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Results of the Radiological and Beryllium Verification Survey at the Sacandaga Site, Glenville, New York (SY002V)

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ABSTRACT

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an independent verification radiological and non-radioactive beryllium survey at the Sacandaga site, located on Sacandaga Road, Glenville, New York following limited remediation of the site by Allwash of Syracuse, Inc. At the time of this survey, only building P was still standing. A small concrete structure at the east end of the property had been demolished and the debris hauled away, leaving only a pit. The purpose of the survey, conducted between April and August 1993, was to confirm the success of the remedial actions performed to remove any beryllium concentrations or radioactive materials in excess of the identified guidelines. The verification survey included surface gamma scans and gamma readings at 1 meter indoors and outdoors, alpha and beta scans inside building P, and the collection of soil, dust and debris samples and smears for radionuclide and beryllium analyses.

Results of the survey demonstrated that all radiological and beryllium measurements on the property were within applicable DOE guidelines. Based on all data collected, the Sacandaga Site, Glenville, New York, conforms to all applicable radiological and non-radioactive beryllium guidelines established for this site by DOE and approved by the State of New York.

RESULTS OF THE RADIOLOGICAL and BERYLLIUM VERIFICATION SURVEY at the SACANDAGA SITE, GLENVILLE, NEW YORK (SY002V)*

INTRODUCTION

The Sacandaga site, located on Sacandaga Road, Glenville, New York, was operated by the General Electric Company for the Atomic Energy Commission (AEC) between 1947 and 1951. AEC-sponsored research at the site involved physics studies and sodium technology development in support of breeder reactor design and other AEC programs. Work was also conducted using non-radioactive beryllium. The general location of the site is shown in Fig. 1.

It is the policy of the U.S. Department of Energy (DOE) to verify that environmental conditions related to DOE activities at formerly used sites and facilities comply with current DOE guidelines. At the request of the Office of Naval Reactors through the Office of Remedial Action and Waste Technology, a site visit and preliminary scoping survey of the portion of the site that had contained the process and associated service buildings (5-6 acres) was conducted by Oak Ridge National Laboratory in July 1988.¹ When the survey was conducted, building P (the former critical facility building) and a small concrete structure at the east end of the property were the only aboveground structures still standing. Figure 2 is a diagram of the site showing the relative locations of building P and the small concrete structure. In order to provide a more comprehensive assessment of the site, it was recommended that a second survey including subsurface investigations be conducted. A radiological characterization survey covering about 10 acres of the site was performed between August and October 1989.² Based on the results of that survey, a supplementary survey for beryllium was conducted within the small concrete structure in February 1991.² Additional beryllium sampling in building P was performed in April 1993. Representatives of the New York State Departments of Environmental Conservation and Health also participated in the site characterization studies.

Survey results indicated that no detectable residual radioactivity from former Sacandaga site research operations was present. All radiation levels and radionuclide concentrations were within DOE guidelines. Although concentrations of beryllium in samples from across the site were consistent with natural background levels, residual beryllium was found in samples of the gravel floor and subfloor soil from within the small concrete structure. Although there is no explicit Occupational Safety and Health Administration standard for allowable areal concentrations of beryllium, the concentration of beryllium identified in the small concrete structure exceeded the site specific guidelines which were developed (Table 1), and limited remedial action was planned.³

Remedial actions at the site, which included removal of the small concrete structure, were conducted and completed in August 1993 by Allwash of Syracuse, Inc.⁴ Samples

*The survey was performed by members of the Measurement Applications and Development Group of the Health Sciences Research Division of Oak Ridge National Laboratory under DOE contract DE--AC05-84OR21400.

were taken to demonstrate that the residual beryllium had been removed. In keeping with the DOE policy to assign an independent verification contractor, concurrent with the remedial actions, ORNL performed an independent survey to confirm the success of the remedial actions. Soil samples were taken in the vicinity of the former small concrete structure and outside of building P. Additionally, radiological surveys were conducted inside building P in areas that became accessible as a result of the remedial actions. This report describes the verification survey and documents the results.

VERIFICATION PROCEDURES

OBJECTIVES

The objective of the verification activities was to confirm that the remedial action reduced beryllium levels to within the DOE guidelines. In addition, radiological surveys were conducted in areas made accessible by the remedial activities to confirm that these areas also met DOE guidelines. Applicable guidelines, which were established by the DOE and approved by New York State, are shown in Table 1.

SURVEY METHODS

The post-remedial action survey was performed on this property as described for a generic site.⁵ This survey consists of ground-level beta-gamma measurements, surface gamma measurements, and systematic soil and miscellaneous material sampling.

