Attachment A

Final Status Survey Report #1 Documentation

(UNDER SEPARATE COVER)

FINAL

COLUMBUS CLOSURE PROJECT CHARACTERIZATION AND FINAL STATUS SURVEY REPORT FOR THE JN-4 NORTH GROUNDS AREA

Revision 2
June 16, 2006

Prepared by

ECC & E2 Closure Services
1425 State Route 142 East
West Jefferson, OH 43162

Contract Number: DE-AC24-04OH20171

Final Characterization and Final Status Report for the JN-4 North Grounds Area

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Contract Number: DE-AC24-04OH20171

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1.0 Introduction

This report contains the final status surveys (FSS) of the JN-4 North Grounds Area located at the Columbus Closure Project (CCP), 1425 State Route 142 East, West Jefferson, OH 43162. Final status surveys were conducted according to the guidance presented in the *Manual for Conducting Surveys in Support of License Termination*, NUREG/CR-5849 (NUREG/CR-5849) (ORAU, 1992) and the *Radiological Characterization and Final Status Plan for Battelle Columbus Laboratories Decommissioning Project, West Jefferson Site*, DD-97-02 (Final Status Plan) (Battelle, 2000). The final status surveys were conducted in January and February of 2005 and performed under Work Instruction 2806 (Closure Services, 2004).

The intent of this final status survey report is to provide a complete and unambiguous record of the radiological status of the JN-4 North Grounds Area. Sufficient information and data is provided to enable an independent re-creation and evaluation at some future date of both the survey activities and the reported results for the excavation. Information in this report is also available in referenced technical basis documents, final status survey plans and procedures, and the *Battelle Memorial Institute Columbus Operations, Decommissioning Plan*, DD-93-19 (BMI Decommissioning Plan), and reporting and quality assurance procedures.

To the extent practicable, this final status survey report is presented with minimal information incorporated by reference. This final status survey report has been generated following the comprehensive, annotated outline presented in Chapter 9 of NUREG-5849 (ORAU, 1992).

1.1 Background

On April 16, 1943, BMI, acting through what is now its Battelle Columbus Operations (BCO), entered into Contract No. W-7405-ENG-92 with the Manhattan Engineering District to perform atomic energy research and development (R&D) activities. BCO performed nuclear materials research and development at privately-owned facilities for the Manhattan Engineering District and its successor agencies – the Atomic Energy Commission (AEC), the Energy Research and Development Agency (ERDA), and the Department of Energy (DOE). Research and development continued until 1988 (Battelle, 2003a).

The BCO facilities at the King Avenue Site, Columbus, Ohio, and the West Jefferson North (WJN) and South (WJS) Sites, West Jefferson, Ohio, became partially radiologically contaminated as a result of the R&D activities. Decontamination of the King Avenue and WJS Sites has been completed and activities continue at the WJN site. The DOE, as the successor to the AEC and the Government's earlier work, is the agreed party with predominant liability and responsibility for decontamination and decommissioning (D&D) of the BCO facilities (Battelle, 2003a). The Assistant Secretary

for Nuclear Energy of the DOE accepted the decontamination and decommissioning (D&D) of the WJN into the DOE's Surplus Facilities Management Program as a major project (DOE, 1986). The DOE is the agency funding and managing the cleanup of the WJN (Battelle, 2003a). However, the site is not a DOE-owned facility.

BMI holds U.S. Nuclear Regulatory Commission (NRC) license number SNM-7. BMI has continually operated and conducted D&D activities in full compliance with this NRC license. The BMI Decommissioning Plan for the WJN site does not serve as a declaration to terminate SNM-7, but establish the criteria for performing D&D activities. The end goal of the BMI Decommissioning Plan is to reach unrestricted use conditions for the site (Battelle, 2003a).

The DOE has contracted ECC&E2 Closure Services, LLC (Closure Services) to safely remove DOE radioactive materials and contamination from the WJN site. Removal of radioactive material will be to levels allowing future use of the site without radiological restrictions as described in the BMI Decommissioning Plan. Closure Services has conducted characterization and final status surveys of the JN-4 North Grounds Area to demonstrate the area is available for unrestricted release.

2.0 Site Description

Created in 1984, the Battelle Columbus Decommissioning Project (BCLDP) is a remediation project that includes nine buildings at the King Avenue site and five at the WJN site. The CCP is the successor of the BCLDP. The WJN site has one permanent structure (Well House). Three former research facilities, JN-1, JN-2 and JN-3 have been demolished as well as JN-6, the guard house. Several outfalls, filter beds, and wells are also located at the site. The JN-4 facility was previously decommissioned and is now a research facility. Figure 1 shows the JN-4 facility in relation to the CCP site.

2.1 Area Description

The JN-4 North Grounds Area is a parcel of land located north of JN-4. The area encompasses the land located between the parking lot and the physical structure of JN-4.

Two classifications of areas are used in NUREG-5849 and are termed **affected** or **unaffected.** These classifications are defined as (NRC, 1992):

> **Affected Areas:** Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on past or preliminary radiological surveillance). This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination, and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used, stored, or buried are included in this classification because of the potential for inadvertent spread of contamination.
>
> **Unaffected Areas:** All areas not classified as affected. These areas are not expected to contain residual radioactivity, based on knowledge of site history and previous information.

The JN-4 North Grounds Area was characterized in 2000 and 2001. Analyses of the soil samples demonstrated radionuclide concentrations consistent with background. The JN-4 North Grounds Area is considered an unaffected area based on these results and the history of JN-4. However, the contract between Closure Services and the DOE requires the area be subject to the 100% surface scan required by an affected area final status.

3.0 Decommissioning Activities

3.1 Decommissioning Objective

The objective of the final status survey performed on the JN-4 North Grounds Area was to statistically demonstrate that the area is free from residual radioactive contamination that would not make it suitable for unrestricted release. The objective of the survey was also to validate previous data and provide assurance that the area satisfies the requirements for unrestricted release. The area is determined to be free of residual radioactive contamination when remaining soil contamination levels are below those presented DD-93-03, Rev. 0. "Volumetric Release Criteria Technical Basis Document for Battelle Columbus Laboratory Decommissioning Project" (Battelle, 1993A). **Table 1** presents the volumetric release criteria as presented in DD-93-03, Rev. 0.

4.0 Final Status Survey Procedures

Planning and implementation of the final status survey of the area adhered to the requirements the Final Status Plan (DD-97-02) (Battelle, 2000) and Work Instruction 2806 (CS. 2004)

4.1 Sampling Parameters

Characterization samples of the JN-4 North Grounds Area were taken in 2000 and 2001 by dividing ten by ten meter grids in four quadrants and taking samples from each quadrant in accordance with DD-97-02. Closure Services performed confirmation sampling at a rate of one sample per grid in accordance with Section 6.4 of DD-97-02. Analyses of samples by gamma spectroscopy were performed by the Onsite Radioanalytical Laboratory (RAL).

4.2 Major Contaminants Identified

The characterization of the JN4 North Grounds Area excavation identified Cesium-137 (Cs-137) as the primary radiological contaminant of concern (RCOC). Other RCOCs included Cobalt-60 (Co-60), Europium-152 (Eu-152). Eu-154. Americium-241 (Am-241), Strontium-90 (Sr-90). Plutonium-238 (Pu-238), and Pu-239. Cs-137 is used as a surrogate for the other RCOC present in the soils as it typically accounts for 64 percent of the total radio isotopic activity. Further, the release criteria set for Cs-137 is considered conservative for the decommissioning activities. The surrogate relationship of Cs-137 to other RCOCs was calculated using data presented in **Table 2**. **Table 2** presents the isotopic quantity and activity concentrations of samples collected from the filter bed area by BMI from March through September 2000. These data are not associated with the release surveys of the JN4 North Grounds. Average activities for the multiple samples were calculated for each RCOC prior to setting the ratios against Cs-137.[1] For each RCOC, the average activity concentration was set as a ratio against the average Cs-137 activity concentration as obtained from previous actions at the filter beds. Cs-137 activity ratios for each RCOC utilized to calculate the RCOCs for the JN4 North Grounds are presented at the lower portion of **Table 2**.

No radioisotopes were detected above background levels.

4.2.1 Guidelines Established

Table 1 presents the guidelines for residual radioactivity concentrations for soil and solid volumes as applied to the JN-4 North Grounds Area. Criteria for residual radioactivity concentrations in soil are defined in a number of references. DOE Order 5400.5, Section IV.a.2 provides generic guidelines for residual concentrations of Ra-226. Ra-228, Th-

[1] Battelle. *Radiological Status of Abandoned Filter Bed Presentation*. http://www.ohio.doe.gov/ccp_seb/. Posted 7/15/2003. Presentation provided by DOE to the CCP website. Page titled "Radioactive Inventory of the Abandoned North Filter Beds & Limit Fractions" contains sampling data obtained from March through September 2000 from the filter beds. Average Cs-137 ratios were utilized to calculate the activity concentrations of the isotopes of concern.

