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Formerly Utilized Sites Remedial Action Program (FUSRAP)
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POST-REMEDIAL ACTION REPORT FOR THE NIAGARA FALLS STORAGE SITE VICINITY PROPERTIES—1985 AND 1986

Lewiston, New York

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Bechtel National, Inc.

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POST-REMEDIAL ACTION REPORT FOR THE NIAGARA FALLS STORAGE SITE VICINITY PROPERTIES - 1985 AND 1986

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ABBREVIATIONS

cm*	centimeter
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
ft	foot
ft^2	square feet
g	gram
h	hour
in.	inch
m	meter
m^2	square meter
mi	mile
mrad/h	millirad per hour
mrem	millirem
mrem/yr	millirem per year
pCi	picocurie
pCi/g	picocurie per gram
uR/h	microroentgen per hour
WL	working level
yd^3	cubic yards
yr	year

*Words appearing in boldfaced print are explained in the glossary. Some words do not appear in boldfaced print in the text but are included in the glossary for additional explanation.

1.0 INTRODUCTION

The Niagara Falls Storage Site (NFSS) is a U.S. Department of Energy (DOE) facility. The site covers approximately 191 acres and is used for the storage of radioactive residues and contaminated soils and rubble. The site is located approximately 10 mi north of the City of Niagara Falls and lies within the Town of Lewiston, New York (Figure 1).

The NFSS is a remnant of the U.S. Army's original Lake Ontario Ordnance Works (LOOW), portions of which were used by the wartime Manhattan Engineer District (MED) for the storage and transshipment of radioactive materials. As a result of these operations, some portions of the former LOOW other than the present NFSS were also contaminated. In addition, some of the radioactive materials stored at the NFSS were subject to water and wind erosion over the years. As a result, radioactive materials migrated off-site, chiefly through on- and off-site drainage ditches. These radioactively contaminated areas located adjacent to or near the NFSS are referred to as "vicinity properties."

The contaminated materials in the off-site drainage ditches and on the vicinity properties are the responsibility of the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP is a DOE effort to identify, decontaminate, or otherwise control sites where low-activity radioactive contamination remains from the early days of the nation's atomic energy program. Administratively, the vicinity properties are under the jurisdiction of FUSRAP. DOE also has established the Surplus Facilities Management Program (SFMP) to manage and plan the ultimate disposition of DOE-owned facilities such as the NFSS.

Bechtel National, Inc. (BNI), in its capacity as DOE's Project Management Contractor for the NFSS, removed radioactively contaminated soil from the vicinity properties. This report documents BNI's post-remedial action sampling of the properties cleaned up in 1985 and 1986 and briefly describes the origin of the

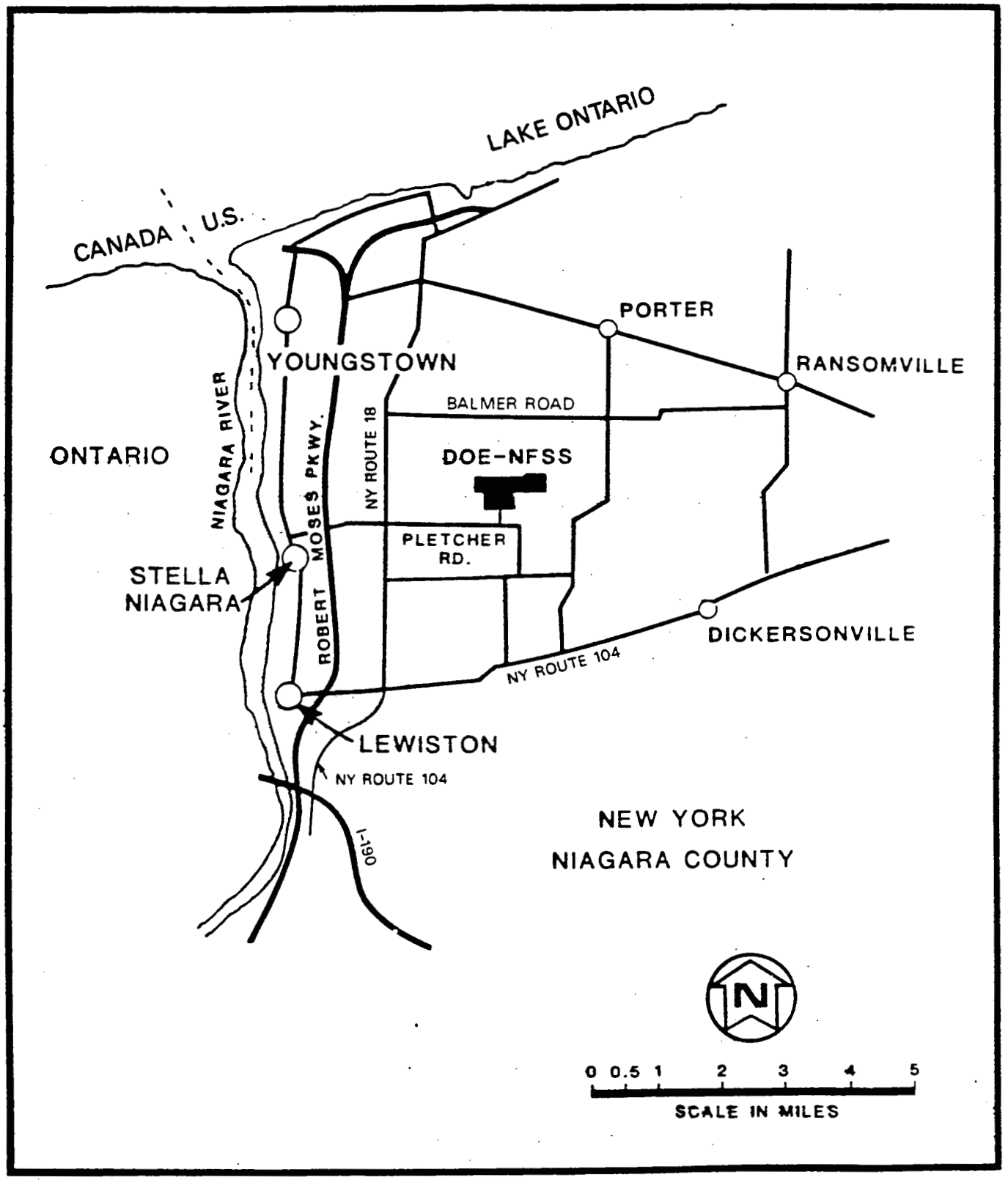

FIGURE 1 LOCATION OF THE NFSS

radioactive contamination on the properties, the methods used to determine the extent of contamination, and the types of remedial action performed. This report also provides the guidelines used in performing the remedial action and provides data on the current radiological status of the properties.

Background

The NFSS and adjacent vicinity properties were part of the U.S. Army's original 7,500-acre LOOW, which was constructed and used for TNT production early in World War II. When TNT production ceased, the LOOW was reassigned to the Army Corps of Engineers - MED.

From 1944 to 1947, the MED used the LOOW to store uranium ore processing residues from a ceramics plant operated by Linde Air Products in Tonawanda, New York. By 1948, 6,000 acres of the LOOW had been transferred or sold by the War Assets Administration, with ownership of the remaining 1,500 acres given to the newly formed Atomic Energy Commission (AEC). The AEC continued to use the 1,500-acre LOOW site to store additional residues from the Linde plant, as well as residues from the Mallinckrodt Chemical Works in St. Louis, Missouri.

In addition to storage of uranium ore processing residues, the LOOW was also used for interim storage of uranium metal billets (rods) manufactured at the Simonds Saw and Steel Company's plant in Lockport, New York, and as a disposal site for radioactive material wastes from the Knolls Atomic Power Laboratory in Schenectady, New York; the University of Rochester in Rochester, New York; and the MED-AEC's Middlesex Sampling Plant in Middlesex, New Jersey. Other probable sources of radioactive materials at the LOOW include the Harshaw Chemical Company in Cleveland, Ohio; Electromet in Niagara Falls, New York; Eldorado Mining and Refining, Ltd. in Port Hope, Ontario; Allegheny Ludlum Steel Company in Watervliet, New York; and Vitro Corporation of America in Grand Junction, Colorado.

On-site storage operations had ceased by 1953, and an on-site steam plant was modified to separate nonradioactive isotopes of boron.

The plant was in operation between 1953 and 1959 and again between 1965 and 1971. During the first period, a major cleanup of the site included consolidating and removing surface debris and shipping most of these wastes to Oak Ridge, Tennessee. Radioactively contaminated soils and residues were left at the site. After 1971, more than 1,300 acres of the LOOW were transferred or sold to private concerns, leaving 191 acres as the current NFSS (Figure 2). Responsibility for the NFSS was transferred from the AEC to the Energy Research and Development Administration, and then to DOE. In 1981, DOE chose BNI as the Project Management Contractor for the NFSS project. Since then, BNI has been custodian of the NFSS, with responsibility for conducting remedial action at the site and at the off-site or vicinity properties.

Radiological Surveys

During October 1970 and June 1971, radiological surveys of the approximately 1300 acres formerly held by the AEC indicated that about 6.5 acres exceeded the AEC exposure criterion of 50 uR/h. As a result of this survey, 15,000 to 20,000 yd^3 of contaminated soil and debris were removed and transported to the NFSS during 1972.

In 1971, an aerial survey of the greater Niagara Falls area was conducted by EG&G (Ref. 1). This survey identified several areas of elevated gamma radiation levels. Most of these areas were later shown to contain a slag-type material similar to wollastonite ($CaSiO_3$). This material was reported to be of natural origin, probably the by-product of a local phosphorous extraction process. Other areas identified as contaminated were locations of known contamination such as the Linde Plant and the NFSS.

In 1979 and 1980, Battelle Columbus Laboratories conducted a comprehensive radiological characterization of the NFSS, including the West Drainage Ditch and Central Drainage Ditch on- and off-site

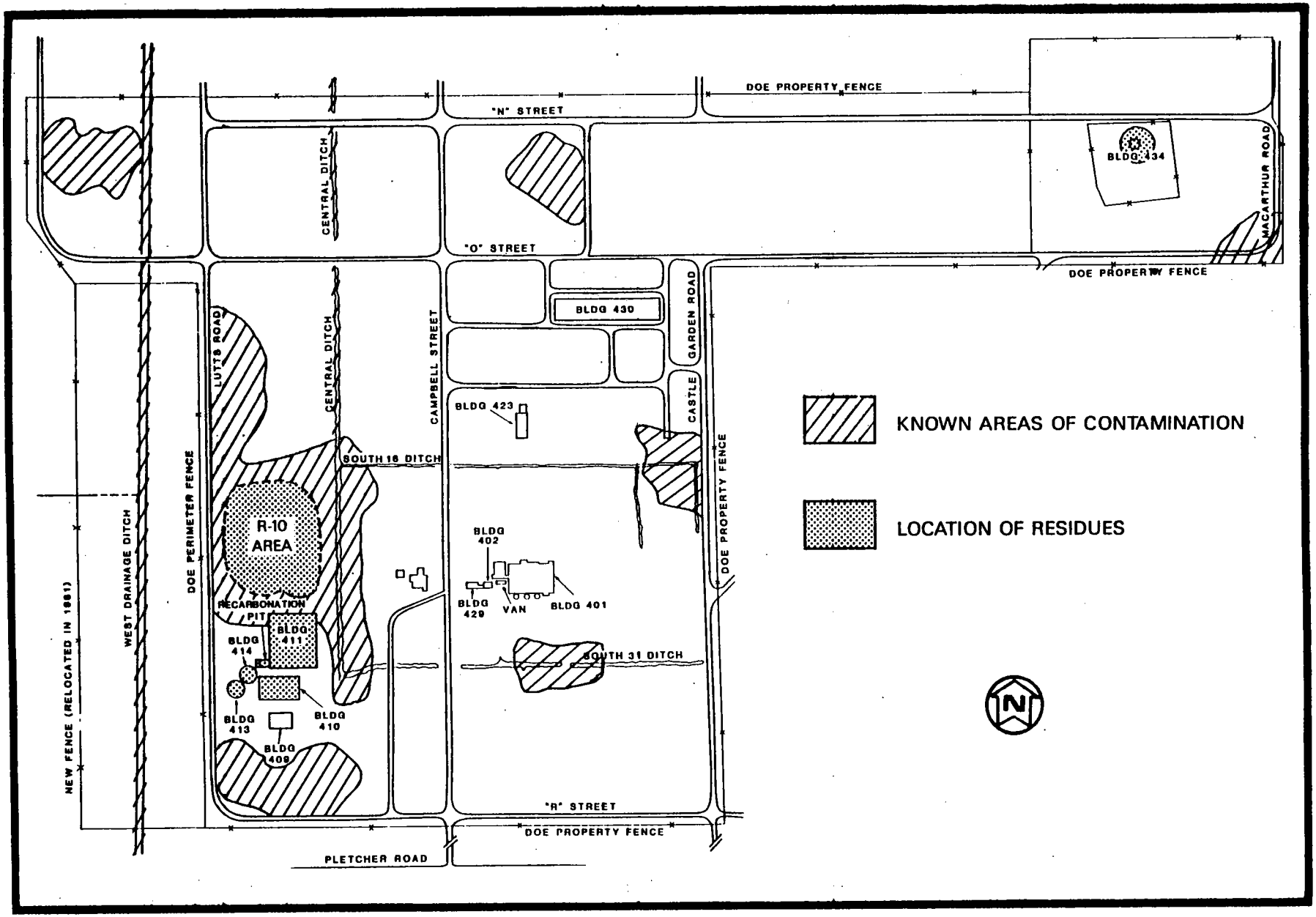

FIGURE 2 CURRENT BOUNDARIES OF THE NFSS AND LOCATIONS OF CONTAMINATION IN 1981

(Ref. 2). This survey identified contamination in excess of the DOE guidelines along the entire length of the West Drainage Ditch and most of the Central Drainage Ditch.

From 1981 to 1985, Oak Ridge Associated Universities (ORAU) and Oak Ridge National Laboratory (ORNL) performed radiological surveys of the approximately 1,300 acres, formerly a part of the AEC's LOOW, that lie outside of the current NFSS (Refs. 3-31). This area has been subdivided into letter-designated vicinity properties, as shown in Figure 3.

Twenty-four of these properties were surveyed by ORAU. Part of Property N/N' North, owned by Modern Landfill, Inc., and Property O, which was inaccessible until 1985 because of delays in obtaining an access permit, were surveyed by ORNL. Of the 25 properties, 21 were found to be contaminated in excess of DOE guidelines, 2 were found to be free of significant contamination, and 2 were too close to a uranium ore residue storage area to allow accurate measurement of the low-level radiation. Following removal of residues from the storage area, the two properties were surveyed and cleaned. In addition to these properties, the section of Pletcher Road between the entrance to the NFSS and Creek Road was decontaminated in 1985 based on results of an ORAU survey (Ref. 32).

Three more properties, one each in the City of Niagara Falls and the Towns of Niagara Falls and Lewiston, were designated for remedial action in late 1985 based on results from an ORNL scanning van survey (Ref. 33). These three properties are referred to in this report as Anomalies AA, BB, and CC and are shown in Figure 4.

2.0 REMEDIAL ACTION GUIDELINES

All soil contains trace amounts of uranium and thorium because these are naturally occurring elements. Typically, soils in the northeastern U.S. contain about 1 pCi/g each of uranium, radium, and thorium. These radionuclide concentrations are called background

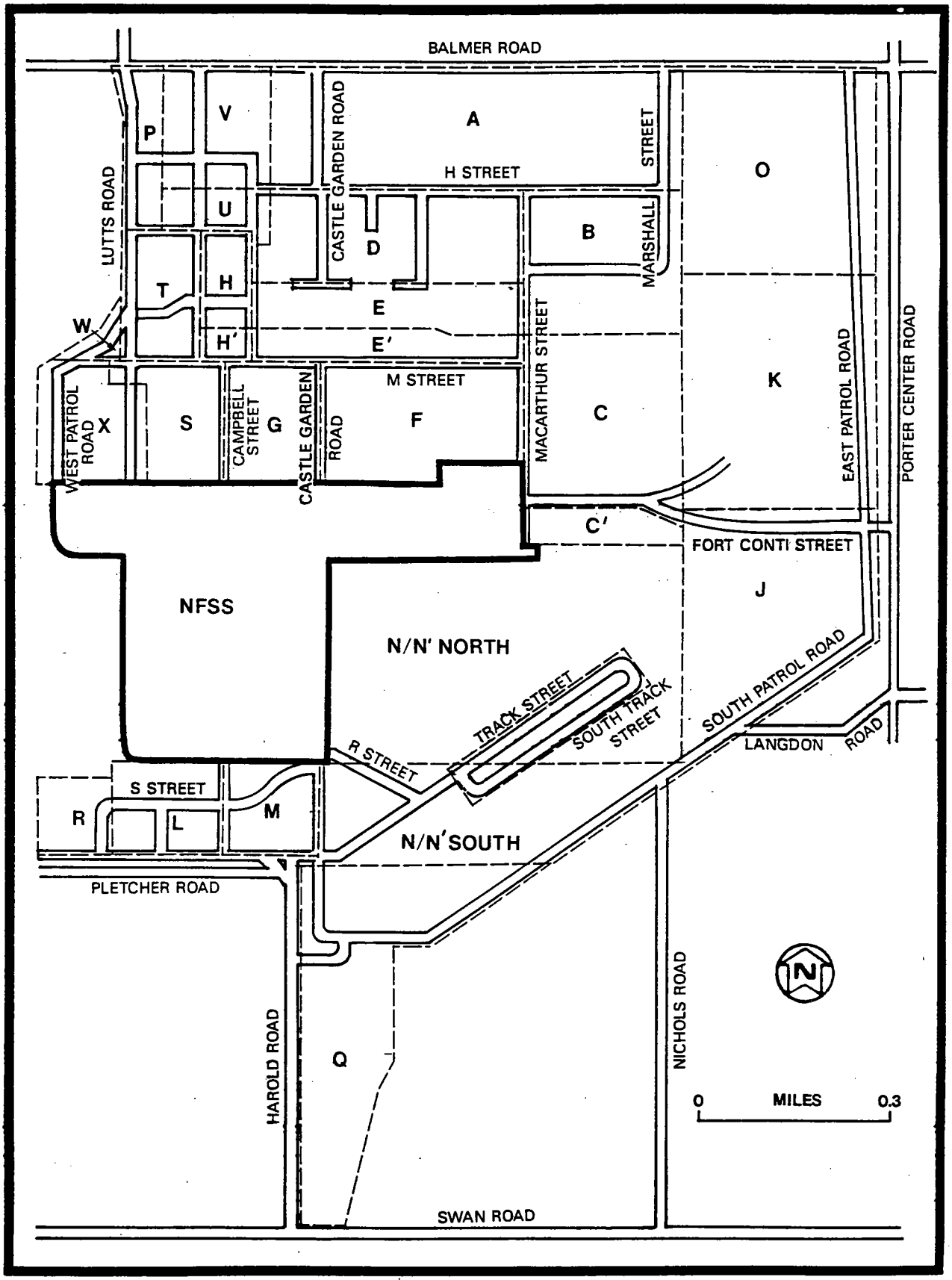

FIGURE 3 LETTER-DESIGNATED VICINITY PROPERTIES

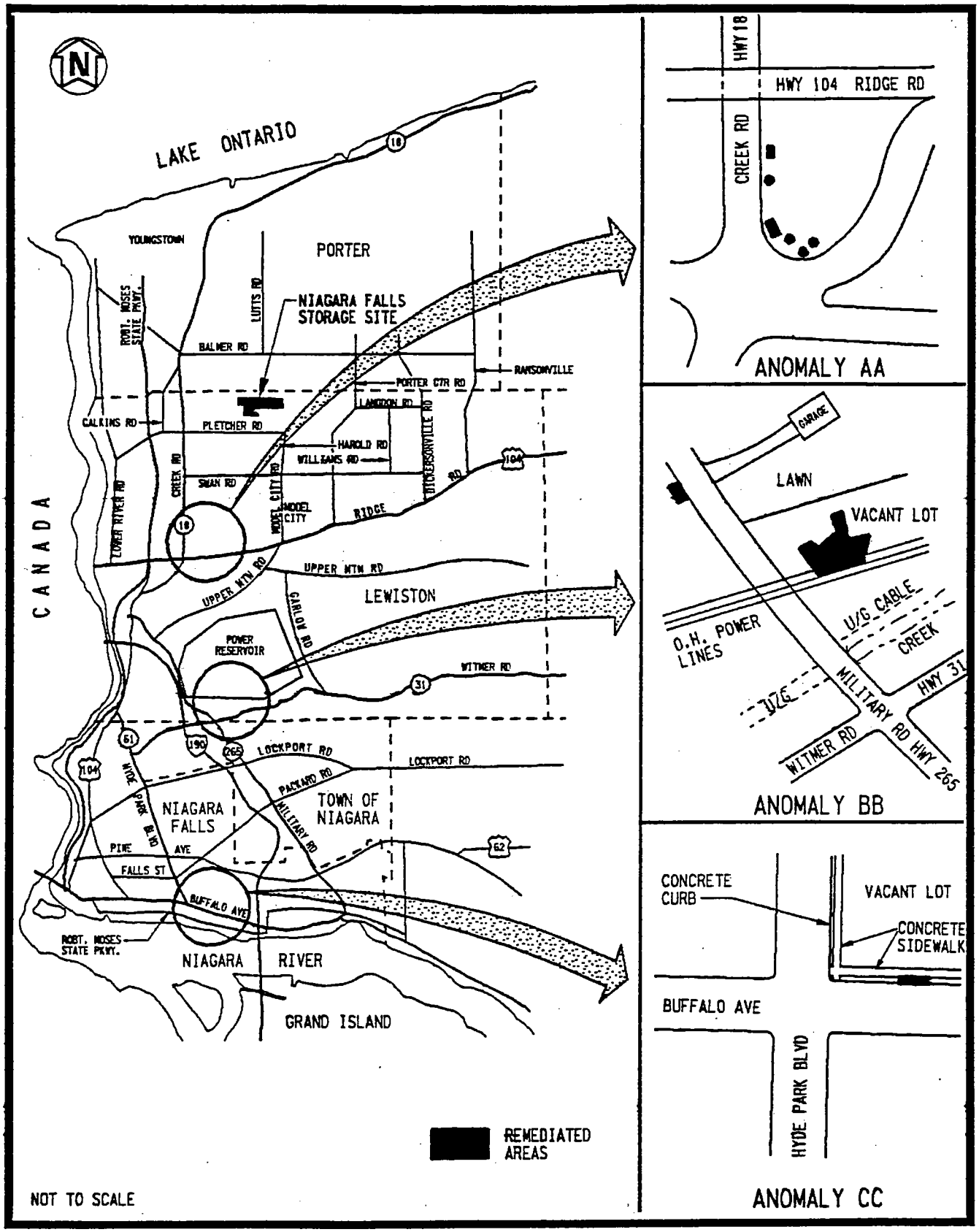

FIGURE 4 LOCATIONS OF ANOMALIES AA, BB, AND CC

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levels and do not originate from manufacturing operations using radioactive materials.

The DOE guideline for residual radioactivity from radium-226 (the principal contaminant at the NFSS), thorium-230, thorium-232, and radium-228 in soil is 5 pCi/g above background (see Table 1). The concentrations of these radionuclides are averaged over a 100-m^2 (1076-ft^2) area and to a depth of 15 cm (6 in.). Below the 15-cm (6-in.) depth, the guideline increases to 15 pCi/g above background for each successive 15-cm (6-in.) layer within the 100-m^2 (1076-ft^2) area (Ref. 34). For total uranium, the guideline was 90 pCi/g above background. For uranium-234, uranium-235, and uranium-238 (the isotopes comprising total uranium), the respective guidelines were 44 pCi/g, 2 pCi/g, and 44 pCi/g above background (Ref. 35).

Since the long-term land usage of Property B indicated that certain radiation exposure pathways were not realistic, pathways analyses were performed to develop specific guidelines for soils or structures on this property. The concentrations of radionuclides in the soils on Property B comply with the guidelines specified in Table 1. However, a warehouse contaminated with radium-226 and presently used for storing polychlorinated biphenyl (PCB) materials remains on the property. An analysis was performed to verify that the structure could be rubbled and buried in place without undesirable radiological effects.

3.0 REMEDIAL ACTION

A property was "designated" for remedial action if the results of the ORAU/ORNL survey showed that it was contaminated in excess of the DOE guidelines presented in Table 1. After a property was designated, BNI began engineering design work and activities to hire local subcontractors to perform the cleanup work (Refs. 36 and 37). Engineering drawings were prepared using the results from the ORAU/ORNL surveys to indicate the location(s) of the contamination on a given property. BNI's radiological support subcontractor,

TABLE 1.

SUMMARY OF RESIDUAL CONTAMINATION GUIDELINES FOR THE NFSS VICINITY PROPERTIES

BASIC DOSE LIMITS

The basic limit for the annual radiation dose received by an individual member of the general public is 100 mrem/yr.

SOIL (LAND) GUIDELINES (MAXIMUM LIMITS)

Radionuclide	Soil Concentration (pCi/g) above background[a,b,c]
Radium-226 Radium-228 Thorium-230 Thorium-232	5 pCi/g, averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer.
Total Uranium	90 pCi/g[d]
Other radionuclides	Soil guidelines will be calculated on a site-specific basis using the DOE manual developed for this use.

STRUCTURE GUIDELINES (MAXIMUM LIMITS)

Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that has no radiological restrictions on its use; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR 192) is: In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL.[e] In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions are not required in order to comply with this guideline when there is reasonable assurance that residual radioactive materials are not the cause.

External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site that has no radiological restrictions on its use shall not exceed the background level by more than 20 μR/h.

Indoor/Outdoor Structure Surface Contamination

	Allowable Surface Residual Contamination[f] (dpm/100 cm^2)		
Radionuclide[g]	Average[h,i]	Maximum[i,j]	Removable[i,k]
Transuranics, radium-26, radium-28, Th-230, Th-228 Pa-231, Ac-227, I-125, I-129	100	300	20
Th-Natural, Th-232, Sr-90, radium-23, radium-24 U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 α	1,000 α

TABLE 1 (Continued)

Indoor/Outdoor Structure Surface Contamination (continued)

Radionuclide[g]	Allowable Surface Residual Contamination[f] (dpm/100 cm^2) Average[h,i]	Maximum[i,j]	Removable[i,k]
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 β-γ	15,000 β-γ	1,000 β-γ

[a]These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If either thorium-230 and radium-226 or thorium-232 and radium-228 are both present, not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that the dose for the mixtures will not exceed the basic dose limit.

[b]These guidelines represent unrestricted-use residual concentrations above background averaged across any 15-cm-thick layer to any depth and over any contiguous 100-m^2 surface area.

[c]Localized concentrations in excess of these limits are allowable provided that the average concentration over a 100-m^2 area does not exceed these limits.

[d]Assumes 44 pCi/g uranium-234, 44 pCi/g uranium-238, and 2 pCi/g uranium-235. See Reference 35.

[e]A working level (WL) is any combination of short-lived radon decay products in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha energy.

[f]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[g]Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[h]Measurements of average contamination should not be averaged over more than 1 m^2. For objects of less surface area, the average shall be derived for each such object.

[i]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

[j]The maximum contamination level applies to an area of not more than 100 cm^2.

[k]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. The numbers in this column are maximum amounts.

Thermo Analytical/Eberline (TMA/E), resurveyed the contaminated area to define the boundaries of the contamination. The contaminated area was then marked for the excavation subcontractor.

The excavation subcontractor removed the contaminated soil from the area(s) as shown on the engineering drawings. The soil was loaded into watertight trucks to prevent the spread of contamination to work areas and haul routes and was transported to the waste containment area at the NFSS. During excavation, the subcontractor was required to keep all work areas free from airborne dust. This was accomplished by spraying contaminated areas with water.

Personnel trained in radiation protection observed all operations to ensure that established safety procedures were followed. Haul trucks were surveyed for radioactive contamination before leaving the loading area. If found, contamination was removed before the truck was allowed to leave the loading area.

The remedial action performed in 1985 and 1986 consisted of excavating contaminated soils and rubble; each property was restored after the excavation was complete, i.e., excavated soil was replaced with clean fill material and the land returned to its original condition. Similar remedial action was performed on several other vicinity properties in 1983-84 (Ref. 38).

4.0 POST-REMEDIAL ACTION SAMPLING

After the contaminated soil was removed, another radiological survey was conducted to ensure that radiological conditions at each excavated area complied with remedial action guidelines before the area was backfilled. Three techniques were used for this survey:

- First, a near-surface scan of the entire area was performed with a gamma radiation detector to ensure that no significant areas of contamination were left after excavation. This process was repeated until the average concentrations were below the applicable DOE guideline values.

- Second, a sampling/measurement grid was established within each area excavated. Typically, grid intersections were spaced 3 m (10 ft) apart. Soil samples were obtained from alternate grid intersections [i.e., 6 m (20 ft) apart] and analyzed by the TMA/E laboratory for uranium, radium, and thorium using gamma spectrometry. The results of these analyses were used to demonstrate that remaining contamination, if any, averaged less than the DOE guidelines.

- Third, a directionalized (downward-looking only) radiation detector was used to obtain the gamma count rate at each grid intersection point. These measurements were made at 30 cm (12 in.) above the ground surface. By calibrating gamma count rate measurements with the results from laboratory analyses of soil samples, surface measurements provided a reliable estimate of radionuclide concentrations of the excavated areas.

Figures 5 through 51 show the vicinity properties that were cleaned and restored during the 1985 and 1986 work seasons. The locations shown in these figures indicate where the post-remedial action soil samples were collected and correspond to the grid coordinates given in Tables 2 through 15.

5.0 POST-REMEDIAL ACTION STATUS

Analysis results for the samples collected following removal of contaminated soils are presented in Tables 2 through 15. Unless specifically noted, background has not been subtracted from any of the listed data. Use of the "less than" (<) notation in reporting results indicates that the radionuclide was not present in concentrations that are quantitative with the instruments and techniques used. The "less than" value represents the lower bound of the quantitative capacity of the instrument and technique used and is based on various factors, including the volume, size, and weight of the sample; the type of detector used; the counting time, and the background count rate. The actual concentration of the radionuclide is less than the value indicated. In addition, since radioactive decay is a random process, a correlation between the rate of disintegration and a given radionuclide concentration cannot be precisely established. For this reason, the exact concentration of the radionuclide cannot be determined. As such, each value that

can be quantitatively determined has an associated uncertainty term (±), which represents the amount by which the actual concentration can be expected to differ from the value given in the table. The uncertainty term has an associated confidence level of 95 percent.

An independent review of the remedial action performed by BNI will be conducted by the ORAU Radiological Site Assessment Program before the properties can be officially certified and released from the FUSRAP. However, the BNI data show that these properties now comply with DOE remedial action guidelines. Summaries of data collected on each property are provided below.

In addition to surveying each property to ensure that contaminated material had been removed, BNI surveyed all haul roads after remedial action was complete to verify that no cross-contamination had occurred.

Property B

Seven small areas on Property B were decontaminated and backfilled (see Figures 5 through 7). Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas (see Figure 6). These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g.

Results of soil sample analyses indicate that the remedial action guideline was met (Table 2). The average radium-226 concentration was 5.1 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 4.1 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

A warehouse on Property B is contaminated with radium-226 and PCBs. The building is being used to store PCB materials. In certain parts of the building, the levels of surface contamination exceed those permitted by the generic remedial action guidelines (see Table 1). Because of the toxicity problems presented by the presence of PCBs, the pathways analysis was performed to determine the appropriate remedial action response (Ref. 39).

The results of this analysis show that if the warehouse were to be demolished, the maximum concentration of radium-226 in the rubble would be 2.4 pCi/g. Actual concentrations, when averaged over 10-m by 10-m areas and a depth of 15 cm (6 in.), would be a fraction of this value. Demolition and burial of the warehouse at least 15 cm (6 in.) beneath the surface of the ground in an unrestricted burial area is therefore feasible from a radiological standpoint.

Property C'

Four small areas on Property C' were decontaminated (see Figures 8 and 9). These areas were not backfilled because they are in a wetlands area and were under water. Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figure 9. These samples were analyzed to verify that the concentration of radium-226 in surface soil was below the remedial action guideline of 5 pCi/g.

Results of soil sample analyses indicate that the remedial action guideline was met (Table 3). The average radium-226 concentration in the four areas was 1.9 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 0.9 pCi/g above background. This is well below the remedial action guideline of 5 pCi/g for radium-226 concentration in the top 15 cm (6 in.) of soil.

Although analysis results for two soil samples (E4723, N0169 and E4885, N0116) exceeded 5 pCi/g, a review of analysis results for soil and of near-surface gamma measurements obtained at locations contiguous with these two sampling locations indicated that the average concentrations per 100 m^2 were each less than 5 pCi/g. For the highest value (9.4 pCi/g at location E4885, N0116), the average concentration in the immediate area was 2.0 pCi/g. This value is the average of the values for three contiguous samples; background has been subtracted. Thus, the remedial action guideline for surface soil has been met throughout the decontaminated area.

Property D

Eight areas on Property D were decontaminated (see Figures 10 and 11). Data are presented in this report for six of the eight areas. Analysis results for soil from these six areas indicate that the remedial action guideline was met (Table 4). The average radium-226 concentration in the six areas was 2.3 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.3 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

The seventh area, centered at N3690, E1460 was part of a much larger area of contamination on Property U, which was decontaminated and backfilled as a part of remedial actions completed in 1984. The soil sample results for the small portion of the contamination that was on Property D were reported as part of the results for Property U in the Post-Remedial Action Report for the Niagara Falls Storage Site Vicinity Properties - 1983 and 1984 (Ref. 38).

The eighth area, located in an area bounded by N3083, N3132 and E1718, E1850, contained several 15- to 30-cm (6- to 12-in.) diameter pieces of a slag-like material with a uranium-to-radium ratio that was characteristic of MED/AEC materials. This material was removed by ORAU and BNI personnel during the verification survey. After the

slag-like material was removed, a near-surface gamma survey indicated that there was no contamination present.

Property E

During May and June 1983, ORAU conducted a radiological survey of Property E that identified one area of contamination in part of the berm surrounding Lagoon 6 and another smaller area of contamination in the north-central part of the property (Ref. 8). Lagoon 6, which is used to retain PCB-contaminated liquids, is part of a much larger, limited-access, hazardous chemical waste disposal facility.

As part of remedial action on the property in 1985, additional radiological surveys of the two contaminated areas were conducted by BNI (Ref. 40). These surveys included electromagnetometer measurements, gamma logging of boreholes, and surface radiation scans. Data from the 1983 and 1985 surveys indicated that contamination in the berm consists of small metal objects and plaster-like chips. According to ORAU, the chemical composition of these chips suggests that they may be lead cake residues (Ref. 8). Data from the ORAU survey indicated that, while there were small areas in which contamination exceeded the 5 pCi/g on the surface and 15 pCi/g subsurface, as specified by the generic remedial action guidelines, the average concentration of radium-226 in the area was less than either criterion (Ref. 8). Contamination levels measured in both the berm and the contaminated area in the north-central part of Property E during the 1985 survey complied with the generic guideline (see Table 1).

Since PCBs are stored in the lagoon, no survey was made of the soil beneath the lagoon. DOE has expressed its willingness to the owner of Property E to resurvey the area beneath Lagoon 6 after the lagoon is decommissioned. It is not possible to state categorically that contamination does or does not exist in that area. However, the probability that the concentration of radioactive contamination beneath the lagoon is greater than the levels permitted by the generic remedial action guidelines (Ref. 34) is small. This

evaluation is based on the type of radioactively contaminated material found in the berm and the fact that the berm was constructed by excavating material from the area now filled by the lagoon. Contaminated soil or rubble that might originally have been present within the bermed area should now be in the berm itself.

Since the survey data collected by ORAU and BNI did not reveal the presence of contamination in excess of the generic guidelines, remedial action was not performed on the berm around Lagoon 6 and the other small area in the northern part of the property. All contamination noted during the ORAU and BNI surveys was in the form of small pieces of metal or plaster-like chips buried more than 15 cm (6 in.) beneath the ground surface. No subsurface concentrations of radium-226 in excess of 15 pCi/g when averaged over a 100-m^2 area were measured.

Property E'

Sixteen areas on Property E' were decontaminated and backfilled (see Figures 12 through 16). Property E' is part of a much larger, limited-access, hazardous chemical waste disposal facility. Since several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figures 13 through 16. These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g.

