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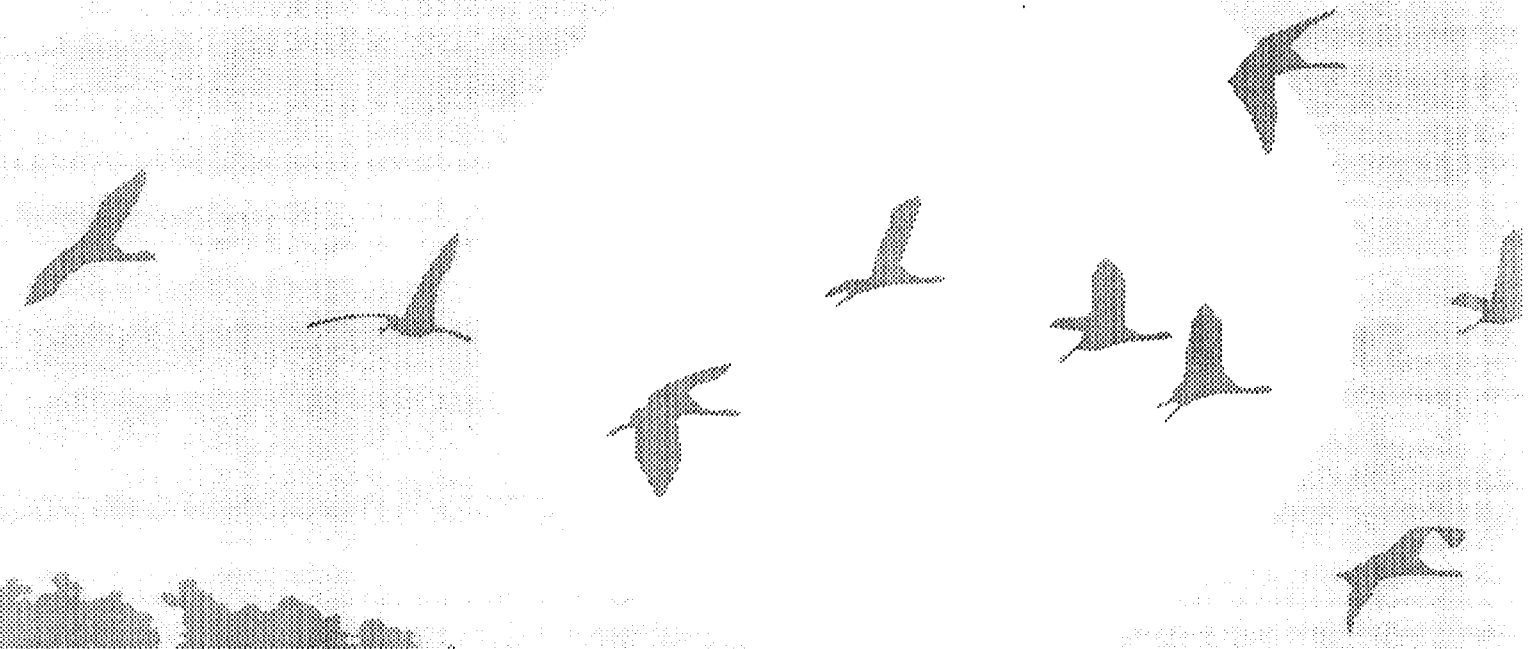
RADIOLOGICAL SURVEY OF THE EXTERIOR PORTIONS OF THE FORMER BLISS AND LAUGHLIN STEEL COMPANY FACILITY BUFFALO, NEW YORK

T. J. VITKUS

Prepared for the Office of Environmental Restoration
U.S. Department of Energy



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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION
Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

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T. J. Vitkus

Environmental Survey and Site Assessment Program
Energy/Environmental Systems Division
Oak Ridge Institute for Science and Education
Oak Ridge, TN 37831-0117

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RADIOLOGICAL SURVEY
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BUFFALO, NEW YORK

Prepared by: Timothy J. Vitkus Date: 1/18/95
T. J. Vitkus, Project Leader
Environmental Survey and Site Assessment Program

Reviewed by: Mark Laudeman Date: 1/18/95
M. J. Laudeman, Radiochemistry Laboratory Supervisor
Environmental Survey and Site Assessment Program

