

## 6.0 Grand Junction, Colorado, Disposal Site

### 6.1 Compliance Summary

The Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on March 23, 2011. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. A portion of the disposal cell remains open and is operated by the U.S. Department of Energy (DOE) to receive additional low-level radioactive waste materials from various sources. The annual inspection requirement applies only to the closed and completed portion of the disposal cell and the surrounding site.

Groundwater monitoring was performed as a best management practice. No maintenance needs were identified. No cause for a follow-up inspection was identified.

### 6.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado* (DOE/AL/62350-243, Rev. 1, DOE, April 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 6-1 lists these requirements.

Table 6-1. License Requirements for the Grand Junction Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 6.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 6.3.2
Routine Maintenance and Repairs	Sections 2.7.3 and 4.0	Section 6.3.3
Groundwater Monitoring	Section 2.6	Section 6.3.4
Corrective Action	Section 5.0	Section 6.3.5

**Institutional Controls**—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 access road.

The United States of America owns the 360-acre site. DOE will operate the site until final closure. Only closed and completed parts of the disposal cell and the area surrounding the site are addressed during the annual inspection. Approximately 21 acres in the center of the disposal cell are active to receive residual radioactive material and other authorized radioactive waste. The active area, the temporary structures associated with its operation, and the temporary contaminated material stockpile areas are not part of the annual inspection except as they may affect the long-term safety and performance of the closed portion of the disposal cell.

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

## 6.3 Compliance Review

### 6.3.1 Annual Inspection and Report

The site, south of Grand Junction, Colorado, was inspected on March 23, 2011. The results of the inspection are described below. Figure 6–1 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.

Weekly environmental and security inspections of the entire site are performed to verify that the site is secure, and radon is monitored continuously to ensure that the open portion of the cell protects human health and the environment. This portion of the disposal cell is scheduled to remain open until 2023, or until filled to its design capacity, at which time it will be closed in accordance with design criteria. Once the U.S. Nuclear Regulatory Commission (NRC) concurs on the final closure of the open portion of the cell and the final version of the LTSP, the site will be accepted under the NRC general license (10 CFR 40.27). DOE will then become the licensee and, in accordance with the requirements for UMTRCA Title I sites, be responsible for the custody and long-term care of the site. The open and active portion of the disposal cell within the closed but unlicensed portion of the disposal cell makes the site unique among the 19 UMTRCA Title I disposal sites.

#### 6.3.1.1 Specific Site-Surveillance Features

**Site Access Gate, Access Road, Entrance Gate, and Fence**—A double swing stock gate, at the U.S. Highway 50 right-of-way fence, and a double swing chain-link gate, 1.7 miles east at the site entrance, control access to the site. The DOE locks, chains, and gates were in excellent condition.

A paved all-weather access road extends approximately 1.7 miles east from U.S. Highway 50 along DOE’s perpetual right-of-way across federal land administered by the U.S. Bureau of Land Management (BLM). No erosion problems were observed along the access road.

A standard four-strand barbed-wire stock fence runs along the access road right-of-way corridor and also surrounds the disposal area. The fence is secure and remains in good condition.

**Entrance and Perimeter Signs**—An entrance sign is at the entrance gate, and 29 perimeter signs are at regular intervals along the DOE property boundary. The signs are installed on galvanized steel posts set in concrete. All of the signs were in excellent condition.

Additional warning signs are posted on the wire perimeter fence and are associated with the operation of the open cell. Metal controlled-area signs and yellow plastic no-trespassing signs are secured to the fence in pairs. There are 75 warning signs, each about 200 feet apart along the site boundary. All signs were present and legible.