Results of soil sample analyses indicate that the remedial action guideline was met (Table 5). The average radium-226 concentration was 2.3 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.3 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Two additional areas of the property, shown in Figure 15, were not accessible for remedial action. One of these areas was beneath two PCB storage tanks and the other was beneath a road. The contamination remaining in these areas is present in a 0.3-m-thick (1-ft-thick) layer, approximately 0.6 m (2 ft) beneath the ground surface. It is in the form of small white chips, the chemical composition of which suggests that they may be lead cake residues (Ref. 9). Although the concentrations of radium-226 in these small chips are above 15 pCi/g, the average concentrations for contiguous areas of 100 m^2 are below 15 pCi/g (Ref. 9).

Remedial actions were conducted in the vicinity of these two areas to remove as much of the contamination as possible in an effort to reduce radiation levels to as low as reasonably achievable (ALARA). Since the average concentrations of radium-226 for contiguous areas of 100 m^2 are below 15 pCi/g, the decision was made to leave the residual contamination remaining under the PCB tanks and the roadway in place. No undesirable effects on the health and safety of workers in the area will occur as a result of these materials.

Property F

One small area on Property F was decontaminated and backfilled (see Figures 17 and 18). Results of soil sample analyses indicate that the remedial action guideline was met (Table 6). The radium-226 concentration was 0.8 pCi/g; thus, the concentration was below background levels.

Property G

Forty-five areas on Property G were decontaminated and backfilled (see Figures 19 through 24). Because external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figures 20 through 24.

These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g. Results of soil sample analyses indicate that the remedial action guideline was met (Table 7). The average radium-226 concentration was 2.1 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.1 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Uranium-238 concentrations exceeded 44 pCi/g in two samples (E1377, N0973 and E1290, N1300). A review of analysis results for soil samples obtained at locations contiguous to location E1290, N1300 indicated that the average concentration (with background subtracted) was 30 pCi/g, which is within the remedial action guideline for uranium-238 in soil (see Table 1). No sample was collected from the area contiguous to location E1377, N0973; therefore, no average value could be obtained. However, near-surface gamma measurements in this contiguous area and the as-built drawing were reviewed. The review of these sources demonstrated that the area contiguous to location E1377, N0973 was approximately 24 m^2; thus, the "hot spot" criteria may be applied. The hot spot criterion is determined by multiplying the remedial action guideline for the respective radionuclide by a factor of $(100/A)^{1/2}$, where A is the area of the hot spot. Using this formula, a value of 90 pCi/g is obtained for the uranium-238. Therefore, the uranium-238 concentration at location E1377, NO973 meets the hot spot criterion.

All of Property G was cleaned up in 1986, except for one small area containing several buried drums. One drum was removed in 1986 and its contents analyzed. The analysis showed the presence of numerous organic compounds. These compounds are common constituents of coal tars and coal tar derivatives. The drum also was found to be radioactively contaminated. It was postulated that the drums were originally used to store K-65 residues (one drum was marked K-65) and that there is residual contamination because it was not possible

to remove all of the K-65 residues. In 1987, the area of the drums was excavated. Thirty-one additional drums were removed and placed in over-packs. Ninety drums of soil contaminated with the material from the original drums were also removed.

Property N/N' North

Property N/N' North is owned by Modern Landfill, Inc., which requested in 1980 that DOE remove restrictions on a 19-acre parcel of the property so that it could be developed as a sanitary landfill. The parcel is a triangular area bounded by Vine and "O" Streets and Castle Garden Road. DOE entered into an agreement with Modern Landfill, Inc., to perform the remedial action and certify that the subject property is in compliance with applicable radiological criteria and guidelines. BNI conducted the remedial action in June 1981 and surveyed an additional 15.8 acres of the property in November of that year (Ref. 41). In 1982, a post-remedial action report was issued by ORAU (Ref. 42), and the 34.8-acre parcel was certified by DOE that use of the subject property will not result in any measurable radiological hazard to the general public derived from the activities of DOE's predecessor agencies.

The remainder of Property N/N' North was decontaminated during the 1985 and 1986 work seasons. Twenty-three areas were decontaminated and backfilled (see Figures 25 through 29). Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figures 26 and 28. These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g.

Results of soil sample analyses indicate that the remedial action guideline was met (Table 8). The average radium-226 concentration was 1.8 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 0.8 pCi/g above background.

Although results from one soil sample (at E4900, S1580) exceeded 15 pCi/g, a review of the soil samples and near-surface gamma measurements at locations contiguous with this location indicated that the average concentration per 100 m^2 was 6.6 pCi/g. This value is the average of three contiguous samples; background has been subtracted. Thus, the remedial action guideline for radium-226 in subsurface soil has been met in all decontaminated areas.

The concentration of uranium-238 exceeded 44 pCi/g in only one sample (at E4970, S1570). A review of analysis results for soil samples taken at locations contiguous with E4970, S1570 indicated that the average concentration (with background subtracted) was 64 pCi/g, which still exceeds the remedial action guideline. However, near-surface gamma measurements and the as-built drawing of the contiguous areas were both reviewed. The review of these sources demonstrated that the area contiguous to location E4970, S1750 was approximately 21 m^2; thus, the "hot spot" criteria may be applied. Again, the hot spot criterion is determined by multiplying the respective remedial action guideline by a factor of $(100/A)^{1/2}$, where A is the area of the hot spot. Location E4970, S1570 meets the 96-pCi/g hot spot criterion thus calculated.

Property P

One small area on Property P was decontaminated and backfilled (see Figures 30 and 31). Results of soil sample analysis indicate that the remedial action guideline was met (Table 9). The radium-226 concentration was 0.8 pCi/g; thus, the concentration was within the range of background levels.

Property T

Thirty-seven small areas on Property T were decontaminated and backfilled (see Figures 32 through 36). Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several

samples were taken in unexcavated areas, as shown in Figures 33 and 34. These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g. Results of soil sample analyses indicate that the remedial action guideline was met (Table 10). The average radium-226 concentration was 2.5 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.5 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Property W

Two small areas on Property W were decontaminated and backfilled (see Figures 37 and 38). Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figure 38. These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action guideline of 5 pCi/g. Results of soil sample analyses indicate that the remedial action guideline was met (Table 11). The average radium-226 concentration was 2.5 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.5 pCi/g above background. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Pletcher Road

Twenty-six areas along Pletcher Road were decontaminated and backfilled (see Figures 39 through 48). Because several external radiation measurements taken near some of the excavations indicated that additional contamination might have been present, several samples were taken in unexcavated areas, as shown in Figures 42 and 43. These samples were analyzed to verify that the concentration of radium-226 in surface soil was lower than the remedial action

guideline of 5 pCi/g. Results of soil sample analyses indicate that the remedial action guideline was met (Table 12). The average radium-226 concentration was 5.2 pCi/g, including a background concentration of 1 pCi/g. Thus, average concentration was 4.2 pCi/g above background.

Although results from three soil samples (W3880, S3117; W5152, S3097; and W5192, S3097) exceeded 15 pCi/g, a review of the soil samples and near-surface gamma measurements at locations contiguous with these three locations indicated that the average concentrations per 100 m^2 were each less than 15 pCi/g. For the highest value (21.1 pCi/g at location W5152, S3097), the average concentration in the immediate area was 12.3 pCi/g. This value is the average of two contiguous samples; background has been subtracted. Thus, the remedial action guideline for subsurface soil has been met throughout the decontaminated area.

Anomaly AA

Five small areas known as Anomaly AA were decontaminated and backfilled (see Figure 49). Results of soil sample analyses indicate that the remedial action guideline was met (Table 13). The average radium-226 concentration was 6.4 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 5.4 pCi/g above background levels. This is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Results from only one sample, at location W055, S079, exceeded the remedial action guideline of 15 pCi/g. A review of the soil samples and near-surface gamma measurements at locations contiguous with this location indicated that the average concentration per 100 m^2 was less than 15 pCi/g. The average concentration in the immediate area was 13.5 pCi/g. This value is the average of the concentration at W055, S079 and the concentration at W047, S089; background has

been subtracted. Thus, the remedial action guideline for radium-226 has been met in all decontaminated areas.

Anomaly BB

Two small areas known as Anomaly BB were decontaminated and backfilled (see Figure 50). Results of soil sample analyses indicate that the remedial action guideline was met (Table 14). The average radium-226 concentration was 2.8 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 1.8 pCi/g above background, which is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

Anomaly CC

One small area known as Anomaly CC was decontaminated and backfilled (see Figure 51). Results of soil sample analyses indicate that the remedial action guideline was met (Table 15). The average radium-226 concentration was 3.3 pCi/g, including a background concentration of 1 pCi/g. Thus, the average concentration was 2.3 pCi/g above background, which is well below the remedial action guideline of 15 pCi/g for radium-226 concentrations in soil more than 15 cm (6 in.) beneath the ground surface.

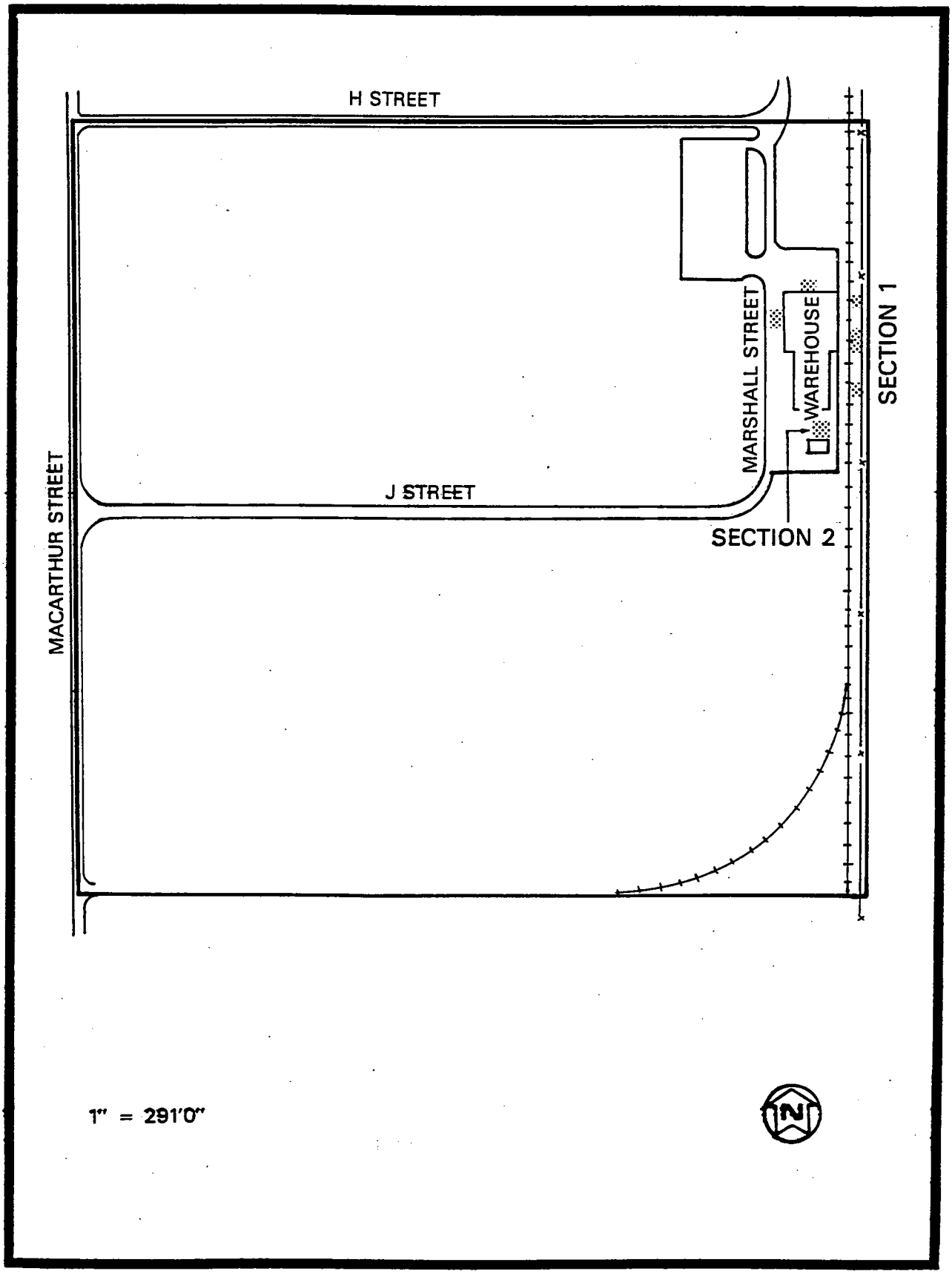

FIGURE 5 EXCAVATED AREAS ON PROPERTY B

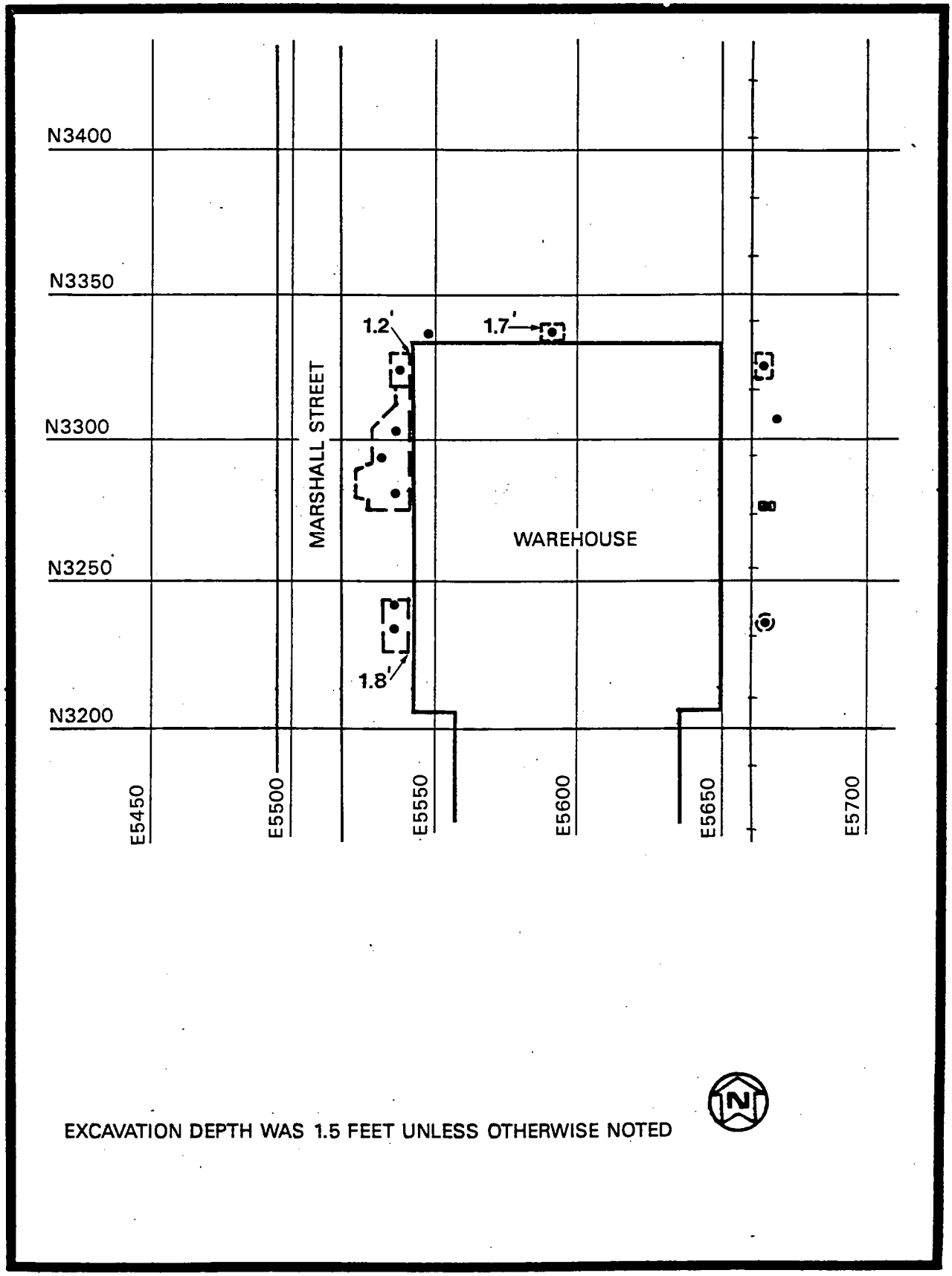

FIGURE 6 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY B - SECTION 1

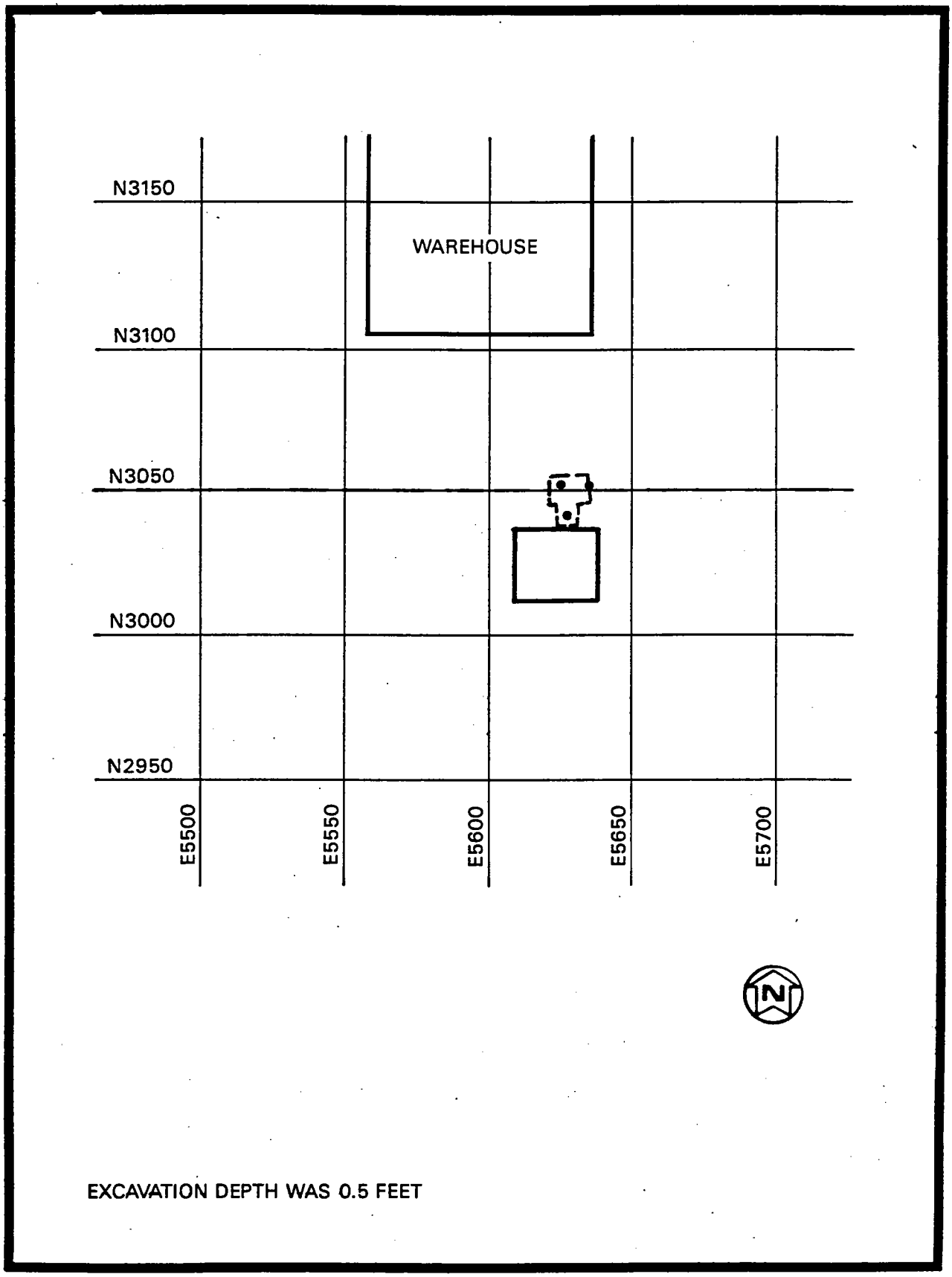

FIGURE 7 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY B - SECTION 2

TABLE 2

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY B

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E5527	N3293	A	2.0 ± 0.3	1.6 ± 0.5
E5531	N3233	A	1.1 ± 0.3	1.0 ± 0.4
E5537	N3243	A	0.9 ± 0.2	A
E5537	N3283	A	4.1 ± 0.4	2.0 ± 0.4
E5537	N3303	A	1.1 ± 0.3	1.0 ± 0.4
E5538	N3328	A	4.7 ± 0.4	A
E5548	N3339	A	1.6 ± 0.2	3.9 ± 0.2
E5591	N3338	A	2.9 ± 0.4	0.3 ± 0.4
E5624	N3052	A	13.1 ± 0.7	A
E5627	N3042	A	1.0 ± 0.3	1.2 ± 0.4
E5636	N3052	A	0.6 ± 0.2	0.6 ± 0.3
E5663	N3323	A	14.8 ± 1.0	4.3 ± 0.7
E5664	N3236	A	11.8 ± 0.8	2.4 ± 0.5
E5664	N3274	A	13.0 ± 1.1	2.2 ± 0.6
E5669	N3307	A	4.1 ± 0.3	0.4 ± 0.2

'A' denotes less than detectable activity.

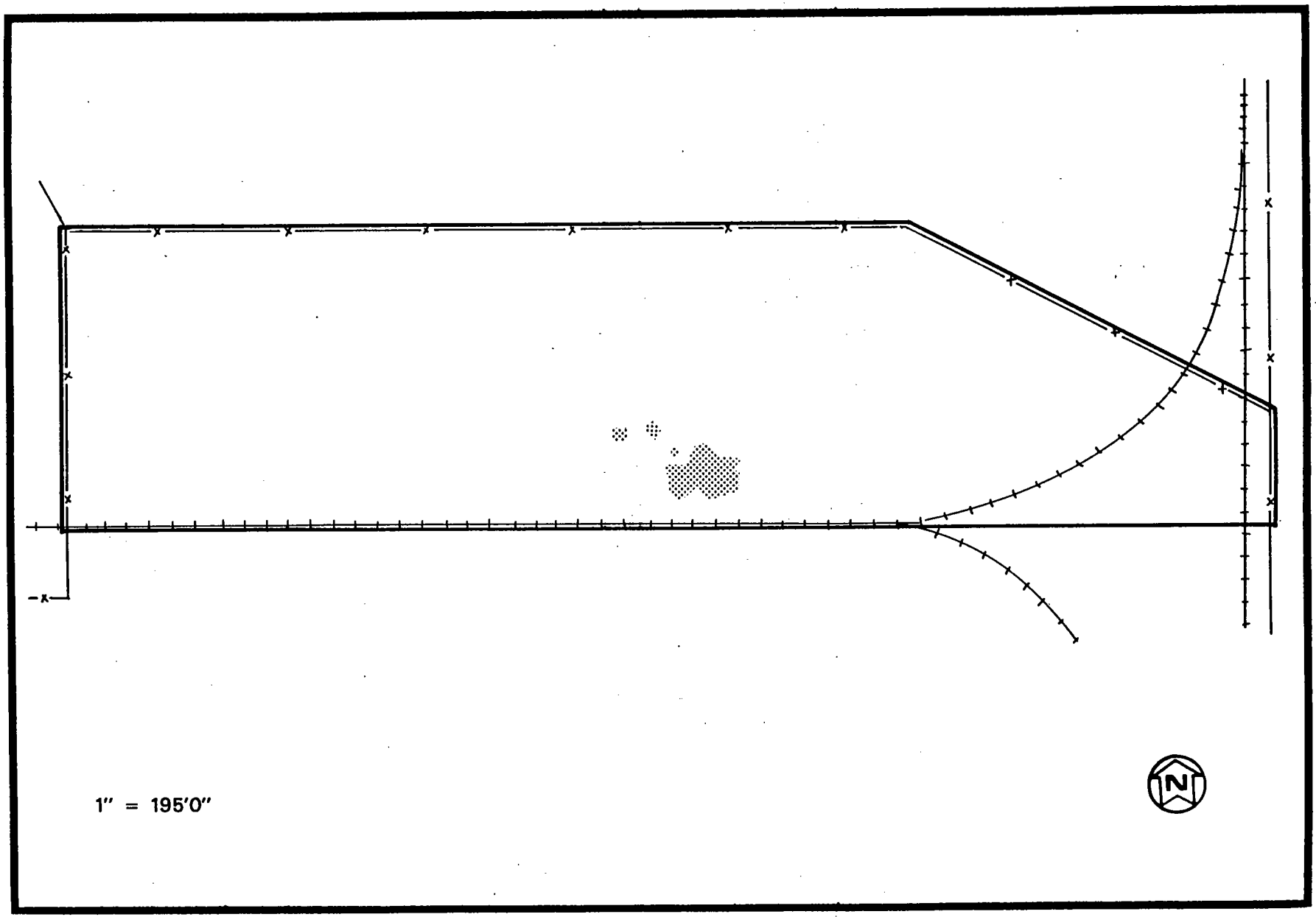

FIGURE 8 EXCAVATED AREAS ON PROPERTY C'

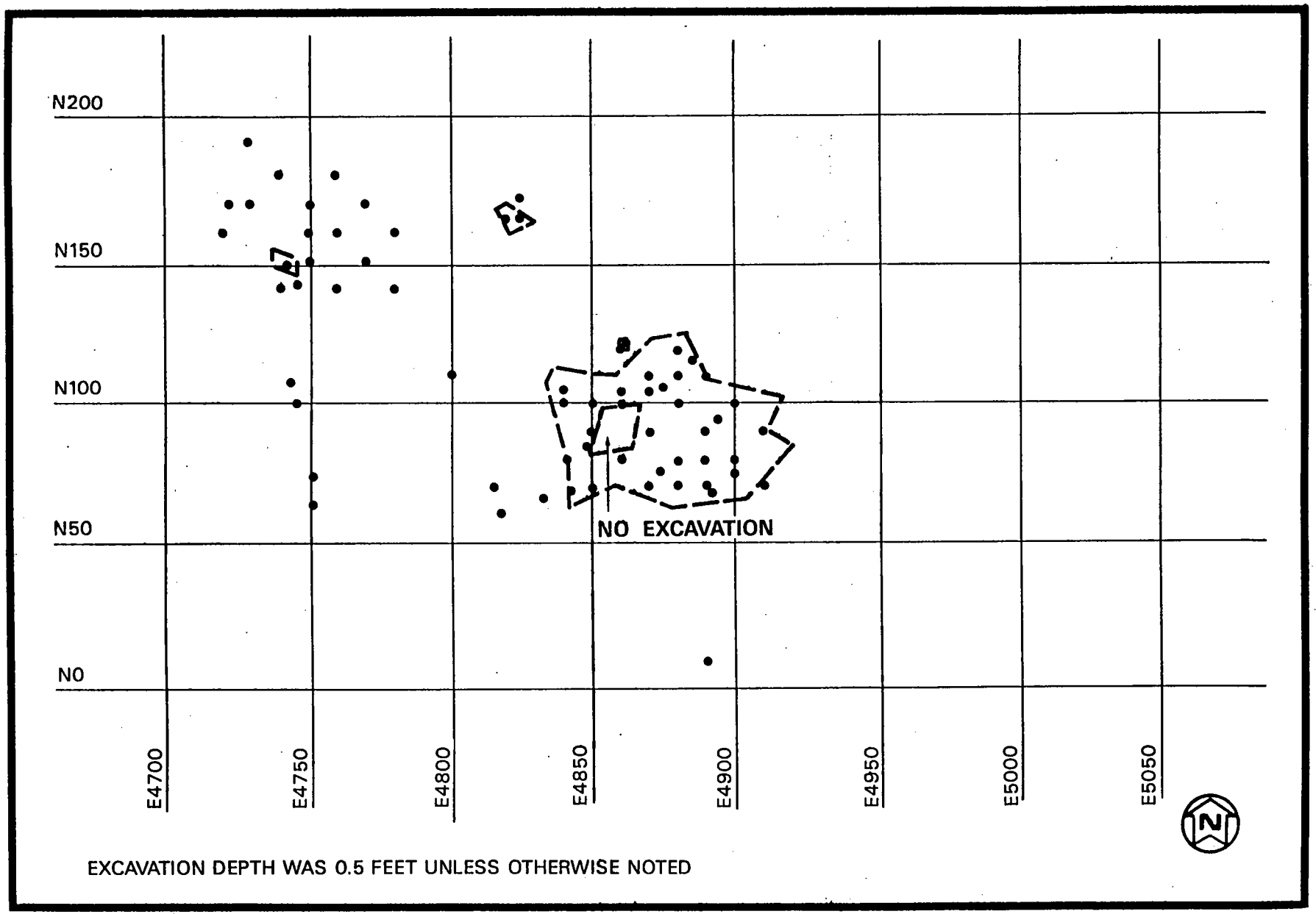

FIGURE 9 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY C'

TABLE 3

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY C'

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N;S	Uranium-238	Radium-226	Thorium-232
E4720	N0160	3.4 ± 2.6	1.8 ± 0.1	0.8 ± 0.2
E4723	N0169	12.6 ± 3.2	6.2 ± 2.5	2.2 ± 3.2
E4729	N0192	10.3 ± 2.5	2.9 ± 0.1	1.3 ± 0.2
E4730	N0170	A	2.1 ± 0.2	1.1 ± 0.2
E4740	N0142	8.9 ± 2.4	2.4 ± 0.2	0.8 ± 0.2
E4740	N0180	A	1.4 ± 0.1	1.1 ± 0.2
E4743	N0107	3.9 ± 1.7	2.9 ± 0.1	0.9 ± 0.2
E4746	N0100	2.3 ± 1.4	1.7 ± 1.1	0.8 ± 0.2
E4746	N0143	10.9 ± 3.0	5.9 ± 0.3	1.4 ± 0.3
E4746	N0150	A	0.6 ± 0.2	0.6 ± 0.3
E4750	N0150	A	0.9 ± 0.1	0.8 ± 0.2
E4750	N0160	7.4 ± 3.3	5.0 ± 0.2	1.4 ± 0.2
E4750	N0170	4.7 ± 2.1	1.3 ± 0.2	1.0 ± 0.2
E4752	N0064	A	1.2 ± 0.1	1.5 ± 0.2
E4752	N0074	9.7 ± 2.5	3.9 ± 0.2	2.0 ± 0.3
E4760	N0140	9.7 ± 2.9	4.3 ± 0.2	1.3 ± 0.2
E4760	N0160	22.0 ± 3.7	6.0 ± 0.3	1.3 ± 0.3
E4760	N0180	7.9 ± 2.7	2.8 ± 0.2	1.4 ± 0.2
E4770	N0150	18.3 ± 2.9	4.7 ± 0.2	1.6 ± 0.2
E4770	N0170	A	1.1 ± 0.1	1.1 ± 0.2
E4780	N0140	A	1.3 ± 0.1	0.9 ± 0.2
E4780	N0160	13.2 ± 2.7	2.2 ± 0.2	1.3 ± 0.2
E4800	N0110	11.0 ± 6.0	1.1 ± 0.4	1.0 ± 0.5
E4815	N0070	A	0.8 ± 0.2	0.4 ± 0.3
E4818	N0061	5.9 ± 2.0	3.4 ± 0.2	1.2 ± 0.2
E4820	N0165	14.0 ± 7.0	1.4 ± 0.5	1.4 ± 0.6
E4824	N0172	25.0 ± 3.1	3.0 ± 1.8	1.5 ± 0.2
E4825	N0165	A	0.7 ± 0.4	A
E4833	N0066	24.2 ± 3.4	4.8 ± 2.3	1.4 ± 0.2
E4840	N0080	A	1.3 ± 0.8	2.4 ± 1.5
E4840	N0100	A	0.8 ± 0.3	0.8 ± 0.4
E4840	N0105	3.7 ± 1.5	1.1 ± 0.1	1.4 ± 0.2
E4842	N0069	A	1.0 ± 0.1	0.9 ± 0.2
E4848	N0084	5.6 ± 2.0	1.0 ± 0.1	1.0 ± 0.2
E4850	N0070	A	0.6 ± 0.2	0.6 ± 0.3
E4850	N0090	A	0.7 ± 0.3	0.7 ± 0.4
E4850	N0100	A	0.7 ± 0.3	0.6 ± 0.4
E4860	N0080	A	1.9 ± 0.4	0.7 ± 0.5
E4860	N0100	A	0.8 ± 0.2	0.8 ± 0.3
E4860	N0105	A	0.8 ± 0.1	0.9 ± 0.2
E4860	N0118	A	0.7 ± 0.3	1.0 ± 0.5
E4861	N0120	A	0.9 ± 0.1	1.3 ± 0.2
E4870	N0070	A	1.5 ± 0.4	A

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E4870	N0090	A	2.6 ± 0.5	1.0 ± 0.5
E4870	N0105	2.7 ± 1.5	1.1 ± 0.1	1.4 ± 0.2
E4870	N0110	A	0.7 ± 0.5	0.8 ± 0.4
E4874	N0076	A	0.7 ± 0.2	0.7 ± 0.3
E4875	N0106	A	0.6 ± 0.3	0.7 ± 0.5
E4880	N0071	A	0.8 ± 0.3	0.7 ± 0.4
E4880	N0080	A	0.6 ± 0.3	0.5 ± 0.3
E4880	N0100	A	0.9 ± 0.3	0.8 ± 0.4
E4880	N0110	A	1.0 ± 0.1	1.2 ± 0.2
E4880	N0120	A	0.9 ± 0.4	0.6 ± 0.5
E4885	N0116	10.0 ± 8.0	9.4 ± 1.1	1.2 ± 0.7
E4890	N0010	A	0.7 ± 0.2	0.7 ± 0.3
E4890	N0070	A	1.2 ± 0.4	0.8 ± 0.5
E4890	N0080	A	1.2 ± 0.3	0.9 ± 0.4
E4890	N0090	A	0.8 ± 0.3	0.7 ± 0.4
E4890	N0110	A	0.7 ± 0.3	0.6 ± 0.3
E4891	N0068	A	1.1 ± 0.3	0.8 ± 0.4
E4894	N0094	3.2 ± 1.7	0.7 ± 0.1	1.0 ± 0.2
E4900	N0074	A	1.0 ± 0.4	1.2 ± 0.5
E4900	N0080	A	0.9 ± 0.3	0.9 ± 0.4
E4900	N0100	A	0.9 ± 0.3	0.8 ± 0.4
E4910	N0070	A	1.2 ± 0.3	1.2 ± 0.5
E4910	N0090	A	0.9 ± 0.3	0.9 ± 0.4

'A' denotes less than detectable activity.