Reviewed by: Ann T Payne Date: 1/19/95
A. T. Payne, Quality Assurance Officer
Environmental Survey and Site Assessment Program

Reviewed by: W S Beck Date: 1/18/95
W. L Beck, Program Director
Environmental Survey and Site Assessment Program

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FIELD STAFF

T. L. Bright

LABORATORY STAFF

R. D. Condra
J. S. Cox
M. J. Laudeman

CLERICAL STAFF

D. A. Cox
R. D. Ellis
K. E. Waters

ILLUSTRATOR

T. D. Herrera

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ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
ASME	American Society of Mechanical Engineers
cm	centimeter
DOE/EM	Department of Energy/Office of Environmental Restoration and Waste Management
EPA	Environmental Protection Agency
EML	Environmental Measurements Laboratory
ESSAP	Environmental Survey and Site Assessment Program
FUSRAP	Formerly Utilized Sites Remedial Action Program
kg	kilogram
LOOW	Lake Ontario Ordnance Works
NLO	National Lead of Ohio
MeV	million electron volt
NaI	sodium iodide
NIST	National Institute of Standards and Technology
m	meters
m^2	square meters
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
PIC	pressurized ionization chamber
μR/h	microroentgens per hour

RADIOLOGICAL SURVEY
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INTRODUCTION AND SITE HISTORY

National Lead of Ohio (NLO) operated the Fernald Site in Ohio under contract to the Atomic Energy Commission (AEC). In the fall of 1952, the Bliss and Laughlin Steel Company, located in Buffalo, New York, performed machining and straightening operations on uranium rods under subcontract to NLO. The finished rods were shipped directly to the Fernald site; turnings were returned by the AEC, to the Lake Ontario Ordinance Works (LOOW) for packaging and ultimate disposal or recycle. Available records indicate uranium machining occurred at the site during September and October of 1952, and that 53 drums of turnings were generated by the Bliss and Laughlin activities.[1] It is unknown whether these records described the full extent of the Bliss and Laughlin work; no records, indicating the total quantity of uranium handled at this site, have been located. There is also mention of possible earlier AEC work at the site (the nature of which is unknown[1]) in an October 1951 correspondence, which indicated that several drums of dry uranium oxide had been accumulated. In 1972 the facility was sold to Ramco Steel, Inc.; the current owner is Niagara Cold Drawn Corporation.

Based on the operations performed at this site, the potential radiological contaminant would be processed natural uranium, i.e. uranium chemically separated from its long-lived daughter products and in its naturally occurring isotopic abundances. Surveys of the facility, conducted by NLO at the time of the rod turning operations, identified contamination on the turning machines. The machinery used for this work has been replaced; disposition of the old equipment is not known. No records, indicating the radiological conditions of the site following the uranium machining, have been located.

As a result, the U.S. Department of Energy's Office of Environmental Restoration and Waste Management (DOE/EM) recommended that the current radiological conditions be determined and requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak

Ridge Institute for Science and Education (ORISE) perform a radiological survey of the facility. A preliminary survey of portions of the building interior and exterior was performed in March 1992 and the results provided in a June 1992 report.[2] ESSAP identified localized contamination in that portion of the facility known as the "Special Finishing" area. Samples collected during that survey confirmed the contaminant as processed natural uranium. Therefore, DOE designated the facility into the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1992. FUSRAP was created in 1974 to identify and eliminate residual radioactive contamination that exceeds current guidelines from sites utilized during the early years of the Nation's atomic energy program.

However, there was a significant accumulation of snow on the ground during the March 1992 survey, limiting the effectiveness of the exterior surface scans that were performed. In addition, several of the contaminated locations identified on the floor of the "Special Finishing" area were adjacent to equipment or stored material, beneath which floors were inaccessible for survey. As a result, DOE requested that ESSAP perform additional radiological/characterization surveys of the exterior grounds, and once equipment and materials are relocated inside the building, the previously inaccessible portions of the floor in the "Special Finishing" area and other selected facility areas will be surveyed. This report describes the results of the radiological survey of the exterior grounds of the facility. Additional interior surveys will be performed at a later date.

