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Mr. John Hickman
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and Environmental Protection
U.S. Nuclear Regulatory Commission
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**SUBJECT: IN-PROCESS INSPECTION SURVEY RESULTS FOR THE REACTOR
SUPPORT STRUCTURE CONCRETE BASE AND INSIDE OPEN LAND
AREAS AT THE YANKEE NUCLEAR POWER STATION, ROWE,
MASSACHUSETTS [DOCKET NO. 50-29; RFTA NO. 05-008]**

Dear Mr. Hickman:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed in-process inspection survey activities on several Reactor Support Structure (RSS) Concrete Base and Inside Open Land (NOL) survey units at the Yankee Nuclear Power Station in Rowe, Massachusetts during the periods of August 9 and 10 and September 13 and 14, 2005. These survey activities were requested and approved by the U.S. Nuclear Regulatory Commission (NRC). The survey activities included beta and gamma surface scans, direct measurements for beta activity, and soil sampling. Enclosed are the in-process survey results documenting these survey activities.

If you have any questions or comments, please direct them to me at (865) 576-0065 or Scott Kirk at (865) 574-0685.

Sincerely,

Wade C. Adams

Wade C. Adams
Health Physicist/Project Leader
Environmental Survey and
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WCA:ar

Enclosure

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**IN-PROCESS INSPECTION SURVEY RESULTS
FOR THE REACTOR SUPPORT STRUCTURE CONCRETE BASE
AND INSIDE OPEN LAND AREAS
AT THE YANKEE NUCLEAR POWER STATION
ROWE, MASSACHUSETTS**

INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) requested that the Oak Ridge Institute for Science and Education's (ORISE) Environmental Survey and Site Assessment Program (ESSAP) perform an in-process inspection survey of the Reactor Support Structure (RSS) remaining concrete support base and the Inside Open Land (NOL) Area Excavations at the Yankee Nuclear Power Station (YNPS). The in-process inspection surveys were performed during the periods of August 9 and 10, 2005 and September 13 and 14, 2005. Figures 1 through 4 indicate the survey units that were part of these survey activities.

PROCEDURES

The in-process inspection surveys were performed in accordance with a site-specific survey plan that was submitted to and approved by the NRC (ORISE 2005a). The ORISE/ESSAP Survey Procedures and Quality Assurance Manuals were also followed (ORISE 2004 and 2005b).

Reactor Support Structure Concrete Base

Beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Surface scans were performed on up to 25% of the RSS structural surfaces. Particular attention was given to cracks, joints, and scabbled areas in the evaluated structural surfaces where material may have accumulated. Direct measurements for beta activity were performed at five locations within each of the six RSS survey units (SU) which were available for confirmatory survey activities. At the discretion of the NRC site representative, smear samples were not deemed necessary. Locations where direct measurements were taken are indicated on Figure 1.

Inside Open Land Area (NOL) Excavations

Gamma surface scans were performed over 90% of accessible portions of the NOL excavations consisting of SUs NOL-01, Units 1, 2, and 3 and NOL-06, Unit 1 using sodium iodide (NaI) scintillation detectors coupled to ratemeters with audible indicators. However, access to some areas was restricted due to safety concerns. Soil samples were collected from five locations within each of the four SU excavations which were available for confirmatory survey activities. Locations where soil samples were taken are indicated on Figures 2 through 4.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Radiological data and sample media were returned to ESSAP's laboratory in Oak Ridge, TN for analysis and interpretation. Radioassays were performed in accordance with the ESSAP Laboratory Procedures Manual (ORISE 2005c). Soil samples were analyzed by gamma

spectroscopy for the primary radionuclides of interest (i.e., Co-60 and Cs-137). However, spectra were also reviewed for other gamma-emitting fission and activation products associated with the YNPS and other identifiable total absorption peaks. Soil sample results were reported in units of picocuries per gram (pCi/g). Direct measurement data were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm²).

