



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005**

May 3, 2004

Lt. Col. Kali Mather
Department of the Air Force
USAF Radioisotope Committee
HQ AFMSA/SGPR
110 Luke Ave, Suite 405
Bolling AFB, DC 20322-7050

SUBJECT: NRC INSPECTION REPORT 030-28641/03-009

Dear Lt. Col. Mather:

An NRC inspection was conducted on November 18-20, 2003, and February 12-13, 2004, at Kirtland Air Force Base, New Mexico. An exit briefing was conducted onsite at the conclusion of the inspection and a final telephonic exit was conducted with Kirtland Air Force Base staff on April 14, 2004, to discuss the results of confirmatory measurements performed by the NRC inspector. The enclosed report presents the scope and results of that inspection.

The inspection was an examination of activities conducted under Master Materials License 42-23539-01AF and Air Force Permit No. NM-03110-01/07AFP's Installation Restoration Program for Site OT-10 as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The purpose of this inspection was to conduct a closeout inspection and radiological survey of your decommissioning efforts in Training Sites TS5, TS6, TS7, and TS8. Confirmatory soil surveys were performed by the inspector and as part of the NRC's confirmatory sampling program, and the results of the soil samples were compared with Kirtland's split sample results. No violations of NRC regulations or regulatory requirements were identified during the inspection.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Mr. R. Rick Muñoz at (817) 860-8220 or the undersigned at (817) 860-8197.

Sincerely,

/RA/

Jack E. Whitten, Chief
Nuclear Materials Licensing Branch

Docket No.: 030-28641
License No.: 42-23539-01AF

Department of the Air Force

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Enclosure:
NRC Inspection Report
030-28641/03-009

cc w/enclosure:
New Mexico Radiation Control Program Director

Department of the Air Force

-3-

bcc w/enclosure (via ADAMS e-mail):

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Department of the Air Force

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.	030-28641
License No.	42-23539-01AF
Air Force Permit No.	NM-03110-01/07AFP
Report No.	030-28641/03-009
Licensee:	Department of the Air Force
Facility:	Installation Restoration Program Site OT-10 Training Sites TS5, TS6, TS7, and TS8
Location:	Kirtland Air Force Base Albuquerque, New Mexico
Dates:	November 18-20, 2003, and February 12-13, 2004
Inspector:	Rick Muñoz, Health Physicist Fuel Cycle and Decommissioning Branch
Approved By:	D. Blair Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachment:	Supplemental Inspection Information
ADAMS Entry	IR 030-28641/03-009; on 00/00/2004; Department of the Air Force; Kirtland Air Force Base. Decommissioning Report.

EXECUTIVE SUMMARY

Department of the Air Force
NRC Inspection Report 030-28641/03-009

The inspector noted that Kirtland Air Force Base had completed site remediation activities at the Installation Restoration Program Site OT-10 (OT-10 Site) that included former Training Sites TS5, TS6, TS7 and TS8, for release for unrestricted use. This announced inspection focused on confirmatory radiological surveys including the collection and analysis of soil samples from Training Sites TS5, TS-6, TS-7 and TS-8, included surface swipes from Bunker Building 28010.