SITE DESCRIPTION

The former Bliss and Laughlin Steel Company facility is located at 110 Hopkins Street in south Buffalo, New York (Figure 1). The facility consists of a single 19,000 square meter (m^2) building, surrounded by approximately 15,000 m^2 of grounds. A large asphalt parking area is located in the northeast section of the property. The property is bounded to the south and west by railroad right-of-way, and to the east by Hopkins Street (Figure 2). The property adjacent to the south side of the building [out approximately 10 meters (m)] was inaccessible to survey due to dumped trash and overgrown brush.

OBJECTIVE

The objective of the survey was to provide adequate data for use by the DOE in determining the radiological status of the exterior grounds of the facility.

PROCEDURES

On September 15, 1994, ESSAP personnel visited the site and performed a radiological survey of the exterior perimeter of the former Bliss and Laughlin Steel Company facility. The survey was conducted in accordance with a survey plan submitted to and approved by the DOE/EM.[3] This report summarizes the procedures and results of the survey. Additional information regarding major instrumentation, survey and analytical procedures may be found in Appendices A and B.

SURVEY PROCEDURES

Reference System

ESSAP used prominent site features to reference measurement and sampling locations.

Surface Scans

Surface scans for gamma activity were performed over 100% of accessible areas out to 20 meters of the building's perimeter. Scans were performed using NaI detectors coupled to ratemeters with audible indicators.

Exposure Rate Measurements

Exposure rate measurements were performed at 14 locations around the facility where the highest gamma surface activity levels were noted during surface scans (Figure 3). Measurements were made at 1 m above the surface using a pressurized ionization chamber (PIC).

Soil Sampling

A surface soil sample (0 to 15 centimeters) was collected from each of the 14 locations where exposure rate measurements were performed (Figure 3).

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data were returned to ESSAP's laboratory in Oak Ridge, Tennessee for analysis and interpretation. Soil samples were analyzed by solid state gamma spectrometry. The spectra were reviewed for uranium and any other identifiable photopeaks. Ra-226 levels were also evaluated in order to determine whether the uranium present was processed natural, or naturally occurring uranium with daughters present and in equilibrium. Soil sample results were reported in units of picocuries per gram (pCi/g). Exposure rate measurements were reported in microroentgens per hour (μR/h). Additional information concerning major instrumentation and analytical procedures is provided in Appendices A and B.

FINDINGS AND RESULTS

SURFACE SCANS

Gamma surface scans did not identify any locations of elevated direct radiation greater than 1.5 to 2 times the site background range.

RADIONUCLIDE CONCENTRATIONS IN SOIL

Radionuclide concentrations in soil samples are presented in Table 1. Uranium-238 concentrations ranged from 1.2 to 5.8 pCi/g and U-235 concentrations were less than 1.0 pCi/g. The concentration of Ra-226 ranged from 0.7 to 5.9 pCi/g, indicating that the daughters are present and in equilibrium with the U-238. Based on the presence of approximately equal amounts of the longer-lived uranium series daughters, it can be concluded that the uranium present is of natural origin, rather than associated with the uranium machining activities

performed for the MED/AEC. It should be noted that during surface scans and soil sampling, the presence of slag and cinder-like materials were observed throughout the property. This material is similar in appearance and radionuclide content to that which has been encountered at various other sites in the Buffalo area. Therefore, the observed radium and uranium concentration levels encountered at this site are considered comparable to background levels for industrial areas in and around Buffalo.

EXPOSURE RATES

Exposure rates are presented in Table 1. Exposure rates ranged from 8 to 13 μR/h, and averaged 10 μR/h. Background levels for the western New York area averaged 8 μR/h.[4,5] The DOE exposure rate guideline is 20 μR/h above background.[6]

SUMMARY

On September 15, 1994, ESSAP performed a radiological survey of the exterior portions of the former Bliss and Laughlin Steel Company facility in Buffalo, New York at the request of the U.S. Department of Energy. Survey activities included gamma surface scans, exposure rate measurements, and surface soil sampling.

Gamma scans did not identify any locations of elevated direct radiation indicative of surface or near surface contamination. Site exposure rate measurements were within expected background levels. Analysis of soil samples indicated the presence of natural, unprocessed uranium.

