOE/AL/62350-60F, Rev. 1, U.S. Department of Energy [DOE], September 1994; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 16-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 16.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 16.3.2
Routine Maintenance and Repairs	Section 8.0	Section 16.3.3
Groundwater Monitoring	Section 5.0	Section 16.3.4
Corrective Action	Section 9.0	Section 16.3.5

**Institutional Controls**—The 105-acre site is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. The site was accepted under U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) 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. DOE Order 454.1 defines institutional controls as federal control of the property, site perimeter fencing, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 16.3 Compliance Review

### 16.3.1 Annual Inspection and Report

The results of the site inspection, conducted on June 1, 2011, are discussed below. Figure 16-1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin refer to items in the “Executive Summary” table.

#### 16.3.1.1 Specific Site-Surveillance Features

**Access Road, Gates, Fence, and Signs**—Access to the site is via a gravel road off U.S. Highway 491 and through a sand and gravel processing facility, operated by the Navajo Engineering and Construction Authority (NECA), to the main entrance gate. DOE retains perpetual access to the site through a Custody and Access Agreement with the Navajo Nation (DE-FC04-83AL16258, October 7, 1983). All access roads were in good condition.

All three vehicle access gates—the main entrance gate at the east corner of the site (near the terrace escarpment), the gate providing terrace access at the northwest corner of the site, and the former entrance gate at the west corner of the site—were locked, intact, and functional. However, a gap has formed in the northwest gate (PL-1). This gap will be repaired, as will eroded areas under the gate that could allow animals or small children access to the site. Near each gate, entrance signs are placed in pairs—one text and one pictorial. One pair is placed near each of the east and northwest gates (E3 and E4, respectively), and two are placed near the west gate (E1 and E2). At the time of the inspection, the pictorial sign was missing from the northwest gate, and the pictorial sign from E1 was missing from the west gate. The remaining entrance signs were in good condition; on the signs, contact information for DOE and the Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action Office was correct.

The security fence along the perimeter was intact but has damage in several areas, as observed in previous years. Damaged areas consist of bent posts and bent fence fabric between perimeter signs P11 and P12, dirt mounded against the fence near perimeter sign P13, bent posts near perimeter sign P14, a broken fence riser near perimeter sign P15, and fence risers separated from posts between perimeter signs P15 and P16. Because the damage does not yet threaten the overall integrity of the fence, repairs are not recommended at this time. Damaged areas will continue to be monitored.

Tumbleweeds have accumulated in many places along the perimeter fence, particularly near the east gate (PL-2) and perimeter sign P8. These accumulations potentially represent a fire hazard and increase the possibility of damage to the fence, particularly during high winds. Trash has also accumulated along, and become entangled in, the fence. To improve the safety and appearance of the site, tumbleweed and trash around all site fences will be removed before the next annual inspection.



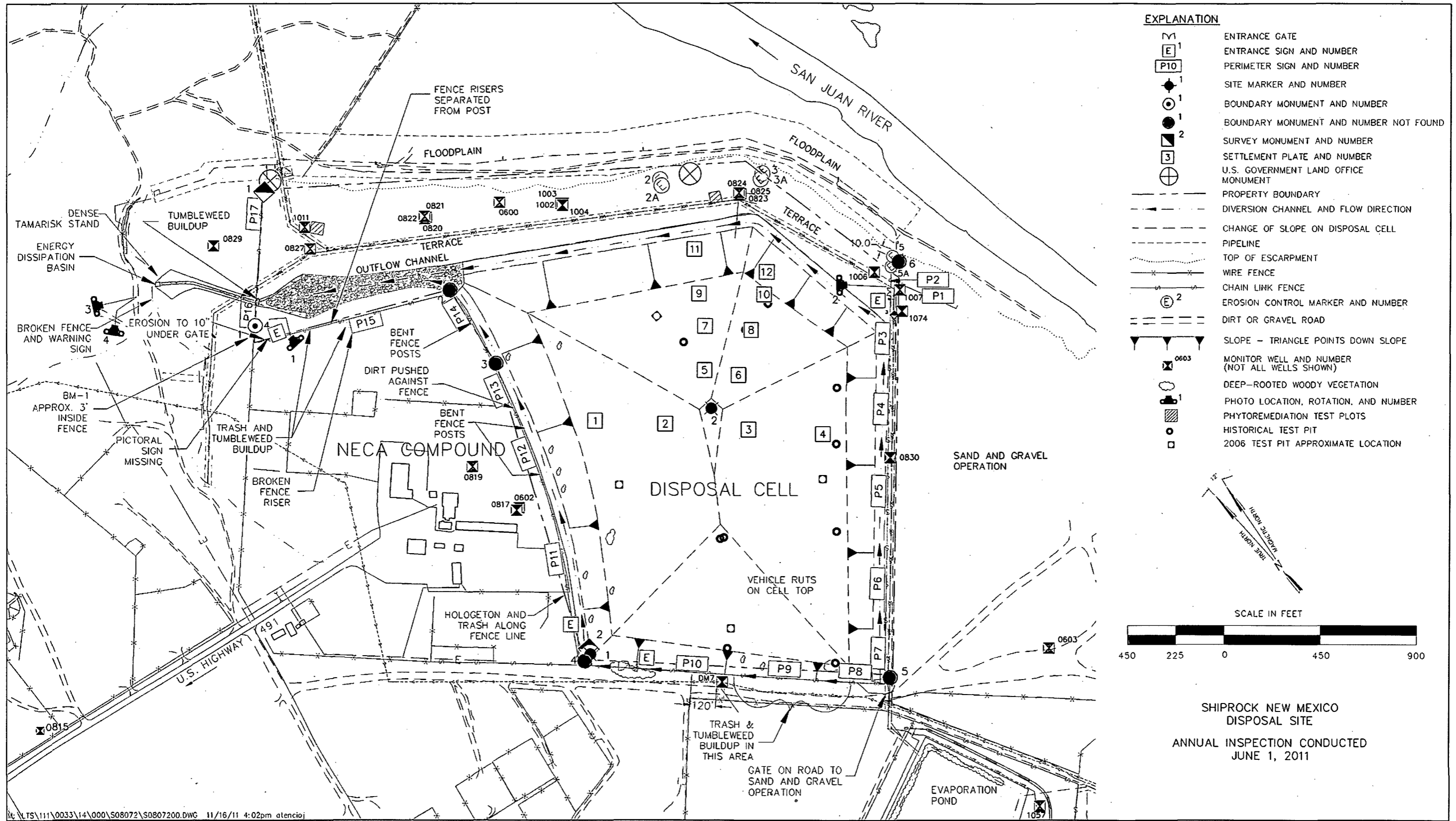


Figure 16-1. 2011 Annual Compliance Drawing for the Shiprock Disposal Site

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16A There are gaps beneath the fence, most formed by animals, along the site perimeter. Two 6-inch gaps were identified near perimeter sign P3, between perimeter signs P4 and P5, and between perimeter signs P14 and P15. In 2011, inspectors placed rocks in all significant gaps.

All perimeter signs were in good condition, showing no evidence of vandalism, with one exception: one pictorial sign near the entrance gate (P2) was missing. This sign will be replaced.

**Site Markers and Monuments**—Two site markers are placed at the site: site marker SMK-1 is just inside the former main entrance gate, and site marker SMK-2 is on top of the disposal cell. Minor cracking in the concrete around the base of SMK-1 was sealed in May 2003. Both site markers were in good condition at the time of the 2011 inspection.

All three survey monuments were inspected and in good condition. As was the case in previous inspections, only boundary monument BM-1 was located in 2011. The five remaining boundary monuments were buried by windblown sand or inadvertently removed during past construction activities. Because DOE does not own the land, the presence or exact location of these boundary monuments is not critical to managing the disposal site. However, the monuments were constructed with magnets inside the caps, which would allow them to be located with a metal detector. A search for these monuments will be attempted during the 2012 annual inspection. If all monuments cannot be located and missing monument locations become a critical issue in the future, DOE will subcontract a licensed surveyor to reestablish the monuments.

**Erosion Control Markers**—The four sets of erosion control markers along the edge of the terrace escarpment were in good condition except for the marker near the east entrance gate (ECM-5A on Figure 16-1). This marker was previously damaged by a vehicle, but the marker is still functional and does not require repair at this time.

**Monitoring Wells**—The LTSP does not require cell performance groundwater monitoring for this site. Numerous monitoring wells are present along the terrace and at off-site locations for monitoring associated with the processing site. These wells are not included in the annual inspection because the DOE groundwater restoration staff maintains the wells during the frequent sampling events. All wells encountered during the 2011 inspection were secure, locked, and in good condition.

#### **16.3.1.2 Transects**

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called “transects”: (1) the disposal cell (including the riprap-covered top and side slopes, diversion channels, and outflow channel), (2) the terrace area north and northeast of the disposal cell, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect site integrity or long-term performance.

**Disposal Cell, Diversion Channels, and Outflow Channel**—The riprap-covered top and side slopes of the cell are in good condition; no evidence of settling or slumping was found. The

surface of the cell was covered with vehicle ruts, most of which were formed in 2008 during herbicide treatment activities. The condition of the ruts has not visibly changed since the 2010 inspection. Approximately 24 historical test pits were installed across the cell top for research purposes and repaired in 2002. In 2009, several of the pits began to subside slightly, forming conical depressions in the cover. For monitoring purposes, the subsided pits were mapped during the 2010 inspection. The condition of the pits had not changed in 2011. Four additional open research pits, described in previous annual inspection reports, were also present on the cell top. These pits are associated with ongoing research concerning cell performance and the collection of saturated hydraulic conductivity measurements. The condition of these pits also had not changed in 2011.

Diversion channels around the base of the disposal cell were in good condition and contained little vegetation. Small quantities of non-woody vegetation were growing in the outflow channel, and woody vegetation was growing on the banks of the channel; neither is expected to obstruct flow. However, tumbleweeds and trash have accumulated along the perimeter fence where it crosses the outflow channel and could potentially obstruct flow. Removal of this material is recommended. The off-site portion of the outflow channel remained in good condition (PL-3). To prevent potential entanglement of wildlife and remove a tripping hazard, it is recommended that a loose portion of erosion control fabric on the side slopes of the lower channel be removed.