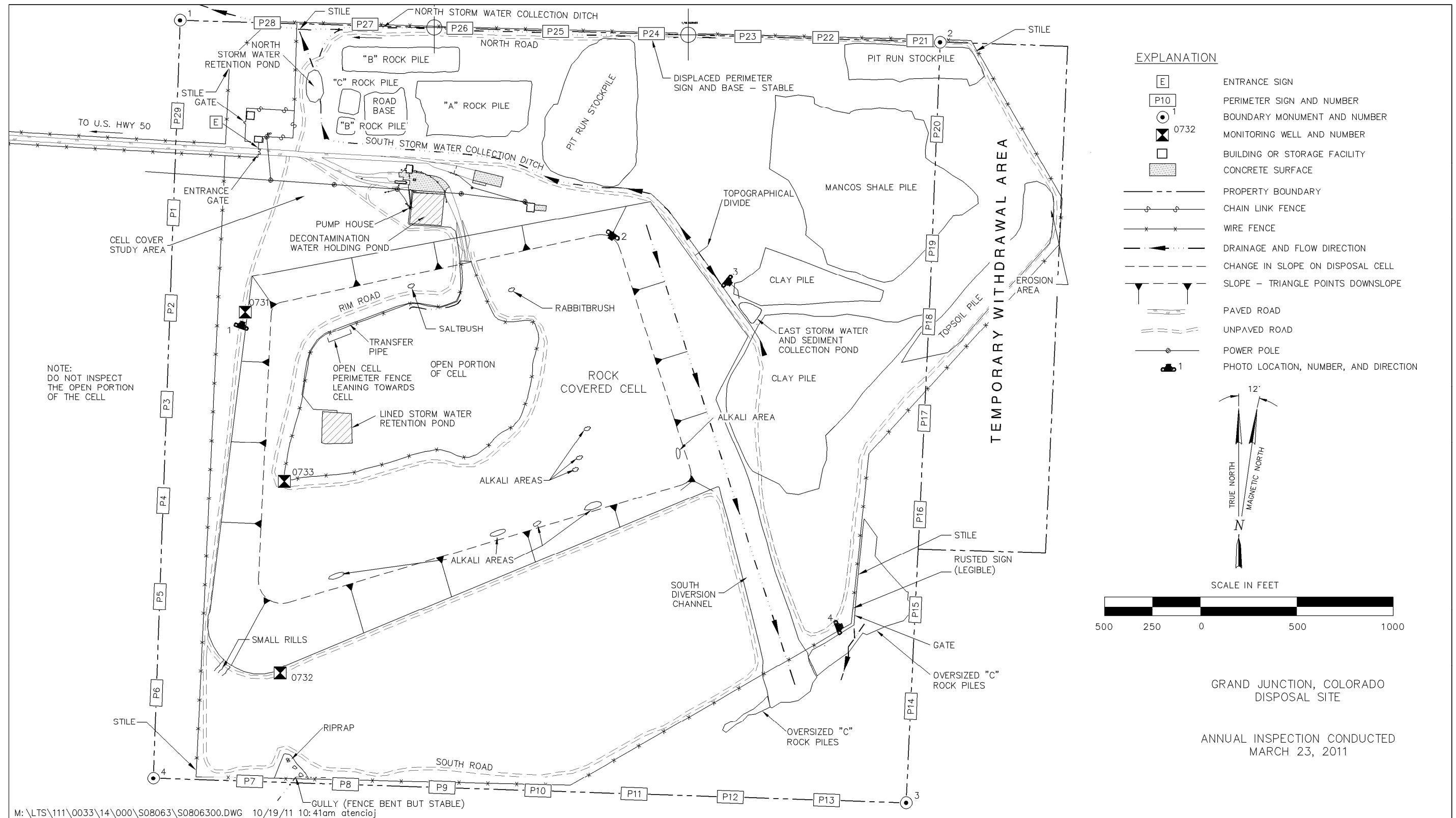


Figure 6-1. 2011 Annual Compliance Drawing for the Grand Junction Disposal Site

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**Site Markers and Monuments**—Granite site markers similar to those installed at other sites will not be installed at this site until the disposal cell is closed.

The site has four permanent boundary monuments, one at each of the four corners. The monuments mark the exact location of the site corners. All of the boundary monuments were in excellent condition.

**Monitoring Wells**—The groundwater monitoring network consists of three monitoring wells. All three are inside the site boundary. The wells were secure and in excellent condition (PL-1).

### **6.3.1.2** *Transects*

To ensure a thorough and efficient inspection, inspectors divided the site into five areas called “transects”: (1) the closed portion of the disposal cell, (2) the diversion structures and drainage channels, (3) the area between the disposal cell and the site boundary, (4) the site perimeter, and (5) 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, slumping, or other phenomena that might affect the site’s integrity or long-term performance.