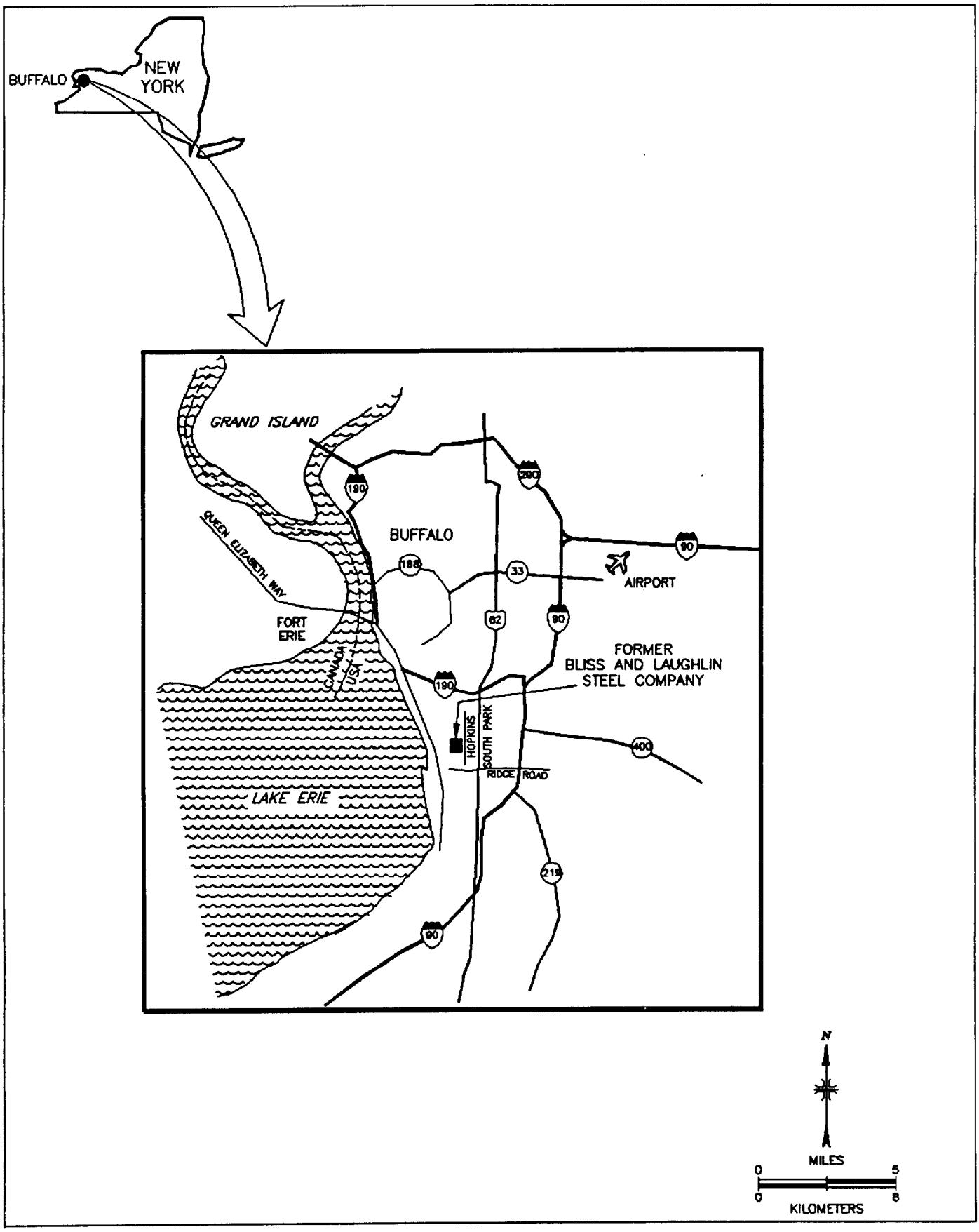

FIGURE 1: Buffalo, New York Area – Location of Former Bliss and Laughlin Steel Company Site

