

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

February 20, 1997

FEB 20 1 20 PM '97

W. Alexander Williams, PhD
Designation and Certification Manager
U.S. Department of Energy
EM-421
Cloverleaf Building
Washington, DC 20585-0002

SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 21, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification survey activities at the St. Louis Airport Property Site (SLAPS) Vicinity Property (VP) No. 21 during the period May through June 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 21 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 5 to 10 meters north of the road. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. Figure 2 shows the remediated portions of VP 21. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 21 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the status of the remediated area. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans identified locations of elevated direct gamma radiation within VP 21 in an unremediated area between grids 1 and 2. Elevated direct gamma radiation was also noted in grid 6 along the south wall of the excavation which borders Frost Avenue. ESSAP personnel initially collected six soil samples—three surface (0 to 15 cm) and three subsurface (15 to 30 cm)—from three locations within the area of elevated direct gamma radiation between grids 1 and 2. One sample was collected from the south wall of grid 6 at the location of elevated surface activity. Five systematic surface samples, one each from the center and four points equidistant from the grid center and the grid corners, were collected in grid 3. Additionally, six samples were collected from two borehole locations in the driveway area near the east end of VP 21 at depths of 0-15 cm, 15-30 cm, and 30-45 cm. Figure 2 shows soil sampling locations. In addition, exposure rate measurements at 1 meter above the surface using a microrem meter were performed at each soil sampling location—results are presented in Tables 1 and 2. Exposure rates ranged from 5 to 11 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Selected samples were also analyzed for isotopic thorium by alpha spectrometry. Radionuclide concentrations in initial soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 0.8 to 16.3 pCi/g for Ra-226, less than 4.0 to 650 pCi/g for Th-230, and less than 2.6 to 5.4 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Two sampling locations, one in the area between grids 1 and 2 and one in grid 6 along the south excavation wall, exceeded the guidelines for Th-230. The sample from the area between grids 1 and 2 also exceeded the guideline for Ra-226. As a result, BNI excavated the area between grids 1 and

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2. ESSAP performed additional verification activities of this area during a subsequent survey visit that included gamma surface scans, exposure rate measurements, and the collection of five additional systematic soil samples (Figure 2).

Concentrations in verification samples following the additional remediation are presented in Table 2 and ranged from 0.8 to 1.4 pCi/g for Ra-226 and for Th-230 were less than 4.5 pCi/g, which satisfies the guidelines. The elevated activity noted in the excavation wall of grid 6 was not associated with the property to be released, but rather the contamination that remains beneath the road base. BNI intends to prepare a hazard assessment for this material at a later date.

In summary, verification surveys of the property identified locations of undocumented residual contamination where the hot spot criteria and/or the 100 m² average residual radionuclide concentration guidelines were exceeded—requiring BNI to perform additional remediation. Followup investigations of these areas, together with verification surveys of the remaining portions of VP 21, indicated that the radiological status of the property satisfied the DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,

Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

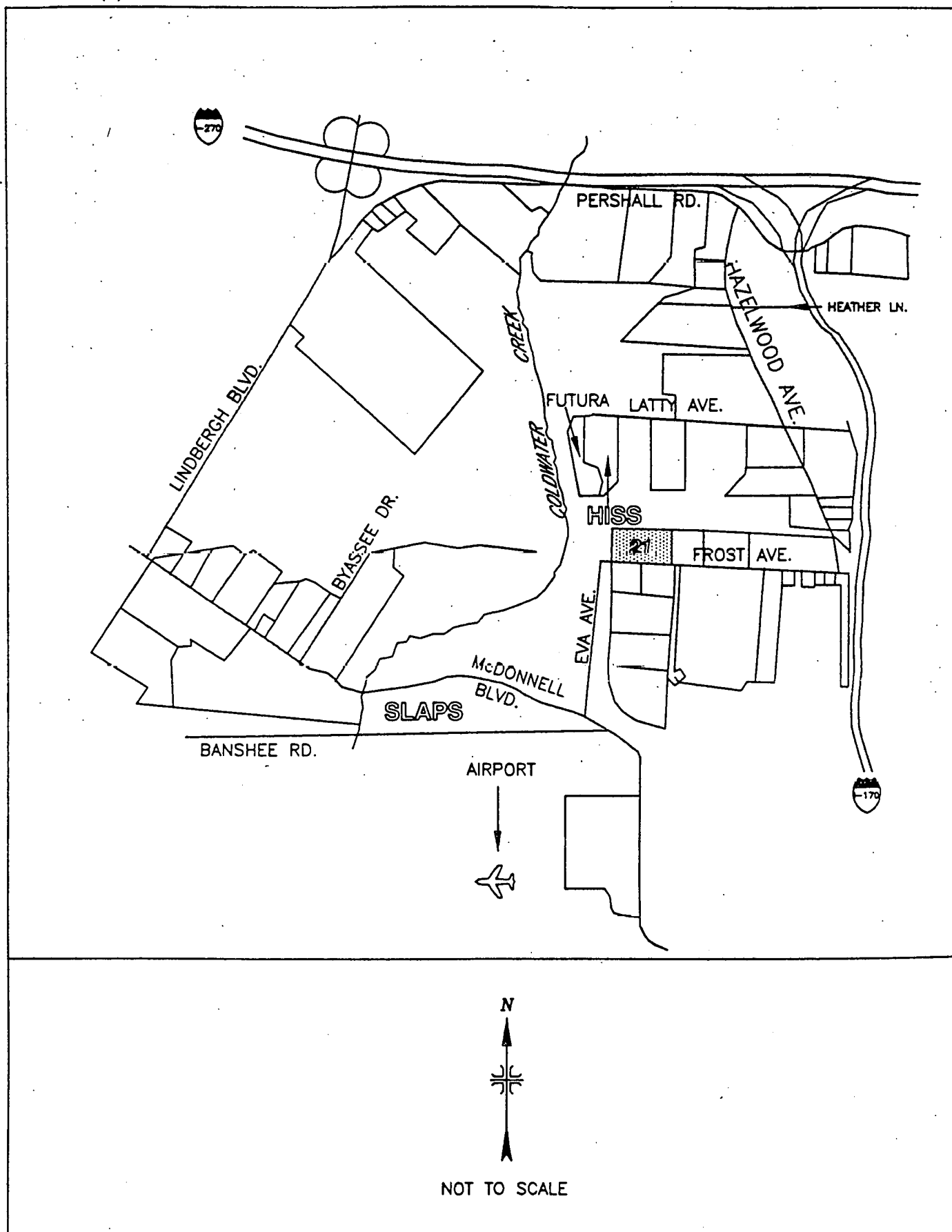


FIGURE 1: Location of SLAPS Vicinity Property Number 21

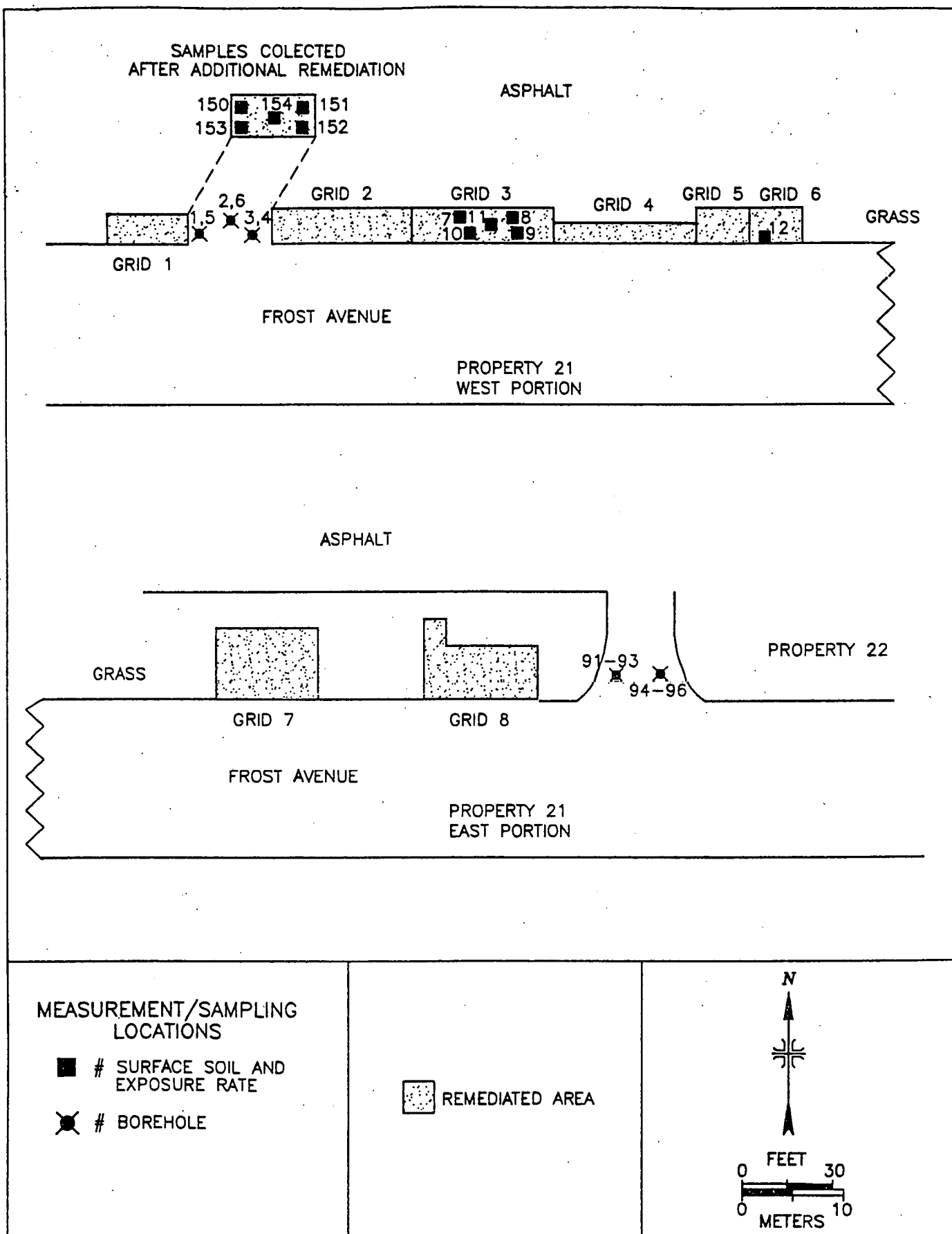


FIGURE 2: SLAPS Vicinity Properties, Property 21 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 21
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
AREA BETWEEN GRIDS 1 AND 2				
1 (0-15 cm)	7	1.1 ± 0.3 ^c	5.19 ± 0.57 ^d	1.0 ± 1.4
5 (15-30 cm)	---	1.3 ± 0.2	10.56 ± 1.06 ^d	1.1 ± 1.1
2 (0-15 cm)	5	1.5 ± 0.2	7.22 ± 0.89 ^d	2.7 ± 1.4
6 (15-30 cm)	---	1.3 ± 0.2	6.04 ± 0.70 ^d	1.8 ± 1.6
3 (0-15 cm)	5	3.3 ± 0.3	110 ± 20	<2.5
4 (15-30 cm)	---	16.3 ± 0.6	650 ± 49	5.4 ± 3.0
GRID 3				
7	7	1.2 ± 0.2	1.7 ± 0.3	2.4 ± 1.6
8	7	1.2 ± 0.2	2.22 ± 0.33 ^d	1.2 ± 0.9
9	6	1.3 ± 0.2	4.35 ± 0.49 ^d	2.1 ± 1.5
10	8	1.3 ± 0.2	2.01 ± 0.32 ^d	2.1 ± 1.6
11	7	0.9 ± 0.2	3.02 ± 0.47 ^d	0.7 ± 1.2
GRID 6 ^f				
12	11	4.0 ± 0.3	77.79 ± 6.96 ^d	<2.6
ASPHALT DRIVE BETWEEN PROPERTIES 21 AND 22				
91 (0-15 cm)	---	0.9 ± 0.1	<4.0	0.8 ± 0.3
92 (15-30 cm)	---	1.0 ± 0.1	<3.1	0.9 ± 0.3
93 (30-45 cm)	---	0.8 ± 0.1	<4.0	1.0 ± 0.3
94 (0-15 cm)	---	0.9 ± 0.1	3.8 ± 2.4	1.2 ± 0.3
95 (15-30 cm)	---	0.9 ± 0.1	<3.0	1.2 ± 0.3
96 (30-45 cm)	---	0.9 ± 0.1	<4.0	1.3 ± 0.4

^aRefer to Figure 2.

^bResults include background.

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

^dAlpha spectrometry value.

^eMeasurement not performed.

^fRepresents soil from the excavation wall adjoining road base that will be hazard assessed.

TABLE 2

EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS
IN SOIL SAMPLES AFTER ADDITIONAL REMEDIATION
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 21
HAZELWOOD, MISSOURI

Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
AREA BETWEEN GRIDS 1 AND 2				
150	5	1.3 ± 0.1 ^c	<3.4	1.0 ± 0.3
151	5	0.8 ± 0.1	2.8 ± 2.3	0.8 ± 0.3
152	5	1.2 ± 0.1	<3.4	1.1 ± 0.3
153	5	1.2 ± 0.1	<4.5	1.1 ± 0.4
154	6	1.4 ± 0.1	<3.5	1.3 ± 0.4

^aRefer to Figure 2.

^bResults include background.

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

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 22, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification survey activities at the St. Louis Airport Property Site (SLAPS) Vicinity Property (VP) No. 22 during the period May 14 and 15, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 22 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 5 to 10 meters north of the road. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. Figure 2 shows the remediated portions of VP 22. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 22 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans identified one location of elevated direct gamma radiation within VP 22 in grid 1, which BNI remediated while ESSAP was on-site. ESSAP personnel collected five systematic surface (0-15 cm) soil samples from grids 1 and 6. Samples were collected at the center and at four points equidistant from the center and the grid corners and included the remediated location in grid 1. Sample locations are shown on Figure 2. In addition, exposure rate measurements at 1 meter above the surface using a microrem meter were performed at each soil sampling location (with the exception of one sampling location in grid 1 which was underwater) and results are presented in Table 1. Exposure rates ranged from 6 to 7 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Selected samples were also analyzed for isotopic thorium by alpha spectrometry. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 1.0 to 1.8 pCi/g for Ra-226, 1.53 to 12.90 pCi/g for Th-230, and less than 1.8 to 3.0 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

One sample from grid 6 contained 12.90 pCi/g of Th-230, which is in excess of the 5 pCi/g surface (0 to 15 cm) guideline but less than the 15 pCi/g subsurface guideline. Because the surface this sample was collected from was originally, and will be again following backfill, at a depth of greater than 15 cm, the subsurface guideline is applicable and has been satisfied.