**Closed Portion of the Disposal Cell**—Basalt riprap covers the top and side slopes of the disposal cell. The rock is durable and in excellent condition. There is no evidence of slope instability. The cover was in excellent condition with no evidence of settling or erosion (PL-2).

Some large basalt boulders in the apron at the toe of the southwest corner of the disposal cell have shifted, and minor erosion had recently occurred on the site road at that location. It is assumed that these conditions are attributable to freeze-thaw actions and runoff from melting snow and ice. The disposal cell side slope at this location is stable, and there is no concern regarding the integrity or function of the disposal cell.

Grasses and weeds grow on most of the cell cover, and scattered deep-rooted vegetation (primarily shrubs) has persisted on the cover. The grasses and weeds have shallow root systems and do not degrade cell cover performance. Historically, deep-rooted shrubs have been considered to pose a potential threat to the long-term integrity of the radon barrier and were periodically removed or treated with herbicide. However, recent studies by DOE and the U.S. Environmental Protection Agency (EPA) have indicated that evapotranspiration cover designs perform significantly better than the conventional rock-covered compacted soil layer designs (as used at this site) in terms of limiting permeability and the percolation of moisture into the cells. Therefore, as part of DOE’s Renovated Evapotranspiration Cover Assessment Project, a test facility consisting of two lysimeters was constructed at the site in 2007 to compare the performance of the existing cover design with a renovated evapotranspiration design. DOE will use the results from this study to make long-term surveillance and maintenance decisions at this and similar sites.

**Diversion Structures and Drainage Channels**—The south diversion channel is a large riprap-armored structure that conveys runoff from the disposal cell southeast into a natural drainage that

flows away from the site to the southwest. The diversion channel is in excellent condition. Some plant growth, including grasses, weeds, and deep-rooted shrubs, exists within the channel. However, there is not enough growth to impede water flow within the channel. Erosional features at the outfall of the channel are self-armoring with large basalt boulders and are stable.

Other drainage features at the site include north and south storm water collection ditches, the north storm water retention pond, and a storm water and sediment collection pond on the east side of the south diversion channel (PL-3). These small drainage features control storm water runoff primarily from the various cover materials stockpiled on the northern and eastern portions of the disposal site property. The north storm water collection ditch also captures storm water run-on from a large catchment area north and east of the disposal site. The ditches and ponds are functioning as designed.

**Area Between the Disposal Cell and the Site Boundary**—There are 12 discrete stockpiles of rock and soil between the disposal cell and the site boundary on the north and east sides of the disposal cell. These materials eventually will be used to cover and close the open cell. Natural vegetation is generally well established and is protecting the stockpiles from significant erosion.

On the south and west sides of the site, between the disposal cell and the perimeter fence, the ground is relatively flat and covered with native vegetation that consists primarily of perennial grasses and small shrubs. No erosion was observed in the undisturbed areas south and west of the disposal cell.

**Site Perimeter**—A location of active erosion near the southeast corner of the perimeter fence was repaired in 2009. The area was regraded, basalt boulders were installed to reduce erosion, and a drainage ditch to redirect runoff was constructed. No new erosion was apparent (PL-4). A gully is present along the south perimeter fence (near perimeter sign P8) on the fringe of a riprap-armored drainage area. It does not appear to be actively eroding at this time. At some point, the gully may erode beneath one or more of the line posts; however, the fence and posts were taut and stable at the time of the inspection.

**Outlying Area**—The area outward from the site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect the site was observed. Most of the land surrounding the site is rangeland administered by BLM. The land is covered by native grass and shrubs, and is used primarily for cattle grazing.

Directly east of the site, just beyond the site boundary, there is a 40-acre temporary withdrawal area of federal land administered by BLM. The temporary withdrawal area is not included in the interim LTSP and, therefore, is not formally inspected. DOE uses the temporary withdrawal area to stockpile cover materials for the eventual closure of the open portion of the cell.

### **6.3.2 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.

### 6.3.3 Routine Maintenance and Repairs

No routine maintenance or repairs were required in 2011.