Using a portable gamma scintillation meter, ranges of measurements were recorded for areas of the property surface and one meter above the surface, as well as inside the structure. To assure identification of any possible remaining beryllium following cleanup, visual inspection of surfaces for lingering dirt and/or dust accompanied the survey activities. Smears and/or samples of dust and debris were collected at systematic locations.

Systematic soil samples were obtained from an area outside the northwest corner of building P and from established grid coordinates in the small concrete structure area (Fig. 3).

The following procedures were performed to assess the success of the beryllium cleanup activities and for the additional radiological surveys:

Beryllium

- visual inspections for dust on all indoor surfaces;
- collection and analysis of smears and miscellaneous samples on selected building P surfaces including walls, floors, and beams;
- collection of soil and debris samples at the small concrete structure site, now excavated.

Radiological

- alpha and beta-gamma scans of all structural areas, including areas previously inaccessible;
- Radiological surface measurements near the soil surfaces in the hole remaining after demolition of the small concrete structure prior to backfilling;
- collection and analysis of smears taken from selected areas inside building P to determine radionuclide content;
- collection and analysis of soil samples taken from areas outside building P and in the excavated small concrete structure area.

VERIFICATION SURVEY AND ANALYSIS

Typical background radiation levels for the Glenville, New York, area are listed in Table 2. The data are provided for purposes of comparison with the survey results presented in this section.

Direct measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background radiation levels have not been subtracted from radionuclide concentrations measured in environmental samples.

RADIOLOGICAL SURVEY RESULTS

Building P

Indoors: Following the removal of all equipment and miscellaneous materials inside, a general gamma scan was conducted of the interior concrete room and covered port area. The survey included alpha, gamma, and beta-gamma scans, as well as smears of the rail supports, ceiling and "I" beams, walls and floors. One elevated measurement was found in a spot on the floor near the north wall. This spot was within applicable DOE guidelines; however, consistent with the principle of ALARA (as low as reasonably achievable), it was remediated by chipping up the concrete, and verified as clean by ORNL during this survey (see Fig. 4).

The gamma scan resulted in measurements ranging from 6-11 $\mu\text{R/h}$ both at the surface and at one meter inside building P (Fig. 4). These values are comparable to the background levels recorded for the area (Table 2).

Smears were taken from the floors, walls, and ceiling beams, and counted for alpha and beta radioactivity. No structural transferable alpha or beta-gamma radioactivity above guidelines was observed. Maximum transferable activities of 40 dpm/100 cm^2 beta-gamma, and 6 dpm/100 cm^2 alpha were measured in smears taken from inside the structure. All activities are well below DOE guidelines for surface radioactivity levels of 1000 dpm/100 cm^2 transferable uranium alpha or beta-gamma activity (Table 1).

Some of these smears, identified as sample numbers VT200-VT208, were also analyzed for beryllium as discussed below.

Outdoors: Elevated gamma readings at the northeast corner on the outside of the building were reported by the State of New York. Surface and auger samples taken earlier by ORNL from this area, when analyzed, indicated natural background levels. The area was a mound of debris which appeared to contain chips of local shale (Fig. 4). Gamma readings of 15-18 $\mu\text{R/h}$ were measured by ORNL in the area, a measurement probably influenced by the presence of the shale.

Three soil samples (VS225-VS227) were taken at 6 inch intervals in the mound of debris at the northeast corner of building P (Fig. 4) and analyzed for uranium, radium and thorium. Radionuclide concentrations of ^{238}U in both surface and subsurface soil ranged from 1.5 to 1.9 pCi/g. These concentrations are well below DOE guidelines for this site and are comparable to background concentrations for the area (Table 1). Concentrations ranging from 1.2 to 1.4 pCi/g for ^{226}Ra , and from 1.2 to 1.6 pCi/g for ^{232}Th are also comparable to background concentrations.

Small Concrete Structure Area

The small concrete structure had been demolished and debris and all soil exceeding beryllium guidelines had been removed. Grid coordinates were established for scanning and sampling the soil in and around the pit left in the excavated area ($\sim 3600 \text{ ft}^2$).

Gamma levels in the area ranged from 9-20 $\mu\text{R/h}$ at one meter above the excavated area. In a general surface scan of the pit, gamma ranges were from 12-24 $\mu\text{R/h}$ from the bottom of the pit to the rim of soil at the top (Fig. 3). A maximum of 30 $\mu\text{R/h}$ was measured on contact with the walls. These values are typical of those found previously and are identified in association with a material resembling coal ash. Coal ash, as well as many other natural substances, typically exhibits elevated gamma exposure rates when compared to surrounding soils. The results of radionuclide analysis of the soil samples (see below) substantiate the probability of a source for the general elevations other than Sacandaga site research operations (i.e., naturally occurring ^{40}K ; an elevated range of 15 to 32 pCi/g ^{40}K was also measured in the samples).

