N4.4-5

N4.4

PRELIMINARY SURVEY OF ELECTROMET CORPORATION UNION CARBIDE METALS DIVISION NIAGARA FALLS, NEW YORK

Work performed
by the
Health and Safety Research Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830

March 1980

OAK RIDGE NATIONAL LABORATORY
operated by
UNION CARBIDE CORPORATION
for the
DEPARTMENT OF ENERGY
as part of the
Formerly Utilized Sites--
Remedial Action Program

ELECTROMET CORPORATION
UNION CARBIDE METALS DIVISION
NIAGARA FALLS, NEW YORK

At the request of the Department of Energy (DOE, then ERDA), a preliminary survey was performed at the former Electromet Plant (currently Union Carbide Corporation - Metals Division plant) in Niagara Falls, New York (see Fig. 1), on August 24, 1976, to assess the radiological status of those facilities utilized under Manhattan Engineer District (MED) contract during the period 1943 through 1946. Robert D. Forgeng, Plant Manager, provided information about the contract operations and identified the former site of the one building (a cinder block and wood structure) utilized in the process. C. R. Allenbach and Don Hawkes also provided information as to the building location and project operations. Also, Bill Chynoweth, an employee at the plant during the MED contract period, provided information about operational processes and assisted in identifying the location of the building which was demolished about 1958.

The project involved receiving Green Salt (UF_4) in drums from the Linde Air plant at Tonawanda, New York, reacting the Green Salt in furnaces, converting it to metal, and then recasting it into ingots. The building was formerly located where Building 166 now stands and just west of Building 163 (see Figs. 2 and 3) which existed at the time of the project. The former process building was constructed of wood and cinder block and was about 18 x 46 m at one end and 14 x 46 m at the opposite end. Waste from the operation was disposed at the Lake Ontario Ordnance Works depot. Residues of dolomite slag liners (MgF_2 slag), uranium chips, and crucible dross associated with the process were shipped to other sites for uranium recovery.

Present Use of Facilities

The building utilized in the MED project was washed, vacuumed, and, in some locations, the concrete floor and some wood platforms were removed (see Report N04600). Following the project (post-1946), the building was used for zirconium processing from 1947 to 1948, and later titanium was processed prior to demolition. Building 166 (see Fig. 4)

was constructed on the site of the former process building, and it is currently used by Union Carbide's Metal Division operations.

Results of Preliminary Survey

The preliminary survey was performed by H. W. Dickson of the Oak Ridge National Laboratory and W. T. Thornton of the DOE/Oak Ridge Operations Office (then ERDA). Accompanying Dickson and Thornton during the survey was C. R. Allenbach, Don Hawkes, and Bill Chynoweth. Measurements taken at this site included external gamma-ray exposure rates taken at 1 m in height and beta-gamma dose rate taken at 1 cm from the surface. Results of the survey measurements were within background levels with the exception of slightly elevated background with maximum beta-gamma dose-rate readings of 0.1 mrad/hr at a location between Buildings 163 and 166. Survey measurements in sections of the old Union Carbide dump (200 to 300 acres and now owned by CECOS International, Inc.) located to the north of Pine Avenue (see Figs. 5 and 6) resulted in radiation levels that were not significantly above background levels. Some of the waste from the process and rubble from the demolition of the old building has been buried at this dump.

In view of the near background radiation measurements taken at this site, a comprehensive, formal survey will probably not be required. However, it is suggested as a precautionary measure to (1) obtain further measurements between Buildings 163 and 166 to define extent of elevated readings, (2) obtain a soil sample at location in (1) where maximum β-γ and external gamma measurements are observed, (3) drill core samples in the old Union Carbide dump to determine if any radioactive material has been deposited in this area.

A formal survey of this facility was performed as part of the dismantlement and decommissioning of Electromet by the Health and Safety Division of the AEC on August 11 and 14, 1953. The results of this survey are reported in the attached document.

