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 6, 2008. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. Erosion repair of the interceptor trench, undertaken in fall 2005, continues to perform as designed—no new erosion was observed. Pore water continues to be removed from the disposal the cell to maintain the water level below the action level. Monitoring indicated the pore water level remained below the action level except for a brief period in May before pumping resumed in early June. The third-year survey of the standpipes and nine settlement plates conducted in December 2007 continues to indicate negligible movement in the disposal cell cover. 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 Rifle Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Estes Gulch Disposal Site near Rifle, Colorado* (DOE/AL/62350–235, Rev. 1, U.S. Department of Energy [DOE], Albuquerque Operations Office, November 1997) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 14–1.

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 14.3.5

Institutional Controls— The 205-acre disposal 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, access control fencing, warning/no-trespassing signs placed 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. 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 6, 2008. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 14–1. 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, Colorado, for 5 miles on State Highway 13 and turning northeast on an improved gravel road. 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 a second tubular metal gate at the site perimeter limiting 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. This fence had previously been broken or loose in several places and was repaired in 2007; no new fence breaks were noted during the 2008 inspection. No evidence of cattle or sheep grazing inside the site boundary was noted. However, signs of deer and elk grazing in the revegetated areas adjacent to and inside the disposal cell site boundary were common. No evidence of trespassing was noted.

One entrance sign and 26 perimeter signs were placed at the site. Perimeter sign P9, located just east of the entrance sign, has been missing for several years and will not be replaced. All remaining signs are legible and in good condition.

Markers and Monuments—Two granite site markers, one just inside and left of the entrance gate (SMK–1) (PL–1) and the other on the disposal cell (SMK–2), were undisturbed and 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 downfall 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 sideslope of the disposal cell and were in good condition. These standpipes were installed during construction to monitor water levels in the toe of the cell. Dataloggers with remote data transfer systems (i.e., telemetry) were installed in MW–02 and MW–03 to measure water-level

