



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

February 26, 2019

MEMORANDUM TO: Docket File 030-28641

THROUGH: James L. Thompson, Chief/RA/
Materials Licensing and Inspection Branch
Division of Nuclear Materials Safety

FROM: Janine F. Katanic, PhD, CHP, Chief/RA/
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety

SUBJECT: APPROVAL OF FINAL STATUS SURVEY REPORT FOR
SITE WR-111, LITTLE MOUNTAIN TEST FACILITY, HILL AIR
FORCE BASE, UTAH

By Memorandum dated August 24, 2018 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML18236A672), the Department of the Air Force (licensee) requested U.S. Nuclear Regulatory Commission (NRC) review and approval of its Final Status Survey Report (FSSR) dated July 18, 2018 (ADAMS Accession No. ML18236A678) for Site WR-111 at Hill Air Force Base (AFB), Utah.

Site WR-111 is a magnesium-thorium (Mg-Th) disposal trench located at the Little Mountain Test Facility (LMTF), formerly known as the Little Mountain Test Annex, situated approximately 15 miles northwest of Hill AFB. The trench, formerly known as the Radioactive Disposal Area, was used in 1961 for disposal of Mg-Th alloy and other industrial waste from the Marquardt Aircraft Ramjet manufacturing plant in Ogden, Utah. No documentation of any other disposal at Site WR-111 was identified in the NRC docket files.

In July 2013, contractors EA Engineering, Science, and Technology Inc. (EA) and Cabrera Services, Inc. (Cabrera) surveyed the site. This survey was intended to supplement an earlier site characterization survey performed in 2009 by another contractor (AECOM). The 2013 survey concluded that the radionuclides of concern (ROCs) for Site WR-111 are radium-226, thorium-230, and thorium-232. The elevated radium-226 activity was determined to be progeny of the thorium-230 contamination. The 2013 site characterization surveys and sample analyses were used to develop the licensee's Decommissioning Plan (DP) for Site WR-111, which was submitted to the NRC in September 2015 (ADAMS Accession No. ML15282A466). The NRC approved the licensee's DP in Amendment No. 27 to NRC License No. 42-235369-01AF on March 4, 2016 (ADAMS Accession Nos. ML16067A326 [publicly available cover letter] and ML16067A327 [not publicly available license]).

CONTACT: Austin C. Roberts, Health Physicist/DNMS
817-200-1209

This project was originally classified as a Group 4 decommissioning project in accordance with the guidance provided in NUREG-1757, "Consolidated NMSS Decommissioning Guidance," Volume 1, Revision 2. Table 1.2 from NUREG-1757 provides the principal regulatory features of the seven decommissioning groups. The principal regulatory features for a Group 4 decommissioning project, and the status of each feature, are provided below:

Principal Regulatory Feature	Status
NEPA compliance - completion of an environmental assessment (EA)	The EA (ML16013A246) & Finding of No Significant Impact (FONSI) were published in the <i>Federal Register</i> on March 4, 2016 (81 FR 11598; ML16028A454)
Restricted or unrestricted use	The licensee has requested unrestricted use
DP required - Yes or No	The DP was approved by NRC on March 4, 2016, via Amendment 27 to License No. 42-23539-01AF (ML16067A326 and ML16067A327)
DP review documentation	Safety Evaluation Report issued on March 3, 2016 (ML16013A248)
Radioactive material disposition documentation	Radioactive material will be dispositioned as described in DP and implementing procedures
Method for demonstrating site is suitable for release - survey or demonstration	FSSR was submitted to NRC by Memo dated August 24, 2018 (ML18236A672)
Confirmatory or side-by-side survey	NRC conducted an inspection during remediation activities in accordance with the DP; the inspection included confirmatory surveys and the collection of soil samples. See NRC Inspection Report 030-28641/2016-001 (ML17011A409)
Closeout inspection	NRC determined that a closeout inspection is not necessary. The staff determined that an adequate closeout survey has been conducted by the licensee.
<i>Federal Register</i> Notice (FRN) used to inform the public of NRC staff actions	The receipt of DP was announced via FRN in 80 FR 13446, dated March 13, 2015; the EA/FONSI was announced via FRN in 81 FR 11598, dated March 4, 2016.
Documentation used to support license termination	After completion of all decommissioning activities and approval of the FSSR, the licensee plans to terminate Permit UT-00517-xx/xxAFP at Hill AFB

The NRC staff considered whether a consultation with the U.S. Environmental Protection Agency (EPA) was required per the EPA-NRC Memorandum of Understanding dated October 9, 2002 (Appendix H to NUREG-1757, Volume 1, Revision 2). An EPA consultation was not required because the NRC-approved surrogate derived concentration guideline levels for radium-226 (1.6 picocuries per gram) and thorium-232 (1.9 picocuries per gram) do not exceed the values specified in the Memorandum of Understanding (5 picocuries per gram for both isotopes).