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In summary, the radiological status of VP 22 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
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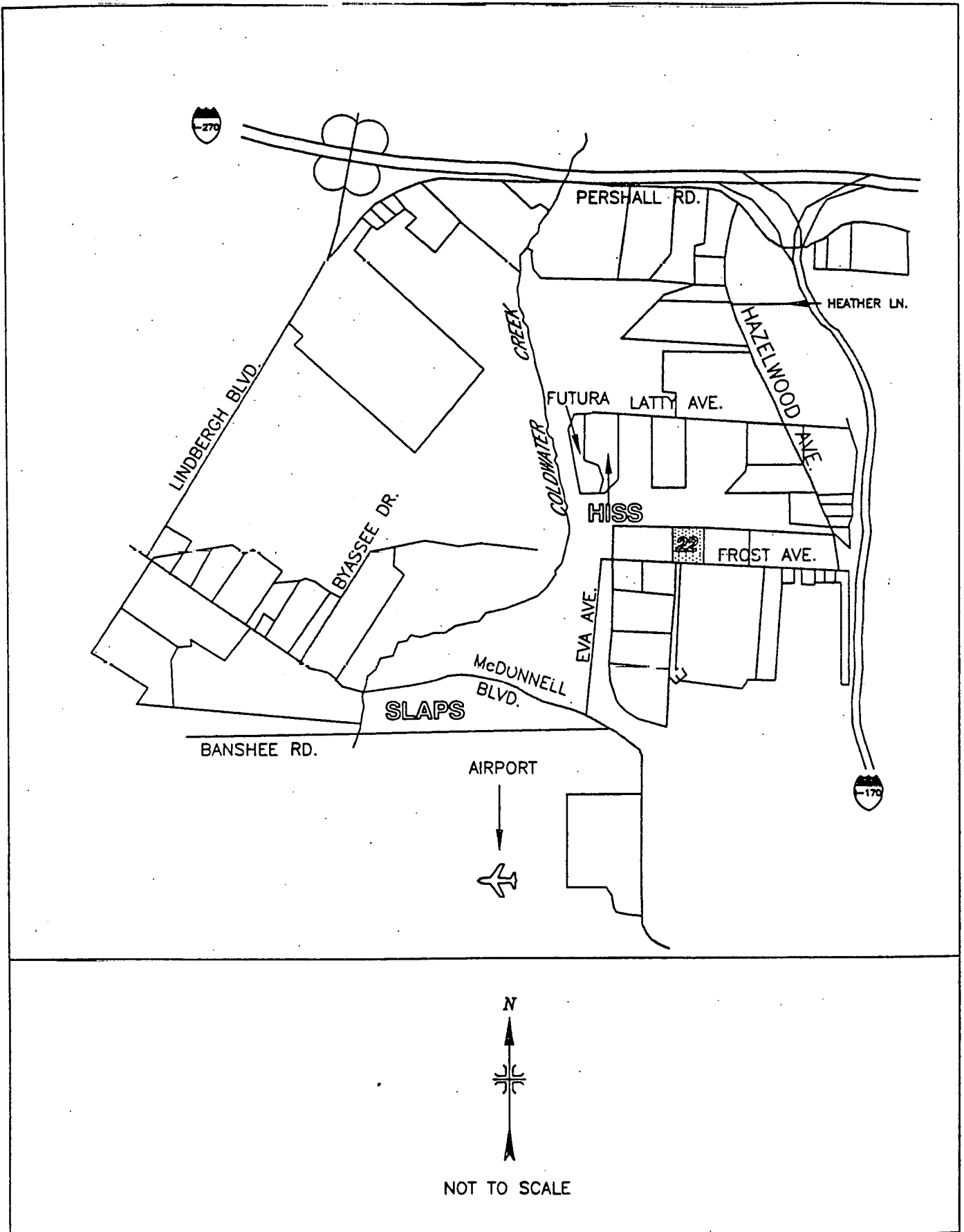


FIGURE 1: Location of SLAPS Vicinity Property Number 22

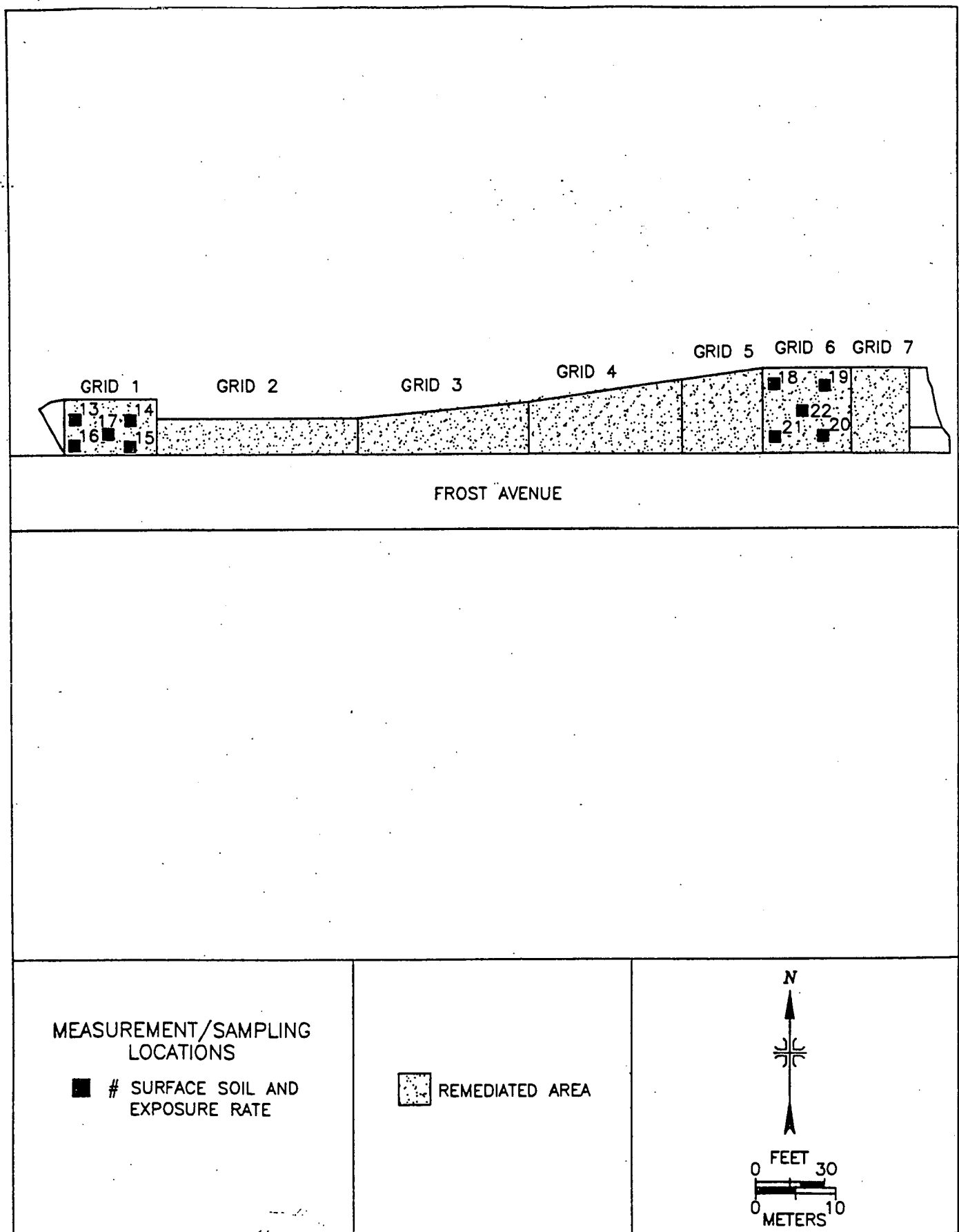


FIGURE 2: SLAPS Vicinity Properties, Property 22 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 22
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 1				
13	---	1.1 ± 0.2 ^c	2.72 ± 0.37 ^d	1.2 ± 1.1
14	7	1.1 ± 0.2	1.85 ± 0.29 ^d	3.0 ± 1.5
15	6	1.4 ± 0.2	2.01 ± 0.30 ^d	<1.8
16	6	1.0 ± 0.2	1.53 ± 0.25 ^d	1.7 ± 1.2
17	6	1.3 ± 0.2	1.54 ± 0.25 ^d	1.8 ± 1.2
GRID 6				
18	6	1.7 ± 0.2	1.97 ± 0.29 ^d	<1.6
19	7	1.3 ± 0.2	1.56 ± 0.27 ^d	2.2 ± 1.3
20	7	1.8 ± 0.2	12.90 ± 1.29 ^d	2.5 ± 1.4
21	6	1.2 ± 0.2	5.55 ± 0.59 ^d	2.2 ± 1.2
22	6	1.4 ± 0.2	2.05 ± 0.29 ^d	<1.5

^aRefer to Figure 2.

^bResults include background.

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

^dAlpha spectrometry results.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 23, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 23 during May and June, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 23 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 2.5 meters north of the road. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. Figure 2 shows the remediated portions of VP 23. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 23 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas radiological status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans identified two locations of elevated direct gamma radiation, one each in grids 1 and 2. ESSAP personnel collected a total of 15 systematic surface (0-15 cm) soil samples from grids 1, 2, and 4. Samples were collected along the east to west center line of the excavation. The two locations of elevated direct gamma radiation identified by surface scans were also sampled. Additionally, two boreholes were hand-augered beneath the paved drive adjacent to the excavation. Samples were collected from 0-15 cm, 15-30 cm, and 30-45 cm depths from each borehole. Sample locations are shown on Figure 2. In addition, exposure rate measurements at 1 meter above the surface using a microrem meter were performed at each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 4 to 13 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 0.8 to 2.0 pCi/g for Ra-226, less than 4.9 to 28.6 pCi/g for Th-230, and less than 2.1 to 2.6 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Because the surface these samples were collected from was originally, and will be again following backfill, at a depth of greater than 15 cm, the subsurface guideline is applicable. Two samples—one each in grids 1 and 2—exceeded the 15 pCi/g guideline for Th-230 with concentrations of 19.75 pCi/g and 28.61 pCi/g, respectively. However, the guidelines permit averaging the radionuclide concentration over an area of 100 m² and application of the hot spot criteria. For both grids 1 and 2, the 100 m² averages for Th-230 concentration, which were 7.48 and 9.54 pCi/g, satisfied the guideline. Radionuclide concentrations in all other samples satisfied the guidelines.

Dr. Alexander Williams

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February 20, 1997

In summary, the radiological status of VP 23 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:tsf

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
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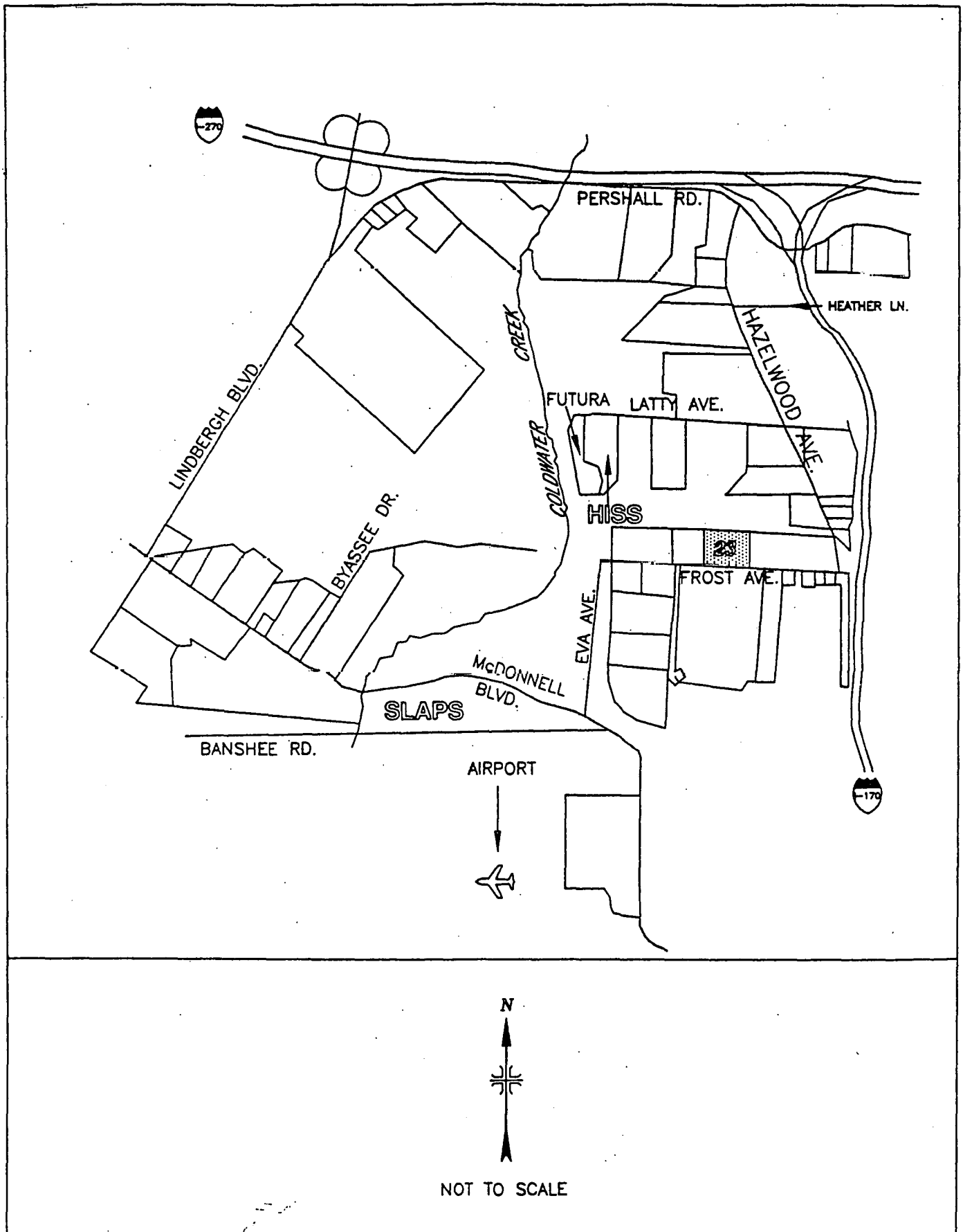