FINDINGS AND RESULTS

Reactor Support Structure Concrete Base

Beta surface scans did not identify any areas of elevated activity on the RSS concrete base structures. The ranges of total net beta activity measurements for each of these SUs are as follows:

Survey Unit ^a	Range of Total Net Beta Activity (dpm/100 cm ²)
BRT-01 Unit 1	460 to 4,330
BRT-01 Unit 3	280 to 670
BRT-01 Unit 4	1,370 to 2,460
BRT-01 Unit 5	1,170 to 2,190
BRT-01 Unit 6	1,640 to 2,720
BRT-01 Unit 7	1,220 to 2,350

^aBRT = Big Round Thing, the YNPS nomenclature for the Reactor Support Structure concrete base.

A complete listing of the surface activity level results is presented in Table 1.

Inside Open Land Area (NOL) Excavations

Gamma surface scans identified eight locations of elevated direct gamma radiation on the soil surfaces within NOL-01 Units 1, 2 and 3 and no elevated gamma activity locations on the soil surfaces in NOL-06 Unit 1. Based on the gamma scan results, biased soil samples were collected at the eight locations exhibiting elevated gamma radiation. The remaining twelve sample locations were randomly selected. With the exception of the one location in NOL-01 Unit 1, the areas of elevated gamma activity identified on the soil surfaces were believed to be attributable to discrete particles within the soil. Further investigations by the licensee, and by the ESSAP laboratory, indicated that this assumption was correct. The elevated gamma activity in NOL-01 Unit 1 was believed to be attributable to naturally occurring radioactive material within a medium sized rock that YNPS personnel disposed of as radiological waste. The range of radionuclide concentrations for the five soil samples collected by ESSAP from each of the NOL SUs are as follows:

Survey Unit	Range of Radionuclide Concentrations in Soil Samples (pCi/g)	
	Co-60	Cs-137
NOL-01 Unit 1	0.00 to 0.19	0.00 to 0.22
NOL-01 Unit 2	0.01 to 357	0.17 to 0.99
NOL-01 Unit 3	0.01 to 14.02	0.04 to 347
NOL-06 Unit 1	0.00 to 0.02	0.00 to 0.06

A complete listing of the soil sample results is presented in Table 2.

SUMMARY

Since this was an in-process confirmatory survey, the licensee did not have final status survey (FSS) data available for review. YNPS personnel provided preliminary direct measurement and soil sample results to ESSAP while on site.

Beta surface scans did not identify any areas of elevated beta activity on the RSS concrete base structural surfaces. Direct measurements were performed at 30 locations and all results were well within the derived concentration guideline levels (DCGLs) for Co-60 and Cs-137 as provided in the License Termination Plan [LTP (YAEC 2004)].

Gamma surface scans identified eight locations of elevated direct gamma radiation within NOL-01 Units 1, 2 and 3 and each of these locations were sampled. The soil contamination was determined to be non-uniformly distributed within the samples. With one exception, the elevated activity was due to discrete particles within the soil sample. The exception was a medium sized rock within NOL-01 Unit 1 which exhibited elevated gamma radiation believed to be attributable to naturally occurring radioactive materials within the rock. Regardless, YNPS personnel disposed of the rock as radiological waste.

The in-process confirmatory surveys determined that detectable activity, in excess of the soil DCGLs, was present at several locations within NOL-01 Units 2 and 3. Three of the 20 soil samples exceeded the Co-60 DCGL of 4.0 pCi/g and one sample exceeded the Cs-137 DCGL of 8.6 pCi/g. Therefore, the results of the survey activities for these SUs failed to confirm that the radiological conditions were suitable for unrestricted use in accordance with clean up criteria cited in the licensee's LTP.