In summary, the NRC staff review of the FSSR is complete. The results of the final status survey meet the criteria presented in the NRC-approved DP. Therefore, the NRC staff recommends approval of the FSSR. The technical justification for this recommendation is provided in the enclosure to this memorandum. This approval confirms that the Site WR-111 meets the radiological criteria established in Title 10, *Code of Federal Regulations* (CFR) 20.1402 for unrestricted use. As requested by the licensee it is necessary to issue an amendment to License No. 42-23539-01AF which approves the Site WR-111 FSSR and allows the licensee to release the site for unrestricted use.

Docket No.: 030-28641

License No.: 42-23539-01AF

Enclosure: Safety Evaluation Report

Safety Evaluation Report for Final Status Survey Report for Site WR-111, Little Mountain Test Facility, Hill Air Force Base, Utah

By Memorandum dated August 24, 2018 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML18236A672), the Department of the Air Force (licensee) requested that the U.S. Nuclear Regulatory Commission (NRC) review and approve its Final Status Survey Report (FSSR) dated July 18, 2018 (ADAMS Accession No. ML18236A678) for Site WR-111 at Hill Air Force Base (AFB), Utah.

Site WR-111 is a magnesium-thorium (Mg-Th) disposal trench located at the Little Mountain Test Facility (LMTF), formerly known as the Little Mountain Test Annex, situated approximately 15 miles northwest of Hill AFB. The trench, formerly known as the Radioactive Disposal Area, was used in 1961 for disposal of Mg-Th alloy and other industrial waste from the Marquardt Aircraft Ramjet manufacturing plant in Ogden, Utah. In 1961, under the conditions of their license (STB-434) with the Atomic Energy Commission (AEC), Marquardt incinerated approximately 3,600 pounds of Mg-Th scrap material, sludge containing thorium fluoride, and other industrial waste (lathe turnings and milling scraps) in the disposal trench. No documentation of any other disposal at Site WR-111 was identified in the NRC docket files. Marquardt's AEC license was terminated in 1971; no documentation exists in the NRC docket files for any closeout inspection or survey that may have been performed by the AEC at that time.

The radioactive material buried at the LMTF is possessed by the U.S. Air Force (USAF) under its NRC Master Materials License (MML) No. 42-23539-01AF, Docket No. 030-28641. As an MML, the USAF authorizes permits for the possession and use of radioactive materials at its facilities or temporary jobsites anywhere in the United States and its territories. The USAF MML issued Permit No. UT-00517-01, Docket No. 040-00517 to the 75th Civil Engineering Group (CEG) at Hill AFB for the possession, storage and transfer of low-level radioactive waste materials found at the waste burial site, WR-111.

In July 2013, contractors EA Engineering, Science, and Technology Inc. (EA) and Cabrera Services, Inc. (Cabrera) surveyed the site. This survey was intended to supplement an earlier site characterization survey performed in 2009 by a different contractor (AECOM). The 2013 survey concluded that the radionuclides of concern (ROCs) for Site WR-111 are radium-226, thorium-230, and thorium-232. The elevated radium-226 activity was determined to be progeny of the thorium-230 contamination. The 2013 site characterization surveys and sample analyses were used to develop the licensee's Decommissioning Plan (DP) for Site WR-111, which was submitted to the NRC in September 2015 (ADAMS Accession No. ML15282A466). The NRC approved the licensee's DP in Amendment No. 27 to NRC License No. 42-235369-01AF on March 4, 2016 (ADAMS Accession Nos. ML16067A326 [publicly available cover letter] and ML16067A327 [not publicly available license]).

The licensee used site-specific dose modeling to calculate the derived concentration guideline levels (DCGL_{ws}) to demonstrate that the Site WR-111 meets the unrestricted use criteria in Title 10, *Code of Federal Regulations* (CFR) 20.1402. The use of site-specific DCGL_{ws} was necessary due to the presence of subsurface contamination; the NRC's screening values apply only to surface soil. Based on its review, as documented in Safety Evaluation Report dated March 3, 2016 (ADAMS Accession No. ML16013A248), the NRC concluded that the DCGL_{ws} provided reasonable assurance that exposures as a result of any residual radioactivity

Enclosure

remaining at the Site WR-111 after remediation will comply with the radiological criteria specified in 10 CFR 20.1402.

The USAF contracted with EA, with subcontractor Cabrera, to perform the work scope, remediation, and final status surveys. The licensee initiated its mobilization and site preparation activities in May 2016 and commenced remediation activities in June 2016. The material exhumed from the trench was loaded into dump trucks and tarped for transportation to U.S. Ecology in Grand View, Idaho. The USAF performed its confirmatory surveys in August 2016 through the USAF School of Aerospace Medicine (USAFSAM) based at Wright-Patterson AFB.

