**INTERIM LETTER REPORT
VERIFICATION SURVEY ACTIVITIES IN
THE VITRIFICATION TEST FACILITY
AT THE WEST VALLEY DEMONSTRATION PROJECT
ASHFORD, NEW YORK**

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DOE CONTRACT NO. DE-AC05-06OR23100

Prepared for the
U.S. Department of Energy

INTERIM LETTER REPORT

APRIL 2009

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INTRODUCTION

In 1961 the state of New York acquired 3,345 acres of land in the town of Ashford, New York, near West Valley, for the Western New York Nuclear Service Center (WNYNSC). The next year Davison Chemical Company established Nuclear Fuels Services, Inc. (NFS) as a reprocessing company, and leased the WNYNSC. NFS developed 200 acres of the land and operated a nuclear fuel reprocessing center from 1966 to 1972. During that time, approximately 640 metric tons of spent reactor fuel was processed. The plant accepted radioactive waste for disposal until 1975. Highly radioactive liquid wastes were generated and stored in an underground waste tank. Fifteen acres were used for disposal of radioactive waste from commercial waste generators and another seven acre landfill was used to dispose of radioactive waste generated from reprocessing.

The WNYNSC encompasses 14 square kilometers (5 square miles) in the town of Ashford, New York, in rural Cattaraugus County, approximately 50 kilometers (30 miles) southeast of Buffalo, New York. In the operational period of West Valley Demonstration Project (WVDP), the Vitrification Test Facility (VTF) was used for mockup testing for the Vitrification Facility. No radiological materials were processed or stored in the VTF. The only indication of radiological source term in the VTF is the occasional nesting of contaminated insects within the building.

OBJECTIVES

The objective of the verification activities was to provide independent radiological surveys and data for use by the Department of Energy (DOE) to ensure that the building satisfies the requirements for release without radiological controls.

PROCEDURES

Verification survey procedures included surface scans, direct measurements, and sampling for removable activity. Surveys were performed in accordance with a site-specific survey plan and the Oak Ridge Institute for Science and Education (ORISE) Survey Procedures and Quality Program manuals (ORISE 2009b, 2008a, and ORAU 2007).

SURFACE SCANS

Alpha and alpha plus beta surface scans were performed on 25% of the lower wall and floors, and in a 1 m² area around each direct measurement taken on the upper walls and ceiling. Particular attention was given to cracks and joints and other horizontal surfaces where material may have accumulated. Surface scans were performed using large-area (Ludlum Model 43-37) and hand-held gas proportional detectors (Ludlum Model 43-68) coupled to ratemeter-scalers (Ludlum Model 2221) with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

Random alpha and alpha plus beta direct measurements were performed at 30 locations in each of the two interior survey units. The upper walls and ceiling were grouped as one survey unit, and the lower walls and floor were another. Screen captures of the VSP generated maps are presented in Figures 2 and 3. Upper walls are defined as wall area above the height of 2 m and lower walls are defined as the wall area between 2 m and the floor. Random measurement locations were pre-generated using the VSP software version 5.1.1. A smear sample was collected from each direct measurement location to determine removable gross alpha and gross beta activity levels (ORISE 2009c).

SAMPLE ANALYSIS AND DATA INTERPRETATION

Construction material specific background measurements were collected from a non-impacted area of the site for correcting gross activity measurements performed on structural survey units. Insulation, metal, and concrete surfaces were used for alpha and alpha plus beta direct measurement backgrounds. An average of ten direct measurements in both alpha and alpha plus beta mode for each material at the background location was used for direct measurement background subtraction.

All data collected onsite were brought back to the ORISE facility for analysis and interpretation. Samples collected for radiological analysis were delivered to the ORISE radiochemistry laboratory in Oak Ridge, Tennessee for analysis. Sample analyses were performed in accordance with the Oak Ridge Institute for Science and Education (ORISE) Laboratory Procedures Manual (ORISE 2009a). Smear samples were analyzed using a low-background proportional counter. Smear sample and direct measurement results are reported in units of disintegrations per minute per one-hundred square centimeters (dpm/100 cm²).

GUIDELINES

Based on past operations involving reprocessing of spent nuclear fuel, a variety of radiological contaminants are of potential concern at WVDP, including beta-gamma emitters (fission and activation products), and alpha-emitters (isotopes of uranium and transuranics). The release limits for surface contamination as promulgated in DOE Order 5400.5 are provided in Table 2 (DOE 1993).

FINDINGS AND RESULTS

Surface scanning indicates one area of elevated surface activity on the inside surfaces of the VTF. A beta emitting radioactive bird nest near sample location S-16 was found (see Figure 3). DOE was informed of the bird nest location and the removal process was started. Table 3 summarizes the results from the Lower Wall and Floor survey unit. Table 4 summarizes the results from the Upper Wall and Ceiling survey unit. Surface type codes are found in Table 1.

During scanning operations at the VTF, an increase in ambient background was noted as scanning elevation was increased. This has been attributed to the gamma shine from a waste storage facility within the vicinity of the VTF. Direct alpha and alpha plus beta measurements indicated no areas exceeding the release criteria. All smear results were also less than the removable activity release

criteria. Weather at WVDP on March 25th and 26th was partly cloudy with afternoon precipitation and a temperature range of 40-50° F.