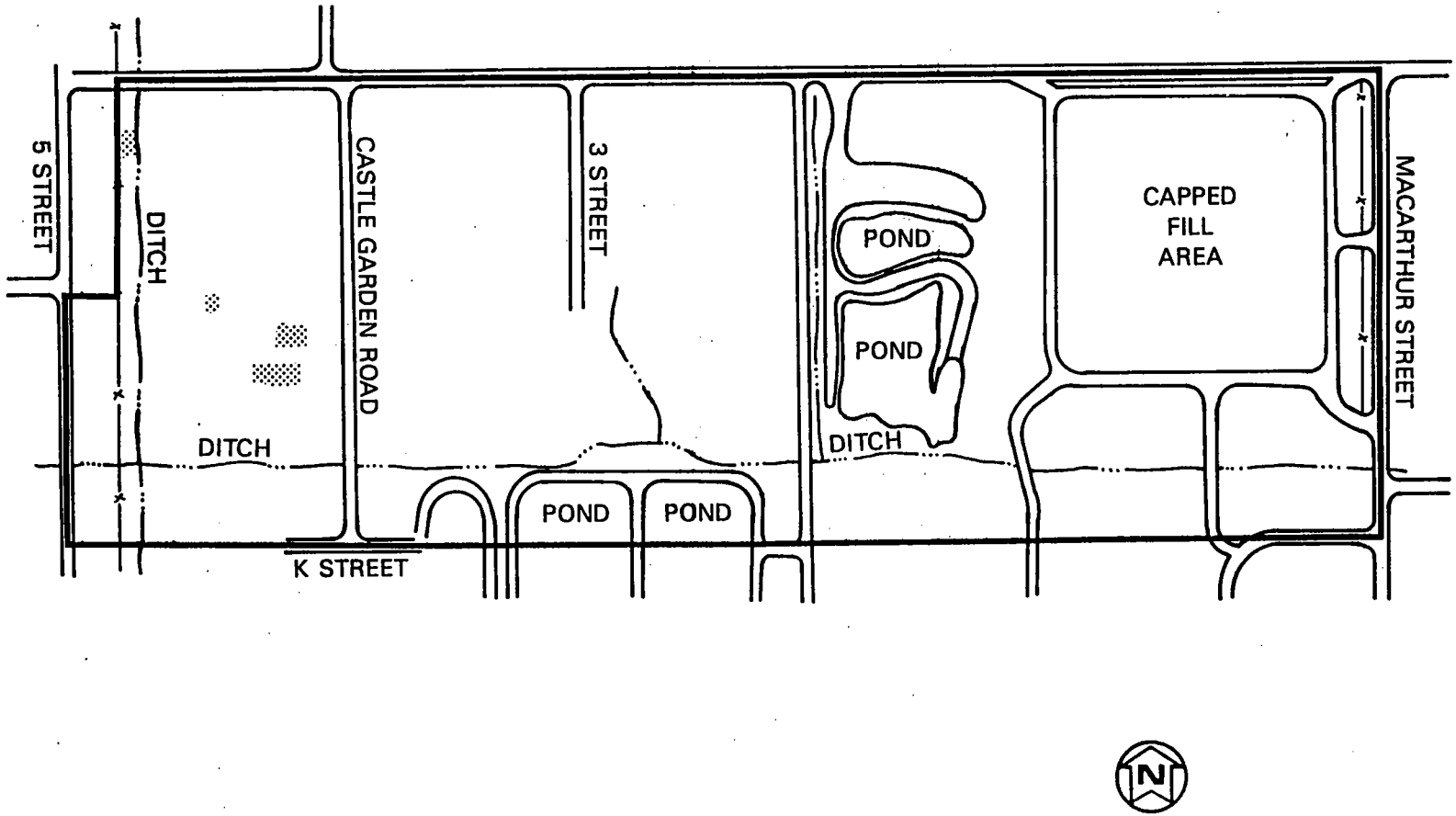

FIGURE 10 EXCAVATED AREAS ON PROPERTY D

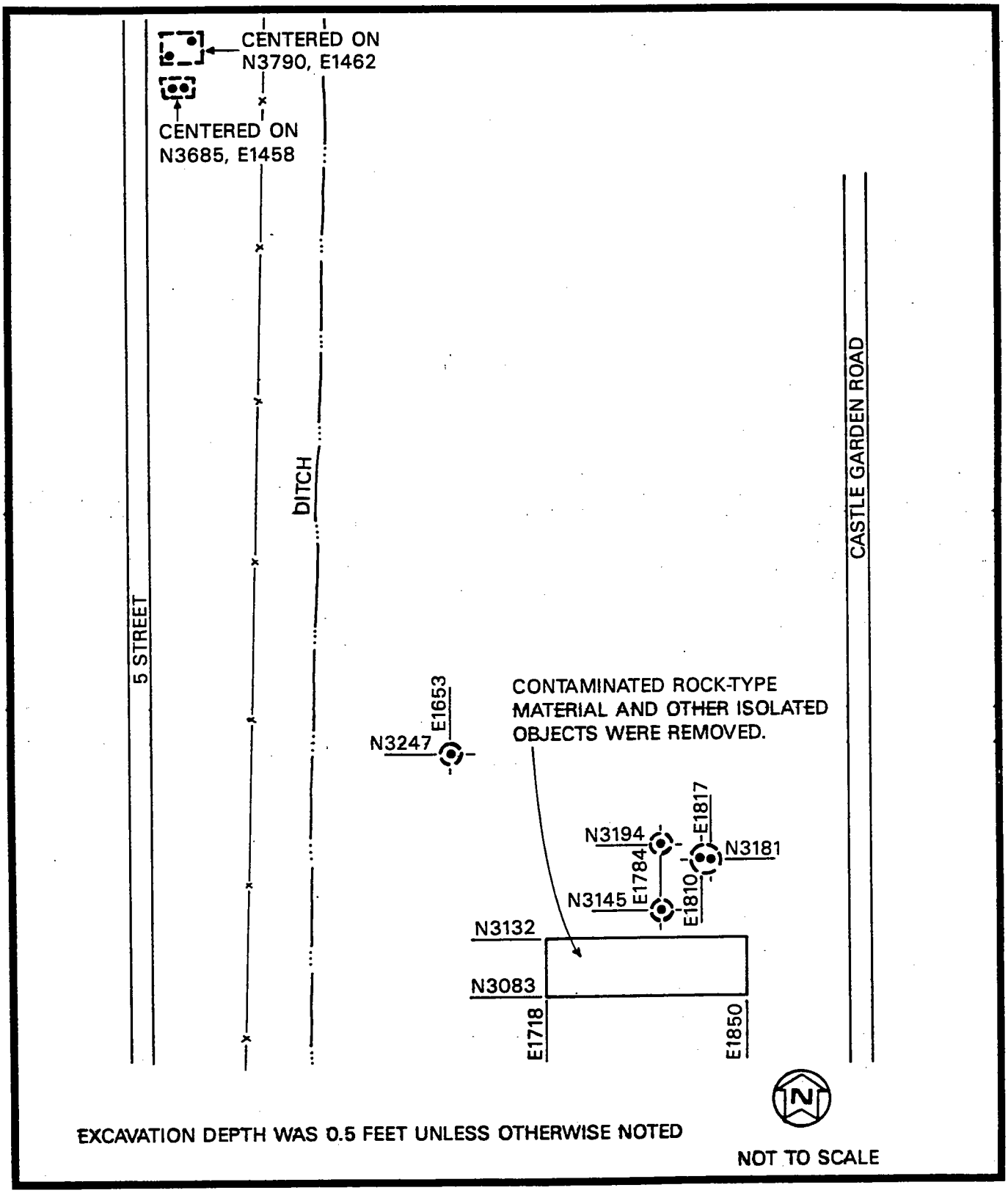

FIGURE 11 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY D

TABLE 4

POST-REMEDIAL ACTION SOIL SAMPLING RESULTS

FOR PROPERTY D

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E1455	N3685	A	1.3 ± 0.6	1.3 ± 0.6
E1460	N3700	A	1.6 ± 0.3	A
E1465	N3685	A	3.3 ± 0.4	1.7 ± 0.4
E1465	N3715	A	8.4 ± 0.7	4.7 ± 0.7
E1653	N3247	A	1.4 ± 0.2	0.9 ± 0.4
E1784	N3145	A	1.4 ± 0.3	A
E1784	N3194	A	1.6 ± 0.3	1.2 ± 0.8
E1810	N3181	A	1.4 ± 0.3	0.6 ± 0.2
E1817	N3181	A	0.7 ± 0.2	0.5 ± 0.3

'A' denotes less than detectable activity.

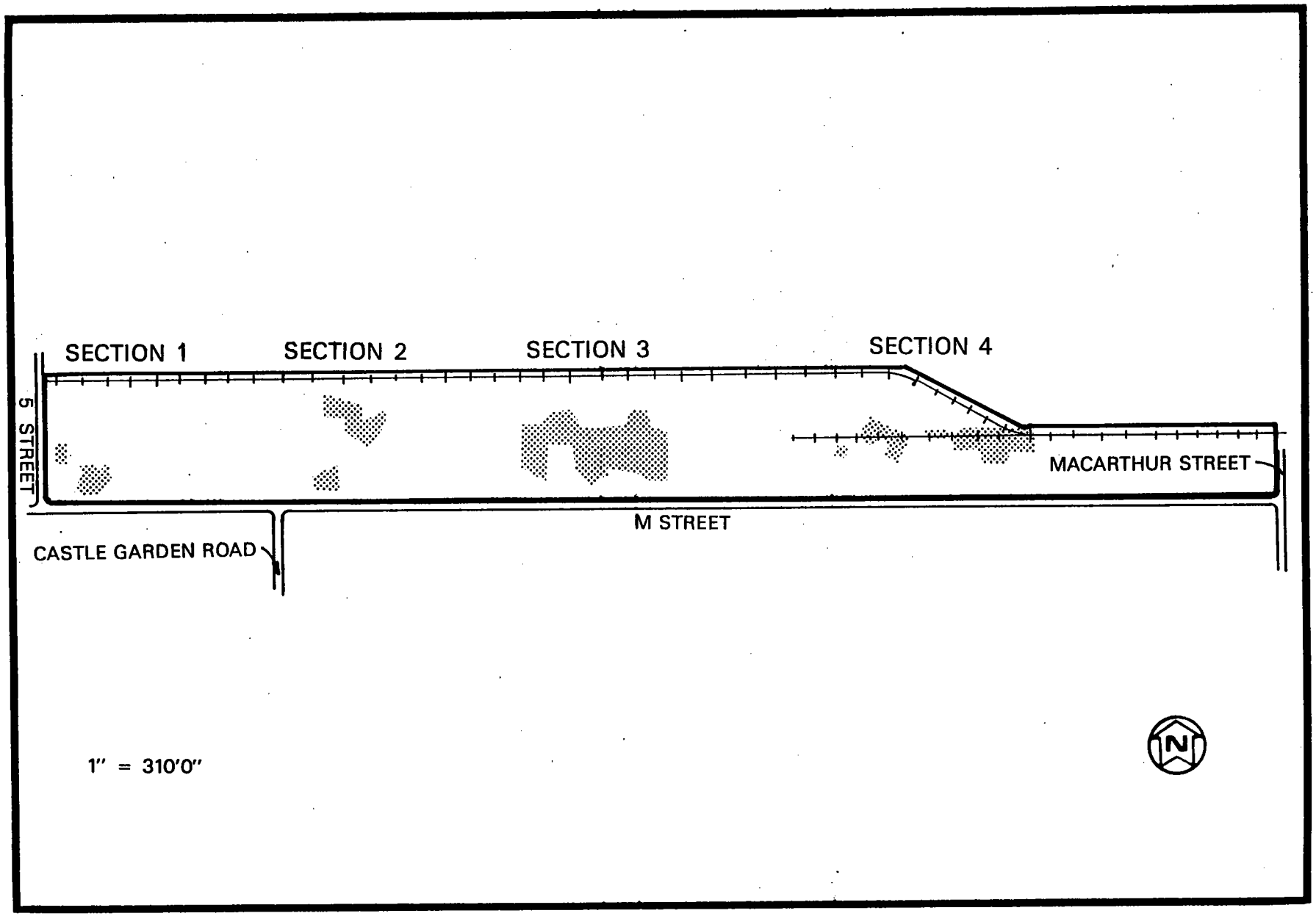

FIGURE 12 EXCAVATED AREAS ON PROPERTY E'

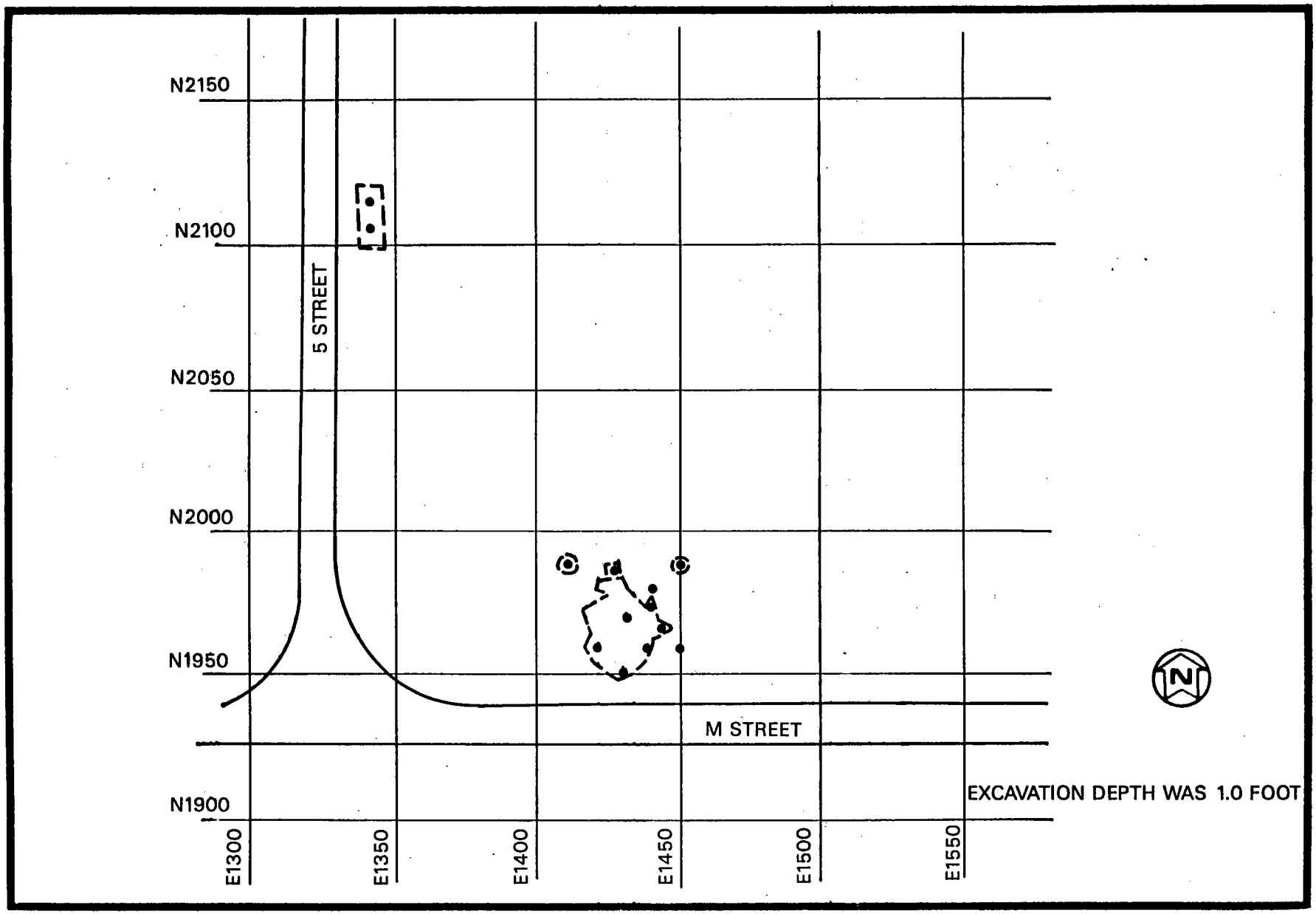

FIGURE 13 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY E' - SECTION 1

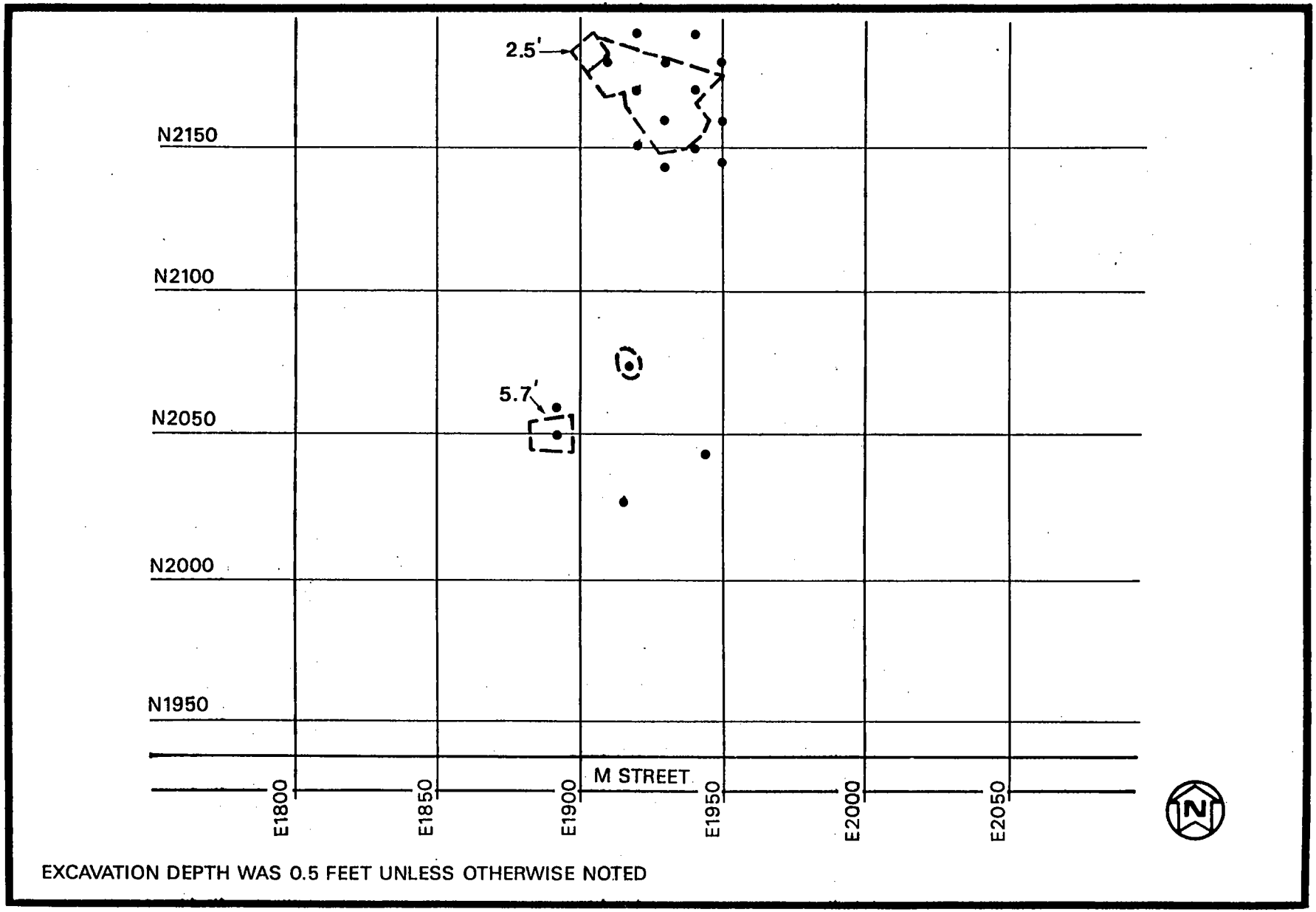

FIGURE 14 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY E' - SECTION 2

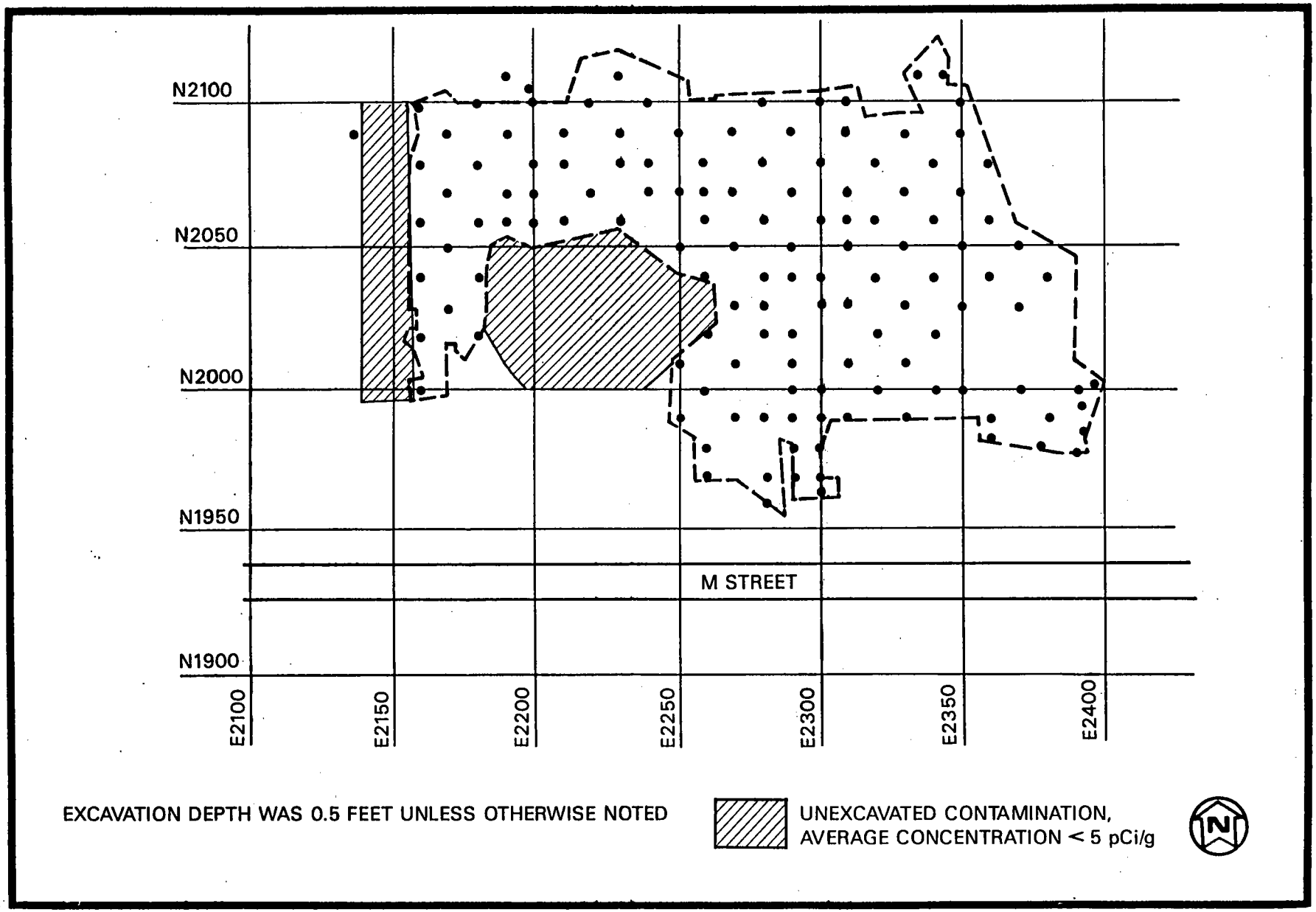

FIGURE 15 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY E' - SECTION 3

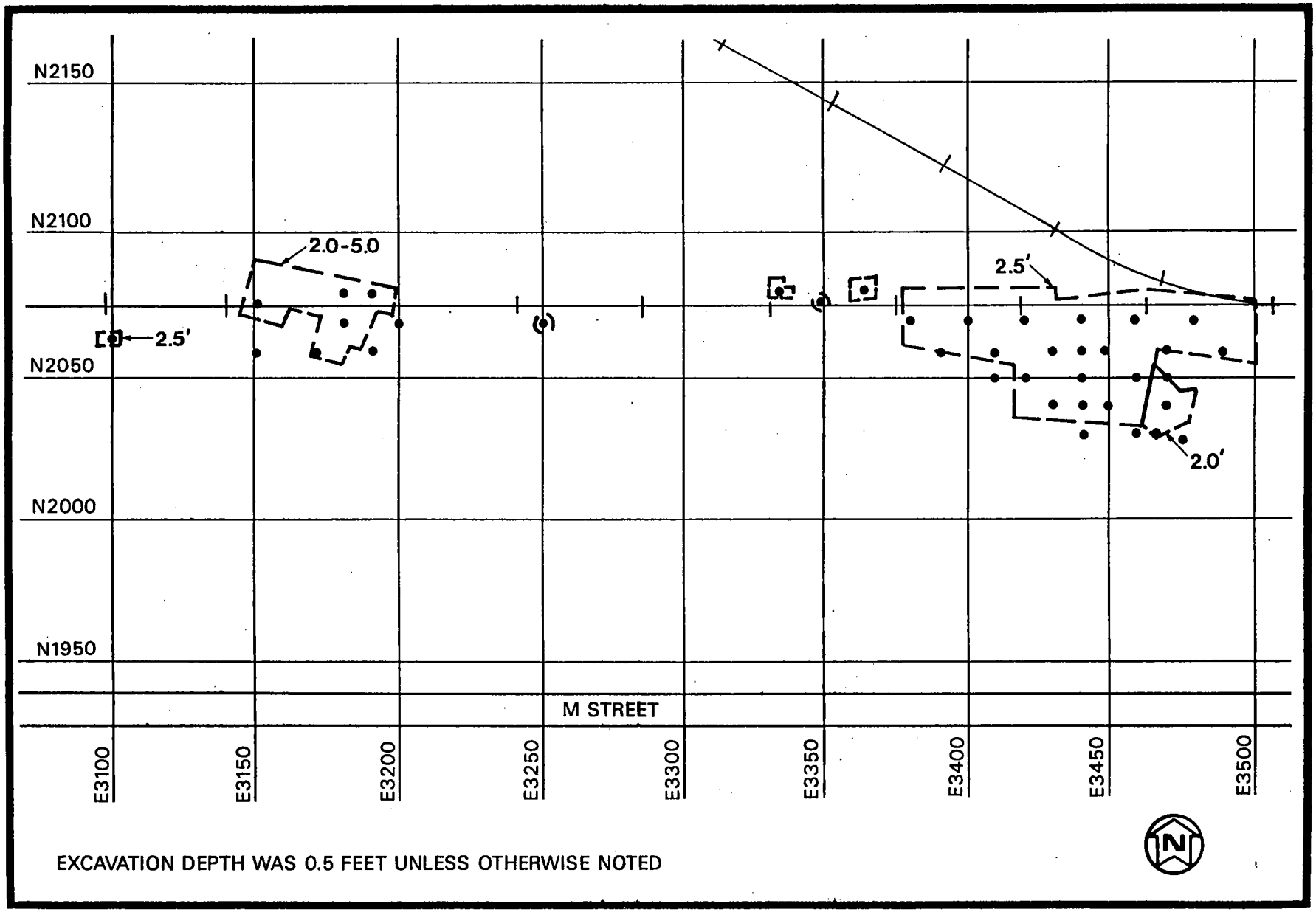

FIGURE 16 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY E' - SECTION 4

TABLE 5

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY E'

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E1340	N2105	A	1.9 ± 1.0	1.2 ± 0.9
E1340	N2115	A	1.4 ± 0.8	1.8 ± 1.0
E1410	N1990	A	4.5 ± 0.6	0.8 ± 0.5
E1420	N1960	A	1.3 ± 0.1	1.0 ± 0.2
E1425	N1986	A	5.2 ± 0.2	1.4 ± 0.3
E1430	N1950	A	4.1 ± 0.8	A
E1430	N1970	1.8 ± 1.1	0.8 ± 0.1	1.4 ± 0.2
E1438	N1974	A	1.3 ± 0.4	1.0 ± 0.4
E1440	N1960	A	A	1.2 ± 0.8
E1440	N1980	A	2.4 ± 0.3	1.1 ± 0.9
E1445	N1967	A	1.3 ± 0.4	1.4 ± 0.5
E1450	N1970	A	0.4 ± 0.1	0.8 ± 0.1
E1450	N1990	A	0.7 ± 0.2	1.5 ± 0.5
E1890	N2050	A	4.4 ± 0.7	0.6 ± 0.5
E1890	N2060	A	0.6 ± 0.3	1.2 ± 0.1
E1910	N2180	A	16.6 ± 1.7	A
E1913	N2028	A	1.1 ± 0.4	0.9 ± 0.6
E1917	N2076	A	1.1 ± 0.3	0.8 ± 0.4
E1920	N2150	A	2.8 ± 0.6	A
E1920	N2170	A	1.9 ± 0.2	0.9 ± 0.1
E1920	N2190	A	A	0.8 ± 0.1
E1930	N2140	A	2.4 ± 0.6	1.3 ± 0.7
E1930	N2160	A	2.2 ± 0.8	0.7 ± 0.2
E1930	N2180	A	4.9 ± 0.8	1.5 ± 1.1
E1940	N2150	A	1.5 ± 0.3	A
E1940	N2170	A	3.1 ± 0.4	A
E1940	N2190	A	0.6 ± 0.5	A
E1944	N1995	A	2.6 ± 0.5	0.6 ± 0.4
E1950	N2140	A	0.7 ± 0.4	1.0 ± 0.8
E1950	N2160	A	1.8 ± 0.4	0.8 ± 0.6
E1950	N2180	A	3.2 ± 0.6	A
E2135	N2090	A	0.8 ± 0.6	1.1 ± 0.9
E2160	N2000	A	4.0 ± 0.5	1.0 ± 0.2
E2160	N2020	1.0 ± 2.2	1.3 ± 0.3	1.1 ± 0.6
E2160	N2040	A	2.3 ± 0.6	0.9 ± 0.2
E2160	N2060	3.8 ± 2.4	1.4 ± 0.1	1.2 ± 0.5
E2160	N2080	3.8 ± 2.7	0.8 ± 0.3	1.0 ± 0.5
E2160	N2100	18.6 ± 8.1	2.3 ± 0.4	0.8 ± 0.3
E2170	N2030	A	1.8 ± 0.2	0.7 ± 0.4
E2170	N2050	6.4 ± 0.3	1.1 ± 0.4	0.9 ± 0.4
E2170	N2070	A	0.7 ± 0.1	1.2 ± 0.7
E2170	N2090	3.1 ± 2.8	1.4 ± 0.2	1.2 ± 0.5
E2180	N2020	A	1.1 ± 0.5	1.0 ± 0.2

TABLE 5

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E2180	N2040	10.8 ± 4.0	3.6 ± 0.7	0.8 ± 0.3
E2180	N2060	5.8 ± 2.4	1.8 ± 0.5	1.2 ± 0.6
E2180	N2080	A	0.5 ± 0.2	A
E2180	N2100	A	0.8 ± 0.3	A
E2190	N2060	A	0.9 ± 0.2	0.8 ± 0.4
E2190	N2070	4.1 ± 1.8	0.8 ± 0.1	0.7 ± 0.1
E2190	N2090	2.8 ± 2.7	0.9 ± 0.2	0.9 ± 0.4
E2190	N2110	A	5.5 ± 1.5	A
E2199	N2106	A	4.7 ± 0.7	A
E2200	N2060	A	1.3 ± 0.3	1.4 ± 0.8
E2200	N2070	A	0.7 ± 0.1	1.1 ± 0.3
E2200	N2080	1.4 ± 0.7	1.1 ± 0.1	0.7 ± 0.4
E2200	N2100	A	2.8 ± 0.5	1.6 ± 0.5
E2210	N2060	A	41.5 ±27.2	A
E2210	N2080	A	2.4 ± 1.9	A
E2210	N2090	A	0.9 ± 0.6	A
E2220	N2070	A	0.6 ± 0.4	0.9 ± 0.8
E2220	N2100	A	1.1 ± 0.2	1.0 ± 0.2
E2230	N2060	A	19.2 ± 1.7	A
E2230	N2080	A	1.0 ± 0.2	1.1 ± 0.2
E2230	N2090	A	1.1 ± 0.1	0.8 ± 0.1
E2230	N2110	A	1.1 ± 0.2	1.1 ± 0.3
E2240	N2070	A	0.9 ± 0.1	0.9 ± 0.3
E2240	N2080	A	1.7 ± 0.1	1.7 ± 0.2
E2240	N2100	A	0.9 ± 0.1	1.1 ± 0.1
E2250	N1990	A	0.9 ± 0.6	1.1 ± 0.8
E2250	N2010	A	0.6 ± 0.3	0.9 ± 0.4
E2250	N2050	A	1.7 ± 0.4	A
E2250	N2070	A	4.3 ± 0.5	1.0 ± 0.6
E2250	N2090	A	1.3 ± 0.2	0.8 ± 0.3
E2260	N1970	A	0.9 ± 0.4	A
E2260	N1980	A	0.8 ± 0.1	1.5 ± 1.0
E2260	N2000	A	1.4 ± 0.7	1.6 ± 0.9
E2260	N2020	A	0.8 ± 0.1	A
E2260	N2040	A	0.7 ± 0.1	1.4 ± 0.9
E2260	N2060	A	4.6 ± 0.8	A
E2260	N2070	A	3.9 ± 0.3	A
E2260	N2080	4.3 ± 1.7	0.9 ± 0.1	1.0 ± 0.2
E2270	N1990	A	0.5 ± 0.4	A
E2270	N2010	A	0.8 ± 0.1	0.5 ± 0.1
E2270	N2030	A	1.4 ± 0.4	0.9 ± 0.7
E2270	N2050	A	A	1.7 ± 1.2
E2270	N2070	A	8.4 ± 0.2	0.7 ± 0.2

TABLE 5

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E2270	N2090	A	0.9 ± 0.4	1.2 ± 1.1
E2280	N1960	A	2.3 ± 1.0	A
E2280	N1970	A	1.0 ± 0.8	1.1 ± 1.0
E2280	N1990	A	1.2 ± 0.7	1.6 ± 1.1
E2280	N2020	A	3.3 ± 0.7	A
E2280	N2030	A	1.3 ± 0.7	1.6 ± 0.9
E2280	N2040	A	3.9 ± 1.1	A
E2280	N2060	A	A	1.5 ± 1.2
E2280	N2080	<1.8	1.4 ± 0.1	1.3 ± 0.2
E2280	N2100	A	1.4 ± 0.8	1.5 ± 1.0
E2290	N1970	1.3 ± 0.1	0.7 ± 0.2	0.7 ± 0.1
E2290	N1980	A	A	1.5 ± 1.3
E2290	N1990	A	7.4 ± 1.3	2.1 ± 1.0
E2290	N2000	A	1.4 ± 0.7	2.5 ± 1.3
E2290	N2010	A	0.9 ± 0.1	1.1 ± 0.2
E2290	N2020	A	1.2 ± 0.7	1.7 ± 1.1
E2290	N2040	A	1.8 ± 1.0	A
E2290	N2050	A	A	A
E2290	N2070	A	1.1 ± 0.2	1.4 ± 0.4
E2290	N2090	A	1.2 ± 0.3	A
E2299	N1980	1.5 ± 1.0	1.0 ± 0.3	0.6 ± 0.3
E2300	N1965	A	1.5 ± 0.1	A
E2300	N1970	A	2.7 ± 0.9	1.6 ± 1.2
E2300	N1990	A	A	1.7 ± 1.0
E2300	N2000	A	4.3 ± 0.8	A
E2300	N2030	A	2.3 ± 0.3	2.0 ± 0.7
E2300	N2040	A	0.9 ± 0.3	A
E2300	N2060	A	2.5 ± 0.5	A
E2300	N2080	A	0.4 ± 0.3	A
E2300	N2100	A	1.0 ± 0.7	1.8 ± 0.9
E2310	N1990	A	0.7 ± 0.1	1.8 ± 0.8
E2310	N2010	A	0.9 ± 0.2	1.0 ± 0.7
E2310	N2030	A	1.7 ± 0.4	A
E2310	N2050	A	1.7 ± 0.5	A
E2310	N2060	7.7 ± 0.7	3.3 ± 0.2	A
E2310	N2070	A	1.3 ± 0.2	0.8 ± 0.7
E2310	N2090	A	1.1 ± 0.6	A
E2310	N2100	A	0.7 ± 0.5	1.5 ± 1.3
E2320	N2000	A	1.0 ± 0.3	3.1 ± 0.7
E2320	N2020	A	0.3 ± 0.1	A
E2320	N2040	A	A	A
E2320	N2060	3.8 ± 1.7	1.2 ± 0.1	0.9 ± 0.2
E2320	N2080	A	1.0 ± 0.1	1.0 ± 0.2

TABLE 5

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E2330	N1990	A	1.0 ± 0.3	A
E2330	N2010	A	2.1 ± 0.2	1.3 ± 0.2
E2330	N2030	A	0.6 ± 0.3	0.7 ± 0.3
E2330	N2050	A	0.6 ± 0.1	0.8 ± 0.1
E2330	N2070	A	5.3 ± 0.2	A
E2330	N2090	A	1.0 ± 0.7	1.6 ± 1.0
E2335	N2110	A	2.3 ± 0.9	A
E2340	N2000	A	4.0 ± 1.3	A
E2340	N2020	A	0.7 ± 0.1	0.8 ± 0.2
E2340	N2040	A	1.1 ± 0.1	1.0 ± 0.2
E2340	N2060	A	0.9 ± 0.1	1.2 ± 0.2
E2340	N2080	A	1.0 ± 0.1	0.9 ± 0.2
E2350	N2000	A	5.7 ± 0.3	0.6 ± 0.2
E2350	N2030	A	1.1 ± 0.4	0.5 ± 0.4
E2350	N2050	A	0.5 ± 0.3	0.9 ± 0.4
E2350	N2070	A	0.4 ± 0.3	0.6 ± 0.3
E2350	N2090	A	A	1.1 ± 0.5
E2350	N2100	A	2.3 ± 0.4	A
E2350	N2110	A	1.6 ± 0.6	A
E2360	N1985	A	0.7 ± 0.1	1.2 ± 0.2
E2360	N1990	A	2.1 ± 0.4	0.6 ± 0.4
E2360	N2040	A	0.9 ± 0.3	1.1 ± 0.4
E2360	N2060	A	0.7 ± 0.3	0.9 ± 0.3
E2360	N2080	10.0 ± 4.0	0.6 ± 0.2	0.8 ± 0.4
E2370	N2000	A	1.4 ± 0.3	0.7 ± 0.3
E2370	N2030	A	0.7 ± 0.3	1.3 ± 0.4
E2370	N2050	A	8.6 ± 1.6	1.0 ± 0.8
E2377	N1984	A	1.1 ± 0.7	A
E2380	N2040	4.0 ± 2.0	2.3 ± 0.4	1.1 ± 0.4
E2390	N1975	9.0 ± 4.0	5.3 ± 0.6	0.5 ± 0.4
E2390	N2000	A	4.5 ± 1.2	1.7 ± 1.0
E2391	N1984	A	2.2 ± 0.5	A
E2391	N1996	A	0.8 ± 0.3	0.9 ± 0.7
E2395	N2002	A	1.0 ± 0.3	0.8 ± 0.4
E3100	N2064	A	7.2 ± 0.7	2.0 ± 0.6
E3150	N2060	A	A	A
E3152	N2076	A	3.0 ± 0.3	1.3 ± 0.3
E3170	N2060	A	1.9 ± 0.7	A
E3178	N2076	A	1.0 ± 0.6	0.7 ± 0.1
E3180	N2070	A	A	A
E3190	N2060	A	0.8 ± 0.1	A
E3191	N2076	A	12.2 ± 0.7	0.6 ± 0.7
E3200	N2070	A	A	A

TABLE 5

(continued)

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Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E3250	N2080	A	1.6 ± 1.1	A
E3335	N2080	A	1.2 ± 0.3	0.6 ± 0.4
E3350	N2077	A	1.4 ± 0.4	0.5 ± 0.4
E3363	N2080	6.0 ± 4.0	1.2 ± 0.3	0.8 ± 0.4
E3380	N2070	A	9.1 ± 1.9	A
E3390	N2060	A	1.3 ± 0.5	A
E3400	N2070	A	0.8 ± 0.1	1.3 ± 0.2
E3410	N2050	2.7 ± 0.6	0.8 ± 0.3	1.2 ± 0.3
E3410	N2060	A	1.6 ± 0.7	1.5 ± 0.9
E3420	N2050	A	1.6 ± 1.0	1.6 ± 1.1
E3420	N2070	A	3.7 ± 1.1	1.5 ± 1.2
E3430	N2040	A	1.7 ± 0.8	1.6 ± 1.1
E3430	N2060	A	0.8 ± 0.5	A
E3440	N2030	A	1.4 ± 0.8	2.3 ± 1.3
E3440	N2040	A	0.8 ± 0.1	0.8 ± 0.3
E3440	N2050	A	1.4 ± 0.8	A
E3440	N2060	A	0.8 ± 0.1	1.1 ± 0.7
E3440	N2070	A	1.2 ± 0.7	2.3 ± 1.4
E3450	N2040	A	8.4 ± 1.9	2.9 ± 1.5
E3450	N2060	A	1.4 ± 0.8	A
E3460	N2030	A	4.7 ± 1.5	A
E3460	N2050	A	1.4 ± 1.0	2.1 ± 1.3
E3460	N2070	A	1.9 ± 0.9	2.2 ± 1.4
E3465	N2030	7.3 ± 2.1	1.2 ± 0.1	1.0 ± 0.3
E3470	N2050	3.2 ± 0.9	1.5 ± 0.3	0.8 ± 0.3
E3470	N2060	A	1.4 ± 0.7	1.6 ± 1.0
E3471	N2039	A	0.9 ± 0.3	1.1 ± 0.4
E3475	N2028	3.5 ± 1.0	0.9 ± 0.1	0.8 ± 0.2
E3480	N2070	A	1.5 ± 0.7	1.5 ± 1.1
E3490	N2060	A	0.7 ± 0.5	1.2 ± 0.9

'A' denotes less than detectable activity.