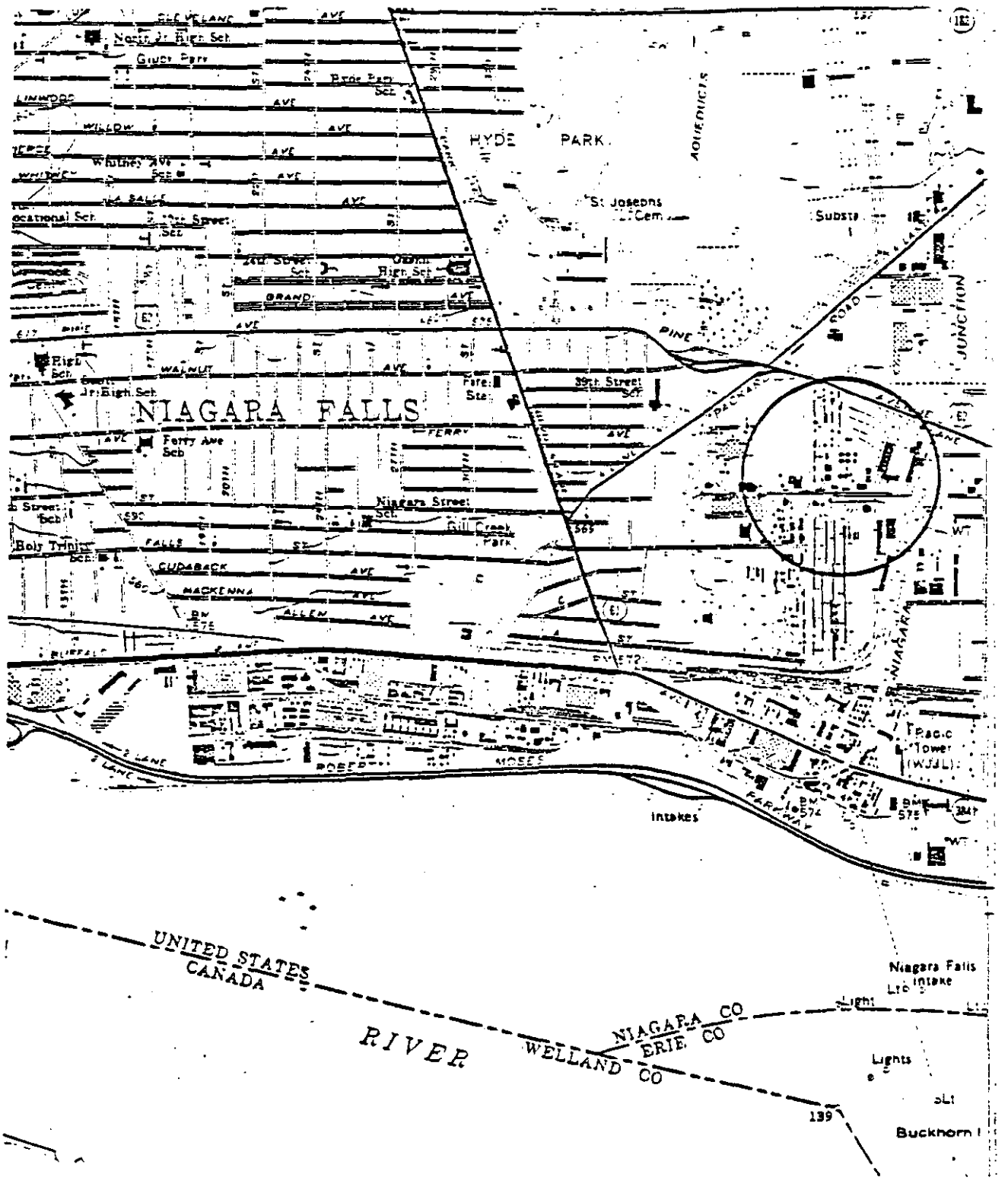

Fig. 1. Location of the Electromet Corporation - Union Carbide Metals Division site in Niagara Falls, New York.

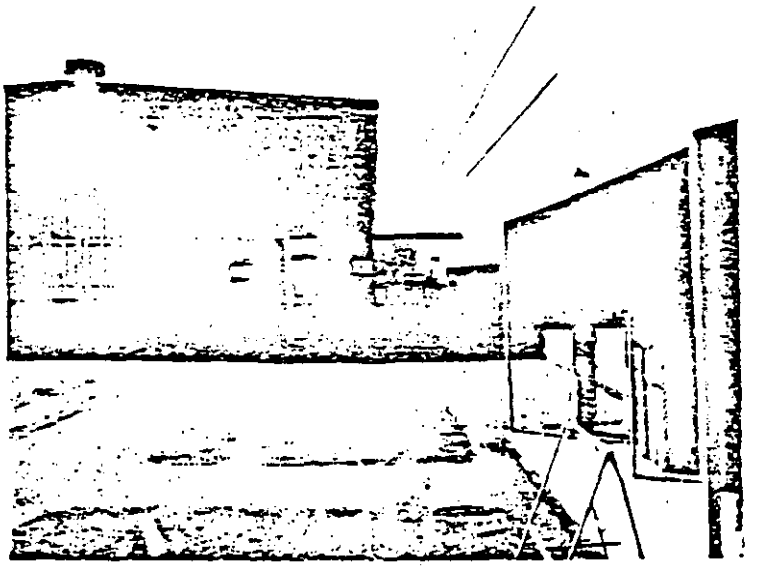

Fig. 2. North end of Building 163 and east side of Building 166.

