



Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831—8723

February 10, 1995

Redacted - Privacy Act :
8841 Heather Lane
Hazelwood, Missouri 63042

Dear Redacted - Privacy Act ::

ST. LOUIS AIRPORT SITE VICINITY PROPERTIES - POST-REMEDIAL ACTION RESULTS FOR THE PROPERTY AT 8841 HEATHER LANE, HAZELWOOD, MISSOURI

This letter transmits a summary of survey results confirming that remedial action is complete on your property at 8841 Heather Lane, Hazelwood, Missouri. Final sample results for your property are not only well below DOE guidelines, they are also barely distinguishable from natural background concentrations.

Included in this letter are figures showing the approximate sample and direct reading survey locations, tables reporting the radiation instrument survey results, and the analytical results from the samples collected.

As always, if you have any questions or concerns, please call me at (615) 576-9634. Given that much of the information enclosed is fairly technical, I would be happy to arrange for someone to discuss it with you in person once you have reviewed it, if you wish. The final Post Remedial Action Report is anticipated to be completed by the end of 1995. The Oak Ridge Institute of Science and Education, the Independent Verification Contractor will also publish their own report in late 1995.

I would once again like to thank you, on behalf of all the FUSRAP staff, for your patience and cooperation during the process of completing the clean-up of your property.

Sincerely,


David G. Adler, Site Manager
Former Sites Restoration Division

Enclosures

POST-REMEDIAL ACTION SAMPLING AND SURVEY RESULTS
8841 Heather Lane, Hazelwood, MO

To document the completeness of the decontamination of your property the following surveying and sampling activities were performed:

1. Background Samples and Surveys

Before collection of any post-remedial action data, samples and direct instrument readings were obtained from three remote background locations in the general vicinity of your property. Background data serves as a frame of reference for evaluating the data from your property because it presents typical conditions for the areas unaffected by the transportation of material from the St. Louis Airport site. Samples from these areas were analyzed for radium-226, thorium-230, thorium-232, uranium-234, uranium-235 and uranium-238. External gamma radiation exposure rates were also measured. This data is presented in Table 1 and the background locations are shown in Figure 1.

2. Soil Sampling

To confirm that all contamination was removed from your property, samples of the soil remaining after excavation were collected and analyzed for radium-226, thorium-230, thorium-232, uranium-234, uranium-235 and uranium-238. The concentrations of each contaminant in these samples shown in Table 1 was barely indistinguishable from background concentrations.

To collect the post-remedial action samples, one-hundred-square-meter grids were established along the curb of your property. Since the formerly contaminated area was limited to the area immediately adjacent to the road, 6 meter by 16 meter (19.7 ft x 52.5 ft) grids were established along the roadway to collect post-remedial action samples and measurements. Within each grid 30 locations were sampled from the surface down to six inches below the surface, and composited into one sample representing the average for the first six inches of the grid. Figure 2 shows the location of the grids on your property.

The DOE guidelines for residual concentrations of radium-226, thorium-232, and thorium-230 in soil at FUSRAP sites are 5 pCi/g above background when averaged over the first 15 cm (6 in.) of soil below the surface, and 15 pCi/g above background when averaged over any 15 cm (6 in.) thick soil layer below the surface layer. These guidelines do not include naturally occurring background radioactivity in soils near the site. The site-specific guideline for the remediation of uranium-238 is 50 pCi/g. Site-specific guidelines are developed based on the reasonable exposure pathways that can be hypothesized for the site to ensure that the annual radiation dose (excluding radon) received by an individual member of the general public is less than 100 millirem per year (the unit used to measure radiation dose to man). All sample results from your property were well below the release criteria.

Note: A picocurie (pCi) is a unit of measure for radioactivity, just as an ounce is a unit to measure weight. A measurement of 1 pCi equals 2.2 disintegrations per minute (dpm), which means that one radioactive particle is released on the average every 27 seconds. Therefore, picocuries per gram is a measure of radioactivity per gram of soil.

The sum of ratios is when the concentration of the individual radionuclides, less natural background, are compared to the guideline for each radionuclide. The summation of each fractional contribution for these radionuclides must not exceed one, per DOE Order 5400.5. An example of how compliance with this DOE Order is determined is given on Table 1. All sample results from your property passed the sum of ratios guideline.

3. External Gamma Radiation Exposure Survey

The results of the external gamma radiation exposure surveys conducted on your property following the completion of the remediation are found in Table 2. The external gamma exposure rate one meter above the surface of the ground was measured in the center of each survey grid block. Readings taken at this height provide an estimate of the potential exposure from gamma radiation to the critical body organs.