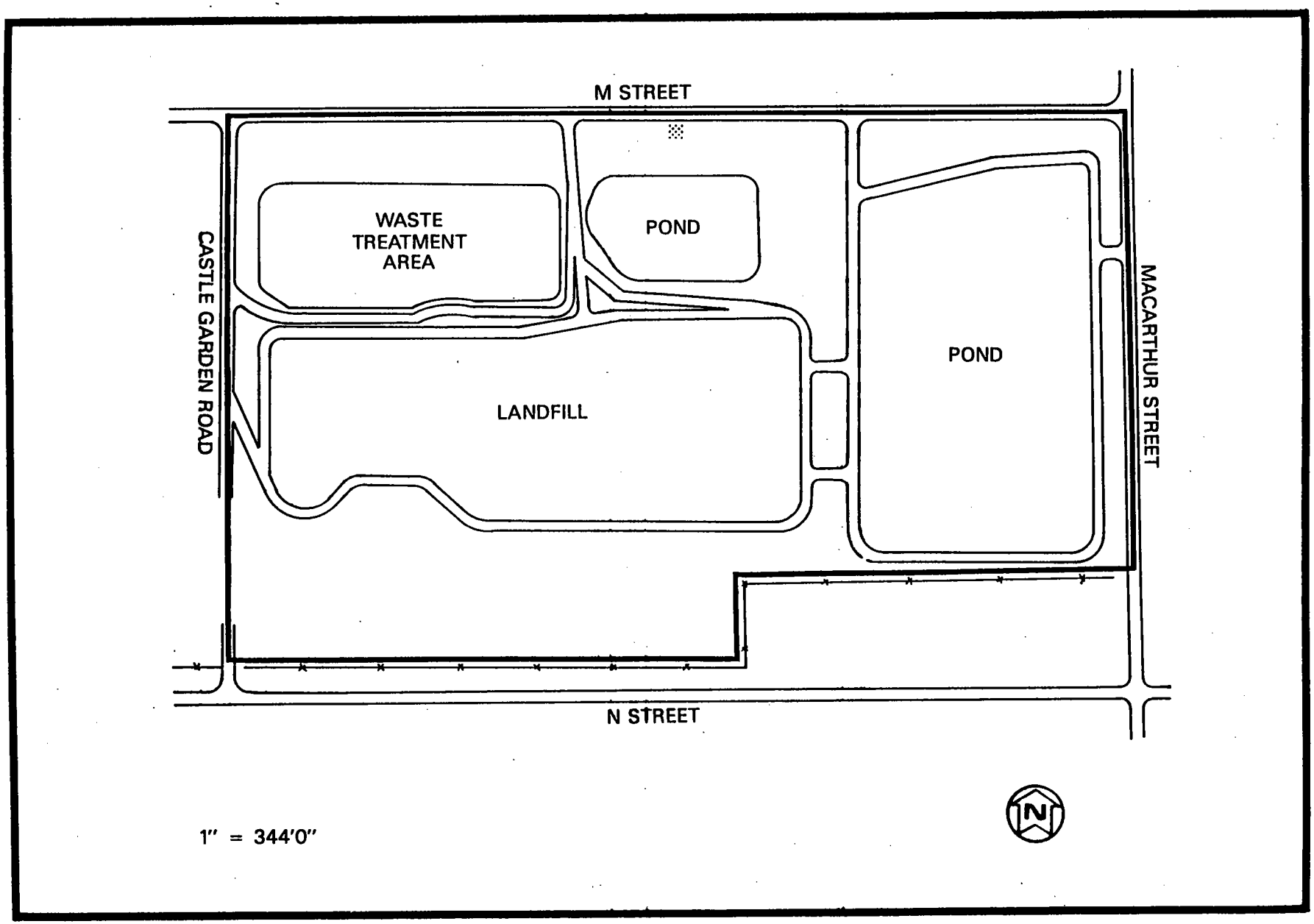

FIGURE 17 EXCAVATED AREA ON PROPERTY F

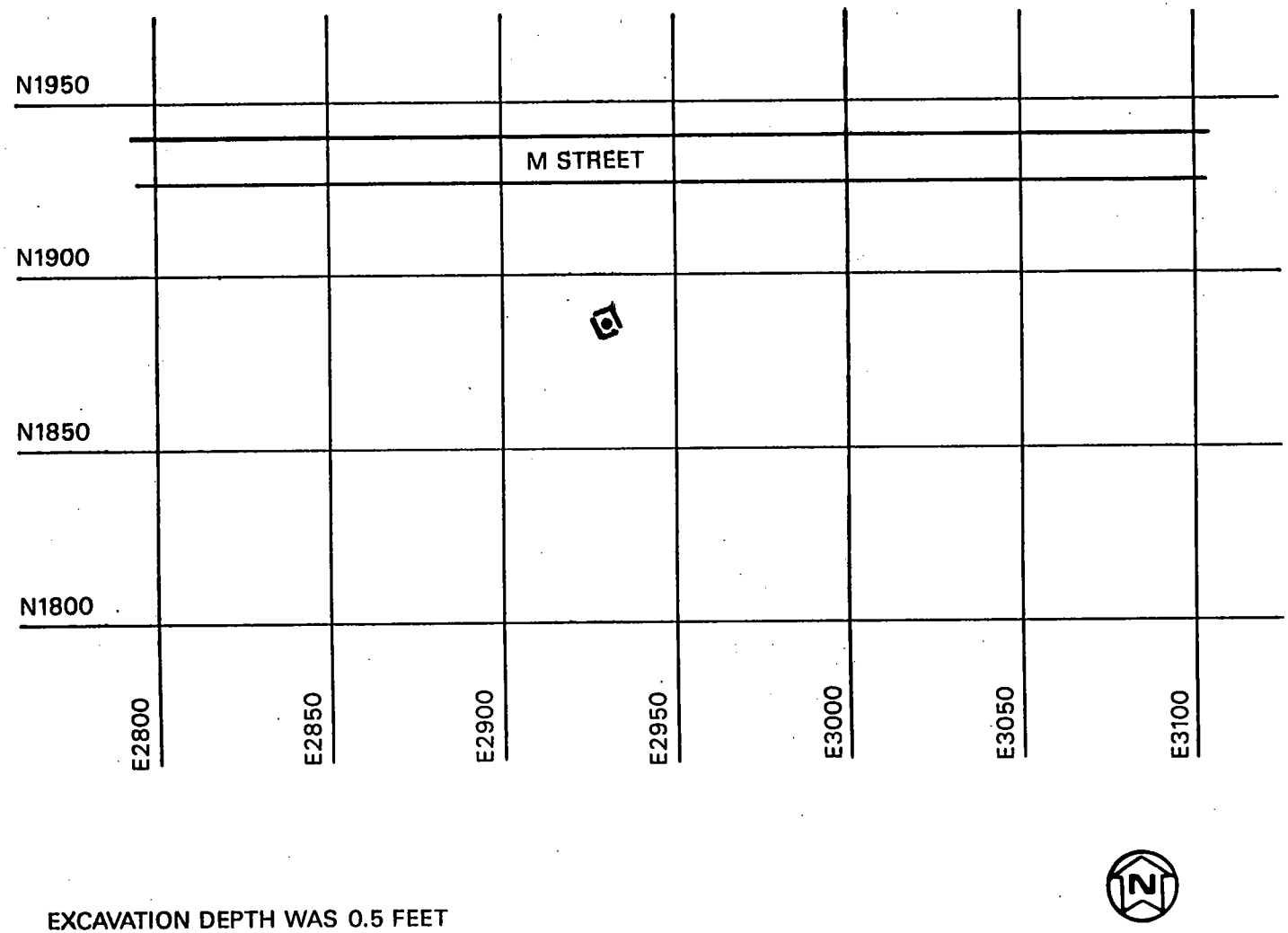

FIGURE 18 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY F

TABLE 6

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY F

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E2936	N1875	1.8 ± 1.6	0.8 ± 0.1	1.3 ± 0.1

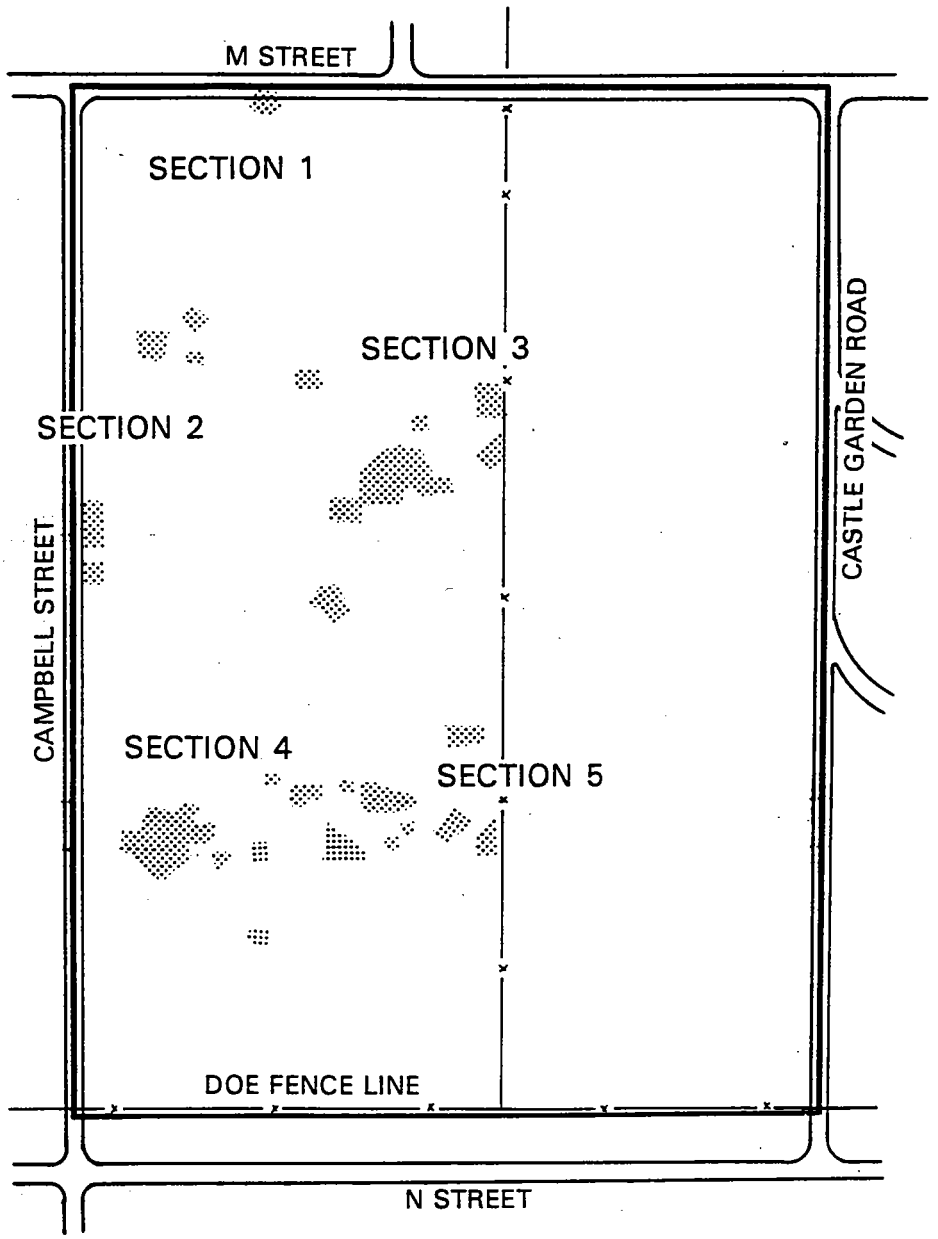

FIGURE 19 EXCAVATED AREAS ON PROPERTY G

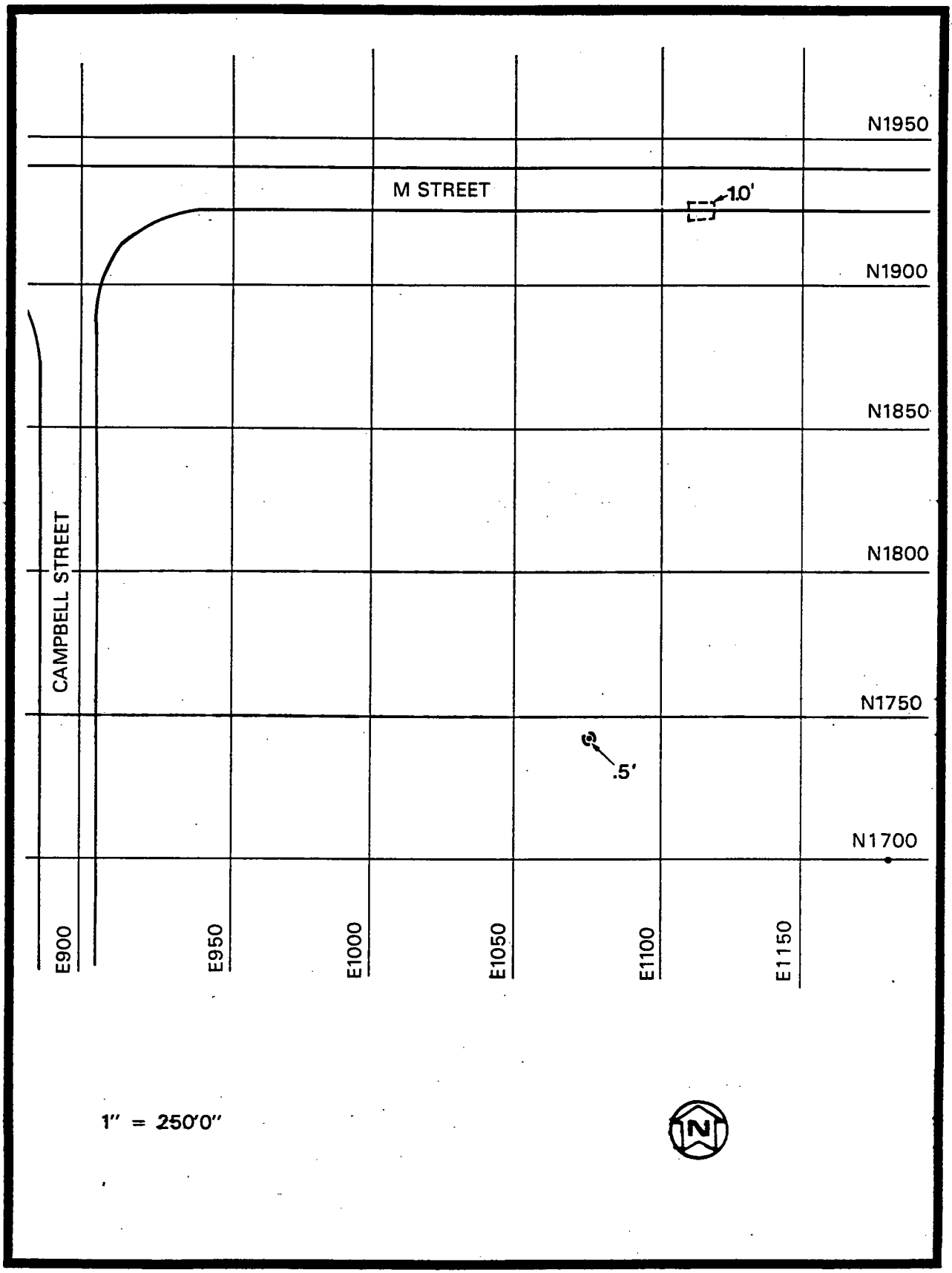

FIGURE 20 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY G—SECTION 1

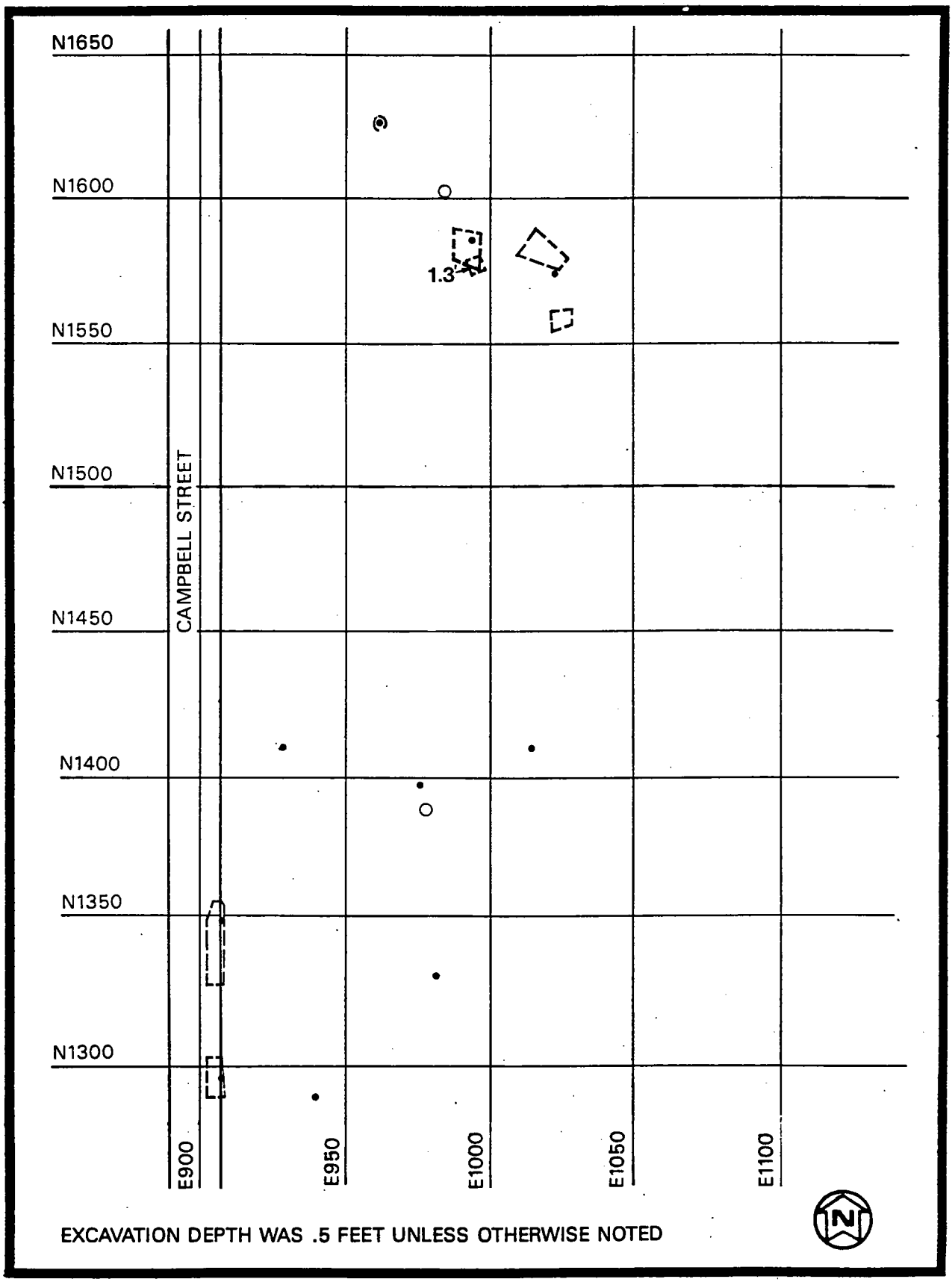

FIGURE 21 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY G—SECTION 2

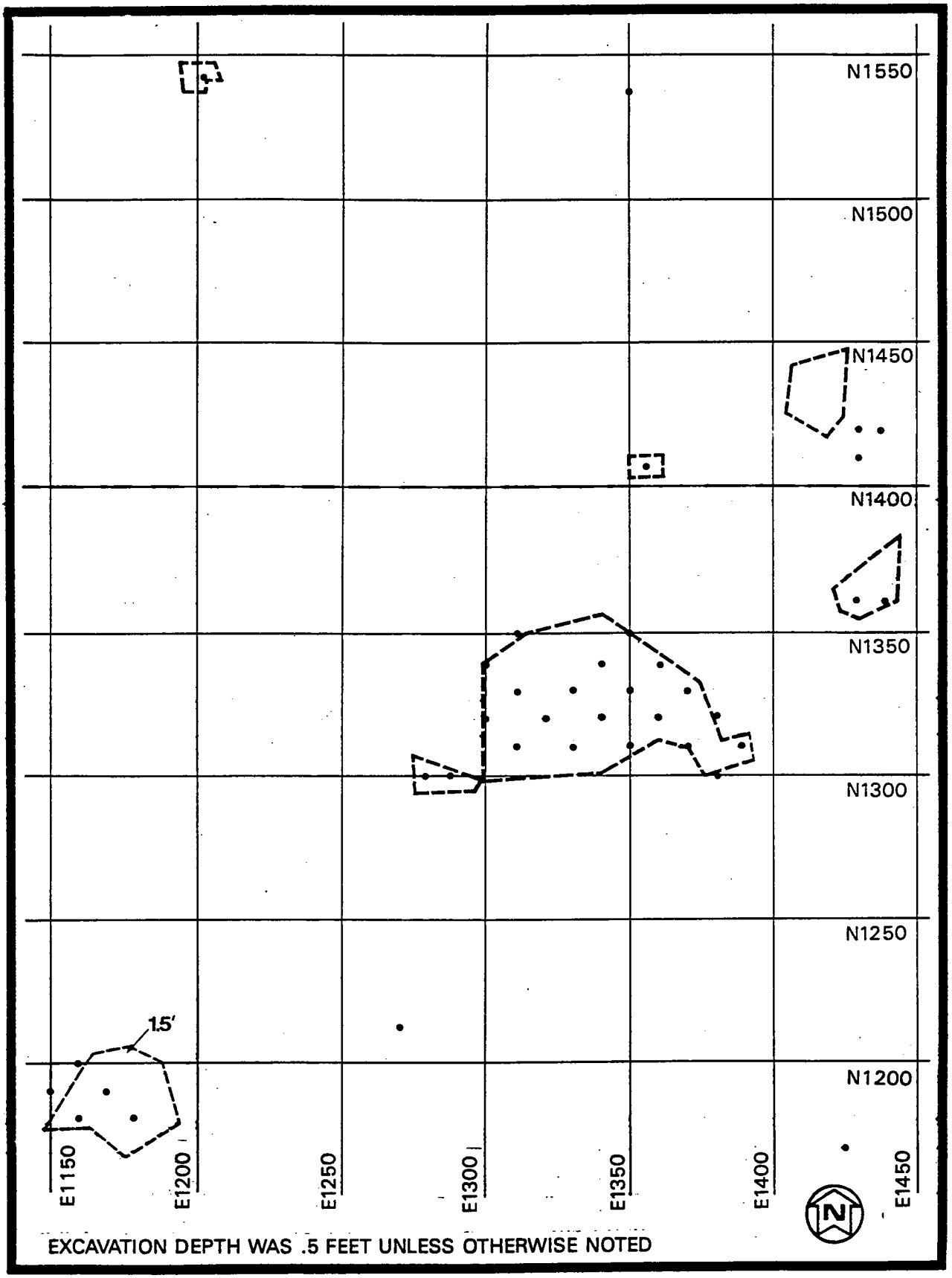

FIGURE 22 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY G—SECTION 3

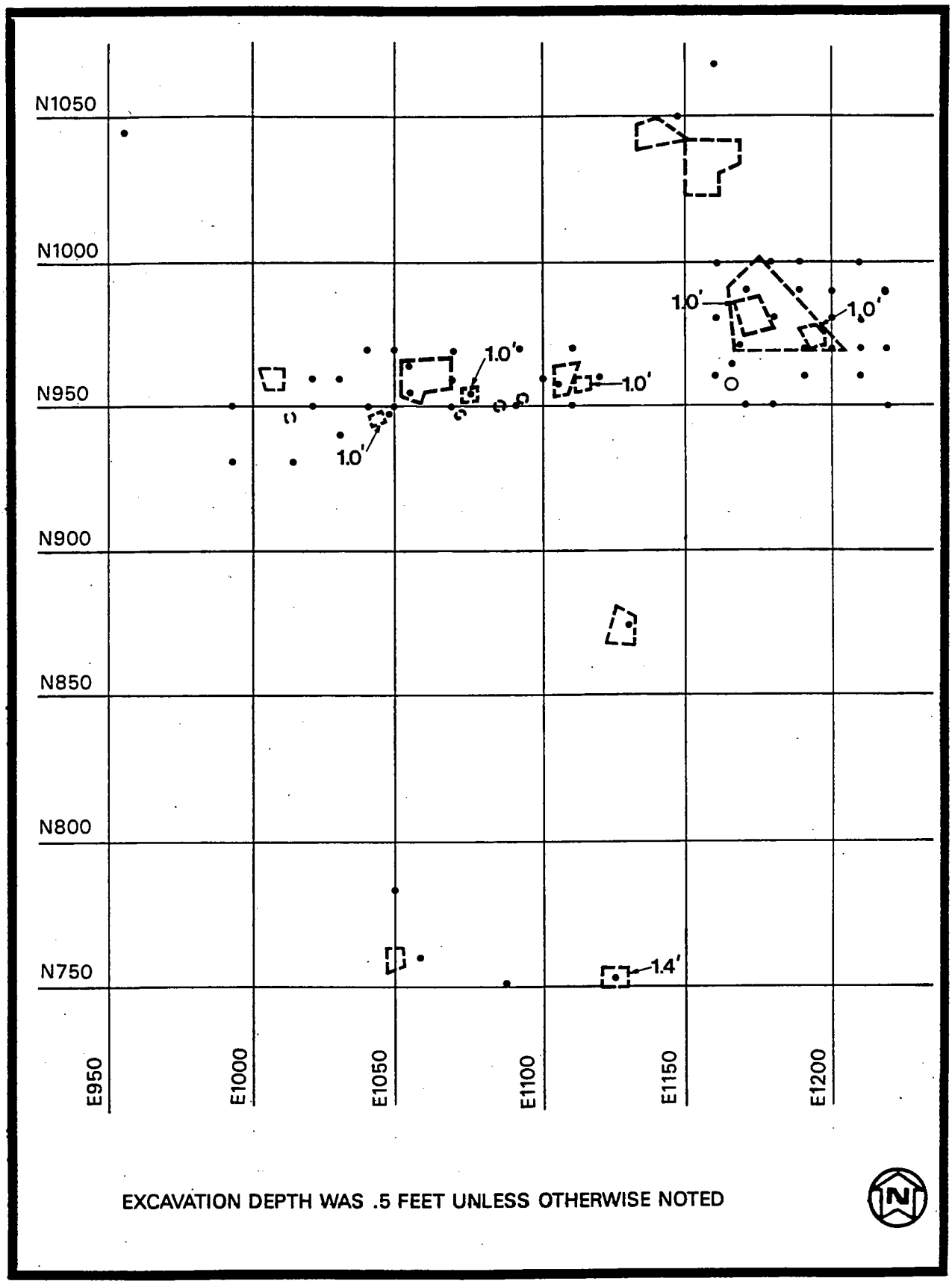

FIGURE 23 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY G—SECTION 4

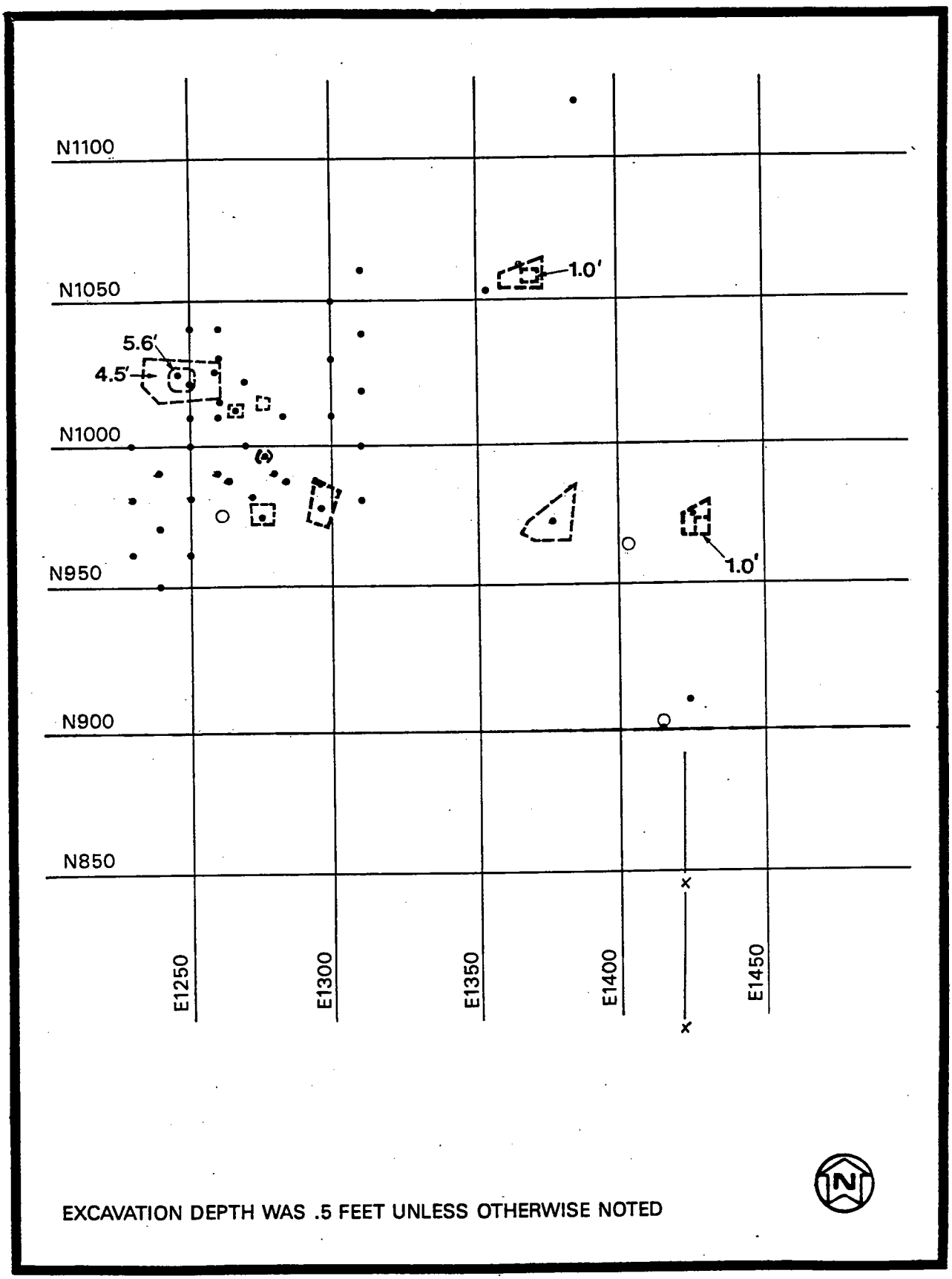

FIGURE 24 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY G—SECTION 5

TABLE 7

POST-REMEDIAL ACTION SOIL SAMPLING RESULTS

FOR PROPERTY G

Page 1 of 4

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E0907	N1348	A	5.3 ± 1.2	2.3 ± 1.2
E0908	N1296	A	3.5 ± 1.2	1.7 ± 1.2
E0930	N1409	A	2.6 ± 1.0	1.3 ± 1.1
E0941	N1291	A	1.0 ± 0.1	1.1 ± 0.2
E0954	N1048	A	1.3 ± 0.8	A
E0962	N1626	A	1.2 ± 0.3	0.8 ± 0.4
E0978	N1389	A	0.9 ± 0.3	0.6 ± 0.5
E0980	N1331	A	1.1 ± 0.8	A
E0992	N1585	A	1.8 ± 0.4	0.7 ± 0.4
E0993	N0930	A	1.1 ± 1.0	1.7 ± 1.5
E0993	N0950	A	1.8 ± 0.2	1.4 ± 0.3
E1016	N0930	A	2.0 ± 1.0	A
E1016	N1409	A	0.9 ± 0.1	0.5 ± 0.1
E1020	N0950	A	0.7 ± 0.3	0.6 ± 0.1
E1020	N0960	A	1.0 ± 0.3	0.8 ± 0.6
E1020	N1574	A	2.3 ± 0.5	0.9 ± 0.4
E1030	N0940	1.5 ± 0.2	3.6 ± 0.3	0.7 ± 0.2
E1030	N0960	A	0.8 ± 0.1	0.5 ± 0.4
E1040	N0950	A	1.0 ± 0.1	0.8 ± 0.2
E1040	N0970	A	1.7 ± 0.3	0.8 ± 0.6
E1049	N0948	A	3.7 ± 0.6	A
E1050	N0787	A	0.9 ± 0.3	1.2 ± 0.5
E1050	N0950	3.0 ± 3.0	7.0 ± 1.0	0.9 ± 0.7
E1050	N0970	A	1.0 ± 0.5	2.0 ± 0.8
E1056	N0954	A	1.3 ± 0.7	1.5 ± 0.9
E1056	N0964	7.2 ± 0.9	0.7 ± 0.2	0.8 ± 0.3
E1060	N0760	A	1.2 ± 0.1	0.8 ± 0.2
E1070	N0950	A	1.2 ± 0.5	1.6 ± 0.7
E1070	N0960	3.5 ± 1.9	2.5 ± 0.4	0.9 ± 0.8
E1070	N0970	A	2.9 ± 0.7	3.0 ± 1.0
E1076	N1740	A	1.2 ± 0.4	1.2 ± 0.4
E1077	N0955	5.2 ± 2.5	1.0 ± 0.3	0.8 ± 0.2
E1086	N0751	A	5.2 ± 0.6	A
E1090	N0950	A	1.3 ± 0.6	2.6 ± 0.8
E1090	N0970	A	1.9 ± 0.6	A
E1100	N0960	A	0.8 ± 0.4	1.8 ± 0.7
E1107	N0959	7.6 ± 3.3	4.7 ± 0.4	0.7 ± 0.5
E1110	N0950	A	1.7 ± 0.6	A
E1110	N0970	A	2.2 ± 0.6	1.3 ± 0.6
E1120	N0960	31.0 ± 8.0	2.4 ± 0.6	A
E1125	N0753	1.9 ± 1.6	1.1 ± 0.1	1.2 ± 0.5
E1126	N0873	A	0.6 ± 0.4	0.8 ± 0.5
E1149	N1050	A	1.0 ± 0.4	1.3 ± 0.5