### 6.3.4 Groundwater Monitoring

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Because narrative supplemental standards apply (40 CFR Part 192.21 [g]), groundwater in the uppermost aquifer (Dakota Sandstone) beneath the site need not be monitored. The basis for supplemental standards is that the groundwater is designated “limited use” because the total dissolved solids (TDS) content exceeds 10,000 milligrams per liter (mg/L) (40 CFR Part 192.11 [e]). Confined groundwater in the uppermost aquifer lies approximately 750 feet below the existing ground surface and is hydrogeologically isolated from the tailings material by mudstones and shales of the Mancos Shale.

In lieu of monitoring groundwater in the uppermost aquifer, DOE voluntarily monitors groundwater as a best management practice from two monitoring wells completed in (or very near) buried alluvial paleochannels adjacent to the disposal cell (0731 and 0732) and one monitoring well in the disposal cell (0733) (Table 6–2). This best-management-practice monitoring is done to assess the disposal cell’s performance and to ensure that seepage (transient drainage) from the disposal cell is not impacting any groundwater in the paleochannels. The paleochannel wells are along the west (downgradient) edge of the disposal cell and are screened at the interface between the alluvium and shallow Mancos Shale. The third well is in the southwest corner of the open portion of the disposal cell and is used primarily for the measurement of water levels in the deepest part of the disposal cell to demonstrate that the groundwater elevation directly beneath the cell has not risen enough to move laterally into the paleochannels.

Table 6–2. Groundwater Monitoring Network at the Grand Junction Disposal Site

Monitoring Well	Hydrologic Relationship
0731	Paleochannel, downgradient, edge of cell, north side
0732	Paleochannel, downgradient, edge of cell, south side
0733	Disposal cell, deepest location, downgradient, center

**Groundwater-Level Monitoring**—Static water-level measurements are obtained from each well before water quality samples are collected (Figure 6–2). In September 2006, a datalogger was installed in each well to obtain continuous water-level measurements (at a 4-hour interval).

Since 1998, the water level in disposal cell well 0733 has risen approximately 2.9 feet and has remained significantly lower than the water levels in the two paleochannels wells (0731 and 0732) (Figure 6–2). Water levels within the two paleochannels wells are approximately equal to 1998 levels. The trends for wells 0731 and 0732 have been slightly decreasing, with level fluctuations that range from 2 to 5 feet. Given these elevations, groundwater at the base of the disposal cell at well 0733 has no potential to migrate to the paleochannels at wells 0731 and 0732.