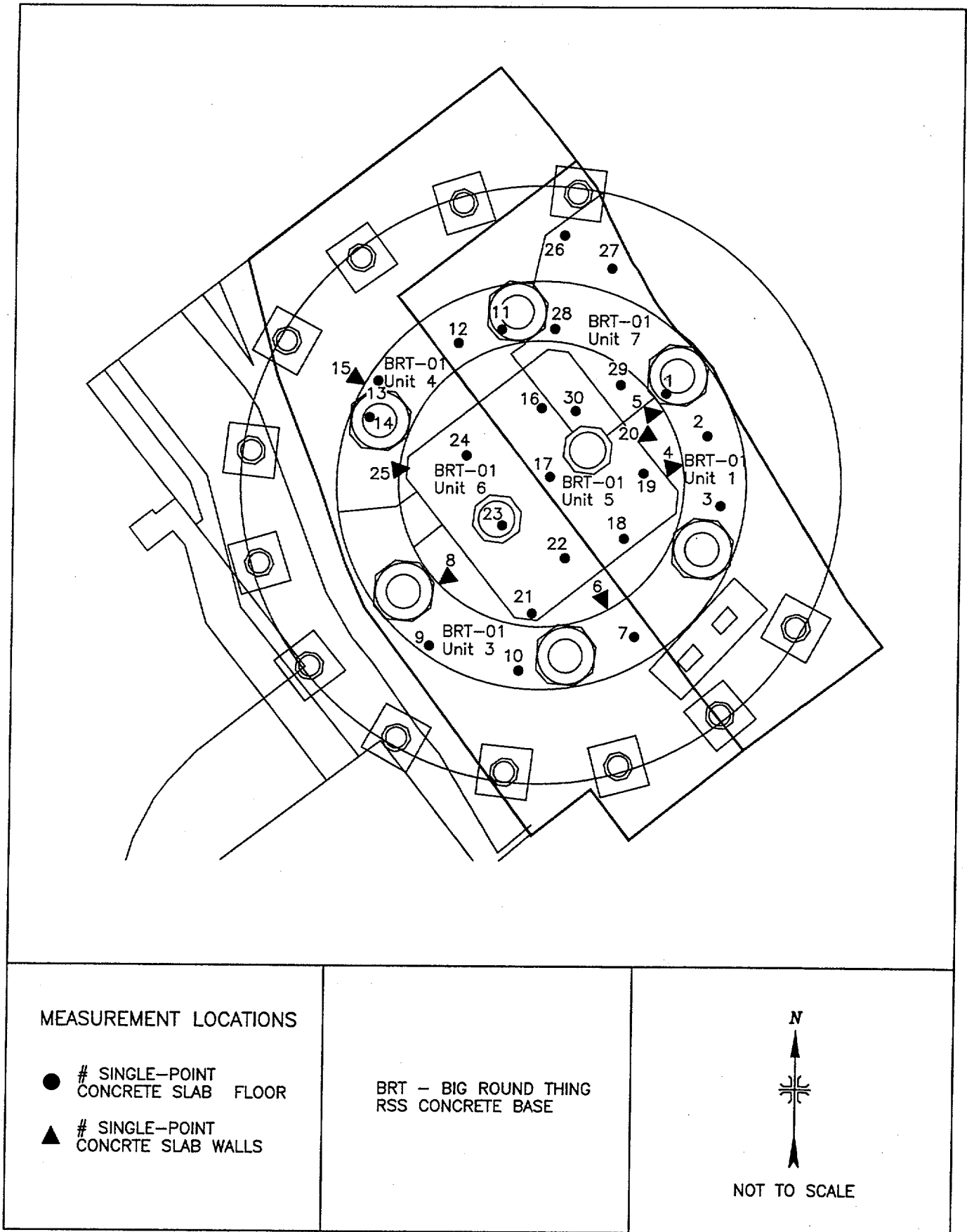


FIGURE 1: Yankee Nuclear Power Station, Reactor Support Structure (RSS) Concrete Base - Direct Measurement Locations