FIGURE 1: Location of SLAPS Vicinity Property Number 23

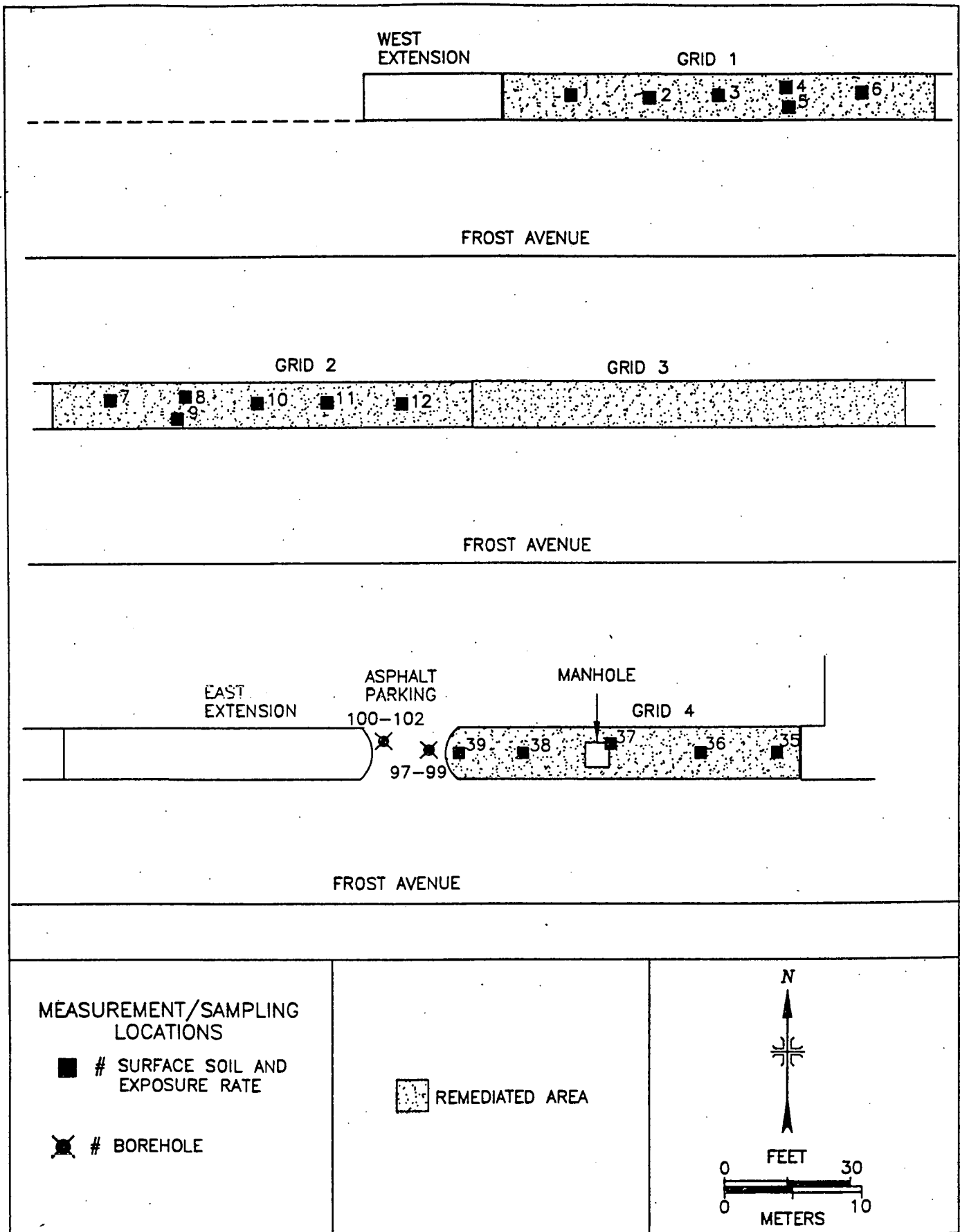


FIGURE 2: SLAPS Vicinity Properties, Property 23 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 23
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 1				
23	5	1.2 ± 0.2 ^c	4.02 ± 0.48 ^d	<2.1
24	5	1.4 ± 0.2	5.84 ± 0.78 ^d	1.3 ± 1.4
25	6	1.4 ± 0.2	4.57 ± 0.69 ^d	<2.1
26	5	1.7 ± 0.2	4.43 ± 0.57 ^d	2.3 ± 1.5
27	8	1.8 ± 0.2	19.75 ± 2.25 ^d	2.5 ± 1.8
28	5	1.1 ± 0.2	6.26 ± 0.65 ^d	2.0 ± 1.4
100 m ² Average:			7.48	
GRID 2				
29	7	1.3 ± 0.2	4.38 ± 0.60 ^d	<1.6
30	4	2.0 ± 0.3	28.61 ± 3.64 ^d	2.6 ± 1.5
31	6	1.5 ± 0.2	3.37 ± 0.44 ^d	2.6 ± 1.6
32	6	1.5 ± 0.2	2.15 ± 0.32 ^d	0.9 ± 1.0
33	7	1.3 ± 0.2	4.60 ± 0.59 ^d	1.8 ± 1.4
34	5	1.5 ± 0.2	14.12 ± 1.47 ^d	1.8 ± 1.4
100 m ² Average:			9.54	
GRID 4				
35	10	0.9 ± 0.1	<4.9	1.1 ± 0.4
36	13	1.0 ± 0.1	5.4 ± 2.8	1.2 ± 0.4
37	12	0.9 ± 0.1	4.6 ± 2.8	1.4 ± 0.4
38	12	0.8 ± 0.1	3.6 ± 1.7	0.9 ± 0.2
39	8	0.9 ± 0.1	6.4 ± 2.4	0.9 ± 0.3

TABLE 1 (Continued)

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 23
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
ASPHALT DRIVE BETWEEN GRIDS 3 AND 4, BOREHOLES				
97 (0-15 cm)	--- ^c	1.1 ± 0.1	5.0 ± 2.4	1.2 ± 0.3
98 (15-30 cm)	---	1.1 ± 0.1	<3.2	1.1 ± 0.3
99 (30-45 cm)	---	1.2 ± 0.1	<3.1	1.4 ± 0.3
100 (0-15 cm)	---	1.1 ± 0.1	<3.2	1.5 ± 0.3
101 (15-30 cm)	---	1.3 ± 0.1	<3.2	1.5 ± 0.3
102 (30-45 cm)	---	1.3 ± 0.1	<3.2	1.0 ± 0.3

^aRefer to Figure 2.

^bResults include background.

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

^dAlpha spectrometry results.

^eMeasurements not performed.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

February 20, 1997

Feb 20 1 20 PM '97

W. Alexander Williams, PhD
Designation and Certification Manager
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EM-421
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Washington, DC 20585-0002

SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 24, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification survey activities at the St. Louis Airport Property Site (SLAPS) Vicinity Property (VP) No. 24 during the period June 4 through 19, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 24 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 5 to 10 meters north of the road. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1.5 meters below the surface. Figure 2 shows the remediated portions of VP 24. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 24 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans identified locations of elevated direct gamma radiation within VP 24 in grids 2, 4, 8, 9, and 12. Systematic soil samples were collected from the center and four locations equidistant from the center and the grid corners of the selected grids. Surface and subsurface samples were also collected at locations of elevated direct radiation detected by surface scans. Additionally, 12 samples were collected from four borehole locations in the VP 24 driveways. Figure 2 shows soil sampling locations. In addition, exposure rate measurements at 1 meter above the surface using a microrem meter were performed at each soil sampling location and results are presented in Table 1. Exposure rates ranged from 5 to 15 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Radionuclide concentrations in initial soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 0.7 to 16.6 pCi/g for Ra-226, less than 4.7 to 773.4 pCi/g for Th-230, and 0.8 to 12.3 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Numerous sampling locations in grids 2, 8, 9, and 12 exceeded the guidelines for Th-230 and one location in grid 9 exceeded the Ra-226 guidelines. As a result, BNI excavated additional soil from these grids. ESSAP then either performed additional verification activities of each area during subsequent survey visits that included gamma surface scans, exposure rate measurements, and the collection of independent soil samples (grids 2 and 9) or performed confirmatory analysis of the post-RA samples that BNI collected (grids 8 and 12).

Dr. Alexander Williams

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Radionuclide concentrations in post-RA soil samples are also presented in Table 1. After the additional remediation, final concentration ranges were from 0.7 to 1.7 pCi/g for Ra-226, less than 3.0 to 25.5 pCi/g for Th-230 and 0.8 to 1.8 pCi/g for U-238. Because these samples were collected from a post-excavation depth of greater than 15 cm and the excavations were backfilled, the subsurface guideline is applicable. Of the final samples, two samples—one each in grids 8 and 9—exceeded the applicable subsurface guideline for Th-230. However, the guidelines permit averaging residual radionuclide concentration levels over an area of 100 m² and application of the hot spot criteria. The average Th-230 concentrations were 10.3 pCi/g for grid 8 and 8.2 pCi/g for grid 9, which satisfy the subsurface guideline.

In summary, verification surveys of the property identified locations of undocumented residual contamination where the hot spot criteria and/or the 100 m² average residual radionuclide concentration guidelines were exceeded—requiring BNI to perform additional remediation. Followup investigations of these areas, together with verification surveys of the remaining portions of VP 24, indicated that the radiological status of the property satisfied the DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