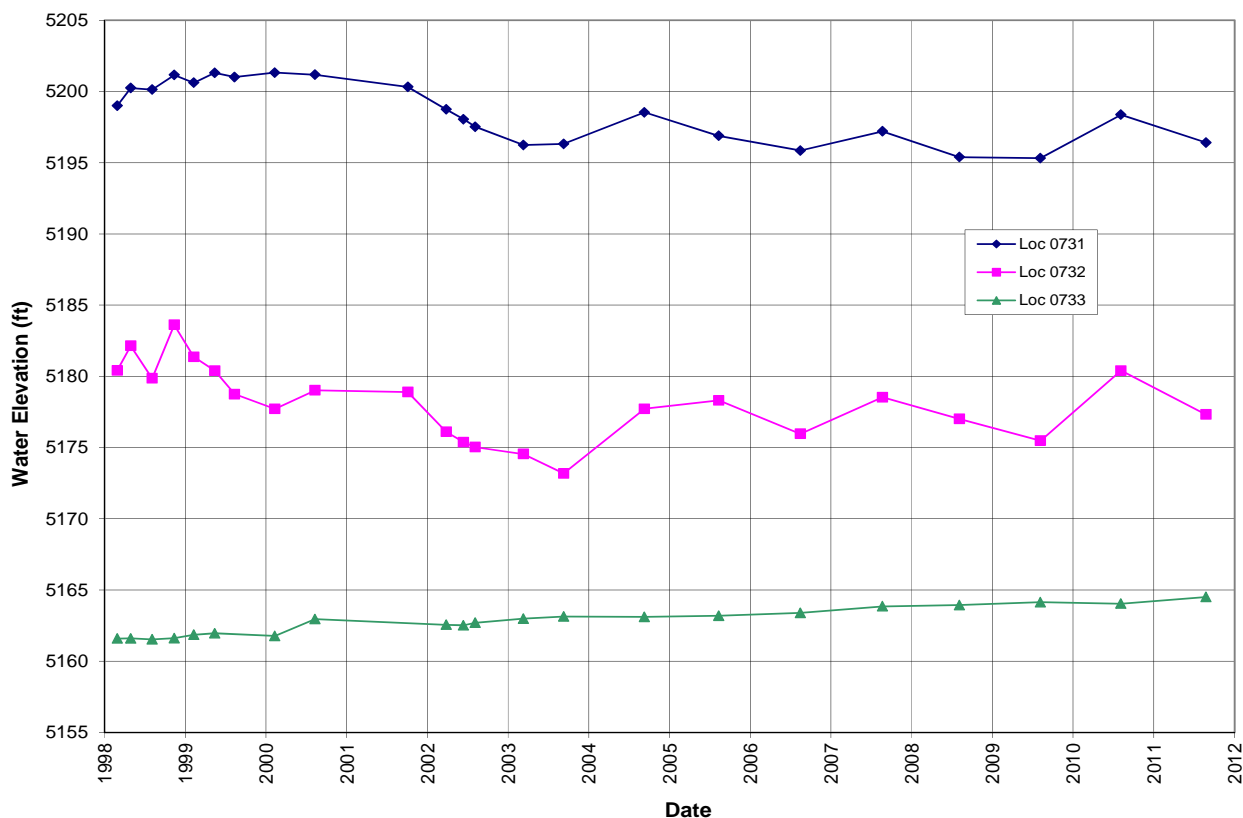


Figure 6–2. Water-Level Measurements at the Grand Junction Disposal Site

**Groundwater Quality Monitoring**—Groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, selenium, sulfate, TDS, uranium, vanadium, and polychlorinated biphenyls. Key indicator analytes are molybdenum, nitrate, selenium, and uranium. At 40 CFR 192, Subpart A, Table 1, EPA has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6–3). Time-concentration plots, from 1998 through 2011, for three key indicator analytes—nitrate (as nitrogen), selenium, and uranium—are shown on Figures 6–3 through 6–5.

Table 6–3. Maximum Concentration Limits for Groundwater at the Grand Junction Disposal Site

Constituent	MCL <sup>a</sup> (mg/L)
Molybdenum	0.1
Nitrate (as Nitrogen)	10
Selenium	0.01
Uranium	0.044

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

Nitrate (as nitrogen) concentrations in groundwater continued to exceed the MCL of 10 mg/L in the paleochannel monitoring wells (0731 and 0732) through 2011 (Figure 6–3). Concentrations

in well 0731, following an initial steep downward trend, remained below the MCL from 2000 through 2004. In 2005 and continuing through 2011, concentrations steadily increased and remain above the MCL. Concentrations in well 0732, though varied, have consistently remained above the MCL since 1998. Concentrations in well 0733 continued a significant downward trend, dropping below the MCL in 2006, and reaching a low of 3.4 mg/L in 2011. Historically, the highest concentration of nitrate (96 mg/L) occurred in 1998 from disposal cell well 0733. In 2011, the concentration of nitrate has increased slightly, and the nitrate levels in both paleochannel monitoring wells are very similar: 31 mg/L in well 0731 and 32 mg/L in well 0732.

