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RESULTS OF THE INDEPENDENT VERIFICATION OF RADIOLOGICAL REMEDIAL ACTION AT 496 SOUTH MAIN STREET, MONTICELLO, UTAH (MS00050)

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CONTENTS

LIST OF TABLES

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ABSTRACT

In 1980 the site of a vanadium and uranium mill at Monticello, Utah, was accepted into the U.S. Department of Energy's (DOE's) Surplus Facilities Management Program, with the objectives of restoring the government-owned mill site to safe levels of radioactivity, disposing of or containing the tailings in an environmentally safe manner, and performing remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material resulting from mill operations. During 1984, UNC Geotech, the remedial action contractor designated by DOE, performed remedial action on the vicinity property at 496 South Main Street, Monticello, Utah. The Pollutant Assessments Group (PAG) of Oak Ridge National Laboratory was assigned the responsibility of verifying the data supporting the adequacy of remedial action and confirming the site's compliance with DOE guidelines. The PAG found that the site successfully meets the DOE remedial action objectives. Procedures used by PAG are described.

RESULTS OF THE INDEPENDENT VERIFICATION OF RADIOLOGICAL REMEDIAL ACTION AT 496 SOUTH MAIN STREET, MONTICELLO, UTAH (MS00050)*

INTRODUCTION

The mill at Monticello, Utah, was built in 1942 by the U.S. government through the Defense Plant Corporation to provide vanadium during World War II. Various government agencies operated the mill until 1947. In 1948 the Atomic Energy Commission (AEC) obtained the mill and operated it under contract through 1959 to provide both uranium and vanadium. Mill operations were terminated on January 1, 1960. In 1961 the mill tailings piles were leveled and graded, covered with rock and soil, and seeded with native grasses. During 1974 and 1975, the ore stockpiles were removed from the site, and the mill foundations were buried.

The Monticello mill site is a 78-acre tract along Montezuma Creek, south of the city of Monticello, in San Juan County, Utah. The site is bordered on the south and southeast by land held by the U.S. Bureau of Land Management. Other boundaries are the city of Monticello and private property.

During the AEC era, the mill processed approximately one million tons of uranium ore. Vanadium and uranium were the only substances extracted in the milling process. Other constituents of the ore remained in the tailings and were not separated prior to disposal. During the years of active mill operation, the mill tailings were normally moist, so erosion was minimal. However, throughout the mill's operating period, area residents used these tailings as fill material and as aggregate in mortar and concrete.

Under the authority of the Atomic Energy Act, the U.S. Department of Energy (DOE) initiated the Surplus Facilities Management Program (SFMP) in 1978 to ensure the safe caretaking and decommissioning of government facilities that had been retired from service but still had radioactive contamination. In 1980 the mill site at Monticello was accepted into the SFMP, and the Monticello Remedial Action Project (MRAP) was established to restore the government-owned mill site to safe levels of radioactivity, to dispose of or contain the tailings in an environmentally safe manner, and to perform remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material resulting from mill operations. The Monticello mill site and the tailings remain in the custody of the DOE Grand Junction, Colorado, Projects Office. In 1983 remedial

*The verification of remedial action was performed by members of the Pollutant Assessments Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc.

actions for vicinity properties were separated from MRAP with establishment of the Monticello Vicinity Properties (MVP) Project.[1]

During 1984, UNC Geotech, the remedial action contractor (RAC) designated by DOE, performed remedial action on the vicinity property that is the subject of this report, a privately owned multiple residence located at 496 South Main Street, Monticello, Utah. The remedial action plan required excavation of all exterior contamination. When the excavation was completed, the property was resurveyed, including soil sampling, to ensure the removal of all contamination, backfilled with uncontaminated material, and restored to its original condition.[2]

The DOE adopted a policy to assign an independent contractor to verify the data supporting the adequacy of remedial action and to confirm the site's compliance with DOE guidelines. The Pollutant Assessments Group (PAG) of Oak Ridge National Laboratory (ORNL) has been assigned the responsibility of this task at the 496 South Main Street site. This report describes the methods and results of that verification.

PROCEDURES

Objective

The objective of the verification activities was to confirm (1) that available documentation adequately and accurately describes the post-remedial-action radiological conditions of the entire property that is to be certified and (2) that the remedial action reduced contamination to within applicable DOE guidelines.

Document Reviews

Review of the property completion report prepared by UNC Geotech[2] indicates the property was evaluated by the DOE on the basis of Environmental Protection Agency standards[3] and that excess residual radioactive materials were present. Thus it was appropriate to designate this property for remedial action.

The pre-remedial action survey performed by UNC Geotech identified 26.8 m^3 (35 yd^3) of mill tailings 15 to 23 cm (6 to 9 in.) deep. However, during the actual removal process, some residual radioactive material was left in place to avoid damage to a mature tree. A total of 113 m^3 (148 yd^3) of contaminated earth and uranium mill tailings, 15 to 91 cm (6 to 36 in.) deep, were removed.

