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RADIOLOGICAL STUDY
OF
MAYWOOD CHEMICAL, MAYWOOD, NEW JERSEY

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1.0 EXECUTIVE SUMMARY

A radiological survey was conducted during the period July 18, 1983 to August 9, 1983 at two sites in Maywood, New Jersey, known as the Sears Site and the Scanel Site. Three other properties are related to this investigation: the Stepan Chemical Company, the Ballod property and a residential area. Figure 1 shows the location of the 2 sites and 3 related properties.

The project was conducted by Region II FIT assisted by the Environmental Services Division of NUS Corporation.

The scope of work involved four major tasks:

- An Engineering Grid System (surveyed grid system)
- Radiological Field Survey
- Borehole Drilling and Sample Collection
- Laboratory Analyses
- Analytical Method

The purpose of the investigation was to delineate and measure the extent of radioactive contamination. Field work included measurement of exposure rates at 425 locations on the sites. In addition, 39 boreholes were drilled at selected locations on these sites. Soil samples were taken at various depths from each borehole. A gamma scintillation probe was inserted down each hole to measure radiation levels at 6" intervals in the hole. A total of 116 soil samples were collected. Activities of radium-226 and radium-228 were determined on all samples. Thorium and uranium isotopic analyses were carried out on 43 soil samples.

The total areal extent of the contamination is approximately 280,000 square feet. The radioactive material generally extends from the surface to a variable depth which may exceed six feet. A volume estimate of contaminated material was then calculated for the two sites.

If action levels of 5 pCi/g for Ra-226 and/or 10 pCi/g for uranium or thorium are followed, approximately 42,000 yd^3 of contaminated material should be considered for remedial action.

No elevated levels of gamma exposure rates or of radon/radon daughters airborne concentrations were measured inside any of the buildings on the survey sites.

2.0 OBJECTIVE

The purpose of this investigation was to delineate and measure the radioactive contamination present at the Scanel and Sears sites. This will determine the amount of material which could require remedial action. Criteria for remedial action are based on proposed Federal Regulation 40 CFR Part 192,[1] which addresses standards for uranium and thorium mill tailings and a Nuclear Regulatory Commission notice [2] concerning disposal of thorium and uranium waste. A volume estimate of contaminated material was then calculated for the two sites.

Radioisotopes of general interest to this study are radium-226, radium-228, and isotopes of uranium and thorium. General discussion of these isotopes and their decay relationships can be found in Appendix D.

The scope of work involved four major tasks:

- An Engineering Grid System

  An engineering grid system system was set up to provide reference grid locations for potential sampling points.

- Radiological Field Survey

  A field survey was conducted at all grid locations to determine beta and gamma radiation levels at the surface as well as at 1 meter elevations.

- Borehole Drilling and Sample Collection

  Samples were collected from all boreholes for analysis by the laboratory. Boreholes were gamma logged to determine exact levels and depths of contamination.

- Laboratory Analyses

  Analytical methods were used to determine concentrations of radium 226, radium-228, thorium-232, 230, 228 and uranium-238, 235, 234. These analyses were performed on the samples obtained from the boreholes.

3.0 BACKGROUND

The Maywood Chemical Works was founded in 1895. From about 1916 until 1957, the company processed thorium from monazite sand for use in the manufacture of gas mantles for various lighting devices. Some of the residues from the processing operations were moved over a period of time from the company's property and used as landfill in nearby swampy areas. Thorium related activities at this plant did not come under Atomic Energy Commission licensing until 1954.

In 1954, the Maywood Chemical Works was issued an AEC license for possession of thorium wastes stored on its property. The Stepan Chemical Company bought the Maywood Chemical Works in 1959, renewed the AEC license for possession of source materials, and began in 1963 to clean up piles of thorium waste. Stepan Chemical Company itself is not involved in the manufacture or processing of any radioactive materials. AEC approval was obtained for the clean-up and burial of wastes on company property.

In September 1980, an area resident assisting in a search for a sealed radioactive source that had been lost in the community discovered the presence of contamination on property that had formerly belonged to Stepan. This property had been used for storage of waste material, but had been cleaned up by Stepan and released for unrestricted use by the AEC before being sold. The discovery that radioactive contamination still existed was reported to the New Jersey State Department of Environmental Protection. The State of New Jersey conducted surveys and soil sample analyses which identified the presence of thorium-232 and radium-226 on Stepan property. These findings were reported to the Nuclear Regulatory Commission in November 1980.

The property found to be contaminated is located west of Route 17 and is known as the Ballod Site. This site was investigated further by the Nuclear Regulatory Commission, and radiation levels were found to exceed NRC limits for unrestricted areas. The radioactive material was described as a white or yellow clay-like material different from the local brown sandy soil. One soil sample taken from the Ballod Site was 3.65% thorium by weight (3975 pCi/g). Direct reading surveys,

visual observations, and measurements of soil concentrations indicated that an area of at least 100 square meters were contaminated on this site. The contamination was considered to be at least 10 cm deep, averaging 0.5% by weight thorium over this area. Taking soil density as one gram per cubic centimeter, a minimum of 50 kilograms of thorium was estimated to be present.

After the initial inspection of Stepan property, the Nuclear Regulatory Commission decided to have a radiation survey made over a large area to detect any further spread of contamination. In January 1981 an aerial radiological survey was conducted by the Washington Aerial Measurements Department of EG&G, Inc., using a helicopter equipped with sodium iodide detectors[3]. The area surveyed was four square miles centered on the Stepan Chemical Company. Two isoradiation contour maps were produced, one showing variations of total gamma-photon activity and another showing concentrations of thallium-208, indicating the presence of excess thorium-232. Higher than normal gamma-photon activity was observed directly over the plant and in areas west (Ballod site) and south (Sears site) of Stepan property. Two other previously unidentified areas showed an increase in thorium concentration; a vacant lot near the intersection of Coles Brook and the Hackensack and Lodi railroad tracks (Scanel site), and a residential area north of Stepan property. Ground-level surveys by the NRC in April-May 1981 confirmed the presence of thorium contamination on these sites. Other areas, including a cemetery, showed gamma radiation levels above average background but no evidence of thorium. These elevated levels were attributed to natural variation. The Ballod site was already under investigation by the NRC, the Sears and Scanel sites are the subject of the present study, and the residential area was subjected to a comprehensive radiological survey by a team from the Oak Ridge National Laboratory during June 1981.

The contamination of the residential property was later confirmed by ground level radiological surveys by the Nuclear Regulatory Commission and the New Jersey Department of Environmental Protection. The radiological survey documented that radionuclides from the naturally occurring thorium-232 and uranium-238 decay series are present on the seven residential properties, although not in equal amounts.[4] Most material was found adjacent to homes but not inside the homes.

Total residual material for the seven properties was estimated at approximately 1650 yd^3. This contamination resulted from the alleged removal of processing byproduct material from the Maywood Chemical Company property. Much of the byproduct material from non-thorium operations was tea and cocoa leaves mixed with other fill material. This material could be used as an organic mulch for gardens and fill for lawns. Apparently it occasionally included wastes from thorium processing operations.

The Sears and Scanel sites are the subject of the present study. Preliminary ground level surveys on these two sites were conducted by the NRC in May 1981. On the smaller of the contaminated areas (Scanel site) radiation levels up to 0.3 mR/hr were reported on dirt piles in an open field bordered by Coles Brook. In September 1982 the Borough of Maywood requested NRC advice concerning a proposed stream clearance project on Coles Brook. Measurements of radiation levels and collection of sediment samples along the bank of the brook indicated that no hazard from radioactive contamination would be created by the stream clearance project. However, no soil beyond 15 feet from the top of the bank on the west side was to be removed from the area. This September 1982 survey is described in NRC Report No. 99990001/82-13. Dredging along Coles Brook was carried out in April/May 1983; this dredging removed many of the features described in that report. Fieldwork for the present study was conducted shortly after dredging, in July-August 1983.

This investigation was authorized under TDD #02-8305-10B, dated 6/1/83 issued to the Field Investigation Team (FIT) by the U.S. Environmental Protection Agency (EPA).

4.0 METHODOLOGY

The field work took place from July 18, 1983 to August 9, 1983. The methodology involved an engineering grid system, field survey, borehole drilling and sample collection, and analytical methods. A description of each procedure follows.

Engineering Grid System

To provide exact locations for measurements, a grid system was laid out over the outdoor portions of the study area. In general, grid points were 100 feet apart over paved areas and 50 feet apart over unpaved areas. Additional points at 25 foot intervals were measured in areas found to be above background radiation levels. Grid lines on the Sears parking lot were run between rows of parked vehicles so that grid line spacing was less than the standard 100 feet.

Figure 2A provides a segment location map for the entire Scanel site. The site is divided into two segments, A and B. A detail of Segment A showing radiological monitoring locations is provided in Figure 2B. A detail of Segment B showing radiological monitoring locations is provided in Figure 2C.

The same procedure is followed for the Sears site. Figure 2D is a segment location map of the entire site. The site is divided into 10 segments, A through J. Details of each of the 10 segments are provided in figures 2E through 2N.

Coordinates for these radiological monitoring locations (grid points) are given in Table 1. Coordinates are given as distances along a base line in a positive or negative direction from the origin and distances right or left of that base line. Thus, 0000050R would indicate a point 50 feet to the right of the origin, and -0200100L would refer to a point 200 feet below the origin and 100 feet to the left of the base line. The prefixes 1, 2, 3, 4 refer to the Scanel, Sunoco, DeSaussure, and Sears properties respectively, so that 2 + 0050050L describes a point with reference to the base line used on the Sunoco property. Six different base lines were used in laying out the grid system.

Radiological Field Survey

External gamma radiation measurements were performed at all grid locations using a micro-R meter (Ludlum Model 19). Readings were taken at all grid points at both the ground surface and 1-meter above the ground. Areas between grid locations were sweep-surveyed. Daily performance checks were made onsite using a sealed source. The meter was also cross-checked against a Reuter-Stokes RS-111 pressurized ionization chamber (PIC) at approximately 10% of the grid locations.

Ground surface and one meter height measurements were also made using a Ludlum Model #12 Count Ratemeter with a Model 44-6 thin wall Geiger-Muller (G-M) tube (closed window). Closed window readings were an additional measurement of gamma radiation, since beta radiation cannot penetrate the closed window on a G-M probe. In unpaved areas, open window readings were also taken at the ground surface. It was anticipated that a significant difference in open window and closed window readings on the G-M survey meter could be used to determine the presence of beta-emitting surface contamination. Beta-emitting contamination below the ground surface would not result in significantly different open/closed window readings. Micro-R and G-M meter readings at 1 meter and surface levels are given in Table 1 for all grid locations. These measurements were used to select locations for boreholes. Isopach plans of external gamma radiation levels based on 1-meter Micro-R readings are shown in Figures 3A through 3J. These plans include additional gamma radiation measurements taken at 1 meter above the ground near selected buildings and points of interest away from grid locations.

Measurements of energy carried by radon daughters were made in the buildings present on the two sites surveyed. Measurements were made over 24 hour periods at each location with an EDA WLM-300.

Borehole Drilling and Sample Collection

Subsurface soil samples were collected at 39 locations using a drilling rig equipped with a split-spoon sampler.

Figure 4A provides a borehole location map for the northern segment of the Scanel site, the only portion containing boreholes.

Figure 4B is a segment location map of the entire Sears site. The site is divided into 10 segments. Borehole locations are provided in figures 4C through 4I.

Two-foot-long cores were collected under favorable conditions from each split-spoon sampler; however, the presence of bricks, wood, concrete debris and other fill materials interfered with sample recovery in many cases. Three core samples were generally taken, covering 0-2', 2-4', and 4-6' intervals. In some cases water was encountered at depths of four to six feet; therefore, deeper samples were not taken. In other cases, 6-8' core samples were also taken. Details of the descriptions of cores obtained by the split spoon sampling are given in Appendix A, Borehole Drill Logs.

After core samples were obtained, boreholes were drilled using a hollow stem, 8" diameter auger. The borehole was temporarily cased with a 4" diameter plastic (PVC) pipe. A 1" x 1" NaI (Tl) scintillation probe was lowered inside the pipe. The probe was encased in a lead shield with a slit on the side. This collimation arrangement allowed measurement of gamma radiation resulting from contamination within small, vertical fractions of the hole depth. Measurements were made at 6" intervals.

The gamma logging data obtained from the boreholes were used to determine which portion of the core would be shipped for laboratory analysis. The cores were also examined with the Ludlum Model 12 Count Ratemeter equipped with a Model 44-9 pancake G-M probe, but this method proved to be inadequate for sample selection. Measurements with the pancake probe rarely exceeded background, even when the core samples were moved into low background areas of the site. In some cases,

samples of the material brought up by the auger were taken for sample splitting with the Environmental Protection Agency. These auger-mix samples were selected based on their visual equivalence to core samples of known depth. Generally, this material consisted of white clay-like fill thought to be Maywood process residue. Other EPA splits were taken directly from the core samples. Samples selected for splitting were mixed as much as possible under field conditions, but no grinding or sieving was done and some inhomogeneity between splits is likely.

A single surface soil sample was taken behind the Sears warehouse in an area inaccessible to the drilling rig. The area was a narrow ledge situated along a fence separating the Sears site from Stepan Chemical Company property. A 4 foot drop exists from the ledge to a railroad spur running behind the Sears warehouse. An exposure rate measurement of 170 microR/hour was obtained at surface level at the sampling location but dropped off to near background levels within a few feet.

Groundwater samples were taken from six boreholes in which water was encountered during split-spoon sampling or augering. These water samples were forwarded to the EPA for analysis for radium-226. The analysis was conducted by the Eastern Environmental Radiation Laboratory in Montgomery, Alabama.

Locations for these groundwater samples are:

Sample No.	Location	Depth	Borehole No.
GW1	1+0525025L	3.8'	1
GW2	1+0550025L	6'	2
GW3	1+0616005L	6'	5
GW4	4-0300050R	2.5'	26
GW5	4-0191205L	4.5'	33
GW6	4-0050250L	4.5	34

Eight soil samples were split in the field and forwarded to the EPA for analysis by the Las Vegas Laboratory. These are splits of samples 16, 23, 45, 52, 58, 63, 82, and 102. Locations for these samples are given in Table 2.

Laboratory Analyses

Samples of soil collected on site were packed in 8 oz. glass jars and shipped to the NUS Environmental Services Division's Radiological Laboratory in Pittsburgh, Pennsylvania for analysis. On receipt at the laboratory, the samples were dried at 110°C. Samples were then ground with a mortar and pestle to pass through a No. 10 standard sieve.

Gamma Spectrometry

Individual samples for gamma spectrometry were weighed into 3-inch diameter, plastic dishes which were filled to a standard volume. The dishes were then sealed and stored until the radon daughters had grown into equilibrium (approximately two weeks). Samples were counted on high-resolution, gamma spectrometry detectors and 4096 channel spectra were accumulated on Canberra Series 85 MCAs. Spectral analysis was performed on a PDP 11/44 computer using the Spectran-F data analysis software. Since the samples were stored for ingrowth to equilibrium, radium-226 was computed from the average estimated activities of lead-214 and bismuth-214. Radium-228 was estimated from the activity of its daughter actinium-228. Decay relationships are discussed in Appendix D. Data reporting conventions are discussed in Appendix E.

Alpha Spectrometry

Aliquots for alpha spectrometry were selected from the previously dried and sieved sample. Subsamples for uranium and thorium isotopic analysis had the appropriate carriers added, and then were totally dissolved by acid treatment. Separation of the elements of interest was performed by liquid-liquid extraction and ion exchange. Samples were mounted by co-precipitation with cerous hydroxide or cerous fluoride. Mounts were counted by alpha spectrometry using diffused junction detectors and a Canberra Series 85 MCA. Chemical yield and counting efficiency were determined by the recovery of the tracer.

5.0 FINDINGS

The findings of this investigation were determined from exposure rate measurements, gamma spectrometry, alpha spectrometry, and working level measurements. A discussion of each follows.

Exposure Rate Measurements

Results of the area exposure rate measurements are presented in Table 1. Except for a set of G-M readings taken under adverse weather conditions, the data are internally consistent. The Micro-R meter readings taken at a height of one meter were used as the basis for further study.

Exposure rates varied from background (4 to 6 microR/hour) to 180 microR/hour. Approximate dose isopleth lines are shown in Figures 3A through 3J.

Gamma Spectrometry

Results of gamma spectral analysis are reported in Table 2. Radium-226 is reported based on the activity of radon daughters, lead-214 and bismuth-214. Radium-228 is reported based on the activity of its daughter, actinium-228. Table 2 indicates the activity of each of the isotopes of interest, the location of the boreholes from which the samples were taken and the composite depth which each sample represents. The radium-226 results varied from 0.40 to 86 pCi/gram (dry) and the radium-228 results varied from 0.48 to 390 pCi/gram (dry). The lower values are typical of background concentrations. As expected, the higher ranges are many times the proposed levels for corrective action.