230. and Th-232. NRC Guidance has been received by the CCP which contains soil radioactivity concentration guidelines for Co-60, Sr-90, Cs-137, Ra-226, and Ra-228. NRC guidance for soil radioactivity concentration guidelines for natural, enriched and depleted uranium are also utilized. **Table 1** compiles soil residual radioactivity concentration guidelines to be utilized by the CCP. **Table 1** values have been generated primarily from the various reference technical documents and from soil guidelines generated from computer pathway analyses. Pu-241 is calculated by applying a ratio to sum of Pu-238 and Pu-239 (obtained from ORIGEN 2.1 derived values. Battelle. 2003c). resulting in a Cs-137 to Pu-241 ratio of 2.8. Using the Cs-137 surrogate ratios from **Table 2,** and a Cs-137 to Pu-241 ratio of 2.8, the sum of ratios of radionuclides will meet unity at Cs-137 concentrations of 11 pCi/g. This provides a modified screening criteria of 11 pCi/g.

Exposure rates were compared to the 5 μR/hr above mean background limit listed in DD-97-02, Rev. 0. The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are 8 ± 2 μR/hr. This value correlates to the background exposure rate values presented in annual environmental reports for the CCP. Data collected from trench-like culverts located on Battelle property unassociated with site operations indicate a geometry effect, increasing the exposure rates inside the trenches by 3 to 5 μR/hr.

5.0 Equipment and Procedures

5.1 Equipment

Survey instruments sensitive to gamma radiation are used to monitor surfaces for residual radioactive materials. Ludlum Model 44-10 two-inch by two-inch sodium iodide detectors with Eberline ESP-2 meters were used to scan the grounds. Ludlum Model 19 exposure rate meters were used to obtain microRoentgen per hour measurements.

Other instrumentation used in the Onsite Radioanalytical Laboratory (RAL) to support the final status survey includes:

- A VMS based Canberra Procount data acquisition system in conjunction with high purity germanium detectors for gamma spectroscopy of soil samples.
- A Tennelec Model LB5100 Simultaneous Alpha and Beta Gas Proportional Counter to count smear samples

5.2 Scanning Minimum Detectable Activities

Scanning minimum detectable concentrations (MDC_{scan}) is determined to demonstrate that the MDC_{scan} is less than the modified Cs-137 screening criteria. The MDC_{scan} is calculated utilizing the methodology described in NUREG-1507 and the background count rate and a default detector response to Cs-137 (NRC. 1998). The equation during the walkover surveys of the CCP incorporates a d' of 1.38 and a surveyor efficiency of 0.5. The ambient background in the area was 27.000 counts per minute (cpm). The following is the calculation of the MDC_{scan}:

b_i = (27,000 cpm) x (1 sec) x (1 min/60 sec) = 450 counts

MDCR = (1.38) x ($\sqrt{450 counts}$) x (60 sec/1min) = 1756 cpm

$MDCR_{surveyor}$ = 1756 cpm/$\sqrt{0.5}$ = 2483 cpm

MDER = 2483 cpm/(900 cpm/μR/hr) = 2.76 μR/hr

$$MDC_{scan} = (5 pCi/g) * \frac{2.76 \mu R/hr}{1.307 \mu R/hr} = 10.6 pCi/g$$

5.3 Procedures

The Characterization Team was formally trained and qualified to applicable procedures prior to the initiation of the characterization and final status surveys. Documentation of training is maintained by CCP Project Records.

The following plans and procedures were utilized for the surveys:

DD-93-19, Rev. 5	Decommissioning Plan, Battelle Memorial Institute Columbus Operations
DD-97-02, Rev. 0	Radiological Characterization and Final Status Plan for BCLDP West Jefferson Site
SC-SP-004.2, Rev. 3	Manual and Mechanical Collection of Surface and Subsurface Soil Samples in Support of Site Characterization
WI-2806	Excavation and Trench Sampling and Surveys

6.0 Survey Findings

6.1 Exposure Rate Surveys

The calculated mean background exposure rate and the 95 percent confidence intervals used for the CCP grounds are 8 ± 2 μR/hr. The exposure rate readings taken for the JN-4 North Grounds Area are presented in **Table 3**. The exposure rate readings were individually compared to the mean background value of 8 ± 2 μR/hr in order to show compliance with the 5 μR /hr above background release criterion (grounds exposure rate surveys must be less than or equal to13 μR/hr to be compliant. trenches, less than or equal to 18 μR/hr). The average one meter grounds measurement was 16.7 μR/hr. the minimum measurement was 14 μR/hr and the maximum measurement was 20 μR/hr. The increased exposure rate in the area is attributable to the area's proximity to Building JN-1. Building JN-1 is the hot cell facility and is in active decontamination and decommissioning. Routine exposure rate surveys performed of the area north of Building JN-1 and immediately south of the JN-4 North Grounds averaged 32 ± 19 μR/hr as noted in Table 8.

Closure Services subsequently performed external exposure rate surveys of the JN-4 North Grounds following the demolition and removal of Building JN-1. The results of these surveys are compliant with the exposure rate release criteria and are included in the Final Status Survey Report for *Remaining Land Areas Inside the WJN Site Restricted Area.*

6.2 Sampling

Samples of the JN-4 North Grounds Area were taken in 2000 and 2001 at a rate of four per ten by ten meter grid in accordance with Section 6.3.3 of DD-97-02, Rev. 0. The samples were taken at various depths, to a depth of one meter past any suspect contamination. Soils samples were screened in accordance with Section 4.0 of DD-97-02. Soil samples which exhibited the highest screening values were sent to the RAL for analysis. A summary of the 2000 and 2001 screening values and Cs-137 results is presented in **Table 4**. Closure Services sampled each grid for confirmation of the 2000 and 2001 data in accordance with Section 6.4 of DD-97-02. **Table 5** presents all radionuclides activities and minimum detectable activities of the Closure Services analyses.

Cesium-137 is utilized as a surrogate for determining compliance to the cleanup criteria presented in **Table 1**. The CCP has consistently utilized Cs-137 as a surrogate for other radionuclides of concern as it is the predominate radionuclide present throughout the site and the buildings. Additionally, Cs-137 exhibits the lowest cleanup criteria for 15 pCi/g. The calculation of the Cs-137 surrogate value is performed utilizing sample results obtained prior to remediation of the area in question. **Table 2** presents the results of the pre-remediation samples of the filter bed and are not associated with the JN-4 North Grounds.

Compliance to the cleanup criteria presented in **Table 1** is demonstrated through a "fraction of limit." The total quantity and activity concentrations are calculated using the average isotopic ratios of radionuclides to Cs-137 as obtained for the filter beds, with the exception of Plutonium (Pu)-241 (Battelle, 2003b). Pu-241 is calculated by applying a ratio to sum of Pu-238 and Pu-239 (obtained from ORIGEN 2.1 derived values, Battelle, 2003c), resulting in a Cs-137 to Pu-241 ratio of 2.8. See **Table 2**. Results for cobalt-60, Cs-137, strontium-90, europium-152 and 154, Pu-239, 240 and 241, and americium-241 are compared to the respective release criteria and a "fraction of limit" calculated. The "fraction of limit" is determined by summing the ratios of each isotopic concentration to the respective release limit. The sum of ratios must be less than one to meet sample release criteria. This ratio has been used in past technical basis documents which have been reviewed and approved by the NRC and licensee. A modified screening criteria for Cs-137 is set at 11 pCi/g by calculating a sum of ratios for the RCOCs using the Cs-137 surrogate ratios presented in **Table 2**. The "fraction of limit" for the JN-4 North Grounds Area samples was not calculated due to the low concentrations of Cs-137 in respect to the modified screening criteria. The following table summarizes the Cs-137 results.

Location	Number of Samples	Average (pCi/g)	Standard Deviation (pCi/g)	Range (pCi/g)	Comparison Value (pCi/g)	Modified Screening Criteria (pCi/g)
2000 – 2001 Data	87	0.08	0.04	0.01 – 0.17	N/A	11
2005 Data	16	0.07	0.03	0.03 – 0.16	0.09	11

Statistical analyses were performed on the surface soil sample data in accordance with Section 6.4.3 of DD-97-02, Rev. 0. As stated in §8.5 of NUREG/CR-5849, the EPA has recommended applying the calculated value of μ_α, relative to a guideline value, at a desired level of confidence. The value of μ_α is compared to the guideline value; if the μ_α is less than the guideline, the area meets the guideline at a 95% confidence level. This in turn means that the probability is less than 5% that the μ_α will pass the test, when the true mean activity level exceeds the guideline value. The calculated the μ_α, for Cs-137 of 0.09 pCi/g, was less than the modified screening criteria of 11 pCi/g. The calculation is presented as **Table 6**.

