



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

**REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511**

May 13, 2019

MEMORANDUM TO: Docket File WM-00063

THROUGH: Heather J. Gepford, PhD, CHP, Chief/RA/
Materials Licensing and Decommissioning Branch
Division of Nuclear Materials Safety

FROM: Robert Evans, PhD, PE, CHP, Senior Health Physicist/RA/
Materials Licensing and Decommissioning Branch
Division of Nuclear Materials Safety

SUBJECT: NRC OBSERVATIONAL SITE VISIT AT THE MEXICAN HAT
DISPOSAL SITE

The U.S. Nuclear Regulatory Commission (NRC), Region IV Office, conducted an observational site visit from April 15-17, 2019, at the U.S. Department of Energy's (DOE) Mexican Hat Disposal Site near Mexican Hat, Utah. This observational site visit was conducted in accordance with the NRC's guidance dated September 7, 2012. The purpose of the site visit was to observe the DOE's representatives conducting geotechnical sampling in accordance with the instructions provided in the DOE's "Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site," dated January 2019. Enclosed to this memorandum is the NRC's report for this observational site visit.

In summary, DOE's representatives conducted the work in accordance with the instructions provided in the work plan, with minor deviations. The deviations from the work plan are expected to be documented in the DOE's final report. The DOE plans to inform the NRC about the results of its investigations after it has analyzed its samples and reviewed the sample results. The DOE will use the results of sampling and testing to formulate long-term plans to address the depressions that have formed on portions of the disposal cell.

Docket: WM-00063
License: General License Pursuant to 10 CFR 40.27

Enclosure:
NRC Report WM-00063/2019-001

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

Docket: WM-00063

License: General License Pursuant to 10 CFR 40.27

Report: WM-00063/2019-001

Licensee: U.S. Department of Energy

Facility: Mexican Hat Disposal Site

Location: Mexican Hat, Utah

Dates: April 15-17, 2019

Inspector: Robert Evans, PhD, PE, CHP, Senior Health Physicist
Materials Licensing and Decommissioning Branch
Division of Nuclear Materials Safety

Approved by: Heather J. Gepford, PhD, CHP, Chief
Materials Licensing and Decommissioning Branch
Division of Nuclear Materials Safety

Attachment: Photographs taken at the Mexican Hat Disposal Site

Enclosure

NRC Report

1 Background

The Texas-Zinc Minerals Corporation constructed and operated a uranium mill at the Mexican Hat, Utah, site from 1957-1963. The mill was sold to Atlas Corporation in 1963. Atlas Corporation continued to operate the mill until 1965. During operation, the mill processed 2.2 million tons of ore for its copper and uranium content. In addition to uranium and copper processing, a sulfuric acid manufacturing plant operated at the site from 1957-1970.

Starting in the 1980s, the U.S. Department of Energy (DOE) conducted site remediation in two phases. The tailings material, contaminated structures, and windblown material were placed in an engineered disposal cell on site property. In addition, tailings, wastes, and vicinity property material from the nearby Monument Valley, Arizona, site were placed in the Mexican Hat disposal cell. The DOE completed reclamation activities in 1995. The disposal cell contains approximately 4.4 million tons (3.6 million cubic yards) of residual radioactive wastes including mill tailings. The disposal cell covers approximately 68 acres of the 119-acre site.

The disposal cell was constructed with a radon barrier, bedding layer, and riprap cover over the contaminated materials. The top cover was constructed with a 2 percent slope to promote rainwater flow to the north and east. Runoff water flows down the 20 percent grade side slopes to a rock apron that surrounds the cell. The runoff exits the disposal cell through three toe drains that discharge into existing arroyos that are located to the north and east of the cell. (An arroyo is a steep-sided gully cut by running water in an arid or semiarid region.)

The Mexican Hat disposal site is located on the Navajo Nation reservation. Pursuant to the Uranium Mill Tailings Radiation Control Act (UMTRCA), the DOE maintains control of the site under a trust agreement. In 1997, the NRC accepted the disposal cell as a Title I, generally licensed site under the provisions of Title 10 to the *Code of Federal Regulations* (10 CFR) 40.27.

Regulation 10 CFR 40.27(c) states, in part, that the DOE shall care for the disposal site in accordance with the provisions of the site-specific long-term surveillance plan (LTSP). The most recent LTSP for the Mexican Hat site was submitted by the DOE to the NRC by letter dated October 22, 2007 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML073050056). This regulation also states that the DOE will notify the NRC prior to undertaking any significant construction, actions, or repairs related to the disposal site.