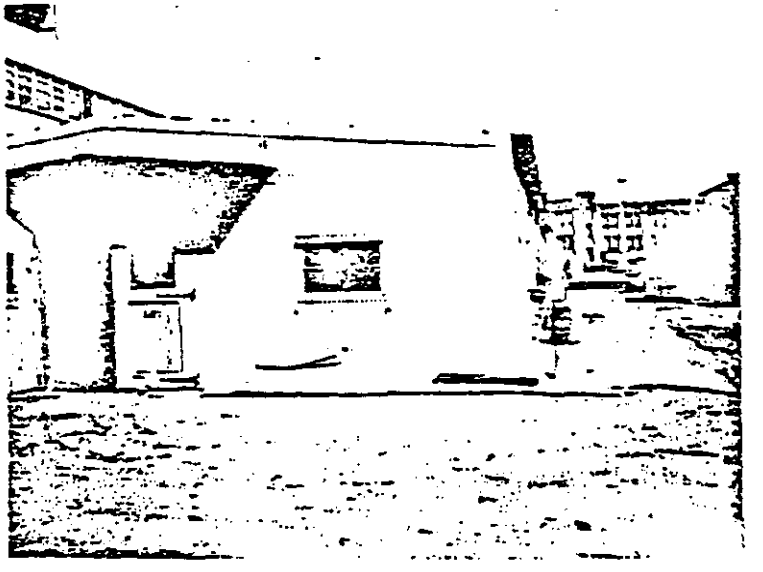

Fig. 3. South end of Building 163 and east side of Building 166.

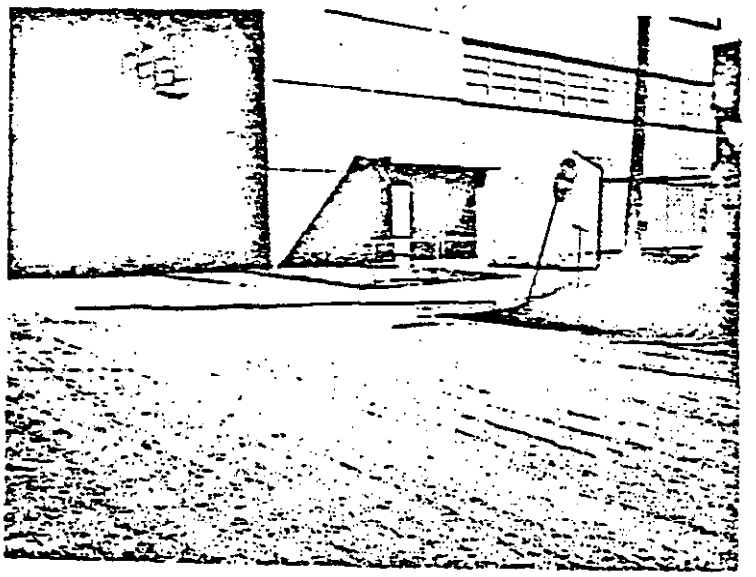

Fig. 4. Building 166.

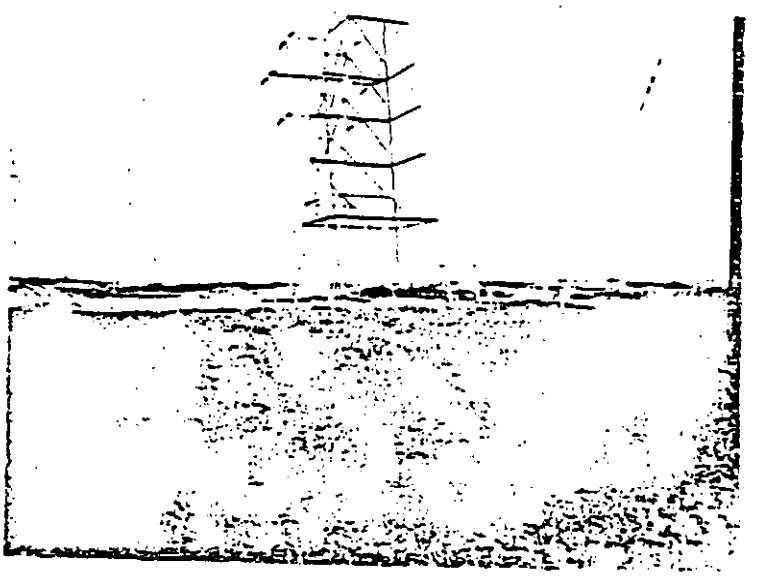

Fig. 5. Old Carbide Dump (now "Niagara Recycling").