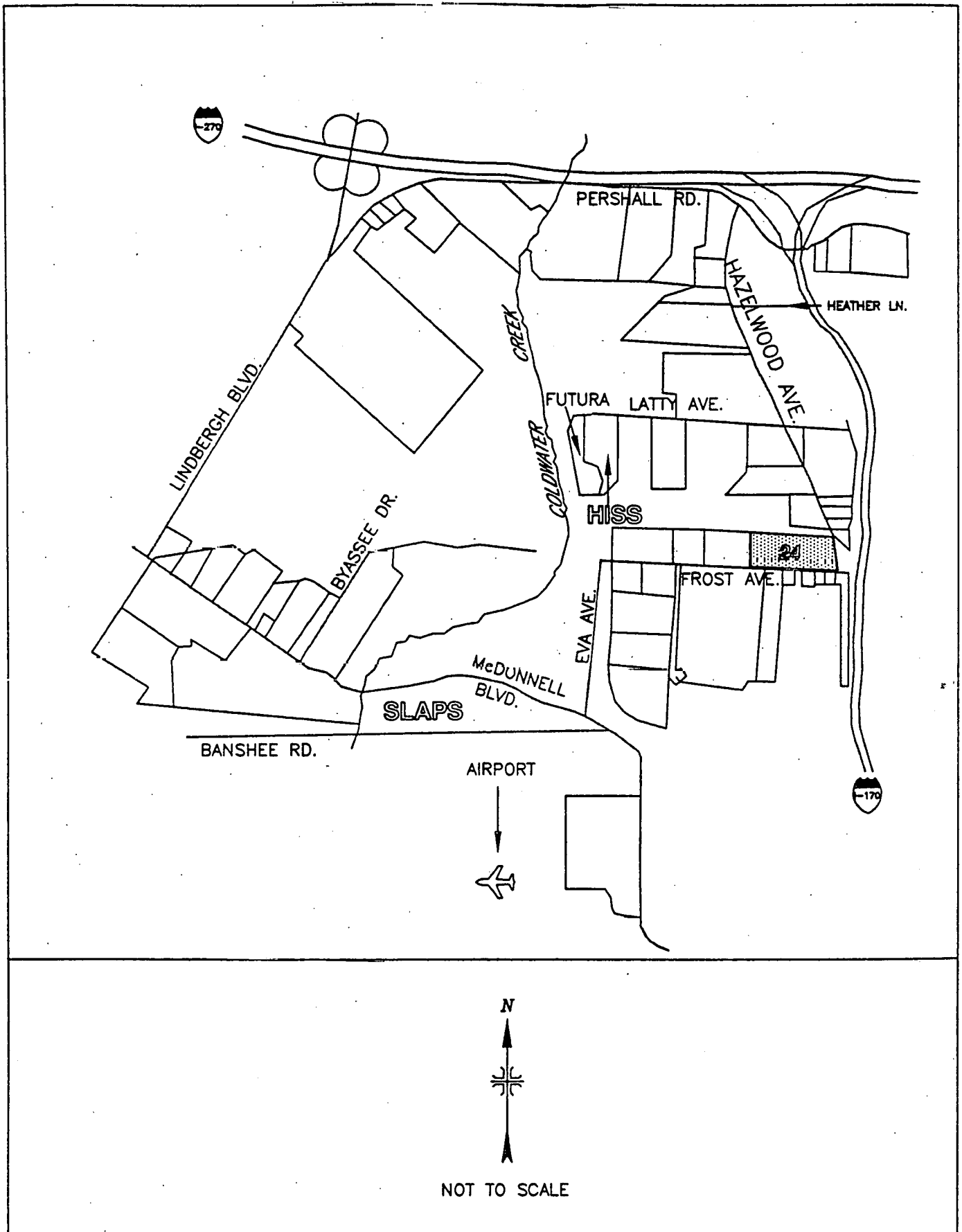


FIGURE 1: Location of SLAPS Vicinity Property Number 24

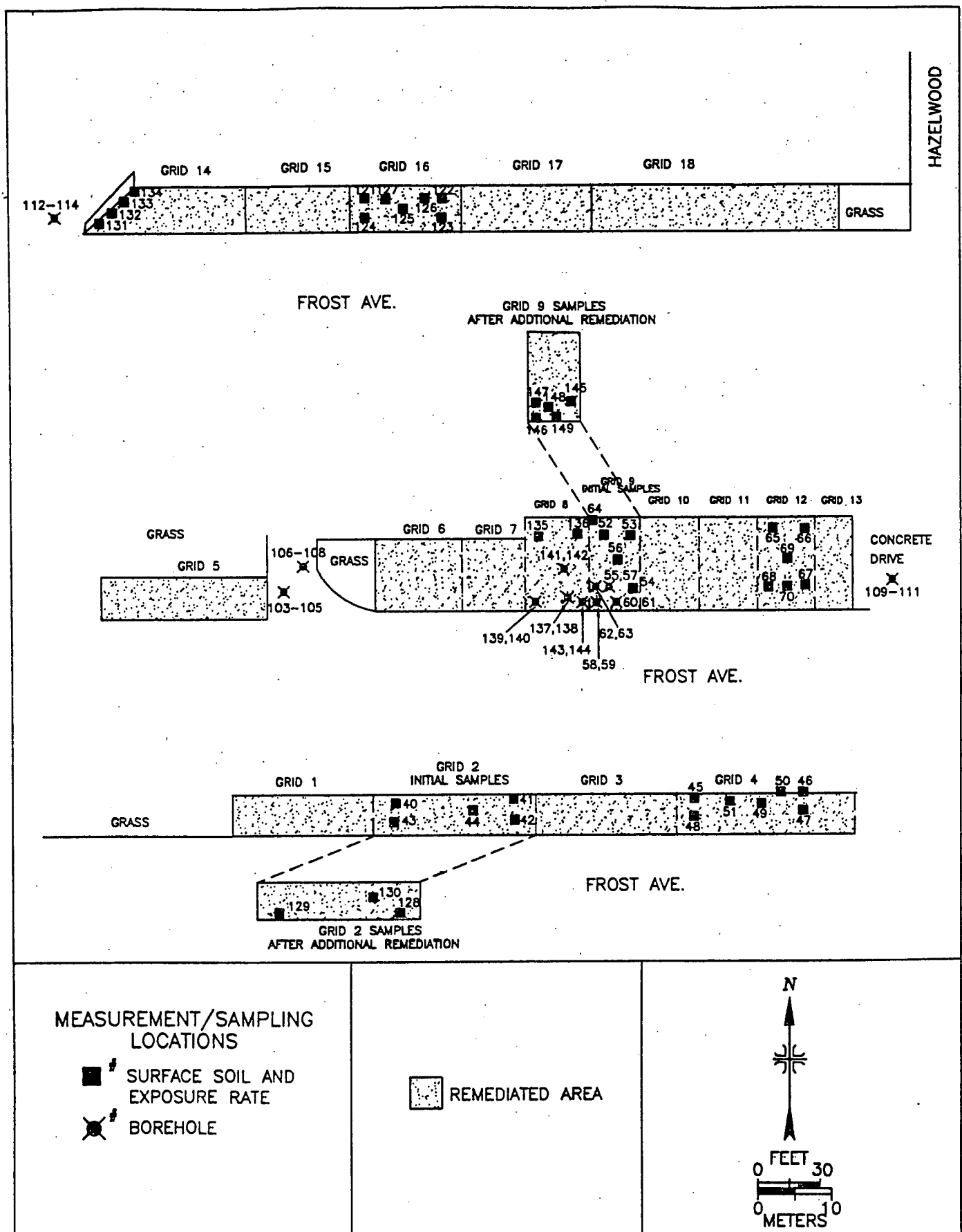


FIGURE 2: Property 24, St. Louis Airport Properties — Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μR/h) ^b	Radionuclide Concentrations (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 2				
40	12	0.7 ± 0.1 ^c	<4.3	1.4 ± 0.4
41	11	0.9 ± 0.1	<3.6	1.1 ± 0.3
42	12	1.3 ± 0.1	26.4 ± 3.7	1.5 ± 0.4
128 (After additional remediation of Location 42)	7	1.0 ± 0.1	5.7 ± 2.4	1.1 ± 0.3
43	13	1.3 ± 0.1	28.7 ± 3.9	2.3 ± 0.4
129 (After additional remediation of Location 43)	5	1.1 ± 0.1	5.7 ± 2.8	1.5 ± 0.3
44	12	0.9 ± 0.1	<4.6	1.3 ± 0.3
130 (After additional remediation of Location 44)	6	1.0 ± 0.1	<3.2	1.0 ± 0.3
GRID 4				
45	13	1.1 ± 0.1	<3.5	1.3 ± 0.4
46	11	0.8 ± 0.1	<4.5	0.9 ± 0.3
47	11	1.2 ± 0.1	12.7 ± 3.3	1.7 ± 0.4
48	11	1.0 ± 0.1	8.3 ± 2.7	1.4 ± 0.4
49	9	1.1 ± 0.1	<3.6	1.3 ± 0.3
50	10	1.0 ± 0.1	<4.7	1.0 ± 0.3
51	13	1.1 ± 0.1	<3.6	1.1 ± 0.3

TABLE 1 (Continued)

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μR/h) ^b	Radionuclide Concentrations (pCi/g)		
		Ra-226	Th-230	U-238
GRID 8				
135	5	1.1 ± 0.1	<4.4	0.8 ± 0.3
136	4	1.1 ± 0.1	<3.2	0.9 ± 0.3
137	5	3.8 ± 0.1	111.6 ± 4.3	3.2 ± .4
138 (15-30 cm)	--- ^d	1.9 ± 0.1	34.5 ± 4.1	1.7 ± 0.4
156 ^c (After additional remediation of Location 137/138)	---	0.8 ± 0.1	<10	1.4 ± 0.7
139	5	1.1 ± 0.1	4.9 ± 2.6	1.5 ± 0.3
140 (15-30 cm)	---	1.1 ± 0.1	2.8 ± 2.1	1.2 ± 0.3
155 ^c (After additional remediation of Location 139)	---	0.8 ± 0.1	<10	0.7 ± 0.7
141	6	1.1 ± 0.1	<4.1	1.2 ± 0.4
142 (15-30 cm)	---	1.6 ± 0.1	<3.6	1.0 ± 0.3
143	5	1.4 ± 0.1	13.3 ± 2.9	1.5 ± 0.4
144 (15-30 cm)	---	1.0 ± 0.1	4.5 ± 2.2	0.9 ± 0.2
157 ^c (After additional remediation of Location 143)	---	0.9 ± 0.2	25.5 ± 11.7	1.4 ± 0.9
100 m ² average			10.3	
GRID 9				
52	8	0.9 ± 0.1	2.7 ± 2.5	0.9 ± 0.3

TABLE 1 (Continued)

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μ R/h) ^b	Radionuclide Concentrations (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 9 (Continued)				
53	10	1.0 \pm 0.1	<3.1	0.9 \pm 0.3
54	14	1.5 \pm 0.1	25.9 \pm 3.1	1.5 \pm 0.4
145 (After additional remediation of Location 54)	6	1.3 \pm 0.1	8.2 \pm 3.0	0.9 \pm 0.3
55	12	16.6 \pm 0.2	773.4 \pm 9.7	12.3 \pm 0.8
57 (15-30 cm)	---	6.7 \pm 0.1	291.1 \pm 6.4	7.3 \pm 0.6
146 (After additional remediation of Location 55/57)	5	1.3 \pm 0.1	10.2 \pm 3.0	1.4 \pm 0.3
56	10	1.0 \pm 0.1	6.9 \pm 3.2	1.2 \pm 0.4
58	15	4.7 \pm 0.1	173.4 \pm 5.2	3.4 \pm 0.5
59 (15-30 cm)	--- ^d	6.8 \pm 0.1	249.2 \pm 8.0	8.7 \pm 0.7
147 (After additional remediation of Location 58/59)	5	1.3 \pm 0.1	6.6 \pm 3.3	1.1 \pm 0.4
60	11	2.2 \pm 0.1	60.1 \pm 3.3	1.9 \pm 0.3
61 (15-30 cm)	--- ^d	2.3 \pm 0.1	47.9 \pm 4.3	1.8 \pm 0.4
148 (After additional remediation of Location 60/61)	6	1.3 \pm 0.1	7.6 \pm 3.2	1.8 \pm 0.3
62	12	1.6 \pm 0.1	26.0 \pm 3.2	1.4 \pm 0.4
63 (15-30 cm)	--- ^d	1.5 \pm 0.1	21.2 \pm 3.3	1.5 \pm 0.4

TABLE 1 (Continued)

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μR/h) ^b	Radionuclide Concentrations (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 9 (Continued)				
149 (After additional remediation of Location 62)	5	1.7 ± 0.1	20.0 ± 3.6	1.3 ± 0.4
64	14	1.1 ± 0.1	3.1 ± 2.5	0.8 ± 0.3
100 m ² average			8.2	
GRID 12				
65	12	1.1 ± 0.1	<3.3	0.9 ± 0.3
66	13	1.0 ± 0.1	3.5 ± 2.5	1.4 ± 0.3
67	11	1.5 ± 0.1	19.1 ± 3.7	1.0 ± 0.3
164 ^c (After additional remediation of Location 67)	--- ^d	1.3 ± 0.1	<15	1.7 ± 1.1
68	15	1.9 ± 0.1	38.0 ± 4.0	2.0 ± 0.4
165 ^c (After additional remediation of Location 68)	--- ^d	1.0 ± 0.2	<12	1.4 ± 1.2
69	14	1.2 ± 0.1	<3.5	1.2 ± 0.3
70	13	1.7 ± 0.1	26.8 ± 4.0	1.5 ± 0.4
166 ^c (After additional remediation of Location 70)	--- ^d	0.9 ± 0.2	<14	1.8 ± 1.0

TABLE 1 (Continued)

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μR/h) ^b	Radionuclide Concentrations (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 14				
131	5	1.2 ± 0.1	<4.4	0.9 ± 0.3
132	5	1.2 ± 0.1	<4.6	0.8 ± 0.3
133	6	1.4 ± 0.1	<3.4	0.8 ± 0.3
134	5	1.3 ± 0.1	<3.4	1.1 ± 0.3
GRID 16				
121	5	0.8 ± 0.1	<4.1	1.0 ± 0.3
122	5	0.9 ± 0.1	<3.2	1.0 ± 0.3
123	5	0.9 ± 0.1	<3.2	0.8 ± 0.3
124	6	1.0 ± 0.1	<4.2	1.0 ± 0.3
125	7	1.0 ± 0.1	<3.4	1.0 ± 0.3
126	5	0.9 ± 0.1	<3.2	0.9 ± 0.3
127	5	1.1 ± 0.1	<4.2	0.9 ± 0.3
BOREHOLES				
103 (0-15 cm)	6	1.1 ± 0.1	6.5 ± 2.5	1.2 ± 0.3
104 (15-30 cm)	---	1.0 ± 0.1	<4.2	1.1 ± 0.3
105 (30-45 cm)	---	1.1 ± 0.1	<3.1	1.2 ± 0.3
106 (0-15 cm)	6	1.1 ± 0.1	2.1 ± 1.9	1.2 ± 0.2
107 (15-30 cm)	---	1.0 ± 0.1	<4.0	0.9 ± 0.3
108 (30-45 cm)	---	1.1 ± 0.1	4.4 ± 2.3	1.1 ± 0.3
109 (0-15 cm)	6	1.0 ± 0.1	6.0 ± 2.7	1.3 ± 0.4

TABLE 1 (Continued)

**EXPOSURE RATES AND
RADIONUCLIDE CONCENTRATION IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY 24
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rate (μR/h) ^b	Radionuclide Concentrations (pCi/g) ^b		
		Ra-226	Th-230	U-238
BOREHOLES (Continued)				
110 (15-30 cm)	---	1.1 ± 0.1	<3.1	0.8 ± 0.3
111 (30-45 cm)	---	1.1 ± 0.1	<3.1	0.9 ± 0.3
112 (0-15 cm)	6	1.0 ± 0.1	<4.1	1.0 ± 0.3
113 (15-30 cm)	---	1.2 ± 0.1	<3.0	1.0 ± 0.3
114 (30-45 cm)	---	1.2 ± 0.1	<4.1	1.1 ± 0.4

^aRefer to Figure 2.

^bResults include background.

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

^dMeasurement not performed.

^eSamples collected by BNI.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

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ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

February 20, 1997

Feb 20 1 20 PM '97

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 26, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 26 on June 4, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 26 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 2.5 meters south of the road. Figure 2 shows the remediated portion of VP 26. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. BNI then performed post-remedial action (post-RA) surveys and sampling of the excavation. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 26 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans did not identify any locations of elevated direct gamma radiation. ESSAP personnel collected five systematic surface (0-15 cm) soil samples from the excavation. Samples were collected along the east to west center line of the excavation. Additionally, two boreholes were hand-augered beneath the paved drive adjacent to the excavation. Samples were collected from 0-15 cm, 15-30 cm, and 30-45 cm depths at each borehole. Sample locations are shown on Figure 2. In addition, exposure rate measurements at 1 meter above the surface using a microrem meter were performed at each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 9 to 11 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 0.7 to 1.4 pCi/g for Ra-226, less than 4.1 pCi/g for Th-230, and 0.6 to 1.4 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

All residual radionuclide levels satisfied these guidelines.

Dr. Alexander Williams

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February 20, 1997

In summary, the radiological status of VP 26 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