In-Process Confirmatory Survey

- The inspector noted that the licensee had performed decommissioning activities in accordance with the approved decommissioning plan (DP), the implementing work plan, and the provisions of 10 CFR Part 30. During remediation activities, Kirtland Air Force Base (Permittee) conducted remedial action support surveys to ensure that contaminated soils exceeding the modified criteria were removed. (Section 1).
- Independent confirmatory radiological surveys were performed by the NRC inspector. The results of confirmatory surveys taken in Training Sites TS5, TS6, TS7, and TS8 were consistent with measurements taken by the licensee. Direct measurements were taken by the NRC inspector for gross alpha contamination. Additionally, the NRC inspector took surface swipes for removable contamination from Bunker Bunker Building 28010. Forty-nine soil samples were collected by the NRC inspector from the OT-10 Site. Fifteen samples taken by the licensee's contractor were split between the NRC's and licensee's independent laboratories for purposes of confirmatory analysis and comparison of sample results. Based on the comparison of sampling results between NRC and the licensee's independent laboratory, the NRC inspector determine that the licensee's laboratory quality assurance and quality control requirements were being met (Section 1).
- A statistical comparison of the licensee's and NRC's soil sample results determined that all but four results were in statistical agreement. Although four of the split soil sample results provided by the licensee's independent laboratory failed the NRC's analytical comparison test for thorium-232 and thorium-228, these samples were determined by the NRC to be below the thorium-232 release criteria levels. Therefore, the disagreements between the licensee's independent laboratory results and those of the NRC's were not a significant concern. The NRC's independent laboratory sample results indicated that thorium-232 concentrations were below the applicable release criteria for unrestricted use (Section 1).
- The NRC's independent confirmatory measurements supported the licensee's determination that the thorium-232 concentrations, in soils, met the release criteria established in the DP (Section 1).

Report Details

Summary of Facility Status

From 1961 through 1990, portions of the Kirtland AFB site were used for radiation training purposes. To simulate radiological contamination that could result from nuclear accidents, the Department of the Air Force applied thorium oxide sludge and thorium ore at their training facilities. The training sites served as a low hazard analog to using plutonium and the sludge and ore could simulate nuclear weapon accidents. A total inventory of 602 kilograms of thorium-232 was applied and tilled into the soils. The training site consisted of approximately 43 acres, in which approximately 9.4 acres were affected with elevated thorium concentrations. The site is owned by the U.S. Government and regulated by the NRC.

During August 2002, the U. S. Air Force Permittee (Permittee) submitted a revised site decommissioning plan (DP) to the NRC to address the remediation and release for unrestricted use for training sites designated as TS5, TS6, TS7, and TS8. Additionally, Training Site TS8 included two contaminated bunker buildings. The NRC staff subsequently reviewed and approved the revised DP. NRC Master Materials License 42-23539-01AF was amended on January 6, 2003, to incorporate the revised DP into the license (License Condition 18.O). The approved DP contains a derived concentration guideline level (DCGL) for thorium-232 in soil of 5.9 pCi/g. Remediation work was completed in 2004. However, these sites are covered by the U.S. Air Force's Master Materials License 42-23539-01AF, and this license will not be terminated when the remediation project is completed.

At the time of the onsite inspection, the Permittee had completed all decommissioning activities. After review of its options, the Permittee decided to keep and maintain one Bunker Building 28005 in Training Site TS8. Decommissioning of the second Bunker Building 28010, was completed, de-posted, and released for unrestricted use by the licensee. Bunker Building 28005 will be maintained by the Defense Threat Reduction Agency for the Defense Nuclear Weapons School as a training site and will remain on the U.S. Air Force's Master Materials License as a contaminated building.

1 Closeout Inspection and Survey (83890)

1.1 Scope

The licensee's NRC-approved DP contained the objective of site remediation activities without license termination. License Condition 18.O authorized the licensee to remediate the OT-10 Site in accordance with methods and criteria described in the licensee's DP. The objective of the NRC-approved DP is to ensure that the total effective dose equivalent to the average member of a critical group would not exceed 25 millirems per year from all exposure pathways. The licensee prepared final surveys and sample analysis using methodologies in NUREG-1575, Multi-Agency Radiation Survey and Site Investigational Manual, the approved site decommissioning plan, and the requirements of 10 CFR 30.36(d).

The NRC's confirmatory surveys of selected areas within the various training site locations were conducted by the NRC inspector. Independent radiological surveys were performed by the NRC inspector to verify that the facility had been decontaminated to approved

release criteria levels. As part of the NRC confirmatory surveys process, soil samples from each training site, including swipe samples from Bunker Building 28010, were collected by the NRC inspector for analysis. The NRC inspector observed the licensee's sample preparation and quality control practices.