COMPARISON OF DIRECT MEASUREMENTS AND SMEARS AGAINST THE RELEASE CRITERIA

Groups 1 and 4 in Table 2 were used as release criteria due to the history of the WVDP site. The “Average” limits were used because each direct measurement covered a 100 cm² area and no areas larger than 100 cm² were found to have contamination. Direct measurements were not corrected for elevated background from shine contribution. This results in a conservative approach to guideline comparison.

Figure 1: Vitrification Test Facility Location

Figure 2: Lower Wall and Floor Survey Unit

Figure 3: Upper Wall and Ceiling Survey Unit

Table 1: Scanning Surface Type Codes

Radionuclides	Average
Metal	ME
Insulation	IN
Concrete	CO

Table 2: Allowable Total Residual Surface Activity (dpm/100 cm²)¹

Radionuclides²	Average^{3,4}	Maximum^{5,6}	Removable⁷
Group 1 - Transuranics, I-125, I-129, Ac-227, Ra-226, Ra-228, Th-228, Th-230, Pa-231	100	300	20
Group 2 - Th-natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1,000	3,000	200
Group 3 - U-natural, U-235, U-238, and associated decay products, alpha emitters	5,000	15,000	1,000
Group 4 - Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission ⁸) except Sr-90 and others noted above	5,000	15,000	1,000
Tritium (applicable to surface and subsurface)	N/A	N/A	10,000

¹ As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

² Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

³ Measurements of average contamination should not be averaged over an area of more than 1 m². For objects of smaller surface area, the average should be derived for each such object.

⁴ The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

⁵ The maximum contamination level applies to an area of not more than 100 cm².

⁶ The amount of removable material per 100 cm² of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

⁷ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

⁸ Property recently exposed or decontaminated should have measurements (smears) at regular time intervals to ensure that there is not a build-up of contamination over time. Because tritium typically penetrates material it contacts, the surface guidelines in group 4 are not applicable to tritium.

**TABLE 3: LOWER WALL AND FLOOR SURVEY UNIT
SURFACE ACTIVITY LEVELS
WEST VALLEY DEMONSTATION PROJECT
ASHFORD, NEW YORK
Sample Data for March 25th and 26th 2009**

Survey Unit/ Location	Surface	Total Alpha Activity (dpm/100 cm ²)	Total Beta Activity (dpm/100 cm ²)	Removable Activity (dpm/100 cm ²)	
				Alpha	Beta
1A	CO	-12	-700	2	2
2A	CO	-20	-1200	0	-4
3A	CO	-20	-800	2	-3
4A	CO	-12	-450	0	-2
5A	CO	-4	-220	0	2
6A	CO	-4	-340	0	1
7A	CO	-12	-320	0	-4
8A	CO	-20	-98	0	-2
9A	CO	4	-970	2	1
10A	CO	-20	-900	0	-1
11A	CO	4	-600	2	3
12A	CO	4	-610	0	-3
13A	CO	-28	-170	0	-1
14A	CO	-20	71	0	-1
15A	CO	-12	-35	4	-4
16A	CO	-12	-530	0	1
17A	CO	-20	-760	2	-3
18A	CO	4	-240	2	-4
19A	CO	12	-350	2	-2
20A	CO	-28	100	2	-1
21A	CO	-20	-250	0	-1
22A	ME	-14	290	0	6
23A	ME	2	-370	0	-1
24A	IN	-17	1600	2	4
25A	IN	-17	1100	0	-1
26A	IN	-1	1200	0	8
27A	IN	7	1400	0	-1
28A	ME	2	-380	0	1
29A	IN	-17	-130	0	-3
30A	ME	-22	240	0	-2

**TABLE 4: UPPER WALL AND CEILING SURVEY UNIT
SURFACE ACTIVITY LEVELS***
WEST VALLEY DEMONSTATION PROJECT
ASHFORD, NEW YORK
Sample Data for March 25th and 26th 2009

Location	Surface	Total Alpha Activity (dpm/100 cm ²)	Total Beta Activity (dpm/100 cm ²)	Removable Activity (dpm/100 cm ²)	
				Alpha	Beta
1	IN	-17	150	0	1
2	IN	15	520	0	-2
3	IN	-9	930	0	2
4	IN	-17	1400	0	2
5	IN	15	980	0	2
6	IN	-1	1400	0	-4
7	IN	-9	2200	0	-3
8	IN	-17	2600	0	-2
9	IN	-1	2200	0	1
10	IN	-9	180	0	-3
11	IN	7	1900	0	-2
12	IN	7	3100	4	-1
13	IN	-17	2600	0	-1
14	IN	-1	1100	0	4
15	IN	-9	2800	0	-1
16	IN	-17	2600	0	-4
17	IN	-9	3100	0	1
18	ME	10	17	0	3
19	ME	-6	240	0	5
20	IN	-17	3100	0	2
21	IN	-1	3300	4	-2
22	IN	-1	2900	0	-1
23	IN	-25	2500	0	2
24	IN	15	-300	6	2
25	IN	-1	2800	0	1
26	IN	-9	2900	0	-3
27	IN	7	3200	0	-5
29	IN	-1	3900	0	5
30	IN	15	3000	0	-5
31	IN	-25	2900	2	-3
32	IN	-20	2200	0	1

*Direct measurements not corrected for background contribution from waste storage gamma shine.

REFERENCES

Oak Ridge Associated Universities (ORAU). Quality Program for the Independent Environmental Assessment and Verification Program. Oak Ridge, TN; November 1, 2007.

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