



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION IV
1600 E. LAMAR BLVD.
ARLINGTON, TX 76011-4511

August 12, 2015

MEMORANDUM TO: Docket File WM-00061

THROUGH: Ray L. Kellar, P.E., Chief **/RA/**
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

FROM: Robert J. Evans, Ph.D., Senior Health Physicist **/RA/**
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

SUBJECT: OBSERVATIONAL SITE VISIT AT GUNNISON DISPOSAL SITE

On July 1, 2015, an inspector from the U.S. Nuclear Regulatory Commission's (NRC) Region IV Office conducted an observational site visit at the U.S. Department of Energy's (DOE) Gunnison disposal site in Gunnison County, Colorado. This site visit was conducted in accordance with the guidance provided in the NRC's Memorandum dated April 17, 2012 (ADAMS accession number ML120930240). The purpose of the site visit was to observe DOE's routine, annual inspection of the Gunnison disposal site. Enclosed to this memorandum is the NRC's trip report for this site visit.

In summary, DOE conducted the annual inspection in accordance with the requirements specified in the NRC-accepted Long-Term Surveillance Plan dated April 1997 (ML15215A681). The disposal cell and associated drainage and diversion channel structures appeared to be in excellent condition. No significant regulatory issues or safety concerns were identified during the site visit.

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Enclosure:
NRC Trip Report

cc: J. Linard, Site Manager
DOE Office of Legacy Management
2597 Legacy Way
Grand Junction, CO 81503

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**U.S. NUCLEAR REGULATORY COMMISSION
REGION IV**

Docket: WM-00061

Report: WM-00061/15-001

Licensee: U.S. Department of Energy

Facility: Gunnison Disposal Site

Location: Gunnison County, Colorado

Date: July 1, 2015

Inspector: Robert J. Evans, Ph.D., C.H.P., P.E., Senior Health Physicist
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Approved by: Ray L. Kellar, P.E., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Attachment: Photographs Taken at the Gunnison Disposal Site

Enclosure

NRC Trip Report

1 Background

The Gunnison mill operated from 1958-1962. The mill was located approximately one-half mile southwest of the City of Gunnison, Colorado. The mill processed about 540,000 tons (350,000 cubic yards) of uranium ore. The radioactive mill tailings were stored adjacent to the mill. The tailings covered about 39 acres of the 61.5-acre property.

The U.S. Department of Energy (DOE) began constructing a permanent tailings disposal cell in 1992 at a site situated about six miles east of Gunnison. The disposal cell was constructed on land formerly controlled by the Bureau of Land Management. During 1993-1994, DOE removed uranium mill tailings, demolition debris, and contaminated soils from the mill site and placed the material into the disposal cell. The DOE also collected vicinity property material and placed this material into the cell. The DOE completed the construction of the disposal cell in 1995.

The Gunnison disposal cell currently occupies 29 acres of the 115-acre property. About 1.14 million tons (740,000 cubic yards) of material was placed in the cell. The total amount of radium-226 encapsulated in the cell was estimated to be 175 curies. The cell is pentagon-shaped and measures approximately 1,200 feet by 1,140 feet.

The cell was constructed partially below grade and rises to a maximum height of 50 feet above the ground surface. The 9-foot thick cover includes a radon barrier, bedding layer, frost protection layer, second bedding layer, and rip-rap erosion-protection layer. A rip-rap apron surrounds the perimeter of the disposal cell, to channel surface water runoff away from the cell. The DOE also installed a rock-lined, 1,800-foot intercept ditch at the upslope portion of the site to divert surface water flow away from the cell.

The Gunnison disposal cell is classified as a Title I site under the Uranium Mill Tailings Radiation Control Act of 1978. The DOE maintains long-term custody of the site under the U.S. Nuclear Regulatory Commission's (NRC's) general license requirements of 10 CFR 40.27. The Long-Term Surveillance Plan (LTSP) explains how DOE will fulfill the general license requirements specified in 10 CFR 40.27. The LTSP for the Gunnison disposal site was submitted to the NRC for review in 1996, and the final version was issued in April 1997 (ML15215A681). The NRC inspector could not locate a copy of the NRC's 1997 acceptance letter; thus, the date that the NRC accepted the LTSP was not clearly identified.