**Terrace Area and Site Perimeter**—The terrace comprises the area north and east of the disposal cell between the cell and the escarpment. The escarpment, more than 300 feet from the eastern edge of the disposal cell, is prone to slumping. Four sets of erosion control markers along the terrace escarpment allow stability to be monitored. Fractures and incipient slumps commonly occur in the Mancos Shale bedrock along the escarpment northwest of erosion control marker ECM-1A. No new erosion was evident in 2011.

**Outlying Area**—A sand and gravel pit operated by NECA is located immediately southeast of the disposal cell. Gravel mining operations ceased in 2009, but gravel stockpiles were still present during the 2011 inspection. Inspectors will continue to monitor sand and gravel operations to ensure that gravel pit activities do not encroach upon or adversely impact the disposal site and perimeter area.

In 2002, DOE constructed an 11-acre lined evaporation pond (across the public access road) as part of the ongoing groundwater treatment program. A chain-link security fence encloses the area. Although the activities associated with the treatment of contaminated groundwater at this site are not within the scope of the LTSP, the pond is monitored for general condition and security as part of the annual inspections. At the time of the 2011 inspection, the pond liner appeared intact, and the pond was full of water.

The security fence was functional, with some damage along the southwestern edge. Tumbleweeds and trash had accumulated in several areas along the fence, and removal is planned. The contact information on the entrance sign is out of date and will be corrected.

A barbed-wire fence runs parallel to the disposal site along Bob Lee Wash, and signs with warnings not to drink the water are posted on the fence. In 2011, a section of the fence was broken, and a warning sign was damaged (PL-4). Fence repair and sign replacement is recommended.

### 16.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### 16.3.3 Routine Maintenance and Repairs

The repairs identified in this report will be completed by the time the 2012 inspection is conducted.

### 16.3.4 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required at the site. The LTSP concluded that the site is located over an aquifer (the alluvial aquifer) that is not useful as a source of water for drinking or any other beneficial purpose because of its poor quality, limited areal extent, and low yield. An effective confining layer (Mancos Shale) and upward hydraulic gradient protect the underlying aquifer. Based on these findings, no additional hydrogeologic investigations were planned for the site, and no cell performance monitoring of groundwater was proposed as part of the long-term surveillance program.

### 16.3.5 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 corrective action was required in 2011.

### 16.3.6 Photographs

*Table 16-2. Photographs Taken at the Shiprock Disposal Site*

Photograph Location Number	Azimuth	Description
PL-1	245	Gap in northwest gate.
PL-2	130	Tumbleweed accumulation near east gate.
PL-3	120	Outflow channel.
PL-4	50	Broken fence wire and warning sign.



*SHP 6/2011. PL-1. Gap in northwest gate.*



*SHP 6/2011. PL-2. Tumbleweed accumulation near east gate.*



*SHP 6/2011. PL-3. Outflow channel.*



*SHP 6/2011. PL-4. Broken fence wire and warning sign.*

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## 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 was inspected on July 26, 2011. The disposal cell and its associated surface water drainage features remain in good condition and are functioning as designed. Several minor erosional features on the site, including rills and gullies south of the disposal cell apron and near the retention pond, have not increased in size since the last inspection. Although this minor erosion does not pose a threat to the disposal cell or to site features, these areas will continue to be monitored during future inspections.

Not all transects were walked during the 2011 inspection due to inclement weather, so most of the boundary monuments and survey monuments were not inspected. Apart from the replacement of a perimeter sign (P30) and routine weed control, no maintenance needs or cause for a follow-up or contingency inspection was identified.

### 17.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Burro Canyon Disposal Cell, Slick Rock, Colorado* (DOE/AL/62350-236, Rev. 0, U.S. Department of Energy [DOE], May 1998; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 17-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.0 and 6.2	Section 17.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 17.3.2
Routine Maintenance and Repairs	Section 4.0	Section 17.3.3
Groundwater Monitoring	Sections 2.5 and 2.6	Section 17.3.4
Corrective Action	Section 5.0	Section 17.3.5

**Institutional Controls**—The 62-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. 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 at the site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 17.3 Compliance Review

### 17.3.1 Annual Inspection and Report

The site, northeast of Slick Rock, Colorado, was inspected on July 26, 2011. Results of the inspection are described below. Figure 17-1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

#### 17.3.1.1 *Specific Site-Surveillance Features*

**Access Road, Gate, Fence, and Signs**—Access to the site is off County Road T11, an improved gravel-and-dirt road maintained by San Miguel County. The road was in excellent condition at the time of the inspection.

The entrance to the site is through a barbed-wire gate that is secured with a DOE lock. The stock fence around the site is strung with four strands of wire with spacers. The top and bottom strands are smooth wire, allowing wildlife to pass over or under, and the middle two wire strands are barbed. This stock fence was dismantled and reconfigured in 2007 to enclose the disposal cell; two new 4-foot-wide, steel-tube pedestrian gates were installed at that time. The entrance gate, pedestrian gates, and stock fence were all in good condition at the time of the 2011 inspection. However, at several places around the perimeter, the top strand of the fence has been slightly lowered by deer or elk.

17A The entrance sign, located inside the stock fence just east of the entrance gate, was in good condition. Thirty-two perimeter signs, designated P1 through P32, are spaced at approximately 200-foot intervals around the site. The signs, attached to steel posts set in concrete, are placed 5 feet inside the site boundary. In 2011, due to inclement weather, only a subset of the perimeter signs was inspected (mostly those visible from within the fenced area). Perimeter signs on the northwest and northeast corner of the site were not visited. As reported the last several years, the signpost at perimeter sign P1 has a bullet hole, but it remains legible and sturdy. Perimeter sign P30 was missing at the time of the inspection. This was later replaced using theft-resistant hardware in September 2011.

**Site Markers and Monuments**—The two granite site markers, SMK-1 near the entrance gate and SMK-2 on the north-central part of the disposal cell, were in excellent condition. Erosion near SMK-1 (PL-1) is being monitored and may require remedial work if heavy rainfalls occur.

Six boundary monuments define the corners of the site boundary, and three survey monuments (SM-1, SM-2, and SM-3) are located along the fence line. Only boundary monument BM-6 was verified during the 2011 inspection, due to inclement weather. The remaining boundary and survey monuments are expected to be in good condition based on previous years’ inspections and the fact that no ground disturbances were observed nearby.

#### 17.3.1.2 *Transects*

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called “transects”: (1) the rock-covered top of the disposal cell including side slopes, the key trench, and the apron; (2) the area between the disposal cell and the site boundary, including the stock pond, re-contoured and reseeded areas, and the stock fence; and (3) the outlying area.

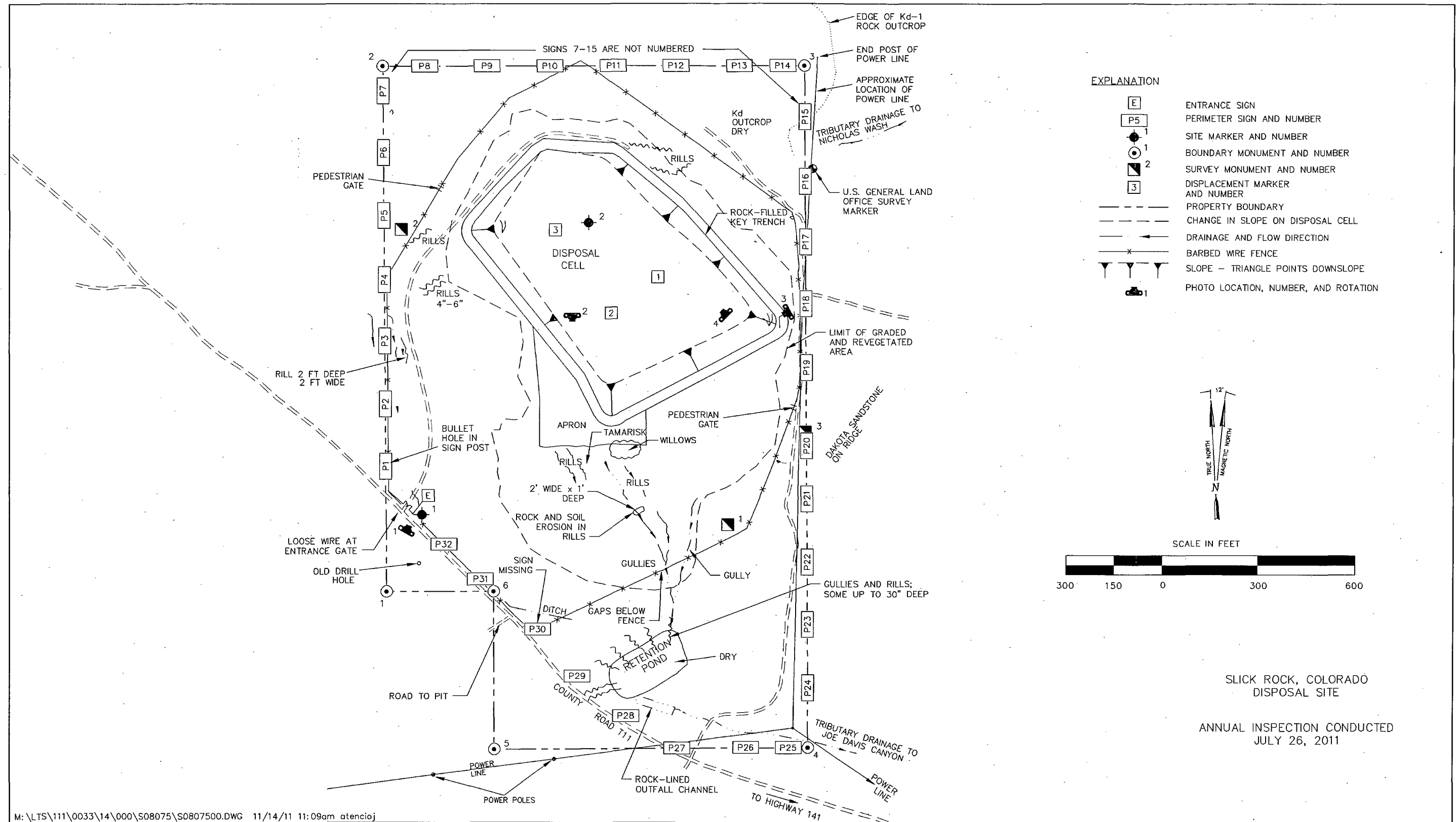


Figure 17-1. 2011 Annual Compliance Drawing for the Slick Rock Disposal Site

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In 2011, due to inclement weather, only the barbed-wire stock fence, disposal cell transects, retention pond, and erosional features south of the cell were walked. Other areas were observed from the access road or at a distance. Inspectors examined each transect for evidence of erosion, settling, slumping, or other disturbance that might affect site integrity or the long-term performance of the site.