6.3 Scanning Measurements

Scanning measurements of the JN-4 North Grounds Area were performed with a two inch by two inch sodium iodide detector in accordance with Section 6.3.1 of DD-97-02. The decision level value (DLV) for the scanning of open grounds and trenches is set at 18,374 cpm for final status surveys at the CCP. The DLV is the mean background plus the MDA of the scanning instruments. Scanning surveys of an area that exceed the DLV require additional radiological measurements.

The JN-4 North Grounds Area grounds surveys exceeded the DLV, but exhibited uniformity and a direct correlation with the exposure rate survey. Survey results are presented as **Table 7.** Closure Services elected to perform additional surveys of the JN-4

North Grounds once the demolition and removal of Building JN-1 was completed. These additional surveys will be included in the Final Status Survey Report for the *Remaining Land Areas Inside the WJN Site Restricted Area.*

7.0 Conclusions

The characterization and final status survey results demonstrate that the radiological endpoint criteria objectives of the NRC-approved Decommissioning Plan have been met for the JN-4 North Grounds Area addressed by this effort. (Battelle, 2003) Reported analytical results for media samples obtained from the area are below the residual radioactivity concentrations for soil and solid volumes as presented in **Table 1**.

Remaining soil contamination levels are below those in DD-93-03, Rev. 0, "Volumetric Release Criteria Technical Basis Document for the Battelle Columbus Laboratory Decommissioning Project" (Battelle, 1993A). The decommissioning objective has been satisfied. The final status survey performed on the JN-4 North Grounds area statistically demonstrates that previous remediation of the area was successful and that the area meets the residual radioactive contamination criteria for unrestricted release.

8.0 References

American National Standards Institute (ANSI). 1997. ANSI-N323a, "Radiation Protection Instrumentation Test and Calibration."

Battelle. 2000. Work Instruction 974. West Jefferson North Site Soil Gridding, Characterization, and Final Status Surveys.

Battelle, 2003a. "Decommissioning Plan for the Battelle Memorial Institute Columbus Operations." DD-93-19.

Battelle, 2003b. Radiological Status of Abandoned Filter Bed Presentation, http://www.ohio.doe.gov/ccp_seb/. Posted 7/15/2003. Presentation provided by DOE to the CCP website. Page titled "Radioactive Inventory of the Abandoned North Filter Beds & Limit Fractions" contains sampling data obtained from March through September 2000 from the filter beds. Average Cs-137 ratios were utilized to calculate the activity concentrations of the isotopes of concern.

Battelle, 2003c. Waste Characterization. Classification, and Shipping Support Technical Basis Document, Rev. 5 for BCLDP West Jefferson Facility, November 2003. Isotopic mixture for Pu-241 is calculated using the values obtained form the ORIGEN2.1-derived data values presented in the technical basis document.

Battelle. 2000. "Radiological Characterization and Final Status Survey Plan for Battelle Columbus Laboratory Decommissioning Project West Jefferson Site." DD-97-02.

Battelle. 1993. "Volumetric Release Criteria Technical Basis Document for Battelle Columbus Laboratories Decommissioning Project." DD-93-03.

ECC&E2 Closure Services, LLC (Closure Services, 2004). Work Instruction 2806, Rev. 1. Excavation and Trench Sampling and Survey.

U.S. Department of Energy (DOE), 1990. Finding of No Significant Impact, Decontamination and Decommissioning of the Battelle Columbus Laboratories in Columbus and West Jefferson, Ohio.

U.S. Department of Energy (DOE), 1986. May 29. 1986 memorandum. Voight to Vaughan, approved by Vaughan, June 10, 1986.

U.S. Nuclear Regulatory Commission (NRC), 1998. "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions" NUREG-1507.

Oak Ridge Associated Universities (ORAU). 1992. "Manual for Conducting Radiological Surveys in Support of License Termination. Draft Report for Comment"

NUREG/CR-5849, ORAU-92/C57, prepared for the Nuclear Regulatory Commission by the Environmental Survey and Assessment Program. Energy/Environmental Systems Division, ORAU, 1992.