1.2 Observations and Findings

a. Instrumentation

Radiological confirmatory surveys were performed by the NRC inspector. A survey rate meter coupled with a 2x2-inch sodium iodide scintillation detector was used for gamma surveys of soil. An Eberline Model E-600 instrument, coupled with an alpha/beta dual phosphor scintillation probe was used to measure fixed alpha and beta radiation:

<u>Model</u>	<u>Serial #</u>	<u>NRC #</u>	<u>Calibration Due</u>
Ludlum-18	15504	012778	11/05/04
Eberline SPA-3	00283	20795G	N/A
Eberline E-600	00763	063472	03/11/04
Eberline SHP 380AB	00906	072357	03/10/04

b. Site Tour

The training sites consisted of approximately 43 acres, of which all most 9.4 acres and one bunker building were affected. The NRC inspector confirmed that the licensee had effectively removed radioactively contaminated soils. Additionally, the inspector confirmed that building decommissioning work had been performed to address areas as identified in the site characterization survey for Training Sites TS5, TS6, TS7, and TS8. The decommissioning work conducted by the licensee's contractors involved excavation activities in training site areas and the decontamination of one bunker building in Training Site TS8 to ensure that cleanup levels were achieved for unrestricted release. Radioactive waste was shipped offsite to an approved disposal facility in Utah. The inspector observed the results of additional remediation work in Bunker Building 28010, which was found to have residual removable alpha/beta contamination that was detected by the NRC inspector during the confirmatory surveys conducted November 18-20, 2003. Additional confirmatory split soil sampling in Training Site TS7 was conducted and documented during a previous inspection. See NRC Inspection Report 030-28641/03-003, Section 2.

c. Surveys

The NRC inspector performed independent radiological surveys for gamma radiation on soil and building surfaces in addition to alpha/beta radiation surveys in Training Sites TS5, TS6, TS7, and TS8. These radiation surveys taken by the inspector were necessary to establish biased soil and swipe sample locations in obtaining a representative number of samples within the training sites for independent and confirmatory analysis. The inspector observed the Permittee's contractor collect the soil samples from the NRC designated locations. Fifteen soil samples were collected from Training Site TS5, 16 from Training Site TS6,

7 from Training Site TS7 and 11 from Training Site TS8. In addition, the inspector collected 29 surface swipe samples from in and around Bunker Building 28010. The soil samples were analyzed for thorium-228 and thorium-232. Swipe samples were analyzed for gross alpha and removable beta contamination.

During NRC's inspection of November 18-20, 2003, the inspector performed a complete survey of Bunker Building 28010 which included all inside walls, ceiling and floor. Sixty-five biased locations were surveyed for gross alpha contamination using 1-minute integrated counts. All surveys were observed by the inspector to be below the approved limit of 167 dpm/100cm² specified in Section 5 of the licensee's DP. The inspector collected surface swipes at 13 locations from inside the bunker for analysis by the NRC's contract laboratory, Oak Ridge Institute for Science and Education (ORISE). The inspector noted that direct measurements for fixed alpha contamination inside the bunker were below the approved release criteria except for the 6 x 6-foot concrete stoop located at the front entrance to the bunker building. Direct measurements at the stoop detected fixed contamination up to 540 dpm/100cm². The licensee indicated that additional remediation of the stoop would be performed. No surface swipes of the stoop of Bunker Building 28010 were collected by the NRC inspector at this time.

During NRC's inspection of February 13-14, 2004, the inspector performed additional surveys on and around the concrete stoop. Direct measurements for gross alpha contamination and an additional 16 swipes for removable contamination were made at the stoop and outer surfaces of the Bunker Building 28010. All direct measurements were below the 167 dpm/100 cm² limit. All 29 swipe samples were counted for 30 minutes and analyzed for gross alpha and beta activity using a low background gas proportional counter per ORISE procedure AP1, Revision 14. The alpha and beta dpm values for all swipes were less than the minimum detectable concentrations of 2.2 dpm/100cm² and 4.7 dpm/100cm² for alpha and beta activity, respectively. The limit specified in Section 5 of the licensee's DP was 34 dpm/100cm².