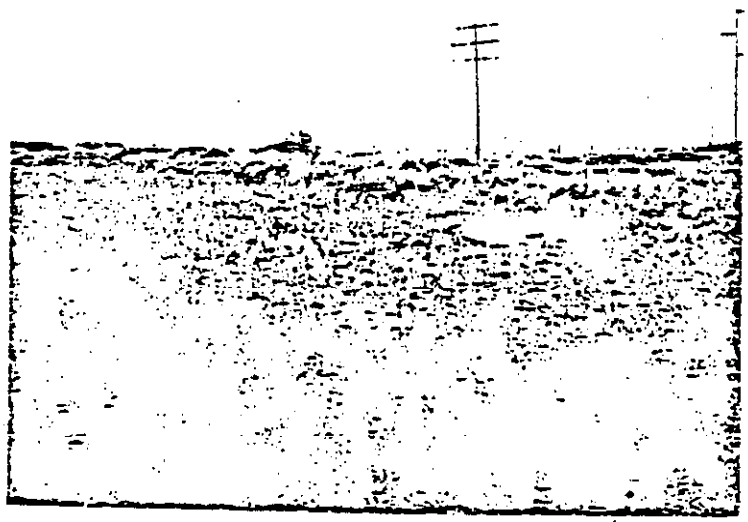

Fig. 6. Old Carbide Dump (now "Niagara Recycling").

PRELIMINARY SURVEY OF THE UNION CARBIDE CORPORATION METALS DIVISION PLANT, NIAGARA FALLS, NEW YORK

Work performed
by the
Health and Safety Research Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830

December 1980

OAK RIDGE NATIONAL LABORATORY
operated by
UNION CARBIDE CORPORATION
for the
DEPARTMENT OF ENERGY
as part of the
Formerly Utilized Sites--
Remedial Action Program

PRELIMINARY SURVEY OF THE UNION CARBIDE CORPORATION METALS DIVISION PLANT, NIAGARA FALLS, NEW YORK

B. A. Berven and R. W. Doane

Introduction

On September 24, 1980, two representatives from Oak Ridge National Laboratory visited Union Carbide Corporation's Metal Division Plant (UCC-MD) in Niagara Falls, New York. The purpose of the visit was to perform a radiological survey of property where anomalously high levels of radiation were observed during an earlier preliminary survey of this site (see attachment). This report presents the results of this radiological survey.

A diagram of the technology area of the UCC-MD plant is shown in Fig. 1. The location of the anomalous radiation levels was between Buildings 163 and 166 where beta-gamma dose-rate levels were measured at 0.1 mrad/h at the ground surface.

Survey Methods

The preliminary radiological survey of the UCC-MD Technology Area consisted of the following measurements or samples: (1) a gamma-ray scan of the outside ground surface; (2) two bias surface soil samples from outside locations where external gamma radiation levels were significantly above background; (3) a gamma-ray scan of the inside floor and wall surfaces of Building 163; (4) bias alpha measurements inside Building 163 where external gamma radiation levels were significantly above background; (5) five smear samples from inside Building 163 measuring transferable alpha and beta contamination.

Portable instrumentation used in this survey included a gamma-ray scintillator [NaI (Tl)] survey meter, an alpha scintillation [ZnS (Ag)] counter, and a Geiger-Mueller (G-M) survey meter.

Survey Results

Outside

The gamma-ray scanning of the ground surface in the Technology Area at UCC-MD indicates wide-spread contamination over an extensive portion of this property (see shaded area in Fig. 2). Relatively high concentrations

of gamma-emitting radionuclides were observed in localized areas. External gamma exposure rates on ground surfaces were measured, ranging from background (approximately 10 μR/h) to a maximum of 3 mR/h. The contamination appeared to be low-level but uniform under several asphalt pads, and high-level and "spotty" following two railroad spurs traversing the property.

The highest external gamma levels (3 mrad/h)* observed in the area where surface soil sample NF_1 (see Fig. 3) was located. Potentially contaminated material appeared to be located beneath the asphalt pads surrounding Buildings 163 and 171. Surface exposure rates were a general 30 μR/h around Building 171, but appeared to be highly variable around Building 163, ranging from 17 to 100 μR/h.

The location of two surface soil samples (0-15 cm) taken in the Technology Area are shown in Fig. 3. The results are listed below:

Sample	External Gamma Exposure Rate at Ground Surface (μR/h)	Radionuclide Concentration (pCi/g)		
		^{238}U	^{226}Ra	^{232}Th
NF_1	3000	3200 ± 3%	3300 ± 4.8%	860 ± 7.1%
NF_2	83	81 ± 3%	72 ± 1.7%	190 ± 7.2%

The highest external gamma readings were found at the surface of the soil, with the levels decreasing rapidly with increasing depth.