Section 3.6 of the LTSP provides the routine site maintenance and emergency measures. In addition, Table 3-2 provides the criteria for maintenance and emergency measures. For example, a breach of the disposal cell with dispersal of radioactive material requires a Priority 1 response. On the other end of the spectrum, minor erosion or undesirable changes in riprap integrity or vegetation requires a Priority 5 response. Priority 5 conditions require DOE evaluation, impact assessment, and response as appropriate to address the concern.

2 Site Status

In 2016, DOE representatives first observed subtle depressions in the rock cover along the lower portion of the northeast side slope leading to the northeast toe drain. The DOE notified the NRC of its findings by letter dated May 5, 2016 (ADAMS Accession No. ML16131A719). The DOE categorized the depressions as Priority 5 conditions per Table 3-2 of the LTSP.

The DOE conducted supplemental examination and evaluation activities in 2017-2018. These activities included installation of a meteorological monitoring station to monitor weather conditions, as well as performance of topographical and radiological surveys. The radiological surveys were conducted, in part, to verify that the radon barrier material was intact and continued to cover the radioactive wastes. The radiological survey results were at background levels, indicating that the radioactive material in the disposal cell were not exposed to the environment.

In December 2017 and January 2018, DOE representatives excavated test pits to observe the erosion, bedding, and radon barrier layers at various locations. The DOE informed the NRC of its investigations by teleconference dated February 12, 2018 (ADAMS Accession No. ML18053A752). The DOE informed the NRC that approximately 20 depressions had been visually observed, and that eight were hand-excavated for closer examination. The larger depressions were roughly 4-5 feet in diameter. The results of the investigations suggested that erosion was a factor in the formation of the depressions. Additional DOE investigations were conducted in May 2018 (ADAMS Accession No. ML18128A365). These investigations included excavation of additional test pits.

Using the information gained during the 2016-2018 investigations, the DOE developed a geotechnical sampling and materials testing work plan. The NRC reviewed and commented on the June 2018 and November 2018 revisions of the draft work plans by letters dated August 13, 2018, and December 10, 2018, respectively. (The DOE requested that the work plan be controlled as a non-publicly available document, a request that was accepted by the NRC.) The inspector reviewed the January 2019 revision of the work plan during the April 2019 observational site visit.

The DOE also submitted a "Final Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report" to the NRC by letter dated January 18, 2019 (ADAMS Accession No. ML19023A388). The report was based on information gained between March 2016 and January 2018. The results of the DOE's May 2018 and April 2019 investigations will be provided to the NRC in separate reports. The NRC provided comments on the January 2019 report to DOE by letter dated March 18, 2019 (ADAMS Accession No. ML19066A167). At the time of the NRC's April 2019 observational site visit, the DOE had not responded to the NRC's comments, and the DOE will use the information gained during its April 2019 investigations in its response to the NRC's comments.

Separately from the April 2019 investigations, the DOE plans to conduct interim repairs on the disposal cell, in the areas where the majority of the depressions have been observed. At the time of the April 2019 observational site visit, the design drawings were undergoing an internal review by the DOE and will be submitted to the NRC for review and acceptance in the near future. The interim repairs are scheduled to be implemented

during the summer of 2019. The DOE plans to use the results of the April 2019 geotechnical sampling results as input into its decision-making process for a permanent fix that will be developed and implemented at a later date.

3 Site Observations and Findings

The NRC inspector observed the implementation of DOE's "Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site" dated January 2019. The work plan described the approach that DOE and its contractors would use to collect and analyze additional samples from the disposal cell cover.

As described in the work plan, the DOE planned to excavate a trench and various test pits (Figures 1 and 2). The excavation work consisted of: (1) removal of riprap material; (2) observation, sampling, and excavation of the bedding material; and (3) observation and sampling of the radon barrier material (Figure 3). After geotechnical sampling, the excavated locations were backfilled and recompacted (Figures 4 and 5). Replacement fill material was used, as needed, with material that met the original design specifications. (The original design specifications were presented in Section 2.0, "Components of the Mexican Hat Disposal Cell Cover," in DOE's January 2019 report.) The NRC inspector visually confirmed that the replacement fill met the specifications provided in the January 2019 report.