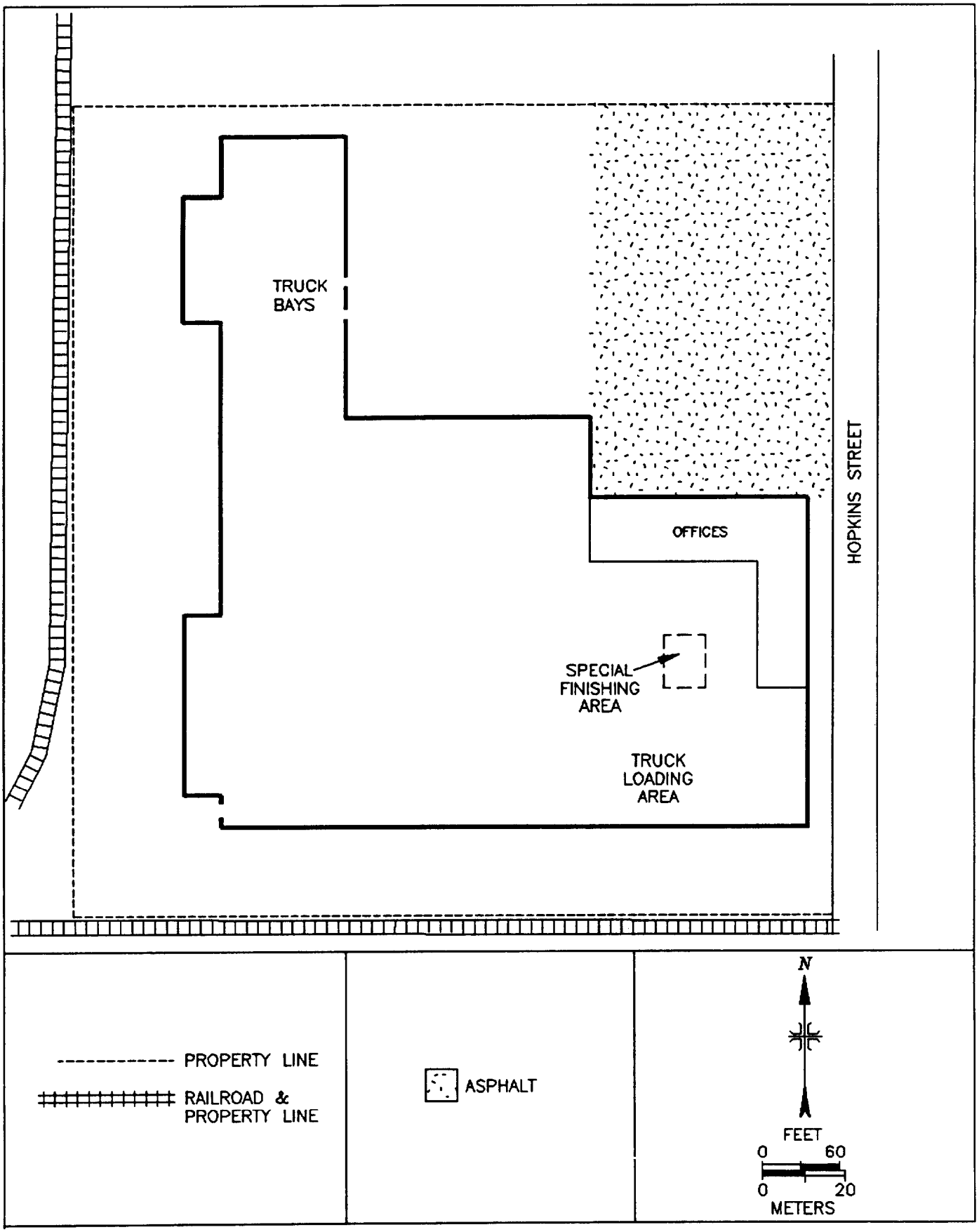

FIGURE 2: Former Bliss and Laughlin Steel Company Site – Plot Plan

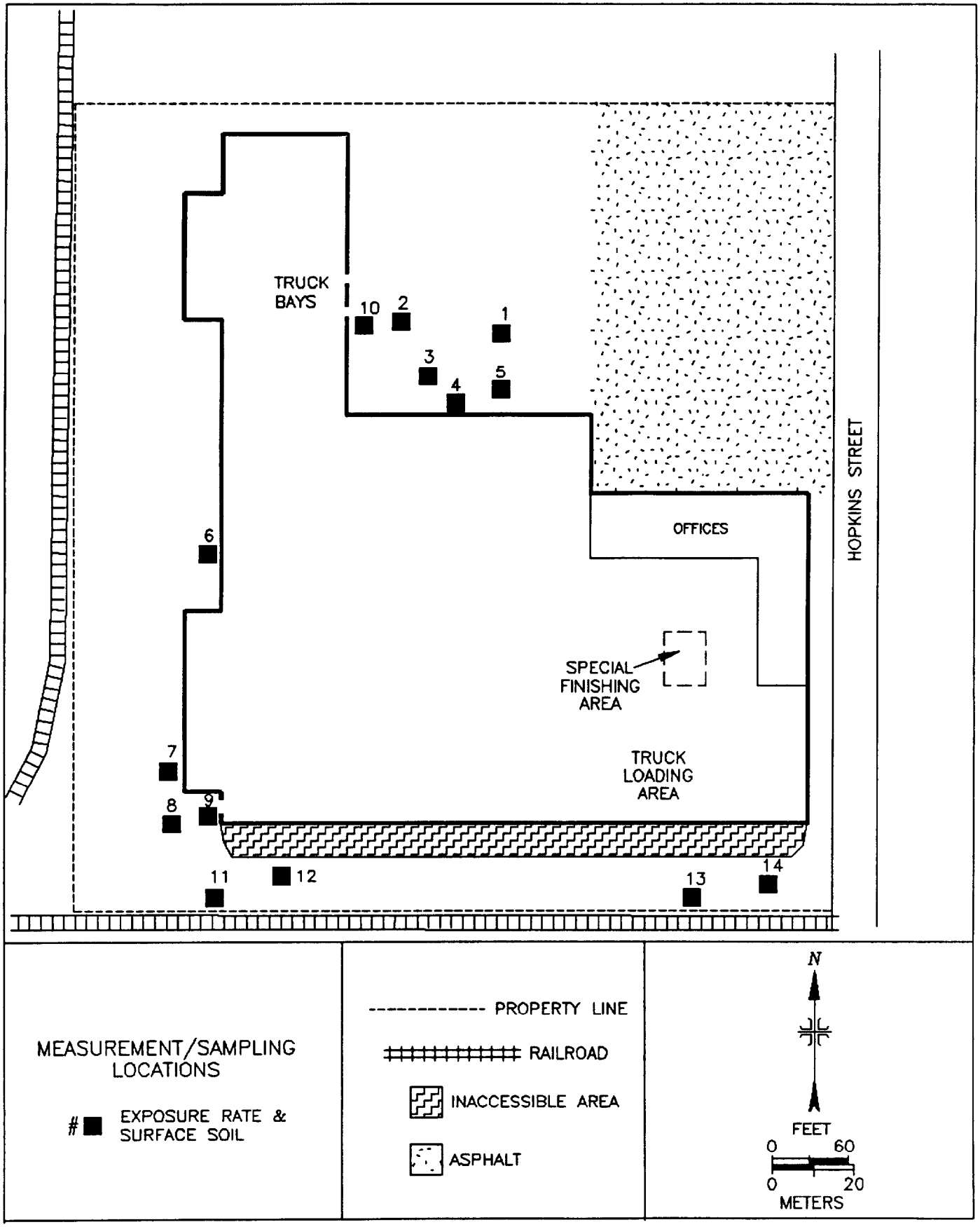

FIGURE 3: Former Bliss and Laughlin Steel Company – Measurement and Sampling Locations

TABLE 1

EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL FORMER BLISS AND LAUGHLIN STEEL COMPANY FACILITY BUFFALO, NEW YORK

Location[a]	Exposure Rate (μR/h)	Radionuclide Concentration (pCi/g)		
		U-238	U-235	Ra-226
1	8	2.0 ± 1.5[b]	0.3 ± 0.1	2.2 ± 0.2
2	8	1.6 ± 1.8	0.6 ± 0.4	1.4 ± 0.2
3	8	2.2 ± 2.0	0.4 ± 0.5	2.1 ± 0.3
4	8	1.3 ± 1.2	<0.4	0.7 ± 0.1
5	9	2.3 ± 1.6	<0.7	2.3 ± 0.3
6	10	2.0 ± 1.1	<0.3	1.0 ± 0.2
7	11	2.1 ± 1.4	<0.5	0.7 ± 0.2
8	9	1.7 ± 1.1	0.3 ± 0.3	1.0 ± 0.2
9	11	1.2 ± 1.3	<0.5	1.5 ± 0.2
10	10	4.3 ± 1.6	0.3 ± 0.4	3.0 ± 0.3
11	11	4.1 ± 1.6	<0.5	3.4 ± 0.3
12	10	5.8 ± 2.2	<1.0	5.9 ± 0.4
13	11	2.1 ± 0.9	<0.4	2.4 ± 0.2
14	13	3.3 ± 1.7	<0.6	3.0 ± 0.3