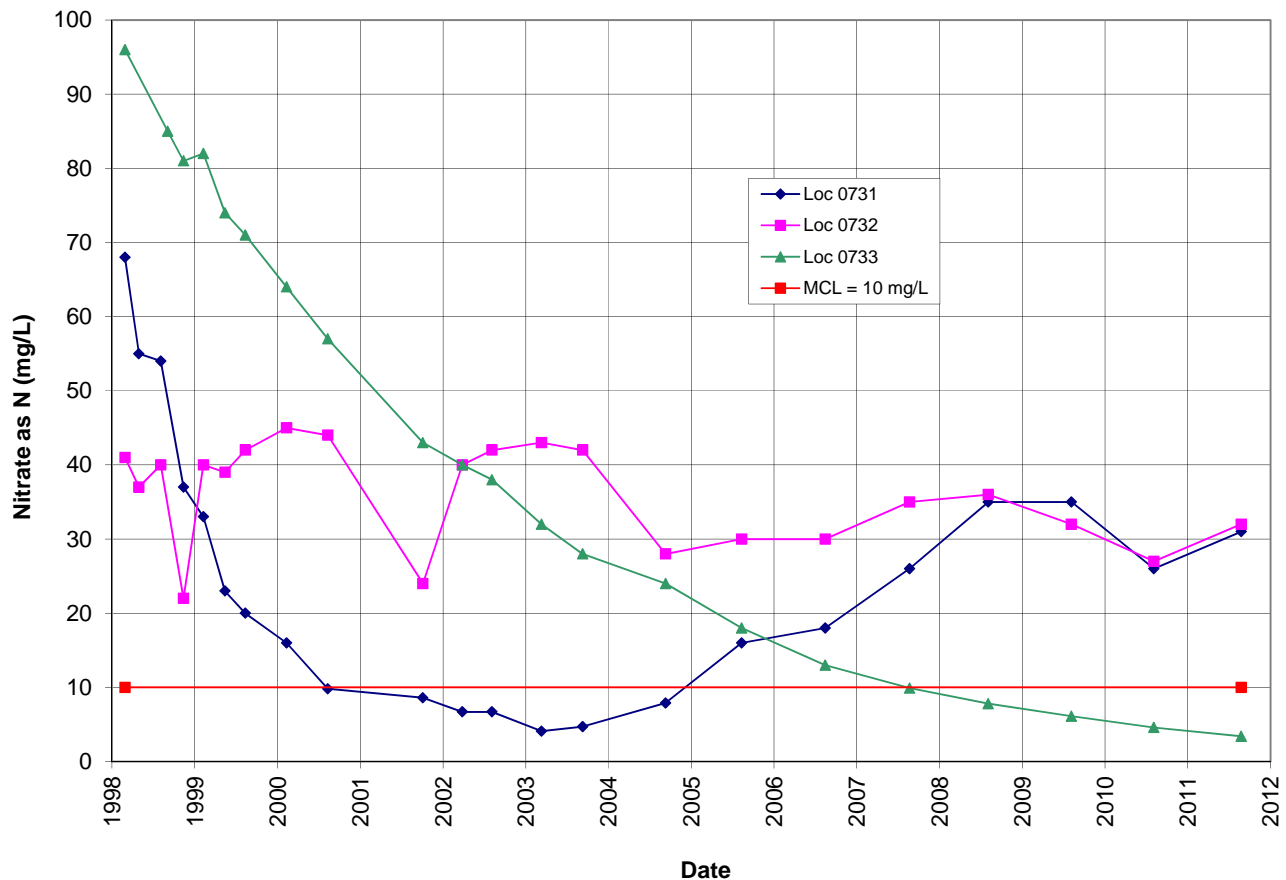


Figure 6–3. Time-Concentration Plots of Nitrate (as Nitrogen) in Groundwater at the Grand Junction Disposal Site

Selenium occurs naturally in the Mancos Shale deposits that underlie the disposal cell, and may be the cause of the elevated concentrations reported in both paleochannel monitoring wells (0731 and 0732). Selenium concentrations continued to exceed the MCL of 0.01 mg/L in the paleochannel wells (Figure 6–4). Concentrations in well 0731 displayed a sharp decreasing trend, and the decreasing trend continued until 2003, when a slight upward trend began. Selenium concentrations in well 0731 have decreased since 2009. Concentrations in well 0732 continue to display no trend. In well 0733, the selenium concentration of 0.0038 mg/L remained well below the standard, with no trend evident.