Alpha Spectrometry

Results of alpha spectrometry measurements on thorium and uranium isotopes are reported in Table 3. As anticipated, the levels varied from background to concentrations many times the proposed action levels. The ranges were from 0.75 to 110 pCi/g (dry) for uranium-238 and from 1.0 to 190 pCi/g (dry) for thorium-232.

Working Level Measurements

Table 4 presents the data obtained from the working level measurements in buildings on the sites. The working level is a unit that describes the amount of energy carried by the alpha radiations emitted by the daughter products of 100 picocuries of radon in one liter of air when the radioactivity of the daughter products equals that of the radon. According to the Surgeon General's Guidelines, Grand Junction, Remedial Action Criteria, remedial action is indicated if the working level is greater than 0.05 and may be suggested if the value is between 0.01 and 0.05. No measurements indicating a need for corrective action were observed in any of the buildings studied.

6.0 CONCLUSIONS

Table 5 compares the results of the gamma spectrometric measurements for radium-226 and radium-228 with the exposure rate results obtained at the borehole sites. It shows clearly that any locations showing exposure rates of more than twice background at one meter are probably underlain by fill materials which should be considered candidates for corrective action. Below these exposure rates, the situation is less clear. When the exposure rate over paved areas is even slightly above background, there is indication of contamination at easily measurable levels. This can be seen most clearly from borehole #36 through #38. Despite the return of the exposure rate measurements to near background (11 microR/hour) in the area of borehole #37, the soil concentrations are still quite high. In areas not shielded by paving materials, exposure rates of less than twice background are probably not indicative of significant contamination. In any case where the borders of a contaminated area are being investigated, additional boreholes are required to account for increasing depth of contamination, decreasing thickness of a high concentration layer, or possible shielding by exposed or concealed paving or fill. The downhole gamma logs proved to be a reliable predictor of contamination even for those holes which showed an unexpectedly high concentration relative to the one meter exposure rates.

The results of the alpha spectrometric data for uranium and thorium were also compared to the exposure rate measurements. No discrepancies were observed in the conclusions relative to the need for corrective action, whether they were based on a 5 pCi/g level for radium-226 or on a 10 pCi/g level for radium-228, total thorium or total uranium. However, there is evidence that the thorium and uranium chains are not in equilibrium. Since the total thorium and uranium concentrations are not obtainable by gamma spectrometry, additional measurements of these parameters may be needed during the corrective actions. This will be true when the action limits measurable by gamma spectrometry become marginal.

No single regression could be performed between the observed exposure rates or average downhole gamma readings and the activities of the various isotopes. This indicates that the observed gamma radiation was due to contributions from several radionuclides. The measured activity of one radionuclide could fall below an action level while another measurement from the same sample remained above action levels. Thus, in estimating the volume of material which could require remedial action, no direct correlation of gamma data with a single isotope such as radium-226 was possible.

Contamination is not restricted to any particular soil level and cannot be recognized from the appearance of the soil. No stratification of radioactive material is apparent. Where contamination exists, the material is generally present from the surface to depths which may exceed six feet. In some parts of the area, the data permit a relatively shallow depth estimate. The basis for depth estimates is discussed below in the description of various parts of these sites.

Scanel Site

Approximately 12,000 square feet of fill and soil in the middle of the vacant lot on Scanel property are contaminated. This area, shown on Figure 3A, extends onto the railroad property (Hackensack and Lodi Railroad). Contamination is present to a depth of 6 feet in the center of the area (boreholes #1 and #2) and to a depth of 5 feet at boreholes #3 through #6. The approximate volume of contaminated material is 2,400 yd^3; much of this is in the form of soil mixed with bricks, wood, concrete blocks, and other fill materials. A pile of concrete boulders on the surface between radiological monitoring locations 30 and 35 (see Figure 2B) is mixed with contaminated soil.

Water is present at depths of 4 to 6 feet over most of the area. Three water samples were analyzed by the Environmental Protection Agency; the results indicate that radioactive contaminants in the soil are not being leached into the water itself.

Radioactive materials are present only on the vacant lot and not on the paved area near Essex Street. The buildings on this site are free of contamination. The interiors of the car wash and the restaurant were surveyed using a Micro-R meter, and only background readings were observed. Working level measurements indicated background activities of radon daughters inside these buildings.

Sears Site

The Sears Site includes several contaminated areas on Sears property, as well as adjacent areas occupied by the DeSaussure Equipment Company, a Gulf station, a Sunoco station, and the Federal Express/Hunter-Douglas property.

At the north end of Sears property behind the warehouse a maximum of 5500 square feet of soil may be contaminated near the surface. Only a surface soil sample could be collected from this area, and only a minimum 6" depth of contamination can be estimated from the analytical data.

Working level measurements were taken inside the warehouse at Gate 67 near this location and were found to be at background levels. Exposure rate measurements throughout the warehouse were also background.

Slightly elevated exposure rates were observed over a small area at radiological monitoring locations at the north end of the Sears parking lot. These may indicate the presence of small isolated patches of contamination beneath the pavement.

Most of the volume of contaminated material on the Sears Site is present in the large grassy areas on either side of the access road. It is possible that some of this material was moved into the grassy areas prior to construction of the Sears warehouse. The topographic base map in Figure 1 shows a U-shaped contour line crossing the northeast boundary of the Sears Site. The shape of this line suggests that a dike area may have existed here at the time the topographic base map was prepared. It is known that settling ponds for Maywood Chemical process residues were created by digging large holes, 2 to 3 feet deep, and using the displaced earth to build walls

or dikes about 5 to 6 feet above ground level to contain waste streams while the water evaporated. Such a topographic feature no longer exists, and it can be assumed that this pile was excavated prior to the construction of the Sears warehouse. On-site burial of residues in the nearby grassy areas may have taken place.

Two large contaminated areas northeast of the road occupy 48,500 and 18,000 square feet. Boreholes were drilled in the larger of these areas; contamination in the smaller area is inferred from exposure rate measurements. Until the analytical data were obtained, it was not realized that exposure rates as low as twice background could still indicate contamination exceeding action levels at depth. Thus no boreholes were drilled in the smaller area and only a rough estimate of a 3-foot contamination depth is possible.

In the larger area, soil sample concentrations indicate contamination to a depth of at least 3 to 4 feet. In a few cases, gamma logs at greater depths do not return to background levels. The volume estimate for the Sears Site northeast of the road is 9,100 yd^3. Contamination probably continues under the road itself. There is no indication of contamination under the Sears parking lot on this side of the road.

The entire grassy area southwest of the road on the Sears Site is contaminated. In this area of 155,000 square feet, contamination is present from the surface to variable depths of 3 to 5 feet. An average 4-foot depth was used to calculate a volume estimate of 23,000 yd^3. The deepest levels are near the drainage ditch and under the southernmost end of the parking lot. There is some indication that approximately 3 feet of contaminated material on the grassy area northeast of the road thickens to 5 to 6 feet on the southwest side of the road, as the drainage ditch between Sears and Federal Express/Hunter Douglas is approached.

On the opposite side of the drainage ditch on Federal Express/Hunter-Douglas property, the area is paved and only surface exposure rates over pavement were obtained. About 500 square feet of this paved area are affected, to a probable depth of 5 feet.

Another 2000 square feet of soil between the Sears parking lot and the Gulf station show elevated exposure rates over pavement. A 5 foot depth was estimated here also.

Sunoco Property

A maximum of 2,500 square feet of soil are contaminated on Sunoco property between the Sears parking lot and Route 17. The area near the station itself and the gasoline pumps is not affected; contamination is restricted to a parking area used primarily for storage of rental vehicles. Maximum depth was 5 feet at the center of the contaminated area (borehole #8) and 1 foot at borehole #9. Five hundred cubic yards of contaminated material are estimated for this property. Variable thicknesses of concrete may mask surface exposure rates.

DeSaussure Property

Contaminated material is present on the north side of the DeSaussure building but not on the south side. Approximately 32,500 square feet of the property are affected, including the area between the road and the woods northeast of the building. At boreholes #17 and #18 the lowest level sampled still exceeded action levels, and contamination deeper than 6 feet is present. An average depth of 5 feet was used to calculate a volume estimate of 6,000 yd^3 for this property.

Despite the presence of radioactive material close to the building, the building interior is not affected. Only background-level readings were observed during an extensive walk-through survey using a Micro-R meter. The WLM-300 working level monitor was placed along the northwest interior wall of the building adjacent to borehole #18. Only background levels were observed.

The low levels inside the building may be due to a thick concrete foundation or to probable removal of contaminated material from underneath the building. The field team was informed that material had been removed to a depth of approximately 6 feet and had been replaced by a foundation fill of granite boulders when the northwest 40' x 230' addition to the building was constructed. The DeSaussure property is nearly 2 feet higher in elevation than the adjoining Sears grassy area and some of the material used to build up this elevation may have come from under the building. If excavated material remained on site, the observed levels of radioactive contamination on this property could be readily explained.

7.0 RECOMMENDATIONS

Criteria for remedial action are based on proposed Federal Regulation 40 CFR Part 192, which addresses standards for uranium and thorium mill tailings.

If action levels of 5 pCi/g for Ra-226 and/or 10 pCi/g for U or Th are followed, approximately 42,000 yd^3 of contaminated material should be considered for remedial action.

8.0 REFERENCES

(1) Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites; Federal Resigter, 40 CFR 192, volume 48, number 84, Friday, April 29, 1983/proposed rules, pages 19584-19603.

(2) Disposal for Onsite Storage of Thorium or Uranium waste from Past Operations, Federal Register, volume 46, number 205, Friday, October 23, 1981/notices, pages 52061-52063.

(3) Mueller, J.R. & Gunn, S.A., 1981, "An Aerial Radiological Survey of the Stepan Chemical Company and Surrounding Area, Maywood, N.J."; 26 January 1981, EG&G Survey Report NRC-8109.

(4) Oak Ridge National Laboratory, "Radiological Survey of Seven Private Properties in Maywood, N.J.," June 1981, Dept. of Energy Contract W-7405-eng-2b.

APPENDIX A

FIGURES

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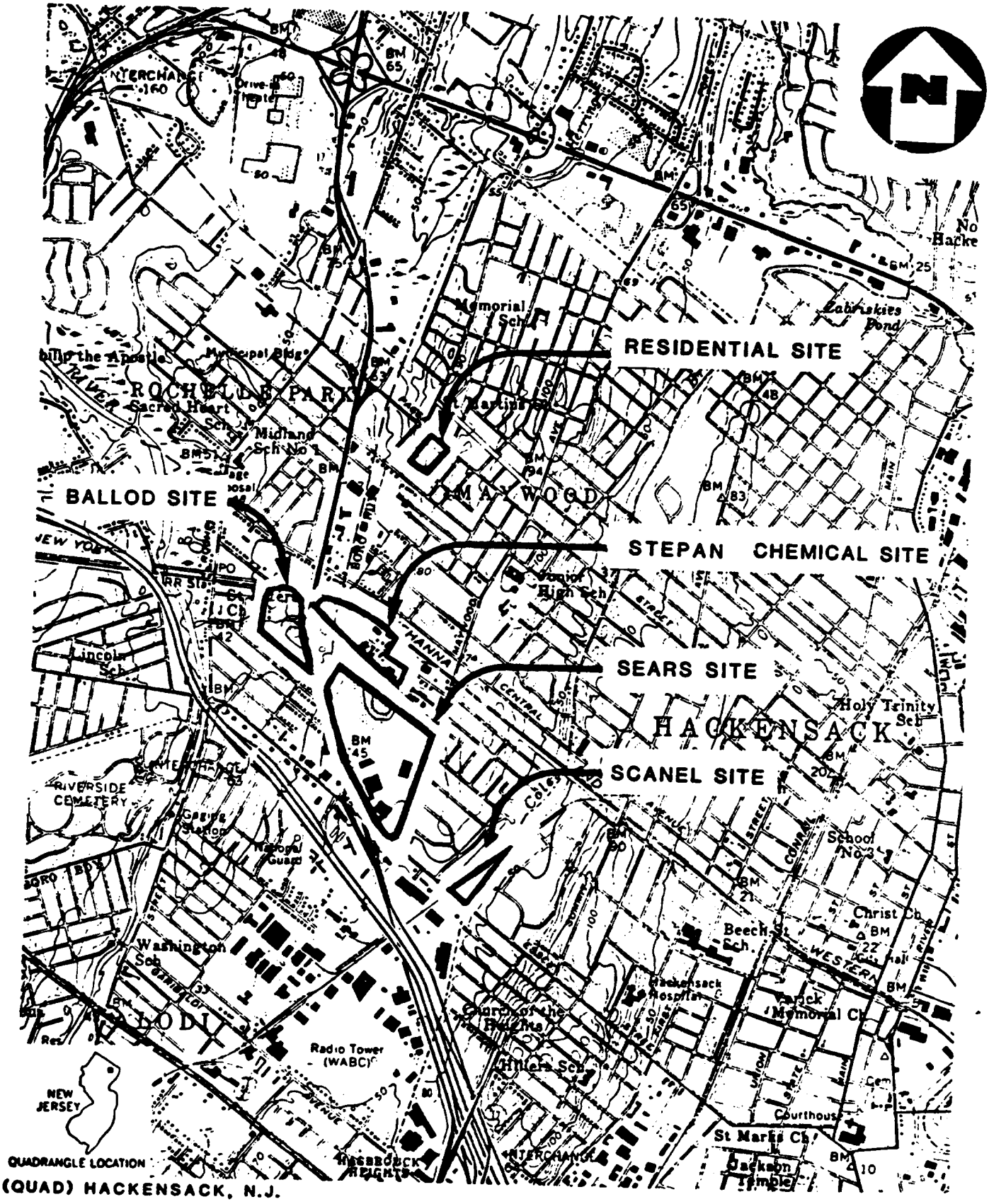


SITE LOCATION MAP

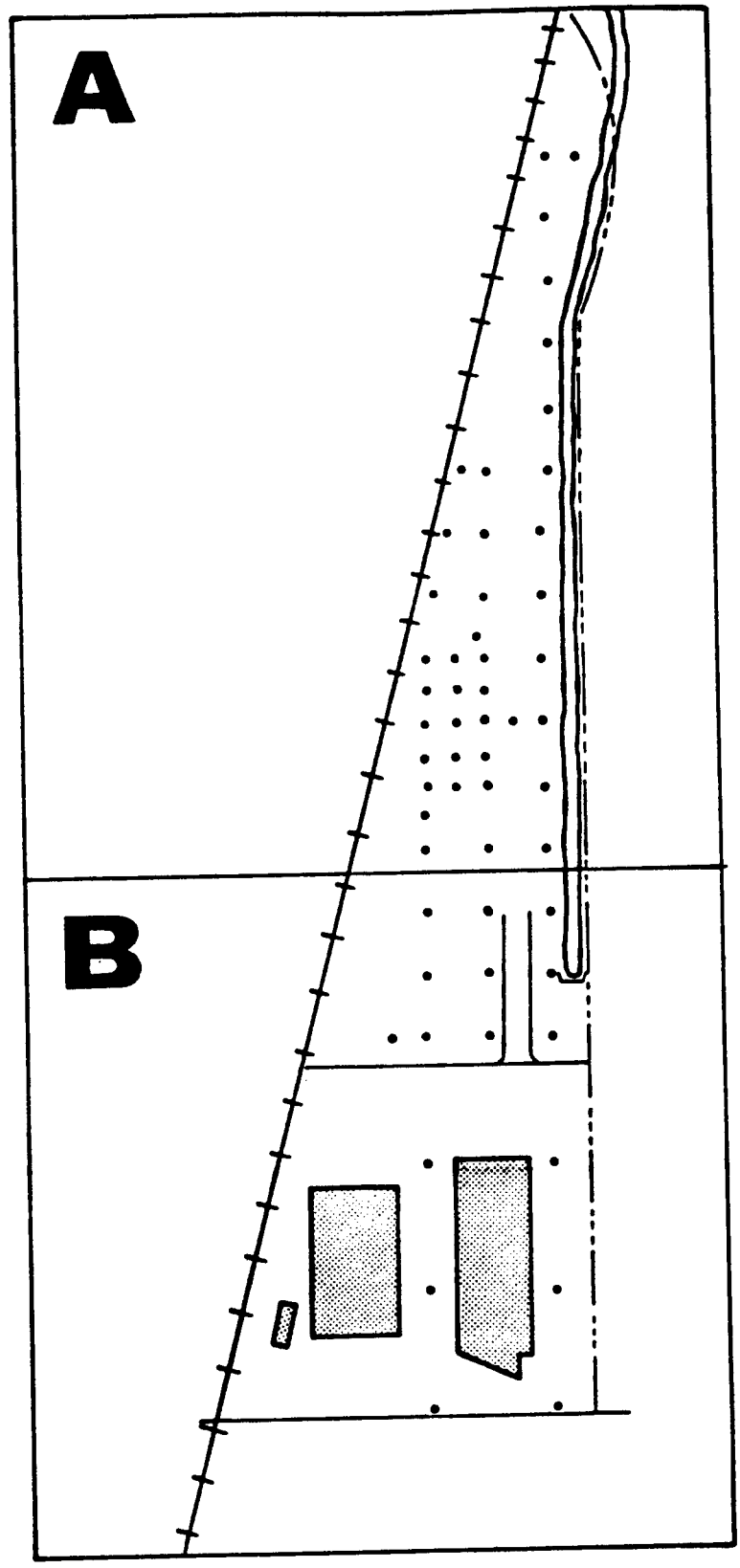
MAYWOOD, N.J.