[a]Refer to Figure 3.
[b]Uncertainties represent the 95% confidence level, based only on counting statistics.

REFERENCES

1. Attachment to letter from A. Williams (DOE/EM) to F. Archer (Niagara Cold Drawn Steel Co.), regarding history of MED/AEC activities at Bliss and Laughlin Steel Company, February 21, 1991.

2. "Radiological Survey of the Former Bliss and Laughlin Steel Company Facility, Buffalo, New York," J. D. Berger, Oak Ridge Institute for Science and Education, June 1992.

3. Letter from T. J. Vitkus, ORISE to W. A. Williams, U.S. Department of Energy, Subject - "Proposed Radiological/Characterization Survey Plan of Portions of the Former Bliss and Laughlin Steel Company Facility, Buffalo, New York," June 30, 1994.

4. "Verification of 1983 and 1984 Remedial Actions, Niagara Falls Storage Site, Vicinity Properties, Lewiston, New York," S. A. Wical, et al., Oak Ridge Associated Universities, December 1989.

5. "Verification of 1985 and 1986 Remedial Actions, Niagara Falls Storage Site, Vicinity Properties, Lewiston, New York," J. D. Berger, et al., Oak Ridge Associated Universities, July 1990.

6. "DOE Order 5400.5, Radiation Protection of the Public and the Environment," February 1990.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Detectors

Reuter-Stokes Pressurized Ion Chamber
Model RSS-112
(Reuter-Stokes, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm Crystal
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

High Purity Extended Range Intrinsic Detectors
Model No: ERVDS30-25195
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

High-Purity Germanium Detector
Model GMX-23195-S, 23% Eff.
(EG&G ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-16
(Gamma Products, Palos Hills, IL) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans for gamma activity were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum. The scans were performed using NaI detectors coupled to countrate meters with audible indicators. Identification of elevated levels was based on increases in the audible signal from the recording and/or indicating instrument.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed at 1 m above the surface, using a pressurized ionization chamber (PIC).

Soil Sampling

Approximately 1 kg of soil was collected at each sample location. Surface soil samples were collected at the 0-15 cm depth. Collected samples were placed in a plastic bag, sealed, and labeled in accordance with ESSAP survey procedures.

ANALYTICAL PROCEDURES

Gamma Spectrometry

Samples of soil were dried, mixed, crushed, and/or homogenized as necessary, and a portion sealed in 0.5-liter Marinelli beaker or other appropriate container. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry. Net material weights were

determined and the samples counted using intrinsic germanium detectors coupled to a pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

U-238	0.063 MeV from Th-234*
Ra-226	0.351 MeV from Pb-214*
U-235	0.143 MeV

*Secular equilibrium assumed.

Spectra were also reviewed for other identifiable photopeaks.

UNCERTAINTIES AND DETECTION LIMITS

The uncertainties associated with the analytical data presented in the table of this report represent the 95% confidence level for that data based only on counting statistics. Additional uncertainties associated with sampling and measurement procedures, have not been propagated into the data presented in this report.

CALIBRATION AND QUALITY ASSURANCE

Calibration of all field and laboratory instrumentation was based on standards/sources, traceable to NIST, when such standards/sources were available. In cases where they were not available, standards of an industry recognized organization were used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Analytical and field survey activities were conducted in accordance with procedures from the following ESSAP documents:

- Survey Procedures Manual, Revision 8 (December 1993)
- Laboratory Procedures Manual, Revision 8 (August 1993)
- Quality Assurance Manual, Revision 6 (November 1993)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance and contain measures to assess processes during their performance.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.
- Participation in EPA and EML laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.