The soil samples were processed in the field by the Permittee's contractor. The samples were homogenized by placing the composite samples into a stainless steel bowl and mixed, using a stainless steel spoon. To the extent practical, the samples were ground down to 1/4-inch size or less. The samples were scanned by the Permittee's contractor with a sodium iodide gamma detector at the time of collection and no radiation levels were detected above ambient background levels. Although the Permittee did not have written procedures for soil sample preparation, the inspector noted that all samples had been prepared adequately. Samples were packaged using NRC-supplied plastic containers, transferred through chain-of-custody to the NRC and shipped to ORISE for analysis on behalf of the NRC.

The NRC samples were analyzed by ORISE using gamma spectroscopy procedure CP1, Revision 13, to identify concentrations of thorium and their decay progeny. Twelve samples were analyzed for isotopic analysis by alpha spectroscopy using procedure AP11, Revision 2. Kirtland Air Force Base soil sample splits were analyzed by an independent commercial contract laboratory by gamma spectroscopy in 640 gram aliquot samples using EPA procedure 901.1 MOD. Using the highest gamma scan results as guidance, the licensee selected to split only 15 of the 45 samples collected. These 15 samples were split for confirmatory analysis and comparison of results. Samples were provided to both the licensee's and NRC's independent laboratories. The results for thorium-232 and

thorium-228, and comparison of 15 of the 45 soil samples taken by the NRC inspector are listed in the tables below.

Tables 1 through 4 present the thorium-232 concentrations analytical comparisons obtained by gamma spectroscopy, and Tables 5 through 8 present the thorium-228 sample analytical comparison results obtained by gamma spectroscopy. All results are expressed as dry weight (pCi/g) and include background concentrations of uranium and thorium present in the soils. Table 9 presents the alpha spectroscopy isotopic analysis of the 12 highest sample results derived from the gamma spectroscopy data.

TABLE 1

TS5 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 232 by Actinium 228

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS5 NRC-1	18000	1.80 ± 0.23	none	n/a
TS5 NRC-2	18000	2.41 ± 0.25	none	n/a
TS5 NRC-3	28000	11.7 ± 1.0	8.9 ± 1.80	Yes
TS5 NRC-4	18000	1.88 ± 0.25	none	n/a
TS5 NRC-5	20000	4.57 ± 0.42	none	n/a
TS5 NRC-6	20000	5.82 ± 0.53	none	n/a
TS5 NRC-7	22000	4.79 ± 0.44	6.9 ± 1.4	No
TS5 NRC-8	20000	5.00 ± 0.48	none	n/a
TS5 NRC-9	20000	3.53 ± 0.41	none	n/a
TS5 NRC-10	22000	5.12 ± 0.47	4.17 ± 0.92	Yes
TS5 NRC-11	22000	6.37 ± 0.58	6.20 ± 1.30	Yes
TS5 NRC-12	18000	4.41 ± 0.45	none	n/a
TS5 NRC-13	20000	6.20 ± 0.55	none	n/a
TS5 NRC-14	20000	1.99 ± 0.25	none	n/a
TS5 NRC-15	20000	6.77 ± 0.64	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 2
TS6 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 232 by Actinium 228