SCALE: 1"=2000'

FIGURE 1

NUS CORPORATION

A Halliburton Company

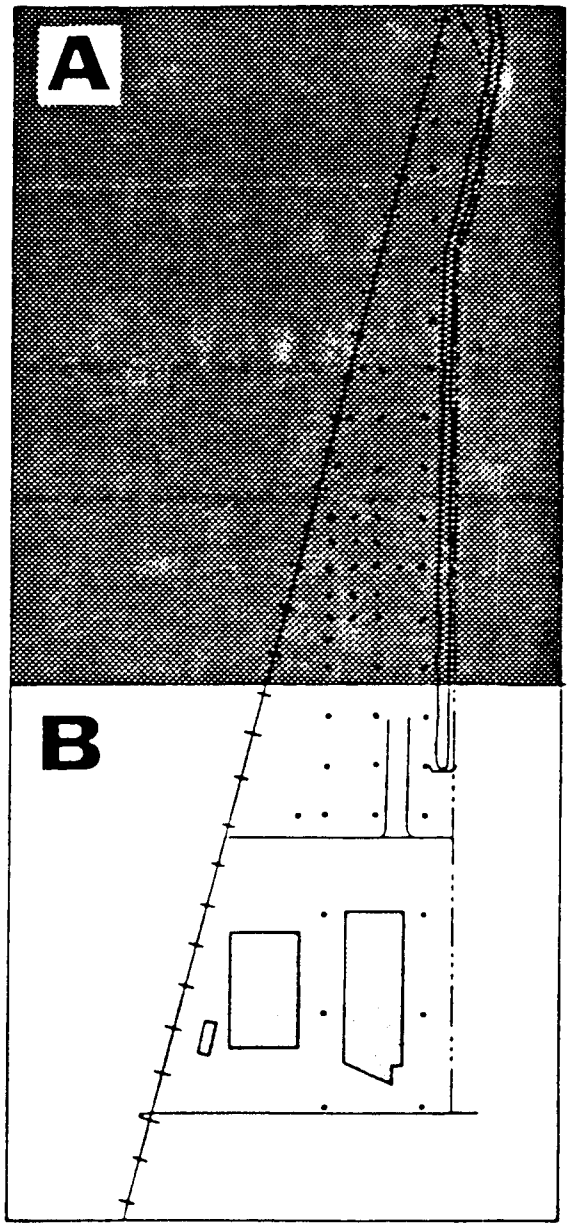


LEGEND:
• GRID POINT

FIGURE 2-A

SEGMENT LOCATION MAP (SCANEL SITE)
MAYWOOD CHEMICAL, MAYWOOD, N.J.

NUS CORPORATION
A Halliburton Company



LEGEND:
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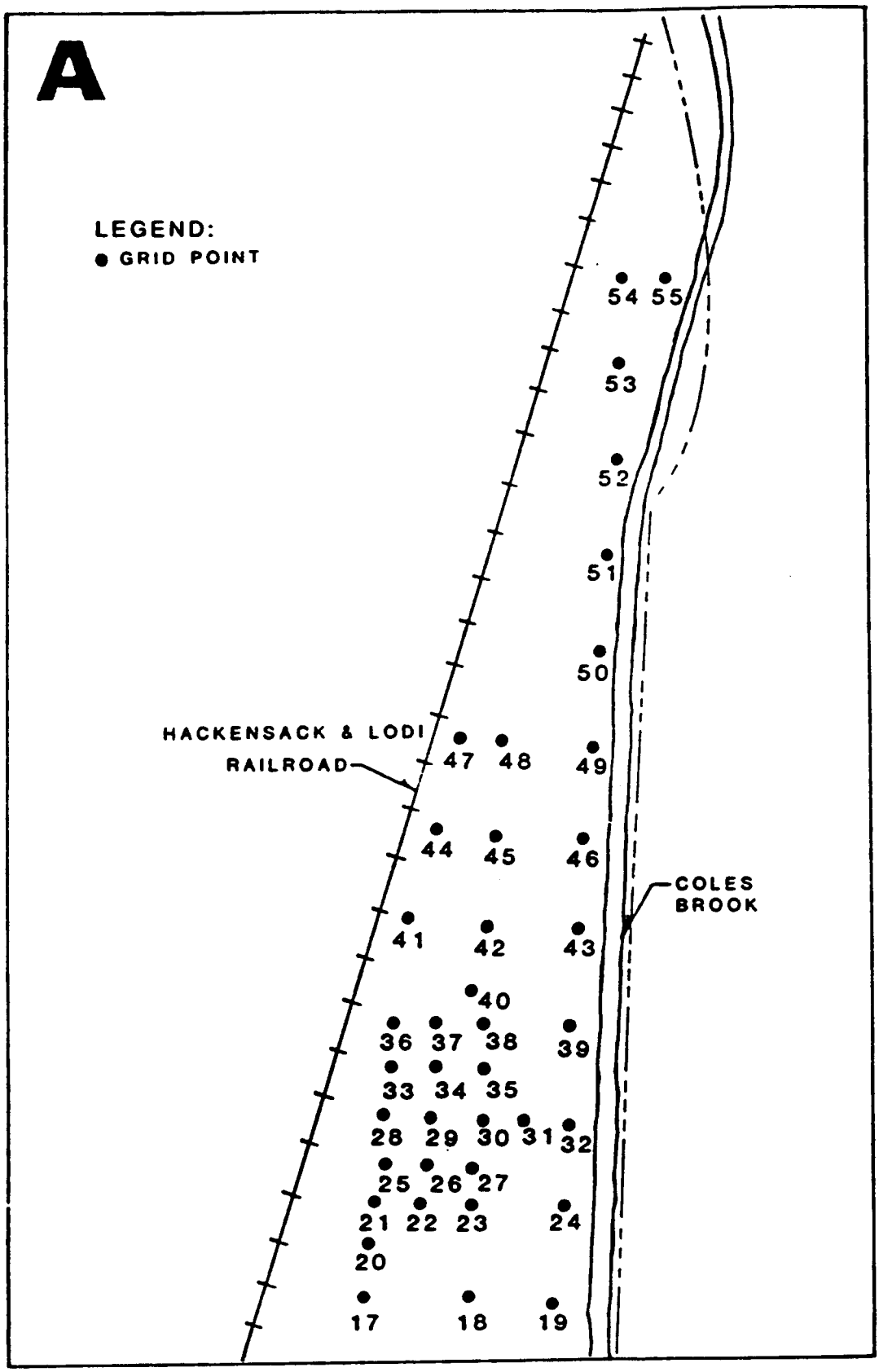


FIGURE 2-B

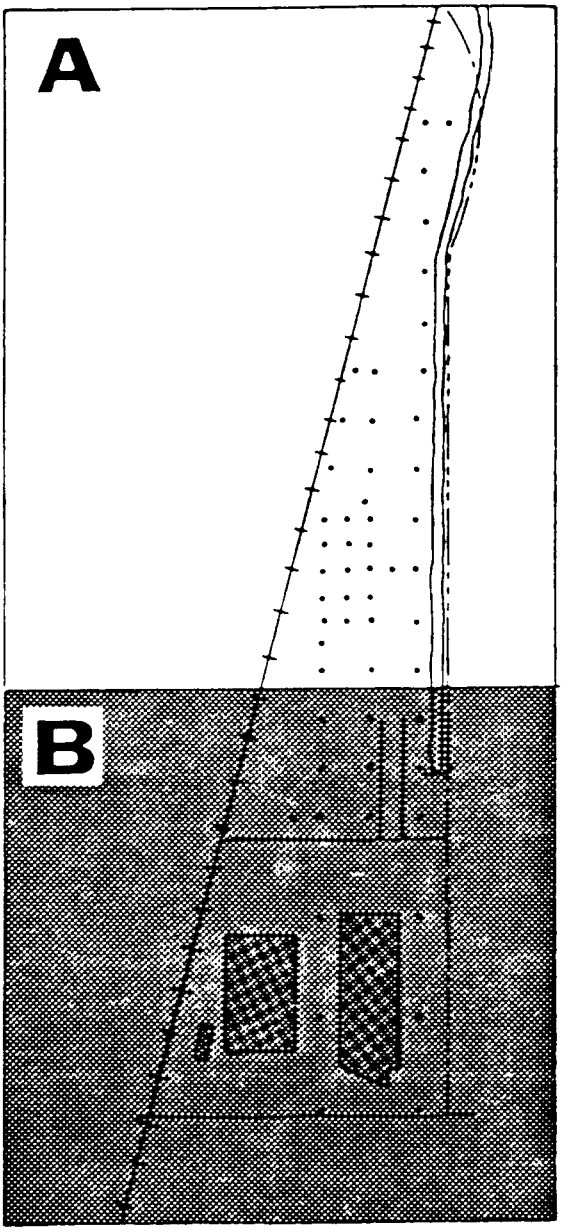
RADIOLOGICAL MONITORING LOCATIONS

SEGMENT A

SCANEL SITE, MAYWOOD, N.J.

NUS CORPORATION

A Halliburton Company



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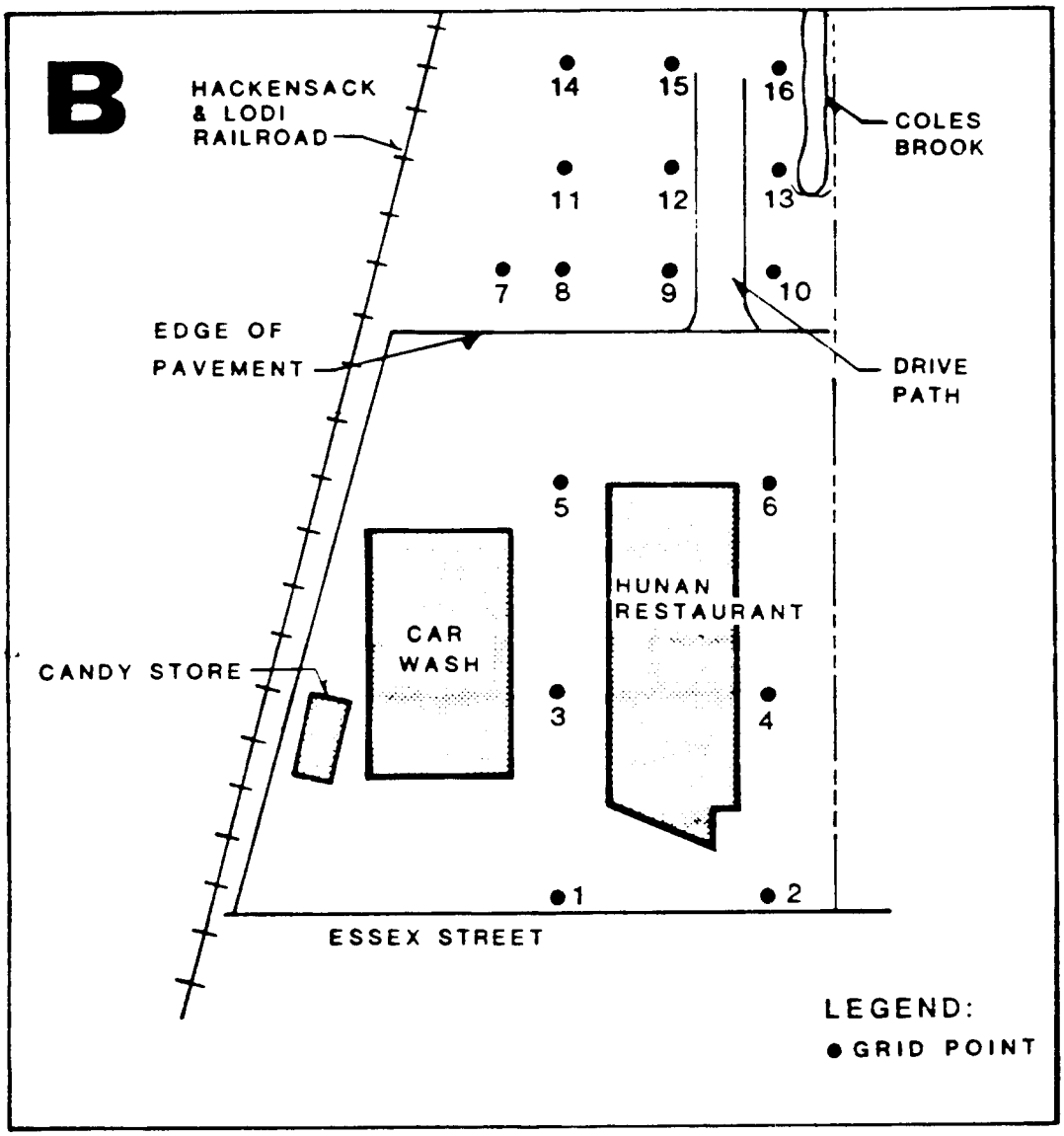


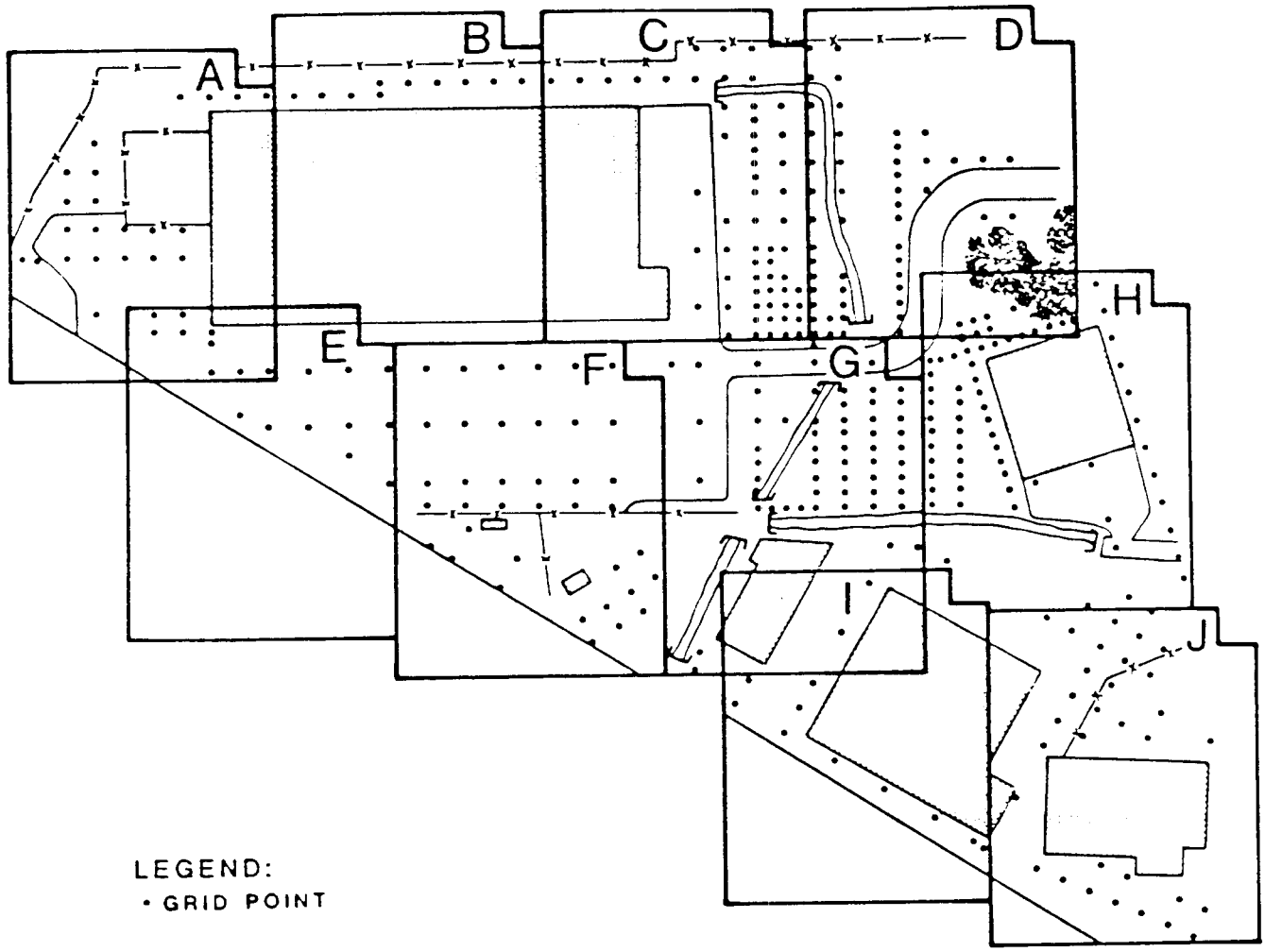
FIGURE 2-C

RADIOLOGICAL MONITORING LOCATIONS

SEGMENT B

SCANEL SITE, MAYWOOD, N.J.