Readings were recorded using a pressurized ionization chamber. Exposure rates measured on your property ranged from 9.6 to 10.5 microroentgens per hour ($\mu\text{R/hr}$) and were comparable to the average background reading of 9.4 $\mu\text{R/hr}$. A microroentgen (μR) is a unit for measuring exposure that applies to gamma radiation. As shown in Table 2, the exposure rates are well below the DOE limit which is 11.4 $\mu\text{R/hr}$ (which over 24 hr/day, 365 days/year equals 100 mrem/year) above background readings.

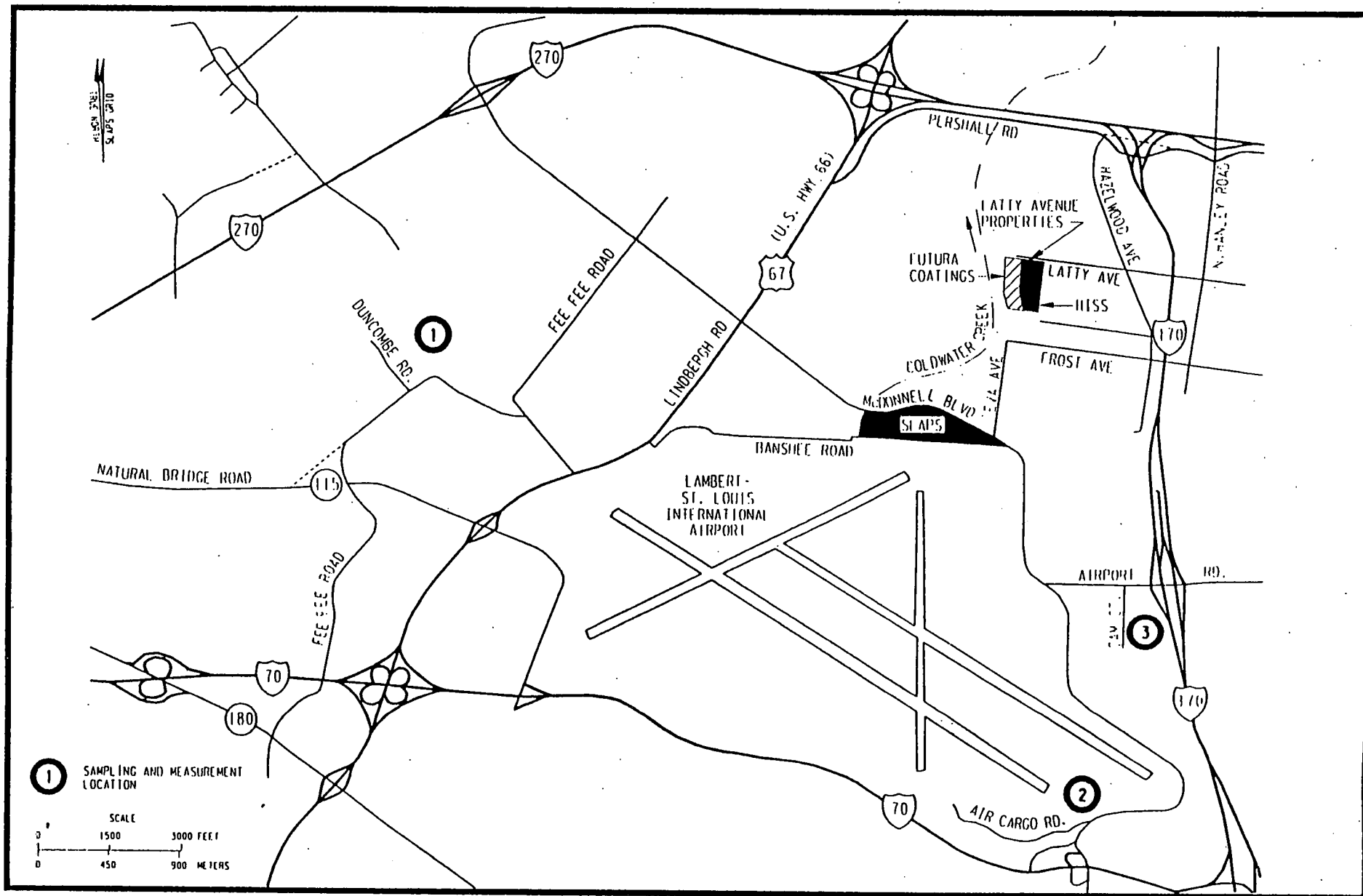
4. Post-RA Survey of Direct Surface Contamination and Transferable Contamination

The results for post-remedial action surveys of direct and transferable contamination are presented in Table 3 and are well below applicable DOE guidelines. Post-remedial action surveys were conducted on all the culverts and retaining walls between your property and 8834 Heather Lane, Hazelwood, MO.

Direct surface contamination is the total amount of radioactive contamination on a surface; therefore, a survey of direct surface contamination will quantify both that portion of the contamination that is removable and that which is permanently fixed. Transferable contamination is the removable component of the total contamination on the surface and is that contamination that could migrate or conceivably be picked up on clothing or skin upon contact.