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS6 NRC-1	12000	1.68 ± 0.23	none	n/a
TS6 NRC-2	18000	5.86 ± 0.52	4.22 ± 0.88	Yes
TS6 NRC-3	20000	7.15 ± 0.65	2.65 ± 0.61	No
TS6 NRC-4	14000	1.07 ± 0.20	none	n/a
TS6 NRC-5	16000	4.68 ± 0.43	none	n/a
TS6 NRC-6	12000	1.06 ± 0.17	none	n/a
TS6 NRC-7	16000	2.98 ± 0.32	none	n/a
TS6 NRC-8	22000	7.75 ± 0.72	6.7 ± 1.4	Yes
TS6 NRC-9	16000	1.78 ± 0.25	none	n/a
TS6 NRC-10	16000	2.16 ± 0.24	none	n/a
TS6 NRC-11	14000	1.23 ± 0.17	none	n/a
TS6 NRC-12	18000	2.76 ± 0.33	2.68 ± 0.62	Yes
TS6 NRC-13	14000	1.00 ± 0.18	none	n/a
TS6 NRC-14	20000	3.33 ± 0.36	3.31 ± 0.77	Yes
TS6 NRC-15	16000	1.99 ± 0.24	none	n/a
TS6 NRC-16	18000	3.28 ± 0.36	3.34 ± 0.78	Yes

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 3
TS7 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 232 by Actinium 228

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS7 NRC-1	20000	3.32 ± 0.36	2.62 ± 0.59	Yes
TS7 NRC-2	18000	4.55 ± 0.41	none	n/a
TS7 NRC-3	16000	2.89 ± 0.32	none	n/a
TS7 NRC-4	18000	2.38 ± 0.25	none	n/a
TS7 NRC-5	18000	4.78 ± 0.49	none	n/a
TS7 NRC-6	18000	4.54 ± 0.45	3.94 ± 0.85	Yes
TS7 NRC-7	16000	2.21 ± 0.25	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 4
TS8 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 232 by Actinium 228

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS8 NRC-1	16000	2.03 ± 0.25	none	n/a
TS8 NRC-2	18000	1.04 ± 0.15	none	n/a
TS8 NRC-3	38000	8.94 ± 0.77	8.0 ± 1.60	Yes
TS8 NRC-4	38000	14.1 ± 1.25	12.8 ± 2.5	Yes
TS8 NRC-5	18000	4.13 ± 0.39	none	n/a
TS8 NRC-6	20000	5.35 ± 0.52	none	n/a
TS8 NRC-7	12000	0.97 ± 0.18	none	n/a
TS8 NRC-8	18000	3.94 ± 0.41	none	n/a
TS8 NRC-9	24000	7.26 ± 0.62	6.3 ± 1.3	Yes
TS8 NRC-10	20000	5.14 ± 0.47	none	n/a
TS8 NRC-11	14000	1.76 ± 0.23	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 5
TS5 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 228 by Pb-212

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS5 NRC-1	18000	1.83 ± 0.14	none	n/a
TS5 NRC-2	18000	2.53 ± 0.17	none	n/a
TS5 NRC-3	28000	11.32 ± 0.78	9.30 ± 1.40	Yes
TS5 NRC-4	18000	1.86 ± 0.14	none	n/a
TS5 NRC-5	20000	4.34 ± 0.29	none	n/a
TS5 NRC-6	20000	5.83 ± 0.41	none	n/a
TS5 NRC-7	22000	4.69 ± 0.31	6.9 ± 1.1	No
TS5 NRC-8	20000	5.07 ± 0.36	none	n/a
TS5 NRC-9	20000	3.61 ± 0.27	none	n/a
TS5 NRC-10	22000	5.23 ± 0.34	3.79 ± 0.60	Yes
TS5 NRC-11	22000	6.57 ± 0.46	5.47 ± 0.89	Yes
TS5 NRC-12	18000	4.23 ± 0.30	none	n/a
TS5 NRC-13	20000	6.19 ± 0.40	none	n/a
TS5 NRC-14	20000	1.99 ± 0.15	none	n/a
TS5 NRC-15	20000	6.56 ± 0.46	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 6
TS6 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 228 by Pb-212