Inside Building 163

Low-level contamination was found inside Building 163 during a cursory survey. The surface external gamma levels from the walls and floor were within typical background ranges (13 to 17 μR/h). The alpha activity on the walls and floor were elevated but not significantly above background levels at 68 dpm/100 cm^2.

Cracks in the floor of Building 163 exhibited elevated radiation levels, with external gamma activities ranging from 17 to 50 μR/h, and alpha activity over these cracks ranging from 100 to 150 dpm/100 cm^2.†

*This exceeds Nuclear Regulatory Commission's maximum beta-gamma level guideline of 1.0 mrad/h at 1 cm (see Ref. 1).

†This exceeds Nuclear Regulatory Commission's guideline of 100 dpm/100 cm^2 for alpha activity originating from ^{226}Ra (see Ref. 1).

Five smear samples were taken to determine the amount of transferable alpha and beta contamination. The location of the smear samples are identified in Fig. 4. The levels of transferable alpha and beta-gamma contamination were all at background levels.

At location "b", surface external gamma levels measured 83 μR/h and alpha activity measured approximately 530 dpm/100 cm^2 (also above NRC guidelines). At location "c", beta-gamma levels of 0.12 mrad/h were observed.

Discussion

Relatively high concentrations of radionuclides in the ^{232}Th and ^{238}U decay chains exist in the surface soil in the Technology Area at UCC-MD in Niagara Falls, New York. These materials also appear in cracks and seams in the walls and floor of Building 163.

Dr. C. R. Allenback, Manager of Environmental, Health, and Product Safety Affairs at the UCC-MD, indicated thorium-bearing ores were used during operations at this site, however, these operations were unrelated to Manhattan Engineer District (MED)/Atomic Energy Commission (AEC) activities. In view of the nature of past MED/AEC operations (limited to reacting of UF_4 to uranium metal), it seems unlikely that the present contamination on-site is related to those MED/AEC activities. However, because uranium appears to be present in the soil in significant amounts, contamination due to MED/AEC activities cannot be eliminated, but only considered improbable.

Recommendations

Based on the results of this preliminary survey, it is recommended that a formal detailed radiological survey of the Technology Area at the UCC-MD Plant in Niagara Falls, New York, be conducted by some responsible agency since radiation levels exceed Nuclear Regulatory Commission guidelines for unrestricted use.

References

Nuclear Regulatory Commission, "Guidelines for Decontamination of Facilities or Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source, or Special Nuclear Material," November 1976.