2 Site Status

The operation of the Gunnison mill resulted in the contamination of the shallow groundwater beneath the site. The DOE's records indicate that the primary radionuclide of concern in the groundwater is uranium, and a plume containing uranium extends up to 7,000 feet down-gradient of the site. The compliance strategy for groundwater remediation includes natural flushing with continued monitoring and institutional controls.

The DOE currently samples 28 monitoring wells, five domestic wells, and six surface water locations on an annual basis at the former mill site. (One domestic water well was removed from the list of wells to be sampled in 2011 because the residence was

connected to a municipal water source.) The most recent sampling event occurred in April-June 2014. The results of the groundwater sampling were presented to the NRC in the 2014 Verification Monitoring Report dated September 2014 (ML14342A086). The results indicate that manganese and uranium continue to be identified in certain monitoring wells in the alluvial (uppermost) aquifer.

The DOE submitted a revised Groundwater Compliance Action Plan (GCAP) to the NRC by letter dated April 20, 2010 (ML101200599). By email dated January 15, 2015 (ML15202A245), DOE requested to withdraw the GCAP. By letter dated February 4, 2015 (ML15037A049), DOE notified the NRC that the groundwater at the Gunnison mill site was not improving at the rate predicted by groundwater modeling. As a result, DOE began evaluating other options for remediation of the groundwater. The NRC responded by letter dated February 18, 2015 (ML15041A350), acknowledging receipt of DOE's letter and requesting that DOE keep the agency informed. In addition, the NRC reminded DOE that a revised GCAP will require NRC review and concurrence prior to implementation.

The groundwater protection monitoring plan at the Gunnison disposal site consists of sampling only. According to Section 2.6.1 of the LTSP, the monitoring well network includes six point-of-compliance wells and two background wells. According to the sampling schedule presented in Table 4.1, after 2006, the eight monitoring wells were to be sampled once every five years.

The most recent sampling event at the Gunnison disposal site occurred in May 2011. The results were presented in a data validation package dated August 2011 (ML11311A136). The sample results indicate that the uranium concentrations in the point-of-compliance wells remained below the action level, suggesting that the groundwater has not been contaminated by the disposal cell. The next sampling event is scheduled to occur in 2016. As noted in Section 4.1 of the LTSP, the DOE can adjust the sampling frequency based on the effectiveness of disposal cell performance, although a change in the sampling frequency will require the concurrence of the NRC.

Site features include 11 boundary monuments, three survey monuments, two site markers, 45 perimeter warning signs, one site entrance sign, an access gate, two background wells, six point-of-compliance wells, and eight groundwater level monitor wells. The LTSP requires DOE to inspect the Gunnison disposal site once every calendar year. The DOE inspectors typically observe the status of site features during each annual inspection.

The DOE conducted the last site inspection on June 11, 2014. At that time, the disposal cell and associated diversion and drainage structures were noted to be in excellent condition and functioning as designed. No evidence of erosion, settling, slumping, or rock degradation was identified. Some isolated patches of shallow-rooted plants were observed, and two small tree saplings were removed from the cover. Nothing was identified that required follow up maintenance or repair.

3 Site Observations and Findings

The DOE staff conducted the annual inspection on July 1, 2015. The purposes of the annual inspection are to confirm the integrity of the visible features of the site, to identify changes in conditions that may affect site integrity, and to determine the need for

maintenance or additional inspection and monitoring. The detailed instructions for implementing the annual inspection are provided in Section 3 of the LTSP.

The LTSP requires the DOE inspectors to observe three areas: the top and side slopes of the disposal cell; the area between the disposal cell and the site boundary; and the outlying area within about a quarter mile of the site. To conduct the annual inspection, DOE and its contractors created an inspection checklist. The checklist included requirements to inspect the tailings cell as well as site features such as fences, boundary monuments, site markers, perimeter signs, and entrance gate. The NRC inspector observed the DOE site inspectors implementing the site-specific checklist.