**Disposal Cell, Side Slopes, Key Trench, and Apron**—The disposal cell was completed in 1996. The top of the disposal cell is roughly pentagonal; five side slopes descend from the top of the disposal cell at a maximum grade of 25 percent and are covered with riprap. At the base of the side slopes is a key trench that encircles the disposal cell. The key trench is as much as 5 feet deep and 20 feet wide and filled with riprap. South and downslope from the disposal cell, an apron of riprap extends for 50 to 200 feet beyond the key trench (PL-2). All side slopes, the key trench, and the apron were in excellent condition.

Rock covering the disposal cell, key trench, and apron is rounded cobble- and pebble-sized material. The rock is in excellent condition (PL-3, PL-4). No evidence of settling, slumping, or erosion was apparent on any of the rock-covered surfaces of the disposal cell. No phreatophytes or other deep-rooted plant species were observed on the cell's surface.

**Area Between the Disposal Cell and the Site Boundary**—Surface drainage from the disposal cell flows south 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 cobblestones for a short distance. Both the pond, which was dry at the time of the inspection, and the outflow channel were in good condition at the time of the inspection.

Historically, large storm water runoff events have caused erosion in several areas near the retention pond. Periodically, the erosion has been significant enough to warrant repair. For example, two large gullies containing deep headcuts that had formed southwest and southeast of the retention pond were repaired in July 2008. Some of the gullies previously noted on the northwest side of the retention pond are still as deep as 30 inches, but they do not present a hazard to the disposal cell or to any site feature. As such, action is still not warranted. These erosional features will continue to be monitored during future site inspections.

As noted during previous inspections, rills have formed downslope of the disposal cell apron, between the apron and the retention pond. In 2004, rock and soil were placed in the rills to disrupt runoff flow. Although this area downslope of the apron appears relatively stable, some erosion is still occurring. As observed during the last several inspections, sedimentation and soil loss were still evident at some of the rill features, indicating further erosion from recent storm water runoff events. However, this erosion is considered minor and does not present a hazard to the disposal cell. No repairs are necessary at this time, but these features will continue to be monitored as part of future inspections.

Rills east of perimeter signs P2 and P3, noted in the last several inspection reports, are still apparent. The largest rill, approximately 2 feet wide by 2 feet deep, has remained stable in size since 2008. These features will continue to be monitored for evidence of continuing erosion requiring repair. (A large rill near the entrance gate was repaired in October 2010 because it would have caused access problems if allowed to remain.)

**Outlying Area**—The natural, undisturbed areas outside the site support grass and scattered piñon and juniper trees; the primary land use is grazing. Steep hillsides north and northeast of the site slope eastward into Nicholas Wash. Areas north and northeast of the site are routinely used for recreational purposes (e.g., hunting, four-wheeling, firewood cutting). No new disturbances or evidence of land use changes in the outlying areas were noted at the time of the inspection.

### 17.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### 17.3.3 Routine Maintenance and Repairs

Along with routine noxious weed control monitoring and herbicide application, maintenance activities required in 2011 included the replacement of perimeter sign P30.

### 17.3.4 Groundwater Monitoring

DOE does not monitor groundwater at this site because there is no preexisting contaminant plume at the site and because the uppermost aquifer is of limited use since it is not a current or potential source of drinking water (due to low yield) (40 CFR 192.21 [g]).

### 17.3.5 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 corrective action was required in 2011.

### 17.3.6 Photographs

*Table 17-2. Photographs Taken at the Slick Rock Disposal Site*

Photograph Location Number	Azimuth	Description
1	30	Erosion under fence near site marker SMK-1.
2	180	View south of apron from top of cell (retention pond in background).
3	240	Southeast face of cell.
4	315	Top of cell, view west from northeast corner.



*SRK 7/2011. PL- 1. Erosion under fence near site marker SMK-1.*



*SRK 7/2011. PL- 2. View south of apron from top of cell (retention pond in background).*



*SRK 7/2011. PL- 3. Southeast face of cell.*



*SRK 7/2011. PL- 4. Top of cell, view west from northeast corner.*



## 18.0 Spook, Wyoming, Disposal Site

### 18.1 Compliance Summary

The Spook, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on June 21, 2011, was in excellent condition. Substantial spring precipitation has resulted in minor erosion in most of the existing rills and gullies; however, the erosion is not adversely impacting the site features. No cause for a follow-up inspection was identified.

### 18.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Spook, Wyoming, Disposal Site* (DOE/AL/350215.000, Rev. 0, U.S. Department of Energy [DOE], January 1993; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 18–1 lists these requirements.

Table 18–1. License Requirements for the Spook Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 18.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 18.3.2
Routine Maintenance and Repairs	Section 8.0	Section 18.3.3
Corrective Action	Section 9.0	Section 18.3.5

**Institutional Controls**—The 14-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) in 1993. 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 at the site, as defined by DOE Policy 454.1, consist of federal ownership of the property and warning/no-trespassing signs along the property boundary. The site is not fenced. Verification of these institutional controls is part of the annual inspection.

Inspectors found no evidence that these institutional controls were ineffective or violated.

### 18.3 Compliance Review

#### 18.3.1 Annual Inspection and Report

The site, in north-central Converse County, Wyoming, was inspected on June 21, 2011. The results of the inspection are described below. Features and the photograph locations (PLs) mentioned in this report are shown on Figure 18–1. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

### **18.3.1.1 Specific Site-Surveillance Features**

**Access Road and Signs**—Access to the site, northwest of Douglas, Wyoming, is via Highway 93 to County Road 31 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.

The site is open-range and unfenced. Perimeter signs were in excellent condition (PL-1).

**Site Markers and Monuments**—Site marker SMK-2 and the eight boundary monuments and three survey monuments were in excellent condition. The concrete base of site marker SMK-1 is damaged due to spalling but is stable; no changes were observed from the previous year (PL-2).

**Monitoring Wells**—Groundwater monitoring is not required at this site. DOE abandoned all monitoring wells in October 2000 and closed out the permits.

A water supply well remains on the site. The well, Spook #1 (Wyoming Permit No. U.W. 617), was installed in 1961 by the former landowner and predates site mining and milling activities. Well ownership was transferred to DOE when DOE acquired the site. The well is completed in a deeper aquifer not affected by regional uranium mineralization and is permitted for 100 gallons per minute. DOE granted use of the well for agricultural and other purposes to Hornbuckle Ranch Limited Partnership through a perpetual access agreement (DE-RO13-02GJ67289). The agreement stipulates that users will hold DOE harmless from all liability associated with the use of the well. A new power pole and electrical panel were installed adjacent to the well in 2007, and a buried pipeline carries water to a storage pond southeast of the site.

The well was off and the electrical panel was locked and tagged at the time of the inspection (PL-3). A plastic pipe that had lain across the site at the time of the 2010 inspection was no longer present.

### **18.3.1.2 Transects**

To ensure a thorough and efficient inspection, the site is divided into three transects: (1) the disposal site, (2) the site perimeter, and (3) the outlying area.

Within each transect, the inspectors examined specific site-surveillance features, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

**Disposal Site**—The site is unique among Title I sites in that tailings were encapsulated in the bottom of an open pit mine and covered with 40 to 60 feet of clean fill and topsoil. As such, many of the observations and concerns routinely associated with above-grade disposal cells—such as the quality of the riprap, the stability of side slopes, or the presence of deep-rooted plants (biointrusion) above the radon barrier—do not apply to this site.