FIGURES

FIGURE 1
SITE MAP

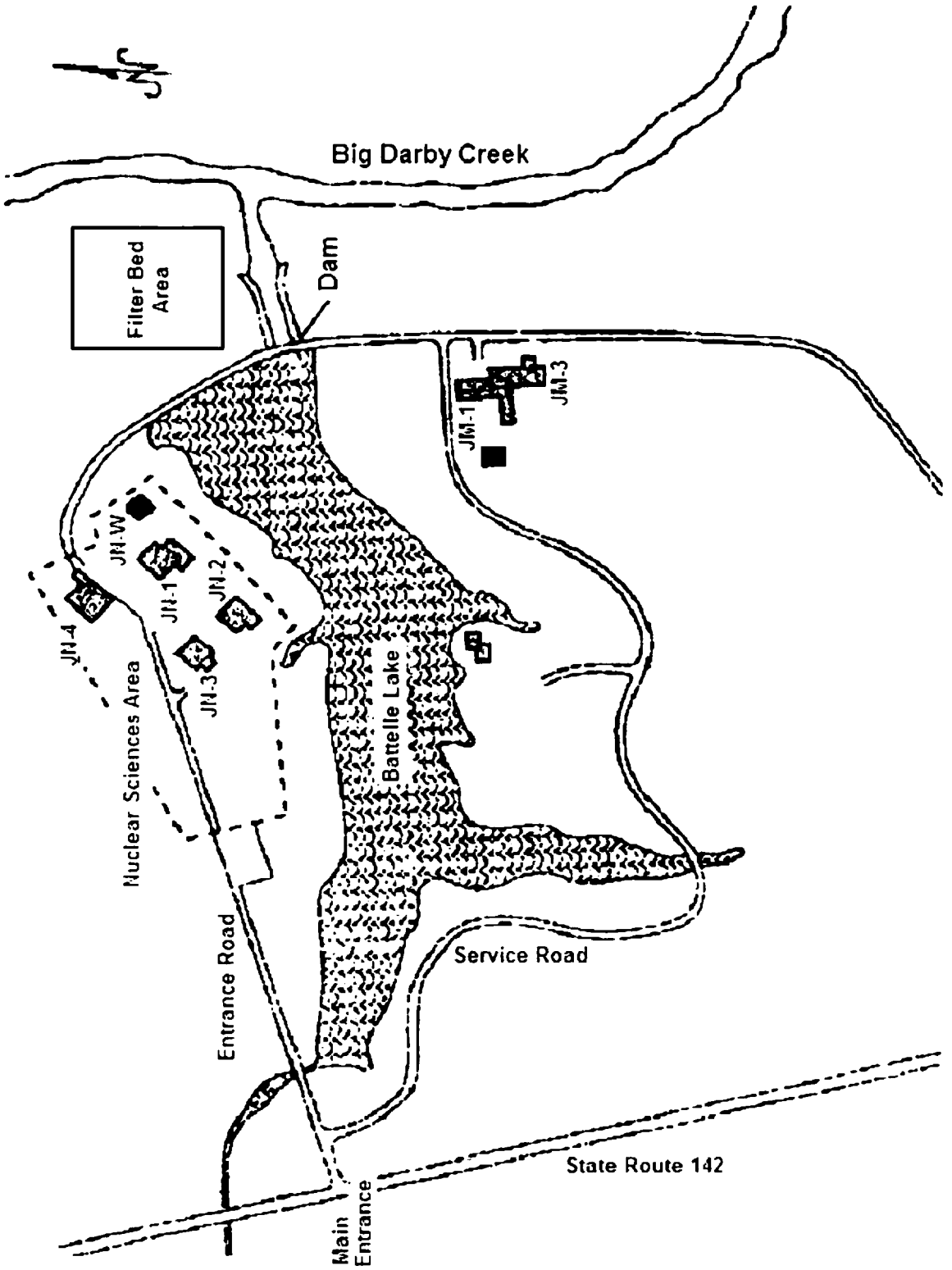


Figure 2

JN-4 North Grounds Area Map

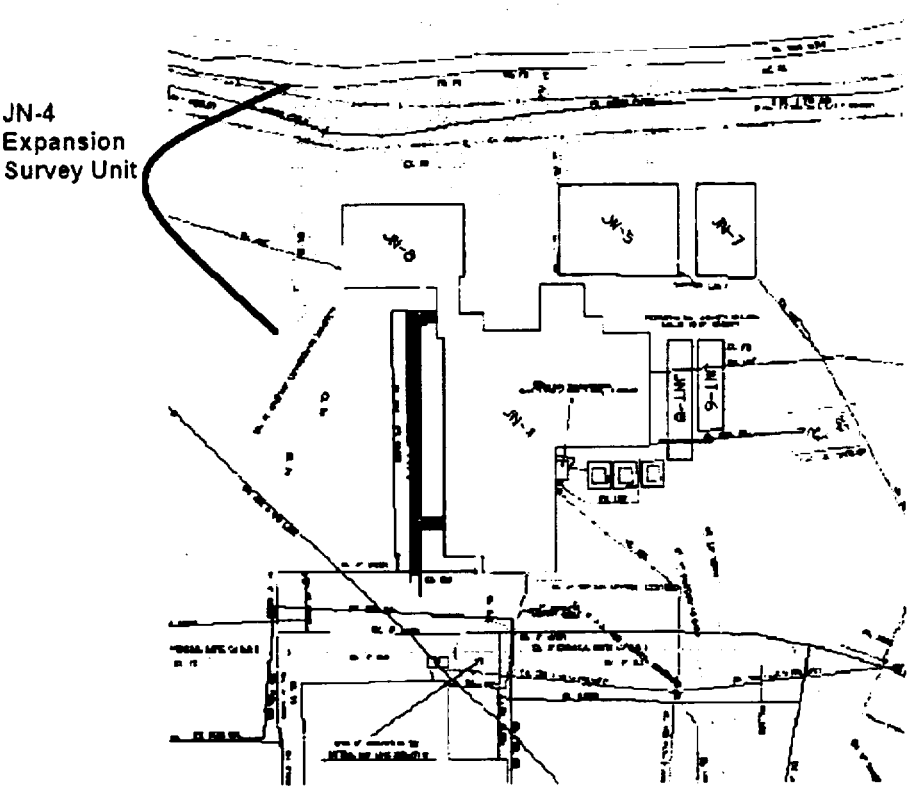
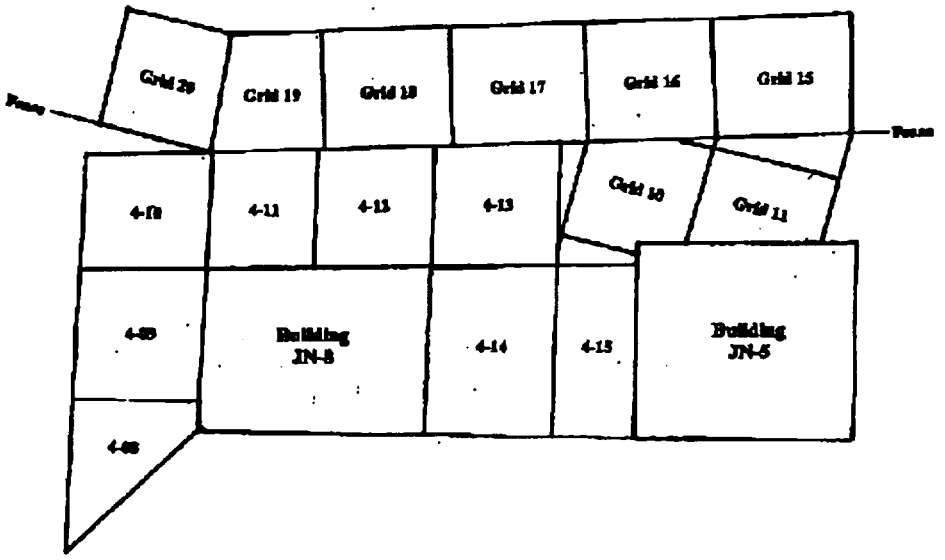


Figure 3

JN-4 North Grounds Area Grid Map



TABLES

TABLE 1
BCLDP GUIDELINES FOR RESIDUAL
RADIOACTIVITY CONCENTRATIONS FOR SOIL AND SOLID VOLUMES

Radionuclide[a]	King Avenue Concentration (pCi/g)[b]	West Jefferson Concentration (pCi/g)[b]
Natural Uranium	10[1]	na[c]
Enriched Uranium	30[1]	30[1]
Depleted Uranium	35[1]	35[1]
Ac-227	19	19
Am-241	na[c]	30
Am-243	na	30
Ce-144	na	2,100
Cm-243	na	0.79
Cm-244	na	1.0
Co-60	8[2]	8[2]
Cs-134	na	33
Cs-137	15[2]	15[2]
C-14	940	940
Eu-152	na	36
Eu-154	na	32
Eu-155	na	1,800
Fe-55	na	2.7E+07
H-3[d]	41,000	38,000
I-129	na	13
Mn-54	na	61
Ni-59	na	1.3E+07
Ni-63	na	4.9E+06
Np-237	na	0.58
Pa-231	18	18
Pb-210	140	na
Pu-238	na	25[4]
Pu-239	na	25[4]
Pu-240	na	25[4]
Pu-241	na	25[4]
Pu-242	na	25[4]

Radionuclide[a]	King Avenue Concentration (pCi/g)[b]	West Jefferson Concentration (pCi/g)[b]
Ra-226 (0-15 cm of soil)	5[2,3]	na
Ra-226 (>15 cm of soil)	15[2,3]	na
Ra-228	5[2,3]	na
Ru-106	na	180
Sb-125	na	118
Sm-151	na	6,700
Sr-90	5[2]	5[2]
Th-228	29	na
Th-230	5[3]	na
Th-232	5[3]	na

Table 1 Notes and References

Notes:

a. Activity concentrations above natural background concentrations. Where more than one radionuclide is present, the sum of the ratios of the individual radionuclide concentrations to their respective concentration limits shall not exceed 1.

b. Concentrations for which no specific reference is cited have been derived from RESRAD calculations and are the more restrictive values calculated for soil deposition at a depth of 5 meters.

c. Indicates that this radionuclide is not expected to be found at the indicated site.

d. Difference in tritium activity concentrations are due to the difference in depths of the water tables at two sites. The water table depth at King Avenue is deeper than that at West Jefferson.

References:

1. Options 1 and 2 of the Branch Technical Position, "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (46 FR 52061, October 23, 1981).

2. NRC Memorandum, "Acceptable Cleanup Criteria and Practices for Decontamination and Decommissioning (License No. SNM-7)" dated April 17, 1992, to Harley L. Toy, License Coordinator and Manager, Nuclear Sciences, Battelle Memorial Institute from J.W.N. Hickey, Chief, Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, Office of Nuclear Material Safety and Safeguards.

3. DOE Order 5400.5, "Radiation Protection of the Public and the Environment".

4. NRC Policy and Guidance Directive FC83-23, "Termination of Byproduct, Source, and Special Nuclear Material Licenses".

Table 2
Cesium-137 Surrogate Analysis Data & Modified Cs-137 Screening Criteria

Sample ID (a,b)	Cs-137 Activity (pCi/g)	Co-60 Activity (pCi/g)	Eu-152 Activity (pCi/g)	Eu-154 Activity (pCi/g)	Am-241 Activity (b) (pCi/g)	Sr-90 Activity (pCi/g)	Pu-238 Activity (pCi/g)	Pu-239 Activity (pCi/g)
16741	40.1	0.05	<0.096	<0.053	1.36 g	<0.172	<0.009	0.053
16746	21.6	0.04	<0.079	<0.051	1.29 a	<0.184	0.026	0.9
16747	26.1	0.06	<0.077	<0.046	0.89 g	<0.175	<0.011	0.116
16751	8	<0.024	<0.068	<0.047	0.93g	<0.151	0.021	0.496
16752	39.1	0.06	<0.086	<0.046	10.74 a	<0.167	0.131	5.822
16607	74.2	0.28	7.28	0.65	1.18 a	0.59	0.0213	0.629
16608	18.7	0.07	4.03	0.26	0.47 a	<0.180	0.016	0.287
16668	41.6	0.06	<0.098	<0.061	2.59 a	NA	0.036	1.846
16686	38.1	0.07	<0.050	<0.031	4.71 a	NA	0.135	3.84
19079	11.7	0.17	8.02	0.64	0.018	4.39	<0.016	0.034
19080	32.4	<0.016	0.562	<0.053	<0.016	0.21	<0.019	<0.017
Average	*31.99*	*0.084*	*1.857*	*0.176*	*2.2*	*0.691*	*0.04*	*1.276*

Calculated Cs-137 Surrogate Ratio (c)	
Cs-137/Co-60	381
Cs-137/Eu-152	17
Cs-137/Eu-154	182
Cs-137Am-241	15
Cs-137/Sr-90	46
Cs-137/Pu-238	800
Cs-137/Pu-239	25
Cs-137/Pu-241 (d)	2.8

Modified Cs-137 Screening Criteria			
Cleanup Criteria (pCi/g)		*Surrogate Activity (pCi/g)*	*Summed Ratio*
Cs-137	15	11	0.73
Co-60	8	0.028884026	0.00
Eu-152	36	0.638543285	0.02
Eu-154	32	0.080518912	0.00
Am-241	30	0.756486402	0.03
Sr-90	5	0.237605502	0.05
Pu-238	25	0.013754298	0.00
Pu-239	25	0.438782113	0.02
Pu-241	25	3.928571429	0.16
		Unity Rule (e)	*1.00*

Notes:

(a) Battelle reported analytical results of samples obtained from the filter bed area between March and September 2000.