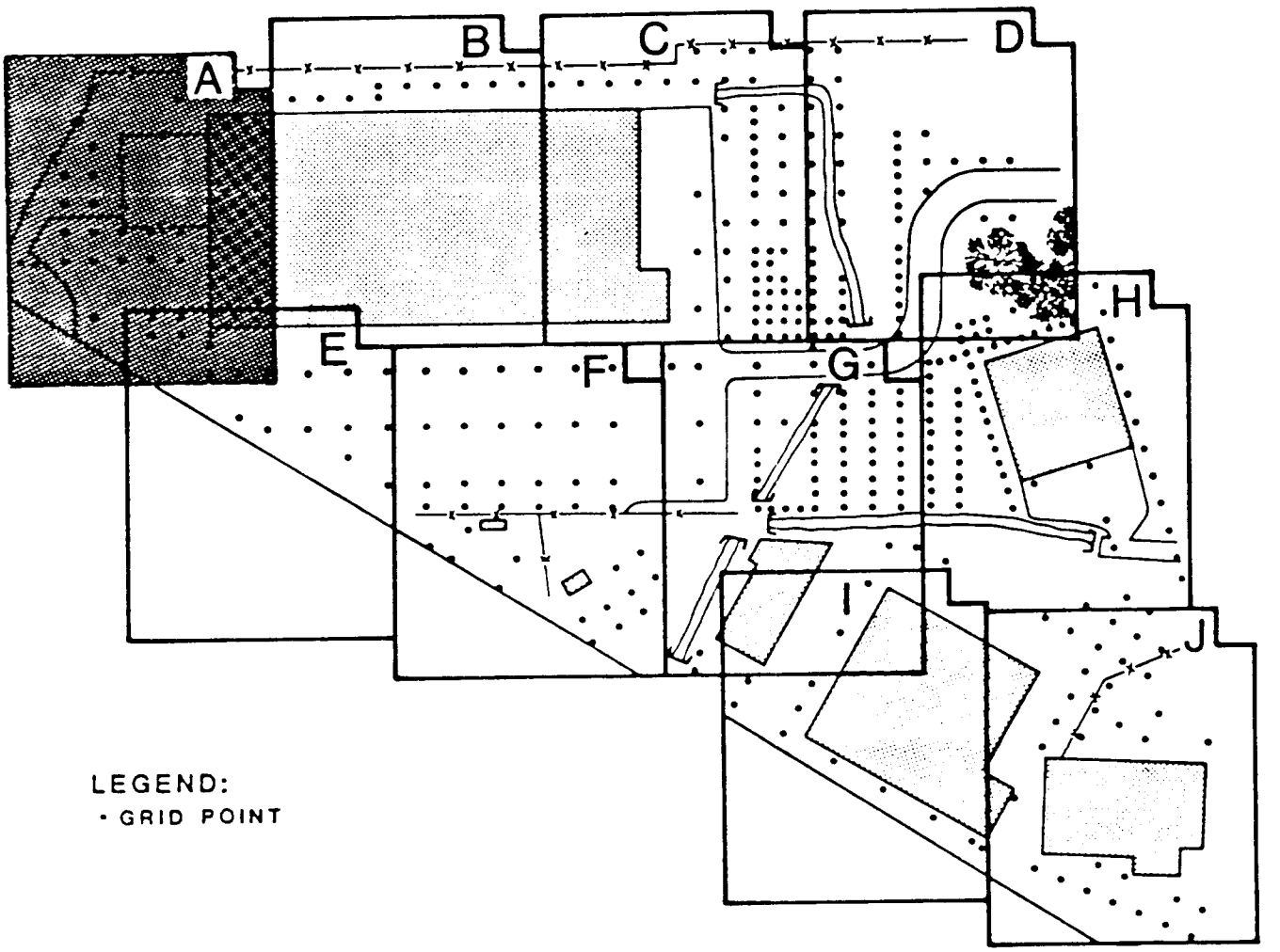
NUS CORPORATION
A Halliburton Company



SEGMENT LOCATION MAP (SEARS SITE)
MAYWOOD CHEMICAL, MAYWOOD N.J.

FIGURE 2-D

NUS CORPORATION
A Halliburton Company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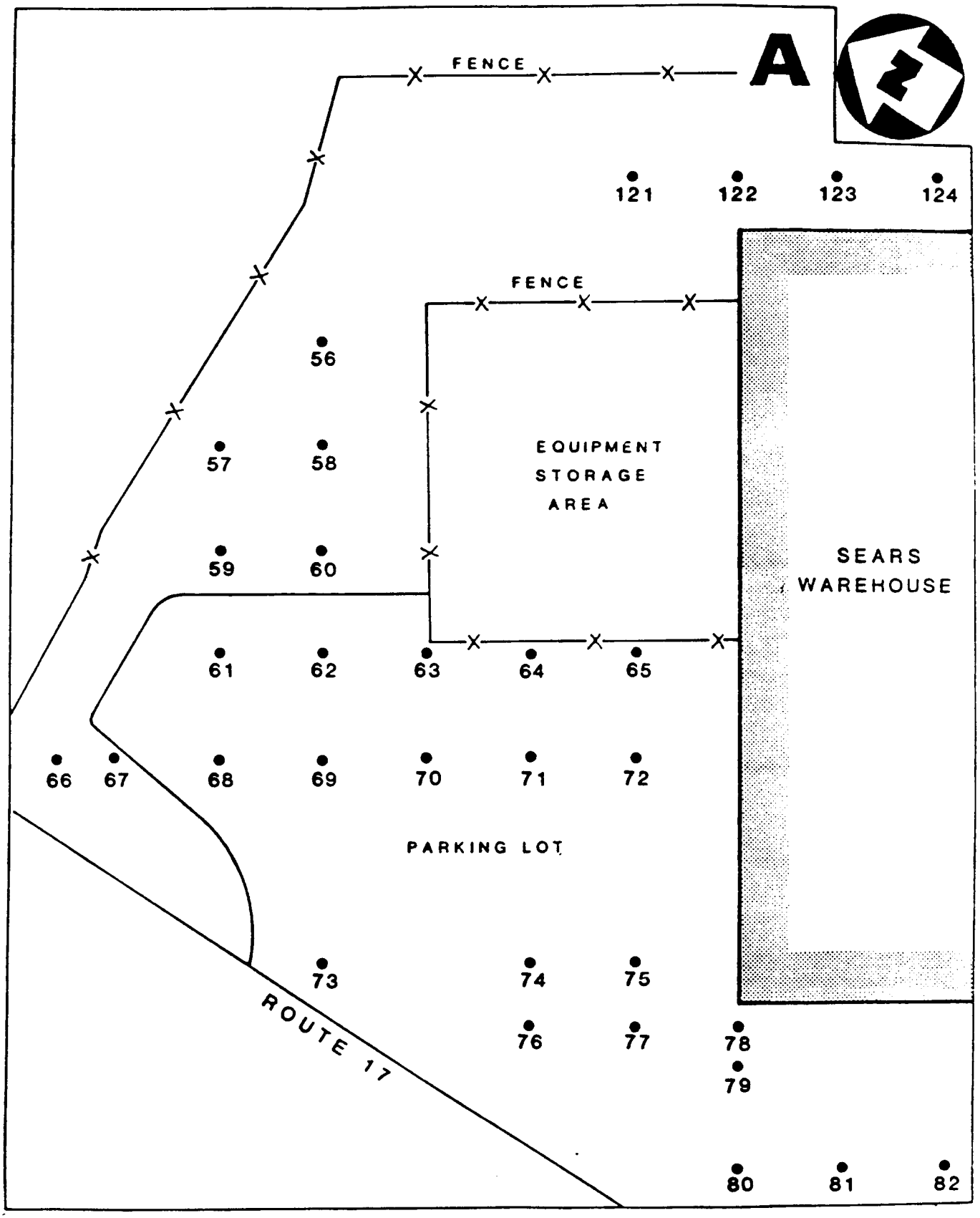


RADIOLOGICAL MONITORING LOCATIONS-SEGMENT A

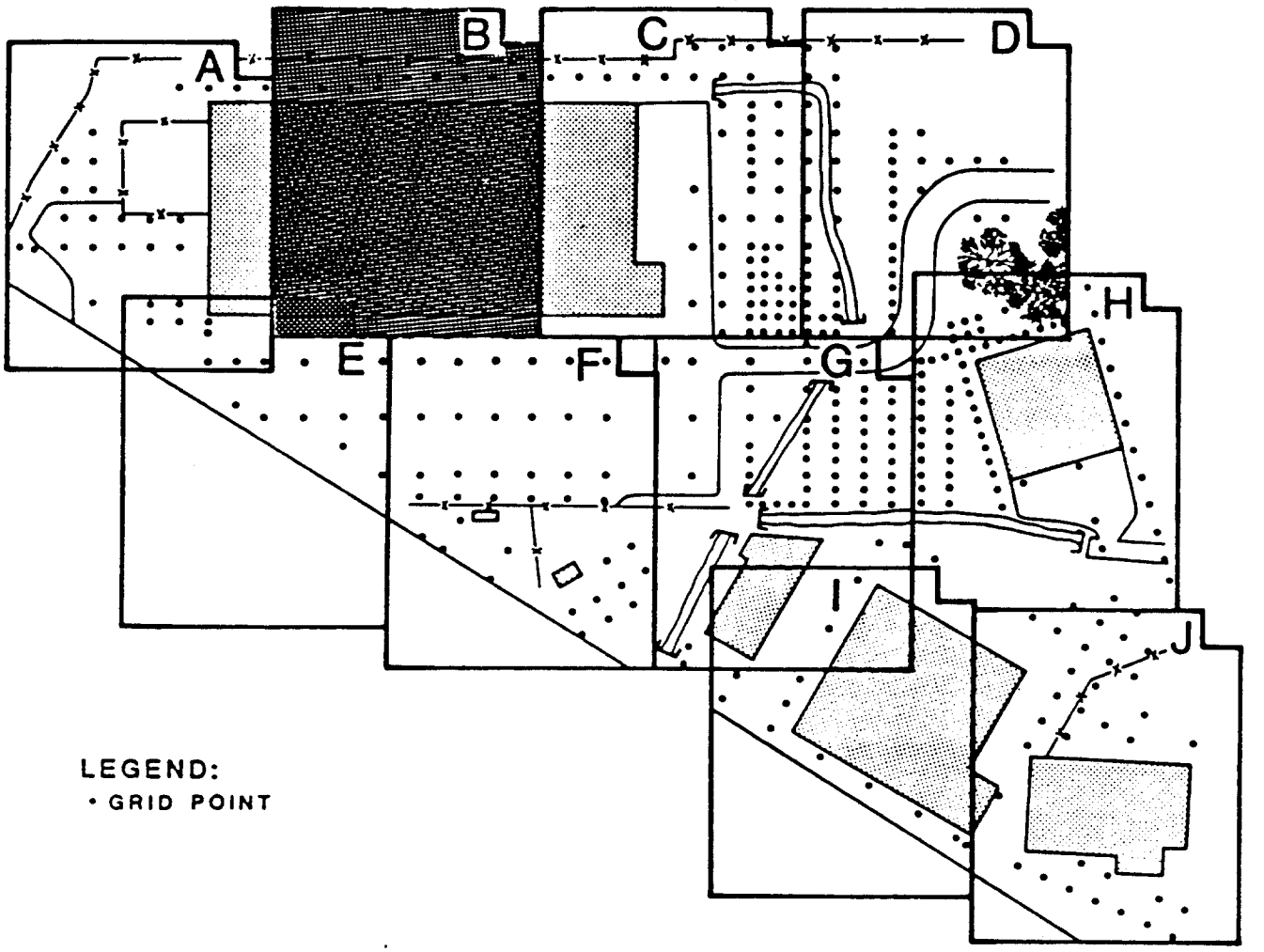
MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 2-E

NUS CORPORATION

A Halliburton Company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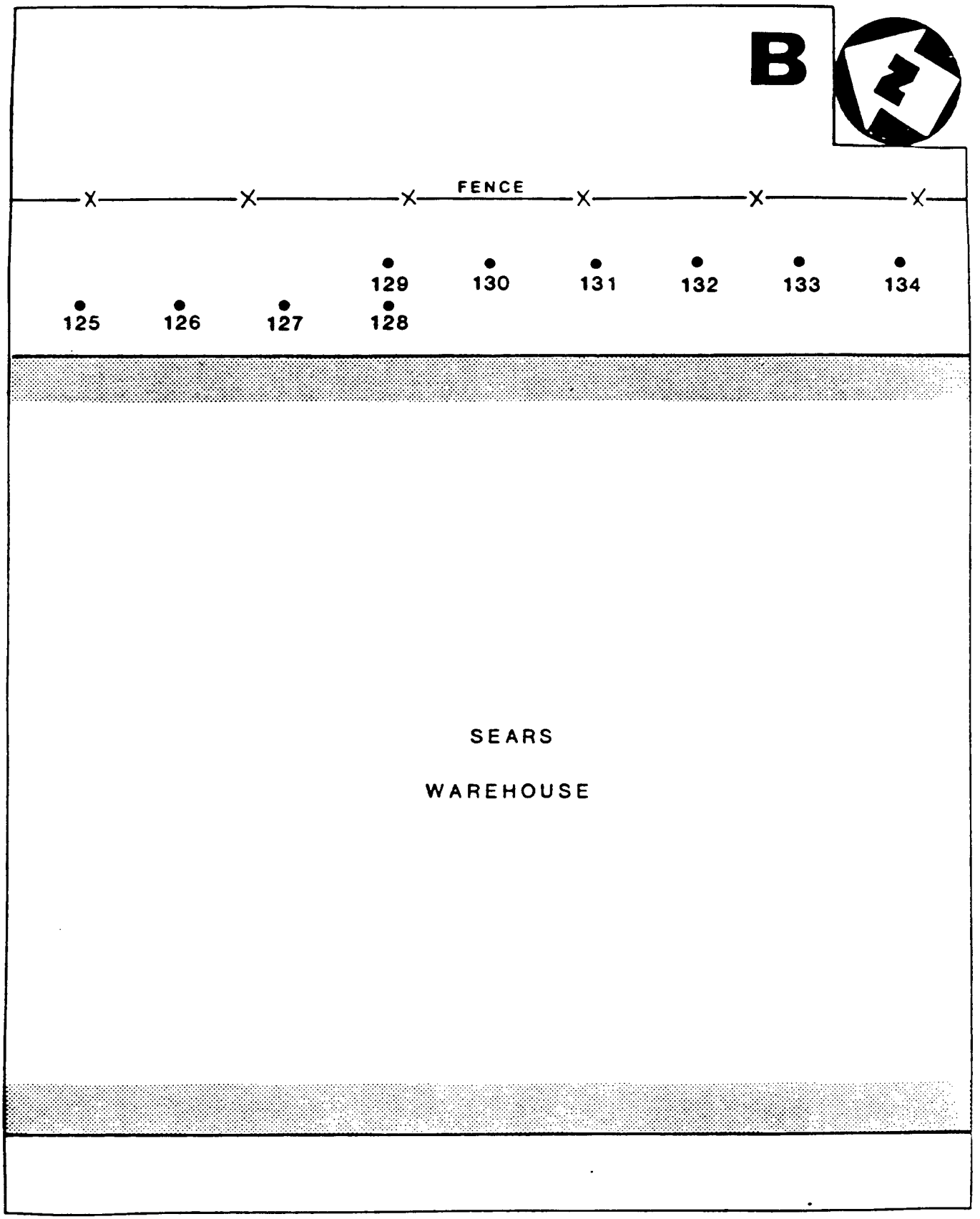


