8.0 Gunnison, Colorado, Disposal Site

8.1 Compliance Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducted the Gunnison, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site inspection on September 7, 2021. No cause for a follow-up inspection was identified.

No changes were observed on the disposal cell or in the associated diversion channels. Inspectors identified several minor maintenance items that were addressed following the annual inspection.

The most recent groundwater sampling event occurred in July 2021. The next scheduled monitoring event will occur in 2026. Groundwater monitoring results were below the site-specific uranium action level in the six point-of-compliance (POC) wells.

8.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (DOE 1997) (LTSP) in accordance with procedures established to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC) general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 8-1 lists these requirements.

Table 8-1. License Requirements for the Gunnison, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 8.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 8.5	(b)(4)
Maintenance and Repairs	Section 5.0	Section 8.6	(b)(5)
Groundwater Monitoring	Section 4.0	Section 8.7	(b)(2)
Corrective Action	Section 6.0	Section 8.8	--

8.3 Institutional Controls

The 92-acre site, identified by the property boundary shown in Figure 8-1, is owned by the United States and was accepted under the NRC general license in 1997. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, LM is responsible for the custody and long-term care of the site. Institutional controls (ICs) at the site include federal ownership of the property, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated diversion channels, entrance gate, and sign; perimeter fence and signs; site markers, survey and boundary monuments, and wellhead protectors.

8.4 Inspection Results

The site, 6 miles southeast of Gunnison, Colorado, was inspected on September 7, 2021. The inspection was conducted by J. Lobato and D. Atkinson of the Legacy Management Support contractor. J. Dayvault (LM), M. Hurt (LM site manager), and M. Cosby (Colorado Department of Public Health and Environment) attended the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate whether maintenance or additional inspection and monitoring are needed. The results of the inspection are reported in the remainder of Section 8.4.

8.4.1 Site Surveillance Features

Figure 8-1 shows the locations of site features, including site surveillance features and inspection areas, in black and gray font. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue text, and new observations identified during the 2021 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 8-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 8.10.

8.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is from Gunnison County Road 42 onto U.S. Bureau of Land Management (BLM) Route 3068, a gravel road maintained by BLM. Entrance to the site is through a locked gate that is part of the perimeter fence. The entrance gate was locked and functional. The entrance sign with bullet damage identified in 2020 was replaced before the inspection. No other maintenance needs were identified.

8.4.1.2 Perimeter Fence and Signs

A three-strand barbed-wire perimeter fence encloses the site; most of it is set along the property boundary. In 2019, fence flagging (PL-1) was added to protect sage-grouse and antelope that occupy the area. The perimeter fence was intact.

Two gates—one on the east fence line and the other on the north fence line—provide access from the site to offsite monitoring wells; both gates were locked.

There are 45 perimeter signs bolted to the perimeter fence posts. Several perimeter signs have bullet damage but remain legible. Perimeter sign P3 was missing, and other perimeter signs constructed of plastic were faded and curling and were replaced following the inspection. Bullet damage to perimeter sign P1, identified in 2019, was replaced after the 2021 inspection. No other maintenance needs were identified.