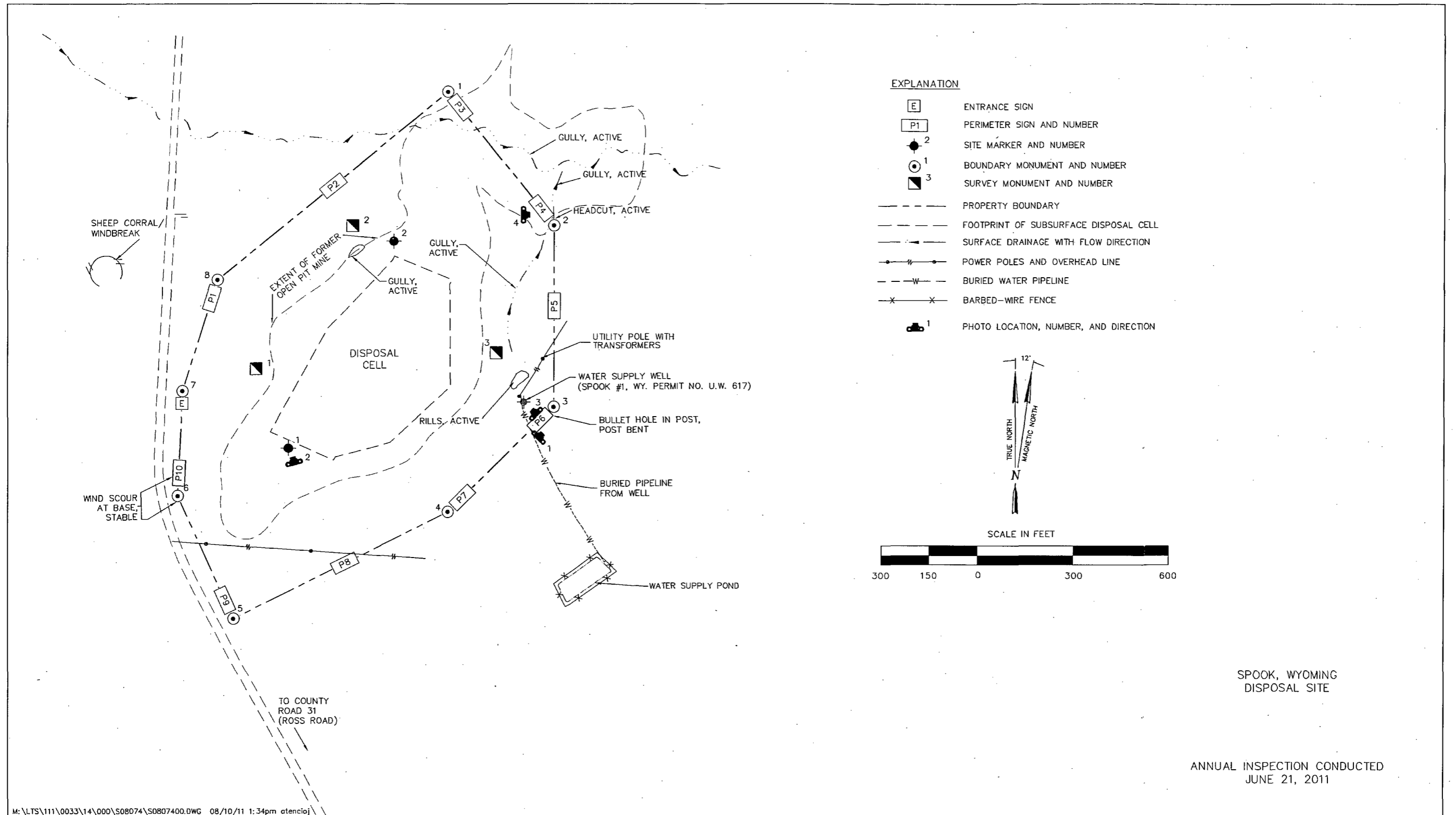


Figure 18-1. 2011 Annual Compliance Drawing for the Spook Disposal Site

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The surface of the 5-acre disposal cell, completed in 1989, was in excellent condition. No evidence of settling was observed over the former mine pit. Vegetation across the site, consisting of grasses and forbs, appears healthy and is indistinguishable from that which grows on the surrounding hills and valleys. The same species are present, and the overall health and density of vegetation are similar.

The site is not fenced; the local landowner controls the grazing of cattle on the DOE property as an extension of his ranching activities. Pronghorn antelope also graze on the site. The range was healthy and has not been overgrazed.

The Pacific Power and Light Company owns a transmission line that crosses the southern end of the site. The company also owns the utility pole with transformers that provide power to the submersible pump in the water supply well on site.

Several minor rills and gullies are on the site. They appeared to be stable during the 2008 inspection. However, substantial precipitation events during the past 3 years have caused most of the features to reactivate (PL-4). The erosion is not harming the function of the cell cover or other site features, and it is not a concern at this time.

**Site Perimeter**—This transect was in excellent condition. If there were no perimeter signs along the boundary, the perimeter of the site would be indistinguishable from the adjacent open range.

Recent precipitation had caused many of the shallow gullies along and adjacent to the property to reactivate. However, the features are minor and do not currently threaten site features' stability.

**Outlying Area**—The area beyond the site boundary for a distance of about 0.25 mile was examined for erosion, disturbance, change in land use, or other features of possible concern. The access road experiences frequent truck traffic to service and maintain the oil wells in the area, and the road was being widened and graded at the time of the inspection. Even though oil field activity has greatly increased near the site, no evidence of trespassing or vandalism was observed.

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

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### **18.3.3 Routine Maintenance and Repairs**

No maintenance or repairs were required in 2011.

### **18.3.4 Groundwater Monitoring**

Groundwater in the uppermost aquifer at this site is contaminated as a result of widespread, naturally occurring uranium mineralization. The aquifer is of limited use because its yield is

marginal and because it cannot be cleaned up by methods reasonably employed in public water systems. Therefore, in accordance with 40 CFR 192.21 (g), narrative supplemental standards have been applied to the site, and groundwater monitoring is not required.

### 18.3.5 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 corrective action was required at the site in 2011.

### 18.3.6 Photographs

*Table 18-2. Photographs Taken at the Spook Disposal Site*

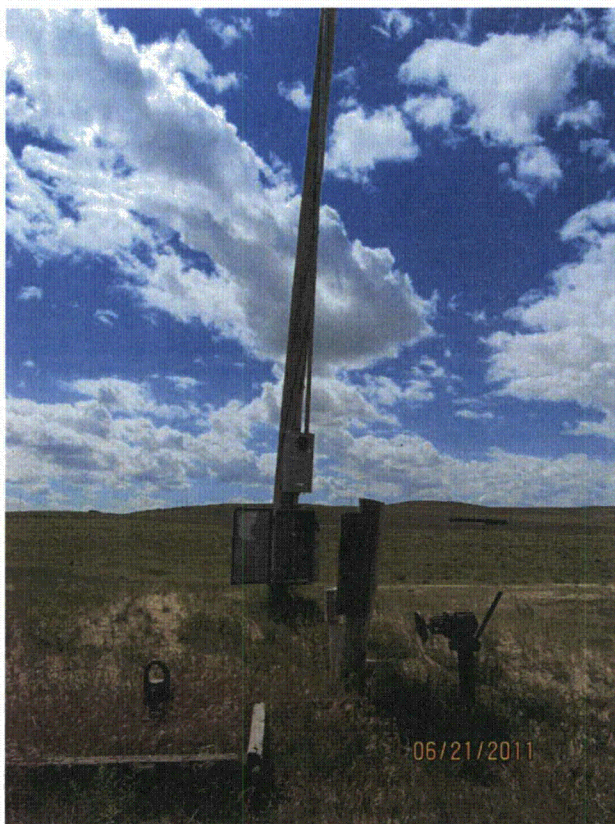
<b>Photograph Location Number</b>	<b>Azimuth</b>	<b>Description</b>
PL-1	45	Perimeter sign P6 and boundary monument BM3.
PL-2	345	Site marker SMK-1.
PL-3	315	Water supply well.
PL-4	90	Headcut erosion near perimeter sign P4.



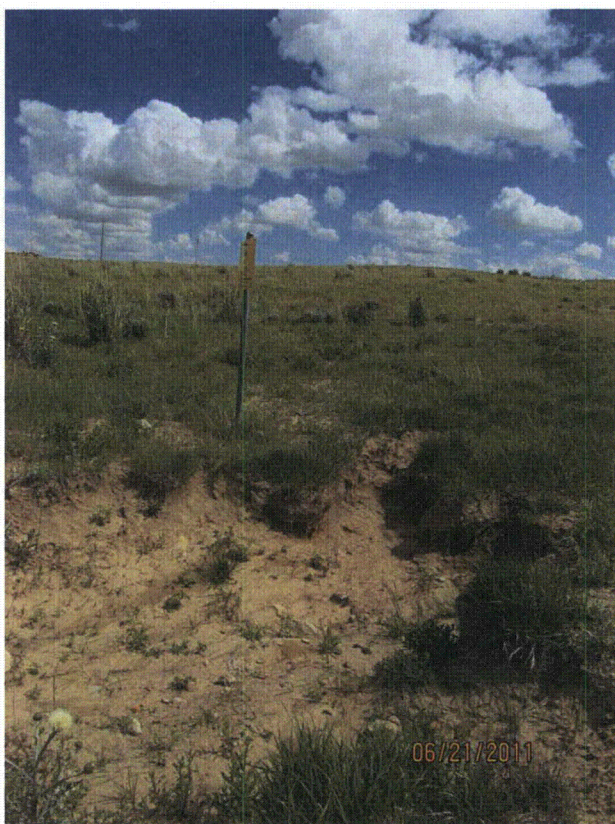
SPK 6/2011. PL-1. Perimeter sign P6 and boundary monument BM3.



SPK 6/2011. PL-2. Site marker SMK-1.



*SPK 6/2011. PL-3. Water supply well.*



*SPK 6/2011. PL-4. Headcut erosion near perimeter sign P4.*



## 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 was inspected on April 6, 2011. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. Although sand accumulation is still evident in the apron ditch and diversion channel along the northwest side of the disposal cell, it is not adversely affecting the function of these features.

Results of groundwater monitoring performed in 2011 indicate no significant change in groundwater quality when compared to historical results. However, groundwater quality downgradient of the former millsite is still degraded due to residual historical (processing-related) contamination. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

### 19.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Tuba City Disposal Site are specified in the *Long-Term Surveillance Plan for the Tuba City, Arizona, Disposal Site* (DOE/AL/62350-182, Rev. 0, U.S. Department of Energy [DOE], October 1996; LTSP) and in procedures established by DOE to comply with the requirements of Title 10, *Code of Federal Regulations*, Part 40.27 (10 CFR 40.27). Table 19-1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 19.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 19.3.2
Routine Maintenance and Repairs	Section 8.0	Section 19.3.3
Groundwater Monitoring	Section 5.2	Section 19.3.4
Corrective Action	Section 9.0	Section 19.3.5

**Institutional Controls**—The U.S. Bureau of Indian Affairs holds the 145-acre disposal site in trust. The Navajo Nation retains title to the land. 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. The U.S. Nuclear Regulatory Commission (NRC) required DOE to enter into Cooperative Agreement DE-FC04-85AL26731 with the Navajo Nation to perform remedial actions at the former processing sites prior to bringing the site under the general license. DOE and the Navajo Nation executed a Custodial Access Agreement (CAA) 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 NRC general license (10 CFR 40.27) in 1996 for compliance with 40 CFR 192, Subpart A. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal control of the property, a site perimeter security fence, warning/no-trespassing signs (called perimeter signs) along the property boundary, and a locked gate at the entrance to the

site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

## 19.3 Compliance Review

### 19.3.1 Annual Inspection and Report

The site, located east of Tuba City, Arizona, was inspected on April 6, 2011. Results of the inspection are described below. Figure 19–1 shows the features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

Many structures and features at the site—including an office building, a water treatment plant, a solar water-heating system, a solar photovoltaic system, evaporation ponds, an extensive network of extraction and monitoring wells, and a treated water infiltration system—are associated with the active treatment of contaminated groundwater, which is ongoing. The purpose of the active groundwater remediation is to mitigate contamination resulting from former uranium processing that occurred at the site. These activities are not addressed in the LTSP, however, because they are not related to the long-term disposal and stabilization of encapsulated contaminated materials. As such, associated features are not included in the annual inspection and are only addressed herein as they relate to site integrity or safety concerns. Operation of the remediation system was suspended for the bulk of this reporting period (from October 2010 through September 2011) to upgrade and replace treatment system components.