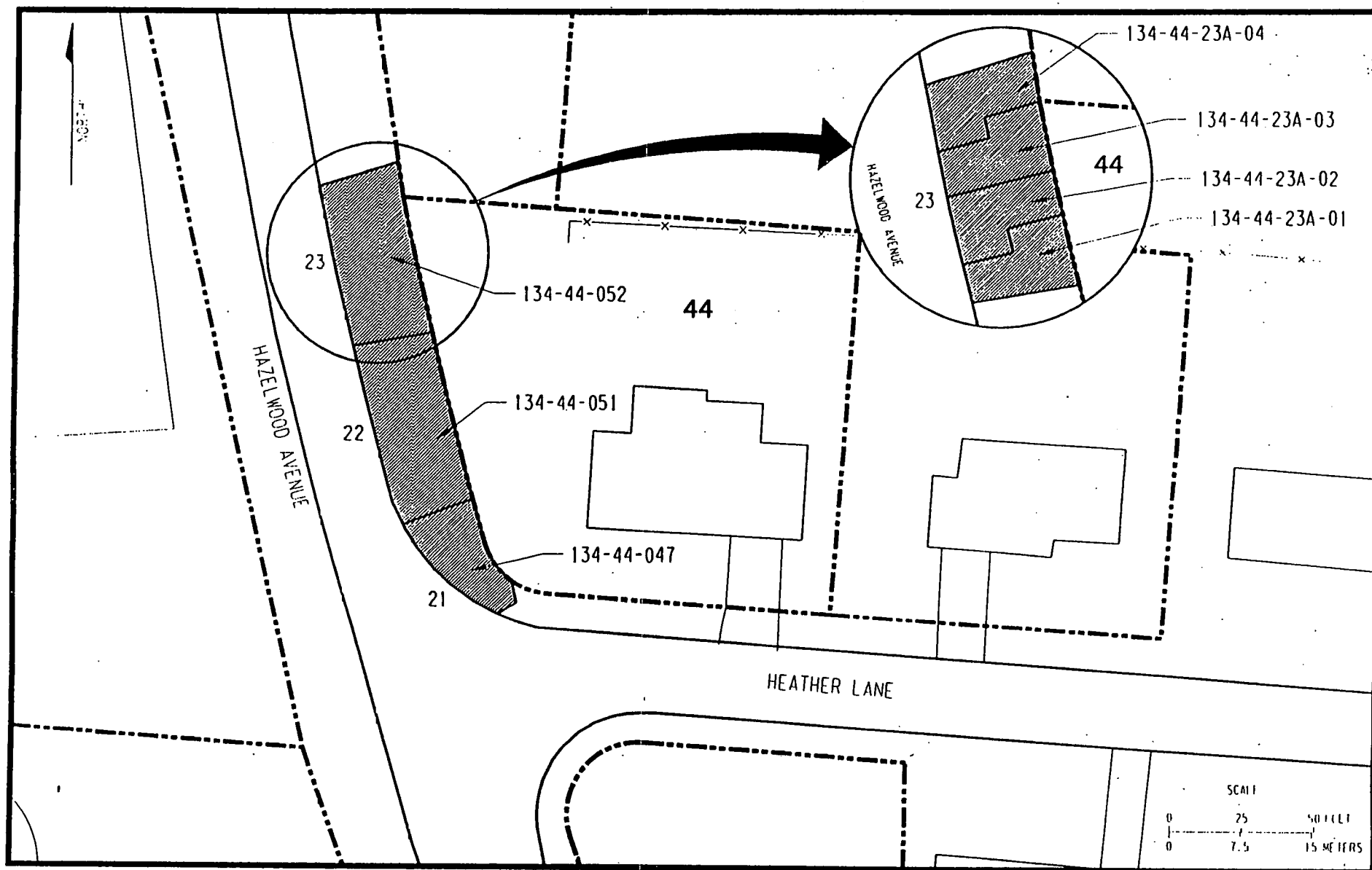
To quantify direct surface contamination, radiation detection instrumentation is placed directly on the surface to measure the radioactivity emitted from a known surface area. Direct alpha radiation is measured with an alpha scintillation detector connected to a rate meter, an instrument that counts the number of radioactive disintegrations (decays) detected in a specified amount of time. Direct beta/gamma radiation measurements are obtained with a Geiger-Meüller probe attached to a rate meter. The probe is placed on the surface to be surveyed, and pulses are allowed to accumulate for one minute on the rate meter, resulting in a measurement of counts per minute (cpm) for the surface area. These measurements are then converted, with appropriate calibration and conversion factors, to disintegrations per minute per 100 cm² area surveyed (dpm/100 cm²), a commonly used unit of measurement in health physics.