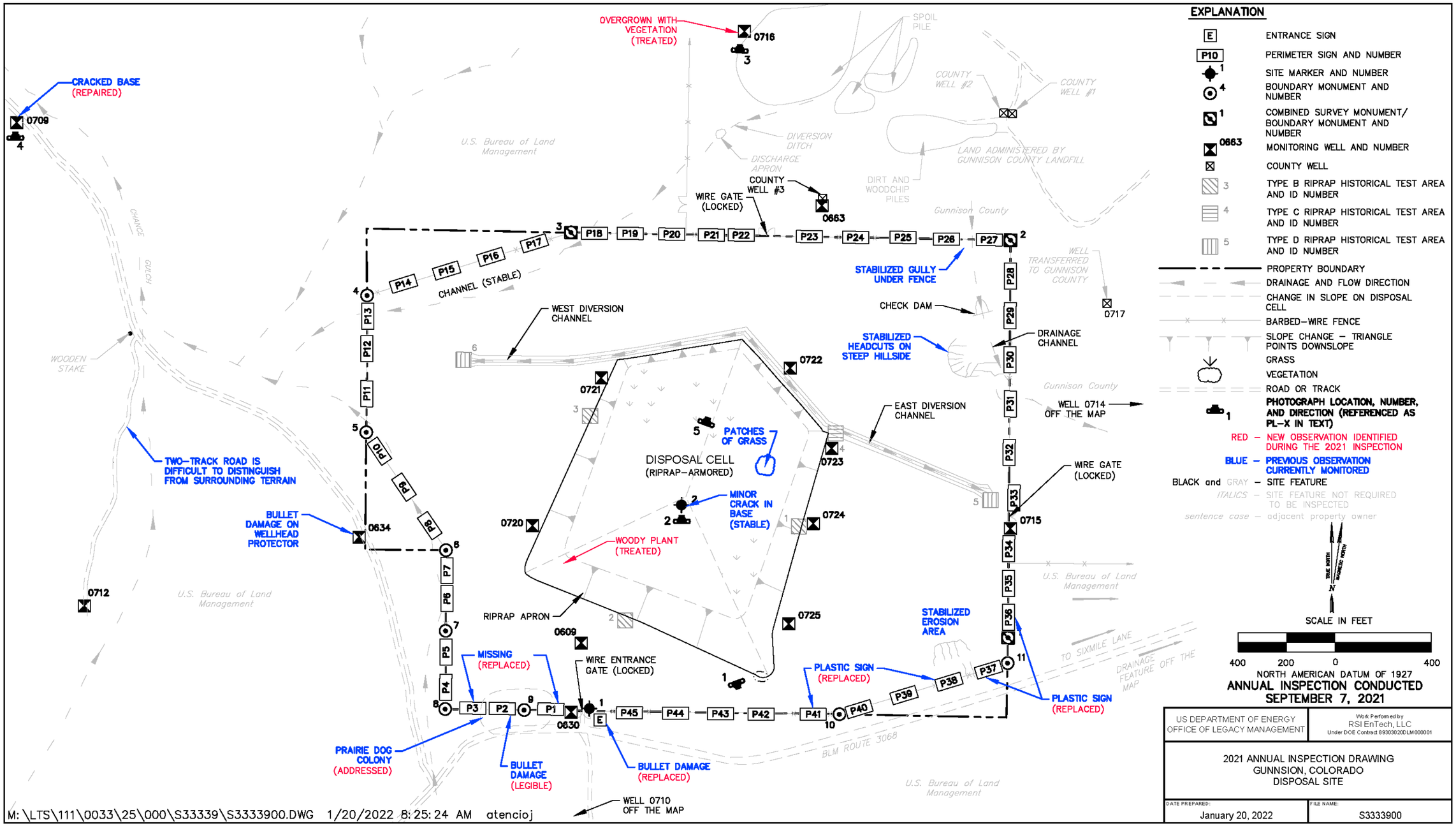

Figure 8-1. 2021 Annual Inspection Drawing for the Gunnison, Colorado, Disposal Site

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8.4.1.3 Site Markers

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

8.4.1.4 Survey and Boundary Monuments

Three combined survey and boundary monuments and eight additional boundary monuments delineate the property boundary. No maintenance needs were identified.

8.4.1.5 Monitoring Wells

The site has 16 groundwater monitoring wells. The wellhead protectors were locked and properly labeled. Bullet damage is present on the wellhead protector of monitoring wells 0634 and 0712, but the well casings are not impacted and remain functional. The bullet-damaged locks reported in the 2020 inspection report (wells 0630 and 0712) will be replaced before the next inspection. The well casing at well 0709 had a cracked base and was repaired following the 2021 inspection.