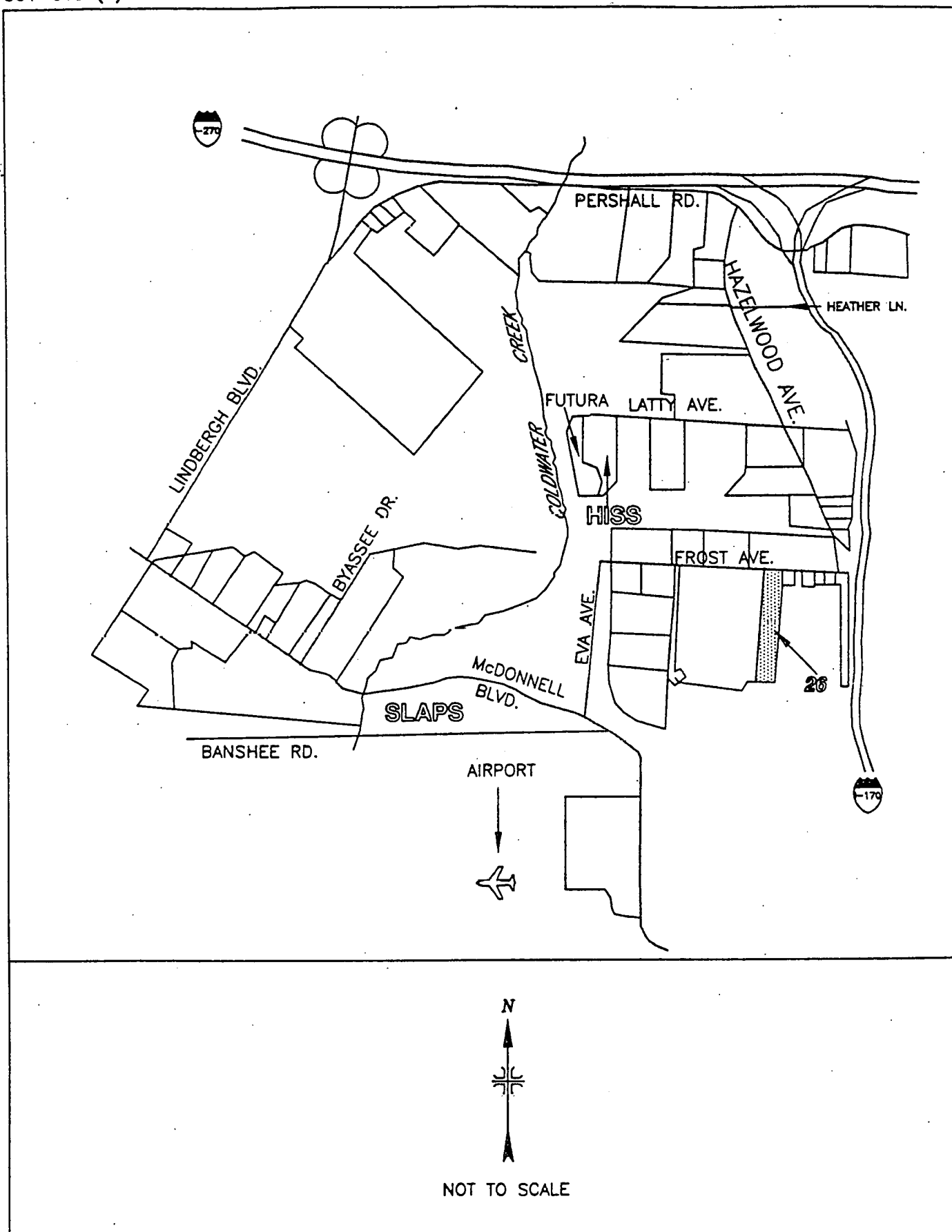


FIGURE 1: Location of SLAPS Vicinity Property Number 26

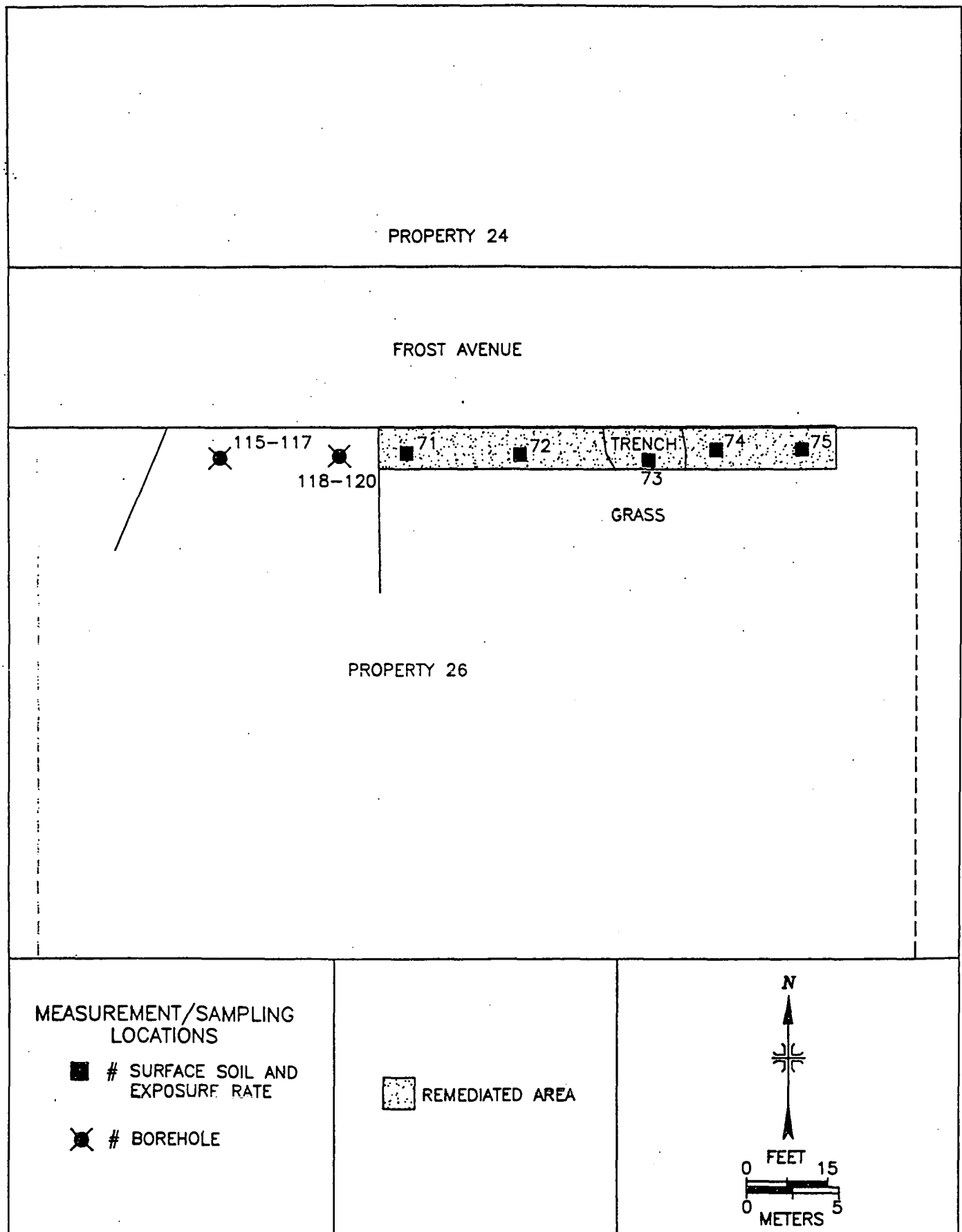


FIGURE 2: SLAPS Vicinity Properties, Property 26 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 26
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 1				
71	9	0.8 ± 0.1 ^c	<2.5	0.6 ± 0.2
72	9	0.7 ± 0.1	2.0 ± 1.6	0.7 ± 0.2
73	11	1.0 ± 0.1	<3.1	0.8 ± 0.3
74	9	0.9 ± 0.1	<3.8	0.8 ± 0.3
75	10	1.2 ± 0.1	<3.7	0.9 ± 0.3
ASPHALT DRIVE				
115 (0-15 cm)	--- ^d	1.1 ± 0.1	<3.0	1.0 ± 0.3
116 (15-30 cm)	---	1.2 ± 0.1	<4.1	1.4 ± 0.4
117 (30-45 cm)	---	1.4 ± 0.1	<3.3	1.2 ± 0.4
118 (0-15 cm)	---	1.1 ± 0.1	<4.0	0.9 ± 0.3
119 (15-30 cm)	---	1.2 ± 0.1	<3.2	1.0 ± 0.3
120 (30-45 cm)	---	1.1 ± 0.1	<3.2	1.3 ± 0.3

^aRefer to Figure 2.

^bResults include background.

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

^dMeasurement not performed.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

February 20, 1997

FEB 23 1 23 PM '97

W. Alexander Williams, PhD
Designation and Certification Manager
U.S. Department of Energy
EM-421
Cloverleaf Building
Washington, DC 20585-002

**SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS
AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 27, HAZELWOOD,
MISSOURI**

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 27 on June 5, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 27 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to an 80 m² area approximately 10 meters south of Frost Avenue. The excavation is bounded to the south by a building. Figure 2 shows the remediated portions of VP 27. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. BNI then performed post-remedial action (post-RA) surveys and sampling of the excavation. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 27 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Dr. Alexander Williams

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Surface scans did not identify any locations of elevated direct gamma radiation within VP 27. ESSAP personnel collected six random surface (0-15 cm) soil samples from the excavation. Sample locations are shown on Figure 2. In addition, exposure rate measurements using a microrem meter were performed at 1 meter above each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 11 to 15 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 1.1 to 1.2 pCi/g for Ra-226, less than 4.7 to 5.9 pCi/g for Th-230, and 1.0 to 1.2 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

All residual radionuclide levels satisfied these guidelines.

In summary, the radiological status of VP 27 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

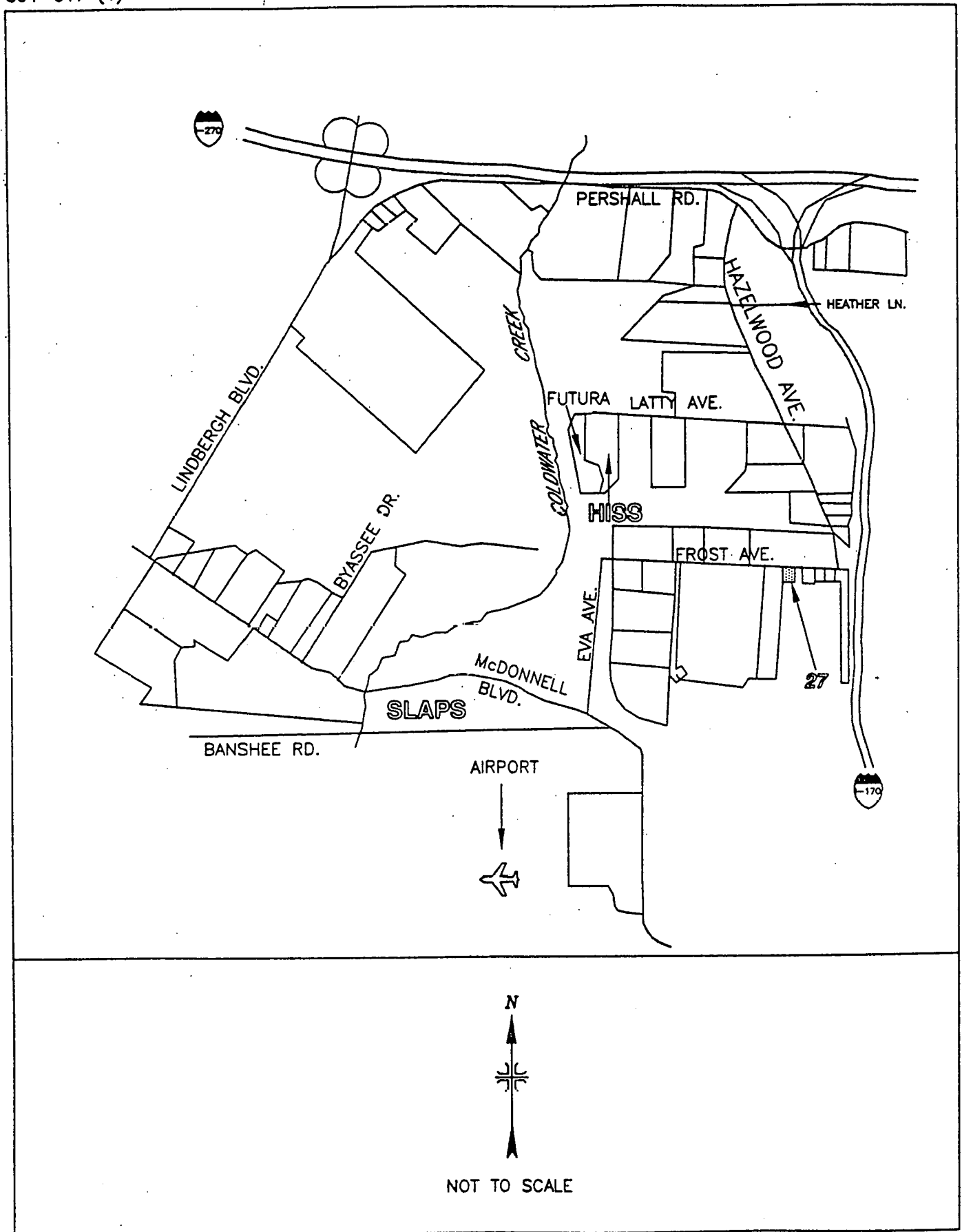


FIGURE 1: Location of SLAPS Vicinity Property Number 27

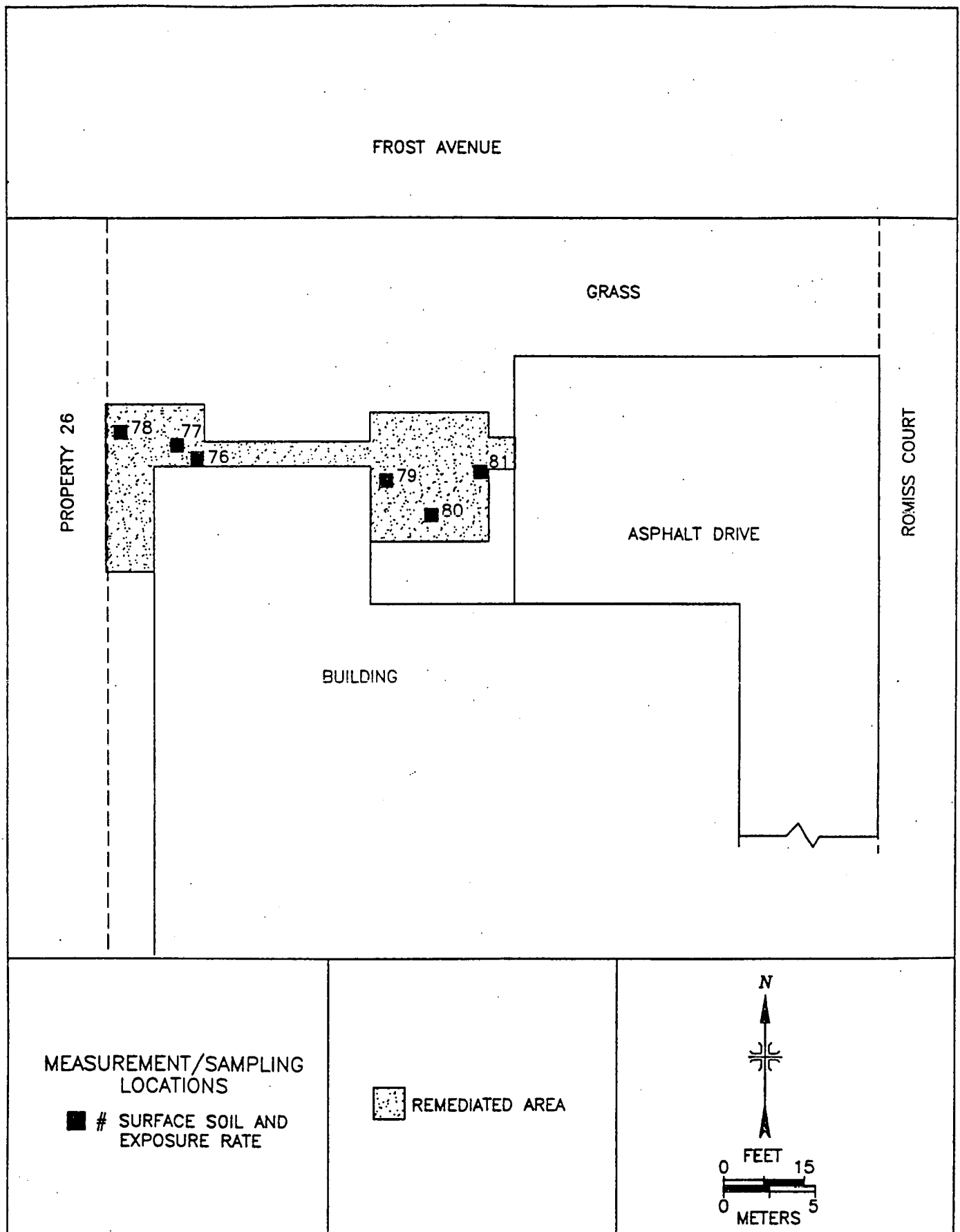


FIGURE 2: SLAPS Vicinity Properties, Property 27 –
Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 27
HAZELWOOD, MISSOURI**

Location ^a	Exposure Rates at 1 m (μR/h)	Radionuclide Concentration (pCi/g)		
		Ra-226	Th-230	U-238
GRID 1				
76	11	1.1 ± 0.1 ^b	5.9 ± 2.7	1.2 ± 0.4
77	12	1.2 ± 0.1	<3.6	1.1 ± 0.4
78	12	1.1 ± 0.1	<4.7	1.1 ± 0.4
79	12	1.2 ± 0.1	<3.5	1.0 ± 0.3
80	15	1.1 ± 0.1	<4.5	1.1 ± 0.3
81	13	1.1 ± 0.1	<4.6	1.2 ± 0.3

^aRefer to Figure 2.