Soil samples were systematically taken from the gridded area of the small concrete structure and analyzed for radionuclide concentrations. The maximum concentrations (surface and subsurface samples) for ^{226}Ra and ^{232}Th were 1.9 pCi/g and 1.8 pCi/g respectively. Both are comparable to background values for the area. A maximum of 2.5 pCi/g was measured for ^{238}U , also comparable to background levels and well below DOE guidelines for this site. Analytical results are listed in Table 3, and sample locations are shown on Fig. 3.

BERYLLIUM SURVEY RESULTS

Building P

Analysis of the smears that were taken in April 1993 from inside building P indicated non-radioactive beryllium concentrations that were below, but close to guideline values. Therefore, on the basis of the ALARA policy, remediation of the surfaces within the structure was conducted by Allwash of Syracuse, Inc. and additional sampling was

done in August. Table 4 shows the results from both sampling intervals.

In August, another visual inspection was conducted for dust within the building, as well as the collection of smears and samples from all surfaces including those from previously inaccessible areas. Beryllium concentrations in the smears ranged from 0.45 to 0.85 $\mu\text{g}/\text{ft}^2$. These values are well below the guidelines for beryllium in dust. Fig. 4 shows the approximate location of the sampling in building P. Results of the analysis indicate beryllium content below the guidelines for beryllium in dust (2 $\mu\text{g}/\text{ft}^2$) and soil/debris (13 $\mu\text{g}/\text{g}$). See Table 1 for identified guidelines for the Sacandaga site.

Small Concrete Structure Area

Soil samples were taken within the gridded area of the excavated small concrete structure and analyzed for residual beryllium in addition to the analysis for radionuclides. Each sample was split into two parts and given odd and even numbers. The odd numbered samples were analyzed for beryllium only. Results of analysis are detailed in Table 4. Beryllium concentrations ranged from 0.62 $\mu\text{g}/\text{g}$ to 3.2 $\mu\text{g}/\text{g}$ in these samples. Natural beryllium in soil concentrations average from 0.6 to 6.0 $\mu\text{g}/\text{g}$ as reported in several soil geochemistry surveys. The maximum concentration was found in sample VS214 (taken from the excavated pit) as shown in Table 4 and located on Fig. 3. All of the samples were well below the guidelines for concentrations of beryllium in soil of 13 $\mu\text{g}/\text{g}$.

OVERCHECKS BY NEW YORK STATE

Representatives of the New York State Departments of Environmental Conservation and Health conducted additional independent overcheck surveys on August 27 and September 1, 1993, respectively, for residual radioactivity and beryllium. The results of these surveys showed no radioactivity above natural background levels and all beryllium concentrations were well below the established criteria.⁶

CONCLUSION

Results of this independent verification survey confirm that no detectable residual radioactivity from former research operations remain at the Sacandaga site. All radiation levels and radionuclide concentrations are consistent with radionuclide concentrations typical of natural soil and coal ash and are well below DOE guidelines established for this site.

The results of this survey also confirm that the concentration of non-radioactive, elemental beryllium at the site following remediation is well below DOE guidelines established for the site. All measured concentrations of beryllium in outdoor soil and indoor dust/debris were within the range of natural beryllium in soil and below guidelines established for the site.

Based on all data collected, the Sacandaga Site, Glenville, New York, conforms to all applicable radiological and non-radioactive beryllium guidelines established for the site by the DOE and approved by the State of New York.

REFERENCES

1. W. D. Cottrell, R. D. Foley, and R. F. Carrier, *Preliminary Site Survey Report for the Sacandaga Site, Glenville, New York*, ORNL/RASA-88/102, Martin Marietta Energy Systems, Inc., Oak Ridge Natl Lab., March 1989.
2. R. D. Foley, W. K. Cottrell, R. F. Carrier, *Results of the Radiological Survey at the Sacandaga Site, Glenville New York*, ORNL-6638, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., August 1992.
3. U.S. Department of Energy, *Remedial Action Plan for Sacandaga Site, Glenville, New York*, August 1992.
4. Knolls Atomic Power Laboratory, Inc., *Post Remedial Action Report for the Sacandaga Site Property in Glenville, New York*, KAPL-4804, August 1994.
5. T. E. Myrick, B. A. Berven, W. D. Cottrell, W. A. Goldsmith, and F. F. Haywood, *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program*, ORNL/TM-8600, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., April 1987.
6. New York State Department of Environmental Conservation, correspondence from Merges to A.R. Seepo, U.S. Department of Energy, Radiological/Environmental Control and Safety Division, Schenectady, New York, February 1994.

