

ORISE  
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

January 28, 1997

Mr. William Snell  
U. S. Nuclear Regulatory Commission  
Region III  
801 Warrenville Road  
Lisle, IL 60532-4351

**SUBJECT: INTERIM LETTER REPORT FOR THE ALLIANT TECHSYSTEMS  
PROVING GROUNDS, ELK RIVER, MINNESOTA (DOCKET NO. 040-  
07982; RFTA NO. 96-41)**

Dear Mr. Snell:

The PBL Range and NW SCAR at the Alliant Techsystems Proving Grounds (ATPG) Site in Elk River, Minnesota, were used as test firing ranges of munitions containing depleted uranium (DU). Tests using DU were initiated in 1979 and completed in 1991. Scientific Ecology Group (SEG) was contracted in 1992 to remediate and perform final radiological status surveys of the PBL Range and NW SCAR as well as other associated areas. During the period from November 1992 through July 1993, SEG removed the contaminated material, decontaminated the ranges, and performed the final radiological status surveys for both ranges. At the request of the U. S. Nuclear Regulatory Commission (NRC), Region III Office, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed independent confirmatory surveys of the PBL Range and NW SCAR, on January 7 and 8, 1997. This survey was conducted in accordance with a site-specific survey plan dated January 6, 1997 (ORISE 1997). Confirmatory survey activities included beta and gamma radiation surface scans, beta surface activity measurements, removable surface activity sampling, soil sampling, and exposure rate measurements.

Surface scans identified two areas of elevated direct beta radiation. Both areas were located within the PBL Range. One area with an activity level of 21,000 dpm/100 cm<sup>2</sup> was located on a piece of wood frame structure near the beginning of the catcher end of the range. The second location was in the catcher end, on the lower wall, approximately 1 meter above the soil surface, within a wall penetration approximately 7.5 centimeters in diameter. The beta surface activity at this location was 5,800 dpm/100 cm<sup>2</sup>. SEG remediated the wood structure by removal of the piece of wood, and the activity within the penetration was evaluated in order to determine the average activity over the contiguous area. The average activity was determined to be 2,800 dpm/100 cm<sup>2</sup>. All remaining surface scans were comparable to natural background activities.

A total of 30 systematic direct measurements for gross beta surface activity, were performed on the floor of the PBL Range Flight Path. Beta surface activity levels ranged from 440 to 2,700 dpm/100 cm<sup>2</sup>. The ESSAP and SEG determined mean activity levels for this area were compared using the

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student t-test. The null hypothesis, based on a 95% confidence level, was that ESSAP's mean was less than SEG's mean, and the student t-test result yielded a satisfactory value for t based on n-1 degrees of freedom. Removable surface activity levels ranged from -2 to 3 dpm/100 cm<sup>2</sup> for gross alpha and from -5 to 3 dpm/100 cm<sup>2</sup> for gross beta.

Background exposure rates were obtained at nine locations from the 100 meter Production Support Range and ranged from 8 to 14  $\mu$ R/h. Exposure rates for the PBL Range and NW SCAR Buildings were performed at six locations and ranged from 8 to 15  $\mu$ R/h.

ESSAP collected a total of ten soil samples. Five were collected from the catcher end of the PBL Range and five from the west end (newly poured concrete area-1995) of the NW SCAR. Samples were analyzed by solid-state gamma spectroscopy for U-238. Results are summarized in Table 1. Uranium-238 concentrations ranged from 0.5 to 45.3 pCi/g and the total uranium levels, based on the licensee's U-238 to total uranium ratio of 1:1.5, were 0.7 to 68.9 pCi/g. In addition, four samples that SEG collected in 1996 as final status samples from the PBL Range catcher end were requested for confirmatory analysis. Results for these samples are also summarized in Table 1. Concentrations in these samples ranged from 22.4 to 29.1 pCi/g and 34.0 to 44.3 pCi/g for U-238 and total uranium, respectively.