The inspector observed that the disposal cell and surrounding areas appeared to be in excellent condition. No erosion or slumping was observed on or around the cell. Although minor amounts of vegetation was observed on the cell cover and apron, there were no large trees growing on top of the cell.

The LTSP requires the DOE inspectors to observe two site-specific concerns. The first concern is the potential for onsite impacts from the Gunnison County landfill, located about 1,200-feet north of the site. At the time of the site inspection, the landfill was in service, but landfill activities did not appear to have an impact on the disposal site.

The second site-specific concern was the freeze-thaw effects on the erosion protection rock material. In response, the DOE staff created six test plots that are visually inspected on an annual basis for indications of rock degradation. The DOE inspectors compared the current status of the rock in the six 1-square meter test plots to photographs taken in 2012. During the 2014 inspection, the DOE staff did not identify any evidence that individual rocks had split or otherwise had degraded. The 2015 inspection findings did not deviate significantly from 2014 inspection findings. As discussed in Section 3.4 of the LTSP, the final set of photographs will be taken at the six test plots during the 2017 inspection. The need for special surveillances will be re-evaluated at that time.

The NRC inspector conducted radiological surveys using a Ludlum Model 19 microRoentgen survey meter (NRC No. 015546, calibration due date of 07/22/15, calibrated to radium-226). With a background of 14-16 microRoentgens per hour ($\mu\text{R/hr}$), as measured on the access road to the site, measurements within the 115-acre property ranged from 13-18 $\mu\text{R/hr}$. The ambient gamma radiation measurements across the site were indistinguishable from background levels indicating that no residual radioactivity or naturally occurring radioactivity was identified at the site.

During the observational site visit, the NRC inspector witnessed DOE staff collecting water samples from two domestic wells for analysis. The domestic wells were located near the former Gunnison mill site. The unfiltered samples were analyzed in the field for temperature, pH, conductivity, and dissolved oxygen concentrations. The NRC inspector concluded that the DOE staff collected the samples in accordance with the guidance provided in the procedure entitled "Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites." (This plan can be downloaded from DOE at http://energy.gov/sites/prod/files/2013/06/f1/S04351_SAP.pdf.) The Sampling and Analysis Plan provides the instructions for physically collecting the samples and the quality assurance requirements. The results of these two samples will

be presented in the DOE's 2015 annual groundwater report, expected to be submitted to the NRC later this year.

4 Conclusions

The DOE inspectors conducted the site inspection in accordance with the site-specific checklist, LTSP, and 10 CFR 40.27 requirements. The disposal cell and adjacent apron and diversion ditch structures appeared to be in excellent condition with no erosion, slumping, or large trees on the cell. The two site-specific concerns, the nearby landfill and freeze-thaw effects on cover rock, were not observed during this site inspection. The ambient gamma radiation levels across the site were indistinguishable from background levels. The DOE staff collected two water samples in accordance with guidance provided in a DOE-issued sampling plan. Finally, any proposed changes to the GCAP for the Gunnison mill site will be reviewed by the NRC when the proposed changes are submitted to the NRC.

5 Meeting Summary

The NRC inspector participated in a pre-planning meeting with the DOE site manager and DOE representatives prior to the site inspection. During this meeting, the NRC and DOE representatives discussed topics such as site status, inspection plan, and potential physical hazards. The inspector discussed the final site observations with DOE staff at the conclusion of the onsite visit.

6 Persons Contacted

S. Campbell, Site Lead, Stoller Newport News Nuclear (SN3)
M. Cosby, Environmental Protection Specialist, Colorado Department of Public Health
and Environment
T. Jasso, Project Coordinator, Stoller Newport News Nuclear (SN3)
R. Johnson, Site Lead, Stoller Newport News Nuclear (SN3)
J. Linard, Site Manager, U.S. Department of Energy



Figure 1: Gunnison disposal site marker



Figure 2: Top of disposal cell looking north (public landfill in background)



Figure 3: Southwestern edge of cell; note change in rock size from side slope to top



Figure 4: East diversion channel (looking northwest towards cell)



Figure 5: DOE inspection of rip-rap Test Area 5 in east diversion channel



Figure 6: County landfill north of disposal cell, as seen from the disposal cell