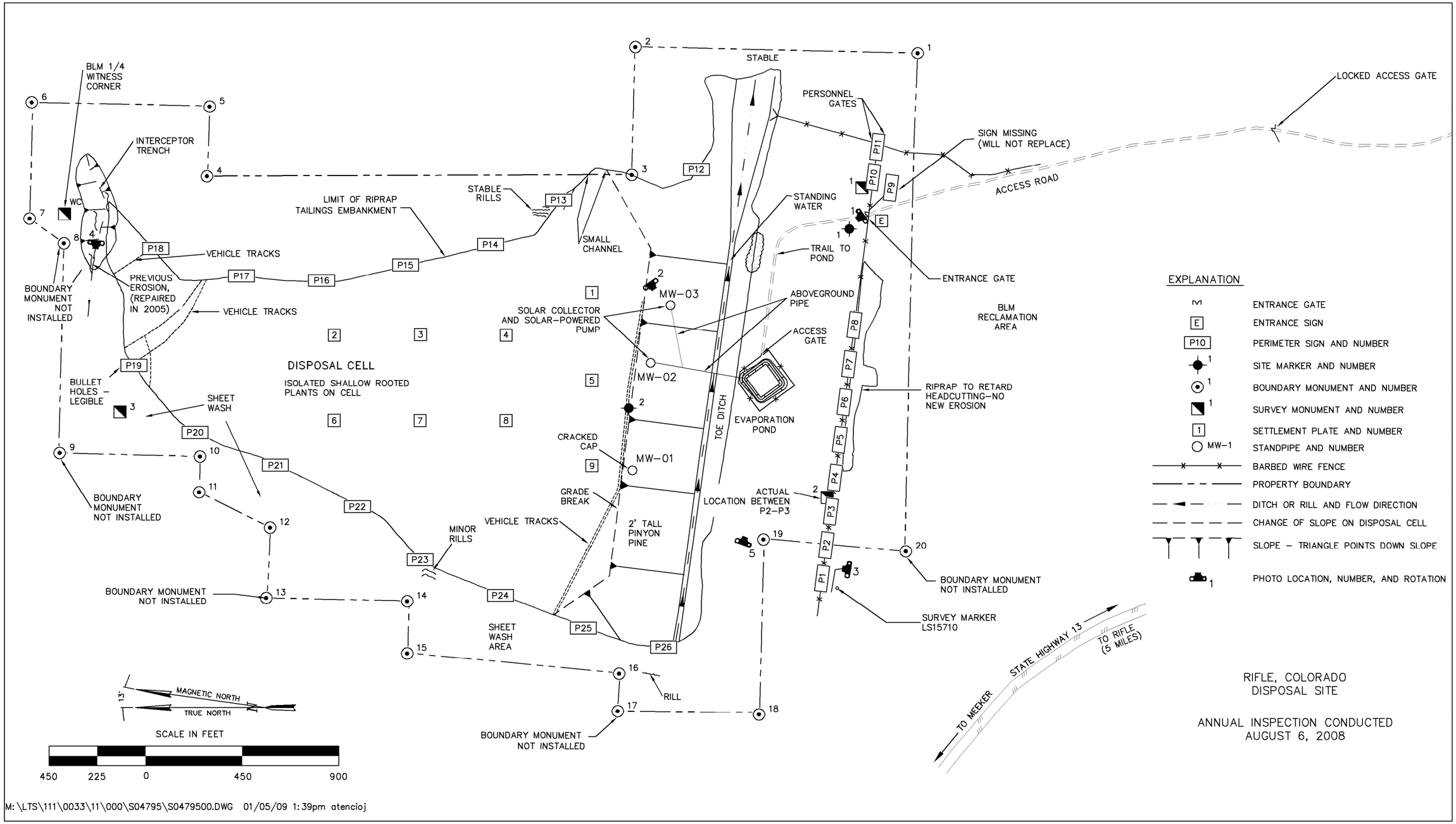

Figure 14–1. 2008 Annual Compliance Drawing for the Rifle Disposal Site

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fluctuations. Standpipes MW–02 and MW–03 have solar-powered pumps installed in them so that water may be removed and discharged to a lined evaporation pond directly south of the cell (PL–2). 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, and usually it is dry. Pumping at MW–02 was discontinued in September 2006 due to consistent lack of sufficient recharge; however, the pump and datalogger remain installed. Since that time, only standpipe MW–03 has been pumped; corresponding water level data are presented in Section 14.3.5.

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 lined pond, surrounding security fence, and locked gate were in excellent condition. The small-diameter plastic above ground water line to the pond was also in good condition. The evaporation pond continues to function as designed because water in the pond is evaporating as fast, or faster, than influent arrives**.**

14.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into four transects: (1) the top of the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) onsite 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.

Disposal Cell and Interceptor Trench—Rock armor covers the 71-acre disposal cell, which was in excellent condition at the time of the inspection (PL–3). No evidence of subsidence, differential settling, or slumping was found. During the 2008 inspection, only small, isolated patches of annual weeds or annual grasses were found on the cell top.

In 2005, it was noted that standpipes MW–02 and MW–03 were not vertical and were tilting slightly downhill. Therefore, surveys of the standpipe inclinations and lateral locations were initiated in December 2005. Surveys were also conducted for nine settlement plates that were installed on the disposal cell during construction (the prior survey was performed in 1997). Results of surveys conducted in 2005 and 2006 indicate that the stickup sections of the standpipes (about 36 inches) were inclined as much as 5 degrees downhill. No record of the
14A original inclination of the standpipes was found, and they may not have been vertical when installed. Neither standpipes nor settlement plates have moved laterally since they were installed in 1996; however, minor settling of the settlement plates (up to 0.46 foot) was indicated. This amount of settlement is not unexpected, and the lack of lateral movement suggests that the cell has been stable for the past 10 years. The most recent survey, conducted in fall 2007, did not indicate any further movement of the settlement plates beyond the survey error of 0.01 foot. However, the slight tilting first observed in 2005 was still evident. The standpipes still appear to be tilting downhill, but surveys indicate they are shifting slightly in differing directions around a vertical axis over the past 3 years, which may be a result of survey error. Surveys of these features will continue annually for the next several years.