#### 19.3.1.1 Specific Site-Surveillance Features

**Access Road, Fence, Gate, and Signs**—The site is accessed directly from U.S. Highway 160. Perpetual access to the site is granted by the CAA. A gate in a fence on the highway right-of-way allows access to the site along a gravel access road; the site entrance gate is at the perimeter security fence. The access gate, road, and entrance gate to the site were in good condition. The gates were open at the time of the inspection because of ongoing groundwater remediation operations at the site. The security fence around the site perimeter was in good condition, as were the entrance signs posted on both gates.

Perimeter signs are posted in pairs at regular intervals around the site perimeter. Each sign pair, secured to a metal post, consists of a “No Trespassing” sign with a radioactive materials trefoil symbol and a schematic sign with a diagram of the disposal cell (also identified by the radioactive materials trefoil symbol) and the site boundary. Faded perimeter signs noted during the 2010 inspection (P7, P8, and P9) were replaced prior to the 2011 inspection. All of the signs were in good condition.

**Markers and Monuments**—The two granite site markers, one just inside and to the right of the entrance gate and the other on top of the disposal cell, were in good condition. The survey and boundary monuments that were observed were also in good condition. As was the case last year, boundary monument BM–3, at the northeast corner of the site, was buried by windblown sand.

**Monitoring wells**—Seven wells comprise the cell performance monitoring network: 0903, 0906, 0908, 0940, 0941, 0942, and 0945. The six wells inside and immediately adjacent to the disposal site were secure. Monitoring well 0903, located about 0.25 mile south of the disposal cell, was not inspected.

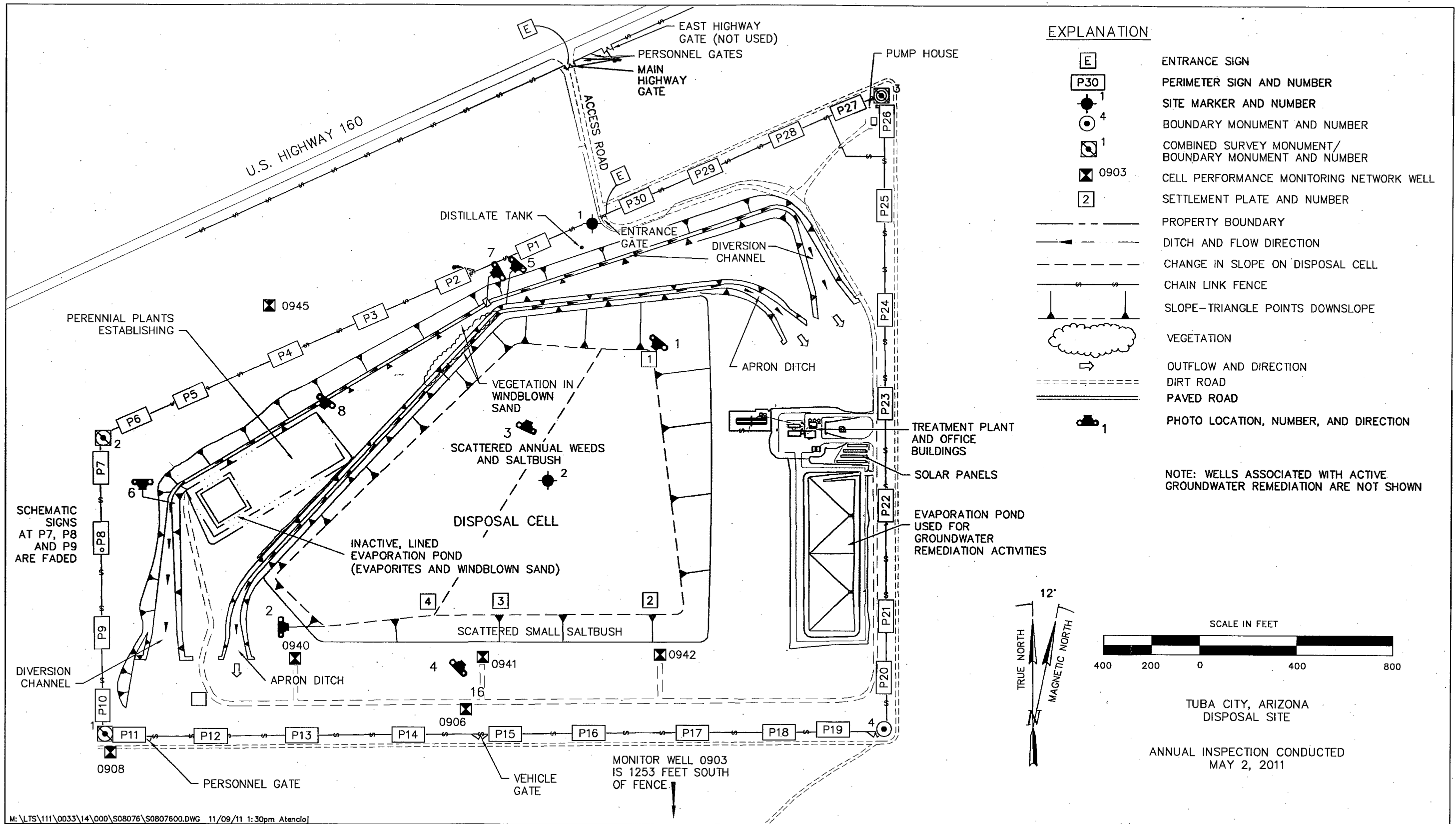


Figure 19-1. 2011 Annual Compliance Drawing for the Tuba City Disposal Site

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### 19.3.1.2 *Transects*

In accordance with the LTSP, the site is divided into three areas, referred to as transects, to ensure a thorough and efficient inspection: (1) the disposal cell; (2) the area between the disposal cell and the site boundary; and (3) the outlying area. The area inside each transect is inspected by walking a series of traverses.

Within each transect, the inspectors examined specific site-surveillance features, such as the integrity of the cover, drainage structures, vegetation, and other features. Inspectors also examined the site for evidence of settlement, erosion, vandalism, or other disturbances or modifying processes that might affect site integrity or the long-term performance of the disposal cell.

**Disposal Cell**—The disposal cell is covered with riprap to control erosion. The rock cover material was in excellent condition and showed no signs of deterioration. No evidence of differential settlement or slumping was observed, and all visible components of the disposal cell and cover were in excellent condition (PL-1 and PL-2).

In accordance with the LTSP, deep-rooted vegetation, primarily saltbush, is removed or controlled to prevent potential penetration of the radon barrier. The most recent removal effort occurred in 2004. Since then, periodic application of herbicide has been very effective in controlling deep-rooted vegetation growth on the cell cover. All shrubs on the disposal cell were treated with herbicide during the 2010 inspection; only a few small shrubs were noted during the 2011 inspection. Scattered patches of grass and annual weeds also grow on the cell top and side slopes; however, these shallow-rooted plants are not a concern. Windblown sand continues to accumulate on the rock-covered surfaces, providing a favorable environment for plant growth (PL-3).

Sand accretion and vegetation encroachment are still evident at several locations along the south side slope of the disposal cell. Photographs are taken at these locations annually to document changes in sand accretion and vegetation conditions. The gradually increasing vegetation coverage likely indicates that sand accumulation on the rock-covered slope continues to increase (PL-4).

**Area Between the Disposal Cell and the Site Boundary**—The apron drainage ditch at the base of the disposal cell (PL-5) and the diversion channel (PL-6), both located along the north and northwest sides of the cell, are in good condition. Windblown sand deposition continues to be monitored at the site because unstable dunes in outlying areas can contribute to sand accumulation along fence lines, in diversion channels, and in the rock cover of the disposal cell. Sand accretion and vegetation encroachment have been checked annually since 2001 in the diversion channel and apron drainage ditch on the north and northwest sides of the cell. The sand tends to periodically accumulate and scour but, overall, sand accretion and concomitant new vegetation growth continues to increase (PL-7). However, these accumulations are not adversely affecting the performance of these features.

In 2007, two of the three evaporation ponds located near the northwest side of the disposal cell were removed, and the area was reclaimed and seeded with a native vegetation seed mix. Although the area is scoured by wind, perennial vegetation continues to establish (PL-8). The

progress of revegetation in this area will continue to be monitored. The remaining pond is retained as a backup for the main evaporation pond located on the east side of the site.

**Outlying Area**—The area beyond the site boundary for a distance of about 0.25 mile was examined for erosion, disturbance, change in land use, and other features of possible concern. No changes were observed.

### 19.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2011.

### 19.3.3 Routine Maintenance and Repairs

No maintenance or repairs were required in 2011.

### 19.3.4 Groundwater Monitoring

- 19A In accordance with the LTSP, DOE monitors groundwater to compare current conditions to baseline post-construction (disposal cell) 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 (legacy) processing-site-related groundwater contamination might mask any contamination leaching from the disposal cell. Additionally, transient drainage resulting from the presence of wet tailings and slimes placed within the disposal cell may also occur that would not reflect cell performance. These conditions limit the effectiveness of normal point-of-compliance (POC) groundwater monitoring as a reliable indicator of cell performance (40 CFR 192, Subpart A).

Given the preexisting processing-site-related contamination described above, long-term groundwater monitoring at POC wells in the uppermost aquifer to demonstrate cell performance is not technically feasible at the Tuba City Site. Therefore, groundwater monitoring is performed in accordance with Section 5.2.2 of the LTSP and is defined as *evaluative monitoring*. According to the LTSP, the purpose of this monitoring is to (1) evaluate 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. Preexisting processing-site-related groundwater contamination at the site is currently under remediation (40 CFR 192, Subpart B).

In accordance with the LTSP, seven compliance wells (Table 19–2) are monitored for four target analytes: molybdenum, nitrate (nitrate plus nitrite as nitrogen), selenium, and uranium. Because of the preexisting groundwater contamination, the LTSP provides provisional upper baseline limits (UBLs) as the main criteria for assessing the results of the evaluative monitoring (Table 19–3). As stated in the LTSP, maximum concentration limits (MCLs) are not appropriate for determining the concentration limits needed to evaluate disposal cell performance.