FIGURE 2-F

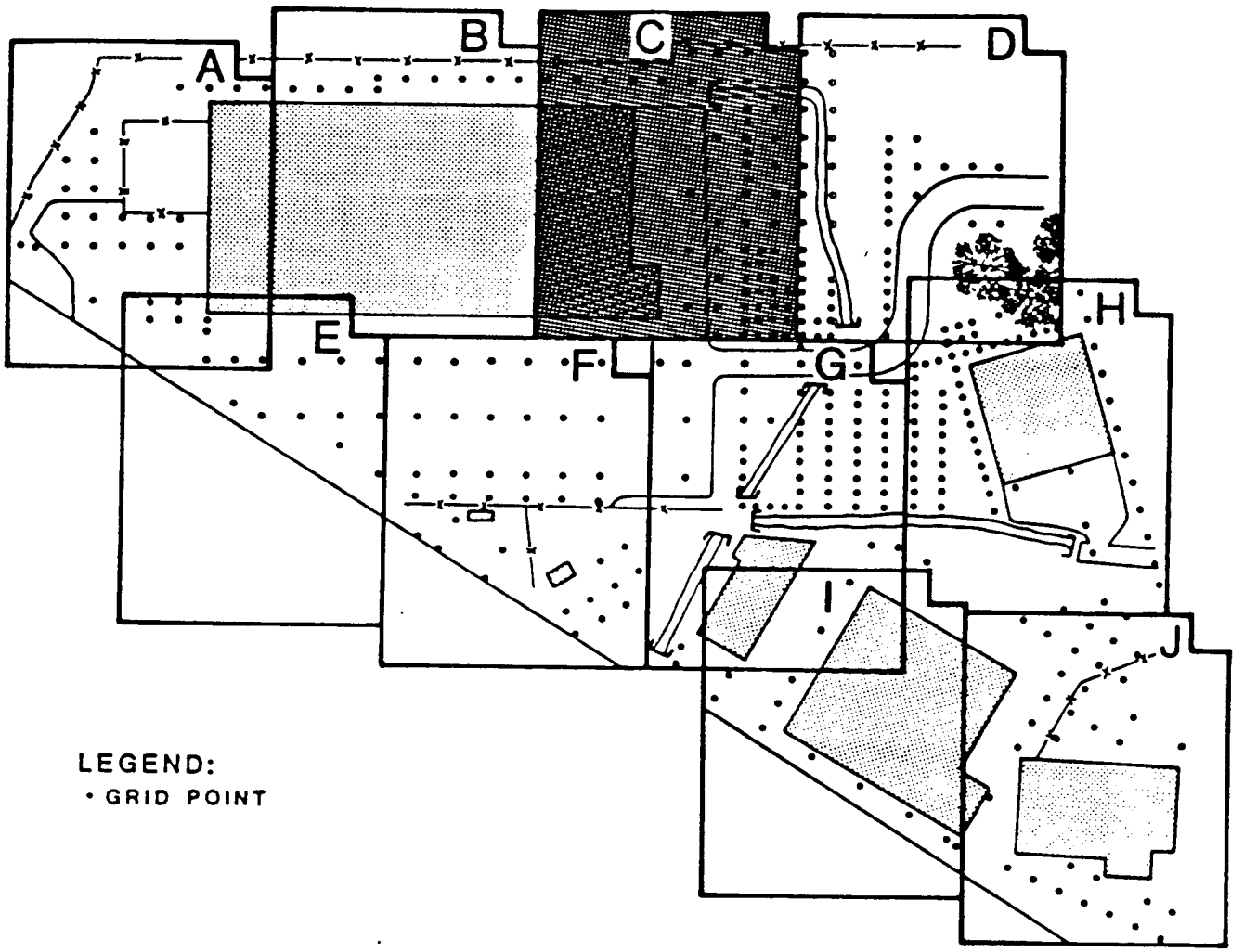
RADIOLOGICAL MONITORING LOCATIONS-SEGMENT B

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company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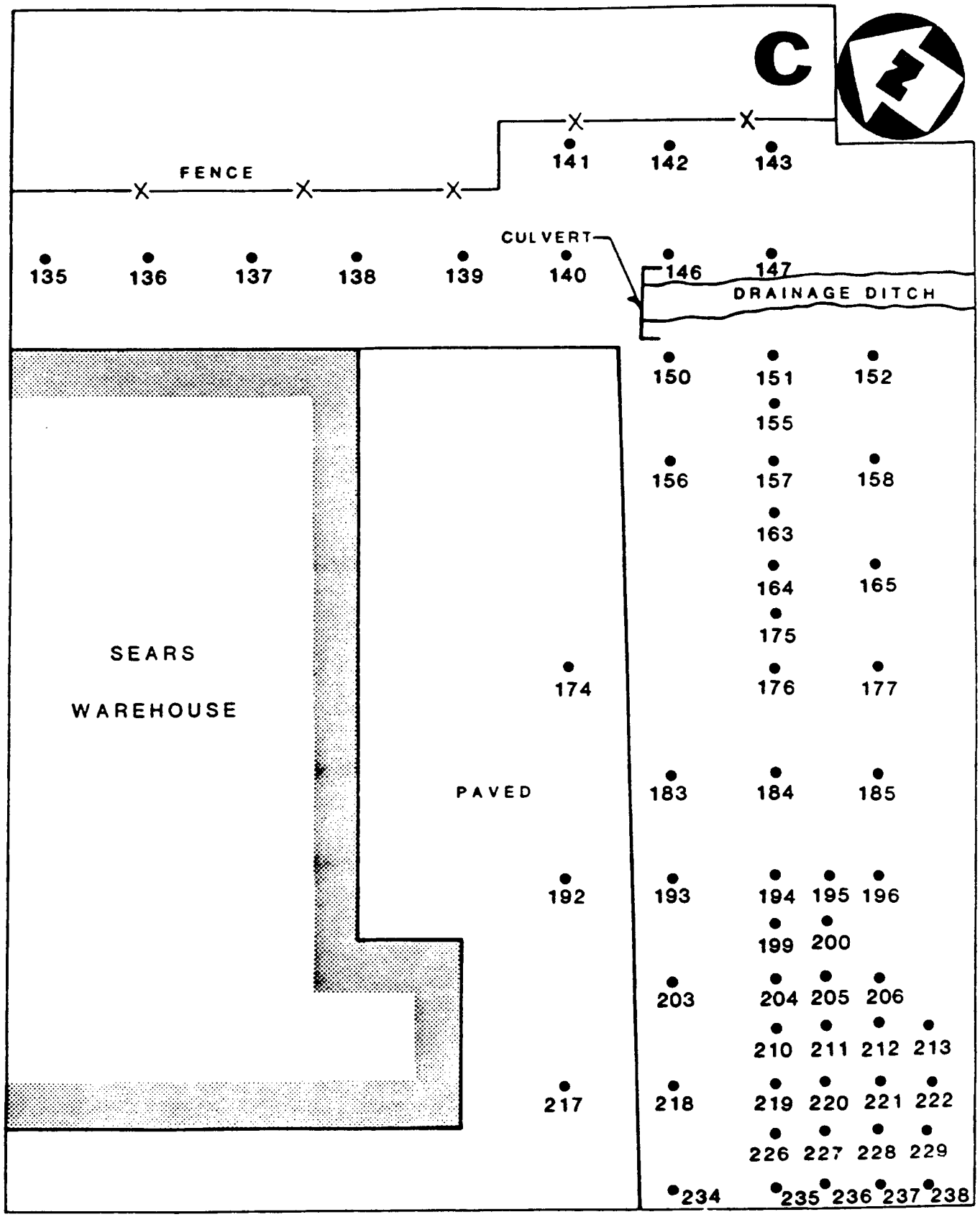


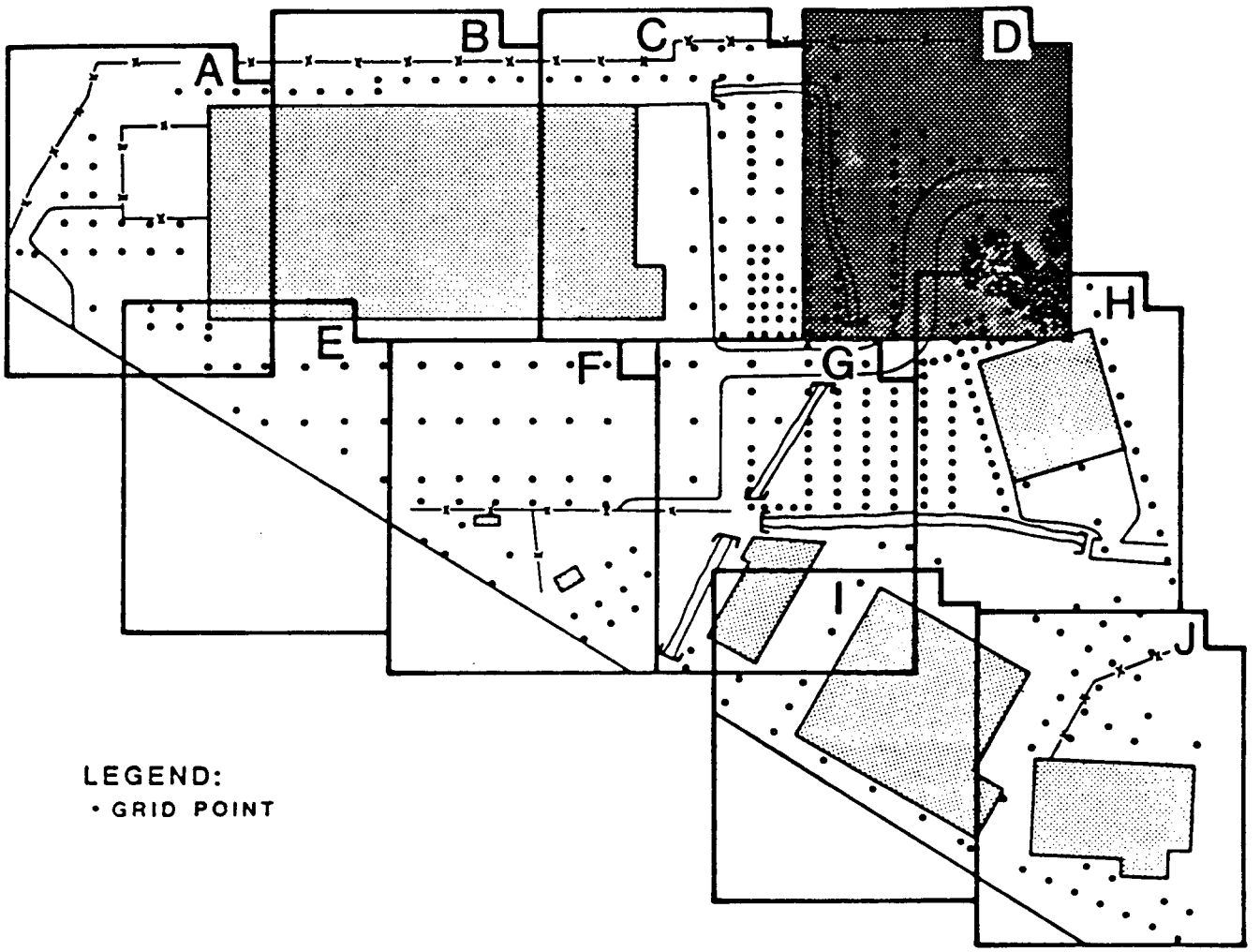
FIGURE 2-G

RADIOLOGICAL MONITORING LOCATIONS-SEGMENT C

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company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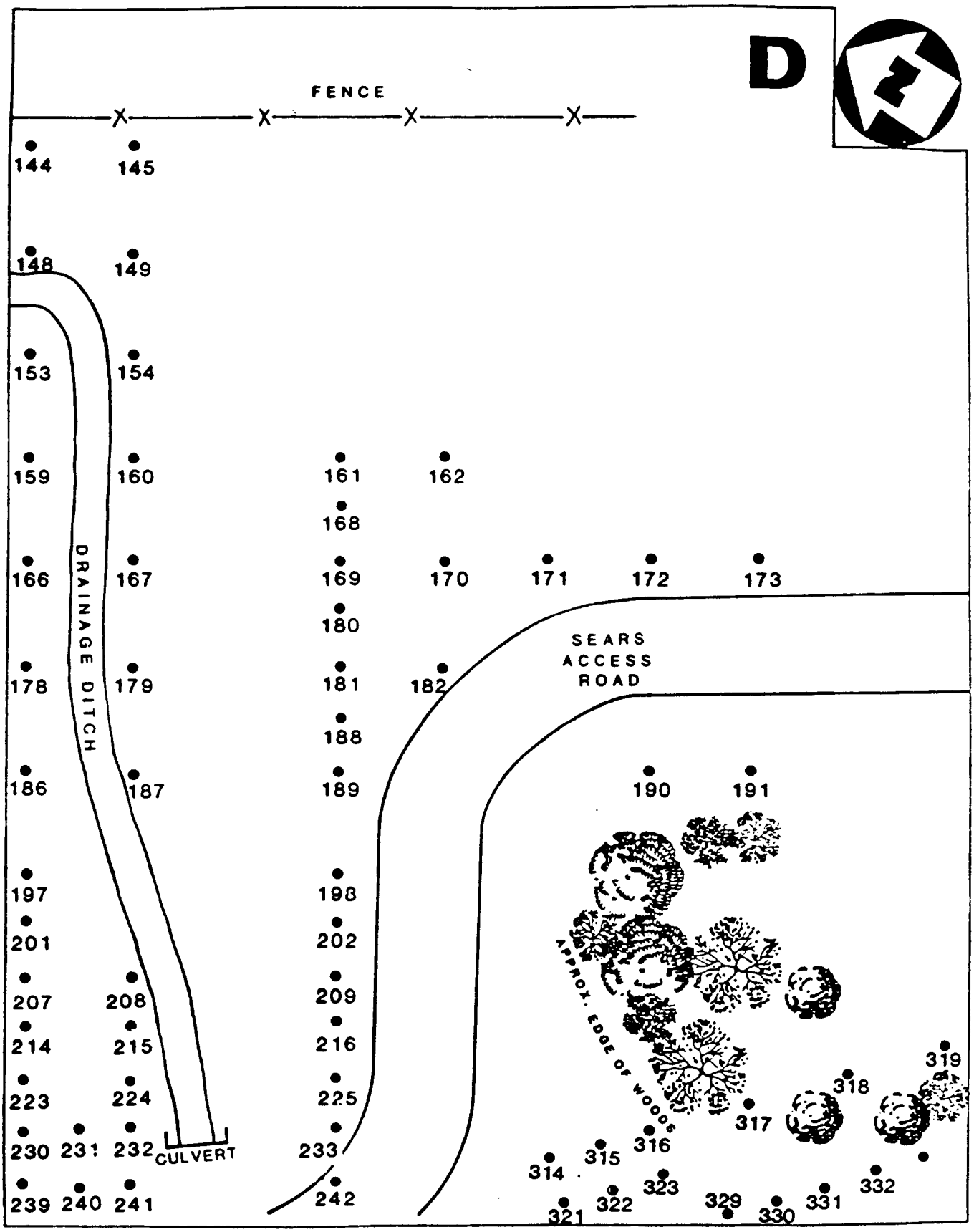


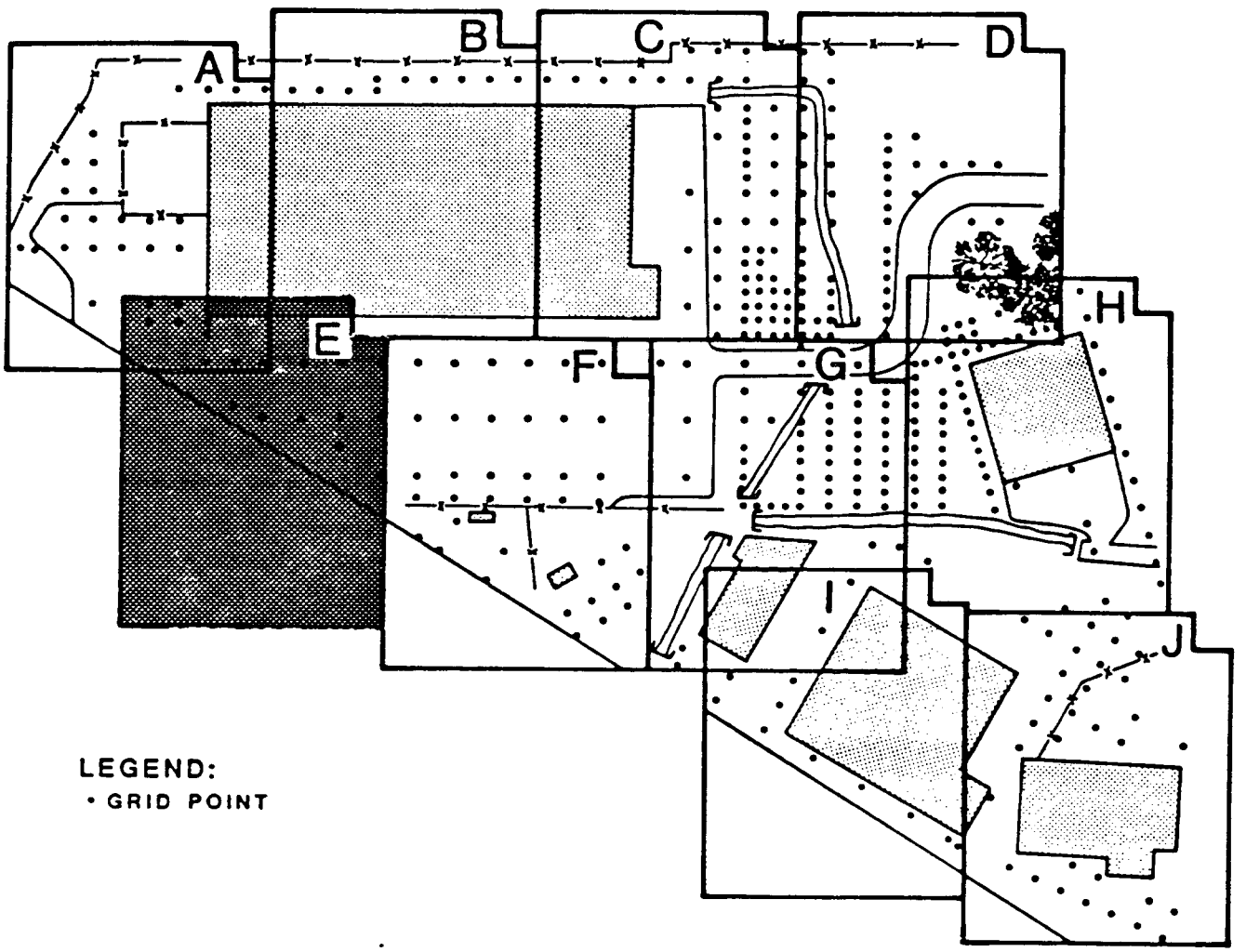
RADIOLOGICAL MONITORING LOCATIONS-SEGMENT D