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 interceptor trench were performed in November 2005. Rocks were moved into the eroded channel, and the erosion was stabilized. No new erosion was evident in this area at the time of the 2008 inspection (PL–4). Monitoring of this trench will continue.

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. A single tamarisk plant found in the toe ditch this year was pulled out by its roots. Tumbleweeds have collected in the southeastern end of the toe ditch. They will be monitored next year to determine the need for removal.

Minor erosion, anticipated in the design, has occurred at the toe ditch outlet. Bedrock is now exposed in this area. Rock previously placed in the outlet to stabilize the erosion is dropping into the eroded area (self-armoring). Although no new erosion was observed in the ditch outlet in 2008, monitoring of this area will continue.

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, primarily grasses, is composed of desirable grasses and some undesirable cheatgrass and annual weeds. Over time, the number of undesirable species has steadily decreased. Although the vegetation was drought-stressed in 2006 and 2007, conditions in 2008 were not as dry, and the vegetation in these reclaimed areas was healthy and robust (PL–5). No evidence of cattle grazing within the site boundaries during the past year was observed. No noxious weeds were found in the onsite reclaimed areas during the 2008 inspection.

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 area will continue to be monitored.

Rills noted during previous inspections in the vicinity of perimeter sign P13 were still stable in 2008. The small channel scoured along the interface between the riprap and the adjacent reclaimed soil area remains unchanged. This feature is not threatening the integrity of the disposal cell at this time; however, continued observation is warranted.

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 revegetated area directly south of the disposal cell on BLM-managed land was inspected. During the construction of the cell, DOE was granted a Right-of-Way Reservation Permit by the BLM to use this area for topsoil storage and other purposes. Because this area did not successfully revegetate, it was reseeded in 2000 and again in 2005. Despite these reseeding

efforts, due to two consecutive drought years in 2006 and 2007, cheatgrass has once again reestablished itself as the dominant plant species in the 16-acre BLM reclamation area. At the time of the 2008 inspection, cheatgrass and annual weeds dominated the area. Therefore, this area was treated with an herbicide that targets cheatgrass in October 2008. Inspectors will continue to monitor this area to evaluate the reclamation effort.

14.3.2 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 2008.

14.3.3 Routine Maintenance and Repairs

In 2008, a second pump was placed in standpipe MW–03 to increase the flow rate, a tamarisk plant was removed from the toe ditch, and cheatgrass was treated with herbicide.

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. Nine monitor wells that had been at the site were decommissioned in 2002.

14.3.5 Disposal Cell Pore Water Monitoring

14B **Disposal Cell Pore Water-Level Monitoring**—In accordance with the LTSP, DOE continues to monitor pore water levels in the disposal cell at standpipes MW−02 and MW−03 (PL–2), installed at the downgradient end of the cell on the south side slope. This monitoring is performed to ensure that water within the disposal cell does not rise above the low-permeability liner that inhibits saturation of the embankment, which would occur at an elevation of 6,020 feet (ft). Wet tailings were included with the materials disposed of within the cell. During construction, tailings material at the toe of the disposal cell was placed against a berm or earthen embankment at the southern (downslope) end of the cell. Because of concern that transient drainage and surface infiltration might cause a seep to develop on the surface of the cell, the design called for a liner to be installed that extends part way up on the inside of the embankment to an elevation of 6,020 ft. If water within the disposal cell were to rise above this elevation, it would overflow the liner and saturate the embankment. This condition could weaken the downslope end of the cell sufficiently to allow slumping to occur, and it could also cause a contaminated seep to emerge on the south slope of the cell. Therefore, an action level elevation of 6,016 ft was established in the LTSP for pumping the pore water within the cell. Water-level monitoring is performed to ensure that pumping occurs when pore water levels reach the action level.

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 2006. In September 2006, pumping at MW–02 was discontinued due to a consistent lack of sufficient recharge; however, 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.