Gunnison County landfill operators have placed concrete barriers to protect monitoring well 0716, which is on landfill property, from landfill activities. Vegetation near well 0716 was beginning to overgrow the well (PL-3) and was treated following the inspection. The cracked base of monitoring well 0709 (PL-4) was repaired. No other maintenance needs were identified.

8.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the top of the disposal cell; (2) the disposal cell side slopes, apron, and diversion channels; (3) the area between the disposal cell and the site boundary; and (4) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of erosion, settling, slumping, or other modifying processes that might affect the site's conformance with LTSP requirements.

8.4.2.1 Top of the Disposal Cell

There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the top slope of the disposal cell. Several isolated patches of grass have established on the top slope; however, these shallow-rooted plants do not degrade the performance of the radon barrier component of the disposal cell's engineered cover. Several small grasses were discovered on the cell top slope (PL-5). This vegetation was treated as necessary following the inspection. No other maintenance needs were identified.

8.4.2.2 Disposal Cell Side Slopes, Apron, and Diversion Channels

The disposal cell, completed in 1995, occupies 29 acres and is armored with basalt riprap to control erosion. Basalt riprap armors the disposal cell side slopes, the apron that collects and diverts stormwater runoff from the disposal cell, and the two diversion channels that protect the disposal cell from precipitation run-on. There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the disposal cell side slopes, apron,

or diversion channels. Six rock-monitoring test areas were last inspected during the 2017 annual inspection; monitoring is no longer required in accordance with the LTSP because no rock degradation had been observed. A small woody plant growing on the side slope was identified and was treated following the inspection.

Stormwater runoff from the disposal cell occasionally ponds in a low-lying area at the southeast corner of the disposal cell apron. The riparian-type vegetation that has become established there indicates that the area retains moisture. Water collection in this area does not pose a problem, because the disposal cell surfaces are designed to drain to the southeast; any water that ponds there is below the elevation of tailings placed under the engineered cover. No other maintenance needs were identified.

8.4.2.3 Area Between the Disposal Cell and the Site Boundary

Reclaimed and undisturbed areas comprise the area between the disposal cell and the site boundary. In general, the vegetation in the reseeded, reclaimed areas consists of well-established grass; native plants are much less abundant and less diverse in reclaimed areas than they are in undisturbed areas. Former erosion areas are stable and naturally revegetating with native plant species. No maintenance needs were identified.

8.4.2.4 Outlying Area

In accordance with the LTSP, a drainage feature from the southeast corner of the site and along BLM Route 3068 was checked for indications of seepage from the vadose zone. The feature, which follows the borrow ditch along the road, was dry and showed no signs of seepage.

The area beyond the site boundary for a distance of 0.25 mile was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. A prairie dog colony that has been observed along the southwestern boundary of the site has grown to a size that may affect the disposal site. The holes in the colony were plugged following the inspection.

Gunnison County owns the land that adjoins the site boundary to the north and east and uses the land for a municipal landfill. The nearest landfill operations continue to be approximately 400 feet north of the site. Although landfill activities do not affect the site, inspectors will continue to monitor the level of activity occurring near the site boundary and surveillance features (e.g., fences and monitoring wells). With regard to groundwater flow, the landfill operations are cross gradient from the disposal cell. The only current concern for activities that could affect a site asset is a spoil pile near monitoring well 0716 (Figure 8-1 and PL-3). Inspectors will continue to monitor this area. No other maintenance needs were identified.

8.5 Follow-Up or Contingency Inspections

LM will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition or (2) LM is notified by a citizen or outside agency that conditions at the site are substantially changed. No need for a follow-up inspection was identified.

8.6 Maintenance and Repairs

Below is a summary of Gunnison site maintenance activities that were completed following the inspection:

- Treated vegetation on top slope and side slope of disposal cell
- Replaced remaining plastic perimeter signs
- Replaced entrance sign and perimeter signs P1 and P3
- Treated vegetation around monitoring well 0716
- Repaired concrete base around monitoring well 0709
- Plugged prairie dog colony holes

Damaged wellhead protector locks will be replaced before the next inspection. No other maintenance needs were identified.