TABLE 7

(continued)

Page 2 of 4

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E1150	N1190	A	0.9 ± 0.3	0.7 ± 0.4
E1160	N0960	A	2.6 ± 0.7	1.3 ± 0.6
E1160	N0980	A	1.4 ± 0.4	1.1 ± 0.6
E1160	N1000	A	1.0 ± 0.5	1.7 ± 0.8
E1160	N1068	12.0 ± 4.0	0.9 ± 0.3	0.5 ± 0.3
E1160	N1180	A	0.8 ± 0.4	0.9 ± 0.4
E1160	N1200	A	A	1.0 ± 0.5
E1166	N0964	A	1.3 ± 0.8	1.8 ± 0.8
E1170	N0950	A	3.2 ± 0.8	1.0 ± 0.7
E1170	N0970	2.3 ± 0.6	1.7 ± 0.4	0.8 ± 0.2
E1170	N0990	A	3.9 ± 0.2	0.9 ± 0.5
E1170	N1190	A	0.9 ± 0.3	0.9 ± 0.5
E1180	N0950	A	1.2 ± 0.6	2.9 ± 1.1
E1180	N0980	1.6 ± 0.3	1.9 ± 0.2	1.0 ± 0.1
E1180	N1000	A	1.4 ± 0.1	0.7 ± 0.5
E1180	N1180	A	0.8 ± 0.4	0.9 ± 0.5
E1180	N1700	A	0.9 ± 0.3	1.3 ± 0.4
E1190	N0960	A	3.1 ± 0.8	A
E1190	N0970	2.0 ± 1.4	0.9 ± 0.1	1.1 ± 0.5
E1190	N0990	2.3 ± 0.8	1.0 ± 0.2	1.0 ± 0.3
E1190	N1000	A	1.7 ± 0.6	2.8 ± 0.9
E1200	N0970	A	2.4 ± 0.7	1.3 ± 0.7
E1200	N0980	A	0.9 ± 0.1	1.3 ± 0.4
E1200	N0990	A	1.0 ± 0.5	1.7 ± 0.7
E1201	N1540	A	1.0 ± 0.4	A
E1210	N0960	A	1.5 ± 0.6	A
E1210	N0970	2.1 ± 0.4	0.8 ± 0.2	0.9 ± 0.3
E1210	N0980	A	1.9 ± 0.7	1.5 ± 0.8
E1210	N1000	A	1.5 ± 0.5	1.7 ± 0.7
E1220	N0950	A	2.8 ± 0.7	1.4 ± 0.7
E1220	N0970	8.0 ± 5.0	7.0 ± 1.0	1.2 ± 0.7
E1220	N0990	A	3.0 ± 0.8	A
E1230	N0960	A	2.0 ± 0.6	1.5 ± 0.6
E1230	N0980	A	2.4 ± 0.8	1.5 ± 0.8
E1230	N1000	A	1.5 ± 0.5	0.5 ± 0.4
E1240	N0950	A	1.2 ± 0.4	2.3 ± 0.7
E1240	N0970	A	1.6 ± 0.6	1.1 ± 0.6
E1240	N0990	A	1.5 ± 0.5	1.3 ± 0.8
E1247	N1024	A	2.3 ± 0.8	1.7 ± 1.1
E1250	N0960	A	0.8 ± 0.4	1.3 ± 0.6
E1250	N0980	A	2.0 ± 0.9	1.8 ± 1.0
E1250	N1000	A	2.6 ± 0.7	1.1 ± 0.6
E1250	N1010	A	1.7 ± 0.6	1.7 ± 0.8

TABLE 7

(continued)

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Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E1250	N1020	A	2.2 ± 0.7	1.6 ± 0.8
E1250	N1040	A	1.8 ± 0.7	2.2 ± 0.7
E1257	N1024	5.1 ± 4.8	2.0 ± 0.4	0.8 ± 0.8
E1260	N0990	A	7.0 ± 1.0	1.5 ± 1.1
E1260	N1010	6.0 ± 3.0	2.8 ± 0.7	A
E1260	N1014	A	5.7 ± 1.7	1.3 ± 0.9
E1260	N1030	A	1.6 ± 0.7	1.4 ± 1.0
E1260	N1040	A	1.8 ± 0.6	3.0 ± 1.0
E1264	N1014	16.1 ± 6.3	14.7 ± 1.6	0.9 ± 0.6
E1265	N0988	1.5 ± 0.1	1.0 ± 0.1	1.1 ± 0.3
E1270	N0980	A	2.8 ± 0.7	2.3 ± 0.6
E1270	N1000	A	3.2 ± 0.8	1.2 ± 0.7
E1270	N1020	10.1 ± 0.4	3.1 ± 0.6	0.8 ± 0.2
E1270	N1214	22.0 ±14.0	5.9 ± 1.8	3.0 ± 1.5
E1275	N0974	2.6 ± 0.7	2.1 ± 0.3	0.7 ± 0.2
E1278	N0997	2.9 ± 1.5	0.9 ± 0.1	1.0 ± 0.2
E1280	N0990	A	2.1 ± 0.6	2.3 ± 0.8
E1280	N1010	10.7 ± 3.8	4.0 ± 0.3	0.5 ± 0.3
E1280	N1300	11.0 ± 6.0	2.4 ± 0.6	A
E1285	N0987	5.7 ± 0.3	2.3 ± 0.5	1.0 ± 0.4
E1290	N1300	50.0 ±11.0	9.3 ± 1.0	1.1 ± 0.7
E1295	N0977	2.6 ± 1.5	0.7 ± 0.1	0.9 ± 0.6
E1295	N0987	A	2.6 ± 1.1	A
E1300	N1010	A	1.8 ± 0.6	1.0 ± 0.5
E1300	N1030	A	0.8 ± 0.5	1.4 ± 0.7
E1300	N1050	A	1.3 ± 0.5	1.9 ± 0.8
E1300	N1320	28.0 ± 6.0	0.9 ± 0.3	A
E1300	N1340	A	0.8 ± 0.3	1.1 ± 0.4
E1310	N0980	A	1.1 ± 0.5	1.1 ± 0.7
E1310	N1000	A	1.2 ± 0.5	1.8 ± 0.8
E1310	N1020	A	1.2 ± 0.6	3.3 ± 1.0
E1310	N1040	A	1.3 ± 0.5	1.1 ± 0.7
E1310	N1060	A	1.2 ± 0.5	1.0 ± 0.6
E1310	N1310	12.0 ± 3.0	0.6 ± 0.2	0.6 ± 0.3
E1310	N1330	16.0 ± 5.0	1.1 ± 0.3	0.6 ± 0.4
E1310	N1350	6.0 ± 2.0	0.6 ± 0.2	0.7 ± 0.4
E1320	N1320	10.0 ± 4.0	1.2 ± 0.4	1.1 ± 0.4
E1330	N1310	A	0.9 ± 0.3	0.6 ± 0.3
E1330	N1330	7.0 ± 3.0	1.0 ± 0.3	1.1 ± 0.4
E1340	N1320	26.0 ± 7.0	0.8 ± 0.4	1.1 ± 0.6
E1340	N1340	22.0 ± 5.0	1.2 ± 0.3	0.6 ± 0.5
E1350	N1310	A	0.8 ± 0.4	1.0 ± 0.6
E1350	N1330	24.0 ± 6.0	0.8 ± 0.4	1.0 ± 0.5

TABLE 7

(continued)

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E1350	N1350	8.0 ± 5.0	1.9 ± 0.5	1.4 ± 0.5
E1350	N1530	11.0 ± 4.0	0.7 ± 0.2	0.8 ± 0.3
E1353	N1055	A	1.1 ± 0.1	0.7 ± 0.2
E1356	N1407	30.0 ±13.0	15.0 ± 1.0	0.9 ± 0.7
E1360	N1320	A	0.7 ± 0.4	1.3 ± 0.5
E1360	N1340	28.0 ± 7.0	0.9 ± 0.3	0.8 ± 0.4
E1367	N1062	A	0.6 ± 0.3	A
E1370	N1310	31.0 ± 8.0	5.8 ± 0.8	0.6 ± 0.5
E1370	N1330	11.0 ± 6.0	7.7 ± 0.8	A
E1377	N0973	52.0 ± 9.0	0.7 ± 0.3	0.5 ± 0.4
E1380	N1300	A	0.4 ± 0.3	1.4 ± 0.5
E1380	N1320	12.0 ± 4.0	1.4 ± 0.3	0.6 ± 0.3
E1384	N1120	A	0.7 ± 0.1	0.7 ± 0.2
E1390	N1310	A	0.4 ± 0.3	0.6 ± 0.4
E1415	N0900	A	1.1 ± 0.4	0.6 ± 0.4
E1424	N0913	4.6 ± 0.4	0.9 ± 0.3	0.8 ± 0.2
E1425	N1170	A	1.1 ± 0.2	1.0 ± 0.9
E1426	N0973	A	1.7 ± 0.9	2.1 ± 1.2
E1430	N1360	14.0 ± 5.0	3.9 ± 0.6	0.9 ± 0.4
E1430	N1410	A	1.0 ± 0.4	1.0 ± 0.5
E1430	N1420	23.0 ± 7.0	0.5 ± 0.3	0.4 ± 0.3
E1440	N1360	A	1.2 ± 0.3	0.8 ± 0.4
E1440	N1420	40.0 ± 8.0	0.6 ± 0.3	1.0 ± 0.5

'A' denotes less than detectable activity.

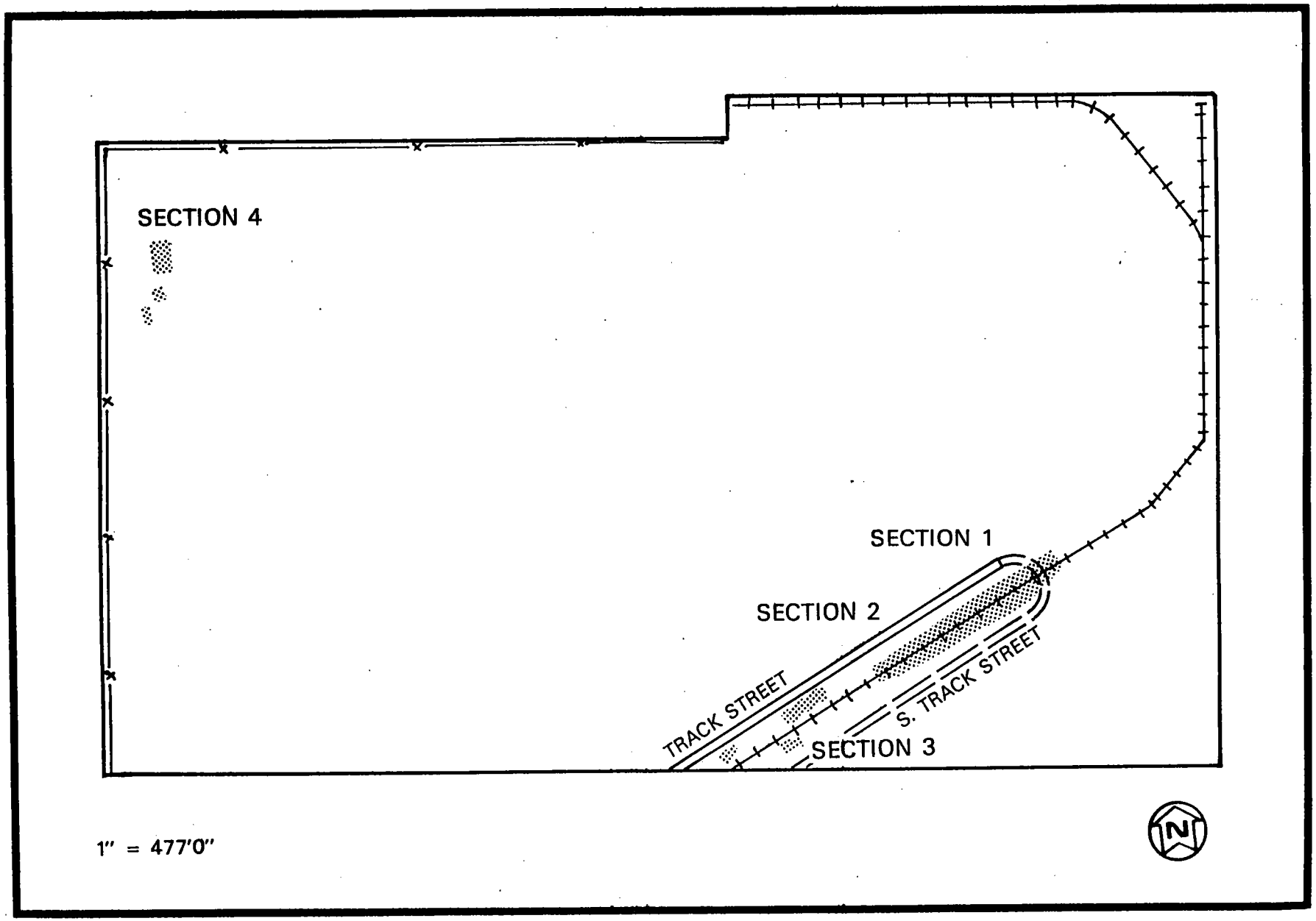

FIGURE 25 EXCAVATED AREAS ON PROPERTY N/N' NORTH

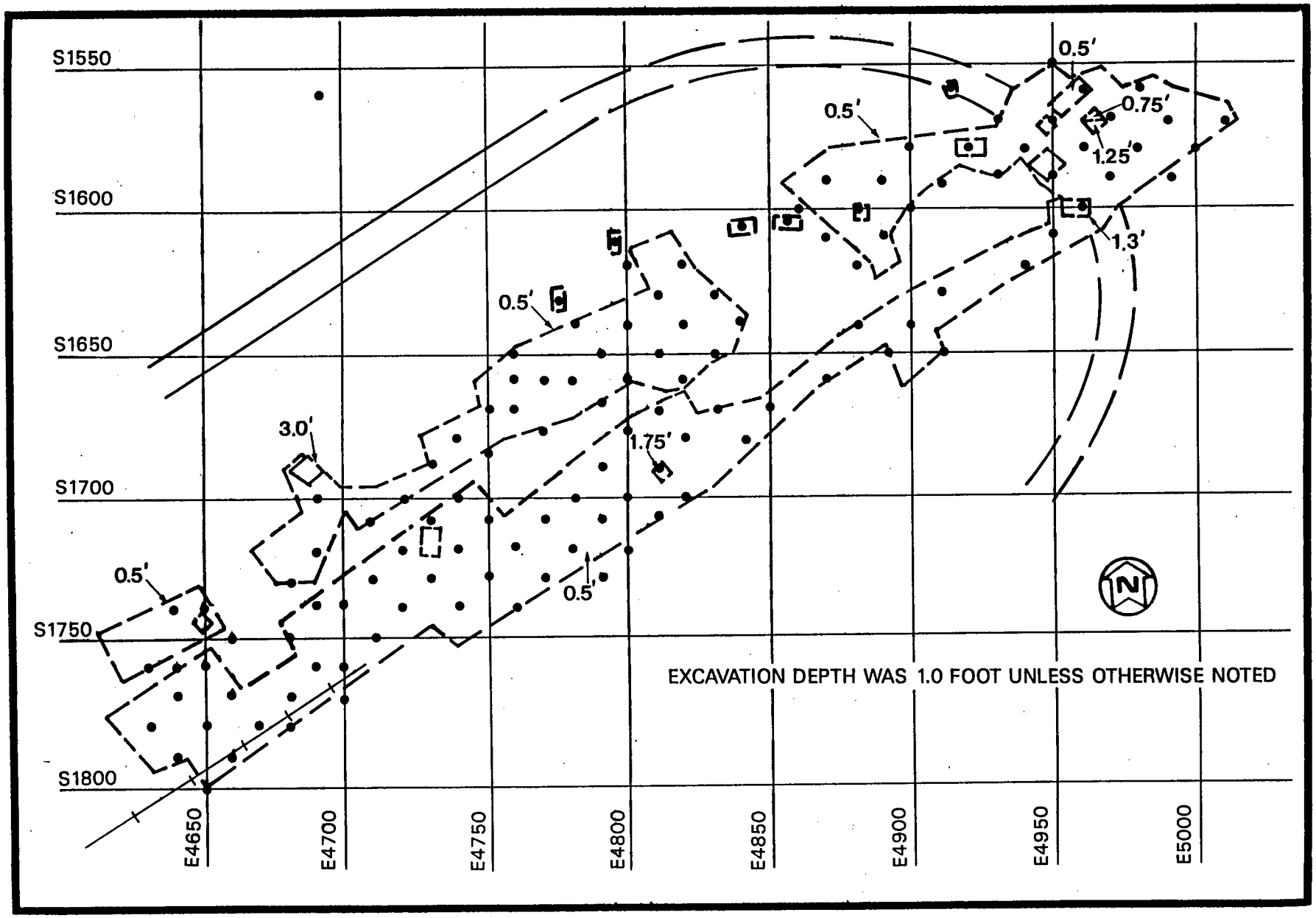

FIGURE 26 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY N/N' NORTH - SECTION 1

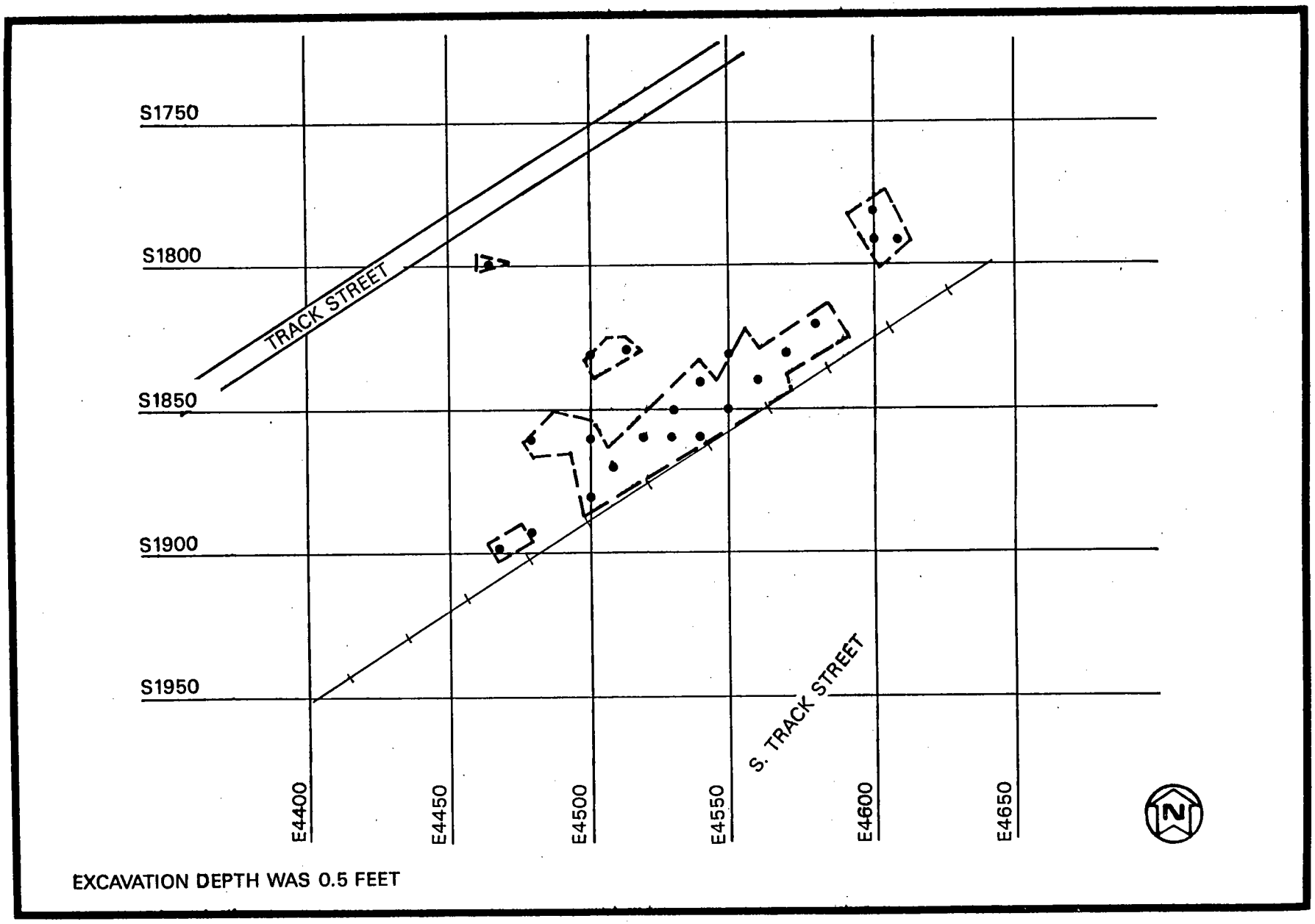

FIGURE 27 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY N/N' NORTH - SECTION 2

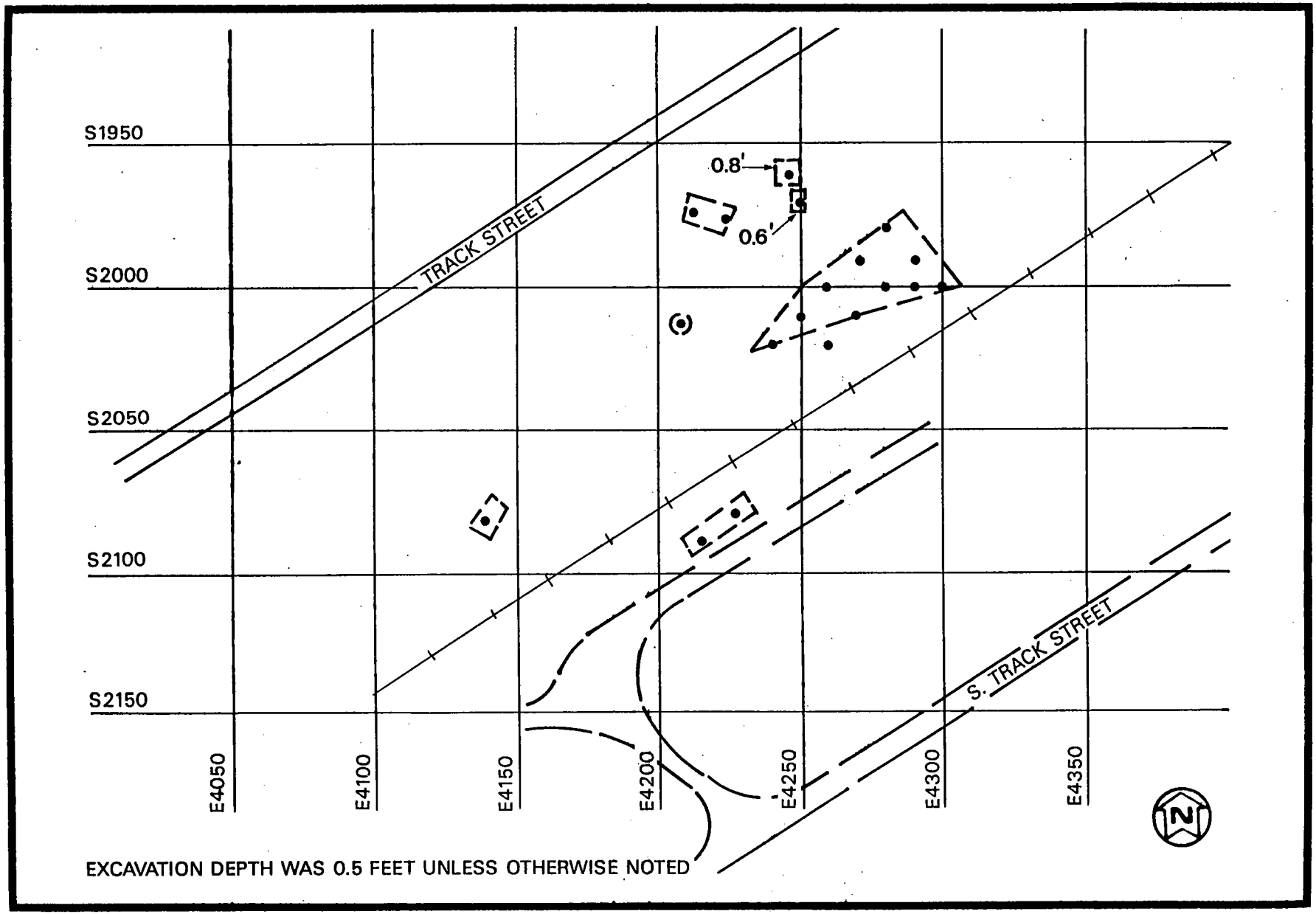

FIGURE 28 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY N/N' NORTH - SECTION 3

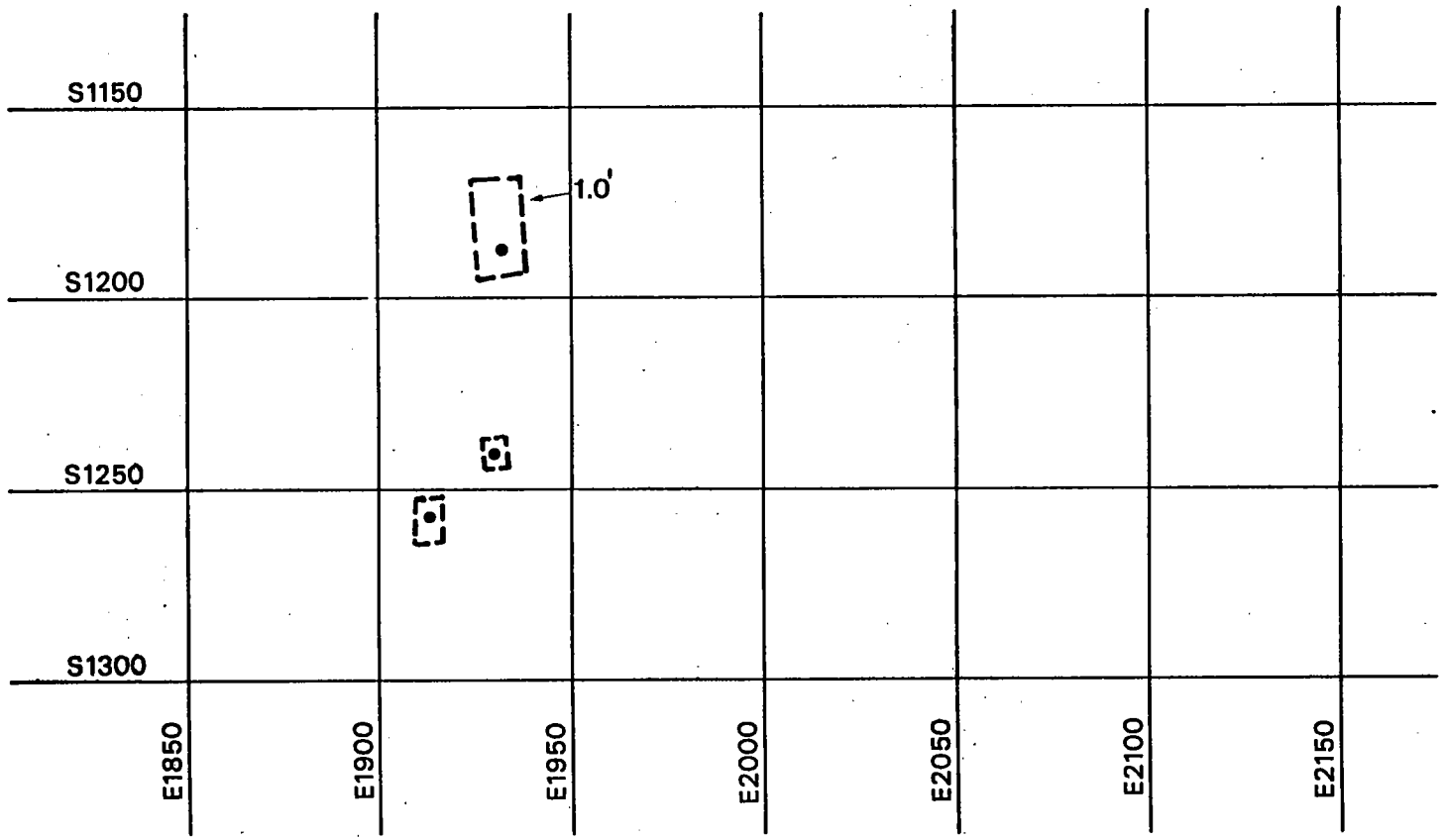

FIGURE 29 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY N/N' NORTH - SECTION 4

TABLE 8

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY N/N' NORTH

Page 1 of 4

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E1914	S1254	A	13.1 ± 0.7	2.2 ± 0.7
E1930	S1240	A	1.2 ± 0.3	1.2 ± 0.5
E1932	S1187	A	0.8 ± 0.2	0.7 ± 0.2
E4144	S2083	A	1.5 ± 0.4	1.0 ± 0.5
E4210	S2012	A	1.0 ± 0.3	1.0 ± 0.4
E4212	S1973	A	0.9 ± 0.4	0.9 ± 0.5
E4215	S2089	A	0.8 ± 0.3	0.6 ± 0.4
E4224	S1976	A	1.1 ± 0.3	1.2 ± 0.5
E4225	S2089	A	1.3 ± 0.4	0.8 ± 0.5
E4240	S2020	11.0 ± 4.0	0.8 ± 0.3	1.0 ± 0.5
E4245	S1961	A	1.0 ± 0.1	1.1 ± 0.3
E4250	S1972	4.5 ± 2.3	1.3 ± 0.2	1.6 ± 0.6
E4250	S2010	A	0.9 ± 0.3	0.6 ± 0.4
E4260	S2000	A	0.5 ± 0.3	0.6 ± 0.4
E4260	S2020	A	1.4 ± 0.1	1.1 ± 0.2
E4270	S1990	18.0 ± 5.0	1.0 ± 3.0	0.8 ± 0.4
E4270	S2010	A	0.7 ± 0.2	1.0 ± 0.4
E4280	S1980	16.0 ± 6.0	1.4 ± 0.4	1.0 ± 0.5
E4280	S2000	A	1.2 ± 0.1	1.4 ± 0.2
E4290	S1990	15.0 ± 5.0	1.3 ± 0.3	1.1 ± 0.4
E4300	S2000	A	0.7 ± 0.3	0.6 ± 0.4
E4465	S1800	A	0.8 ± 0.3	0.5 ± 0.3
E4469	S1897	A	0.5 ± 0.3	0.5 ± 0.3
E4480	S1860	A	A	A
E4480	S1893	A	0.8 ± 0.4	0.8 ± 0.6
E4500	S1830	A	7.7 ± 0.9	0.9 ± 0.5
E4500	S1860	A	0.5 ± 0.3	0.7 ± 0.3
E4500	S1880	A	0.9 ± 0.3	0.9 ± 0.4
E4510	S1870	A	0.7 ± 0.3	0.9 ± 0.5
E4520	S1830	A	0.8 ± 0.2	0.7 ± 0.3
E4520	S1860	A	0.5 ± 0.2	0.5 ± 0.3
E4530	S1850	A	0.8 ± 0.1	0.9 ± 0.2
E4530	S1860	A	1.1 ± 0.3	0.4 ± 0.3
E4540	S1840	A	2.9 ± 0.6	1.2 ± 0.6
E4540	S1860	A	1.1 ± 0.4	0.7 ± 0.4
E4550	S1830	8.8 ± 3.4	8.1 ± 0.3	1.1 ± 0.3
E4550	S1850	A	1.7 ± 0.6	0.8 ± 0.5
E4560	S1840	A	5.6 ± 0.6	2.2 ± 0.6
E4570	S1830	A	1.0 ± 0.3	0.6 ± 0.4
E4580	S1820	A	1.0 ± 0.3	1.1 ± 0.5
E4600	S1780	9.0 ± 4.0	3.0 ± 0.5	1.1 ± 0.4
E4600	S1790	A	0.9 ± 0.3	0.8 ± 0.5
E4610	S1790	A	0.8 ± 0.3	0.8 ± 0.4

TABLE 8

(continued)

Page 2 of 4

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E4630	S1760	A	1.0 ± 0.3	0.8 ± 0.4
E4630	S1780	A	1.0 ± 0.2	A
E4640	S1740	A	6.2 ± 0.4	A
E4640	S1760	3.3 ± 2.1	0.5 ± 0.1	0.8 ± 0.2
E4640	S1770	A	1.0 ± 0.3	1.3 ± 0.5
E4640	S1790	A	1.2 ± 0.4	0.8 ± 0.5
E4650	S1740	A	1.6 ± 0.4	1.3 ± 0.5
E4650	S1760	A	2.8 ± 0.5	1.2 ± 0.4
E4650	S1780	A	1.1 ± 0.3	1.2 ± 0.5
E4650	S1800	A	1.2 ± 0.3	0.7 ± 0.5
E4660	S1750	A	1.4 ± 0.4	1.1 ± 0.4
E4660	S1770	A	0.5 ± 0.3	1.0 ± 0.4
E4660	S1790	A	0.8 ± 0.3	0.6 ± 0.4
E4670	S1780	A	1.6 ± 0.3	1.0 ± 0.4
E4680	S1730	A	1.4 ± 0.4	1.0 ± 0.5
E4680	S1750	A	1.3 ± 0.3	0.8 ± 0.3
E4680	S1770	A	0.8 ± 0.3	1.0 ± 0.5
E4680	S1780	A	0.6 ± 0.3	0.9 ± 0.5
E4690	S1700	33.0 ±10.0	8.2 ± 0.9	0.8 ± 0.5
E4690	S1720	A	4.3 ± 0.5	1.1 ± 0.6
E4690	S1740	A	1.4 ± 0.3	0.6 ± 0.4
E4690	S1760	5.0 ± 3.0	0.5 ± 0.2	0.7 ± 0.3
E4700	S1740	A	0.9 ± 0.3	0.7 ± 0.4
E4700	S1760	A	0.9 ± 0.3	1.3 ± 0.5
E4700	S1770	A	1.5 ± 0.1	1.3 ± 0.2
E4710	S1710	11.0 ± 5.0	1.0 ± 0.3	0.8 ± 0.4
E4710	S1730	A	0.8 ± 0.4	1.0 ± 0.5
E4710	S1750	A	1.9 ± 0.4	0.9 ± 0.4
E4720	S1700	A	0.8 ± 0.3	0.6 ± 0.4
E4720	S1720	A	1.2 ± 0.4	1.0 ± 0.4
E4720	S1740	A	1.1 ± 0.3	0.6 ± 0.4
E4730	S1690	20.0 ± 6.0	1.4 ± 0.4	1.4 ± 0.5
E4730	S1710	A	0.9 ± 0.3	1.1 ± 0.4
E4730	S1730	A	1.2 ± 0.3	1.0 ± 0.4
E4740	S1680	6.0 ± 4.0	1.3 ± 0.4	0.7 ± 0.5
E4740	S1700	A	1.3 ± 0.1	1.0 ± 0.2
E4740	S1720	A	0.3 ± 0.4	1.5 ± 0.5
E4740	S1740	A	1.6 ± 0.5	1.7 ± 0.6
E4750	S1670	A	0.9 ± 0.3	1.1 ± 0.4
E4750	S1690	22.0 ± 5.0	1.0 ± 0.3	0.9 ± 0.4
E4750	S1710	A	1.3 ± 0.3	1.3 ± 0.4
E4750	S1730	4.0 ± 2.0	0.8 ± 0.3	0.7 ± 0.4
E4760	S1650	A	0.8 ± 0.3	1.0 ± 0.4