At the time of the 2008 inspection, telemetry from the site indicated that MW–03 was pumping at about 2.5 gallons per minute (as compared with. 4 gallons per minute recorded in 2007). On
14C August 14, a week after the inspection, a second pump was placed in MW–03 to increase the flow rate. The rate increased only by about 1 gallon per minute, probably because the power supplied by the solar collector limited production. It was noted that the solar collector for MW–03 was tracking the position of the sun for optimal performance.

Datalogger information indicates that the water level in MW–03 increased from 6,013 feet to 6,015 feet within several days of shutting off the pumps in November 2007. Water levels continued to rise slowly, approaching the action level of 6,016 feet over the winter (Figure 14–2). On May 21 and 22, 2008, the action level was reached; recorded measurements ranged from 6,016.01 to 6,016.05 feet. Water levels then decreased back below the action level before pumping of MW–03 resumed in early June 2008. A similar response has been observed in past years during the winter shutdown. Shortly after pumping resumed, the water level decreased to slightly below 6,015 feet. Water levels remained below the action level for the remainder of 2008. Water levels continued to decrease in both standpipes to about 6,014.5 feet as pumping continued during the summer of 2008. About 145,000 gallons of water were produced during the 2008 season.

To date, approximately 4.35 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. The recovery of the water levels in the standpipes to approximately 6,015 ft after pumping is discontinued, and the even slower recovery afterward toward the 6,016-foot action level over the next 6 months, suggests that a large reservoir of water remains in the disposal cell.

Disposal Cell Pore Water and Evaporation Pond Water Quality Monitoring—Another possible explanation for the sustained water level in the toe of the disposal cell is infiltration of rainwater through the cover. To test this, monitoring of effluent from standpipes MW–02 and MW–03 for selected metal contaminants of concern—arsenic, molybdenum, selenium, uranium, and vanadium—began in 2005. The hypothesis was that if the concentrations of metals in the toe of the disposal cell decreased over time, this might suggest that clean meteoric water was diluting the residual connate pore water. Results collected to date are still preliminary and inconclusive; no trends in contaminant levels are apparent. Although concentrations appear to be decreasing overall, no definitive conclusions can be drawn at this time.

Water was also collected from the evaporation pond in July 2008 and analyzed for the same metals as the effluent from standpipes MW–02 and MW–03 to determine if contaminants were becoming concentrated in the pond water (as this could carry ecological risks). As was the case

with the effluent monitoring results, no consistent pattern is evident or was there any apparent relationship with effluent concentrations. For example, for some constituents, concentrations in the pond were approximately three times greater than those measured in the effluent, whereas others exhibited the opposite relationship. Because the pond fills with snow during the winter when pumping ceases, and with rainwater during precipitation events when pumping is occurring, constituents may not be concentrating as much as anticipated. Analyses of MW–03 effluent and evaporation pond water will continue in 2009. Sample collection times will be compared to precipitation events.

Per the LTSP requirement, DOE intends to remove enough water from the disposal cell to lower water levels in the standpipes to below the 6,014-foot elevation. At that time, pumping will be discontinued, and water levels will be monitored to ensure that they remain at or below that elevation. If water levels rise again, pumping will resume.

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 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 2008 and will continue in 2009.

14.3.7 Photographs

Table 14–2. Photographs Taken at the Rifle, Colorado, Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	325	Site marker SMK–1 and the south slope of the disposal cell.
PL–2	235	Solar cell at MW–03 and evaporation pond.
PL–3	10	View of the disposal cell.
PL–4	275	Armored gully at the base of the interceptor trench.
PL–5	100	Reseeded reclaimed area inside fence and south of the disposal cell.