A post-excavation survey performed by UNC Geotech, consisting of a surface gamma scan with a scintillometer and soil sampling, was performed prior to backfilling of the excavated area. Soil samples were collected at the locations of the highest gamma exposure rate measurements and blended to form one composite soil sample representative of the designated areas.

VERIFICATION OF REMEDIAL ACTION

All measurements presented in this report are gross readings. Background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations in soil samples. Applicable DOE guidelines for protection against radiation are given in Table 1.

Gamma Measurements

Surface gamma exposure rate measurements taken by UNC Geotech from the excavated areas prior to backfilling ranged from 8 to 17 μR/h. During the post-restoration radiological survey, it was noted that an area of ~10 m^2 (surrounding UNC Geotech grid point 132282) exceeded 30% above-background gamma exposure rate. A soil sample was taken from this area, and the ^{226}Ra concentration was found to be within guidelines. Interpretation of the data indicated that either surface contamination did not exist or that the source (presumably a small piece of uranium ore) was too small to pin point with a scintillometer.

Soil Sample Analysis

Three soil samples were taken by UNC Geotech from the excavated area prior to backfilling. These samples were taken at the locations of the highest gamma exposure rates and were blended to form one composite soil sample representative of the designated areas. Analysis by UNC Geotech of this composite sample revealed a ^{226}Ra concentration of of 3.1 pCi/g, which is well within the guideline values for surface and subsurface soils (5 and 15 pCi/g, respectively) given in Table 1. An additional surface composite sample (ORNL sample No. X4, Table 2) was taken at the location of the highest gamma exposure rate measurement. This sample revealed a ^{226}Ra concentration of 2.2 pCi/g, which is within the guidelines given in Table 1. The UNC Geotech soil samples were obtained by ORNL PAG, and a confirmatory analysis was performed. Results of UNC Geotech and ORNL soil sample analyses are given in Table 2.

Radon Measurement Results

Radon decay-product concentration measurements for this site were determined by the alpha-track method. To monitor radon levels, UNC Geotech placed three Terradex Track Etch® detectors in the basement of the house for a period of approximately one year (from 1-29-86 to 2-18-87). The average annual working level (WL) of radon progeny concentration, as determined by the Terradex Corporation, was 0.024. Because no residual uranium tailings were found inside the building, this radon level was attributed to naturally occurring radioactive elements commonly found in building materials.

®Track Etch is a registered trademark of Terradex Corporation.

CONCLUSION

Results of UNC Geotech soil sample analysis and confirmatory split soil sample analysis by ORNL show that radionuclide concentrations are within applicable DOE guidelines.

Based upon the results of the post-remedial-action data, which are confirmed by the verification assessment data, these radiological measurements fall below the limits prescribed by DOE guidelines. It is concluded that the site successfully meets the DOE remedial action objectives.

REFERENCES

1. M. W. Smuin, D. B. Ertel, and H. A. Pfuderer, *Verification of Remedial Actions on Vicinity Properties in Monticello, Utah,* Oak Ridge National Laboratory, ORNL–6556 (Draft), May 1989.

2. UNC Geotech, *Property Completion Report for Monticello Vicinity Property Remedial Action for DOE ID NO: MS-00050-RM, Address: 496 South Main Street, Monticello, Utah 84535,* UNC Geotech, Grand Junction, Colorado, October 1987.

3. *Guidelines for Residual Radioactivity at Formerly Utilized Sites, Remedial Action Program and Remote Surplus Facilities Management Program Sites,* Rev. 2, U.S. Department of Energy, March 1987.

Table 1. Applicable guidelines for protection against radiation

Mode of exposure	Exposure conditions	Guideline value
Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels, averaged over a 100-m^2 area ^{226}Ra	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm-thick soil layers more than 15 cm below the surface
Exposure to ^{222}Rn progeny	Average annual radon progeny concentration (including background)	0.03 WL

Source: Adapted from *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites,* Rev. 2, U.S. Department of Energy, March 1987.

Table 2. Results of ORNL analysis of UNC Geotech soil samples from 496 South Main Street, Monticello, Utah (MS00050)

ORNL sample No.[a]	UNC Geotech sample No.[b]	Depth (cm)	^{226}Ra concentration (pCi/g)	
			ORNL	UNC Geotech
X1	MMU026	15–30	1.2	[c]
X2	MMU027	15–30	4.2	[c]
X3	MMU028	15–30	2.6	[c]
X4	MMU049[d]	0–15	2.1	2.2

[a]An X-type sample is a split of the sample taken by the remedial action contractor.

[b]Three individual soil samples were taken by UNC Geotech and blended to form one composite soil sample representative of the designated areas.

[c]The average concentration of ^{226}Ra for the three individual UNC Geotech soil samples was 3.1 pCi/g. The ORNL comparative analysis resulted in an average concentration of 2.7 pCi/g.

[d]An individual surface soil sample was taken by UNC Geotech at the location of the highest gamma exposure rate measurement.