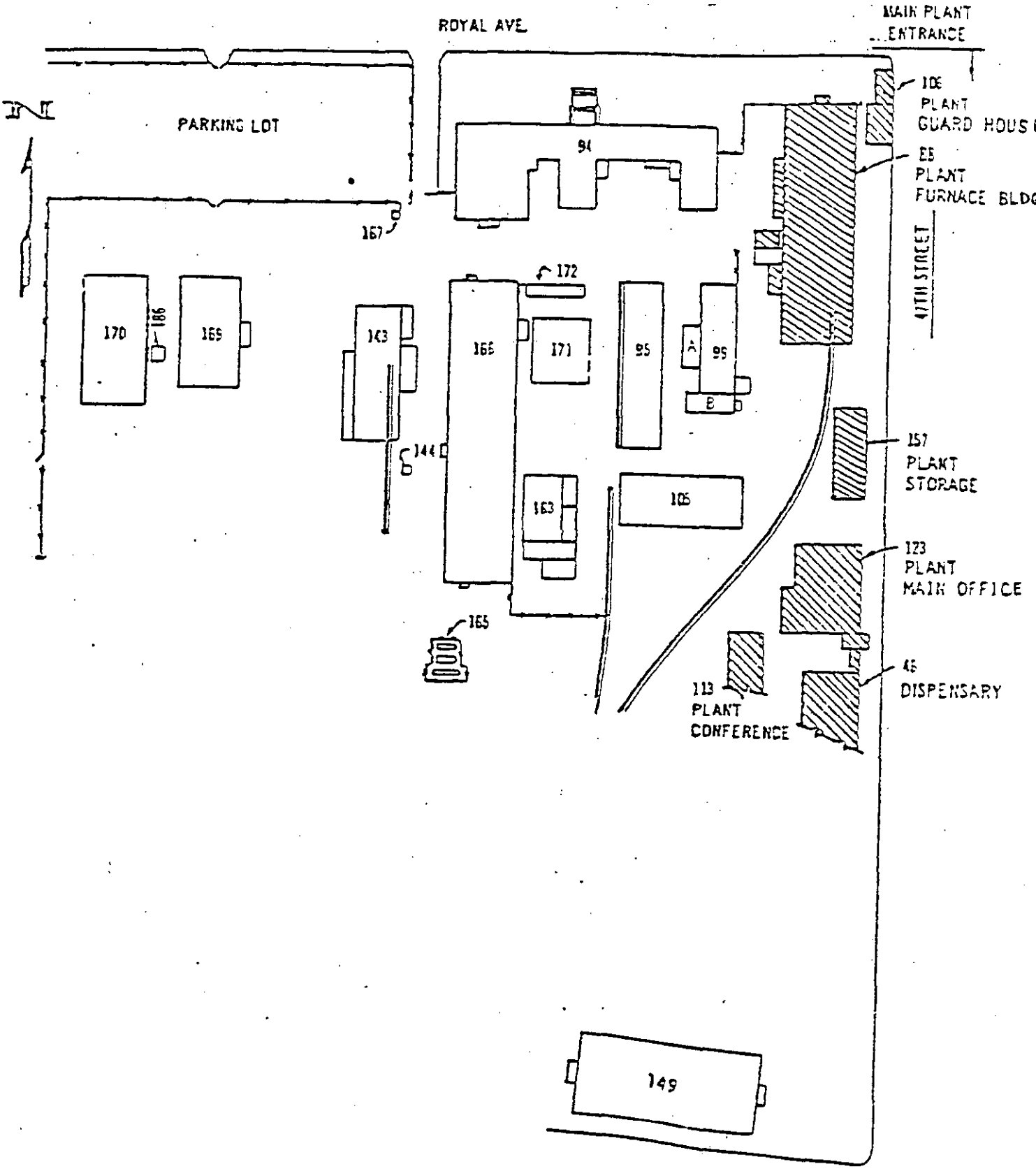

Fig. 1. Technology Area at the Union Carbide Corporation - Metals Division Plant (former Electromet site) in Niagara Falls, NY (adapted from UCC-MD drawing).