Transferable contamination is the radioactive material that can be readily removed from a surface when it is "swiped" or "smeared" with a soft absorbent paper. The smear is taken from a 100 cm² area and is placed in a portable smear counter, and alpha and beta/gamma radiation are each counted for one minute. The resulting measurements in counts per minute are then converted to dpm/100 cm².



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Figure 1
Background Sampling Locations
in the St. Louis Area



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Figure 2
St. Louis Airport Site Vicinity Properties
Post-Remedial Action Sample Locations

TABLE 1

SLAPS VP'S POST RA SOIL SAMPLE RESULTS

GRID #	Sample ID	U-234 (pCi/g)		U-235 (pCi/g)		U-238 (pCi/g)		Ra-226 (pCi/g)		Th-230 (pCi/g)		Th-232 (pCi/g)		Sum of Ratios(c)	Pass/Fail
		result	error	result	error	result	error	result	error	result	error	result	error		
21	134-44-047	0.97	0.36	<0.13 (a)	0.06	0.89	0.34	1.60	0.60	3.70	1.00	0.99	0.42	0.16	pass
22	134-44-051	1.60	0.53	<0.09	0.07	1.50	0.50	1.60	0.65	3.40	1.00	1.10	0.46	0.15467	pass
23	134-44-052	0.97	0.34	<0.05	0.06	1.10	0.37	0.79	0.42	6.60	1.90	1.30	0.58	0.37333	pass
23	134-44-23A-01(b)	0.73	0.28	0.10	0.09	0.96	0.34	1.30	0.46	2.90	0.85	0.70	0.34	0.10667	pass
23	134-44-23A-02	2.10	0.60	0.04	0.00	1.90	0.56	1.30	0.43	1.40	0.50	0.58	0.29	0.04267	pass
23	134-44-23A-03	0.98	0.36	<0.05	0.05	1.50	0.50	1.00	0.40	1.40	0.51	0.43	0.26	0.01467	pass
23	134-44-23A-04	1.10	0.35	<0.08	0.04	1.00	0.34	0.68	0.35	2.40	0.73	0.75	0.34	0.07333	pass
	avg. background	1.1		0.1		1.1		0.9		1.3		1.0			

(a) The "less than" (<) notation indicates that the radioactive contamination was below the detection limit of the analytical technique and/or the detection instrument. Therefore the actual concentration of radioactivity in a sample is less than the reported value preceded by the "less than" symbol.

(b) Grid 23 was subdivided into four subgrids as seen in figure 2, (134-44-23A-01 through -04) to determine whether sampling from smaller grids with fewer sampling points (8 for a subgrid and 30 for a full grid) would affect the results. i.e. isolated areas of higher concentration would be easier to distinguish in the subgrid composites. As the table shows this was not the case.

(c) The "Sum of Ratios" is the concentration of the individual radionuclides, less natural background, compared to the guideline. The summation of each fractional contribution for these radionuclides must not exceed one, per DOE Order 5400.5. The following is an example of how compliance with the DOE Order is determined for sample 134-44-052.

(U-238)		(Ra-226)		(Th-230)		(Th-232)		(Ra-228)	
<u>1.10-1.1</u>	+ greater of :	<u>0.79-0.9</u>	or	<u>6.60-1.3</u>	+ greater of :	<u>1.30-1.0</u>	or	<u>0-0</u>	
50		15		15		15		15	
0	+	(0	or	0.35)	+	(0.02	or	0)	= 0.37

TABLE 2

**Post-Remedial Action
External Gamma Radiation Exposure Rates**

background = 9.4 uR/h

DOE limit = 11.4 uR/h above background

Location	Survey Number	Exposure Rate (uR/h)
Grid # 21	134PIC06	9.6
Grid # 22	134PIC06	10.5
Grid # 23	134PIC06	10.4

TABLE 3

Summary of Post-Remedial Action Radiological Survey Results

Location	<u>Direct Surface Contamination</u>		<u>Transferable Contamination</u>	
	Alpha Sample Activity Range (dpm/100 cm2)	Beta/Gamma Sample Activity Range (dpm/100 cm2)	Alpha Sample Activity Range (dpm/100 cm2)	Beta/Gamma Sample Activity Range (dpm/100 cm2)
North Wall Culvert				
1) East Wall Grid	< BKG - 35	103 - 361	0	0 - 16
2) West Wall Grid	17 - 35	129 - 284	0	0 - 20
Concrete Pad N. Culvert				
1) West	26	594	0	12
2) Middle	< BKG	774	0	0
3) East	36	542	0	0
4) Pipe	26	361	0	4
DOE Guideline	100	5000	20	1000

< BKG - This notation means that the reading was less than average background. When the reading was converted and the background subtracted, the result was less than zero.