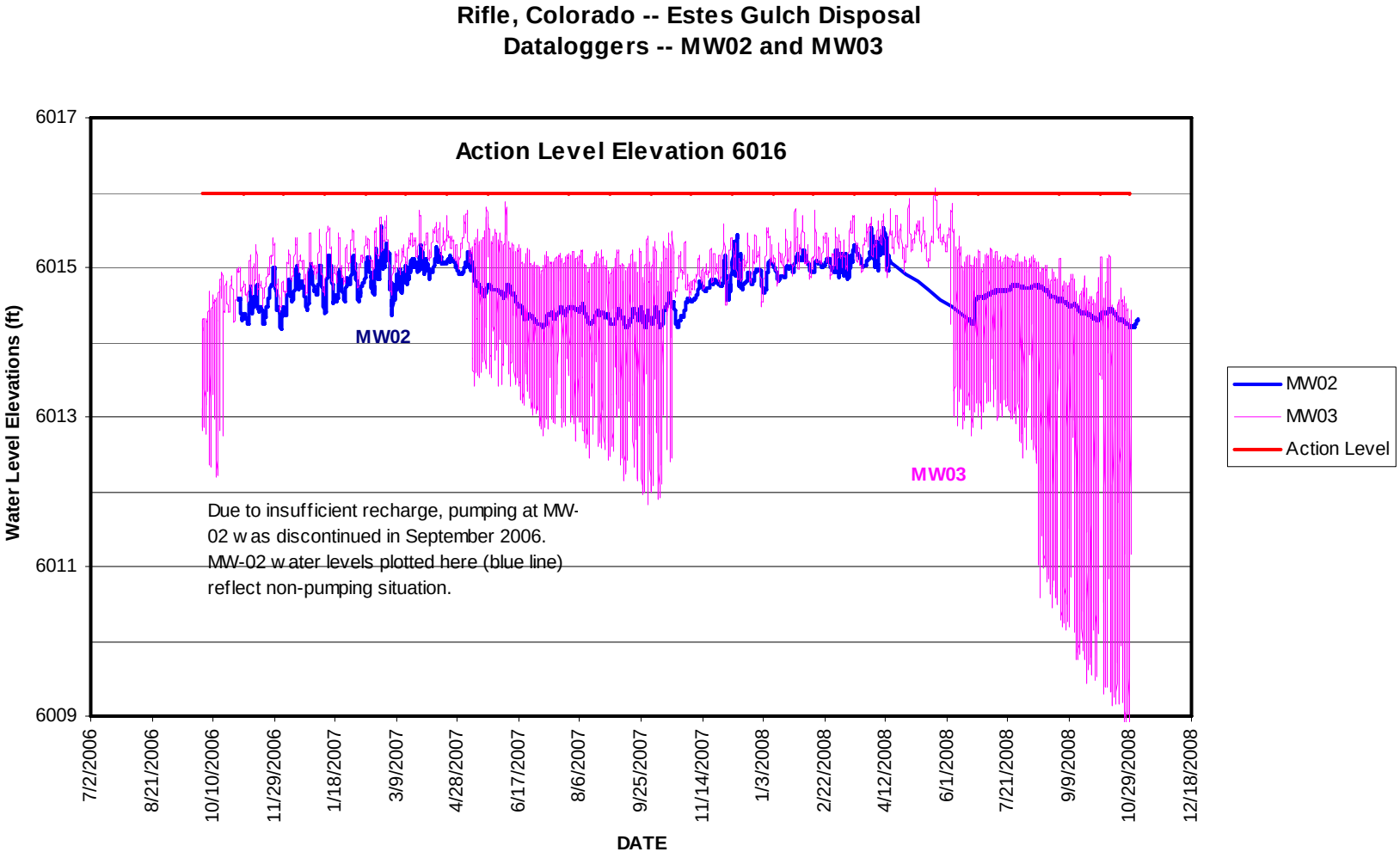

Figure 14–2. Disposal Cell Pore Water Levels in Standpipes MW–02 and MW−03 at the Rifle Disposal Site.

RFL 8/2008. PL–1. Site marker SMK–1 and the south slope of the disposal cell.

RFL 8/2008. PL–2. Solar cell at MW–03 and evaporation pond.

RFL 8/2008. PL–3. View of the disposal cell.

RFL 8/2008. PL–4. Armored gully at the base of the interceptor trench.

RFL 8/2008. PL–5. Reseeded reclaimed area inside fence and south of the disposal cell.

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