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

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

ORISE
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February 20, 1997

FEB 22 1 23 PM '97

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 30, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 30 on June 5, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 30 is located on Frost Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary with Frost Avenue to approximately 5 meters south of the road. Figure 2 shows the remediated portions of VP 30. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1

meter below the surface. BNI then performed post-remedial action (post-RA) surveys and sampling of the excavation. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 30 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans did not identify any locations of elevated direct gamma radiation within the VP 30 excavation. ESSAP personnel collected five systematic surface (0-15 cm) soil samples within the excavation. Samples were collected at the center and at four points equidistant from the grid center and the grid corners. Additionally, two surface samples were collected outside the excavation. Sample locations are shown on Figure 2. In addition, exposure rate measurements using a microrem meter were performed at 1 meter above each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 8 to 10 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 1.0 to 1.3 pCi/g for Ra-226, less than 4.8 pCi/g for Th-230, and 1.0 to 1.2 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

All residual radionuclide levels satisfied these guidelines.

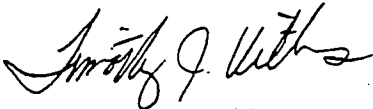
Dr. Alexander Williams

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In summary, the radiological status of VP 30 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

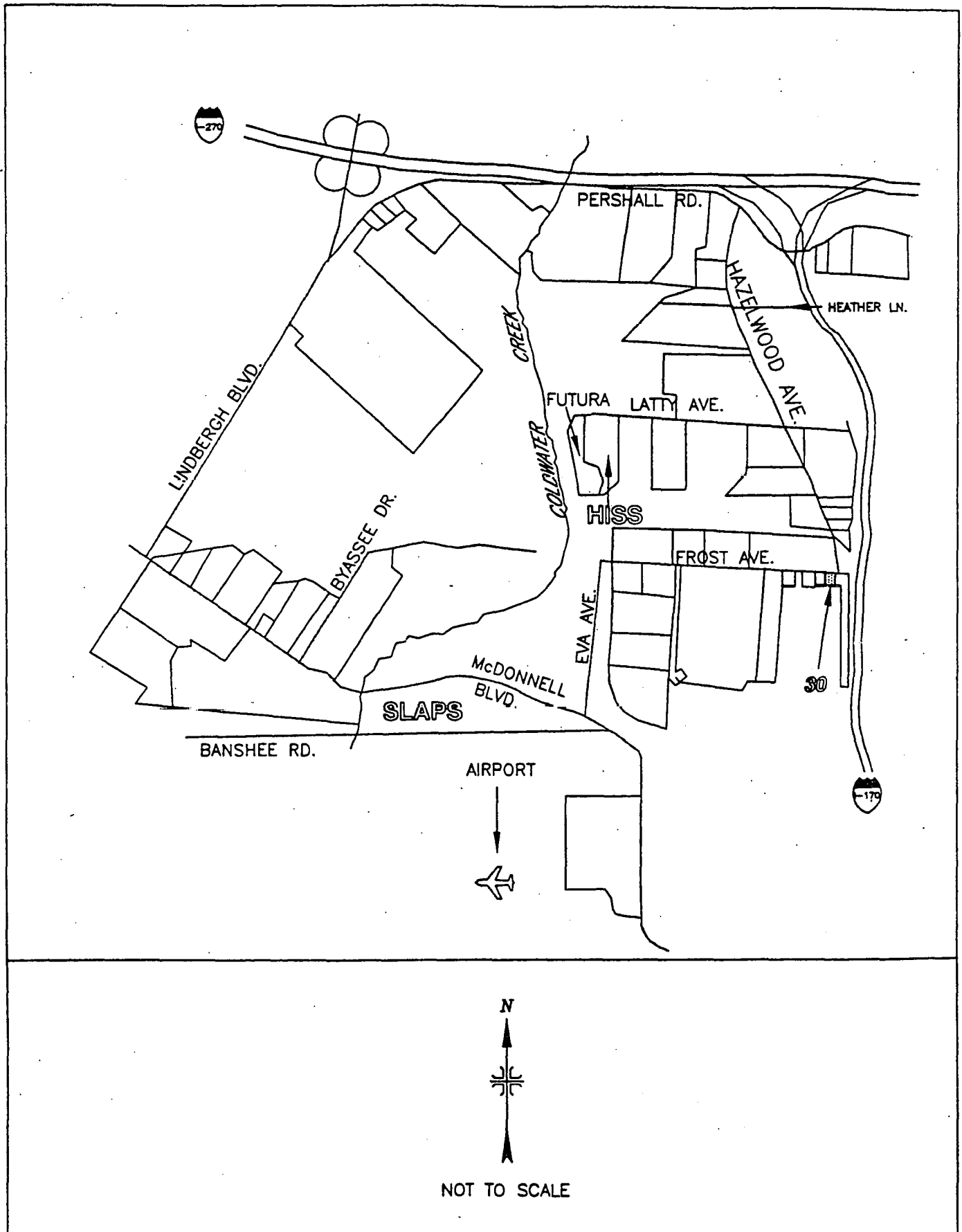


FIGURE 1: Location of SLAPS Vicinity Property Number 30

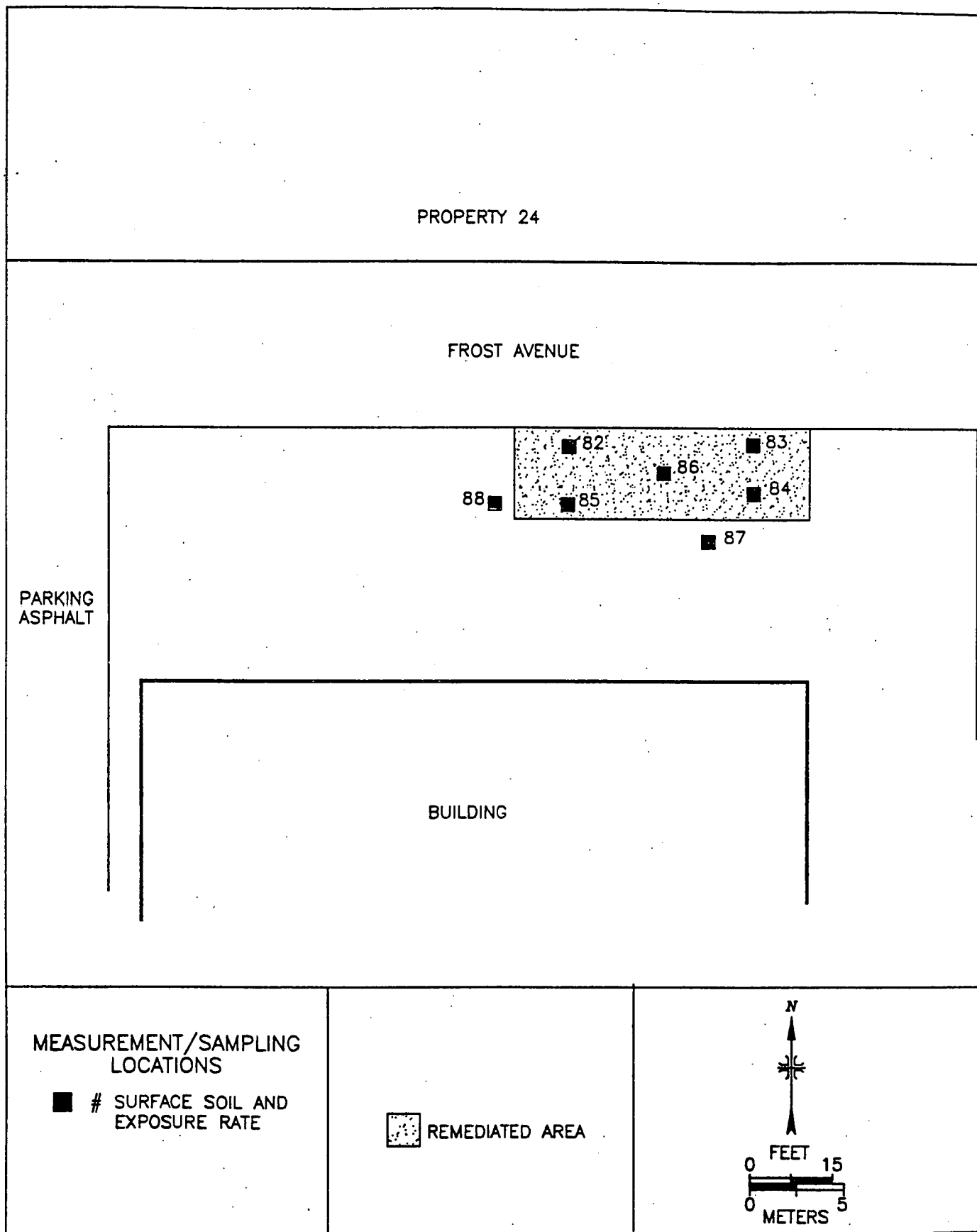


FIGURE 2: SLAPS Vicinity Properties, Property 30 - Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 30
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μ R/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
82	9	1.1 ± 0.1^c	<3.3	1.2 ± 0.3
83	9	1.1 ± 0.1	<4.8	1.1 ± 0.3
84	9	1.1 ± 0.1	<3.5	1.0 ± 0.3
85	8	1.1 ± 0.1	<3.4	1.1 ± 0.4
86	10	1.1 ± 0.1	<3.6	1.0 ± 0.3
87	10	1.0 ± 0.1	<4.6	1.0 ± 0.3
88	10	1.3 ± 0.1	3.4 ± 3.2	1.2 ± 0.3

^aRefer to Figure 2.

^bResults include background.

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

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, Tennessee; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

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February 20, 1997

FEB 20 1 20 PM '97

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 32, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 32 on July 22, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eya Avenue, Frost Avenue, and Latty Avenue.

VP 32 is located on Hazelwood Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary of Hazelwood Avenue to approximately 5 to 10 meters west of the road. BNI subdivided the property into two units—32A and 32B. Figure 2 shows the remediated portions of VP 32B. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units

and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 32 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas radiological status. Verification activities for VP 32B included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling. For VP 32A, ESSAP received BNI's post-RA data and performed confirmatory analysis of BNI's post-RA samples.

Surface scans did not identify any locations of elevated direct gamma radiation within VP 32B. ESSAP personnel collected five systematic surface (0-15 cm) soil samples from grids 2 and 8. Samples were collected from the center and at four points equidistant from the grids center and the grid corners. Sample locations are shown on Figure 2. In addition, exposure rate measurements using a microrem meter were performed at 1 meter above each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 9 to 11 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Samples were also analyzed by alpha spectrometry for isotopic thorium. Radionuclide concentrations in soil samples are summarized in Table 1. Concentration ranges were as follows: 1.1 to 1.5 pCi/g for Ra-226, 1.58 to 8.36 pCi/g for Th-230, and less than 1.5 to 2.5 pCi/g for U-238 for VP 32B. For VP 32A concentration ranges were 0.8 to 1.2 pCi/g for Ra-226, less than 14.8 pCi/g for Th-230, and 0.8 to 2.0 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Because the surface these samples were collected from was originally, and will be again following backfill, at a depth of greater than 15 cm, the subsurface guideline is applicable. All residual radionuclide levels therefore satisfied these guidelines.

Dr. Alexander Williams

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In summary, the radiological status of VP 32 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report for the SLAPS. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
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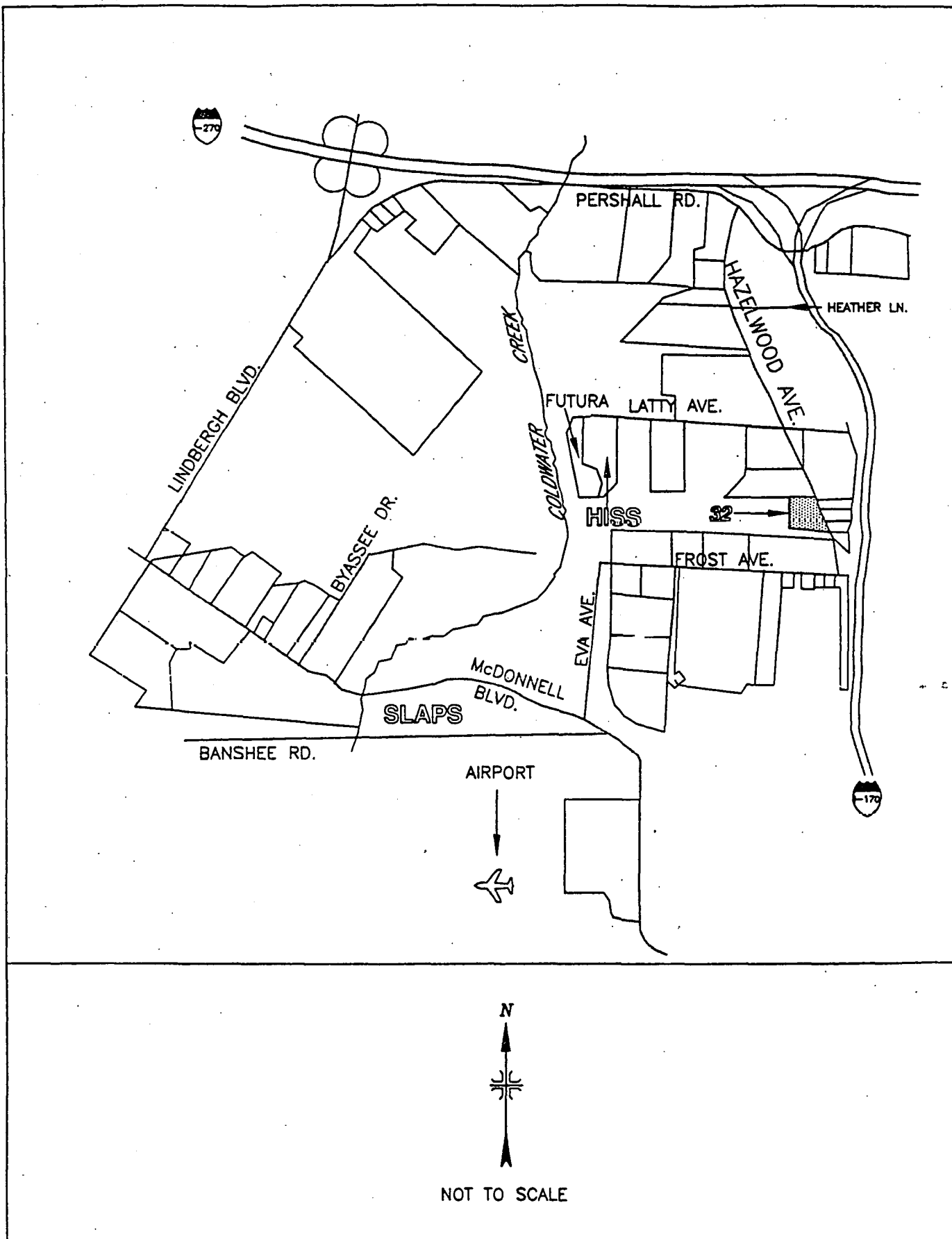