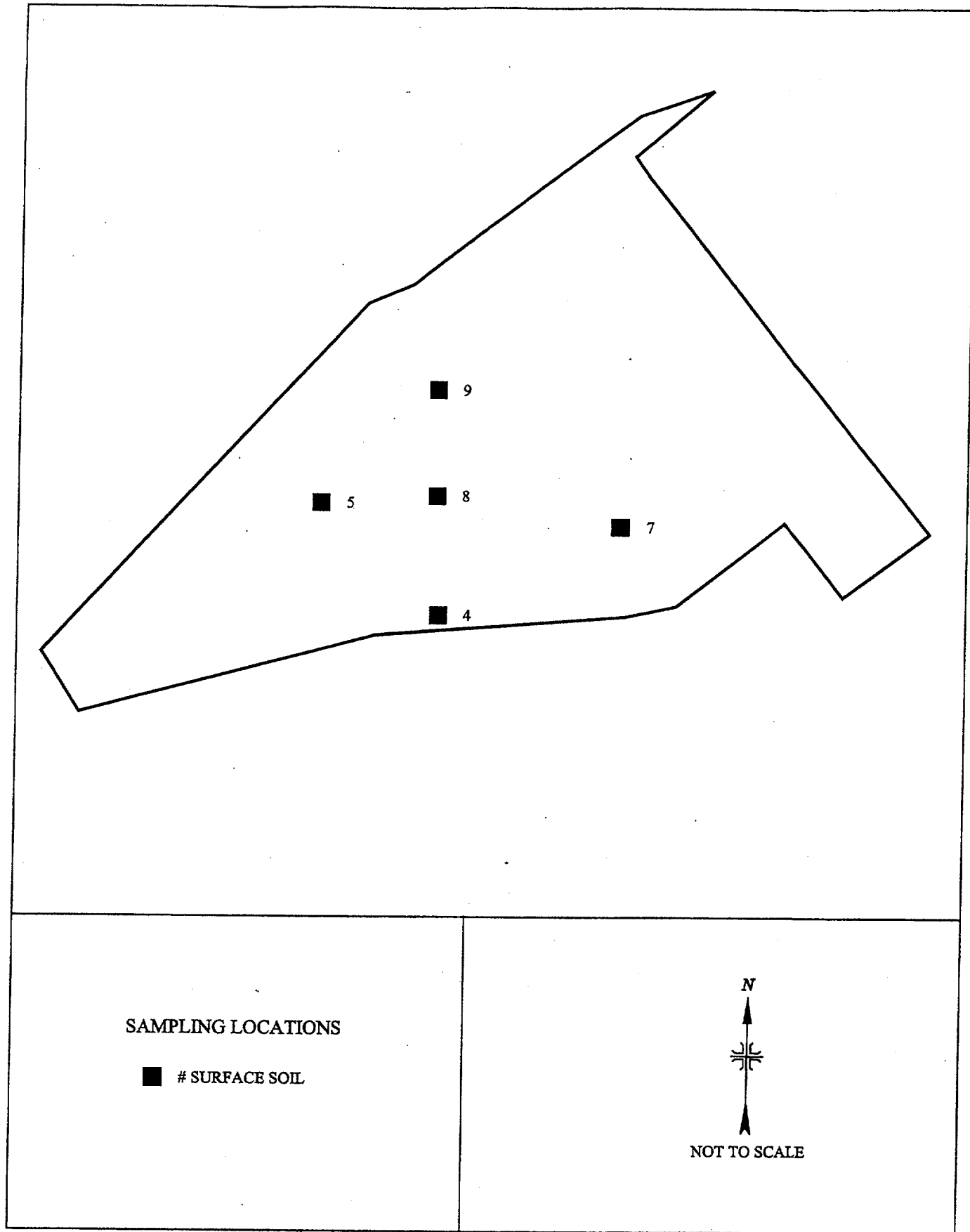


FIGURE 2: Yankee Nuclear Power Station, Inside Open Land (NOL) Excavation, NOL-01, Unit 2 – Soil Sampling Locations