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

FIGURE 2-H

NUS CORPORATION
A Halliburton Company



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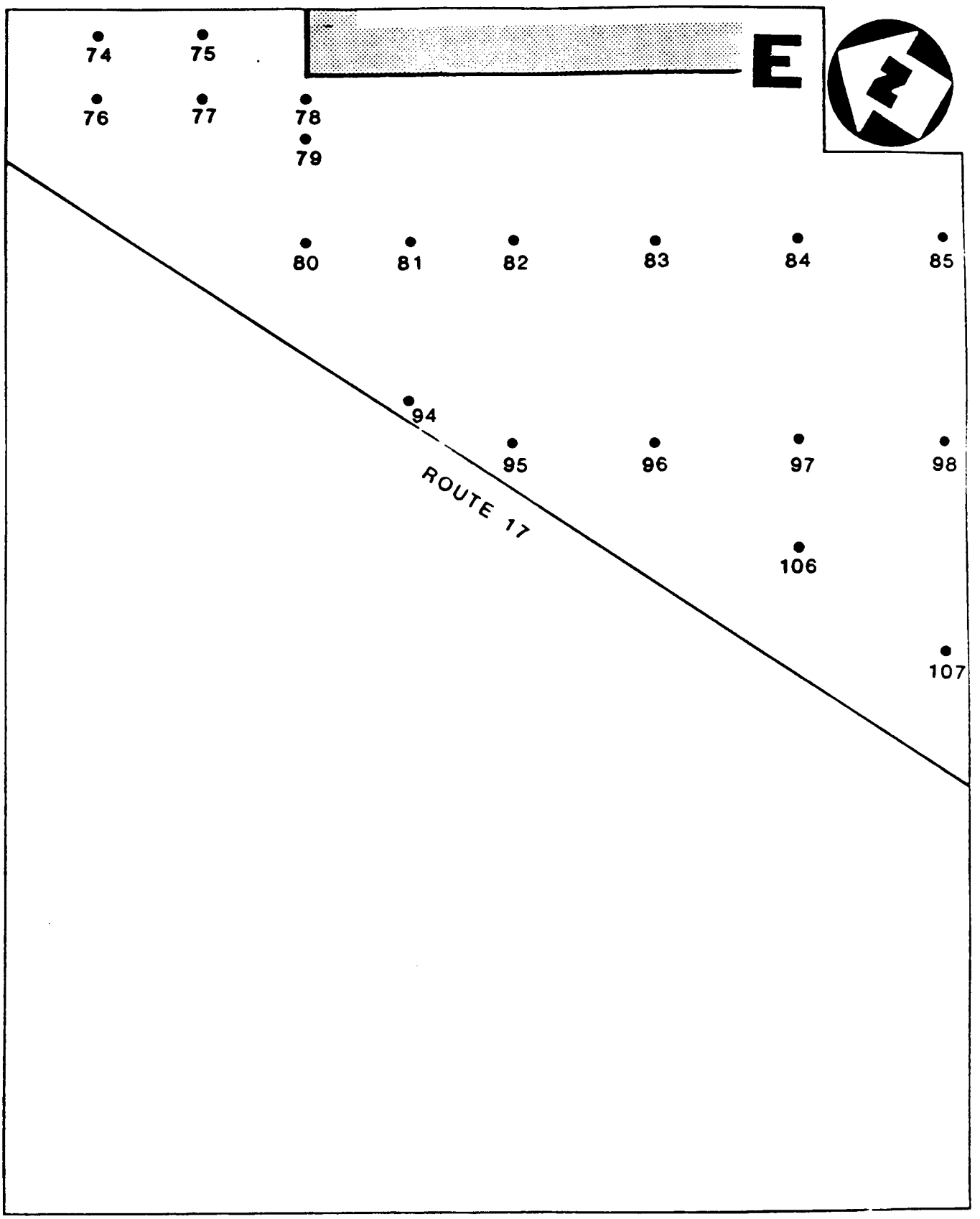


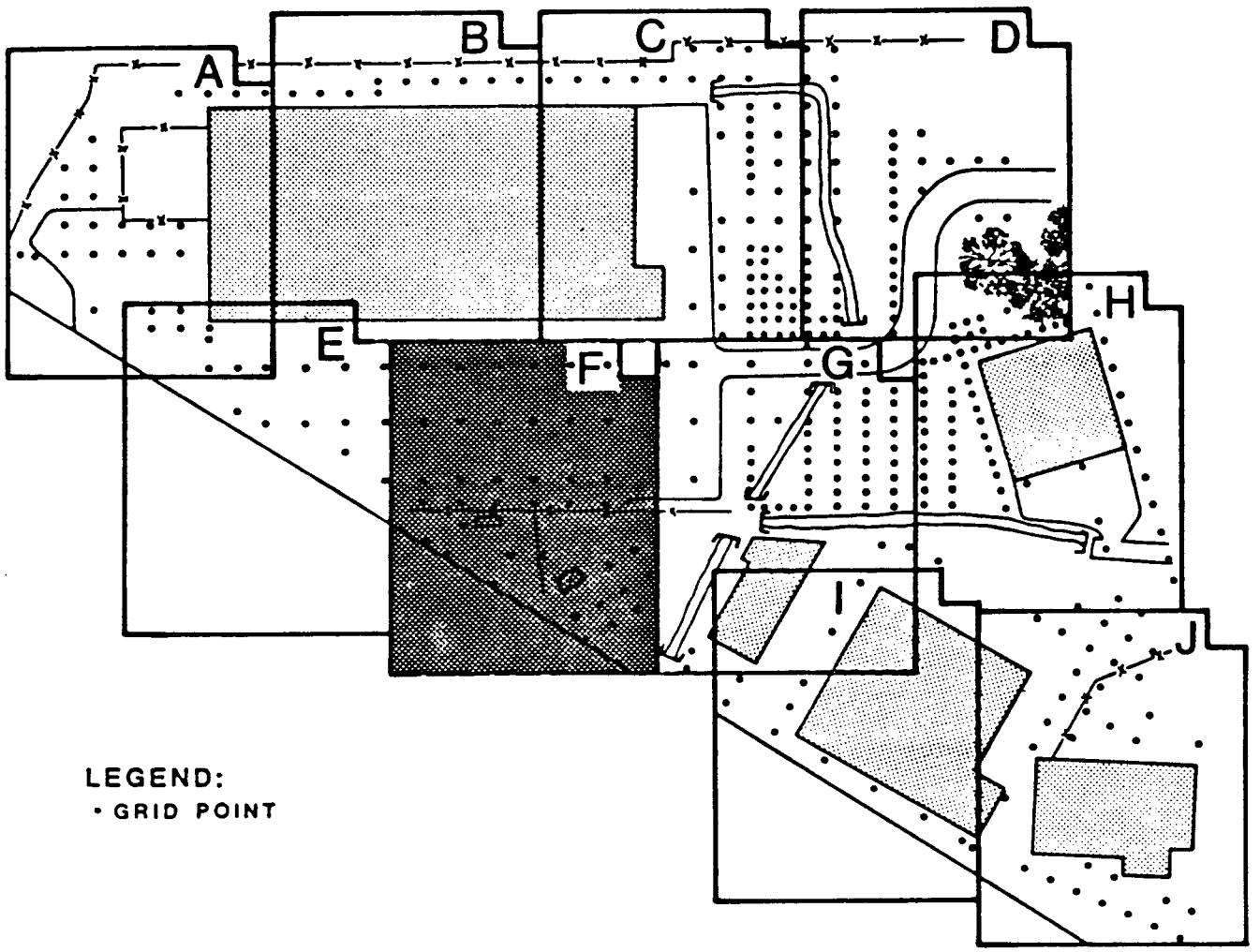
FIGURE 2-1

RADIOLOGICAL MONITORING LOCATIONS-SEGMENT E

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company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LEGEND:
• GRID POINT

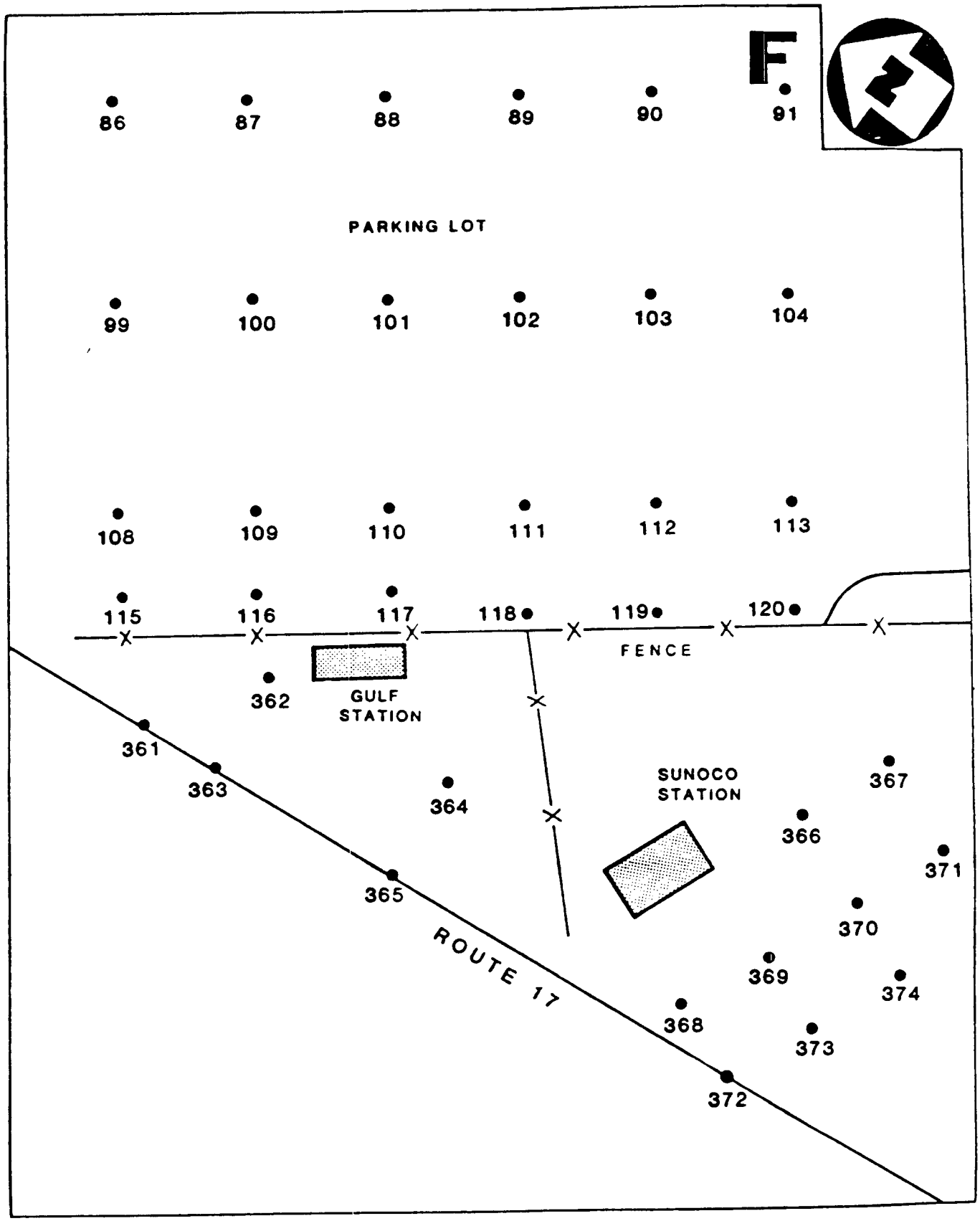


FIGURE 2-J

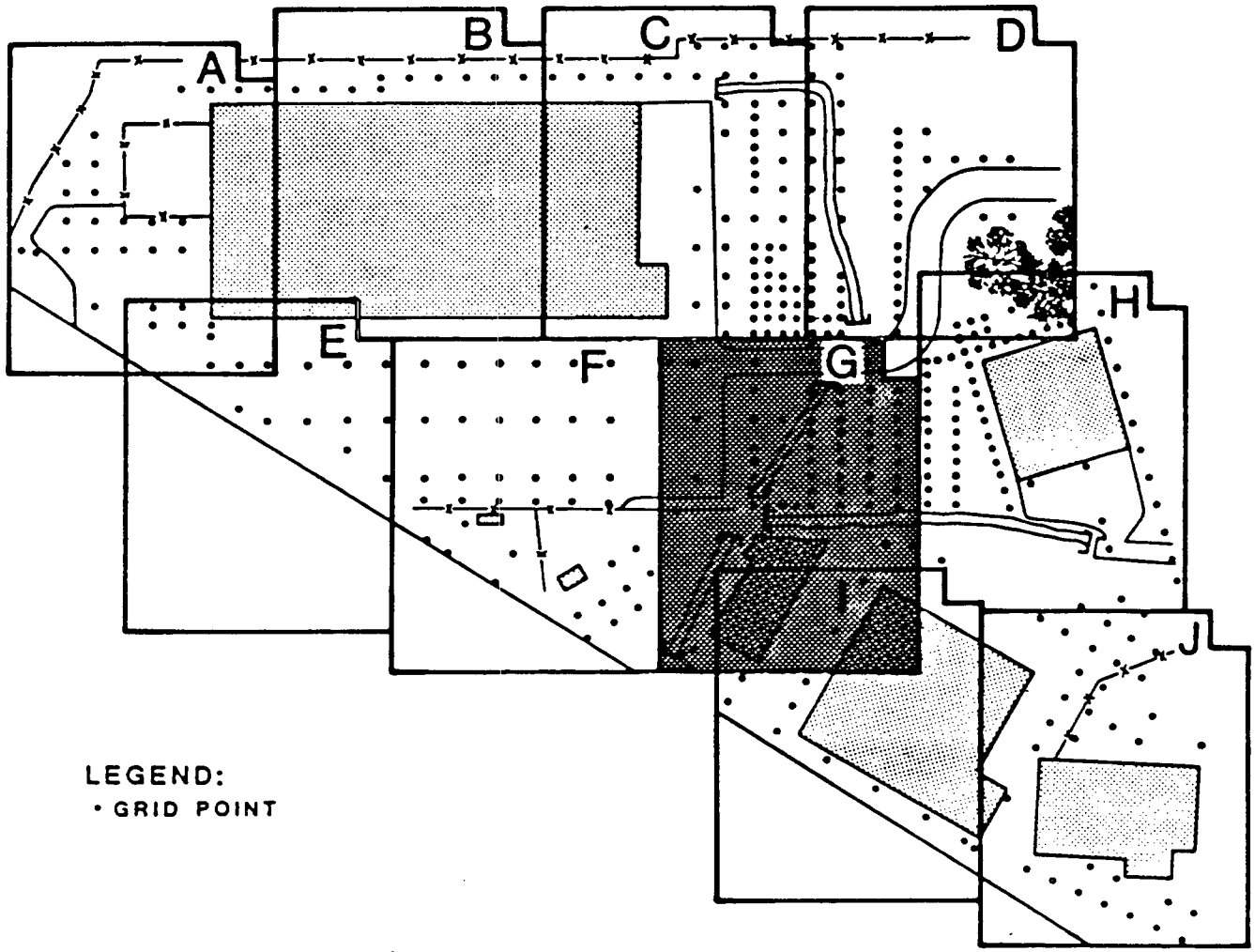
RADIOLOGICAL MONITORING LOCATIONS SEGMENT F