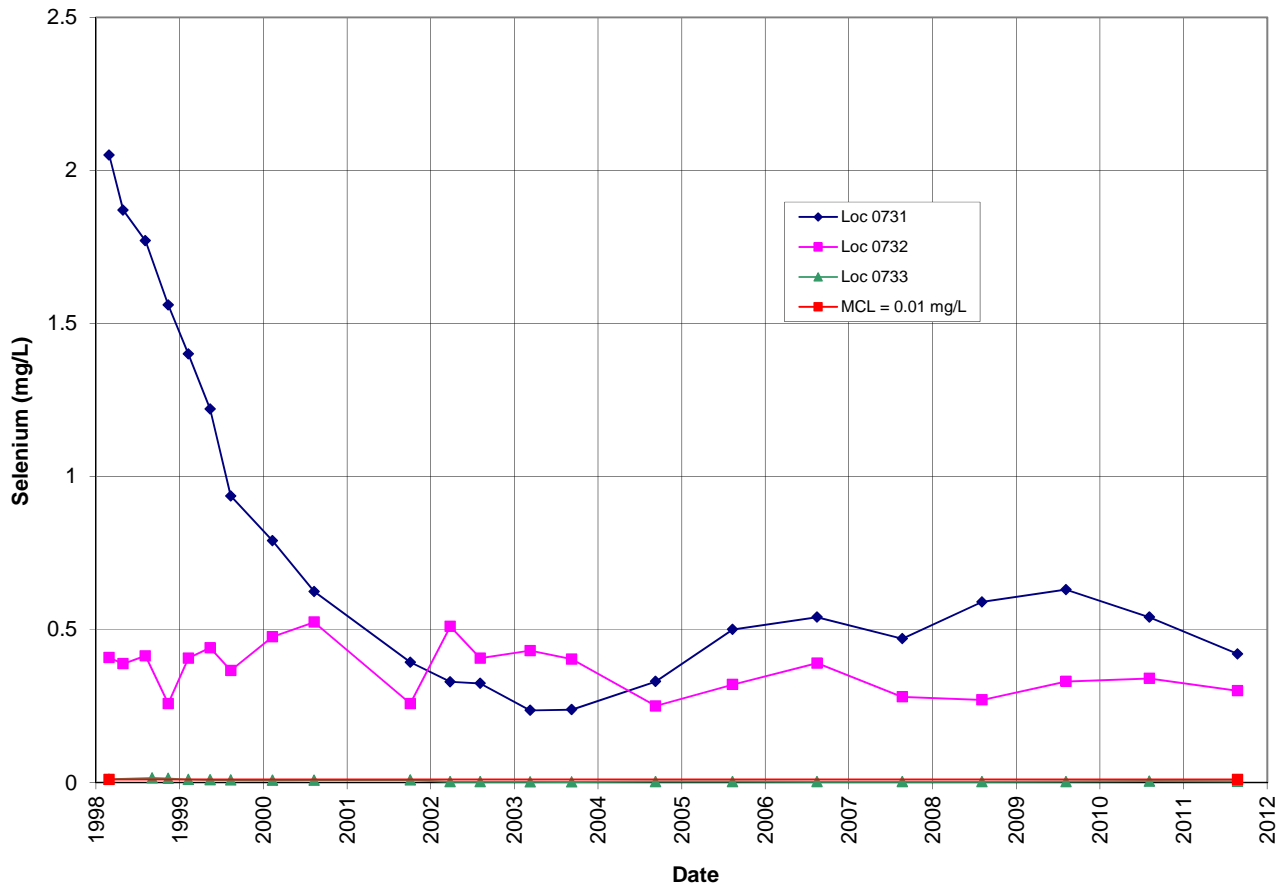


Figure 6-4. Time-Concentration Plots of Selenium in Groundwater at the Grand Junction Disposal Site

Uranium concentrations in groundwater were below the MCL of 0.044 mg/L in paleochannel wells 0731 and 0732, and were above the MCL in well 0733 (Figure 6-5). Concentrations in well 0731, after an initial increase above the MCL, have displayed a decreasing trend that continued in 2011. Concentrations in well 0732 have remained relatively consistent. Concentrations in well 0733 remained relatively consistent through 2003, at which time an upward trend began, which has leveled off at 0.11 mg/L for the 2010 and 2011 sampling events.