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS6 NRC-1	12000	1.84 ± 0.14	none	n/a
TS6 NRC-2	18000	5.88 ± 0.39	3.90 ± 0.62	Yes
TS6 NRC-3	20000	6.86 ± 0.48	2.56 ± 0.43	No
TS6 NRC-4	14000	1.12 ± 0.10	none	n/a
TS6 NRC-5	16000	4.79 ± 0.32	none	n/a
TS6 NRC-6	12000	1.08 ± 0.09	none	n/a
TS6 NRC-7	16000	2.80 ± 0.21	none	n/a
TS6 NRC-8	22000	8.15 ± 0.57	6.90 ± 1.10	Yes
TS6 NRC-9	16000	2.09 ± 0.16	none	n/a
TS6 NRC-10	16000	2.20 ± 0.15	none	n/a
TS6 NRC-11	14000	1.20 ± 0.09	none	n/a
TS6 NRC-12	18000	2.66 ± 0.20	2.06 ± 0.35	Yes
TS6 NRC-13	14000	1.07 ± 0.09	none	n/a
TS6 NRC-14	20000	3.40 ± 0.25	3.03 ± 0.54	Yes
TS6 NRC-15	16000	1.68 ± 0.13	none	n/a
TS6 NRC-16	18000	2.97 ± 0.22	2.98 ± 0.51	Yes

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 7
TS7 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 228 by Pb-212

OT-10 Sample Location ^a	Gamma Scan cpm	NRC Analysis ^{b,c} pCi/g	KAFB Analysis ^{b,c} pCi/g	NRC/Licensee Agreement? ^d
TS7 NRC-1	20000	3.95 ± 0.28	2.58 ± 0.44	Yes
TS7 NRC-2	18000	4.03 ± 0.27	none	n/a
TS7 NRC-3	16000	2.53 ± 0.19	none	n/a
TS7 NRC-4	18000	2.24 ± 0.15	none	n/a
TS7 NRC-5	18000	5.45 ± 0.38	none	n/a
TS7 NRC-6	18000	4.31 ± 0.31	3.30 ± 0.56	Yes
TS7 NRC-7	16000	2.05 ± 0.16	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

TABLE 8
TS8 Soil Sample Comparison - Gamma Spectroscopy Analysis
Thorium 228 by Pb-212

OT-10 Sample Location^a	Gamma Scan cpm	NRC Analysis^{b,c} pCi/g	KAFB Analysis^{b,c} pCi/g	NRC/Licensee Agreement?^d
TS8 NRC-1	16000	1.95 ± 0.15	none	n/a
TS8 NRC-2	18000	1.01 ± 0.08	none	n/a
TS8 NRC-3	38000	9.18 ± 0.59	8.3 ± 1.30	Yes
TS8 NRC-4	38000	14.7 ± 1.00	12.7 ± 1.9	Yes
TS8 NRC-5	18000	3.59 ± 0.24	none	n/a
TS8 NRC-6	20000	5.32 ± 0.39	none	n/a
TS8 NRC-7	12000	0.92 ± 0.08	none	n/a
TS8 NRC-8	18000	4.29 ± 0.31	none	n/a
TS8 NRC-9	24000	7.25 ± 0.47	5.8 ± 0.88	Yes
TS8 NRC-10	20000	5.17 ± 0.34	none	n/a
TS8 NRC-11	14000	1.70 ± 0.13	none	n/a

^a Sample ID are designated locations on the licensee's global positioning system grid.

^b Background was not subtracted from these values.

^c Uncertainty represents the 95 percent confidence level, based on total propagated uncertainties.

^d Agreement status was determined using NRC Inspection Procedure 84525.

Table 9
Concentrations of Uranium and Thorium Isotopes In Soil Samples
by Alpha Spectroscopy As Reported by ORISE
Kirtland Air Force Base OT-10 Sites