FIGURE 1: Location of SLAPS Vicinity Property Number 32

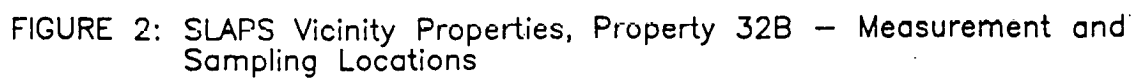


TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 32B
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
32B - GRID 2				
191	9	1.4 ± 0.2 ^c	5.32 ± 0.54 ^d	<1.5
192	10	1.4 ± 0.2	7.70 ± 0.74 ^d	1.0 ± 0.8
193	10	1.2 ± 0.1	8.36 ± 0.81 ^d	1.6 ± 0.7
194	9	1.1 ± 0.2	4.95 ± 0.53 ^d	0.9 ± 0.8
195	9	1.3 ± 0.2	3.97 ± 0.45 ^d	2.2 ± 1.0
32B - GRID 8				
196	11	1.3 ± 0.2	1.72 ± 0.27 ^d	2.5 ± 1.1
197	10	1.3 ± 0.2	1.58 ± 0.26 ^d	1.6 ± 1.1
198	10	1.5 ± 0.2	1.72 ± 0.27 ^d	1.7 ± 1.0
199	11	1.4 ± 0.2	2.08 ± 0.33 ^d	2.0 ± 1.1
200	10	1.2 ± 0.1	2.50 ± 0.36 ^d	1.6 ± 0.9
32A ^e				
171	---	0.9 ± 0.2	13.1	0.8 ± 0.9
172	---	0.9 ± 0.1	13.8	0.9 ± 0.8
173	---	0.8 ± 0.1	12.6	1.7 ± 0.9
174	---	1.0 ± 0.2	12.8	1.4 ± 0.9
175	---	1.2 ± 0.2	14.8	2.0 ± 1.1

^aRefer to Figure 2.

^bResults include background.

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

^dAlpha spectrometry results.

^eSamples collected by BNI. Sample locations are not shown on Figure 2.

^fMeasurement not performed.

REFERENCES

Oak Ridge Institute for Science and Education. Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, TN; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

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February 20, 1997

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SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 36, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 36 on August 7, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 36 is located on Hazelwood Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was mostly confined to the right-of-way portion of the property and extended from the boundary of Hazelwood Avenue to approximately 5 to 10 meters west of the road. At the south end of the property the excavation extends from the boundary of the road to approximately 55 meters west of the road. Figure 2 shows the remediated portions of VP 36. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed

post-remedial action(post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 36 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements and soil sampling.

Surface scans identified one location of elevated direct gamma radiation within grid 4. ESSAP personnel collected five systematic surface (0-15 cm) soil samples from grids 4, 9, and 16. Samples were collected from the center and at four points equidistant from the grid center and the grid corners and included the location of elevated direct gamma radiation identified in grid 4. Sample locations are shown on Figure 2. In addition, exposure rate measurements using a microrem meter were performed at 1 meter above each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 10 to 15 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid-state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Selected samples were also analyzed by alpha spectrometry for isotopic thorium. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 0.9 to 6.5 pCi/g for Ra-226, 1.58 to 290 pCi/g for Th-230, and 0.5 to 7.4 pCi/g for U-238. The highest concentrations of Ra-226, Th-230, and U-238 were from soil sample location 207 in grid block 4. BNI remediated this location and ESSAP collected a follow-up verification sample during a later survey visit. The radionuclide concentrations in this sample are also presented in Table 1. Concentrations were as follows: 1.8 pCi/g for Ra-226, 19.6 pCi/g for Th-230, and 2.3 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Dr. Alexander Williams

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Because the surface these samples were collected from was originally, and will be again following backfill, at a depth of greater than 15 cm, the subsurface guidelines are applicable. One sample in grid 4 exceeded the subsurface guideline for Th-230. However, the guidelines permit averaging the residual radioactive concentrations over an area of 100 m² and application of the hot spot criteria. For grid 4, the 100 m² average Th-230 concentration satisfied the guideline and the hot spot criteria also has been satisfied. All residual radionuclide levels therefore satisfied the guidelines.

In summary, the radiological status of VP 36 satisfies the applicable DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,



Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
Assessment Program

TJV:dka

cc: A. Johnson, DOE/HQ
D. Adler, DOE/FSRD/ORO
K. Albins, BNI
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
File/391

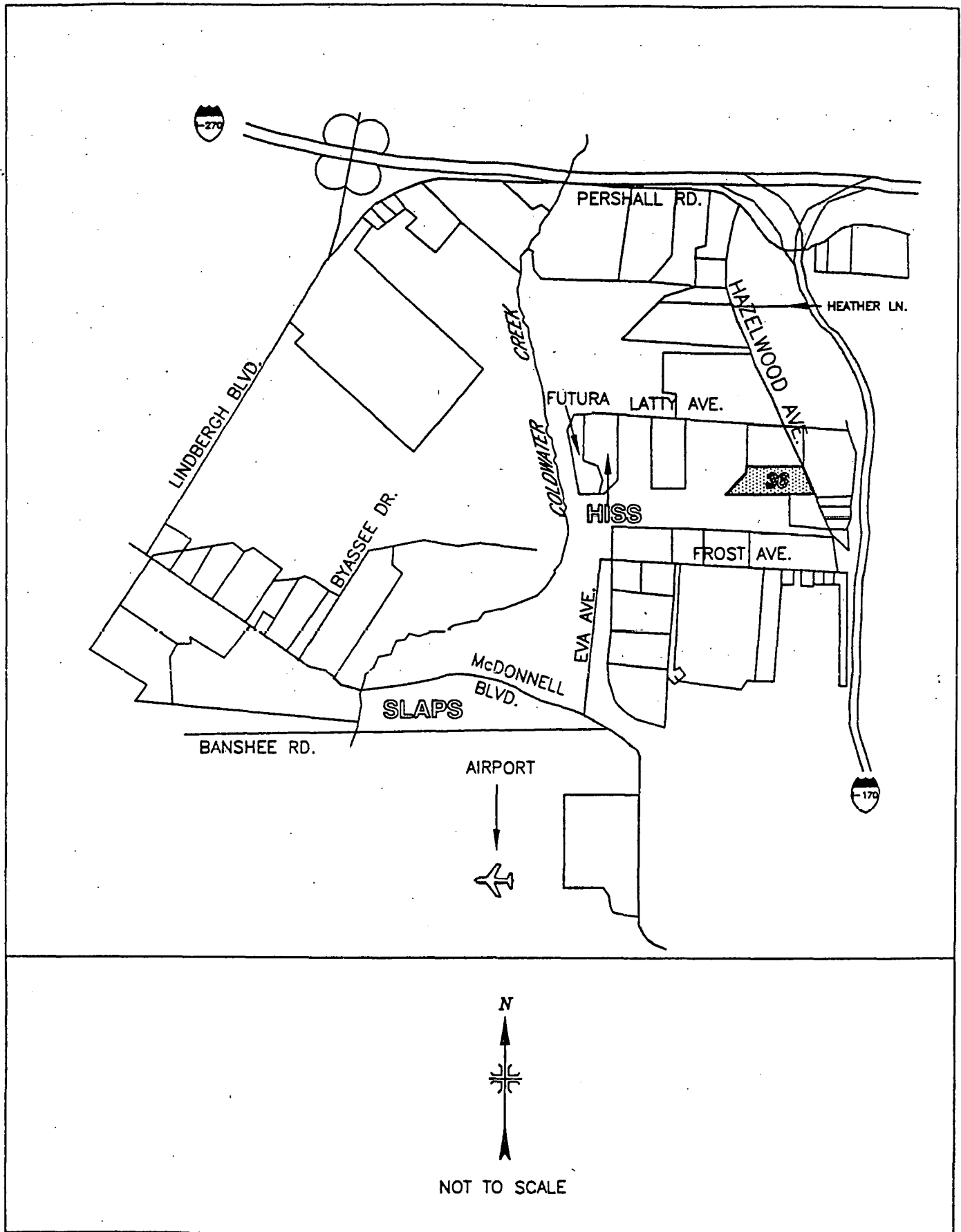


FIGURE 1: Location of SLAPS Vicinity Property Number 36

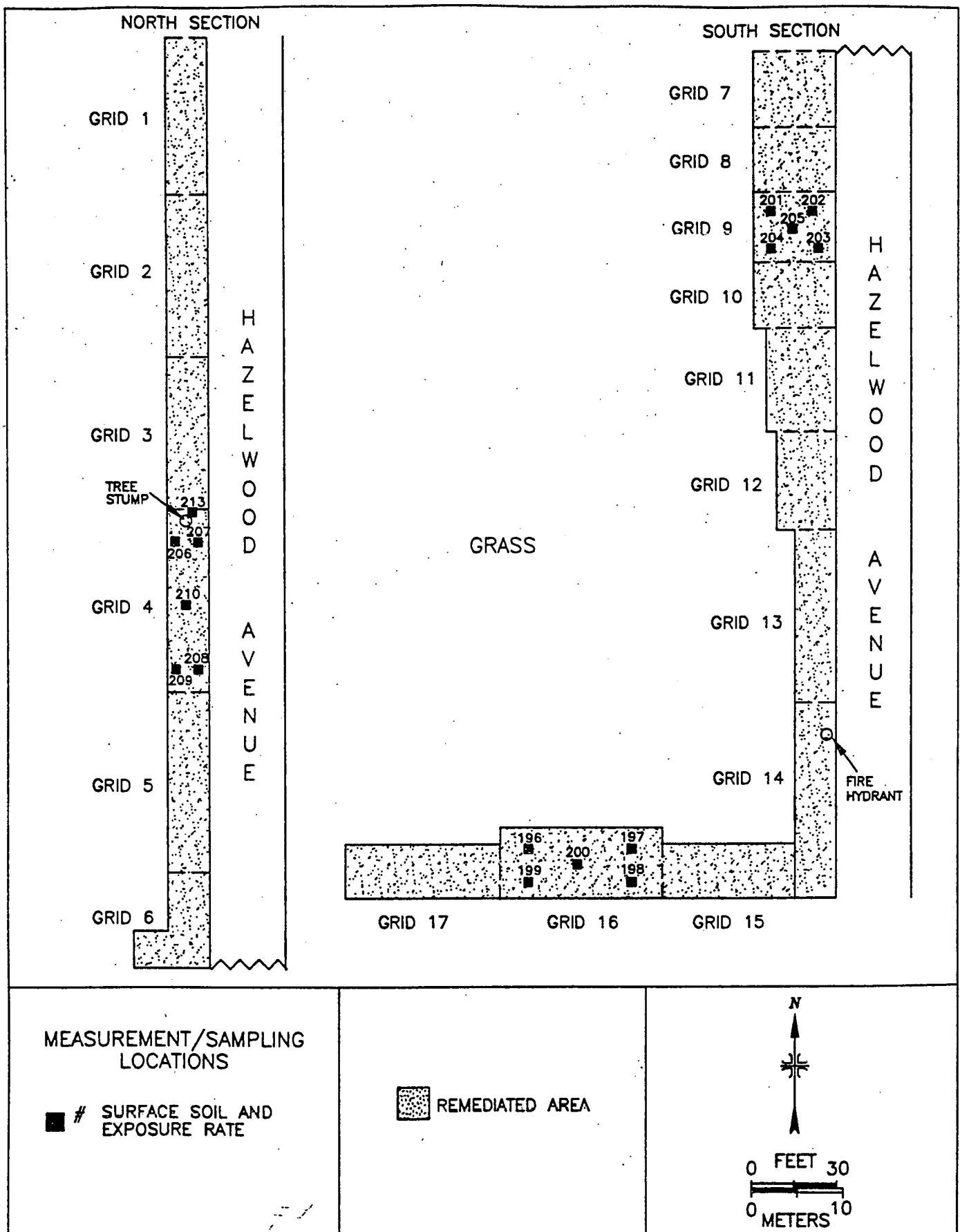


FIGURE 2: SLAPS Vicinity Properties, Property 36 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 36
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 4				
206	12	0.9 ± 0.1 ^c	1.70 ± 0.26 ^d	0.8 ± 0.7
207	11	6.5 ± 0.3	290 ± 20	7.4 ± 2.1
213 (After additional remediation of Location 207)	---	1.8 ± 0.1	19.6 ± 4.6	2.3 ± 0.4
208	10	1.2 ± 0.1	11.83 ± 1.13 ^d	2.1 ± 0.9
209	12	1.2 ± 0.1	5.95 ± 0.64 ^d	1.6 ± 0.9
210	11	1.2 ± 0.1	4.27 ± 0.47 ^d	1.4 ± 0.8
100 m ² Average Concentration:			8.7	
GRID 9				
201	11	1.0 ± 0.1	1.91 ± 0.31 ^d	1.1 ± 1.0
202	13	1.0 ± 0.1	2.01 ± 0.26 ^d	1.3 ± 0.9
203	14	1.0 ± 0.2	1.96 ± 0.28 ^d	0.5 ± 0.8
204	14	1.1 ± 0.1	1.95 ± 0.26 ^d	0.9 ± 0.8
205	13	1.1 ± 0.1	4.05 ± 0.46 ^d	1.0 ± 0.7
GRID 16				
196	13	0.9 ± 0.1	1.72 ± 0.27 ^d	1.7 ± 1.0
197	15	0.9 ± 0.1	1.58 ± 0.26 ^d	1.7 ± 1.0
198	15	0.9 ± 0.1	1.72 ± 0.27 ^d	0.8 ± 0.8
199	13	1.2 ± 0.1	2.08 ± 0.33 ^d	1.0 ± 0.6
200	13	1.1 ± 0.2	2.50 ± 0.36 ^d	1.0 ± 0.9

^aRefer to Figures 2 and 3.