TABLE 8

(continued)

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Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E4760	S1660	A	1.9 ± 0.2	1.1 ± 0.2
E4760	S1670	A	1.0 ± 0.3	1.2 ± 0.4
E4760	S1720	A	0.9 ± 0.3	A
E4760	S1740	A	1.0 ± 0.3	1.0 ± 0.4
E4770	S1660	A	0.7 ± 0.3	1.0 ± 0.4
E4770	S1680	4.9 ± 2.7	3.4 ± 0.2	1.3 ± 0.2
E4770	S1710	A	1.1 ± 0.3	0.8 ± 0.5
E4770	S1730	A	0.7 ± 0.3	0.9 ± 0.4
E4774	S1631	A	1.0 ± 0.1	1.0 ± 0.4
E4780	S1640	8.0 ± 3.0	1.2 ± 0.3	1.0 ± 0.4
E4780	S1660	A	1.0 ± 0.3	1.4 ± 0.5
E4780	S1700	A	0.7 ± 0.3	1.1 ± 0.5
E4780	S1720	A	0.9 ± 0.3	0.5 ± 0.4
E4790	S1650	A	1.3 ± 0.4	0.8 ± 0.5
E4790	S1670	A	2.7 ± 0.5	0.8 ± 0.5
E4790	S1690	A	0.9 ± 0.3	0.9 ± 0.4
E4790	S1710	A	0.9 ± 0.3	0.8 ± 0.4
E4790	S1730	A	1.4 ± 0.1	1.3 ± 0.2
E4794	S1612	12.4 ± 2.5	1.5 ± 0.1	1.7 ± 0.6
E4800	S1620	A	0.9 ± 0.3	1.0 ± 0.5
E4800	S1640	A	1.0 ± 0.3	0.9 ± 0.4
E4800	S1660	A	1.3 ± 0.4	1.4 ± 0.5
E4800	S1680	A	1.3 ± 0.3	0.6 ± 0.4
E4800	S1700	A	2.0 ± 0.4	1.1 ± 0.4
E4800	S1720	A	0.5 ± 0.2	0.5 ± 0.3
E4810	S1630	A	0.8 ± 0.3	1.1 ± 0.5
E4810	S1650	A	0.9 ± 0.3	1.4 ± 0.4
E4810	S1670	A	2.0 ± 0.1	1.3 ± 0.3
E4810	S1690	A	1.3 ± 0.4	0.5 ± 0.4
E4810	S1710	A	0.7 ± 0.4	0.8 ± 0.6
E4820	S1620	A	1.5 ± 0.4	1.8 ± 0.6
E4820	S1640	11.0 ± 5.0	2.2 ± 0.4	0.7 ± 0.4
E4820	S1660	A	1.2 ± 0.3	1.0 ± 0.4
E4820	S1680	A	0.7 ± 0.3	0.7 ± 0.4
E4820	S1700	A	0.6 ± 0.2	0.7 ± 0.3
E4830	S1630	A	5.5 ± 0.4	A
E4830	S1650	A	0.7 ± 0.2	0.6 ± 0.3
E4830	S1670	A	4.9 ± 0.6	A
E4840	S1606	A	1.4 ± 0.2	1.6 ± 0.5
E4840	S1640	A	0.8 ± 0.2	0.5 ± 0.2
E4840	S1680	A	0.6 ± 0.3	0.8 ± 0.4
E4850	S1670	A	1.0 ± 0.3	0.9 ± 0.4
E4856	S1603	A	2.1 ± 0.2	1.6 ± 0.5

TABLE 8

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E4860	S1600	A	1.1 ± 0.4	1.4 ± 0.5
E4870	S1590	8.0 ± 3.0	6.7 ± 0.9	A
E4870	S1610	A	8.0 ± 0.8	0.9 ± 0.5
E4870	S1660	A	0.8 ± 0.3	1.3 ± 0.4
E4880	S1600	9.0 ± 4.0	7.2 ± 0.9	1.2 ± 0.6
E4880	S1620	A	1.1 ± 0.3	0.9 ± 0.3
E4880	S1640	A	3.1 ± 0.3	A
E4890	S1590	A	4.1 ± 0.7	1.6 ± 0.6
E4890	S1610	A	0.4 ± 0.3	0.6 ± 0.5
E4890	S1650	A	1.2 ± 0.3	0.8 ± 0.4
E4900	S1580	A	17.0 ± 2.0	1.5 ± 1.1
E4900	S1600	A	1.8 ± 0.4	1.1 ± 0.4
E4900	S1640	A	1.1 ± 0.4	1.4 ± 0.5
E4910	S1590	A	7.3 ± 0.9	0.8 ± 0.5
E4910	S1630	A	2.3 ± 0.4	1.2 ± 0.4
E4910	S1650	A	1.2 ± 0.4	1.2 ± 0.6
E4914	S1558	3.8 ± 2.0	1.8 ± 0.2	1.3 ± 0.4
E4920	S1580	A	2.1 ± 0.6	A
E4930	S1570	A	0.8 ± 0.5	1.3 ± 0.6
E4930	S1590	A	2.3 ± 0.5	1.3 ± 0.5
E4940	S1580	A	1.2 ± 0.7	1.5 ± 0.9
E4940	S1620	A	0.9 ± 0.3	0.7 ± 0.5
E4950	S1550	A	0.9 ± 0.5	A
E4950	S1570	35.0 ± 7.0	1.2 ± 0.4	0.9 ± 0.6
E4950	S1590	A	0.8 ± 0.3	1.1 ± 0.6
E4950	S1610	9.0 ± 4.0	0.8 ± 0.3	1.6 ± 0.4
E4960	S1560	A	3.1 ± 0.6	1.3 ± 0.6
E4960	S1580	7.0 ± 3.0	1.1 ± 0.4	0.6 ± 0.5
E4960	S1600	A	1.0 ± 0.3	1.2 ± 0.4
E4970	S1570	238.0 ±14.0	1.3 ± 0.3	0.6 ± 0.4
E4970	S1590	A	1.0 ± 0.3	0.9 ± 0.5
E4980	S1560	A	1.3 ± 0.4	A
E4980	S1580	A	0.8 ± 0.4	1.0 ± 0.4
E4990	S1570	A	1.1 ± 0.4	1.6 ± 0.6
E4990	S1590	A	2.9 ± 0.4	0.7 ± 0.4
E5000	S1580	A	8.8 ± 0.7	A
E5010	S1570	A	1.3 ± 0.4	1.0 ± 0.5

'A' denotes less than detectable activity.

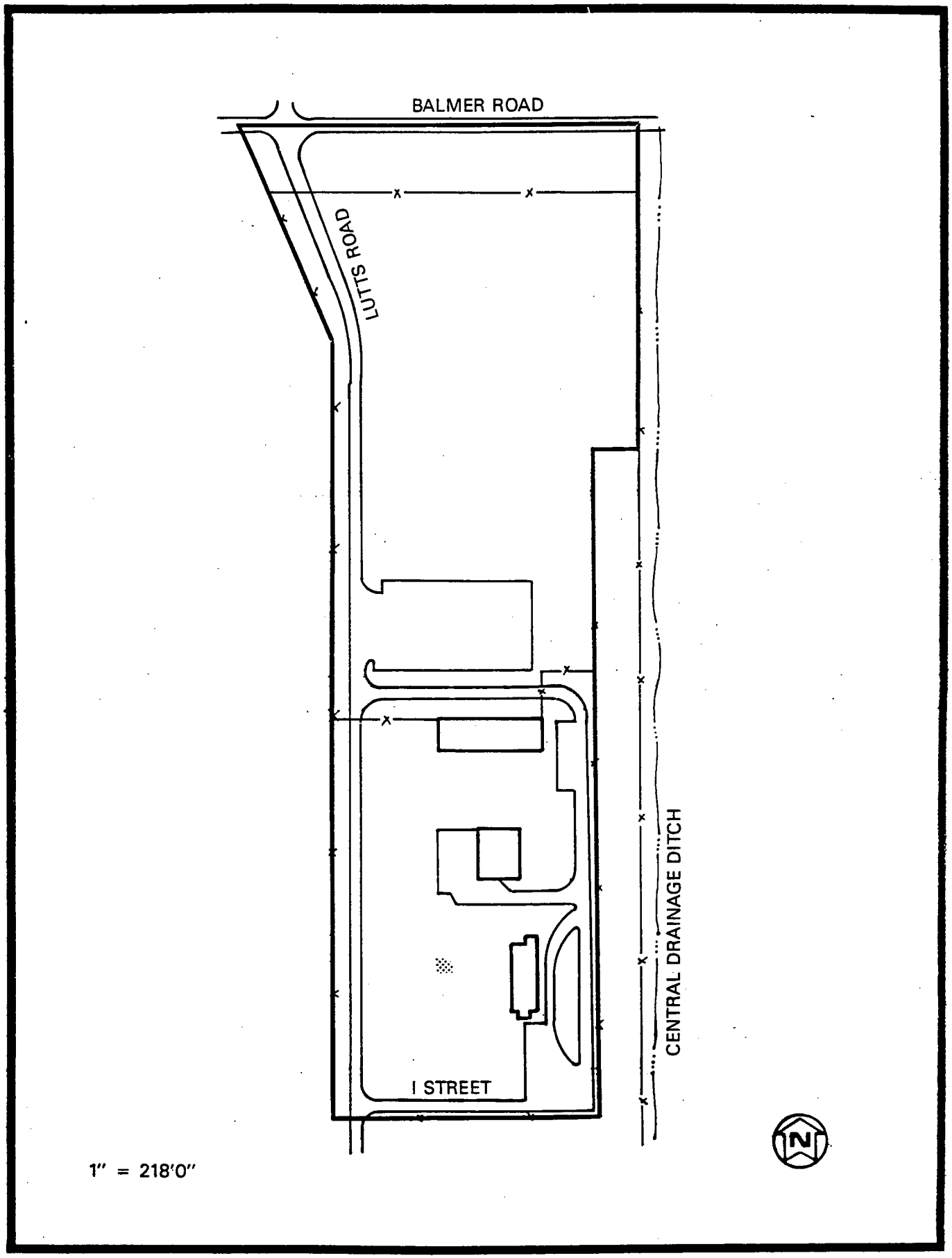


FIGURE 30 EXCAVATED AREA ON PROPERTY P

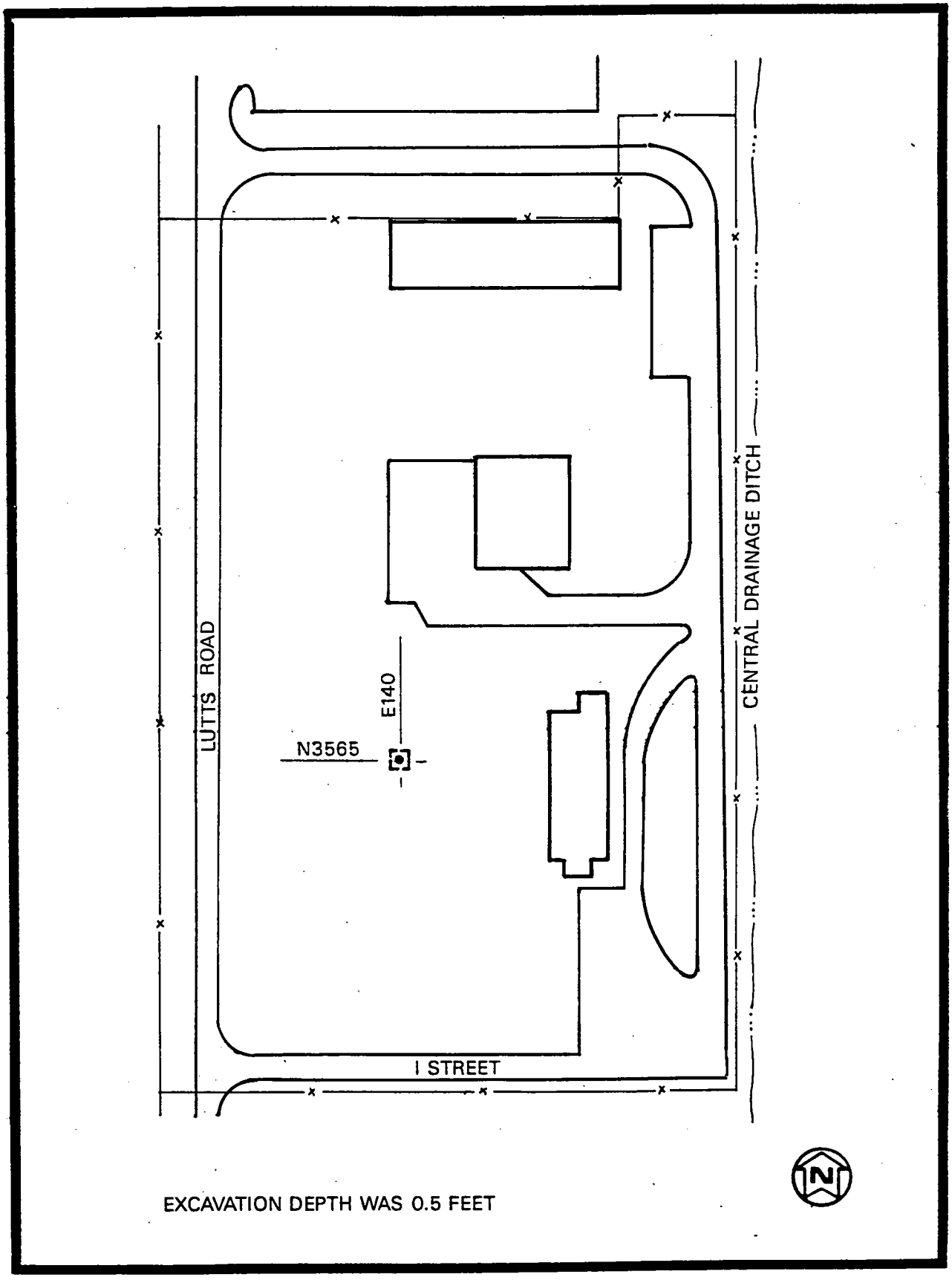


FIGURE 31 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY P

TABLE 9

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY P

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E0140	N3565	A	0.8 ± 0.3	1.9 ± 1.2

'A' denotes less than detectable activity.

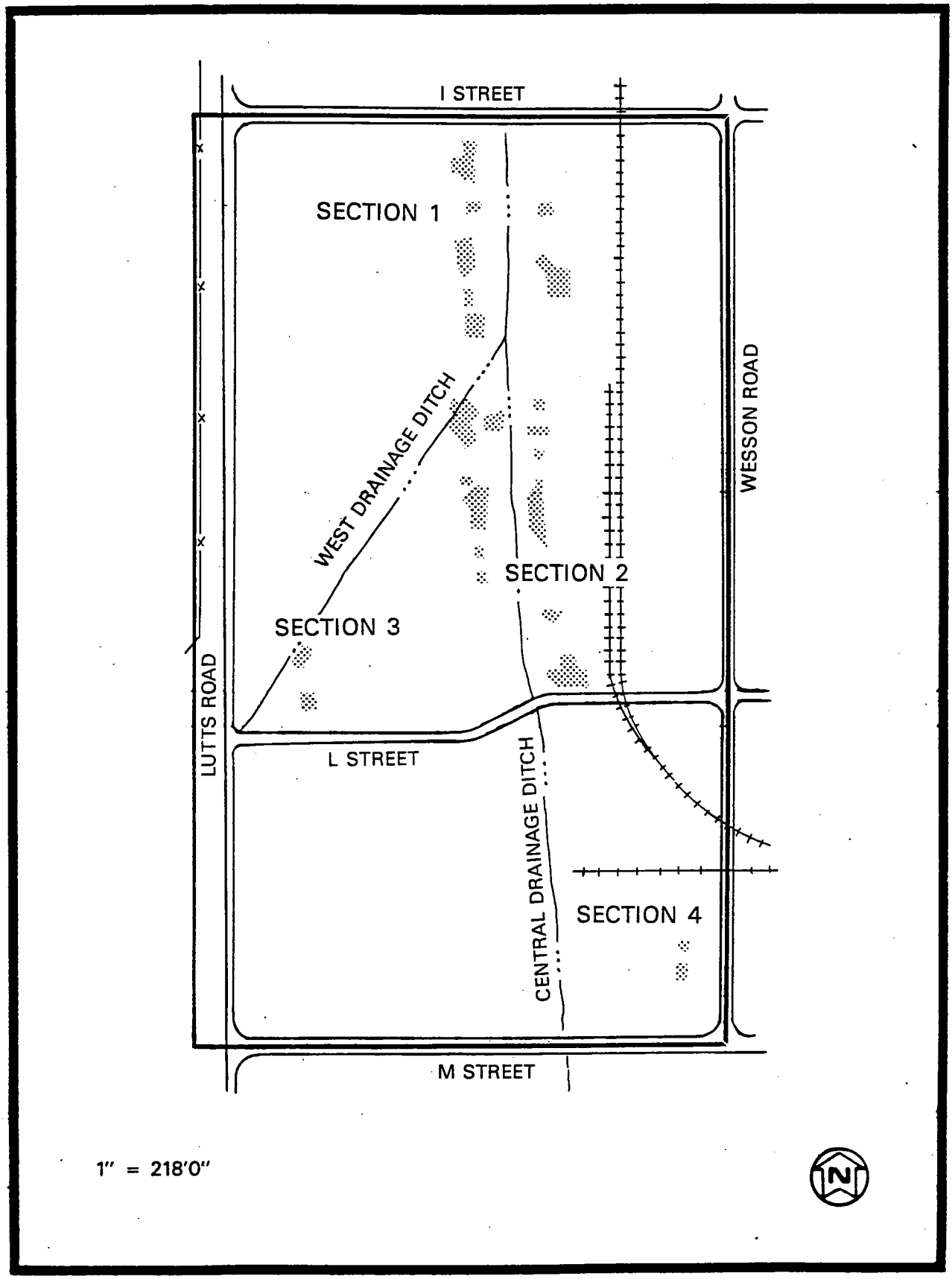


FIGURE 32 EXCAVATED AREAS ON PROPERTY T

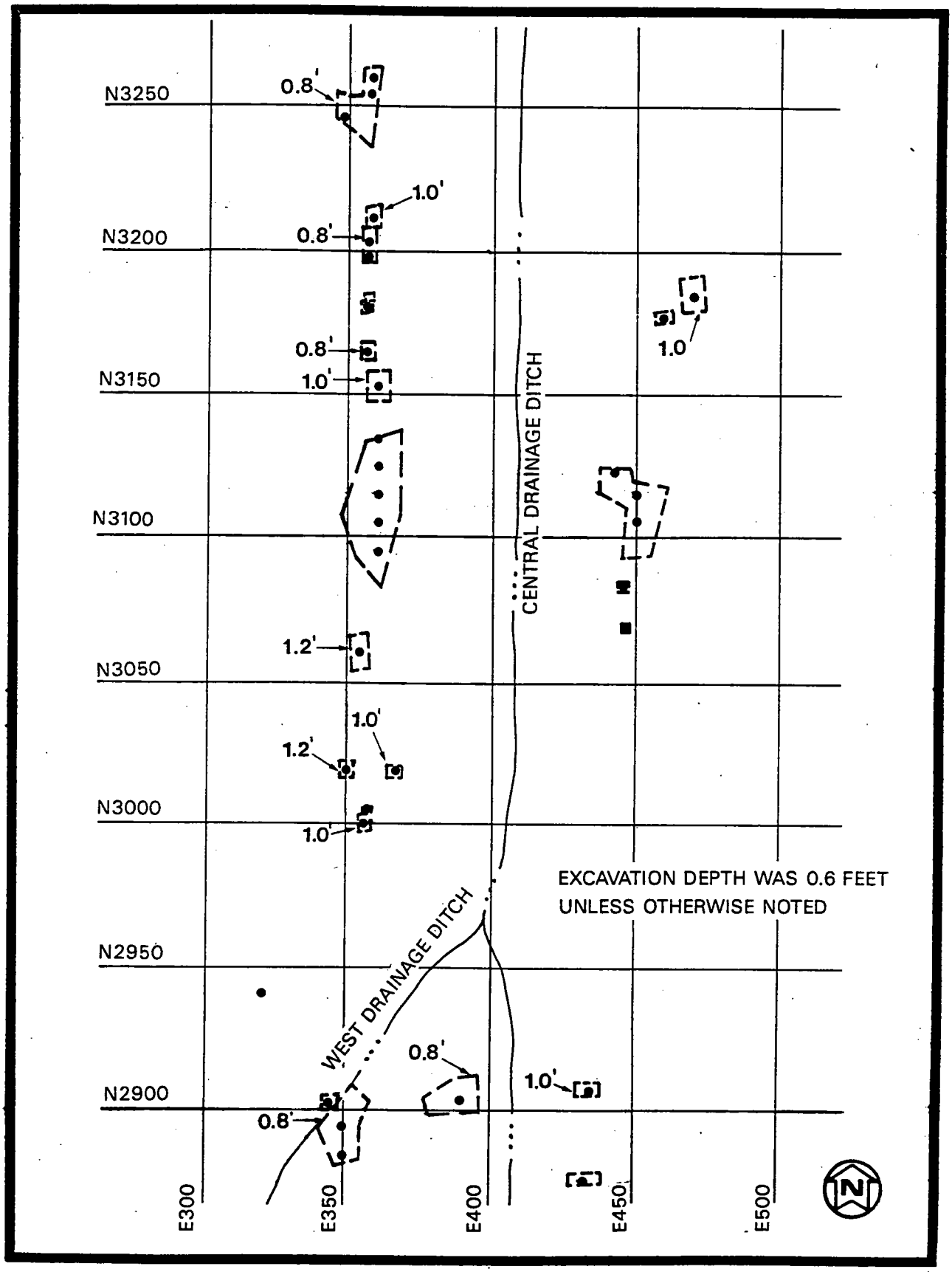


FIGURE 33 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY T - SECTION 1

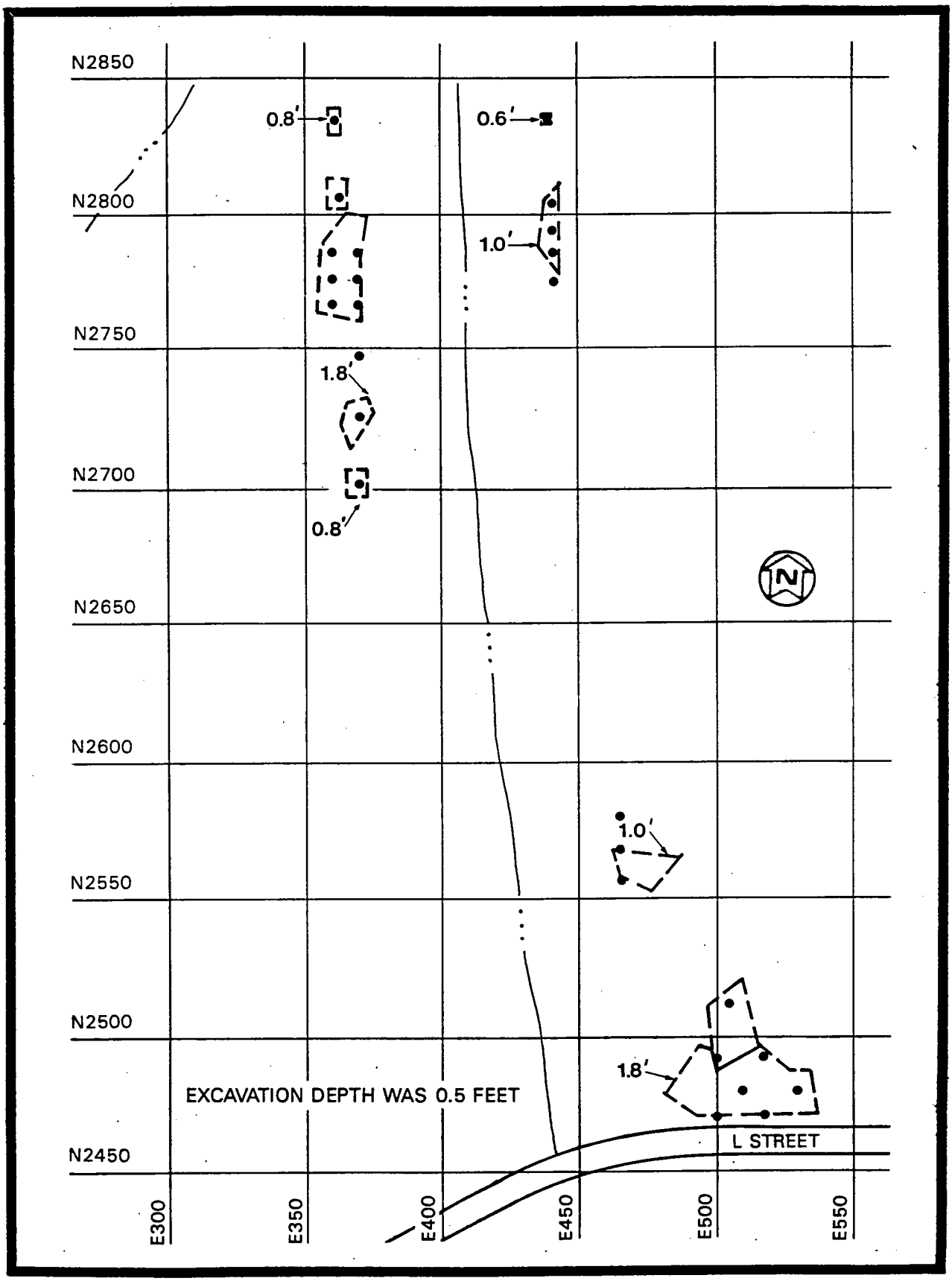


FIGURE 34 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY T - SECTION 2

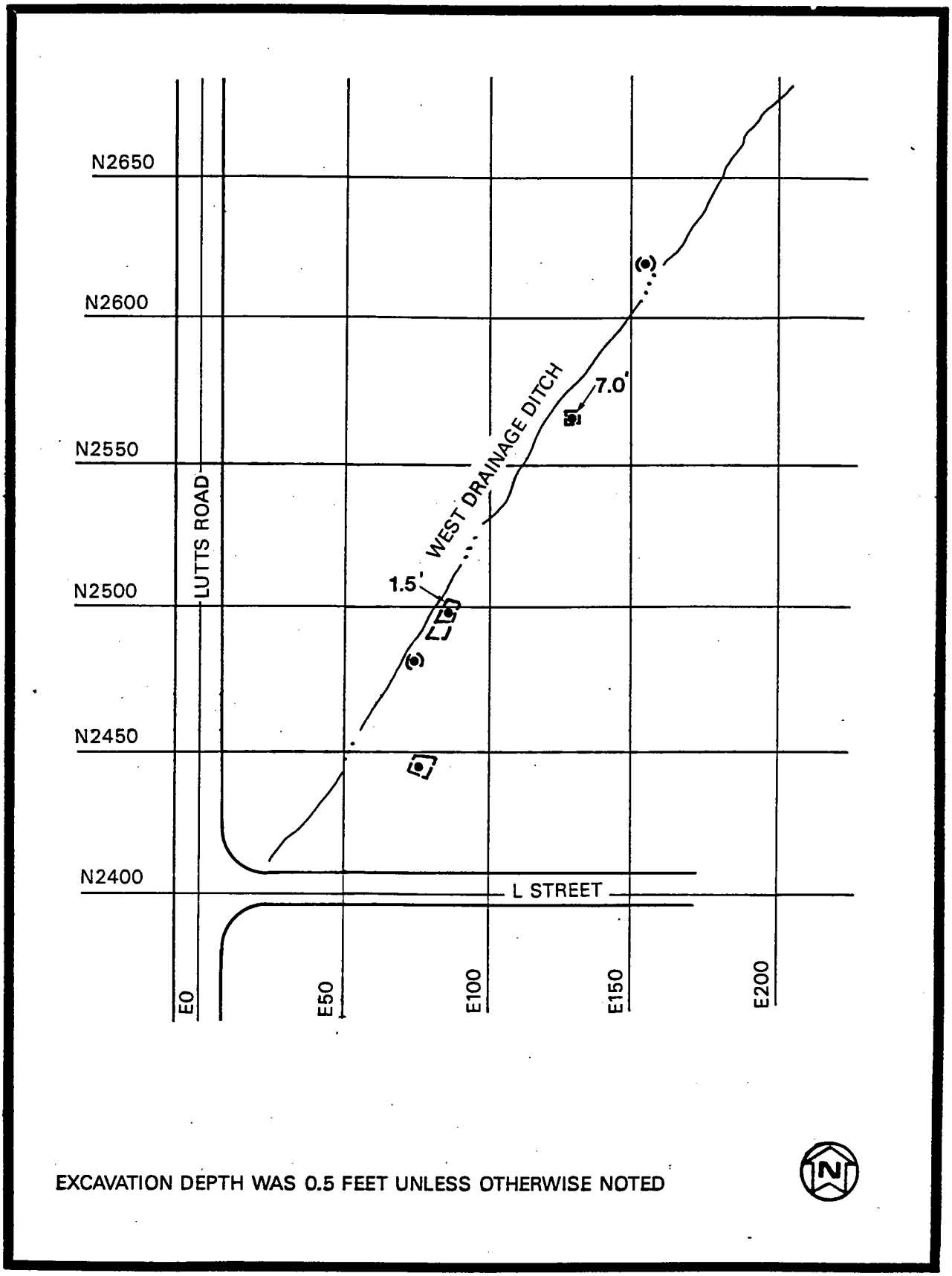
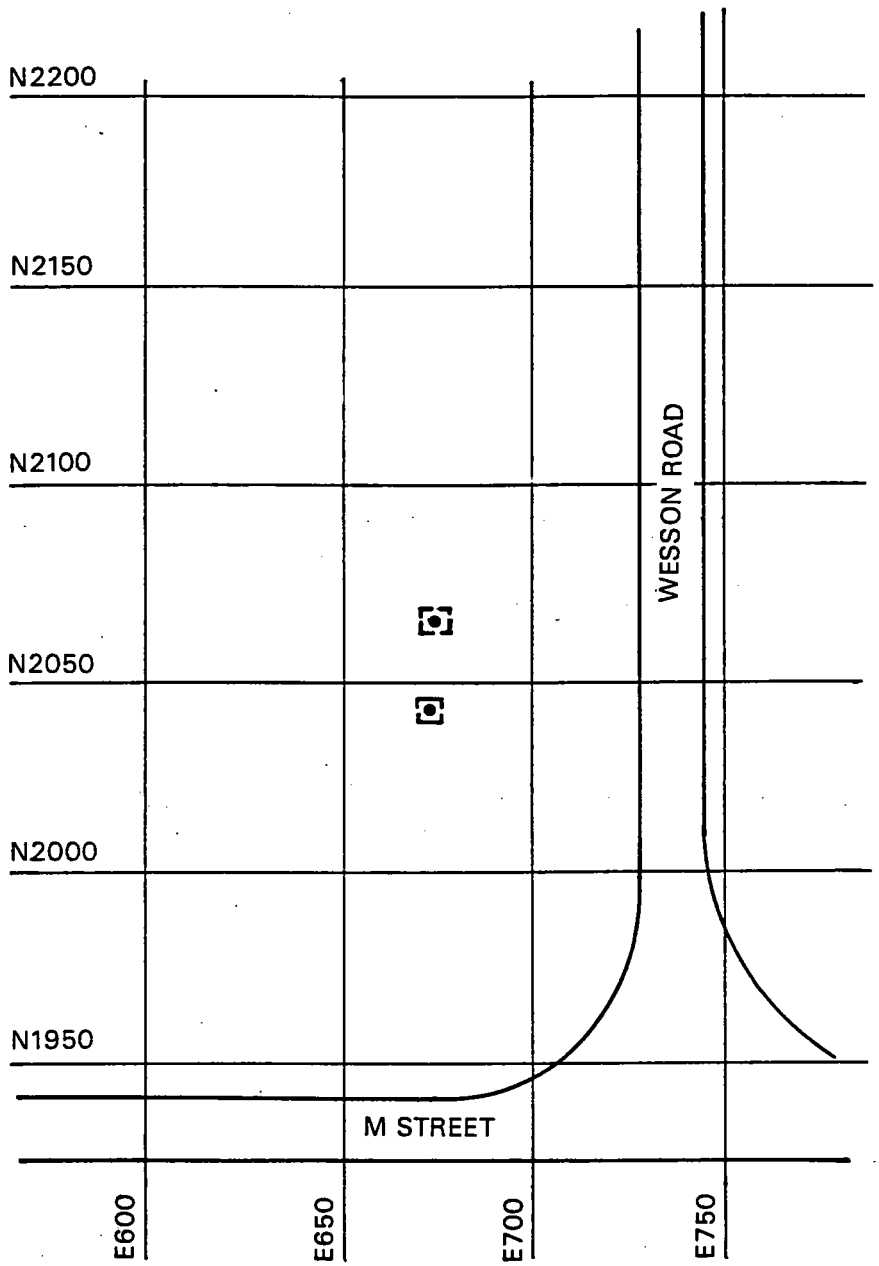