ESSAP Sample ID	NRC Region IV Sample ID	Radionuclide Concentrations ^a (pCi/g dry weight)							
		U-234	U-235	U-238	Total U ^b	Th-230	Th-228 ^c	Th-232 ^c	Total Th ^d
893S003	TS5 NRC-3	1.25 ± 0.13 ^e	0.06 ± 0.02	1.38 ± 0.14	2.69 ± 0.19	1.67 ± 0.16	8.02 ± 0.63	7.29 ± 0.57	15.31 ± 0.85
893S006	TS5 NRC-6	1.10 ± 0.12	0.05 ± 0.02	1.12 ± 0.12	2.27 ± 0.17	1.58 ± 0.16	4.97 ± 0.41	4.92 ± 0.41	9.89 ± 0.58
893S006	TS5 NRC-11	1.02 ± 0.11	0.04 ± 0.03	1.01 ± 0.11	2.07 ± 0.16	1.33 ± 0.14	6.15 ± 0.50	2.95 ± 0.26	9.10 ± 0.56
893S006	TS5 NRC-13	0.94 ± 0.10	0.04 ± 0.02	1.03 ± 0.11	2.01 ± 0.15	1.39 ± 0.15	5.83 ± 0.48	3.84 ± 0.33	9.67 ± 0.58
893S006	TS5 NRC-15	1.07 ± 0.12	0.03 ± 0.02	1.03 ± 0.11	2.12 ± 0.16	1.36 ± 0.14	4.00 ± 0.33	3.48 ± 0.29	7.48 ± 0.44
893S006	TS6 NRC-2	0.98 ± 0.12	0.04 ± 0.02	1.07 ± 0.12	2.10 ± 0.17	1.17 ± 0.13	3.43 ± 0.30	3.10 ± 0.27	6.53 ± 0.40
893S006	TS6 NRC-3	0.87 ± 0.10	0.04 ± 0.02	0.88 ± 0.10	1.79 ± 0.14	0.94 ± 0.11	1.46 ± 0.15	1.15 ± 0.12	2.61 ± 0.19
893S006	TS6 NRC-8	1.79 ± 0.17	0.06 ± 0.03	1.74 ± 0.17	3.59 ± 0.25	2.56 ± 0.23	8.14 ± 0.63	13.3 ± 1.0	21.4 ± 1.20
893S006	TS8 NRC-3	1.23 ± 0.13	0.06 ± 0.03	1.26 ± 0.13	2.55 ± 0.19	1.37 ± 0.14	10.63 ± 0.83	4.75 ± 0.40	15.38 ± 0.92
893S006	TS8 NRC-4	2.22 ± 0.20	0.11 ± 0.03	2.25 ± 0.20	4.59 ± 0.29	2.46 ± 0.23	18.3 ± 1.40	15.5 ± 1.2	33.8 ± 1.80
893S006	TS8 NRC-6	1.57 ± 0.16	0.10 ± 0.03	1.68 ± 0.17	3.35 ± 0.23	2.23 ± 0.20	6.67 ± 0.52	8.07 ± 0.62	14.74 ± 0.81
893S006	TS8 NRC-7	1.04 ± 0.12	0.05 ± 0.03	1.10 ± 0.12	2.19 ± 0.17	1.24 ± 0.14	1.39 ± 0.15	1.34 ± 0.14	2.73 ± 0.21

^aThe average MDC for thorium isotopes is 0.03 pCi/g and for uranium isotopes is 0.02 pCi/g.

^bTotal uranium is the sum of U-234, U-235, and U-238.

^cTh-228 and Th-232 concentrations indicate a possible environmental process causing disequilibrium.

^dTotal thorium is the sum of Th-228 and Th-232.

^eUncertainties represent the 95 percent confidence level, based on total propagated uncertainties.

Thorium-228 was not used as a radionuclide for determining release criteria in the licensee's approved DP. However, thorium-228 was applied in the analytical agreement test and statistical comparison to determine the licensee's laboratory analytical capability to make consistently accurate radioactivity measurements under normal conditions.

The licensee's DP contained the considerations for developing derived concentration guideline levels (DCGLs). The approved DP used a DCGL of 5.9 pCi/g thorium-232 in soils as the release criteria. Section 5 of the DP allowed for area factors for the elevated measurement comparison (EMC). The "modifying area only" is the most conservative and has been adopted for the OT-10 Site decommissioning for the smallest elevated areas (1-square meter). Table 5-3 of Section 5 of the DP allowed the licensee to use a multiple of the DCGL of 3.65 for an area of 1-square meter. Assuming 100 percent area coverage, the allowable DCGL using this method was 21.7 pCi/g averaged over 1-square meter. Therefore, the limit for an area of 1-square meter using the area factor of 3.65 (multiple of the DCGL) was 21.7 pCi/g for thorium-232.