8.7 Environmental Monitoring

8.7.1 Groundwater Monitoring

In accordance with the LTSP, LM conducts groundwater monitoring every 5 years to demonstrate that the site-specific uranium action level has not been exceeded. Groundwater was sampled and groundwater levels were measured annually from 1998 through 2001. Following the 2001 sampling event, the monitoring frequency changed to once every 5 years. The most recent sampling event occurred in July 2021. Groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website https://gems.lm.doe.gov/#site=GUD.

The groundwater monitoring network consists of 16 monitoring wells. That total includes six POC wells, two monitoring wells to monitor background groundwater quality, and eight wells to monitor groundwater levels (Table 8-2 and Figure 8-2). The indicator analyte for disposal cell performance is uranium, which was selected because of its presence in tailings pore fluid, relatively high mobility in groundwater, and low concentration in background groundwater samples (DOE 1997) (Figure 2.5). The site-specific screening monitoring action level (action level) concentration for uranium is 0.013 milligram per liter (mg/L). The basis for this action level is the maximum observed concentration of uranium in background samples before long-term surveillance and maintenance activities began. The U.S. Environmental Protection Agency established a maximum concentration limit for uranium of 0.044 mg/L in groundwater (40 CFR 192 Subpart A Table 1). Water levels are measured at each monitoring well during groundwater monitoring events.

Table 8-2. Groundwater Monitoring Network for the Gunnison, Colorado, Disposal Site

POC and Background Wells	Groundwater Level Wells
0720 (POC)	0630
0721 (POC)	0634
0722 (POC)	0663
0723 (POC)	0709
0724 (POC)	0710
0725 (POC)	0712
0609 (background)	0714
0716 (background)	0715