Fig. 1. Diagram showing general location of the Sacandaga site, Glenville, New York.

Fig. 2. Diagram showing the relative locations of building P and the small concrete structure site at the Sacandaga site, Glenville, New York

Fig. 3. Diagram of the gridded area over the excavated small concrete structure site, Sacandaga site, Glenville, New York. Soil samples and gamma measurements are shown. Even numbered samples were analyzed for radionuclides, odd for beryllium.

Fig. 4. Diagram of building P at the Sacandaga site, showing gamma measurements and smear and soil sampling locations.

Table 1. Applicable Guidelines for the Sacandaga site

Mode of exposure	Guideline value
^{238}U in soil	35 pCi/g
^{238}U in indoor dust, removable alpha activity	1000 dpm/100 cm ²
^{238}U indoors as fixed plus removable alpha surface contamination	5000 dpm/100 cm ²
^{238}U in air	2×10^{-12} $\mu\text{Ci/mL}$
Beta-gamma dose rate at 1 cm from the surface averaged over not more than 1m ² area	0.2 mrad/h
Maximum beta-gamma dose rate at 1 cm from the surface over any 100-cm ² area	1.0 mrad/h
Gamma exposure rate indoors at 1 m above the surface above background	20 $\mu\text{R/h}$
Beryllium in removable surface dust	2 $\mu\text{g/ft}^2$
Beryllium in air	
• 8-hr average	2 $\mu\text{g/m}^3$
• acceptable ceiling	5 $\mu\text{g/m}^3$
• never to be exceeded	25 $\mu\text{g/m}^3$
Beryllium in soil	13 $\mu\text{g/g}$
^{137}Cs in soil	34 pCi/g

Table 2. Background radiation levels and concentrations of selected radionuclides in soil samples taken from the Glenville, New York area

Type of radiation measurement or sample	Radiation level or radionuclide concentration ^a	
	Range	Average
Gamma exposure rate at ground surface ($\mu\text{R/h}$) ^a	—	10
Gamma exposure rate at 1 m above floor or ground surface ($\mu\text{R/h}$) ^b	8-10	9
Concentration of radionuclides in soil (pCi/g dry wt) ^a		
²²⁶ Ra	0.83-0.98	0.93
²³² Th	0.81-0.95	0.89
²³⁸ U	0.94-1.3	1.2

^a Values and soil samples (SY075-SY077) were obtained from three undisturbed locations near the Sacandaga site in Glenville.²

^b Exposure rates obtained from four locations in the Albany area (ORNL/RASA-87/117, Feb 1988).

Table 3. Concentrations of radionuclides and beryllium in soil samples from the Sacandaga site

Sample number ^a	Depth (cm)	Radionuclide concentration (pCi/g) ^b			Be $\mu\text{g/g}$
		²³⁸ U	²²⁶ Ra	²³² Th	
<i>Small Concrete Structure Samples^c</i>					
VS200	0-15	1.6 $\pm$ 0.4	1.4 $\pm$ 0.2	1.4 $\pm$ 0.3	<i>d</i>
VS201 ^a					1.1
VS202	0-15	1.4 $\pm$ 0.4	1.2 $\pm$ 0.1	1.02 $\pm$ 0.2	<i>d</i>
VS203					0.82
VS204	0-15	2.2 $\pm$ 0.5	1.1 $\pm$ 0.2	1.2 $\pm$ 0.2	<i>d</i>
VS205					0.72
VS206	0-15	<1.5	1.02 $\pm$ 0.1	0.86 $\pm$ 0.2	<i>d</i>
VS207					0.72
VS208	0-15	2.1 $\pm$ 0.8	1.02 $\pm$ 0.1	0.87 $\pm$ 0.2	<i>d</i>
VS209					0.62
VS210	0-15	2.5 $\pm$ 1.0	1.3 $\pm$ 0.2	1.2 $\pm$ 0.2	<i>d</i>
VS211					0.72
VS212	0-15	1.9 $\pm$ 0.4	1.9 $\pm$ 0.2	1.8 $\pm$ 0.4	<i>d</i>
VS213					0.96
VS214	0-15	1.4 $\pm$ 0.5	1.6 $\pm$ 0.12	1.4 $\pm$ 0.2	<i>d</i>
VS215					3.2
VS216	0-15	1.8 $\pm$ 0.8	1.6 $\pm$ 0.1	1.4 $\pm$ 0.2	<i>d</i>
VS217					0.88
VS218	0-15	1.8 $\pm$ 0.5	1.7 $\pm$ 0.1	1.6 $\pm$ 0.2	<i>d</i>
VS219					2.6
VS220	0-15	1.7 $\pm$ 0.3	1.5 $\pm$ 0.2	1.6 $\pm$ 0.3	<i>d</i>
VS221					0.76
VS222	0-15	1.5 $\pm$ 0.4	1.5 $\pm$ 0.2	1.5 $\pm$ 0.3	<i>d</i>
VS223					0.88
VS224	0-15	1.7 $\pm$ 0.7	1.5 $\pm$ 0.1	1.5 $\pm$ 0.2	<i>d</i>