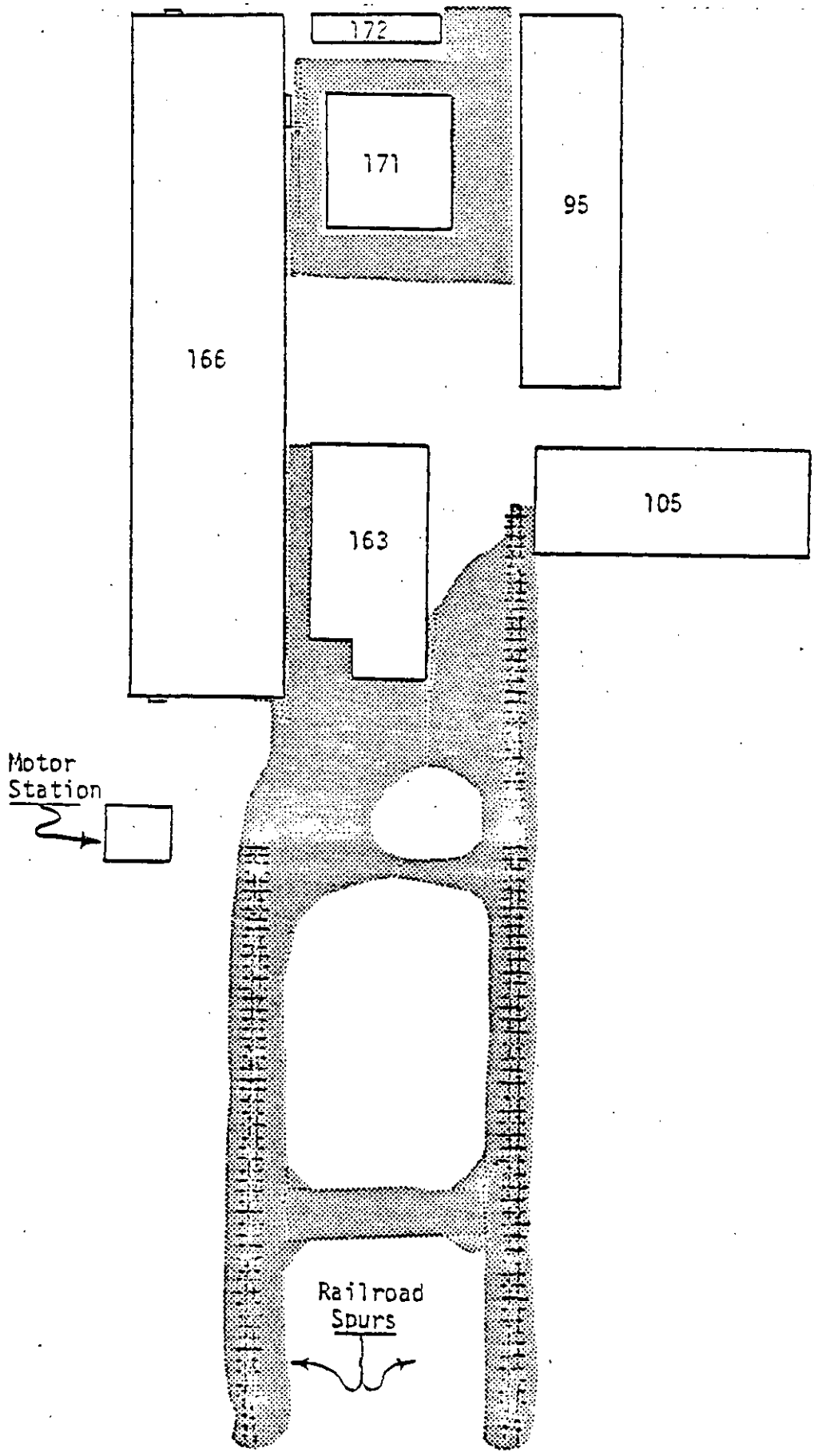

Fig. 2. Location of elevated surface gamma-ray levels (indicated by shading) in the Technology Area at UCC-MD, Niagara Falls, NY.