(b) Reported data obtained from gamma spectroscopy analysis

(c) Surrogate ratio calculated by dividing average Cs-137 activity by average activity of isotope of concern

(d) Pu-241 is calculated by applying a ratio to sum of Pu-238 and Pu-239 (obtained from ORIGEN 2.1 derived values, Battelle, 2003c), resulting in a Cs-137 to Pu-241 ratio of 2.8.

(e) Unity Rule applied to surrogate calculated activity resulting in modified Cs-137 screening level of 11 pCi/g

Table 3
JN-4 North Grounds Area Dose Rate Survey

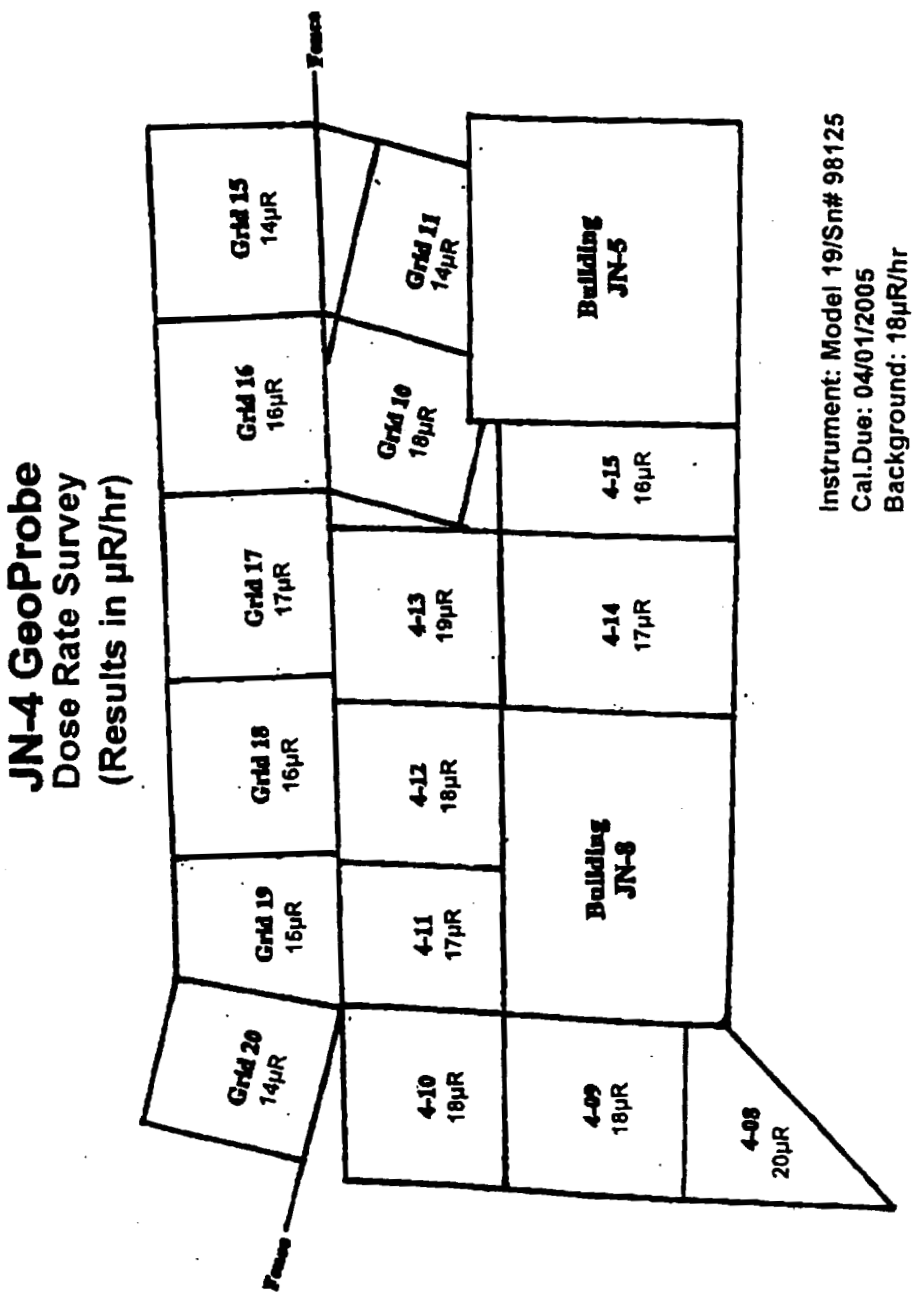


Table 4

2000 and 2001 JN-4 North Grounds Area Soil Analytical Results

Grid	Location	Screen Results(cpm)	Cs-137 Results (pCi/g)
10-Yard	NE Surface	10000	N/A
10-Yard	NE @ 1m	10300	N/A
10-Yard	SE Surface	10300	8.87E-02
10-Yard	SE @ 1m	10400	1.22E-02
10-Yard	NW Surface	10300	N/A
10-Yard	NW @ 1m	10200	N/A
10-Yard	SW Surface	10300	N/A
10-Yard	SW @ 1m	10000	N/A
11-Yard	NE Surface	11000	1.06E-01
11-Yard	NE @ 1m	10700	1.65E-01
15-Perimeter	SE Surface	10900	N/A
15-Perimeter	SE @ 1m	11000	N/A
15-Perimeter	SW Surface	11300	9.25E-02
15-Perimeter	SW @ 1m	11100	6.09E-02
15-Perimeter	NE Surface	10400	N/A
15-Perimeter	NE @ 1m	10500	N/A
15-Perimeter	NW Surface	10700	N/A
15-Perimeter	NW @ 1m	10300	N/A
16-Perimeter	SE Surface	10900	1.32E-01
16-Perimeter	SE @ 1m	11200	1.07E-01
16-Perimeter	SW Surface	10900	N/A
16-Perimeter	SW @ 1m	11000	N/A
16-Perimeter	NE Surface	10800	N/A
16-Perimeter	NE @ 1m	10400	N/A
16-Perimeter	NW Surface	10600	N/A
16-Perimeter	NW @ 1m	10400	N/A
17-Perimeter	SE Surface	10900	3.10E-02
17-Perimeter	SE @ 1m	11100	9.39E-02
17-Perimeter	SW Surface	10800	N/A
17-Perimeter	SW @ 1m	11100	N/A
17-Perimeter	NE Surface	10300	N/A
17-Perimeter	NE @ 1m	10800	N/A
17-Perimeter	NW Surface	10500	N/A
17-Perimeter	NW @ 1m	10500	N/A
18-Perimeter	SE Surface	10800	N/A
18-Perimeter	SE @ 1m	10500	N/A
18-Perimeter	SW Surface	11400	9.81E-02
18-Perimeter	SW @ 1m	11000	N/A
18-Perimeter	NE Surface	11200	N/A
18-Perimeter	NE @ 1m	11100	1.05E-02
18-Perimeter	NW Surface	11200	N/A
18-Perimeter	NW @ 1m	11100	N/A
19-Perimeter	SE Surface	11200	N/A
19-Perimeter	SE @ 1m	11100	N/A

Table 4

2000 and 2001 JN-4 North Grounds Area Soil Analytical Results

Grid	Location	Screen Results(cpm)	Cs-137 Results (pCi/g)
19-Perimeter	SW Surface	11400	N/A
19-Perimeter	SW @ 1m	11400	4.54E-02
19-Perimeter	NE Surface	11300	N/A
19-Perimeter	NE @ 1m	11200	N/A
19-Perimeter	NW Surface	11500	6.13E-02
19-Perimeter	NW @ 1m	11100	N/A
20-Perimeter	SE Surface	11300	4.04E-02
20-Perimeter	SE @ 1m	11000	1.91E-02
20-Perimeter	SW Surface	11000	N/A
20-Perimeter	SW @ 1m	10800	N/A
20-Perimeter	NE Surface	11000	N/A
20-Perimeter	NE @ 1m	10600	N/A
20-Perimeter	NW Surface	11200	N/A
20-Perimeter	NW @ 1m	10900	N/A
JN4-08	SE Surface	9900	N/A
JN4-08	SW Surface	10400	N/A
JN4-08	NE Surface	10200	N/A
JN4-08	NW Surface	10400	1.33E-01
JN4-09	SE Surface	10000	N/A
JN4-09	SW Surface	9630	N/A
JN4-09	NE Surface	10000	N/A
JN4-09	NW Surface	10100	1.46E-01
JN4-10	SE Surface	10100	N/A
JN4-10	SW Surface	10100	N/A
JN4-10	NE Surface	10200	N/A
JN4-10	NW Surface	10700	1.10E-01
JN4-11	SE Surface	10000	N/A
JN4-11	SW Surface	10100	1.35E-01
JN4-11	NE Surface	10000	N/A
JN4-11	NW Surface	10000	N/A
JN4-12	SE Surface	10300	1.29E-01
JN4-12	SW Surface	10200	N/A
JN4-12	NE Surface	10000	N/A
JN4-12	NW Surface	10000	N/A
JN4-13	SE Surface	10200	N/A
JN4-13	SW Surface	10500	7.00E-02
JN4-13	NE Surface	10300	N/A
JN4-13	NW Surface	10100	N/A
JN4-14	SE Surface	10700	6.30E-02
JN4-14	SW Surface	10400	N/A
JN4-14	NE Surface	10400	N/A
JN4-14	NW Surface	10100	N/A
JN4-15	SE Surface	10000	5.27E-02
JN4-15	NE Surface	9850	N/A