FIGURE 35 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY T - SECTION 3



EXCAVATION DEPTH WAS 0.5 FEET

FIGURE 36 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY T - SECTION 4

TABLE 10

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY T

Page 1 of 2

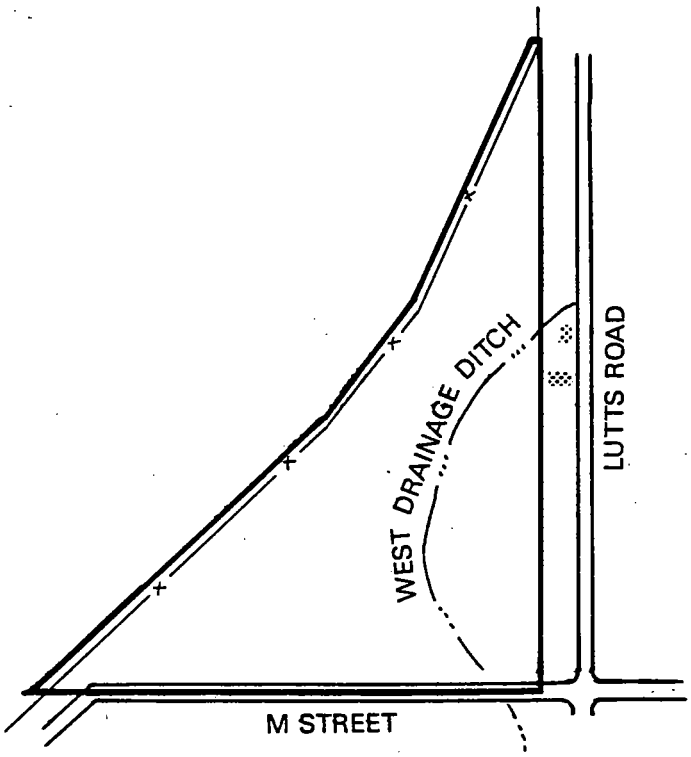
Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E0077	N2445	A	1.2 ± 0.3	0.7 ± 0.4
E0077	N2485	A	0.9 ± 0.3	0.6 ± 0.4
E0088	N2502	A	3.1 ± 0.5	2.0 ± 0.8
E0129	N2567	A	4.4 ± 0.4	A
E0153	N2620	A	0.9 ± 0.5	0.8 ± 0.8
E0320	N2940	A	1.0 ± 0.1	0.9 ± 0.2
E0335	N3007	A	1.0 ± 0.1	1.3 ± 0.2
E0345	N2906	A	3.9 ± 0.2	0.9 ± 0.2
E0347	N3247	A	1.0 ± 0.1	1.3 ± 0.2
E0350	N3022	A	0.8 ± 0.1	0.8 ± 0.2
E0351	N3187	7.0 ± 1.5	1.1 ± 0.1	0.9 ± 0.2
E0352	N3205	A	0.9 ± 0.1	1.4 ± 0.2
E0354	N3059	A	1.1 ± 0.1	1.5 ± 0.3
E0356	N3196	A	4.4 ± 0.2	1.3 ± 0.3
E0357	N2880	A	3.7 ± 0.2	1.1 ± 0.2
E0357	N2890	A	1.5 ± 0.1	1.2 ± 0.3
E0357	N3002	A	1.2 ± 0.1	1.1 ± 0.2
E0357	N3213	A	3.1 ± 0.2	1.4 ± 0.4
E0357	N3256	A	5.3 ± 0.4	A
E0357	N3262	A	4.9 ± 0.3	1.5 ± 0.3
E0360	N2765	A	7.8 ± 0.3	1.3 ± 0.3
E0360	N2775	A	2.4 ± 0.2	1.2 ± 0.2
E0360	N2785	A	1.4 ± 0.1	1.8 ± 0.2
E0360	N3095	A	5.4 ± 0.3	1.5 ± 0.4
E0360	N3105	A	2.9 ± 0.2	1.2 ± 0.2
E0360	N3115	A	2.9 ± 0.3	1.7 ± 0.4
E0360	N3125	A	0.9 ± 0.2	1.1 ± 0.2
E0360	N3135	A	1.1 ± 0.5	1.7 ± 0.4
E0360	N3152	A	1.3 ± 0.1	0.8 ± 0.2
E0364	N2807	A	2.1 ± 0.2	0.9 ± 0.2
E0364	N3164	A	1.0 ± 0.1	1.6 ± 0.3
E0365	N3021	A	0.9 ± 0.1	1.0 ± 0.2
E0366	N2835	A	5.1 ± 0.2	0.8 ± 0.2
E0370	N2703	A	1.0 ± 0.1	1.1 ± 0.1
E0370	N2725	A	1.0 ± 0.1	1.0 ± 0.1
E0370	N2747	A	0.8 ± 0.1	1.2 ± 0.2
E0370	N2765	A	8.1 ± 0.3	1.3 ± 0.3
E0370	N2775	A	1.0 ± 0.1	1.0 ± 0.2
E0370	N2785	A	1.0 ± 0.1	1.1 ± 0.3
E0390	N2905	A	5.2 ± 0.2	0.7 ± 0.2
E0430	N2877	A	5.3 ± 0.2	1.2 ± 0.2
E0431	N2910	A	2.9 ± 0.2	0.9 ± 0.2
E0438	N2833	5.5 ± 2.9	8.0 ± 0.4	1.2 ± 0.3

TABLE 10

(continued)

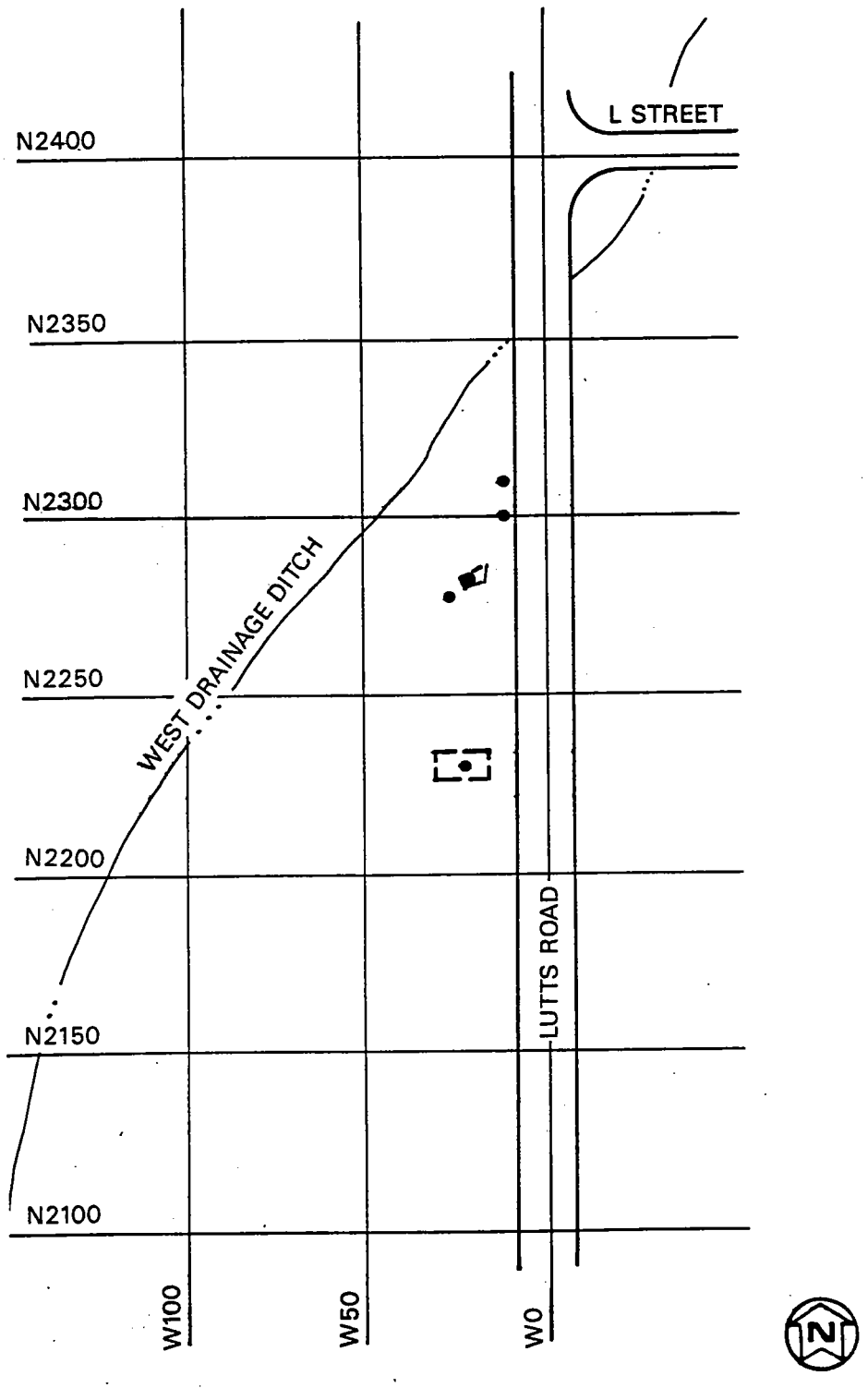
Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E0440	N2775	4.9 ± 1.6	1.6 ± 0.2	0.9 ± 0.2
E0440	N2785	A	7.5 ± 0.3	1.8 ± 0.3
E0440	N2795	A	1.2 ± 0.1	1.4 ± 0.2
E0440	N2805	A	7.4 ± 0.1	0.8 ± 0.2
E0445	N3070	6.5 ± 3.1	1.1 ± 0.3	1.0 ± 0.2
E0445	N3125	A	0.7 ± 0.1	0.9 ± 0.1
E0446	N3084	2.8 ± 1.4	1.0 ± 0.1	1.4 ± 0.2
E0450	N3105	1.3 ± 1.5	1.4 ± 0.1	1.0 ± 0.2
E0450	N3115	A	2.2 ± 0.2	1.4 ± 0.3
E0458	N3179	A	0.8 ± 0.1	1.2 ± 0.2
E0465	N2560	A	4.4 ± 0.2	1.4 ± 0.2
E0465	N2570	A	3.9 ± 0.2	1.5 ± 0.3
E0465	N2580	A	2.4 ± 0.2	1.1 ± 0.1
E0469	N3182	A	6.9 ± 0.3	1.6 ± 0.2
E0500	N2470	7.5 ± 1.4	1.5 ± 0.1	A
E0500	N2490	A	0.9 ± 0.1	1.4 ± 0.2
E0505	N2510	A	1.1 ± 0.1	1.1 ± 0.2
E0510	N2480	A	0.8 ± 0.1	1.3 ± 0.2
E0520	N2470	A	1.0 ± 0.1	1.2 ± 0.2
E0520	N2493	5.3 ± 1.5	1.3 ± 0.1	1.0 ± 0.2
E0530	N2480	A	1.0 ± 0.1	1.3 ± 0.2
E0674	N2044	A	0.7 ± 0.3	1.0 ± 0.5
E0674	N2071	A	1.2 ± 0.4	A

'A' denotes less than detectable activity.



1" = 195'0"

FIGURE 37 EXCAVATED AREAS ON PROPERTY W



EXCAVATION DEPTH WAS 0.5 FEET

FIGURE 38 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PROPERTY W

TABLE 11

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PROPERTY W

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
W0010	N2300	A	4.3 ± 0.2	1.0 ± 0.2
W0010	N2310	A	1.2 ± 0.1	1.7 ± 0.2
W0021	N2280	3.6 ± 1.3	1.0 ± 0.1	1.5 ± 0.2
W0022	N2230	A	1.8 ± 0.4	2.0 ± 0.4
W0026	N2277	A	4.1 ± 0.2	0.8 ± 0.2

'A' denotes less than detectable activity.

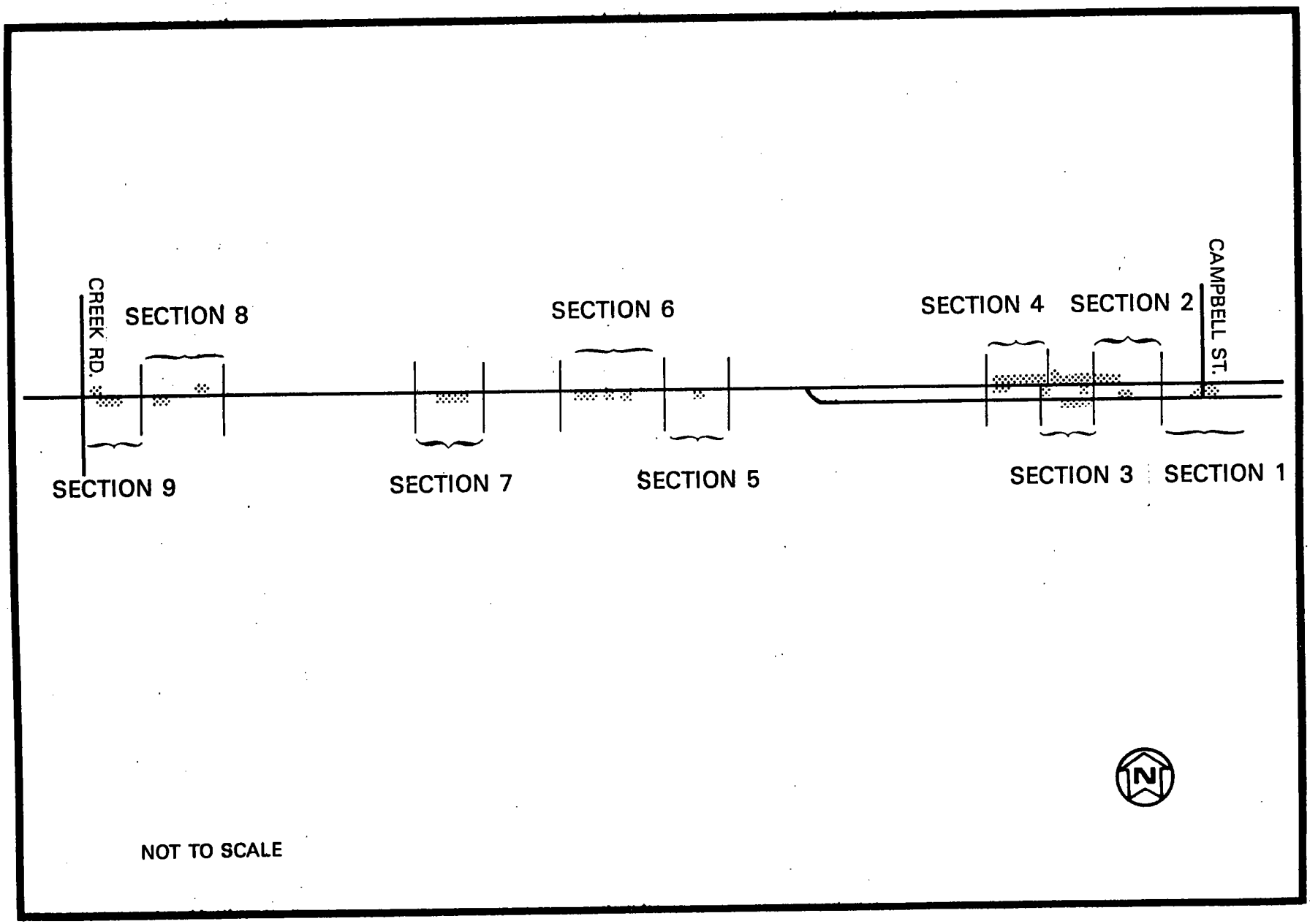
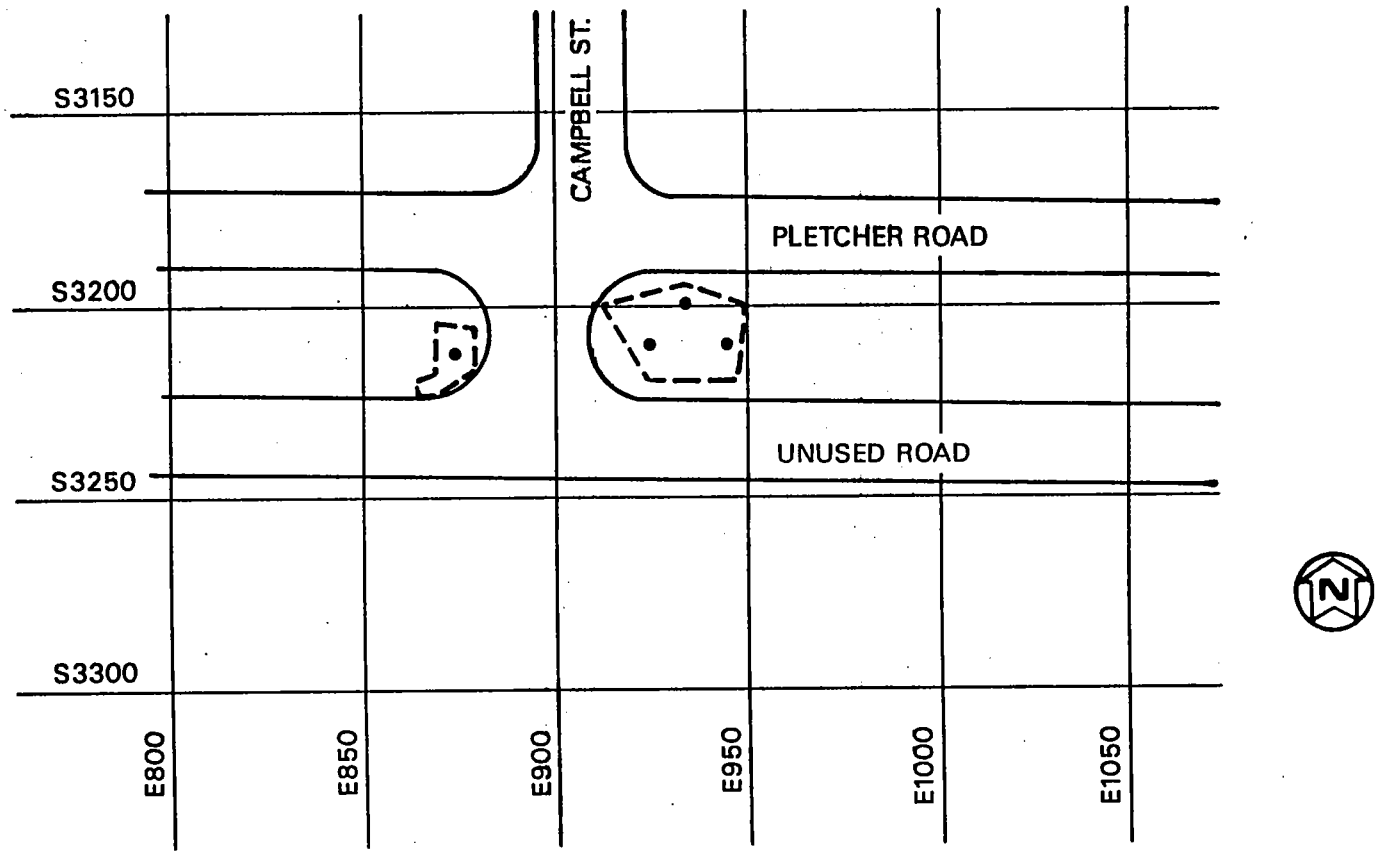