Survey results were compared with the following uranium guidelines (NRC 1987):

Total Activity  
5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area  
15,000  $\alpha$  dpm/100 cm<sup>2</sup>, maximum in a 100 cm<sup>2</sup> area

Removable Activity  
1,000  $\alpha$  dpm/100 cm<sup>2</sup>

The primary contaminant at this site, depleted uranium, emits both alpha and beta radiation. Therefore, either alpha or beta activity may be measured for determining the residual uranium surface activity. Because rough or dirty surfaces may selectively attenuate alpha radiation, beta surface activity levels were measured and compared to the guideline values. All final surface activity levels for total and removable surface activity were less than the specified guidelines. In addition, the statistical data evaluation supported the null hypothesis at the 95% confidence level.

The exposure rate guideline, measured at 1 meter from the surface, is 5  $\mu$ R/h above background (NRC 1991). All exposure rates measured in the PBL Range and NW SCAR were less than the specified guideline.

Soil sample results were compared to the guideline of 35 pCi/g for depleted uranium in soil (NRC 1981). For the PBL range, two samples collected by ESSAP and three samples collected by SEG and analyzed by ESSAP were greater than the 35 pCi/g guideline. It should be noted that background uranium levels have not been subtracted from the data. The average total uranium concentration for ESSAP samples from the PBL range was 38.7 pCi/g. The samples collected from

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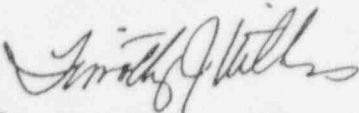
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beneath the concrete of the NW SCAR were all less than the guidelines. However, it was learned after the completion of the confirmatory survey that this area may have been backfilled and that these samples may represent the backfill material, rather than the original soil surface.

Please contact me at (423) 576-3355 or Timothy J. Vitkus at (423) 576-5073 should you have any questions.

Sincerely,

*for* 

Duane R. Quayle  
Assistant Project Leader  
Environmental Survey and  
Site Assessment Program

DRQ:tsf

Enclosure

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TABLE 1

**RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES  
ALLIANT TECHSYSTEMS PROVING GROUNDS  
ELK RIVER, MINNESOTA**

Sample ID	Location	Radionuclide Concentration (pCi/g) <sup>a</sup>	
		U-238	Total U <sup>b</sup>
649S001	PBL Range Catcher End	18.7 ± 1.5 <sup>c</sup>	28.4
649S002	PBL Range Catcher End	45.3 ± 2.6	68.9
649S003	PBL Range Catcher End	20.0 ± 1.5	30.4
649S004	PBL Range Catcher End	26.1 ± 1.8	39.7
649S005	PBL Range Catcher End	17.3 ± 1.3	26.3
649S006	NW SCAR West End	1.0 ± 0.6	1.5
649S007	NW SCAR West End	0.5 ± 0.5	0.7
649S008	NW SCAR West End	0.5 ± 0.5	0.8
649S009	NW SCAR West End	0.5 ± 0.4	0.8
649S010	NW SCAR West End	0.9 ± 0.6	1.3
649S011	SEG Sample ATPG-96-010	29.1 ± 1.9	44.3
649S012	SEG Sample ATPG-96-014	26.2 ± 1.7	39.9
649S013	SEG Sample ATPG-96-025	22.4 ± 1.6	34.0
649S014	SEG Sample ATPG-96-026	23.8 ± 1.6	36.2

<sup>a</sup>Radionuclide concentrations include background activity levels.

<sup>b</sup>Total uranium concentrations were based on a 1:1.5 ratio of U-238 to total uranium.

<sup>c</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

## REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Final Confirmatory Survey Plan for the Alliant Techsystems Proving Grounds, Elk River, Minnesota. Oak Ridge, TN; January 6, 1997.

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U.S. Nuclear Regulatory Commission. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material. Oak Ridge, TN; August 1987.

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