Table 5

2005 JN - 4 North Grounds Area Soil Analytical Results

Analytical Parameter	RL05-0129-0854 Grid 4-08 Surface			RL05-0130-0855 Grid 4-09 Surface			RL05-0131-0856 Grid 4-10 Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	-7.40E-02	1.34E-01	2.24E-01	1.94E-02	1.35E-01	2.37E-01	-2.78E-02	1.45E-01	2.48E-01
K-40	1.28E+01	1.48E+00	2.49E-01	1.34E+01	1.55E+00	2.67E-01	1.53E+01	1.73E+00	2.28E-01
Co-58	-2.74E-02	1.60E-02	2.37E-02	-1.21E-02	1.47E-02	2.44E-02	-1.88E-02	1.78E-02	2.88E-02
Co-60	-9.19E-03	1.58E-02	2.62E-02	3.09E-03	1.68E-02	3.04E-02	1.51E-03	1.70E-02	3.04E-02
Zn-65	-2.57E-02	4.28E-02	5.92E-02	-4.28E-02	4.63E-02	6.04E-02	1.44E-02	3.85E-02	6.14E-02
Sb-125	4.57E-02	4.89E-02	8.85E-02	-8.37E-03	4.71E-02	8.09E-02	8.76E-03	4.51E-02	7.93E-02
I-131	-5.77E-03	1.86E-02	3.19E-02	-1.61E-02	1.89E-02	3.14E-02	-4.69E-03	2.00E-02	3.44E-02
Cs-134	-1.96E-03	1.67E-02	2.45E-02	-6.19E-03	1.70E-02	2.44E-02	-4.67E-03	1.66E-02	2.40E-02
Cs-137	6.15E-02	2.90E-02	3.62E-02	7.59E-02	2.44E-02	2.82E-02	-7.91E-03	2.00E-02	3.32E-02
Eu-152	-8.02E-02	6.73E-02	9.27E-02	-2.51E-02	6.82E-02	9.42E-02	-2.79E-02	6.88E-02	9.94E-02
Eu-154	-2.28E-02	4.65E-02	7.72E-02	5.92E-03	4.71E-02	8.00E-02	-4.51E-02	4.98E-02	8.12E-02
Tl-208	2.70E-01	4.47E-02	2.50E-02	2.77E-01	4.36E-02	2.95E-02	2.59E-01	4.11E-02	3.13E-02
Bi-212	9.11E-01	4.18E-01	3.98E-01	9.67E-01	4.00E-01	3.96E-01	8.53E-01	3.46E-01	4.16E-01
Pb-212	8.08E-01	8.48E-02	6.25E-02	8.96E-01	9.10E-02	6.00E-02	9.41E-01	9.59E-02	6.64E-02
Bi-214	1.23E+00	1.08E-01	5.21E-02	1.15E+00	1.04E-01	5.28E-02	1.38E+00	1.17E-01	5.52E-02
Pb-214	1.32E+00	1.14E-01	7.12E-02	1.27E+00	1.11E-01	6.83E-02	1.50E+00	1.22E-01	7.59E-02
Ac-228	8.58E-01	1.15E-01	1.00E-01	8.89E-01	1.07E-01	1.09E-01	9.72E-01	1.17E-01	1.07E-01
Th-234	3.12E+00	3.01E+00	1.07E+00	1.17E+00	2.87E+00	1.14E+00	-3.16E-01	2.90E+00	1.19E+00
U-235	1.71E-01	1.68E-01	6.48E-02	6.30E-02	1.67E-01	6.38E-02	1.16E-02	1.82E-01	6.86E-02
Am-241	-5.86E-01	5.01E-01	8.22E-01	-7.48E-01	5.07E-01	8.17E-01	-1.73E-01	5.38E-01	9.18E-01
Analytical Parameter	RL05-0132-0857 Grid 4-11 Surface			RL05-0133-0858 Grid 4-12 Surface			RL05-0134-0859 Grid 4-13 Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	1.53E-02	1.53E-01	2.69E-01	-4.31E-02	1.38E-01	2.34E-01	-7.53E-02	1.37E-01	2.29E-01
K-40	1.34E+01	1.60E+00	2.46E-01	1.30E+01	1.50E+00	2.55E-01	1.42E+01	1.63E+00	2.33E-01
Co-58	-6.05E-04	1.61E-02	2.92E-02	-6.59E-03	1.46E-02	2.52E-02	4.28E-03	1.50E-02	2.76E-02
Co-60	-2.04E-03	1.78E-02	3.17E-02	-5.23E-03	1.61E-02	2.76E-02	-1.83E-03	1.56E-02	2.76E-02
Zn-65	-1.62E-02	4.71E-02	6.83E-02	-4.32E-02	4.41E-02	5.66E-02	-4.09E-03	4.72E-02	7.04E-02
Sb-125	-9.00E-03	5.14E-02	8.88E-02	3.15E-03	4.50E-02	7.86E-02	9.35E-03	4.83E-02	8.48E-02
I-131	-1.35E-02	2.06E-02	3.47E-02	8.34E-03	1.84E-02	3.30E-02	5.64E-03	2.14E-02	3.78E-02
Cs-134	2.04E-03	1.97E-02	2.99E-02	2.18E-03	1.63E-02	2.47E-02	1.57E-03	1.62E-02	2.45E-02
Cs-137	1.15E-01	3.18E-02	3.88E-02	1.34E-01	3.70E-02	2.90E-02	1.02E-01	2.82E-02	2.84E-02
Eu-152	-1.37E-02	7.20E-02	1.01E-01	7.46E-03	6.48E-02	8.65E-02	3.82E-02	7.13E-02	9.62E-02
Eu-154	1.63E-03	5.04E-02	8.57E-02	-7.25E-03	4.58E-02	7.70E-02	3.59E-02	4.99E-02	8.59E-02
Tl-208	2.57E-01	4.77E-02	3.17E-02	2.43E-01	3.95E-02	2.88E-02	2.24E-01	4.34E-02	3.08E-02
Bi-212	8.31E-01	4.31E-01	4.16E-01	1.11E+00	4.24E-01	3.45E-01	8.69E-01	4.73E-01	3.79E-01
Pb-212	9.51E-01	1.21E-01	6.76E-02	7.75E-01	8.32E-02	5.89E-02	8.18E-01	8.70E-02	7.03E-02
Bi-214	1.25E+00	1.14E-01	6.27E-02	1.17E+00	1.04E-01	5.20E-02	1.53E+00	1.21E-01	5.42E-02
Pb-214	1.27E+00	1.20E-01	7.75E-02	1.21E+00	1.03E-01	6.18E-02	1.40E+00	1.18E-01	7.26E-02
Ac-228	8.16E-01	1.09E-01	1.18E-01	8.18E-01	9.51E-02	9.21E-02	8.33E-01	9.95E-02	1.02E-01
Th-234	2.86E+00	3.36E+00	1.24E+00	1.83E+00	2.74E+00	1.05E+00	4.23E+00	3.45E+00	1.17E+00
U-235	1.20E-01	1.82E-01	7.40E-02	1.09E-01	1.67E-01	6.41E-02	6.78E-02	1.78E-01	6.86E-02
Am-241	-5.24E-01	5.64E-01	9.37E-01	-2.88E-01	4.69E-01	7.92E-01	-6.53E-01	5.20E-01	8.48E-01