The NRC's results for thorium-232 concentrations in soil ranged from 0.97 to 15.5 pCi/g. Thorium-228, concentrations ranged from 0.92 to 18.3 pCi/g. The background concentration established in the licensee's DP for thorium-232 collected from an un-impacted reference area was 0.91 pCi/g. The NRC collected a soil sample from the same background reference area establishing a background level of 1.04 pCi/g. See NRC Inspection Report 030-28641/03-003, Section 2. Some of the sample results were within the variability of background. The analytical agreement test provided in NRC Inspection Procedure 84525, "Quality Assurance and Confirmatory Measurements for In-Plant Radiochemical Analysis," was used to compare the licensee's and NRC's soil sample results. As noted in the tables above, all but two results were in agreement for thorium-232. A total of four sample results failed the agreement test; however, these samples were below the thorium-232 release criteria. Therefore, the disagreements between the licensee's results and those of the NRC were not a significant concern. Based on the NRC's gamma spectroscopy results, the NRC's alpha spectroscopy results, and the licensee's results, no samples exceeded the limit for thorium-232.

1.3 Conclusions

The inspector noted that the licensee had performed decommissioning activities in accordance with the licensee's approved DP, the implementing work plan, and the provisions of 10 CFR Part 30. During remediation activities, the Permittee conducted remedial action support surveys to ensure removal of contaminated soils exceeding the modified criteria.

Independent confirmatory radiological surveys were performed by the inspector. Results of confirmatory surveys within Training Sites TS5, TS6, TS7, and TS8 were consistent with measurements taken by the licensee. Direct measurements for gross alpha contamination and surface swipes for removable contamination were taken from Bunker Building 28010. Forty-nine soil samples were collected by the NRC from the OT-10 Site. Fifteen samples were split for analysis by both the licensee's and NRC's independent laboratories for confirmatory analysis and comparison of results. The inspector determined that the licensee's laboratory quality assurance and quality control requirements were being met.

A statistical comparison made by the NRC inspector of the licensee's and NRC's soil sample results determined that all but four results were in statistical agreement. Although four of the split soil sample results failed the NRC's test of analytical comparison with the licensee's results for thorium-232 and thorium-228, these samples were determined by the NRC inspector to be below thorium-232 release criteria levels. Therefore, the disagreement between the licensee's results and those of the NRC were not a significant concern. The NRC's confirmatory measurements supported the licensee's determination that thorium-232 concentrations, in soils, met the release criteria established in the DP.

2 Exit Meeting Summary

The inspection results were presented to representatives of Kirtland Air Force Base staff at the conclusion of each of the onsite inspections through a preliminary exit briefing. A final exit briefing was conducted telephonically on April 14, 2004. Permittee representatives acknowledged the findings as presented. The representatives did not identify any information reviewed by the NRC inspector as being proprietary information.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Department of the Air Force, Kirtland Air Force Base

C. Lanz, Chief, Restoration Section
J. Poland, Director, Environmental Management
J. Sillerud, Project Manager

MWH Americas, Inc.

J. Johnson, Project Manager
C. Timm, HP Technician
C. Whitmann, HP Technician

ERG

K. Baker, Site Radiation Safety Officer, ERG
N. Johnson, ERG

INSPECTION PROCEDURES USED

IP 83890 Close-Out Inspection and Survey

ITEMS OPENED, CLOSED AND DISCUSSED

None

Discussed

None

LIST OF ACRONYMS USED

DP	decommissioning plan
DCGL	derived concentration guideline levels
pCi/g	picocuries per gram
EMC	elevated measurement comparison
Lt	Lieutenant