FIGURE 39 EXCAVATED AREAS ON PLETCHER ROAD



EXCAVATION DEPTH WAS 0.5 FEET

FIGURE 40 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 1

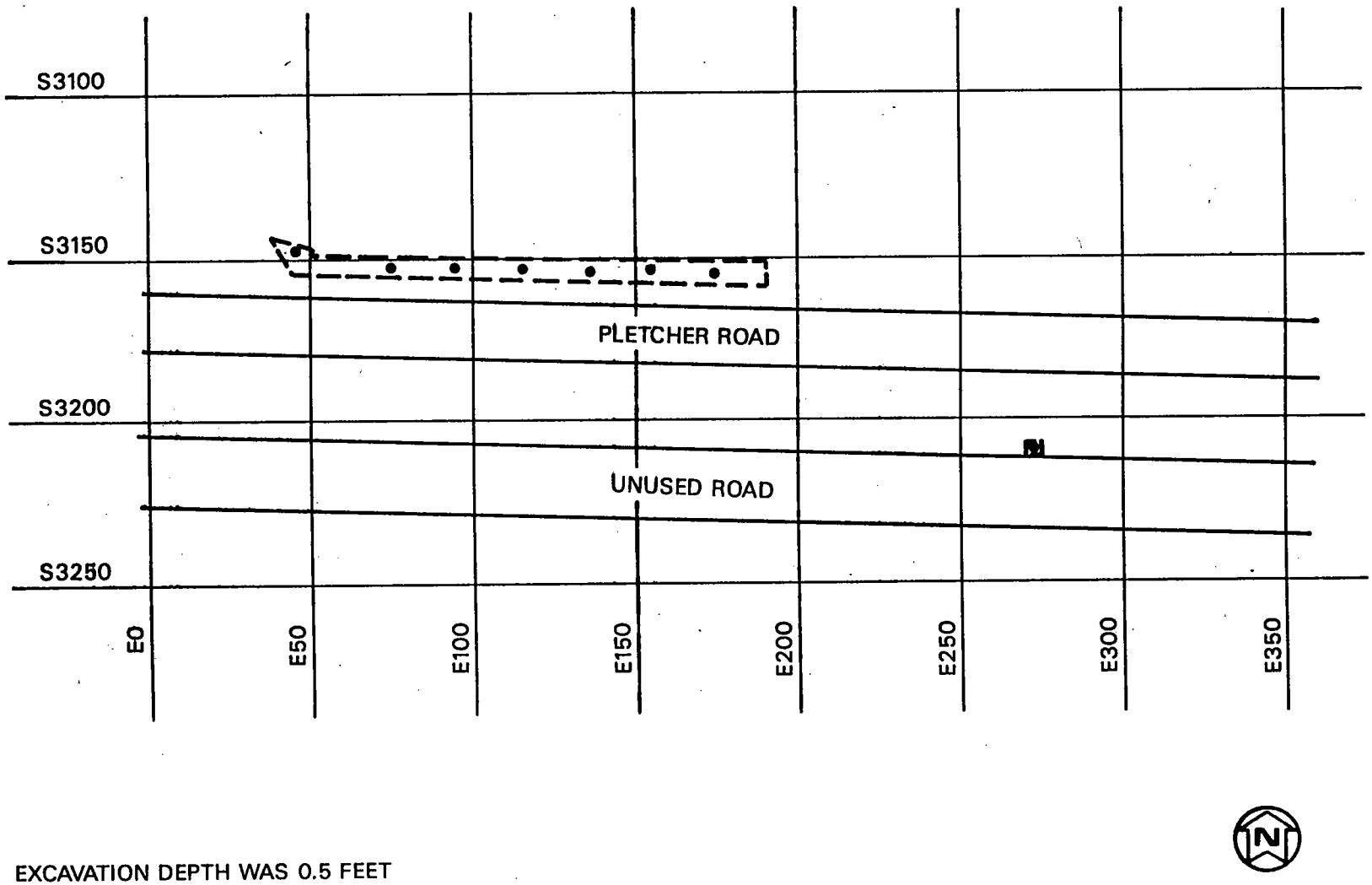


FIGURE 41 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 2

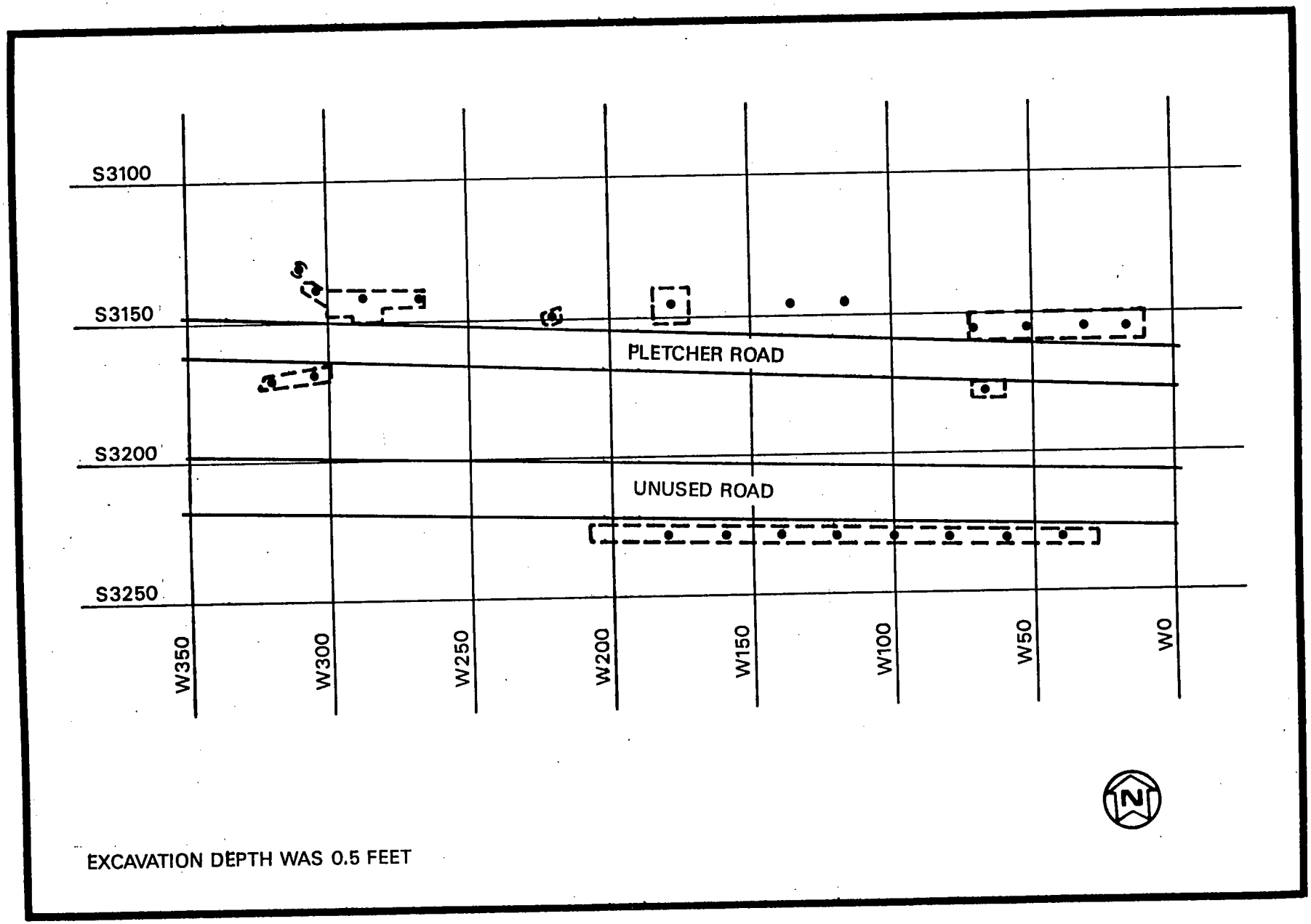


FIGURE 42 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 3

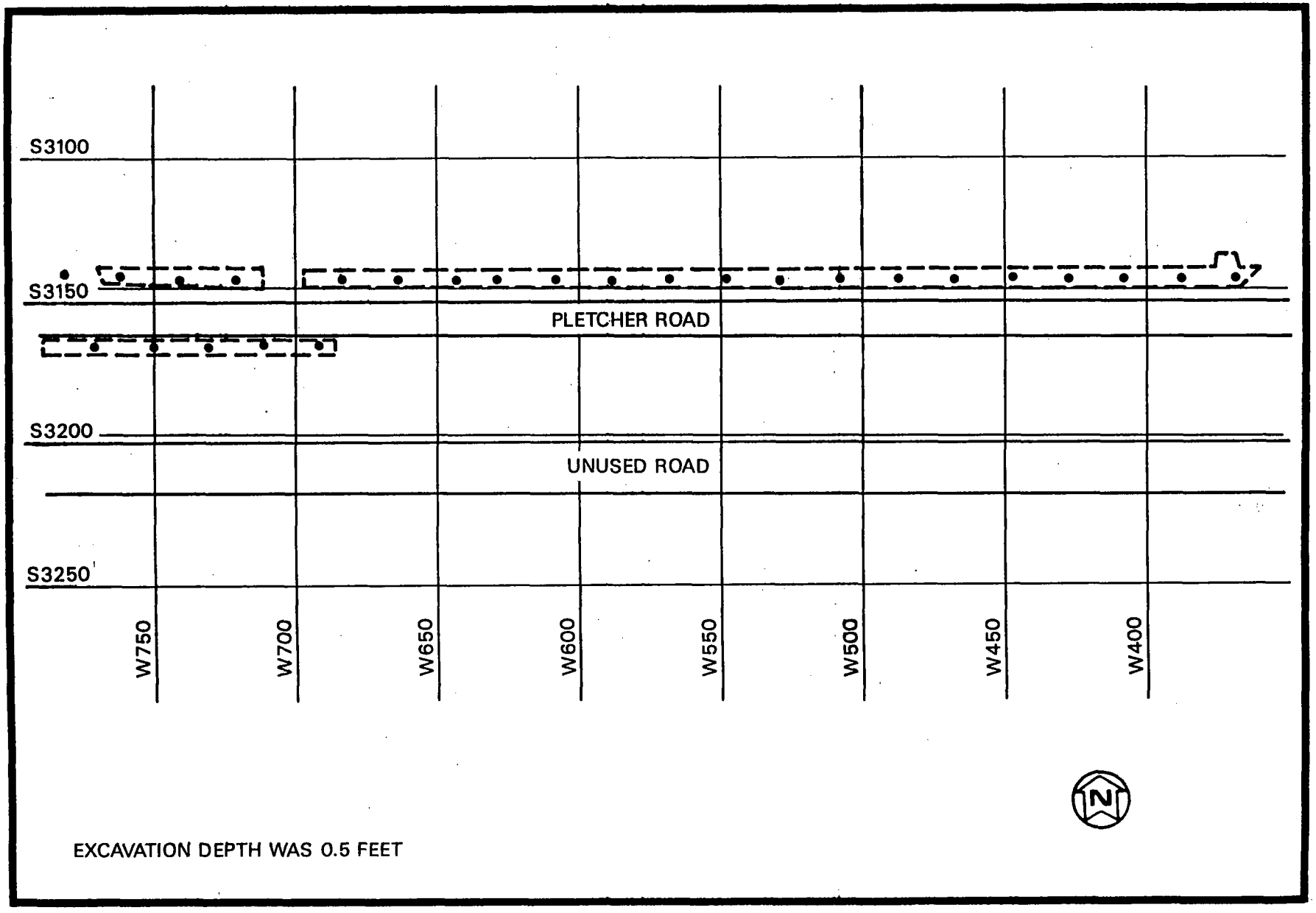


FIGURE 43 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 4

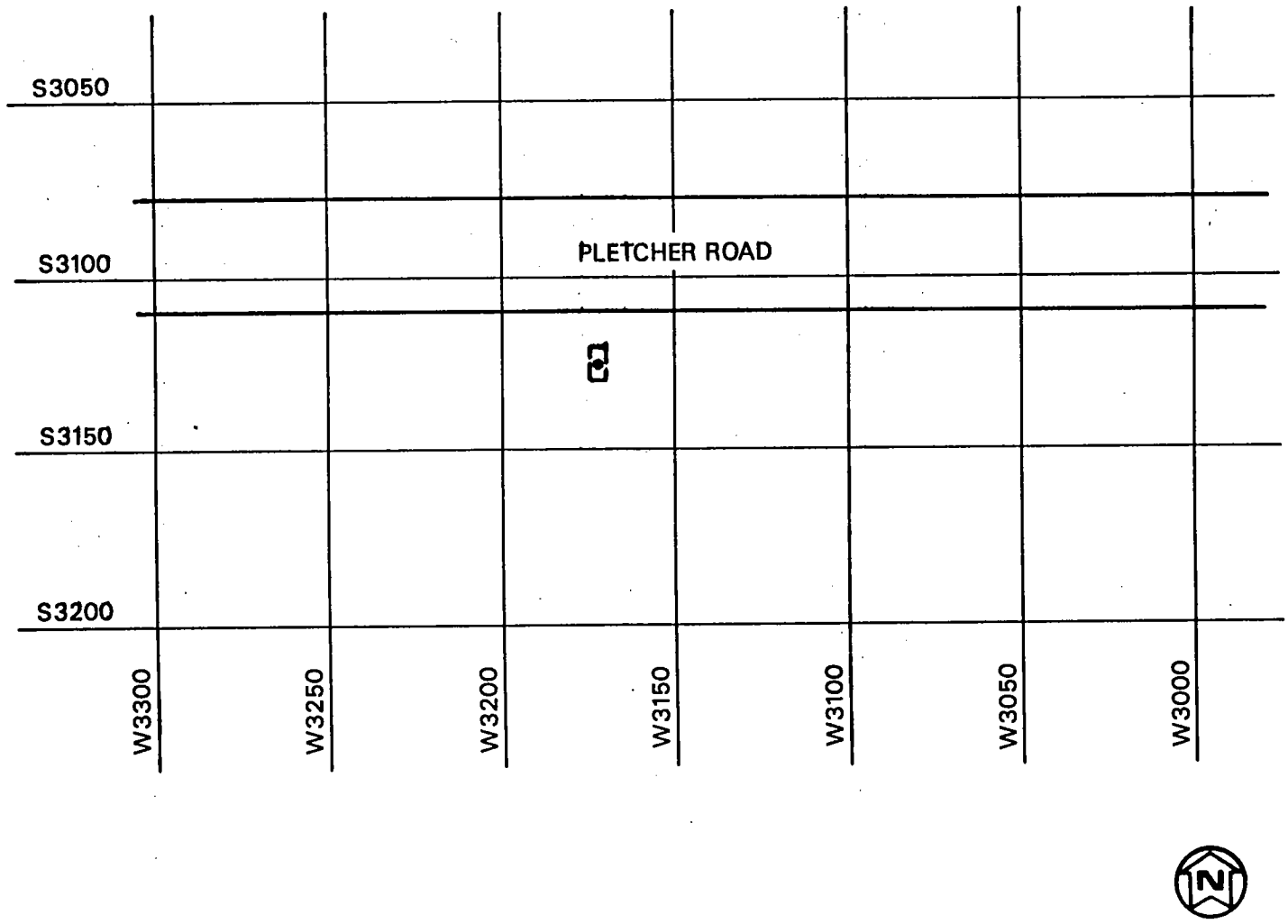


FIGURE 44 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 5

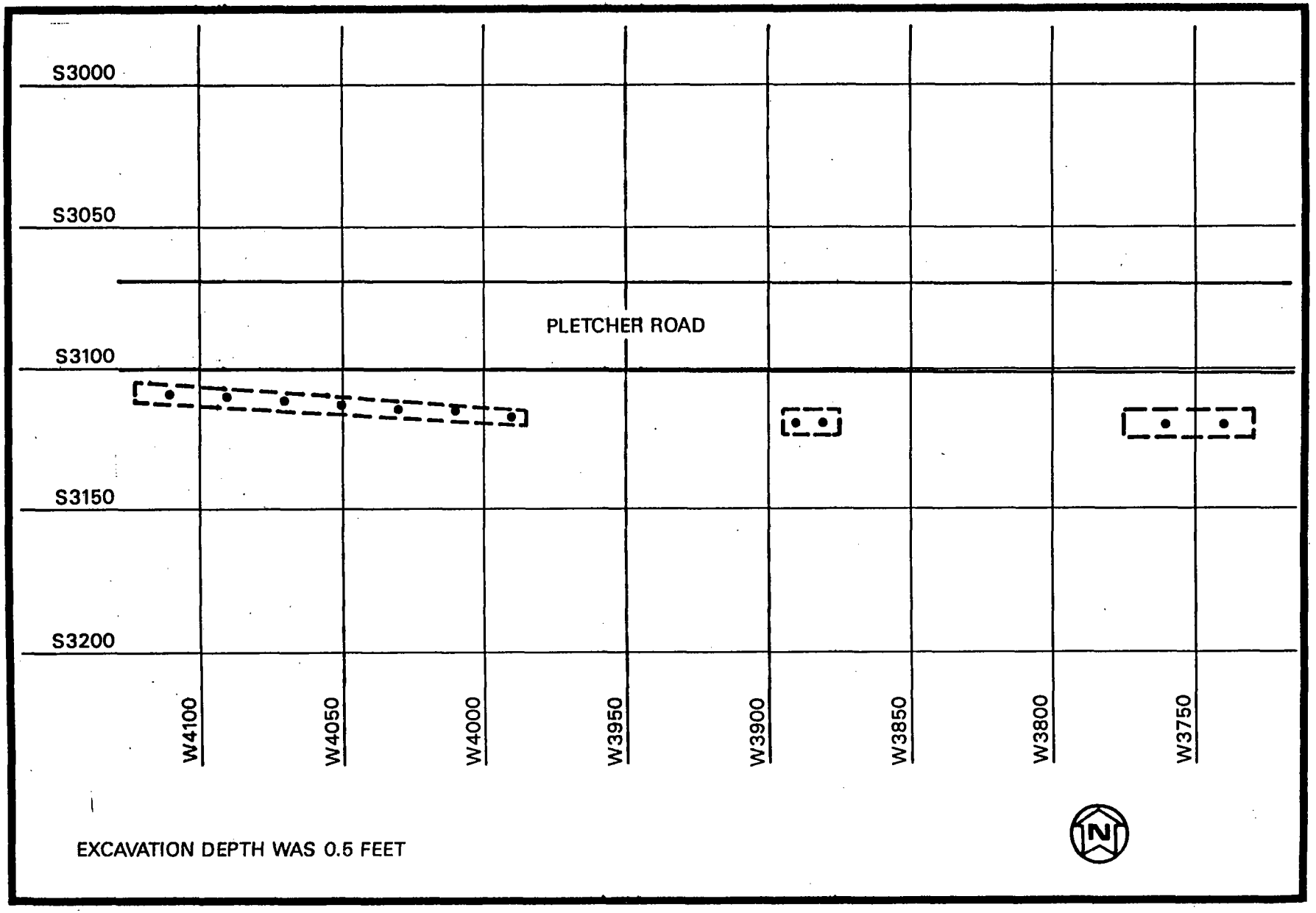


FIGURE 45 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 6

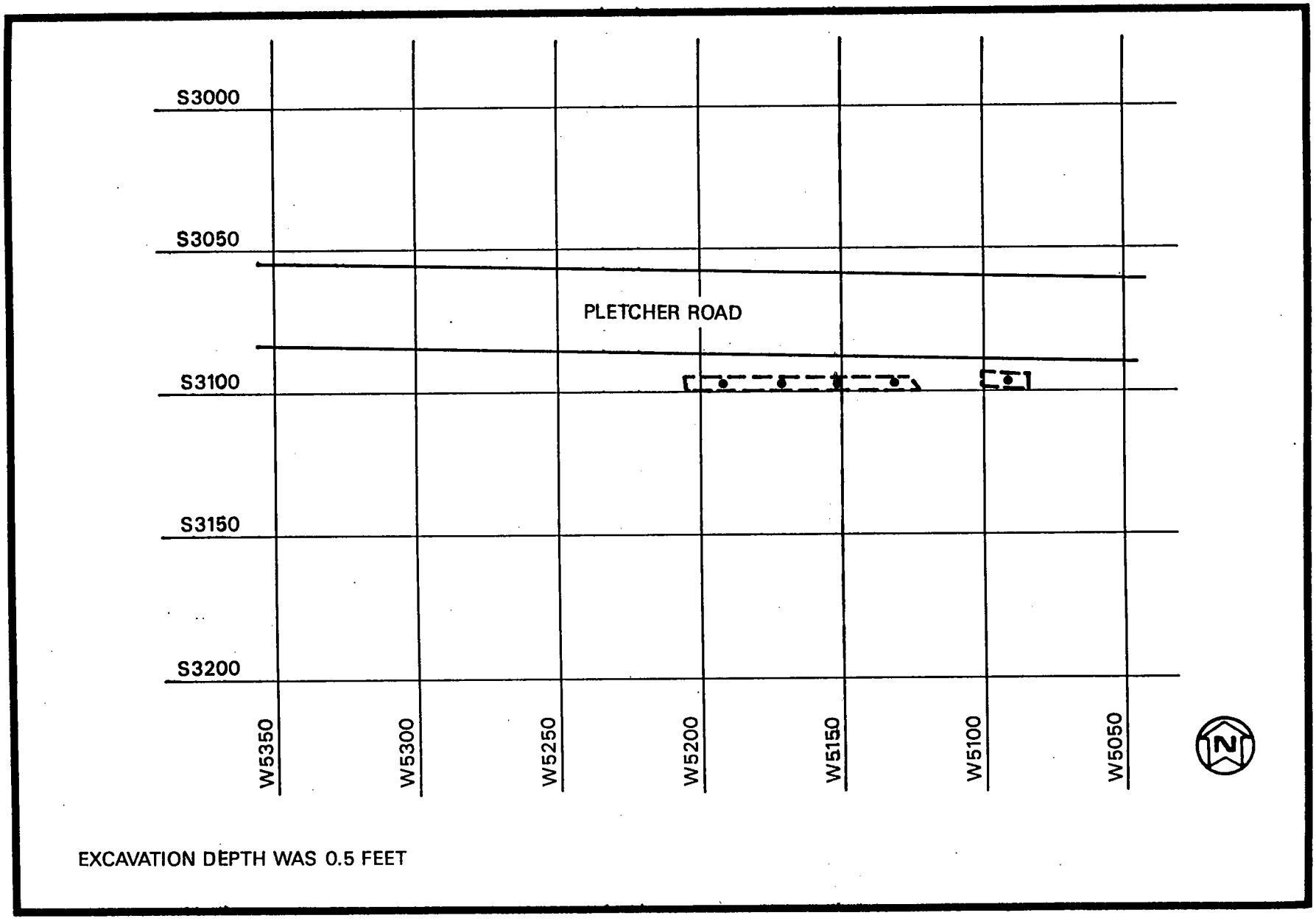


FIGURE 46 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 7

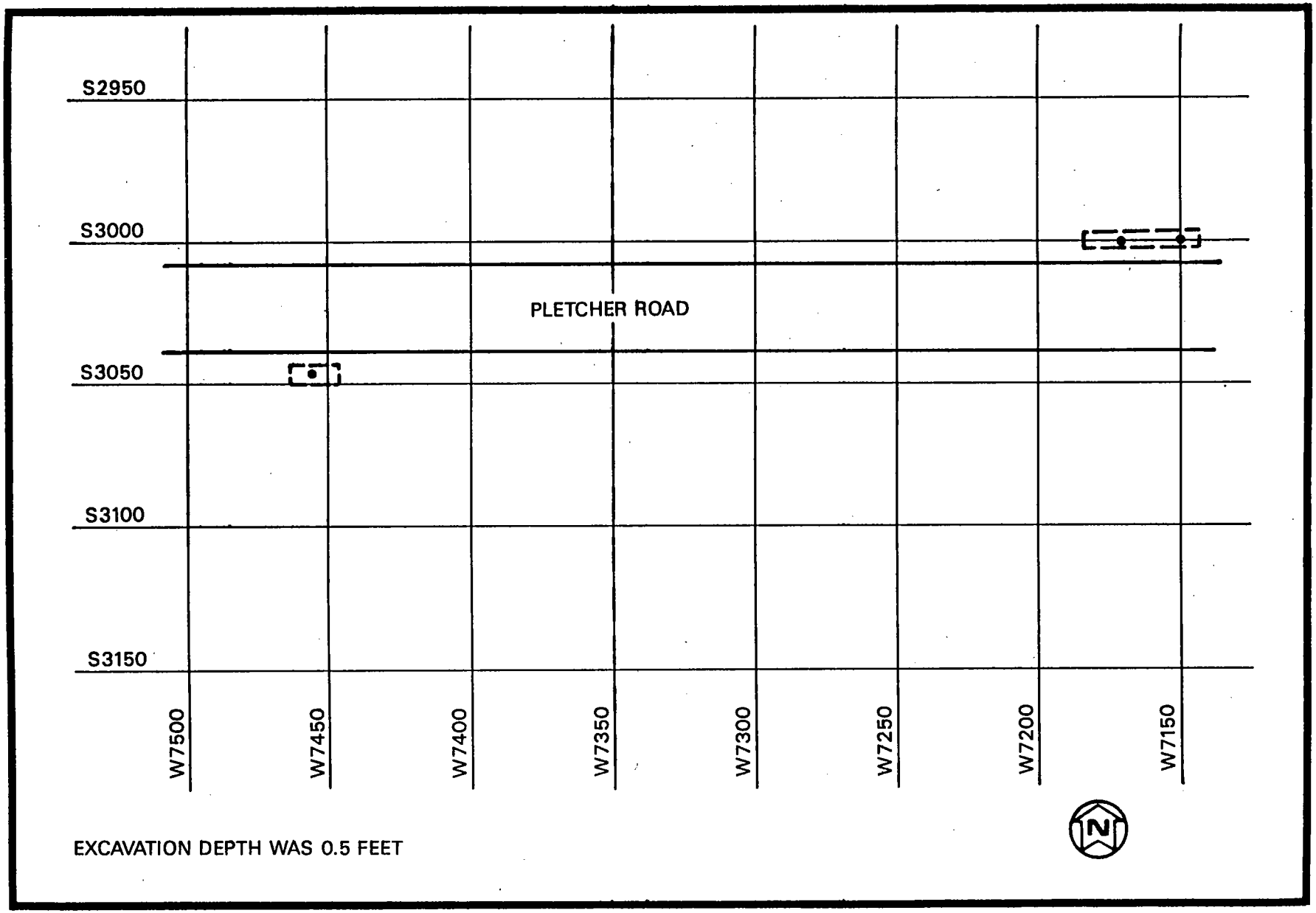


FIGURE 47 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 8

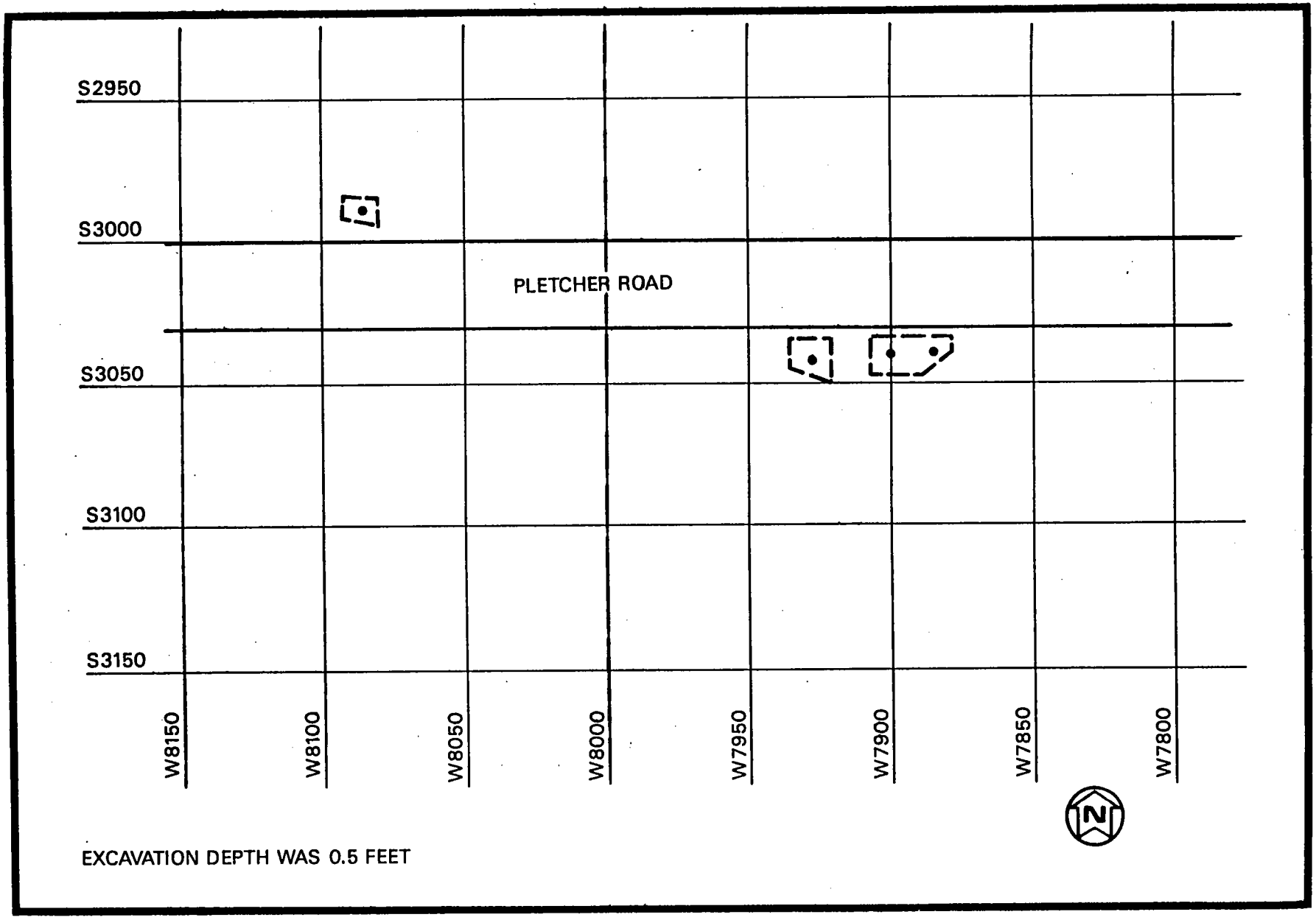


FIGURE 48 POST-REMEDIAL ACTION SAMPLING LOCATIONS ON PLETCHER ROAD - SECTION 9

TABLE 12

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR PLETCHER ROAD

Page 1 of 2

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
E0046	S3142	A	8.4 ± 0.3	1.2 ± 0.2
E0076	S3148	A	9.3 ± 0.3	1.0 ± 0.3
E0096	S3148	A	8.3 ± 0.3	A
E0116	S3148	A	4.7 ± 0.8	A
E0136	S3148	A	4.3 ± 0.8	A
E0156	S3148	A	5.3 ± 0.3	1.8 ± 0.3
E0176	S3148	A	4.7 ± 0.2	1.1 ± 0.2
E0273	S3209	A	5.0 ± 0.8	2.4 ± 0.9
E0864	S3211	A	12.1 ± 0.3	0.9 ± 0.2
E0930	S3210	A	10.3 ± 0.4	1.4 ± 0.4
E0940	S3200	A	6.6 ± 0.3	1.5 ± 0.3
E0950	S3210	A	12.7 ± 0.4	1.3 ± 0.3
W0032	S3146	A	0.9 ± 0.1	0.8 ± 0.2
W0040	S3228	A	1.8 ± 0.2	1.7 ± 0.3
W0060	S3228	4.0 ± 2.6	1.5 ± 0.2	1.2 ± 0.2
W0062	S3175	A	3.1 ± 0.2	1.2 ± 0.2
W0072	S3146	A	3.3 ± 0.1	1.3 ± 0.2
W0080	S3228	6.1 ± 2.4	5.3 ± 0.3	1.7 ± 0.5
W0092	S3146	A	3.5 ± 0.1	0.9 ± 0.2
W0100	S3228	A	4.0 ± 0.3	1.4 ± 0.3
W0112	S3146	A	3.3 ± 0.1	1.3 ± 0.2
W0116	S3148	A	2.8 ± 0.1	0.9 ± 0.2
W0120	S3228	A	2.9 ± 0.2	1.9 ± 0.3
W0136	S3148	A	6.5 ± 0.2	1.0 ± 0.2
W0140	S3228	A	6.3 ± 0.3	1.0 ± 0.3
W0160	S3228	A	1.8 ± 0.2	1.2 ± 0.3
W0175	S3145	A	6.7 ± 0.3	1.2 ± 0.2
W0180	S3228	A	1.4 ± 0.2	1.6 ± 0.3
W0228	S3149	A	7.8 ± 0.3	1.2 ± 0.2
W0265	S3140	A	1.2 ± 0.2	0.6 ± 0.2
W0285	S3140	A	0.7 ± 0.1	0.7 ± 0.2
W0305	S3140	A	11.7 ± 0.8	A
W0305	S3172	A	3.0 ± 0.2	1.3 ± 0.2
W0310	S3130	A	1.4 ± 0.1	1.3 ± 0.2
W0325	S3176	A	10.0 ± 0.3	1.1 ± 0.2
W0367	S3140	A	2.2 ± 0.2	1.1 ± 0.2
W0387	S3140	A	0.9 ± 0.1	1.2 ± 0.2
W0407	S3140	A	1.7 ± 0.1	0.8 ± 0.2
W0427	S3140	A	1.2 ± 0.1	0.6 ± 0.1
W0447	S3140	A	0.8 ± 0.1	1.1 ± 0.2
W0467	S3140	A	1.2 ± 0.1	1.0 ± 0.1
W0487	S3140	A	1.0 ± 0.1	1.2 ± 0.3
W0507	S3140	A	0.7 ± 0.1	0.9 ± 0.2

TABLE 12

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Concentrations (pCi/g +/- 1 sigma) Uranium-238	Radium-226	Thorium-232
W0527	S3140	A	1.3 ± 0.1	A
W0547	S3140	A	1.6 ± 0.2	1.0 ± 0.2
W0567	S3140	A	1.5 ± 0.2	1.1 ± 0.2
W0587	S3140	A	0.9 ± 0.1	A
W0607	S3140	A	4.0 ± 0.2	1.1 ± 0.3
W0627	S3140	A	4.2 ± 0.2	1.4 ± 0.2
W0645	S3140	A	1.5 ± 0.1	0.9 ± 0.2
W0665	S3140	4.2 ± 1.4	1.4 ± 0.1	1.4 ± 0.2
W0685	S3140	A	1.4 ± 0.1	1.1 ± 0.2
W0690	S3165	A	1.8 ± 0.1	1.3 ± 0.2
W0710	S3165	A	3.1 ± 0.2	1.1 ± 0.3
W0720	S3141	A	1.2 ± 0.1	0.8 ± 0.2
W0730	S3165	A	1.7 ± 0.1	1.3 ± 0.2
W0740	S3141	A	2.0 ± 0.1	0.9 ± 0.2
W0750	S3165	A	2.0 ± 0.1	1.4 ± 0.3
W0760	S3141	A	5.9 ± 0.2	1.4 ± 0.2
W0770	S3165	A	1.4 ± 0.1	1.1 ± 0.2
W0780	S3141	A	0.7 ± 0.2	0.8 ± 0.2
W3180	S3135	A	12.3 ± 0.3	1.5 ± 0.3
W3740	S3121	A	3.5 ± 0.7	1.9 ± 0.9
W3760	S3121	A	9.3 ± 1.0	A
W3880	S3117	A	17.8 ± 0.4	1.5 ± 0.3
W3890	S3117	A	1.6 ± 0.4	A
W3990	S3115	A	8.4 ± 0.2	1.4 ± 0.2
W4010	S3115	A	10.4 ± 0.3	1.3 ± 0.3
W4030	S3115	A	9.6 ± 1.0	A
W4050	S3115	A	11.2 ± 0.3	1.8 ± 0.1
W4070	S3115	A	12.3 ± 0.3	1.3 ± 0.4
W4090	S3115	A	8.0 ± 1.0	0.9 ± 0.2
W4110	S3115	A	2.6 ± 0.2	1.2 ± 0.2
W5090	S3097	A	8.8 ± 0.3	A
W5132	S3097	A	13.2 ± 0.4	1.2 ± 0.4
W5152	S3097	A	21.1 ± 0.5	0.9 ± 0.4
W5172	S3097	A	5.5 ± 0.2	1.2 ± 0.2
W5192	S3097	A	19.0 ± 0.5	1.3 ± 0.4
W7148	S3050	A	5.9 ± 0.3	1.8 ± 0.3
W7168	S3050	A	5.1 ± 0.2	1.1 ± 0.3
W7454	S3046	A	12.8 ± 0.4	1.8 ± 0.3
W7878	S3040	A	2.5 ± 0.2	1.5 ± 0.2
W7896	S3040	A	2.6 ± 0.2	1.4 ± 0.2
W7928	S3044	2.1 ± 1.6	3.4 ± 0.2	1.1 ± 0.2
W8085	S2989	A	5.4 ± 0.2	1.5 ± 0.2

'A' denotes less than detectable activity.

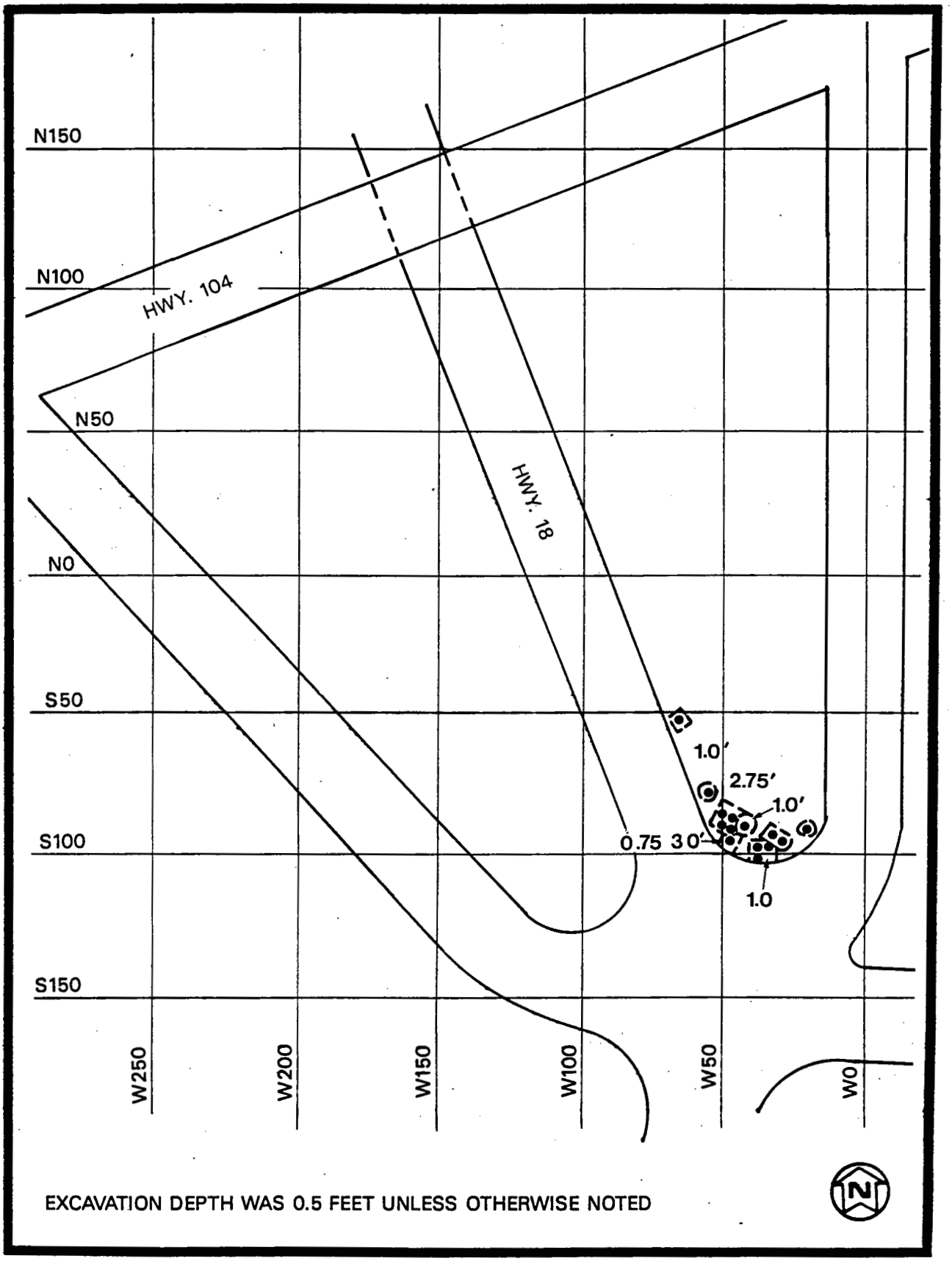


FIGURE 49 EXCAVATED AREAS AND POST-REMEDIAL ACTION SAMPLING LOCATIONS FOR ANOMALY AA

TABLE 13

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR ANOMALY AA

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
W020	S092	A	1.2 ± 0.1	0.8 ± 0.2
W030	S095	A	11.9 ± 0.3	1.6 ± 0.3
W031	S091	A	4.7 ± 0.9	A
W034	S091	A	7.1 ± 0.9	A
W034	S095	A	2.5 ± 0.2	1.4 ± 0.3
W035	S102	A	3.1 ± 0.1	0.9 ± 0.5
W037	S099	A	5.4 ± 0.8	A
W039	S092	A	3.2 ± 0.2	1.6 ± 0.4
W045	S091	A	4.0 ± 0.5	1.2 ± 0.4
W046	S096	A	2.0 ± 0.5	1.6 ± 0.4
W047	S089	A	11.4 ± 0.3	1.0 ± 0.3
W050	S090	A	5.4 ± 0.4	A
W055	S079	A	17.5 ± 0.2	1.2 ± 0.2
W056	S049	A	10.3 ± 0.3	0.8 ± 0.2

'A' denotes less than detectable activity.

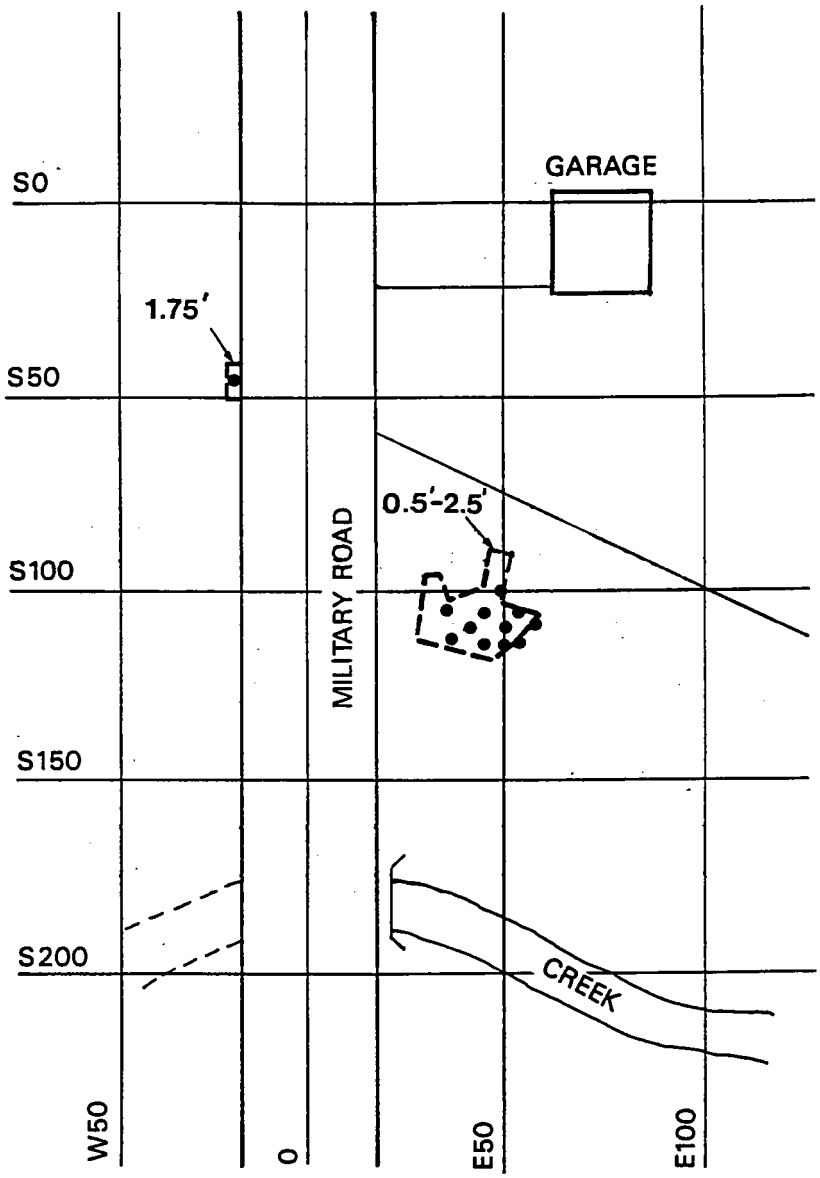


FIGURE 50 EXCAVATED AREAS AND POST-REMEDIAL ACTION SAMPLING LOCATIONS FOR ANOMALY BB

TABLE 14

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR ANOMALY BB

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E035	S105	A	3.3 ± 0.3	1.3 ± 0.3
E035	S115	A	2.9 ± 0.2	1.7 ± 0.2
E040	S110	A	3.6 ± 0.3	0.9 ± 0.2
E045	S105	A	2.4 ± 0.2	0.9 ± 0.2
E045	S115	A	1.6 ± 0.2	1.9 ± 0.3
E050	S100	A	2.2 ± 1.9	1.4 ± 0.3
E050	S110	A	4.5 ± 0.3	1.3 ± 0.3
E050	S115	4.4 ± 2.9	3.2 ± 0.2	1.4 ± 0.4
E055	S105	A	1.8 ± 0.2	1.5 ± 0.2
E055	S115	A	2.0 ± 0.2	1.4 ± 0.3
E060	S110	A	1.7 ± 0.2	1.1 ± 0.3
W018	S040	1.9 ± 1.7	4.9 ± 0.3	0.8 ± 0.3

'A' denotes less than detectable activity.

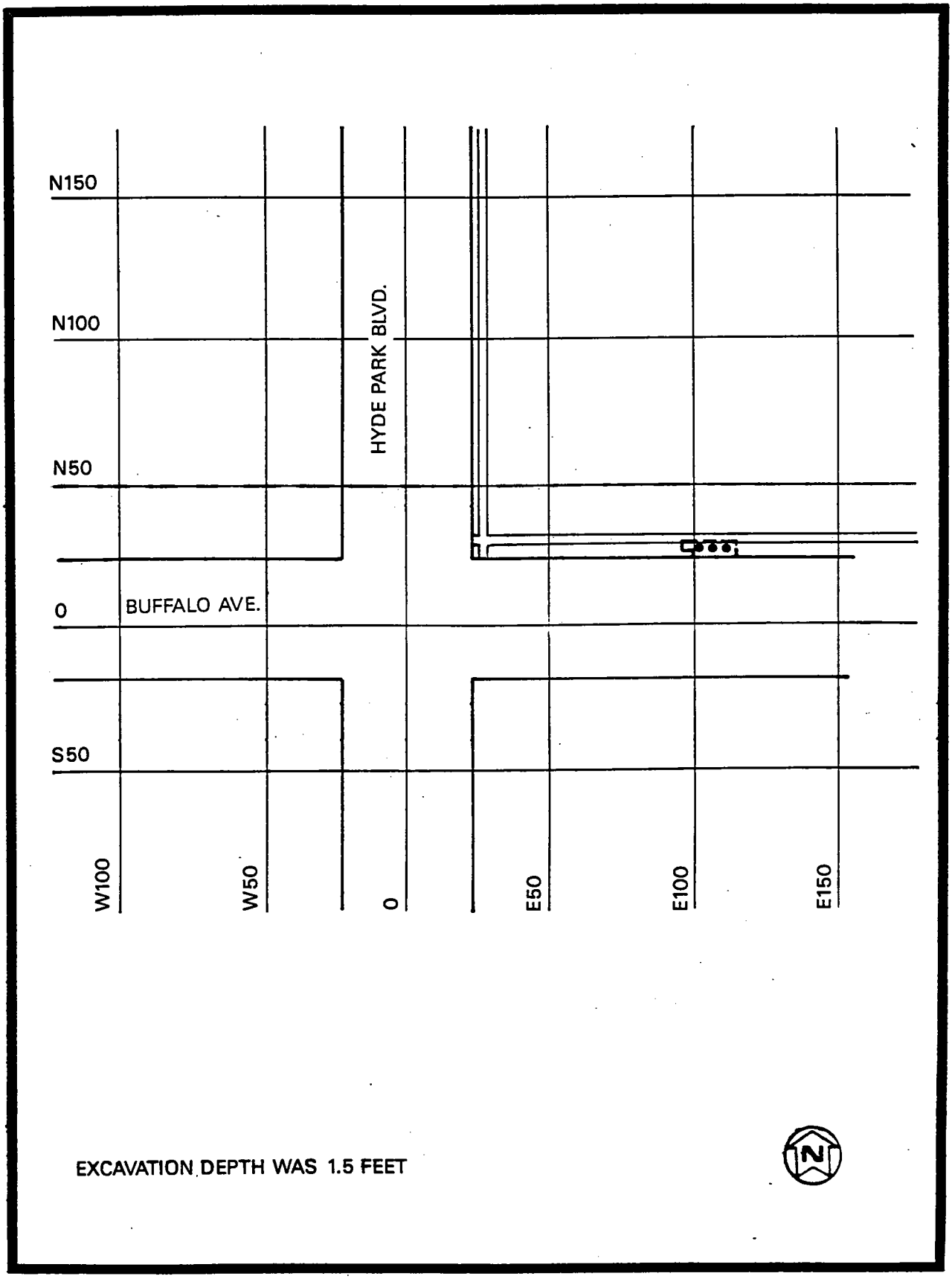


FIGURE 51 EXCAVATED AREAS AND POST-REMEDIAL ACTION SAMPLING LOCATIONS FOR ANOMALY CC

TABLE 15

POST-REMEDIAL ACTION SAMPLING RESULTS

FOR ANOMALY CC

Grid Coordinates		Concentrations (pCi/g +/- 1 sigma)		
E,W	N,S	Uranium-238	Radium-226	Thorium-232
E077	N002	A	1.6 ± 0.1	1.2 ± 0.2
E082	N002	2.6 ± 1.7	1.2 ± 0.1	1.4 ± 0.2
E087	N002	A	7.1 ± 0.3	0.7 ± 0.2

'A' denotes less than detectable activity.

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Alpha-emitting - See radiation.

Background Radiation - Background radiation refers to naturally occurring radiation emitted from either cosmic (e.g., from the sun) or terrestrial (e.g., from the earth) sources. Exposure to this type of radiation is unavoidable and its level varies greatly depending on geographic location; e.g., New Jersey typically receives 100 mrem/yr, Colorado receives about 300 mrem/yr, and some areas in South America receive up to 7000 mrem/yr. Naturally occurring terrestrial radionuclides include uranium, radium, potassium, thorium, etc. These dose levels do not include the concentrations of naturally occurring radon inside buildings.

Beta Radiation - See radiation.

Boron - Boron is a metallic element found in nature.

Centimeter - A centimeter is a metric unit of measurement for length; 1 inch is equal to 2.54 centimeters; 1 foot is equal to approximately 30 centimeters.

Contaminated - Contaminated is used here to mean that the soil contains concentrations of radioactive materials that exceed naturally occurring levels. Contamination may or may not exceed the DOE cleanup guidelines.

Counts per minute - A count is the unit of measurement registered by a radiation detection instrument when radiation imparts its energy within the sensitive range of the detector probe. The number of counts registered per minute can be related to the number of disintegrations per minute occurring from a radioactive material.

Disintegrations per minute - Disintegrations per minute is the measurement indicating the amount of radiation being released from a substance per minute. See the definition of picocurie.

Dose - Dose as used in this report is actually dose equivalent and is used to relate absorbed dose (mrad) to an effect on the body. Dose is measured in mrem. Examples of dose are: a dose of 500,000 mrem to the whole body in a short time causes death in 50 percent of the people who receive it; a dose of 5,000,000 mrem may be delivered to a cancerous tumor during radiation treatment; normal background radiation results in an annual dose of about 100 mrem; DOE radiation protection standards limit the dose to members of the general public to 100 mrem/yr above background levels; living in a brick house results in a dose of about 75 mrem/yr above background.

Exposure Rate - Exposure rate is the rate at which radiation imparts energy to the air. Exposure is typically measured in microroentgens (uR) and the exposure rate is typically given as uR/h. The dose to the whole body can be approximated by multiplying the exposure rate by the number of hours of exposure. For example, if an individual were exposed to gamma radiation at a rate of 20 uR/h for 168 hours per week (continuous exposure) for 52 weeks per year, the whole-body dose would be 170 mrem.

Gamma Radiation - See radiation.

Gram - A gram is a metric unit for weight. It takes approximately 454 grams to make 1 pound; 1 ounce equals 28 grams.

Meter - A meter is a metric unit of measurement for length; 1 meter is equal to approximately 39 inches.

Microroentgen - A microroentgen (uR) is a unit used to measure radiation exposure. For further information, see the definition of exposure rate.

Millirem - Millirem is the unit used to measure radiation doses to man. The DOE limit for members of the general public is 100 mrem above background radiation levels in any one year. Naturally occurring radioactive substances in the ground result in a yearly

exposure to everyone of about 100 mrem. To date, no difference can be detected in the health of population groups exposed to 100 mrem/yr above background and in the health of groups who are not exposed.

Picocurie - A picocurie is the unit of measure for radioactivity just as an ounce is a unit to measure weight. One picocurie means that one radioactive particle is released on the average of every 27 seconds.

Radiation - There are three primary types of radiation: alpha, beta, and gamma. Alpha radiation travels less than an inch in air before it stops, and cannot penetrate the outer layer of skin on the body. Beta radiation can penetrate the outer layers of skin, but cannot reach the internal organs of the body. Gamma radiation is the most penetrating type and can usually reach the internal organs.

Radioactive Decay - Radioactive decay is the change in a radioactive material that accompanies the emission of alpha or beta particles from that material. The radioactive element becomes a different element, which may or may not be radioactive. For example, the following chain describes the radioactive decay of uranium-238: uranium-238 -- thorium-234 -- protactinium-234 -- uranium-234 -- thorium-230 -- radium-226 -- radon-222 -- polonium-218 -- lead-214 -- bismuth-214 -- polonium-214 -- lead-210 -- bismuth-210 -- polonium-210 -- lead-206. Lead-206 is stable; therefore the original atom of uranium-238 has become one of lead-206 and is no longer radioactive.

Radionuclide - Radionuclide is another word meaning a particular radioactive element. For example, radium-226 is a radionuclide, uranium-238 is another, thorium-232 another, and so on.

Radium-226 - Radium-226 is a naturally occurring, radioactive material that spontaneously emits alpha radiation.

Remedial Action - Remedial action is a general term used to mean "cleanup of contamination that exceeds DOE guidelines." It refers to any action required so that a contaminated property can be released for unrestricted use as uncontaminated. In practice, this may mean removing grass and soil, cutting trees, or removing asphalt. Remedial action also includes restoring remediated properties to their original conditions, to the extent that this is possible.

Thorium - Thorium is a naturally occurring, radioactive element that is recovered from monazite for commercial purposes. Monazite contains from 3 to 9 percent thorium oxide. The principal use of thorium to date has been in the preparation of gas lantern mantles. Thorium oxide is also commonly found in high quality glasses and camera lenses because of its good optical characteristics.

Uranium - Uranium is a naturally occurring, radioactive element. The principal use of uranium -- when refined -- is for the production of fuel for nuclear reactors. Uranium in its natural form is not suitable for use as a fuel source.

Working Level - Working level is a unit to measure the energy expended in air by radon or its radioactive decay products. The term was derived to measure radon progeny concentrations to which uranium miners were exposed.