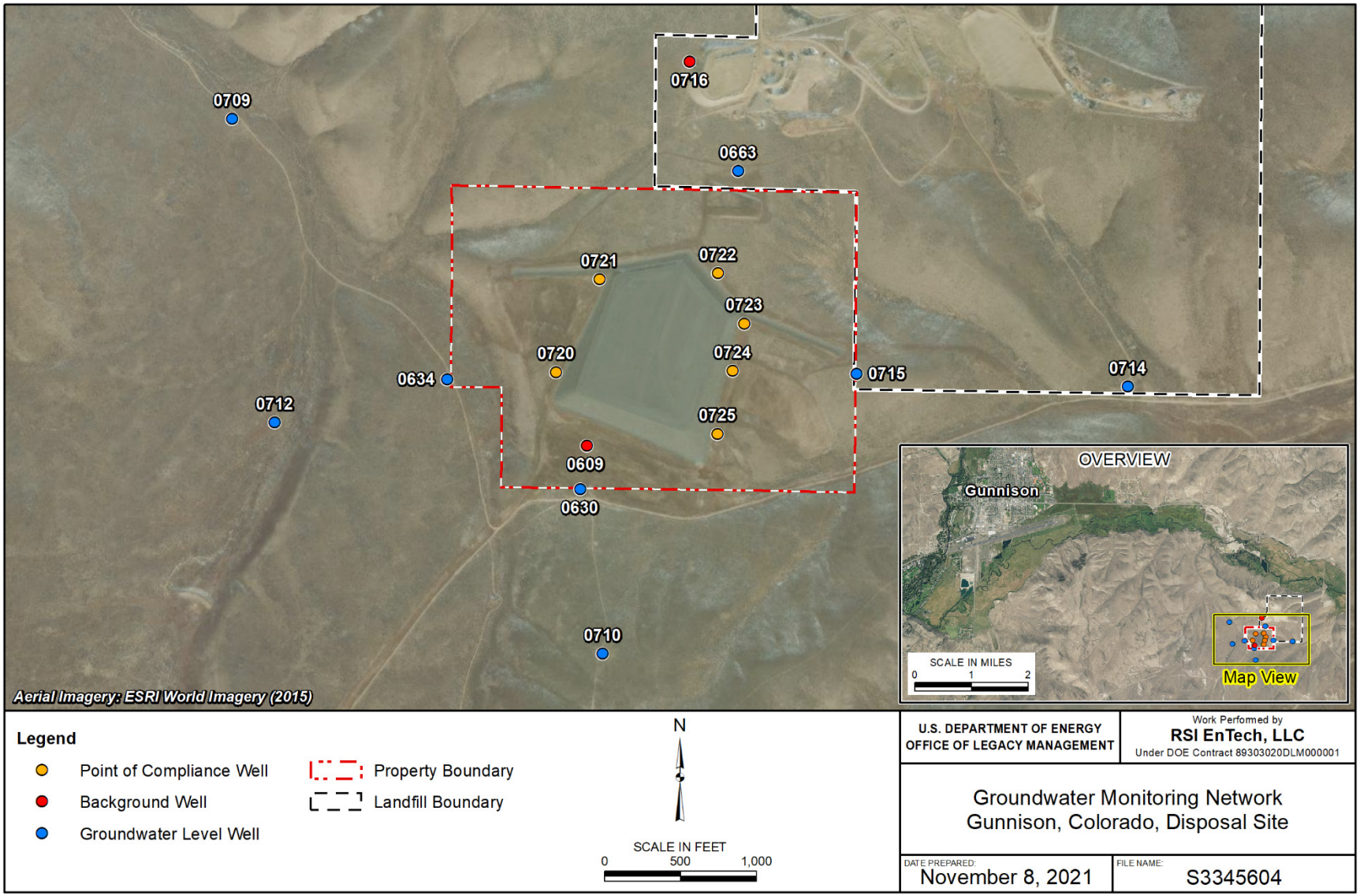