Table 3. (continued)

Sample number ^a	Depth (cm)	Radionuclide concentration (pCi/g) ^b			Be μg/g
		²³⁸ U	²²⁶ Ra	²³² Th	
<i>Outside Building P^c</i>					
VS225A	0-15	1.5 ± 0.4	1.4 ± 0.1	1.6 ± 0.2	<i>d</i>
VS225B	15-30	1.9 ± 0.8	1.3 ± 0.1	1.5 ± 0.2	<i>d</i>
VS225C	30-45	1.6 ± 0.4	1.4 ± 0.1	1.4 ± 0.2	<i>d</i>
VS226A	0-15	1.7 ± 0.4	1.2 ± 0.1	1.2 ± 0.2	<i>d</i>
VS226B	15-30	1.8 ± 0.4	1.4 ± 0.1	1.3 ± 0.2	<i>d</i>
VS227	0-15	1.7 ± 0.4	1.4 ± 0.1	1.4 ± 0.2	<i>d</i>

^aSamples were split and given consecutive even numbers for radionuclide analysis and odd numbers for beryllium analysis. Locations of soil samples from this survey are shown on Figs. 3 and 4.

^bIndicated counting error is at the 95% confidence level ($\pm 2\sigma$).

^cThese are systematic samples taken at locations irrespective of gamma exposure rates.

^dSample not analyzed for beryllium.

Table 4. Samples taken in Building P for the verification of the Sacandaga site showing sample locations and beryllium results

Sample ID ^a	Be (μg/g) (μg)*	Be/area ^b (μg/ft ²)	Location	Location detail
<i>April 1993 samples</i>				
VM001	<0.25	NA	covered port	Crane "I" beam E side
VM002	0.35	NA	covered port	Crane "I" beam W side
VM003	0.36	NA	covered port	Center, crane "I" beam W side
VM004	<0.25	NA	interior room	Center north beam
VT001	<0.20*	<1.8	covered port	E wall, 6 ft from floor, 10 ft from S wall
VT002	<0.20*	<1.8	interior room	Center of S beam
VT003	<0.20*	<1.8	interior room	Hole above door, S wall
VT004	<0.20*	<1.8	interior room	W Wall 6 ft from floor, 3 ft from N wall
VT005	<0.20*	<1.8	West wall (outside)	Hole over drive-in door
VT006	<0.20*	<1.8	covered port	S Wall, center, 6 ft from floor
VT007	<0.20*	<1.8	covered port	N Wall, center, 6 ft from floor
VT008	<0.20*	<1.8	covered port	Tunnel entrance, SE corner
VT009	<0.20*	<1.8	covered port	Center of floor
<i>August 1993 samples</i>				
VT200 ^c	0.11	0.50	covered port	3.5 ft W, 5.5 ft N of SE corner
VT201	0.10	0.45	covered port	Center S wall, 6 ft from floor
VT202	0.10	0.45	covered port	Center E wall, 6.5 ft from floor
VT203	0.10	0.45	covered port	Center N wall, 7 ft from floor
VT204	0.10	0.45	covered port	Center W wall, 7 ft from floor
VT205	0.10	0.45	covered port	Center of floor, 2 ft from E wall
VT206	0.10	0.45	covered port	Rail support, 20 ft from S wall, 14 ft from floor
VT207	0.10	0.45	covered port	Ceiling beam, 20 ft from S wall, 5 ft from W wall
VT208	0.19	0.86	covered port	1 ft S, 6 ft E of NW corner
VM200 (H ₂ O blank)	1.0			
VM201 (equip.rinsate)	1.0			

^aSamples designated "M" are dust or debris; "T" samples are smears. Locations of samples are shown on Fig. 4.

^bConcentrations of beryllium in μg/ft² are calculated using the sample size.

^cSample numbers beginning at VT200 were split and also analyzed for beta-gamma and alpha radioactivity (see text).

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