Table 19–2. Groundwater Monitoring Network at the Tuba City Disposal Site

Monitoring Well	Hydrologic Relationship	Monitoring Frequency
0903	Downgradient (Off-site)	Annually
0906	Downgradient	Semiannually
0908	Downgradient	Semiannually
0940 <sup>a</sup>	Downgradient	Semiannually
0941	Downgradient	Semiannually
0942	Downgradient	Semiannually
0945	Upgradient (Background)	Annually

<sup>a</sup> Between August 2004 and February 2010, it was not possible to obtain a sample from well 0940 because of an insufficient volume of water, reflecting the ongoing groundwater remediation pumping being conducted at the site. However, in July 2010 and during both 2011 monitoring events, the volume of water in well 0940 has been sufficient for sampling.

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

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

<sup>a</sup> UBL = Upper Baseline Limit (as documented in the 1996 LTSP)

<sup>b</sup> 311 mg/L (for nitrate as nitrogen) was calculated based on the 1,379 mg/L UBL for nitrate as NO<sub>3</sub>

<sup>c</sup> 10 mg/L (for nitrate as nitrogen) was calculated based on the 44 mg/L MCL for nitrate cited in the LTSP

mg/L = milligrams per liter

Evaluative groundwater monitoring in 2011 was conducted in February (for those wells sampled semiannually) and in August (for all wells; see Table 19–2). Figures 19–2 through 19–5 show time-concentration plots for the four target analytes, beginning in 1998. In these figures, the legends list the background well (0945) first; remaining wells are listed in general order of increasing distance from the disposal cell. The UBLs and MCLs listed in Table 19–3 are also shown.

Sample results from the 2011 evaluative monitoring indicate that groundwater quality immediately downgradient of the former millsite (in on-site wells, 0940, 0941, and 0942, 0906, and 0908) is still degraded with respect to concentrations of nitrate, selenium and uranium in the upgradient well (0945). However, this is not the case for the more distal off-site downgradient well 0903 (approximately 1,250 feet from the site). For all four target analytes, concentrations in this well are still comparable with those detected in the upgradient (background) well 0945, significantly lower than the on-site cell performance wells, and well below corresponding MCLs and UBLs.

As has been the case since 2004, in 2011, molybdenum (Mo) concentrations in groundwater were below both the 0.1 mg/L MCL and the 0.14 mg/L UBL in all wells (Figure 19–2). With respect to upgradient (background) well 0945, Mo has been elevated only in wells 0906, 0941, and 0942. Concentrations of Mo in wells 0908, 0940, and offsite well 0903 have been comparable to background. Molybdenum concentrations in wells 0906 and 0941 were highly variable between 1998 and 2005 (occasionally exceeding the UBL), but have since stabilized

(<0.03 mg/L). Given these results, and those obtained for biannual sampling of the more extensive (non-LTSP) network, Mo is the least important of the four target analytes.

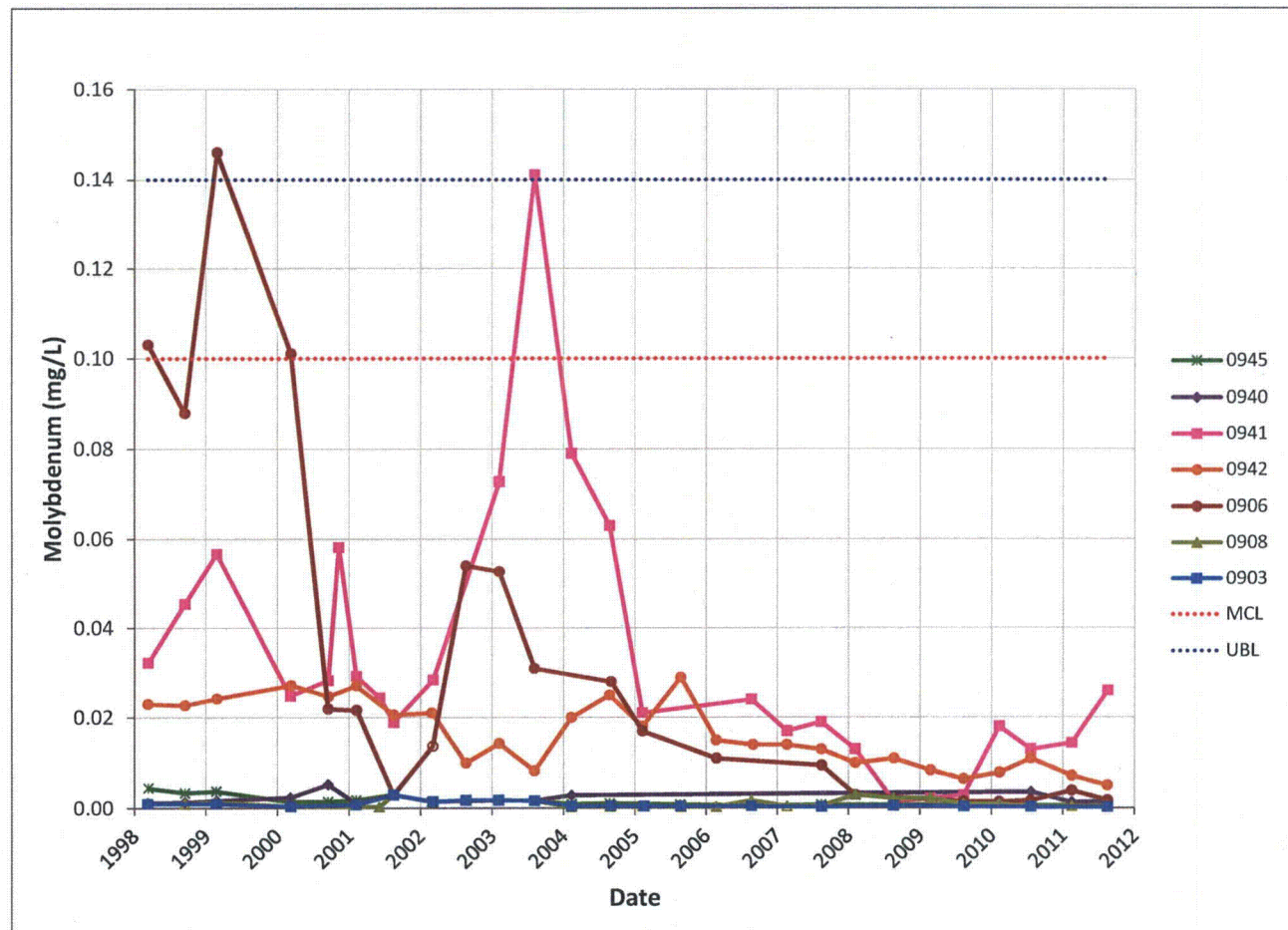


Figure 19–2. Time-Concentration Plots of Molybdenum in Groundwater at the Tuba City Disposal Site

Since 1998, nitrate concentrations in all on-site downgradient wells—0906, 0908, 0941, and 0942—have exceeded the 10 mg/L MCL, most by an order of magnitude or more (Figure 19–3). Nitrate concentrations exceeding the 311 mg/L UBL have only been measured in 0906 (currently 350 mg/L), 0942 (last exceedance in August 2008), and 0940 (currently 440 mg/L). Wells 0908 and 0941 are the only wells indicating any notable trending (with gradual increases evident since 1998–2000), but nitrate concentrations have stabilized somewhat in the last few years. Nitrate concentrations measured in the off-site downgradient well 0903, although above background and occasionally exceeding the MCL (average and maximum historical concentrations are 11.4 and 20 mg/L), are still well below the UBL. Concentrations in the upgradient background well 0945 remain below the MCL.



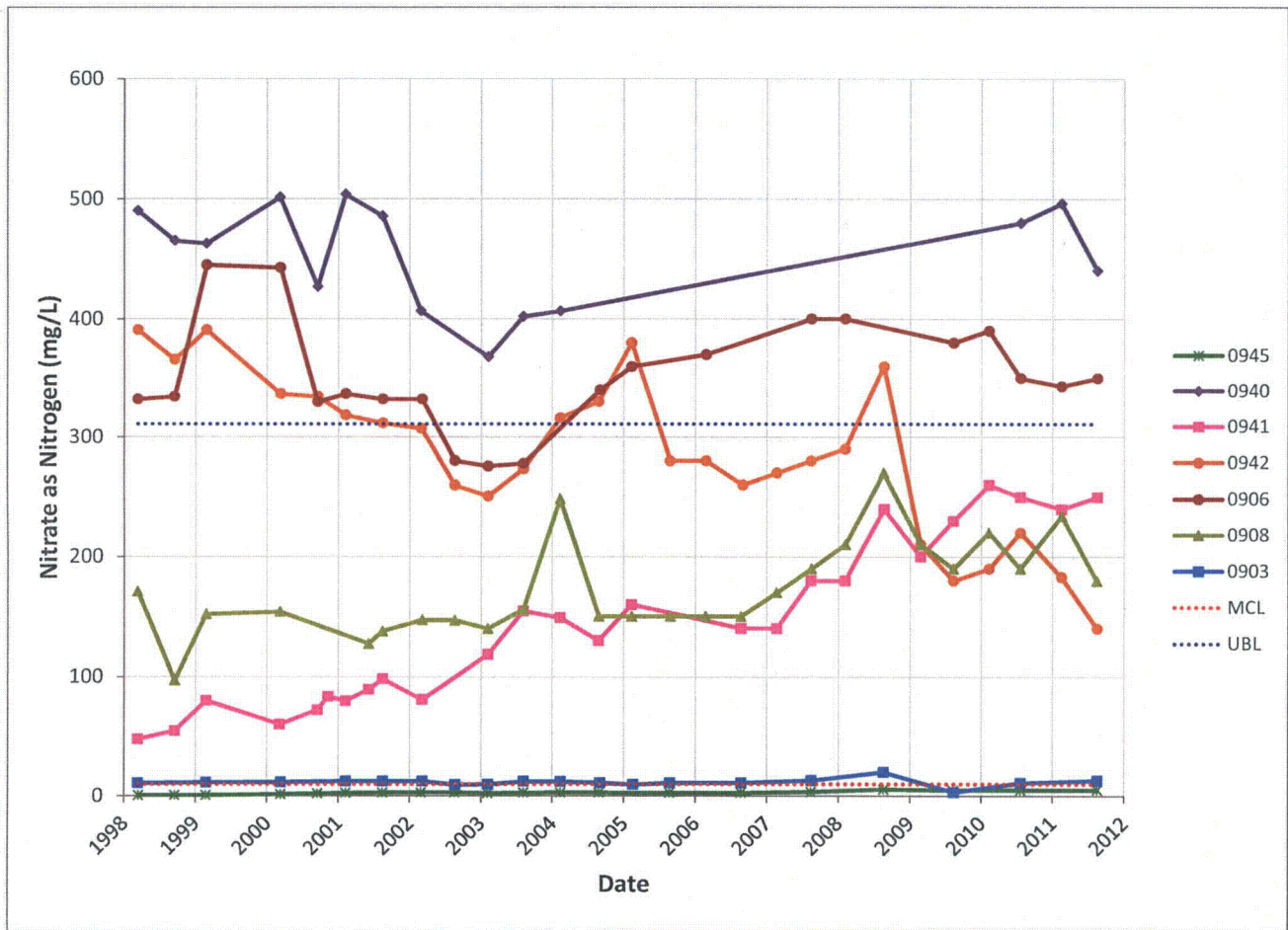


Figure 19-3. Time-Concentration Plots of Nitrate in Groundwater at the Tuba City Disposal Site