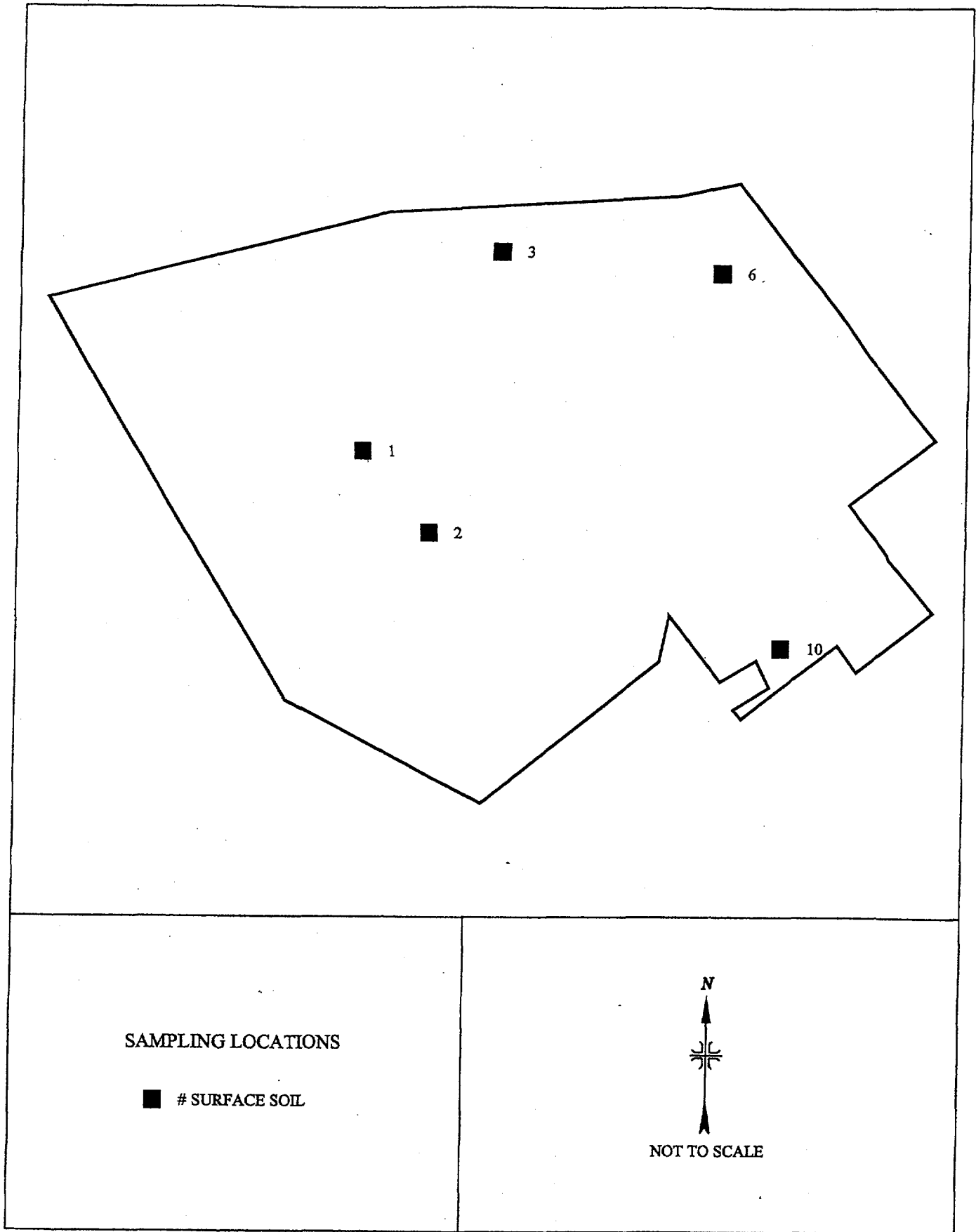


FIGURE 3: Yankee Nuclear Power Station, Inside Open Land (NOL) Excavation, NOL-01, Unit 3 - Soil Sampling Locations