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company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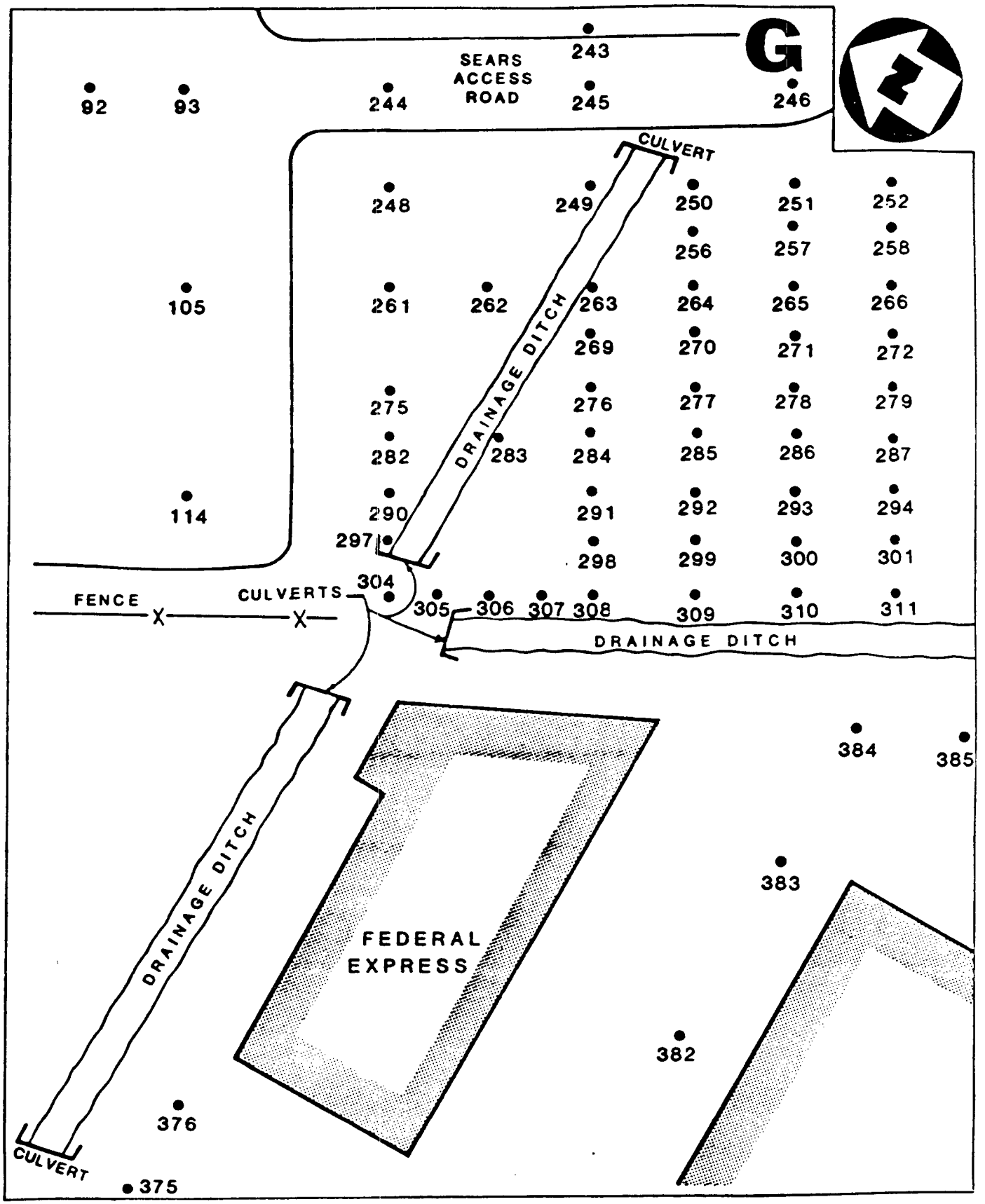


RADIOLOGICAL MONITORING LOCATIONS-SEGMENT G

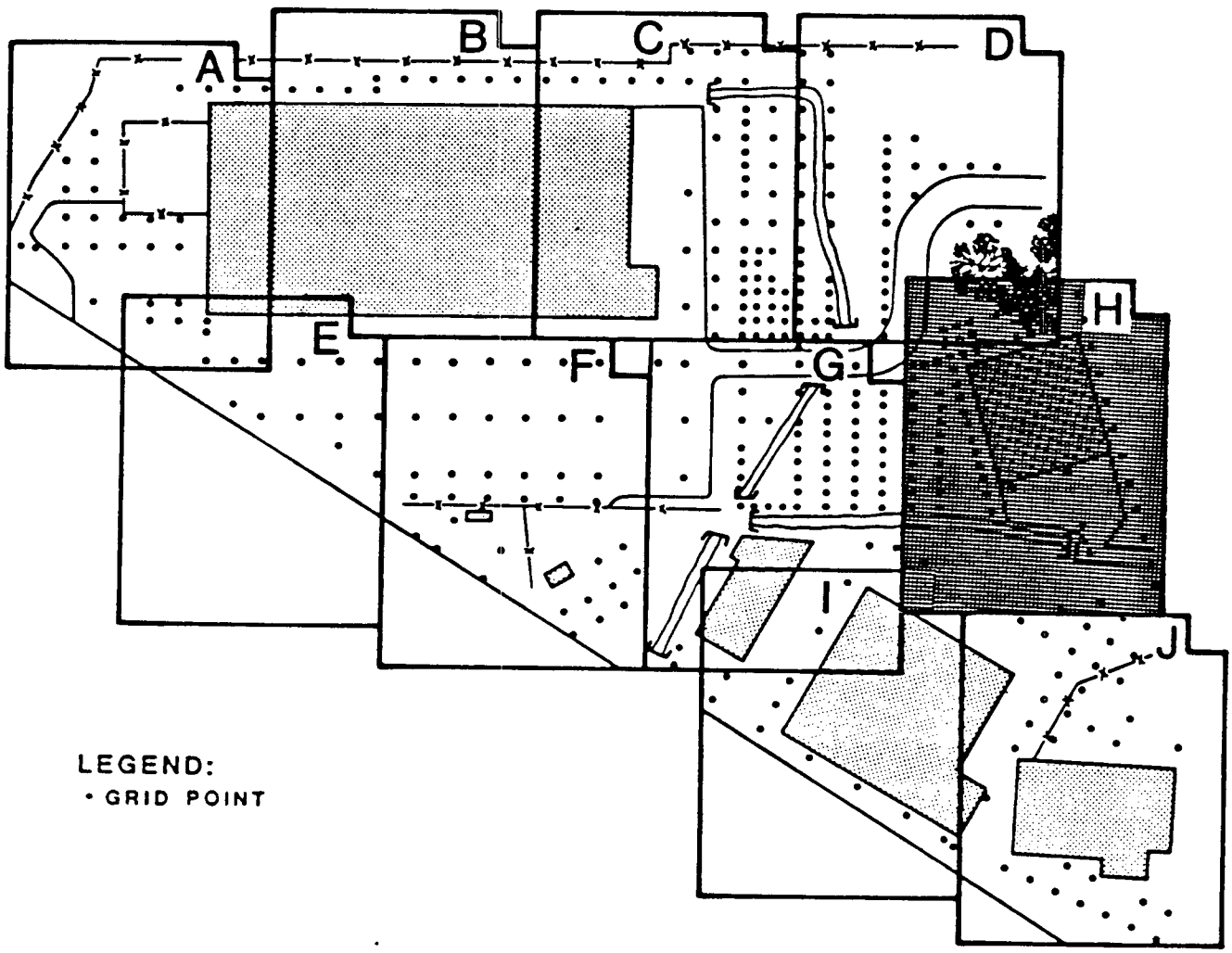
MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

FIGURE 2-K

NUS CORPORATION

A Halliburton Company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• GRID POINT

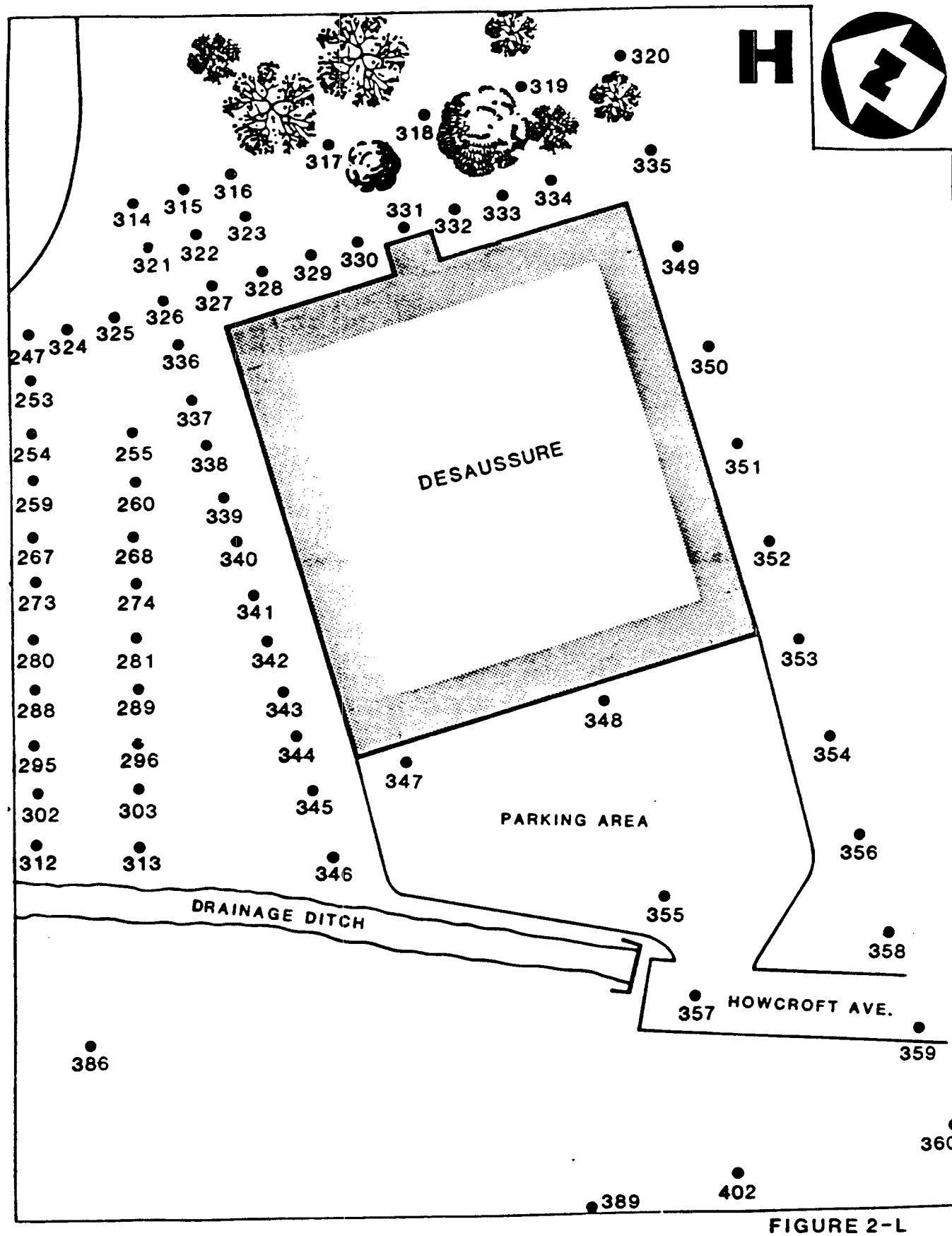


FIGURE 2-L

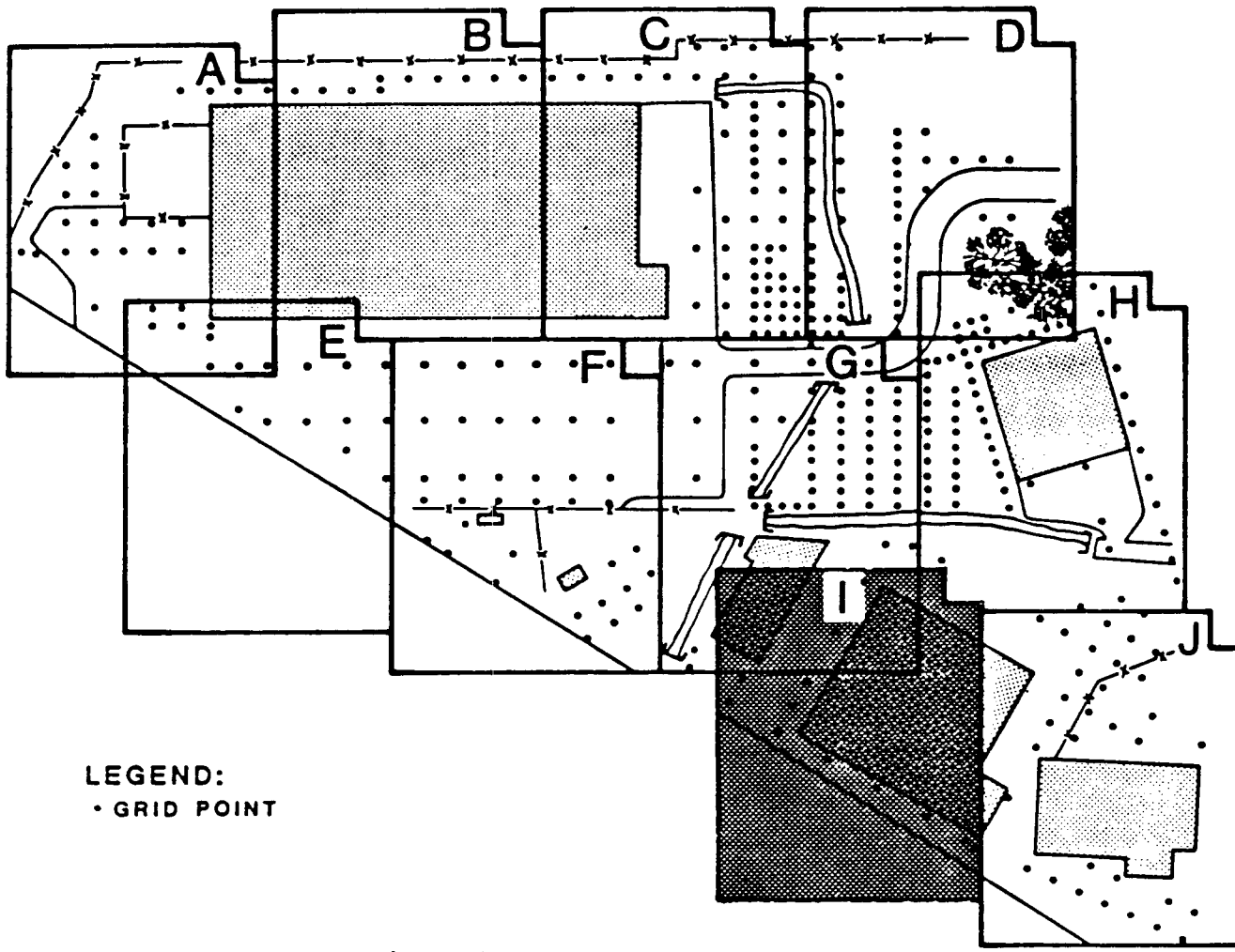
RADIOLOGICAL MONITORING LOCATIONS-SEGMENT H

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company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LEGEND:
• GRID POINT