^bResults include background.

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

^dAlpha spectrometry analysis values.

^eMeasurement not performed.

REFERENCES

Oak Ridge Institute for Science and Education. Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, TN; February 23, 1996.

U.S. Department of Energy (DOE). Radiation Protection of the Public and Environment. Washington, DC: DOE Order 5400.5. June 5, 1990a.

U.S. Department of Energy. Memorandum from J. Fiore to L. Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites." November 6, 1990b.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

February 20, 1997

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W. Alexander Williams, PhD
Designation and Certification Manager
U.S. Department of Energy
EM-421
Cloverleaf Building
Washington, DC 20585-0002

SUBJECT: INTERIM LETTER REPORT—VERIFICATION SURVEY OF THE ST. LOUIS AIRPORT SITE (SLAPS) VICINITY PROPERTY NO. 37, HAZELWOOD, MISSOURI

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) conducted verification activities at the St. Louis Airport Site (SLAPS) Vicinity Property (VP) No. 37 on July 22, 1996. Verification activities were performed in support of the remedial actions that Bechtel National, Inc. (BNI), the Formerly Utilized Sites Remedial Action Program project management contractor, performed for a number of the SLAPS VPs during Fiscal Year 1996.

SLAPS was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which consisted of pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently, transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads and contiguous properties, primarily collecting in the drainage ditches. The haul roads used for transport to the Latty Avenue storage site and other sites included McDonnell Boulevard, formerly Brown Avenue, Hazelwood Avenue, Pershall Road, Eva Avenue, Frost Avenue, and Latty Avenue.

VP 37 is located on Hazelwood Avenue in Hazelwood, Missouri (Figure 1). Soil contamination was confined to the right-of-way portion of the property and extended from the boundary of Hazelwood Avenue to approximately 5 to 10 meters west of the road. Figure 2 shows the remediated portions of VP 37. BNI remediated the contaminated soil from the property to depths of approximately 0.5 to 1 meter below the surface. BNI then subdivided the excavated portion of the property into approximately 100 m² survey units and performed post-remedial action (post-RA) surveys and sampling of each survey unit. The results of BNI's post-RA survey and sampling indicated that contaminants had been reduced to levels below the acceptable residual contamination guidelines.

ESSAP performed independent verification surveys of VP 37 following the completion of remedial activities and upon the receipt of BNI's post-RA data. Independent verification is performed in order to provide independent survey and analytical data for use by the DOE in determining the adequacy and accuracy of the BNI conclusions as to the remediated areas status. Verification activities included review of BNI's post-RA data, gamma surface scans using NaI scintillation detectors coupled to ratemeters with audible indicators, exposure rate measurements, and soil sampling.

Surface scans identified one location of elevated direct gamma radiation within grid block number 2. ESSAP personnel collected five systematic surface (0-15 cm) soil samples from grid blocks 2 and 9. Samples were collected from the center and at four points equidistant from the grid center and the grid corners and included the location of elevated direct gamma radiation identified in grid 2. Sample locations are shown on Figure 2. In addition, exposure rate measurements using a microrem meter were performed at 1 meter above each surface soil sampling location and results are presented in Table 1. Exposure rates ranged from 10 to 14 $\mu\text{R/h}$ and were comparable to background exposure rates obtained during previous SLAPS vicinity property surveys, which ranged from 9 to 10 $\mu\text{R/h}$ (ORISE 1996).

Soil samples were analyzed by solid state gamma spectrometry and the spectra were reviewed for the contaminants of interest, which were Ra-226, Th-230, and U-238. Selected samples were also analyzed by alpha spectrometry for isotopic thorium. Radionuclide concentrations in soil samples, including background, are summarized in Table 1. Concentration ranges were as follows: 1.2 to 7.2 pCi/g for Ra-226, 1.45 to 261 pCi/g for Th-230, and 0.6 to 3.5 pCi/g for U-238. The highest concentrations of Ra-226 and Th-230 were from soil sample location 179 in grid block 2. BNI remediated this location and ESSAP collected a followup sample during a later survey visit. The radionuclide concentrations in this sample are also presented in Table 1. Concentrations were as follows: 0.9 pCi/g for Ra-226, less than 4.3 pCi/g for Th-230, and 0.9 pCi/g for U-238. The previously determined average background radionuclide concentrations in soil were 0.9 pCi/g for Ra-226, 1.31 pCi/g for Th-230, and 1.1 pCi/g for U-238 (ORISE 1996).

Sample results were then compared to the generic and site-specific soil concentration guidelines (DOE 1990a and 1990b). These guidelines are as follows:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

All residual radionuclide levels, following the additional remediation satisfied these guidelines.

Dr. Alexander Williams

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February 20, 1997

In summary, verification surveys of the property identified locations of undocumented residual contamination where the hot spot criteria and/or the 100 m² average residual radionuclide concentration guidelines were exceeded—requiring BNI to perform additional remediation. Followup investigations of these areas, together with verification surveys of the remaining portions of VP 37, indicated that the radiological status of the property satisfied the DOE guidelines for release for unrestricted use. A draft verification report will be prepared following the receipt of BNI's post-remedial action report. In the interim, please contact me at (423) 576-5073 or Eric Abelquist at (423) 576-3740 should you have any questions, comments, or require additional information.

Sincerely,

Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and Site
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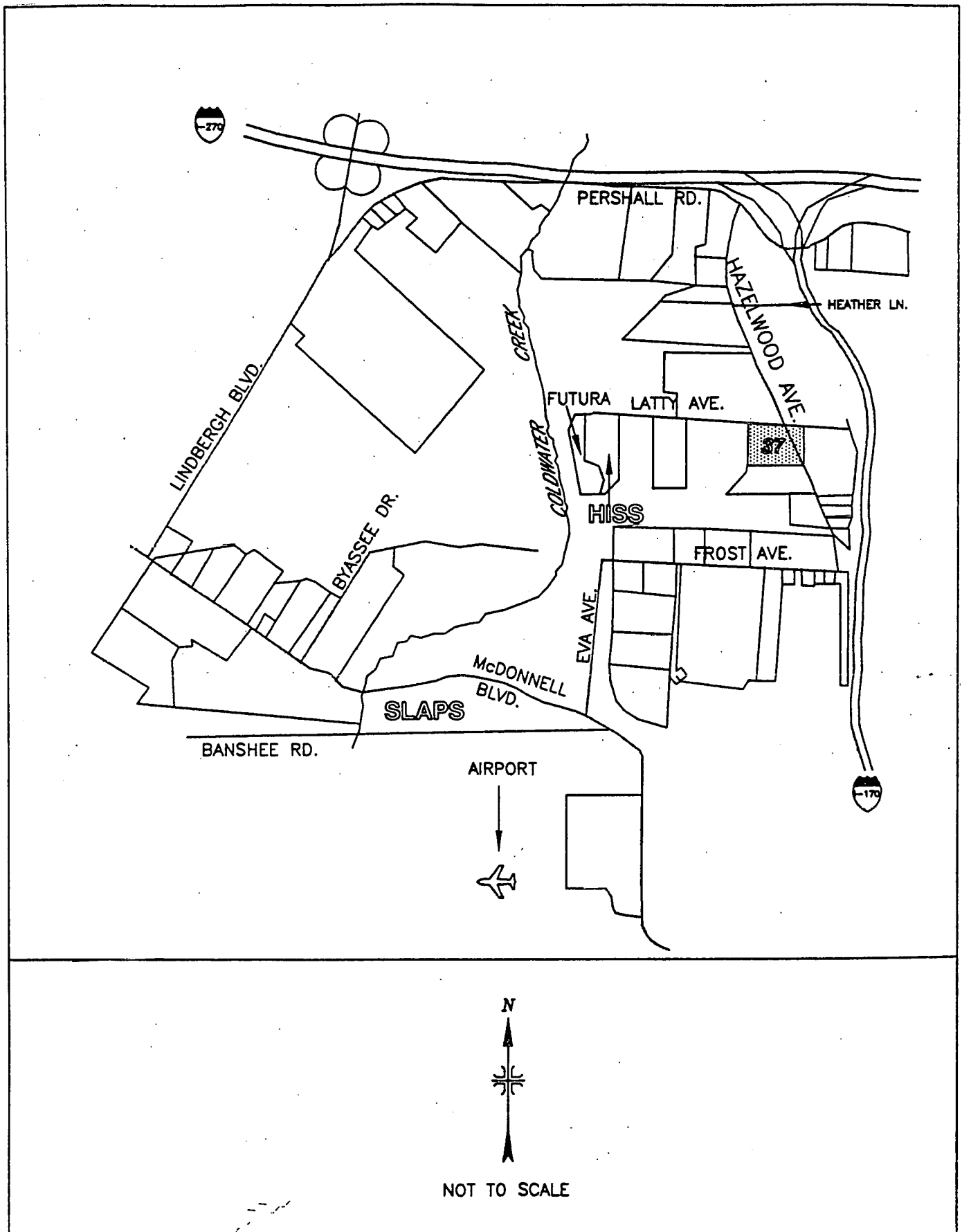


FIGURE 1: Location of SLAPS Vicinity Property Number 37

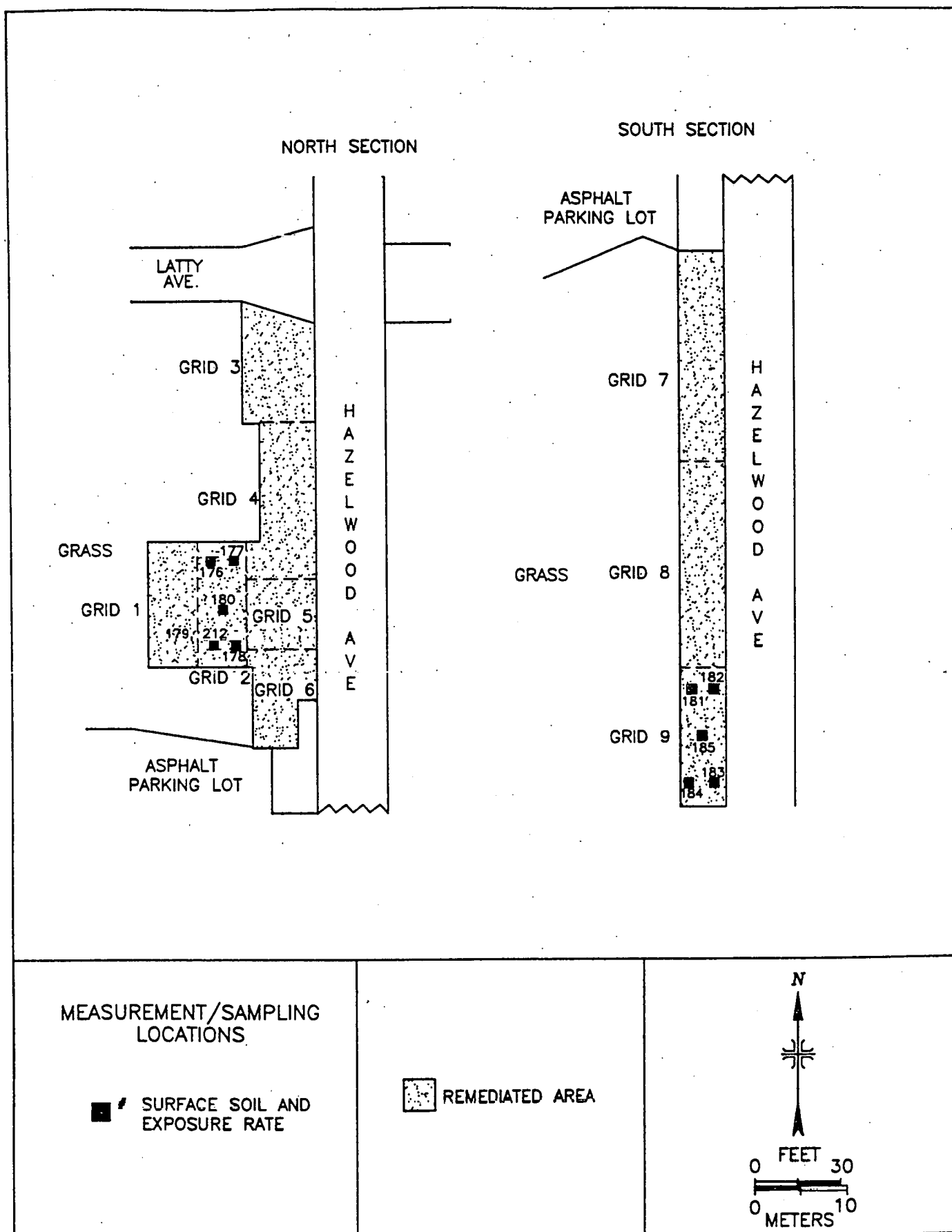


FIGURE 2: SLAPS Vicinity Properties, Property 37 – Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
ST. LOUIS AIRPORT SITE VICINITY PROPERTY NUMBER 37
HAZELWOOD, MISSOURI**

Sample Location ^a	Exposure Rates at 1 m (μR/h) ^b	Radionuclide Concentration (pCi/g) ^b		
		Ra-226	Th-230	U-238
GRID 2				
176	11	1.5 ± 0.2 ^c	2.28 ± 0.33 ^d	1.0 ± 0.9
177	13	1.3 ± 0.2	1.57 ± 0.24 ^d	1.4 ± 1.0
178	12	1.5 ± 0.2	1.45 ± 0.27 ^d	3.5 ± 1.9
179	12	7.2 ± 0.3	261 ± 23	2.4 ± 1.1
212 (After additional remediation of Location 179)	--- ^e	0.9 ± 0.1	<4.3	0.9 ± 0.3
180	14	1.7 ± 0.2	2.64 ± 0.35 ^d	1.3 ± 1.0
GRID 9				
181	11	1.7 ± 0.2	1.86 ± 0.27 ^d	0.6 ± 1.0
182	11	1.5 ± 0.2	4.60 ± 0.54 ^d	0.7 ± 0.7
183	11	1.3 ± 0.2	3.34 ± 0.41 ^d	1.4 ± 0.9
184	10	1.2 ± 0.2	2.50 ± 0.33 ^d	1.2 ± 0.8
185	12	1.4 ± 0.2	4.29 ± 0.51 ^d	0.9 ± 1.0

^aRefer to Figure 2.

^bResults include background.

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

^dAlpha spectrometry results.

^eMeasurement not performed.

REFERENCES

Oak Ridge Institute for Science and Education. Draft Reports-Verification Surveys of Properties 19, 20, 41, 43, 44, and 45, St. Louis Airport Site Vicinity Properties, Hazelwood and Berkeley, Missouri. Oak Ridge, TN; February 23, 1996.

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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri



U.S. Department of Energy