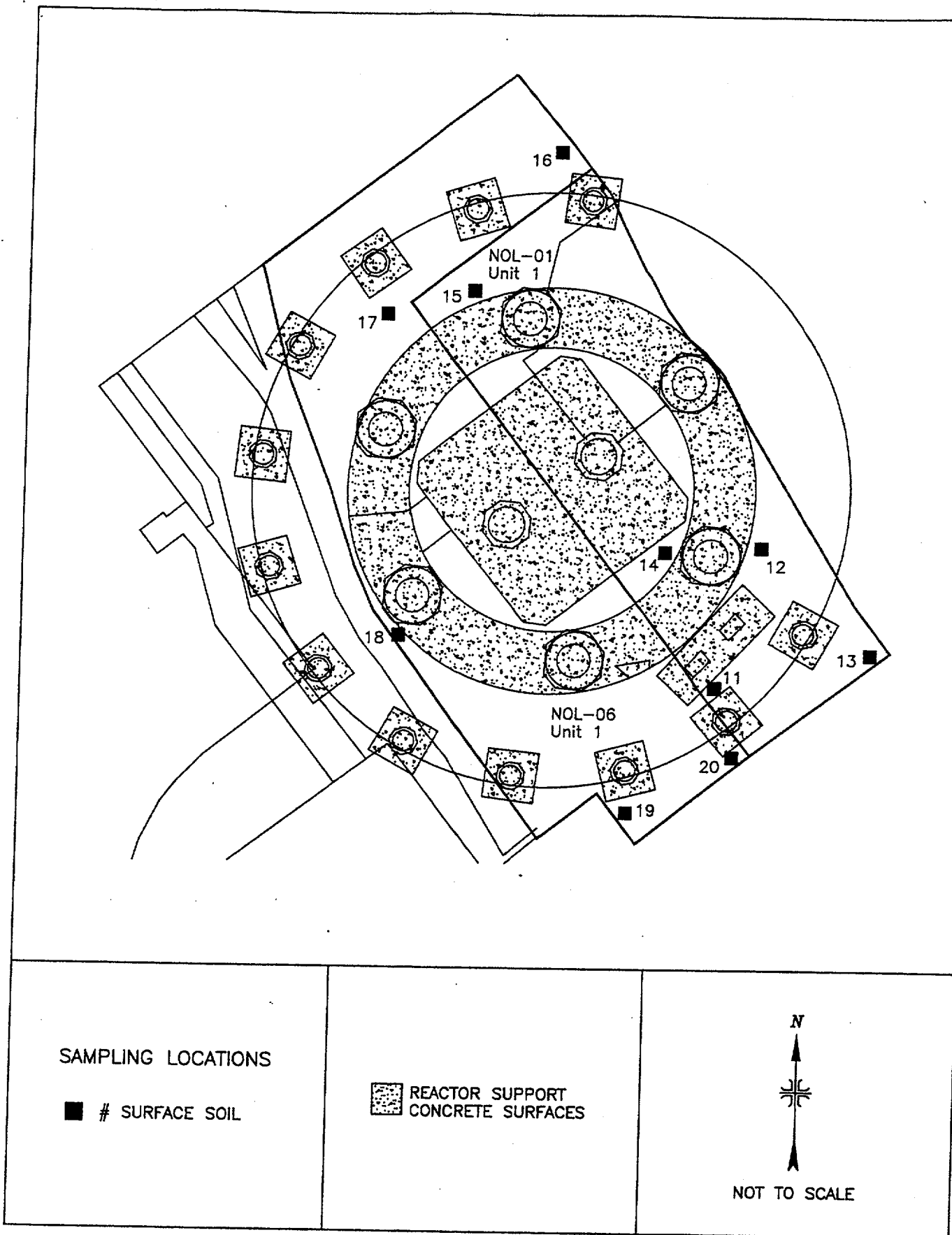


FIGURE 4: Yankee Nuclear Power Station, Inside Open Land (NOL) Excavations NOL-01, Unit 1 and NOL-06, Unit 1 – Soil Sampling Locations