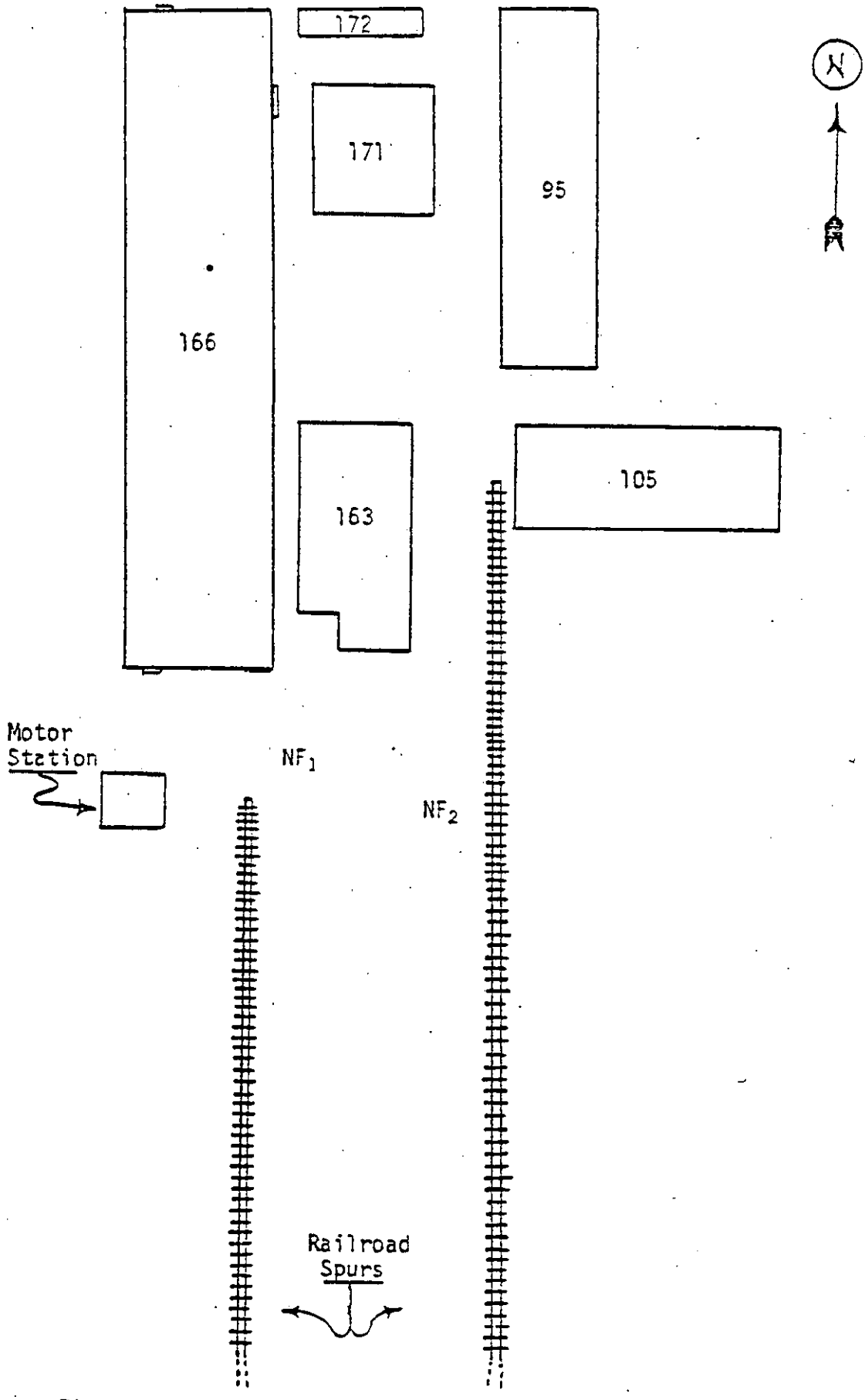

Fig. 3. Location of surface soil samples taken in the Technology Area of UCC-MD in Niagara Falls, NY.

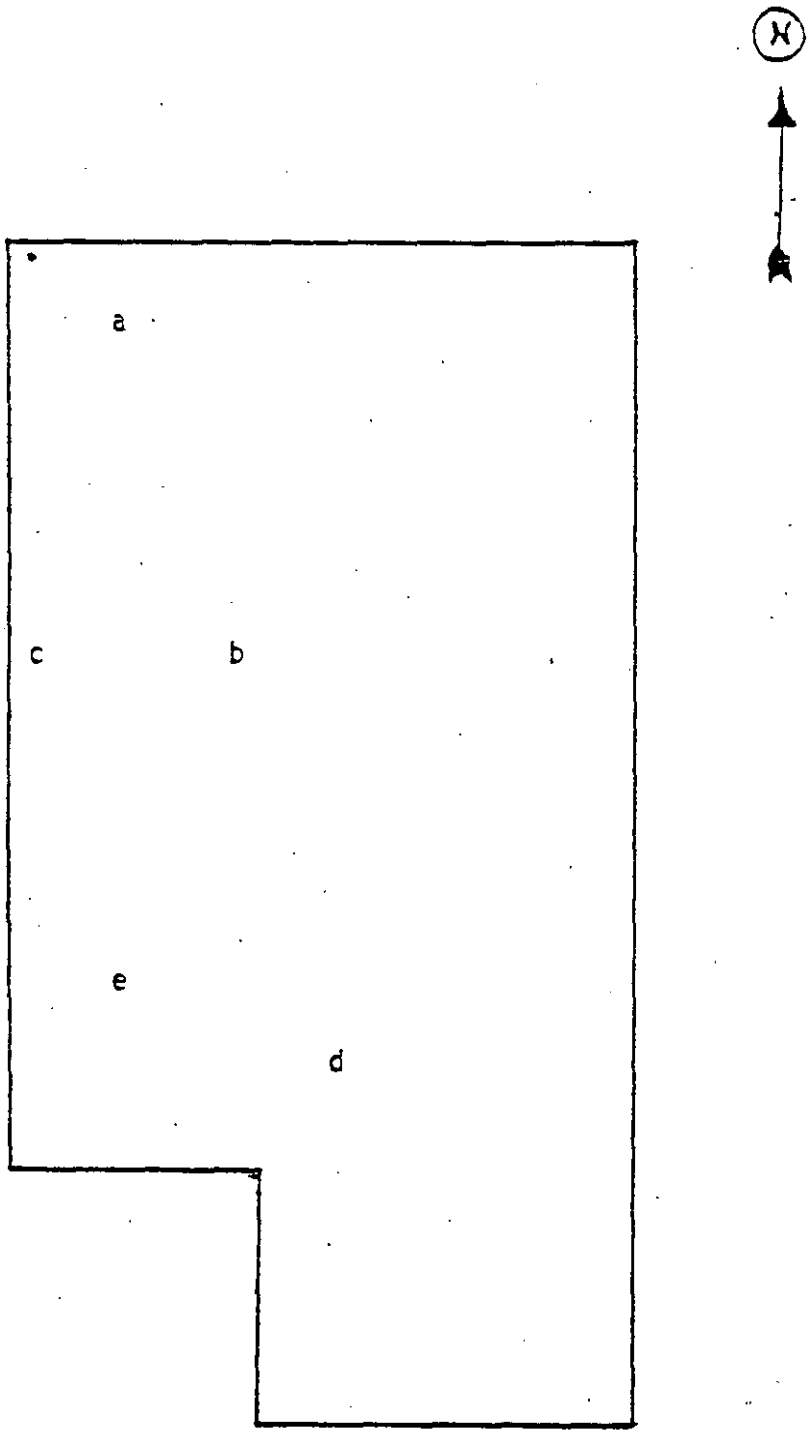

Fig. 4. Location of smear samples in Building 163 in the Technology Area of UCC-MD in Niagara Falls, NY.