Table 5

2005 JN-4 North Grounds Area Soil Analytical Results

Analytical Parameter	RL05-0135-0860 Grid 4-14 Surface			RL05-0136-0861 Grid 4-15 Surface			RL05-0137-0862 Grid 10 Yard Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	6.28E-03	1.46E-01	2.53E-01	8.63E-04	1.31E-01	2.27E-01	2.03E-02	1.34E-01	2.35E-01
K-40	1.28E+01	1.49E+00	2.28E-01	1.14E+01	1.33E+00	2.50E-01	1.01E+01	1.21E+00	2.18E+00
Co-58	-1.51E-02	1.61E-02	2.65E-02	-1.46E-02	1.47E-02	2.40E-02	-1.27E-02	1.48E-02	2.44E-02
Co-60	-1.45E-03	1.61E-02	2.84E-02	-8.85E-03	1.44E-02	2.38E-02	8.18E-03	1.47E-02	2.81E-02
Zn-65	-3.53E-02	4.41E-02	5.88E-02	5.93E-03	3.85E-02	5.95E-02	-1.09E-03	3.65E-02	5.56E-02
Sb-125	3.69E-02	4.63E-02	8.39E-02	2.47E-02	4.40E-02	7.87E-02	1.54E-02	4.39E-02	7.80E-02
I-131	3.79E-04	2.02E-02	3.54E-02	-2.95E-03	1.80E-02	3.11E-02	-1.99E-02	1.91E-02	3.12E-02
Cs-134	-8.64E-04	1.75E-02	2.60E-02	-2.05E-03	1.53E-02	2.25E-02	4.33E-03	1.51E-02	2.33E-02
Cs-137	7.59E-02	2.55E-02	3.29E-02	6.15E-02	2.35E-02	3.04E-02	5.32E-02	3.24E-02	2.49E-02
Eu-152	5.49E-03	6.84E-02	1.01E-01	2.30E-02	6.34E-02	8.00E-02	-3.08E-02	6.23E-02	8.48E-02
Eu-154	-1.78E-03	4.72E-02	7.97E-02	-5.09E-03	4.43E-02	7.46E-02	3.97E-03	4.40E-02	7.48E-02
Tl-208	2.30E-01	4.49E-02	6.33E-02	2.26E-01	3.96E-02	2.57E-02	1.97E-01	3.95E-02	2.80E-02
Bi-212	6.13E-01	3.08E-01	3.86E-01	7.54E-01	4.04E-01	3.47E-01	3.39E-01	3.85E-01	3.54E-01
Pb-212	7.69E-01	9.12E-02	6.30E-02	7.35E-01	8.33E-02	5.74E-02	7.09E-01	8.37E-02	5.96E-02
Bi-214	1.41E+00	1.15E-01	5.86E-02	1.18E+00	9.63E-02	5.18E-02	1.24E+00	1.04E-01	4.86E-02
Pb-214	1.39E+00	1.21E-01	7.16E-02	1.22E+00	1.07E-01	6.43E-02	1.23E+00	1.13E-01	6.20E-02
Ac-228	8.14E-01	1.00E-01	1.08E-01	7.03E-01	1.07E-01	1.03E-01	6.94E-01	9.50E-02	1.09E-01
Th-234	-1.87E-01	2.82E+00	1.12E+00	8.58E-01	2.59E+00	1.02E+00	1.65E+00	2.74E+00	1.02E+00
U-235	2.13E-01	1.73E-01	6.69E-02	5.42E-02	1.59E-01	6.10E-02	-2.44E-02	1.62E-01	6.06E-02
Am-241	-2.76E-01	5.11E-01	8.65E-01	-2.27E-01	4.56E-01	7.74E-01	-4.82E-01	4.79E-01	7.93E-01
Analytical Parameter	RL05-0138-0863 Grid 11 Yard Surface			RL05-0139-0864 Grid 15 Perimeter Surface			RL05-0140-0865 Grid 16 Perimeter Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	6.08E-02	1.65E-01	2.95E-01	5.25E-02	1.55E-01	2.79E-01	3.70E-02	1.55E-01	2.77E-01
K-40	1.36E+01	1.62E+00	2.55E-01	1.30E+01	1.57E+00	2.78E-01	1.22E+01	1.52E+00	3.30E-01
Co-58	-8.11E-03	1.78E-02	3.08E-02	-1.49E-02	1.91E-02	3.18E-02	-1.38E-03	1.73E-02	3.11E-02
Co-60	5.37E-03	1.90E-02	3.55E-02	-8.24E-03	2.09E-02	3.58E-02	-5.89E-03	1.95E-02	3.37E-02
Zn-65	1.09E-02	4.94E-02	7.78E-02	1.57E-02	4.20E-02	6.94E-02	-2.28E-02	5.41E-02	7.72E-02
Sb-125	-1.61E-02	5.66E-02	9.71E-02	5.94E-03	5.14E-02	9.13E-02	1.58E-02	5.01E-02	9.00E-02
I-131	1.62E-03	2.43E-02	4.27E-02	1.87E-04	2.48E-02	4.37E-02	-5.18E-03	2.36E-02	4.08E-02
Cs-134	-8.53E-03	1.90E-02	2.70E-02	1.11E-02	2.10E-02	3.34E-02	-1.03E-02	2.12E-02	2.99E-02
Cs-137	1.64E-01	4.27E-02	4.27E-02	9.33E-02	3.40E-02	3.88E-02	1.14E-01	4.40E-02	3.08E-02
Eu-152	-5.31E-02	7.82E-02	1.12E-01	3.42E-02	7.75E-02	1.17E-01	-3.66E-02	7.54E-02	9.91E-02
Eu-154	2.18E-02	5.25E-02	9.05E-02	-3.00E-02	5.51E-02	9.14E-02	6.54E-04	5.25E-02	8.93E-02
Tl-208	2.48E-01	4.71E-02	3.60E-02	2.45E-01	4.89E-02	7.87E-02	2.37E-01	4.74E-02	7.58E-02
Bi-212	1.37E+00	4.81E-01	4.25E-01	7.42E-01	4.17E-01	4.91E-01	9.04E-01	4.84E-01	4.47E-01
Pb-212	8.72E-01	1.01E-01	6.97E-02	8.89E-01	1.20E-01	1.62E-01	7.98E-01	9.98E-02	7.17E-02
Bi-214	1.27E+00	1.19E-01	5.94E-02	1.29E+00	1.30E-01	7.06E-02	1.29E+00	1.20E-01	6.46E-02
Pb-214	1.38E+00	1.25E-01	7.27E-02	1.43E+00	1.32E-01	8.25E-02	1.28E+00	1.16E-01	7.75E-02
Ac-228	9.47E-01	1.16E-01	1.19E-01	8.54E-01	1.31E-01	1.43E-01	8.35E-01	1.22E-01	1.27E-01
Th-234	2.52E+00	3.34E+00	1.33E+00	-1.76E+00	3.39E+00	1.35E+00	-4.77E-01	3.13E+00	1.27E+00
U-235	4.13E-02	1.93E-01	7.49E-02	7.52E-02	1.96E-01	7.96E-02	1.80E-01	1.87E-01	7.44E-02
Am-241	-7.59E-01	5.78E-01	9.38E-01	1.34E-01	6.03E-01	1.06E+00	-2.79E-01	5.57E-01	9.48E-01