TABLE 1
SURFACE ACTIVITY LEVELS
REACTOR SUPPORT STRUCTURE CONCRETE BASE
YANKEE NUCLEAR POWER STATION
ROWE, MASSACHUSETTS

Survey Unit/ Location ^a	Total Net Beta Activity (dpm/100 cm ²)	Survey Unit/ Location ^a	Total Net Beta Activity (dpm/100 cm ²)
BRT-01 Unit 1^b		BRT-01 Unit 5	
1	4,330 ± 520 ^c	16	1,540 ± 410
2	2,950 ± 470	17	1,840 ± 430
3	2,870 ± 470	18	2,190 ± 440
4	1,730 ± 420	19	1,480 ± 410
5	460 ± 370	20	1,170 ± 400
BRT-01 Unit 3		BRT-01 Unit 6	
6	530 ± 370	21	2,720 ± 460
7	670 ± 380	22	2,390 ± 450
8	280 ± 360	23	1,640 ± 420
9	470 ± 370	24	1,890 ± 430
10	520 ± 370	25	1,790 ± 430
BRT-01 Unit 4		BRT-01 Unit 7	
11	2,460 ± 450	26	2,140 ± 440
12	2,330 ± 450	27	2,350 ± 450
13	2,180 ± 440	28	1,520 ± 410
14	2,380 ± 450	29	1,220 ± 400
15	1,370 ± 410	30	1,400 ± 410

^aRefer to Figure 1.

^bBRT = Big Round Thing; the YNPS nomenclature for the Reactor Support Structure concrete base. The LTP DCGL values are 63,000 dpm/100 cm² for Cs-137 and 18,000 dpm/100 cm² for Co-60.

^cUncertainties represent the 95% confidence level, based on counting statistics only.

TABLE 2
RADIONUCLIDE CONCENTRATIONS
IN SOIL SAMPLES
INSIDE OPEN LAND (NOL) AREA EXCAVATIONS
YANKEE NUCLEAR POWER STATION
ROWE, MASSACHUSETTS

Sample Location ^a	Radionuclide Concentrations (pCi/g) ^b	
	Co-60	Cs-137
Survey Unit NOL-01 Unit 1^c		
1672S0011	0.02 ± 0.03 ^d	0.02 ± 0.02
1672S0012	0.19 ± 0.05	0.03 ± 0.02
1672S0013	0.00 ± 0.02 ^e	0.00 ± 0.02
1672S0014	0.05 ± 0.04	0.22 ± 0.04
1672S0015	0.02 ± 0.02	0.07 ± 0.03
Survey Unit NOL-01 Unit 2^f		
1672S0004	0.03 ± 0.05	0.19 ± 0.04
1672S0005	0.74 ± 0.08	0.99 ± 0.07
1672S0007	0.01 ± 0.03	0.17 ± 0.03
1672S0008	357 ± 11	0.24 ± 0.83
1672S0009	0.60 ± 0.10	0.77 ± 0.08
Survey Unit NOL-01 Unit 3^f		
1672S0001	8.75 ± 0.31	1.84 ± 0.13
1672S0002	0.01 ± 0.09	347 ± 11
1672S0003	14.02 ± 0.51	0.54 ± 0.09
1672S0006	0.14 ± 0.05	0.43 ± 0.04
1672S0010	0.17 ± 0.04	0.04 ± 0.02
Survey Unit NOL-06 Unit 1^c		
1672S0016	0.02 ± 0.03	0.00 ± 0.02
1672S0017	0.02 ± 0.02	0.06 ± 0.03
1672S0018	0.01 ± 0.03	0.01 ± 0.02
1672S0019	0.00 ± 0.02	0.02 ± 0.02
1672S0020	0.01 ± 0.03	0.02 ± 0.01

^aRefer to Figures 2 through 4.

^bThe LTP DCGL values are 8.6 pCi/g for Cs-137 and 4.0 pCi/g for Co-60.

^cSamples collected on September 13, 2005.

^dUncertainties represent the 95% confidence level, based on total propagated uncertainties.

^eZero values are due to rounding.

^fSamples collected on August 9 through 10, 2005.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 2, 2004.

Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for the Open Land Area Survey Units, Yankee Nuclear Power Station, Rowe, Massachusetts [Docket No. 50-29; RFTA No. 05-008]. Oak Ridge, Tennessee; August 3, 2005a.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; July 28, 2005b.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 20, 2005c.

Yankee Atomic Electric Company (YAEC). Yankee Atomic Electric Company (YAEC) License Termination Plan (LTP) for the Yankee Nuclear Power Station (YNPS). Revision 1. Rowe, Massachusetts; November 2004.