As shown in Figure 19-4, selenium concentrations measured in groundwater in 2011 exceeded the 0.01 mg/L MCL in all wells except for the off-site downgradient well 0903 and background well 0945. Selenium concentrations exceed the 0.05 mg/L UBL in wells 0940, 0941, and 0942; levels in 0941 have increased by close to an order of magnitude since 1998. Apart from 0941, no trending is evident. Selenium concentrations in 0903 have consistently been below both the UBL and the MCL.

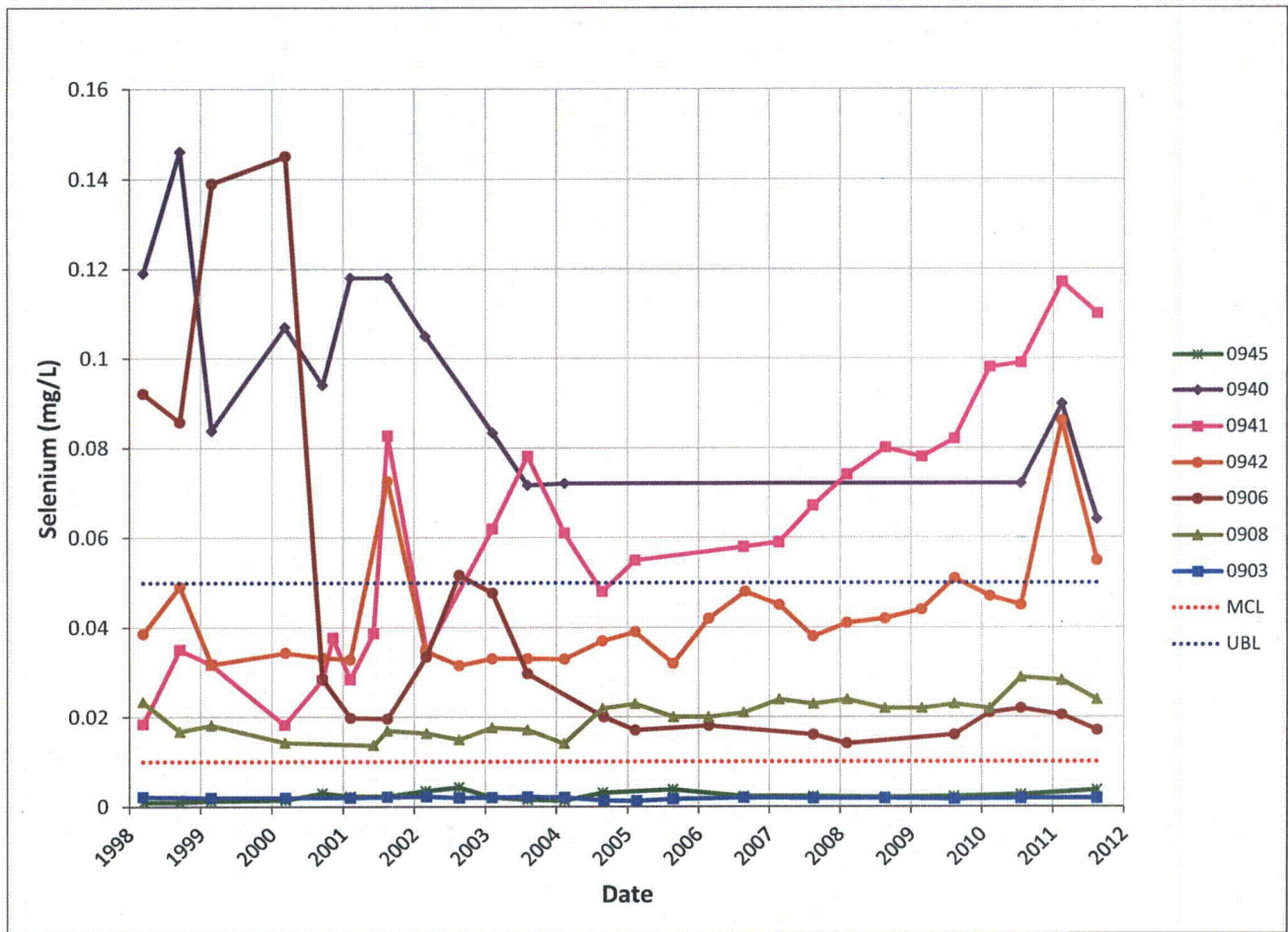


Figure 19-4. Time-Concentration Plots of Selenium in Groundwater at the Tuba City Disposal Site

In 2011, uranium concentrations in groundwater exceeded the 0.044 mg/L MCL but remained below the 1.17 mg/L UBL in all on-site downgradient wells. This has been the case historically as shown in Figure 19-5. Concentrations in the upgradient well 0945 and the off-site downgradient well 0903 remain below the MCL. Trending (either increasing or decreasing) is not evident in any well. Uranium concentrations in most wells have been quite stable. Exceptions are found in wells 0906 and 0942, where uranium has varied erratically at times; most recent measurements are between 0.4 and 0.5 mg/L.

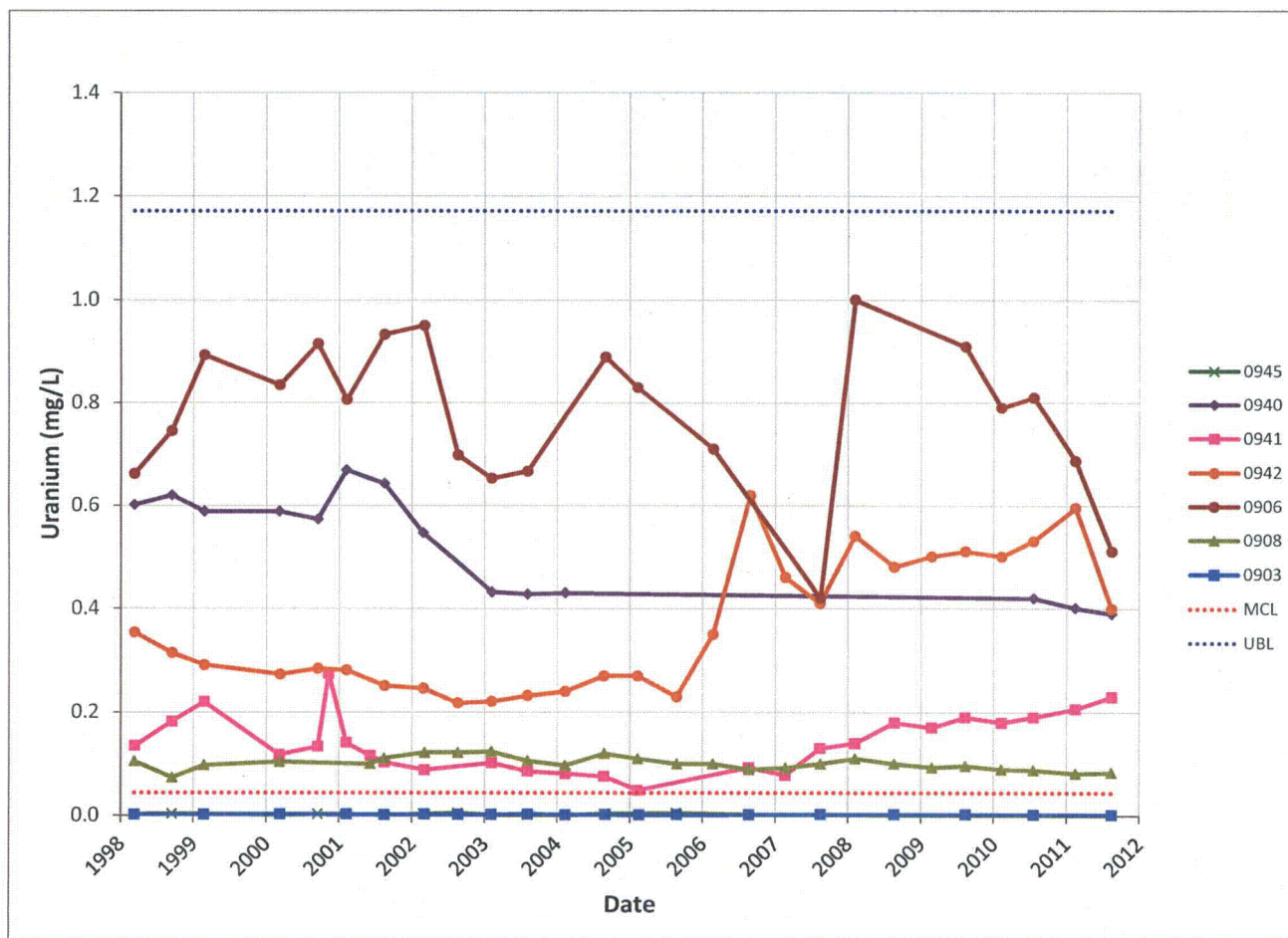


Figure 19-5. Time-Concentration Plots of Uranium in Groundwater at the Tuba City Disposal Site

Active groundwater remediation is ongoing at the site. The wells used for the evaluative monitoring of cell performance are a subset of the larger groundwater remediation monitoring well network. The progress of groundwater remediation is evaluated annually, but remediation has not been active long enough to determine if the disposal cell is performing as designed.