Table 5

2005 JN - 4 North Grounds Area Soil Analytical Results

Analytical Parameter	RL05-0141-0866 Grid 17 Perimeter Surface			RL05-0142-0867 Grid 18 Perimeter Surface			RL05-0143-0868 Grid 19 Perimeter Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	5.52E-02	1.33E-01	2.37E-01	-2.82E-02	1.24E-01	2.12E-01	3.53E-02	1.31E-01	2.30E-01
K-40	1.27E+01	1.47E+00	2.30E-01	1.16E+01	1.34E+00	1.99E-01	1.33E+01	1.54E+00	2.56E-01
Co-58	8.43E-03	1.52E-02	2.82E-02	-3.05E-03	1.54E-02	2.33E-02	-2.51E-02	1.58E-02	2.38E-02
Co-60	-6.72E-03	1.43E-02	2.41E-02	1.87E-03	1.61E-02	2.89E-02	-2.74E-03	1.74E-02	3.02E-02
Zn-65	-2.00E-02	4.22E-02	5.97E-02	-1.35E-02	3.91E-02	5.65E-02	-3.10E-02	4.53E-02	6.19E-02
Sb-125	4.57E-02	4.67E-02	8.50E-02	-2.86E-02	4.12E-02	6.86E-02	3.87E-02	4.96E-02	8.89E-02
I-131	3.58E-03	1.99E-02	3.49E-02	-1.39E-02	1.84E-02	3.08E-02	-6.46E-03	2.04E-02	3.49E-02
Cs-134	-8.55E-04	1.62E-02	2.41E-02	1.02E-02	1.54E-02	2.43E-02	1.03E-02	1.57E-02	2.50E-02
Cs-137	3.19E-02	2.25E-02	3.01E-02	3.30E-02	1.69E-02	3.21E-02	3.17E-02	2.80E-02	3.56E-02
Eu-152	-2.73E-02	6.88E-02	8.62E-02	-5.18E-03	6.34E-02	8.37E-02	-1.35E-02	6.91E-02	8.92E-02
Eu-154	7.35E-03	4.77E-02	8.09E-02	2.02E-03	4.39E-02	7.43E-02	-3.25E-03	4.81E-02	8.09E-02
Tl-208	2.50E-01	4.58E-02	2.69E-02	2.15E-01	3.78E-02	3.02E-02	2.55E-01	4.39E-02	2.95E-02
Bi-212	9.73E-01	5.11E-01	3.35E-01	7.59E-01	3.06E-01	3.48E-01	7.86E-01	4.04E-01	3.77E-01
Pb-212	7.12E-01	8.83E-02	9.77E-02	6.91E-01	7.63E-02	5.77E-02	8.37E-01	8.69E-02	6.48E-02
Bi-214	1.37E+00	1.10E-01	5.52E-02	1.22E+00	1.02E-01	5.17E-02	1.47E+00	1.19E-01	5.56E-02
Pb-214	1.32E+00	1.17E-01	6.81E-02	1.34E+00	1.09E-01	6.44E-02	1.50E+00	1.26E-01	6.96E-02
Ac-228	8.25E-01	9.66E-02	9.32E-02	7.62E-01	9.24E-02	8.52E-02	9.26E-01	1.00E-01	1.06E-01
Th-234	-3.98E-01	2.80E+00	1.13E+00	7.09E-01	2.61E+00	1.05E+00	1.20E+00	2.81E+00	1.12E+00
U-235	1.30E-01	1.65E-01	6.60E-02	7.12E-02	1.57E-01	6.10E-02	1.56E-01	1.69E-01	6.57E-02
Am-241	6.47E-02	5.08E-01	8.82E-01	-1.42E-01	4.71E-01	8.05E-01	-4.69E-01	5.09E-01	8.47E-01

Analytical Parameter	RL05-0144-0869 Grid 20 Perimeter Surface		
	Result (pCi/g)	2 σ (pCi/g)	2 σ MDA (pCi/g)
Be-7	1.59E-01	1.31E-01	2.41E-01
K-40	1.29E+01	1.50E+00	2.42E-01
Co-58	-1.03E-02	1.48E-02	2.49E-02
Co-60	-1.92E-03	1.60E-02	2.80E-02
Zn-65	2.11E-03	4.04E-02	6.14E-02
Sb-125	-3.67E-02	4.43E-02	7.31E-02
I-131	-1.53E-03	1.97E-02	3.41E-02
Cs-134	1.75E-03	1.59E-02	2.39E-02
Cs-137	6.04E-03	1.72E-02	3.02E-02
Eu-152	5.09E-02	6.49E-02	8.64E-02
Eu-154	-1.09E-02	4.57E-02	7.64E-02
Tl-208	2.01E-01	3.92E-02	2.57E-02
Bi-212	7.34E-01	3.50E-01	3.35E-01
Pb-212	6.66E-01	8.70E-02	6.01E-02
Bi-214	1.39E+00	1.11E-01	5.49E-02
Pb-214	1.48E+00	1.21E-01	6.54E-02
Ac-228	7.01E-01	9.55E-02	9.99E-02
Th-234	2.62E+00	2.90E+00	1.09E+00
U-235	1.62E-01	1.66E-01	6.54E-02
Am-241	-5.12E-01	4.93E-01	8.15E-01

Table 6

JN-4 North Grounds Area Comparison Value Calculations

Area/Volume ID		Number of Data Points	t95% (n-1) Value from Table B-1 of NUREG/CR-5849
JN-4 North Grounds Area	Surface Soil	16	1.753

	Sample Number	Cs-137 Result (pCi/g)
1	129-854	0.06
2	130-855	0.08
3	131-856	0.03
4	132-857	0.12
5	133-858	0.13
6	134-859	0.10
7	135-860	0.08
8	136-861	0.06
9	137-862	0.05
10	138-863	0.16
11	139-864	0.09
12	140-865	0.11
13	141-866	0.03
14	142-867	0.03
15	143-868	0.03
16	144-869	0.03
Comparison Value Equation	$\mu_\alpha = \bar{x} + t_{1-\alpha,df}\frac{s_x}{\sqrt{n}}$	

Average	Comparison Value
0.07	0.09

Standard Deviation	Modified Screening Criteria
0.04	11 pCi/g

Comparison < Criteria
Yes

Table 7
JN-4 North Grounds Area Walkover Scan Survey

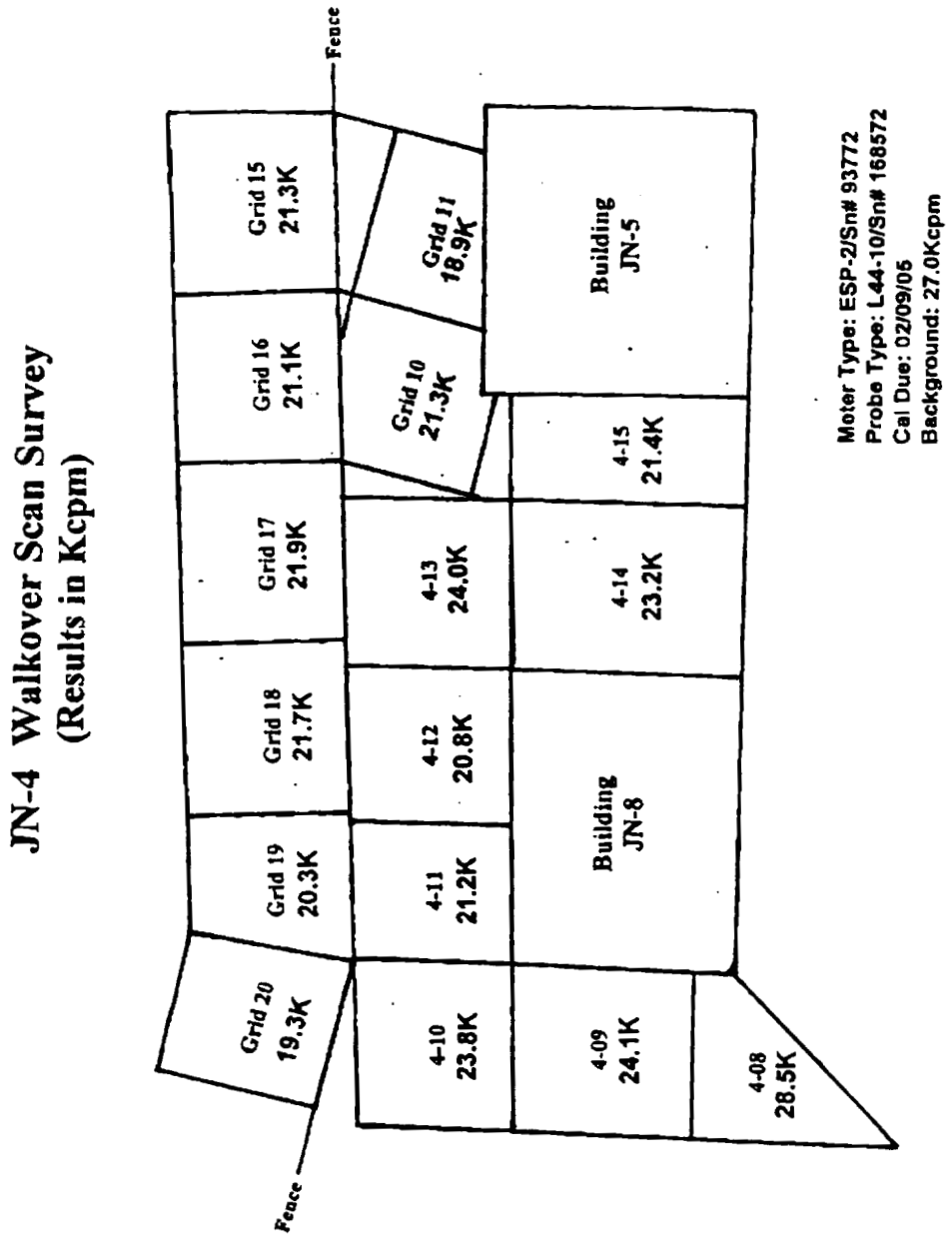


Table 8
Routine Plant Perimeter Surveys

Routine Plant Perimeter Surveys

Date	Jan/Feb 05		
			Reference Survey #
		micro rem/hr	HPS #
Readings in micro rem/hr.		50	J-28077
		30	J-28077
		30	J-28077
		50	J-28134
		60	J-28134
		30	J-28177
		35	J-28177
		35	J-28177
		15	J-28275
		15	J-28275
		7	J-28275
		50	J-28368
		70	J-28368
		25	J-28368
		8	J-28368
		8	J-28368
	Avg.	32	
	SD	19	