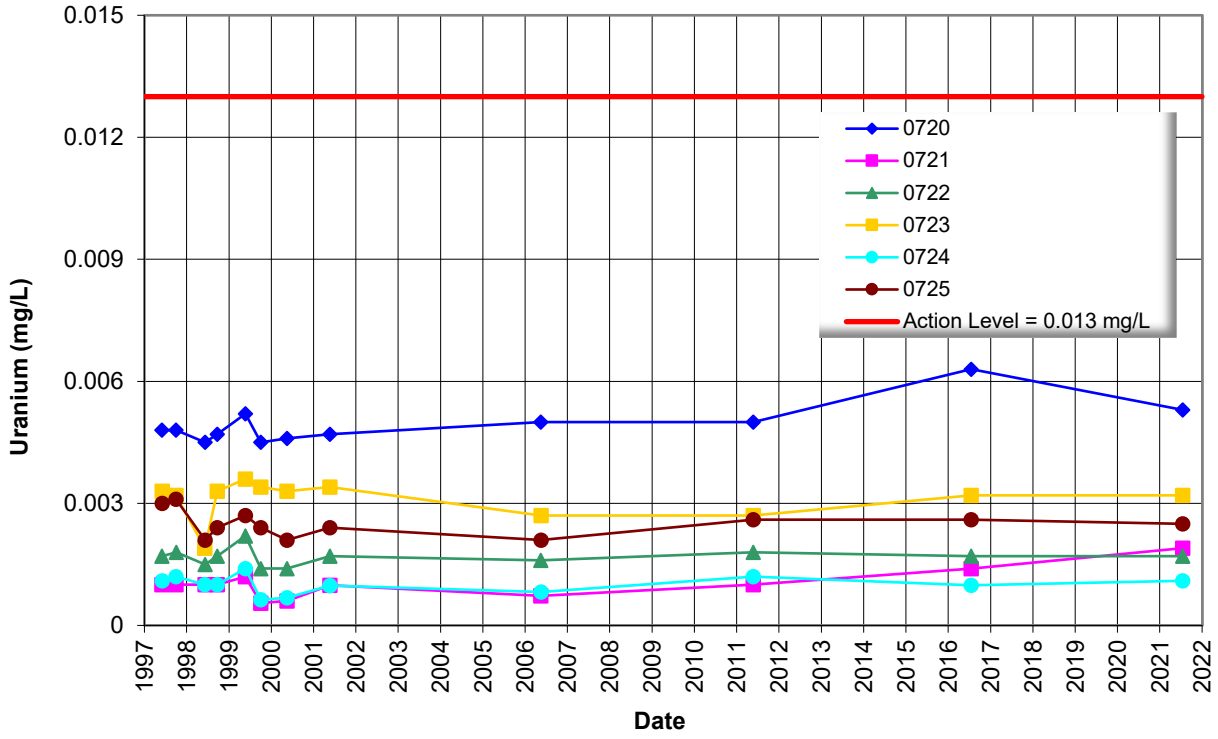