The NRC conducted a confirmatory survey of Site WR-111 in August 2016 (ADAMS Accession No. ML17011A409). The inspector performed walk-over radiological surveys and collected seven soil samples. The soil samples were submitted to an independent laboratory for analysis. The thorium concentration in one of the samples was greater than the associated DCGL. In addition, the licensee informed the NRC that its own soil sample results also indicated there were several locations with contamination that exceeded the DCGL_{WS}. The NRC inspector concluded that the licensee's remediation activities for Site WR-111 were being conducted in accordance with the DP, and were being conducted in a satisfactory manner with respect to the health and safety of workers and the public. However, based on the NRC's and licensee's soil sample results, the NRC also concluded that the area did not meet the criteria for unrestricted use at that time. During a follow-up telephone conference held on November 29, 2016 (ADAMS Accession No. ML16344A475), the licensee agreed to provide area factors to the NRC for review and approval for the identified elevated contaminated areas, or to perform additional remediation activities, or a combination of both.

The licensee performed additional excavation and final status survey activities in May 2017, in accordance with the DP. By memorandum dated March 1, 2018 (ADAMS Accession No. ML18060A451) the licensee submitted a summary of final status survey data and evaluation performed by its contractor. The evaluation found that two locations on the site, SU02 (60 square meters, or m²) and SU04 (339 m²), still contained residual radioactivity in soil above the release criteria. To demonstrate compliance of the site with the unrestricted release requirements specified in 10 CFR Part 20, the contractor used elevated measurement comparison DCGLs (DCGL_{EMCS}), derived area factors, and a sum-of-ratios (SOR) calculation in accordance with NUREG-1575, Revision 1, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). The licensee's calculation was based on Equation 8-2 from MARSSIM, adapted by the licensee to include multiple radionuclides.

The staff's review, as documented by memorandum dated July 24, 2018 (ADAMS Accession No. ML18186A632), concluded that the DCGL_{EMCS} calculated by the licensee, and the corresponding area factors, were acceptable. The licensee's adaptation of MARSSIM Equation 8-2 to account for the presence of multiple radionuclides was determined to be acceptable for use. The staff concluded in its review that the Site WR-111 met the regulatory release criteria for unrestricted use.

By Memorandum dated August 24, 2018 (ADAMS Accession No. ML18236A672), the licensee requested that the NRC review and approve its FSSR dated July 18, 2018 (ADAMS Accession No. ML18236A678). The NRC staff reviewed the FSSR using the guidance provided in Section 11.3.4 of NUREG-1757, Volume 1, Revision 2, "Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees." During review of the FSSR, the staff questioned the licensee's calculation of the relative shift (equal to the shift divided by the standard deviation, or Δ/σ) which determines the necessary number of samples in each survey

unit. Specifically, in its 2015 DP, the licensee assumed a standard deviation value of $\sigma = 0.3$, which was supported by a recommendation in MARSSIM; however, this is a smaller (and therefore potentially less conservative) value than the actual standard deviations that the licensee calculated when it later performed soil samples as part of the final status survey:

Survey Unit	Standard Deviation (σ)
1	0.32
2	0.47
3	0.36
4	0.76
Reference	0.16

The licensee's assumption of a standard deviation (σ) of 0.3 in the FSSR resulted in a larger relative shift (Δ/σ), which in turn yielded a smaller number of survey unit samples. Accordingly, the staff questioned whether the number of samples performed for the final status survey was sufficient.

The licensee responded to the staff's concerns by performing a retrospective power assessment as an attachment to its FSSR, which it submitted via email dated January 17, 2019 (ADAMS Accession No. ML19031C839). This assessment used the actual standard deviation (σ) values for each survey unit to calculate the probability of making a decision error, in accordance with the guidance provided in MARSSIM Appendix I. The resulting power curves demonstrated that for all survey units, the use of $\sigma = 0.3$ did not increase the probability of a Type I decision error (i.e., erroneously determining that a survey unit met release criteria) above the accepted value of 5 percent. The probability of a Type II decision error (i.e., erroneously determining that a survey unit *did not meet* release criteria) was found to increase to 8 percent for SU04, but not for any other survey unit. The consequences of a potential Type II decision error would not be expected to result in an increased risk to public health or safety. Therefore, the staff accepted the licensee's conclusion that the number of samples for each survey unit was sufficient to demonstrate that the Site WR-111 met the regulatory release criteria for unrestricted use.

The NRC staff review of the FSSR is complete. The results of the final status survey meet the criteria presented in the NRC-approved DP. Therefore, the NRC staff recommends approval of the FSSR. This approval confirms that the Site WR-111 meets the criteria established in 10 CFR 20.1402; therefore, the site can be released for unrestricted use.

APPROVAL OF FINAL STATUS SURVEY REPORT FOR SITE WR-111, LITTLE MOUNTAIN
TEST FACILITY, HILL AIR FORCE BASE, UTAH - DATED FEBRUARY 26, 2019

Distribution:

T. Pruett, DNMS
L. Howell, DNMS
J. Thompson, MLIB
M. Simmons, MLIB
J. Katanic, FCDB
R. Browder, DNMS
R. Evans, FCDB
A. Roberts, FCDB
R4DNMS_FCDB
P. Silva, MLIB

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OFFICE	DNMS:FCDB	DNMS:FCDB	C:FCDB	C:MLIB
NAME	ARoberts	REvans	JKatanic	JThompson
SIGNATURE	/RA/	/RA/	/RA/	/RA/
DATE	2/4/19	2/6/19	2/20/19	2/26/19

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