### 19.3.5 Corrective Action

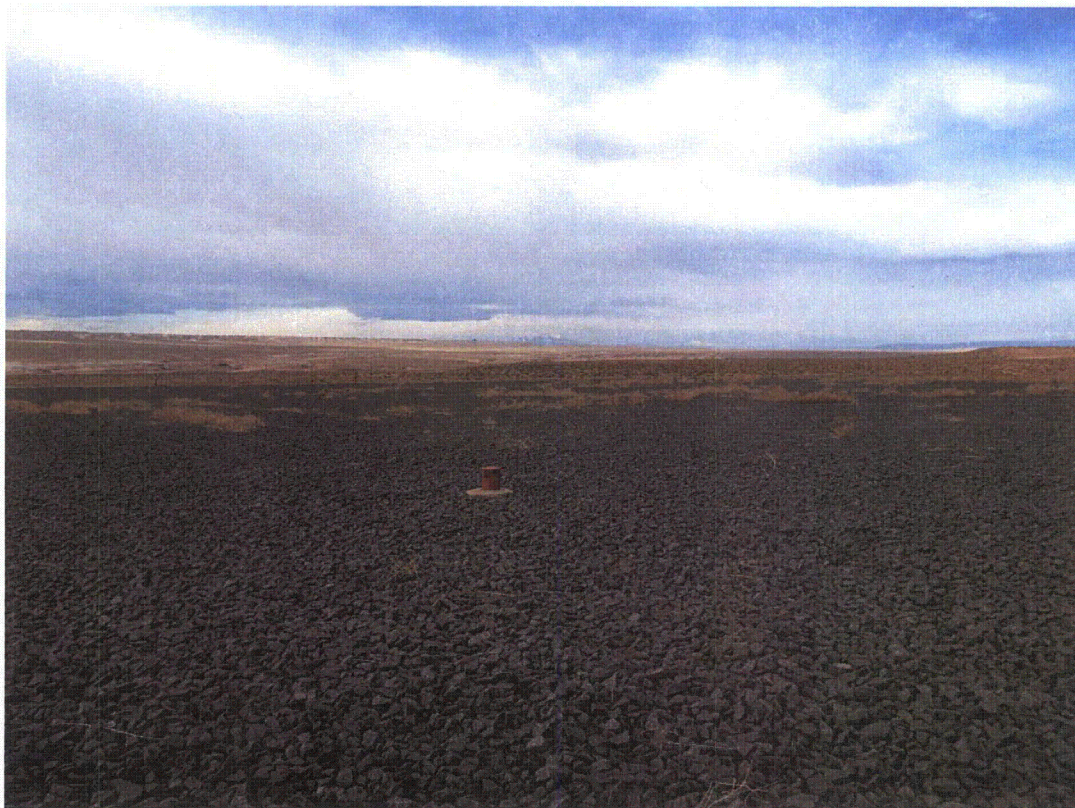
Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2011.

### 19.3.6 Photographs

Table 19-4. Photographs Taken at the Tuba City Disposal Site

Photograph Location Number	Azimuth	Description
PL-1	220	Northeast portion of the disposal cell cover.
PL-2	90	South side slope of the disposal cell cover.
PL-3	25	Windblown sand accumulation on the disposal cell cover.
PL-4	45	Vegetation encroachment on the south side slope of the disposal cell.
PL-5	220	Northwest side slope and apron ditch of the disposal cell.
PL-6	180	Diversion channel on the west side of the site.
PL-7	240	Windblown sand deposition on the south bank of the diversion channel.
PL-8	215	Reclaimed area of former evaporation ponds.



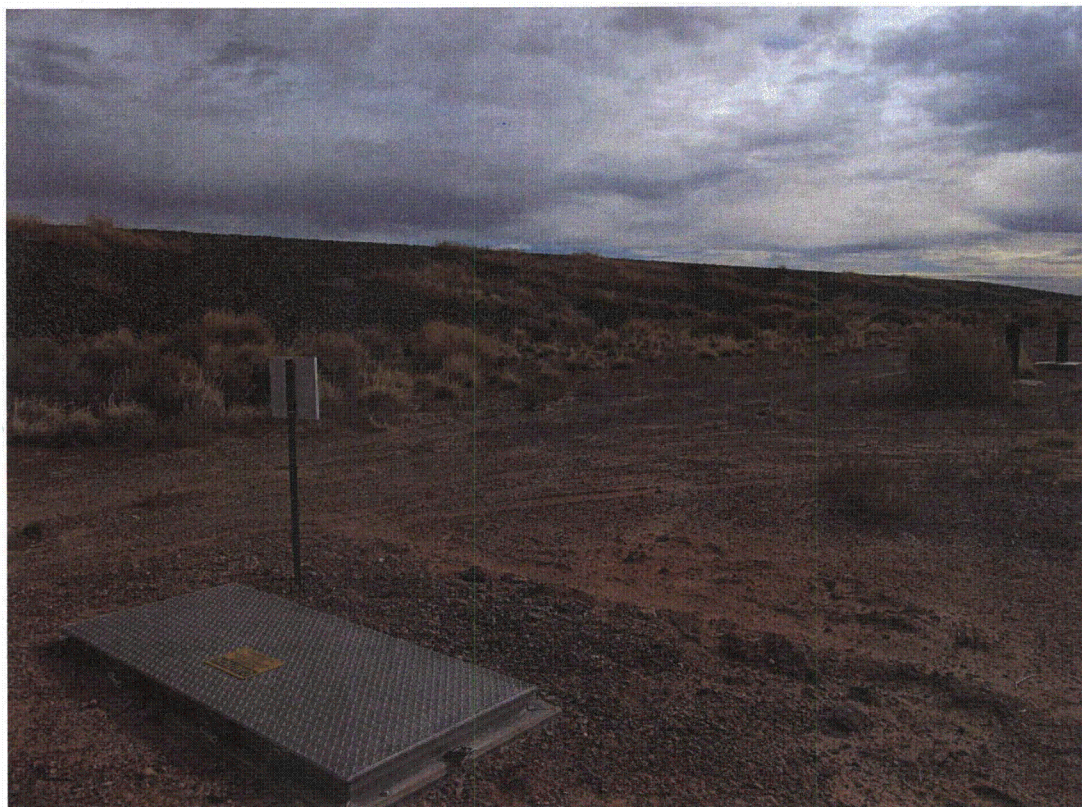
*TUB 4/2011. PL-1. Northeast portion of the disposal cell cover.*



*TUB 4/2011. PL-2. South side slope of the disposal cell cover.*



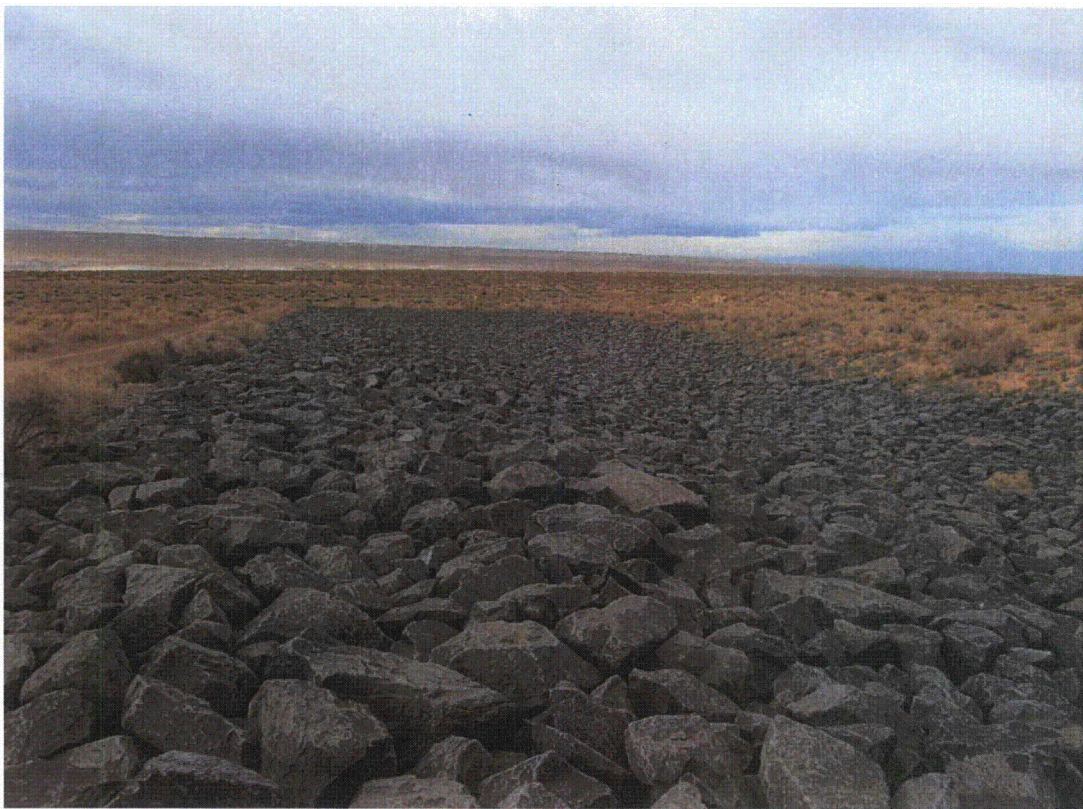
*TUB 4/2011. PL-3. Windblown sand accumulation on the disposal cell cover.*



*TUB 4/2011. PL-4. Vegetation encroachment on the south side slope of the disposal cell.*



*TUB 4/2011. PL-5. Northwest side slope and apron ditch of the disposal cell.*



*TUB 4/2011. PL-6. Diversion channel on the west side of the site.*



*TUB 4/2011. PL-7. Windblown sand deposition on the south bank of the diversion channel.*



*TUB 4/2011. PL-8. Reclaimed area of former evaporation ponds.*