Figure 8-2. Groundwater Monitoring Network at the Gunnison, Colorado, Disposal Site

The concentrations of uranium in samples collected from POC wells ranged from 0.001 mg/L to 0.005 mg/L as shown in Table 8-3 and in a time-versus-concentration graph (Figure 8-3). Uranium concentrations were consistent with historical results in wells 0720, 0722, 0723, 0724, and 0725; however, they slightly exceeded the historical maximum in well 0721. Uranium results from the POC wells were below the action level of 0.013 mg/L.

Table 8-3. July 2021 Uranium Concentrations in POC Wells

Analyte	Action Level (mg/L)	Location	Concentration (mg/L)
Uranium	0.013	0720	0.005
		0721	0.002
		0722	0.002
		0723	0.003
		0724	0.001
		0725	0.003

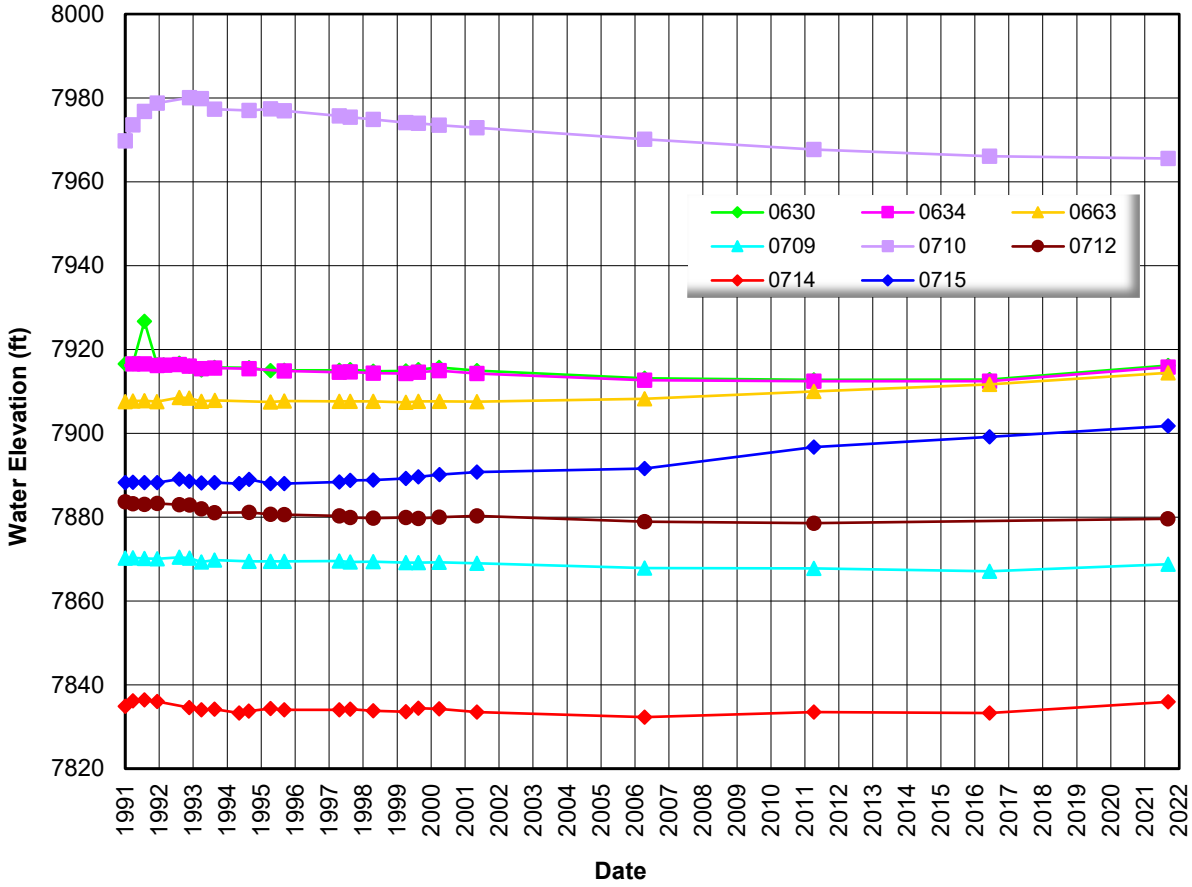


Note: Results include validated data only; results below the detection limit are presented at the laboratory reported value.

Figure 8-3. Uranium in Groundwater at POC Wells at the Gunnison, Colorado, Disposal Site

Additionally, samples were analyzed for major anions (chloride and sulfate) and cations (calcium, magnesium, potassium, and sodium), metals (iron and manganese), and total dissolved solids as indicators of general water quality. These results were consistent with historical results, indicating no significant change in general water chemistry. The consistent general water quality, along with uranium concentrations below the action level, indicates that the disposal cell continues to perform as an efficient containment system.

Groundwater elevations from the entire monitoring network were measured in July 2021. In general, the measurements for groundwater elevations in groundwater level monitoring wells (Figure 8-4) show a gradual groundwater elevation decrease before and after completion of the disposal cell in 1995. Wells 0663 and 0715 are the exception, with groundwater elevations having increased approximately 6.7 and 14 feet, respectively, since 1995. In addition, with the exception of well 0710, the groundwater elevation in each well increased from 2016 to 2021 (Figure 8-4 and Figure 8-5).



Notes: Well 0712 was not sampled in 2016 due to a broken riser. Well 0715 is shown on both graphs for comparison purposes.

Figure 8-4. Groundwater Elevations at Selected Monitoring Wells at the Gunnison Disposal Site

Groundwater elevations from wells 0663 and 0715 are plotted along with the POC wells (0720 through 0725) and the background wells (0609 and 0716) for comparison (Figure 8-5). Similar increases in groundwater elevations are seen for these other wells, except for wells 0609 and 0720, located just beyond the southwestern corner of the cell (Figure 8-2). A cause for the increasing groundwater elevations at wells 0663, 0715, 0716, and 0721 through 0725 has not been determined, but further evaluation is planned in 2022. Water level trends in these wells will continue to be monitored to determine if observed trends become a basis of concern.