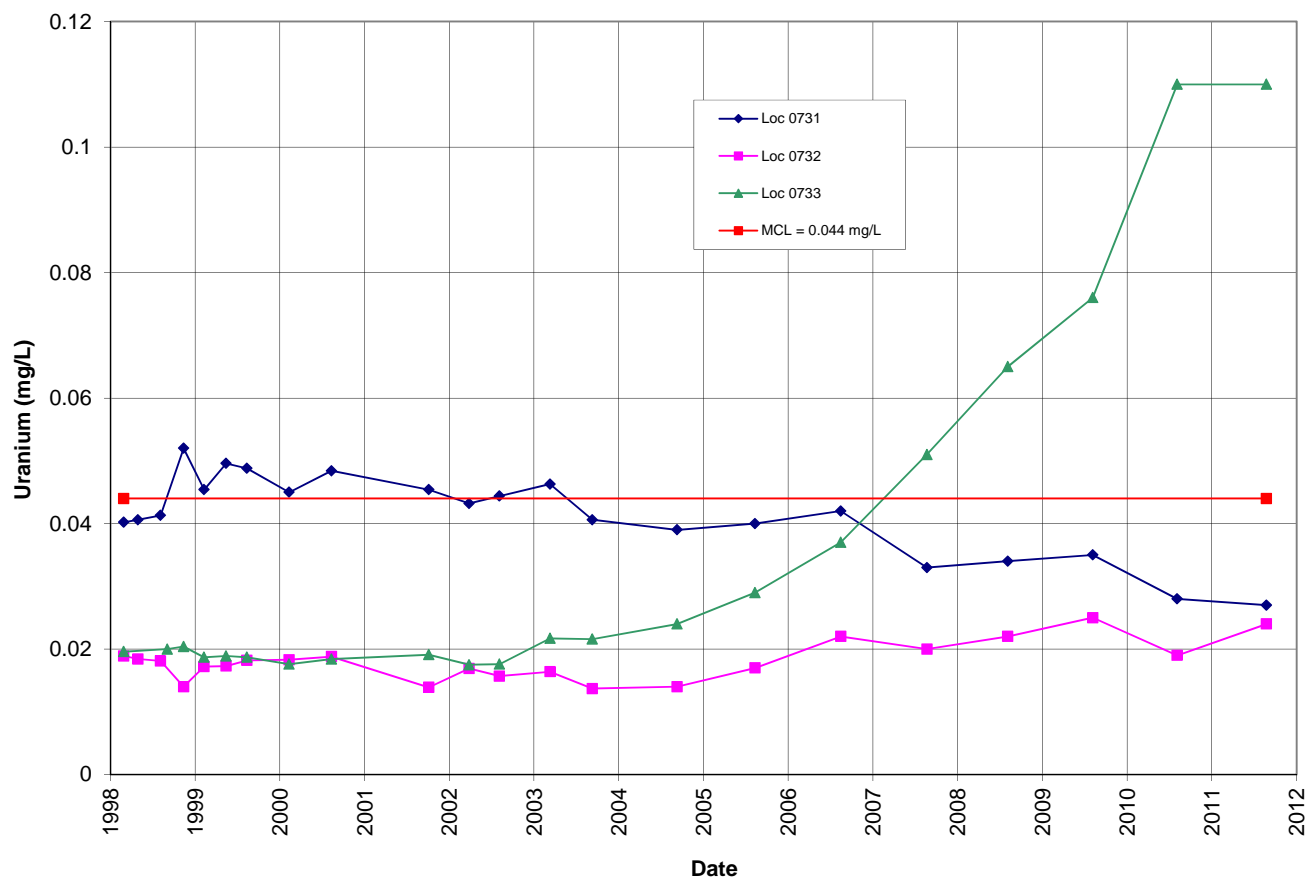


Figure 6-5. Time-Concentration Plots of Uranium in Groundwater at the Grand Junction Disposal Site

### 6.3.5 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.

### 6.3.6 Photographs

Table 6-4. Photographs Taken at the Grand Junction Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL-1	20	Monitoring well 0731 near the northwest corner of the disposal cell.
PL-2	215	Northeast corner of the disposal cell cover.
PL-3	130	East storm water and sediment collection pond.
PL-4	70	Riprap erosion protection near the southeast corner of the perimeter fence.



*GRJ 3/2011. PL-1. Monitoring well 0731 near the northwest corner of the disposal cell.*



*GRJ 3/2011. PL-2. Northeast corner of the disposal cell cover.*



*GRJ 3/2011. PL-3. East storm water and sediment collection pond.*



*GRJ 3/2011. PL-4. Riprap erosion protection near the southeast corner of the perimeter fence.*

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