The DOE started the geotechnical and material sampling work on April 8, 2019. The work lasted about 2 weeks. The DOE excavated 31 test pits. The test pits were chosen using a systematic and iterative process. The test pit excavations were approximately 3-feet by 3-feet. The depth of the test pits depended on the depth of the cover material.

The DOE also excavated a trench that was approximately 3-5 feet wide and 430 feet long. The trench ran from the top of the northeastern edge of the disposal cell down to the apron near the northeastern toe drain. The test trench was constructed, in part, to visually observe the composition of the bedding material at different locations along the slope of the disposal cell.

In addition to sampling the cover material, the DOE also collected samples of aeolian dust on the riprap material to determine if the dust was windblown, bedding, or radon barrier material, or a combination of these materials. Further, DOE sampled radon barrier material that appeared to be cemented due to a cation exchange mechanism. Because cemented material may negatively affect radon barrier performance, the DOE sampled selected locations to fully understand the cementation process.

The DOE implemented several programs for protection of workers. The DOE provided initial training to all workers, and the DOE provided daily safety briefings prior to start of work. Workers were required to wear personal protective equipment. The DOE conducted both radioactive and non-radioactive sampling, to monitor worker exposures to radioactive materials and non-radioactive silica. During all phases of work, a dedicated technician conducted radiological surveys to identify and minimize worker exposure to radioactive wastes (Figure 6). Air samples were used to monitor for airborne silica. In general, no radioactivity was encountered during the work, except when DOE representatives purposely drilled through the radon barrier to determine the thickness of the barrier material.

The NRC inspector independently measured the ambient gamma exposure rates using a hand-held survey meter (Ludlum Model 2401-S, NRC No. 079765, calibrated to cesium-137, calibration due date of 11/05/19). With a background of about 10 microrentgen per hour ($\mu\text{R/hr}$), the measurements on the disposal cell where work was conducted ranged from 8-14 $\mu\text{R/hr}$. Overall, the survey results indicate that the test pits and trench were at background levels, demonstrating that the surveyed areas did not contain exposed radioactive waste material.

During the implementation of the work plan, DOE representatives made several minor changes to the work process. For example, the trench was excavated in a slightly different manner than described in the work plan. The DOE's representatives stated that all changes and variations from the work plan were being recorded in a field log, and the changes would be annotated in the final report.

The NRC inspector observed how the DOE controlled samples collected from the disposal cell cover. These controls included marking of the collected samples in the field and recording of the samples in a logbook. Many samples will be analyzed at an offsite laboratory. Once the DOE has received all sample results, it plans to analyze the information. At a later date, the DOE plans to submit the results of its analysis to the NRC. As noted earlier, the DOE will use the results of its April 2019 investigations, in part, to help develop a permanent fix for the cover depressions.

4 Conclusions

The NRC inspector concluded that DOE conducted the work in accordance with the NRC-reviewed work plan, with minor deviations. These deviations were recorded in a field logbook and will be documented in the completion report. The DOE managed worker safety, and the DOE maintained control of samples collected. The results of the geotechnical sampling and materials testing will be presented to the NRC at a later date, after DOE has completed its analysis of the data.

5 Meeting Summary

The NRC inspector participated in safety meetings with DOE representatives on a daily basis. During these meetings, the participants discussed safety topics such as site status, planned work, and potential hazards.

6 Persons Contacted

D. Brennecke, Engineering Manager, Navarro Research and Engineering, Inc.
K. Bishop, Industrial Hygienist, Navarro Research and Engineering, Inc.
A. Denny, Site Manager, DOE Office of Legacy Management
K. Lott, Site Lead, Navarro Research and Engineering, Inc.
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A. Martinez, Safety and Health Engineer, Navarro Research and Engineering, Inc.
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Figure 1: Construction of trench on northeastern side slope of disposal cell



Figure 2: Test pit with riprap and bedding layer removed, exposing radon barrier



Figure 3: Core sampling of radon barrier material in test pit



Figure 4: Backfilling and compacting radon barrier in test pit



Figure 5: Backfilling test pit with new bedding material that meets original specifications



Figure 6: Radiological scanning of open test pit prior to sampling

NRC OBSERVATIONAL SITE VISIT AT THE MEXICAN HAT, UTAH DISPOSAL SITE, DATED
MAY 13, 2019

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