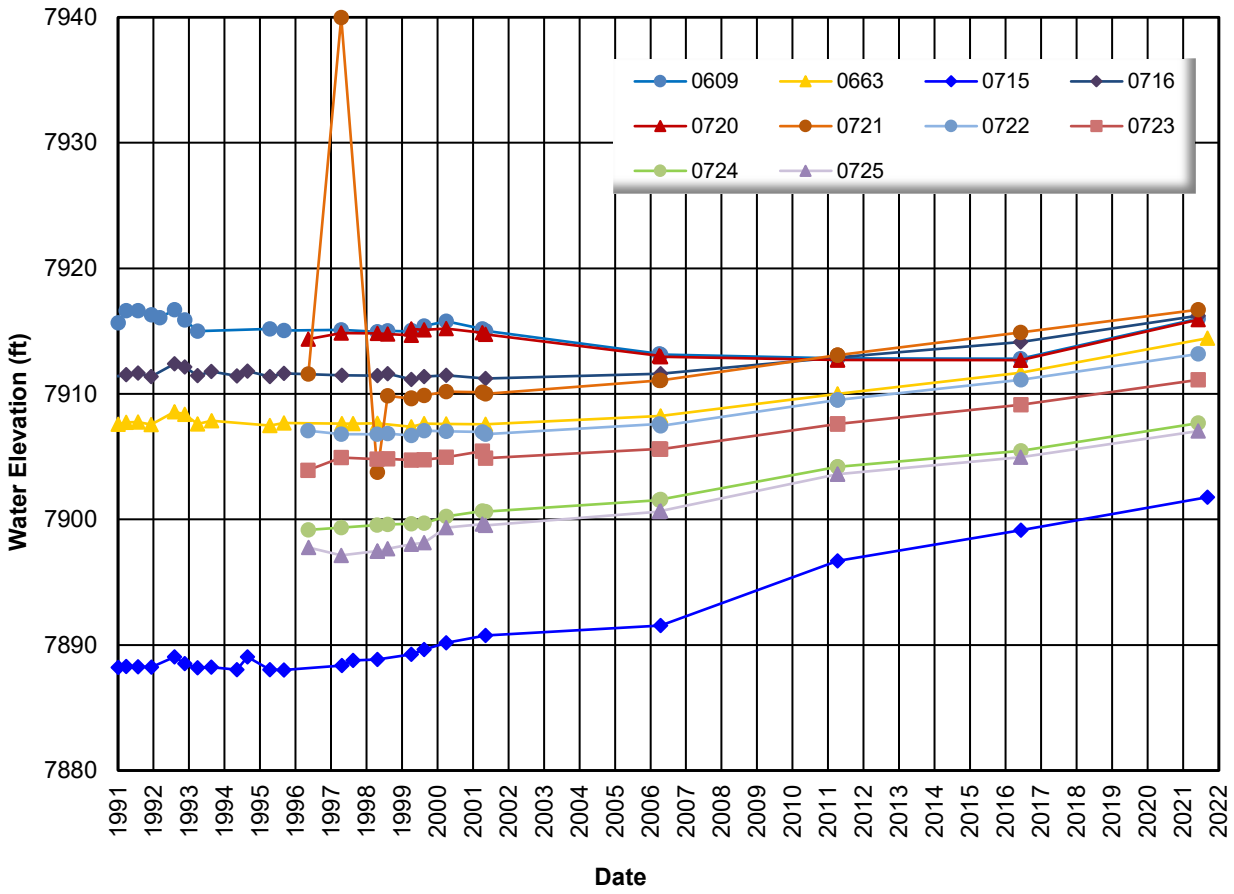


Figure 8-5. Groundwater Elevations at POC Wells, Background Monitoring Wells, and Wells 0715 and 0663 at the Gunnison Disposal Site

8.8 Corrective Action

Corrective actions may be warranted to address hazardous conditions that create a potential health and safety problem or conditions that may affect the integrity of the disposal cell or compliance with 40 CFR 192.04. No need for corrective action was identified as part of this inspection.

8.9 References

10 CFR 40.27. U.S. Nuclear Regulatory Commission, "General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites," *Code of Federal Regulations*.

40 CFR 192 Subpart A Table 1. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations.*

40 CFR 192.04. U.S. Environmental Protection Agency, "Corrective Action," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the Gunnison, Colorado, Disposal Site*, DOE/AL/62350-222, Rev. 2, April.

8.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	160	Southeast Perimeter Fence with Flagging
PL-2	—	Site Marker SMK-2
PL-3	5	Well 0716 Overgrown with Vegetation and Nearby Spoil Pile
PL-4	0	Cracked Base of Well 0709
PL-5	20	Vegetation on Disposal Cell Top Slope

Note:
— = Photograph taken vertically from above.

PL-1. Southeast Perimeter Fence with Flagging

PL-2. Site Marker SMK-2

PL-3. Well 0716 Overgrown with Vegetation and Nearby Spoil Pile

PL-4. Cracked Base of Well 0709

PL-5. Vegetation on Disposal Cell Top Slope

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