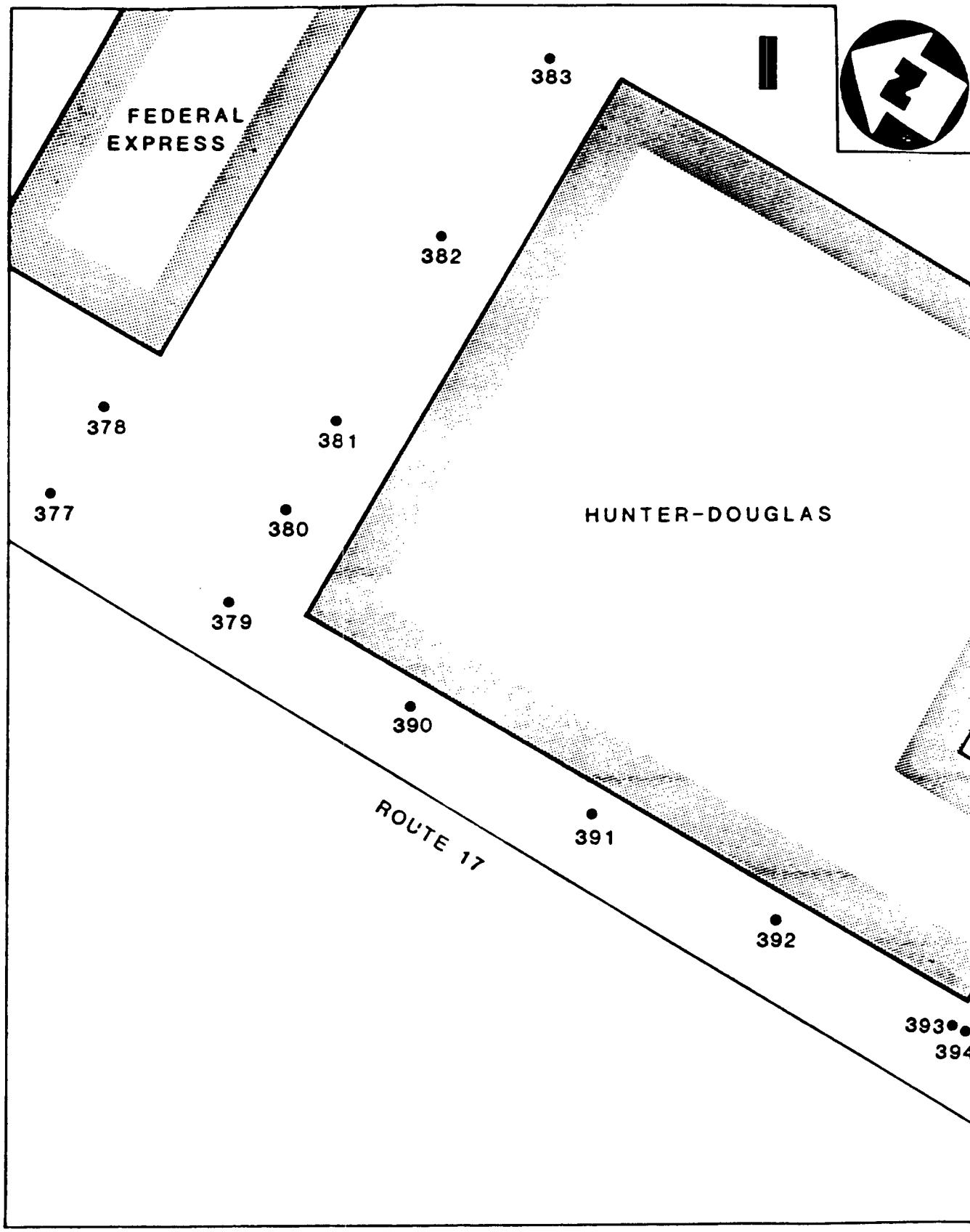


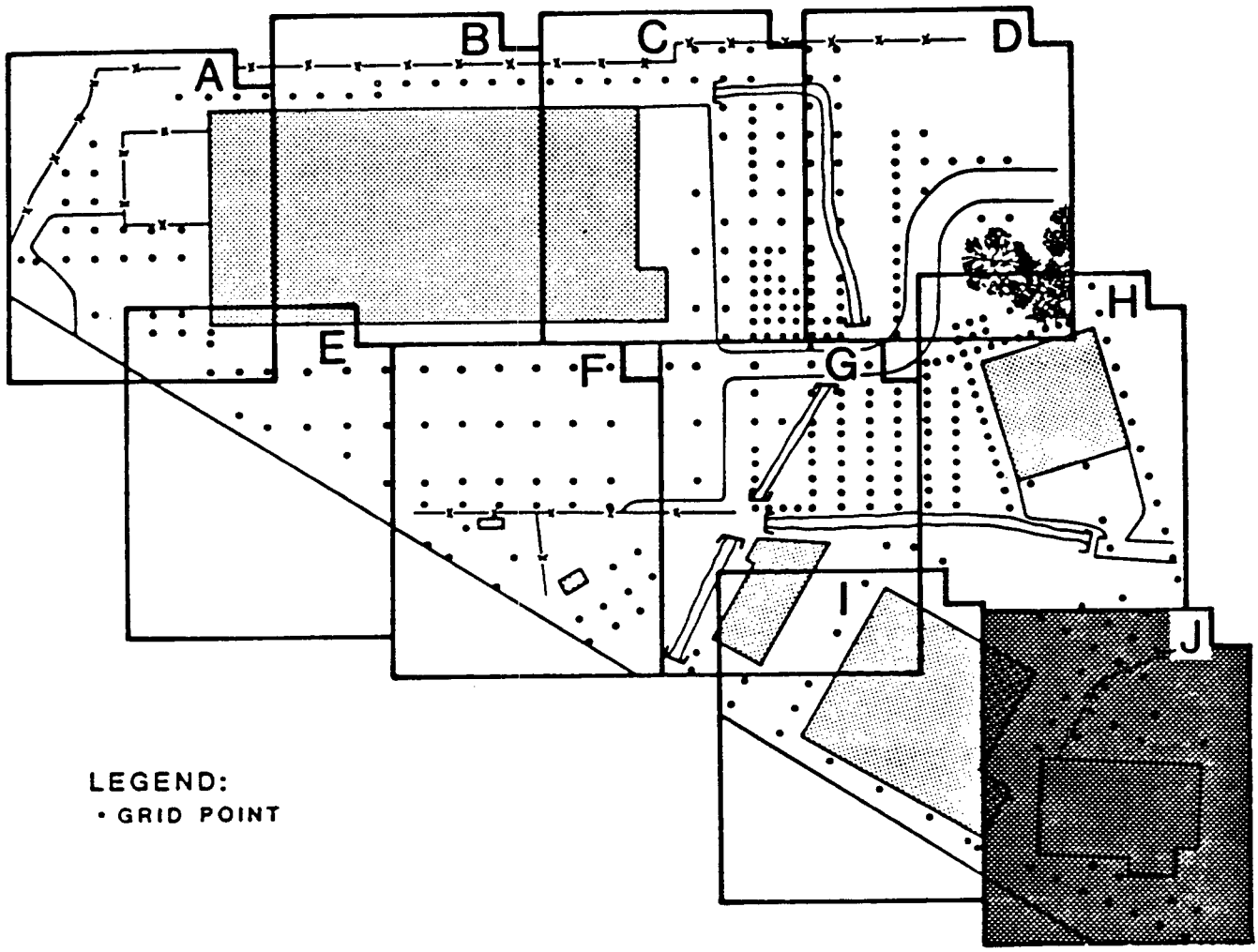
FIGURE 2-M

RADIOLOGICAL MONITORING LOCATIONS-SEGMENT I

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company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LEGEND:
• GRID POINT

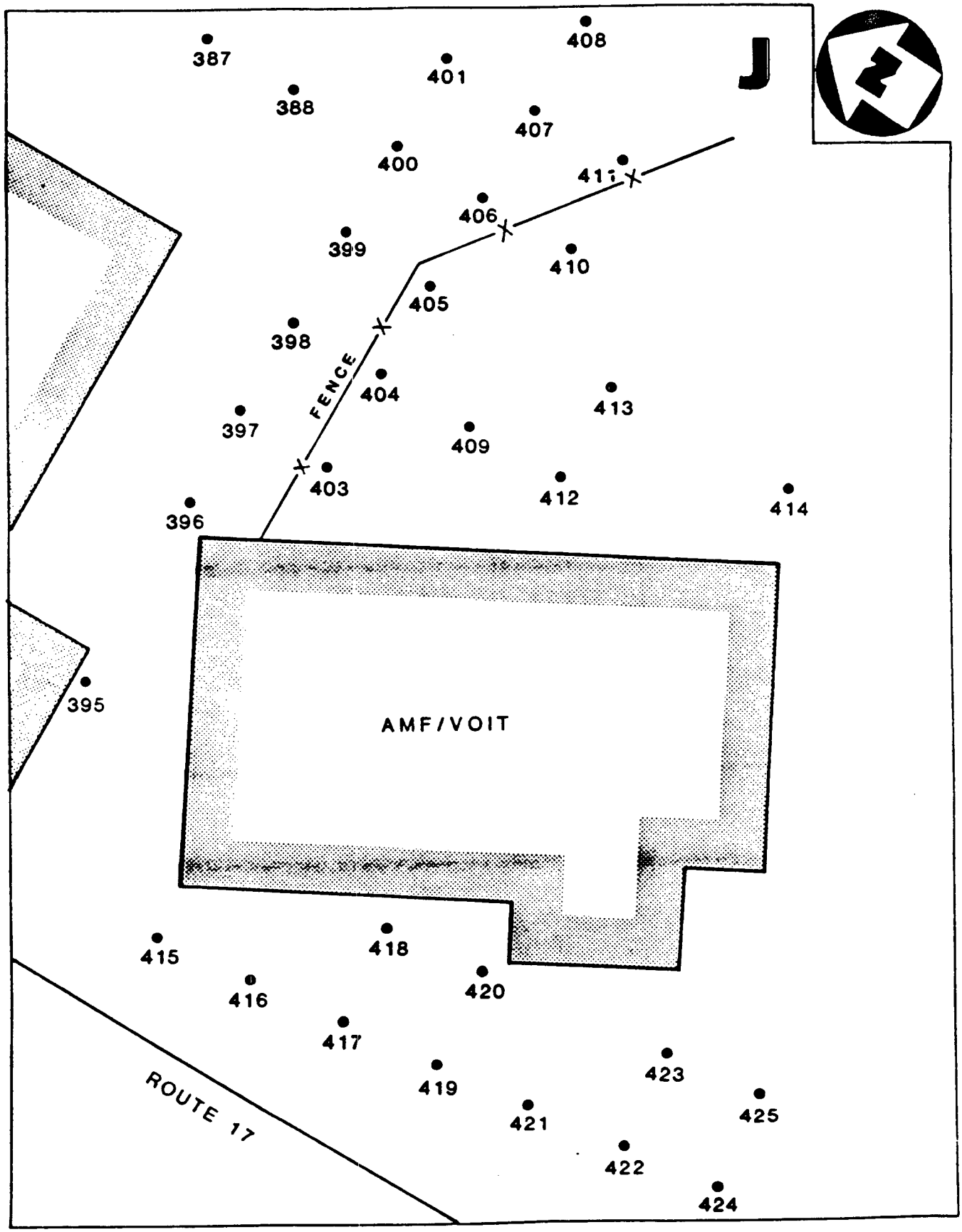


FIGURE 2-N

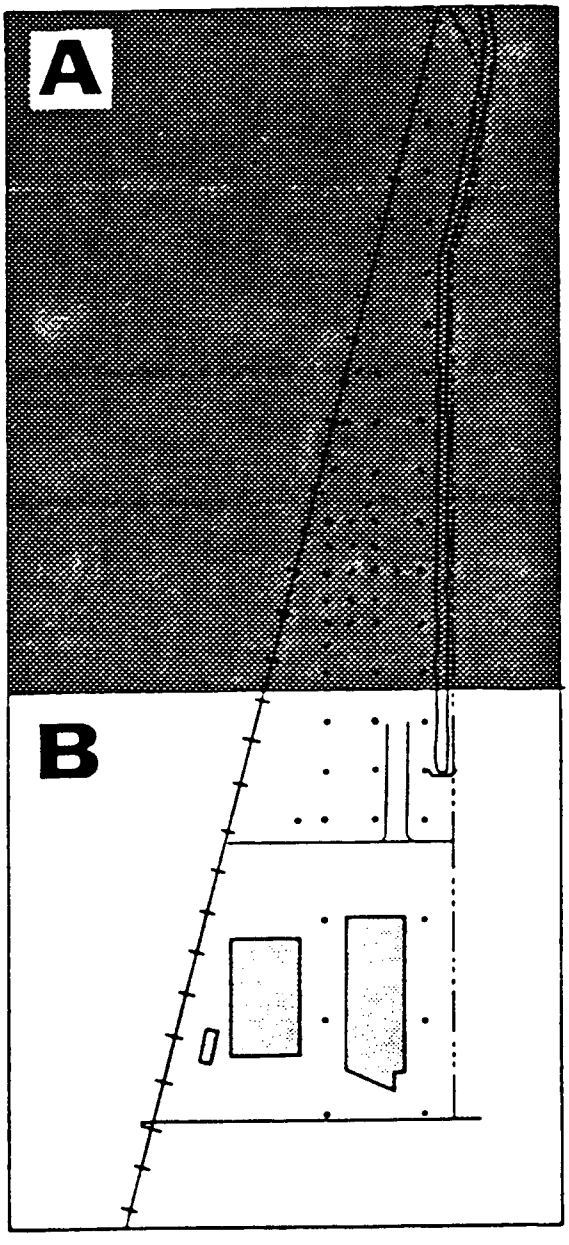
RADIOLOGICAL MONITORING LOCATIONS-SEGMENT J

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company



LEGEND:
• GRID POINT

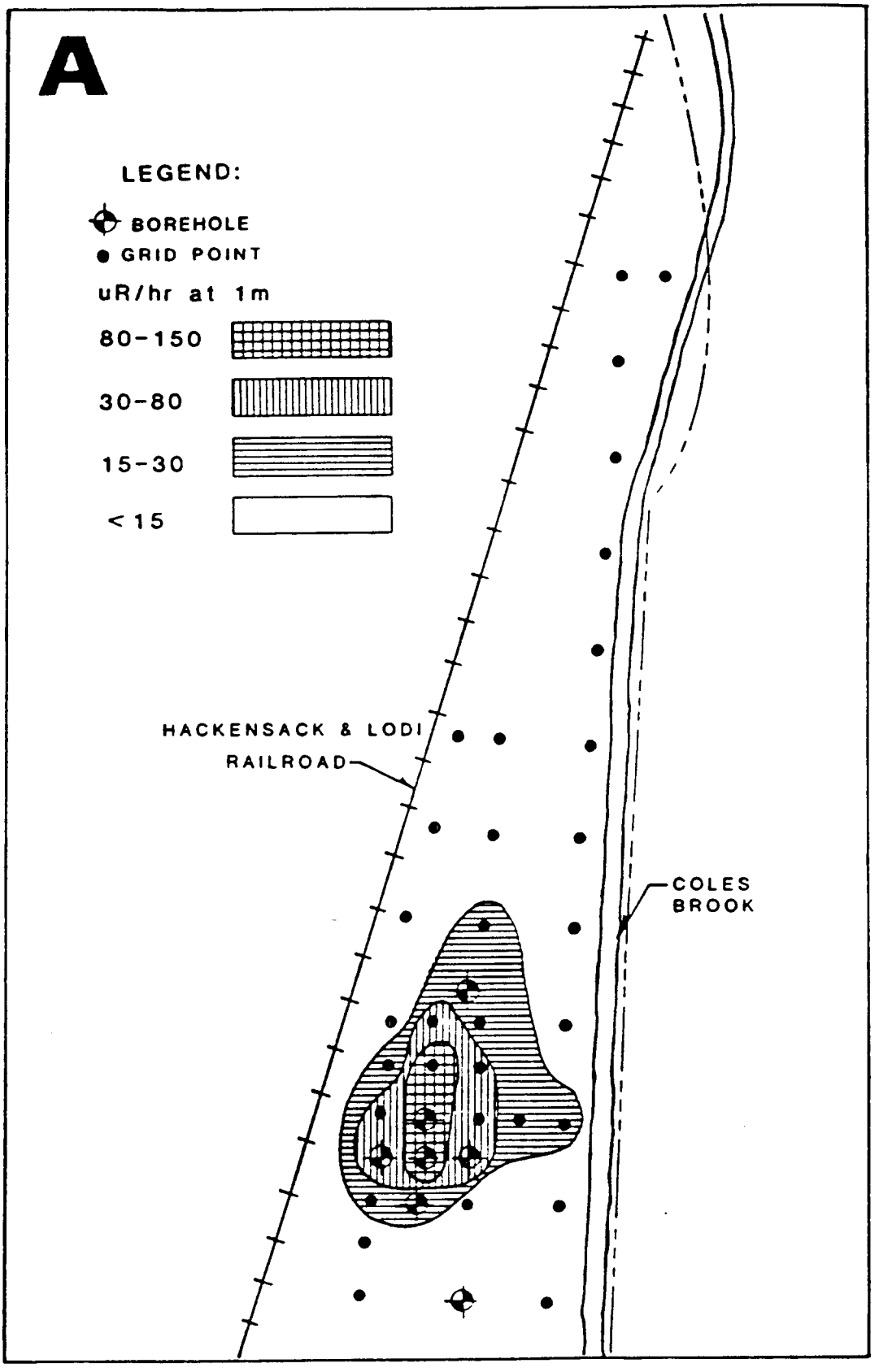


FIGURE 3-A

ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT A SCANEL SITE, MAYWOOD, N.J.

NUS CORPORATION
A Halliburton Company

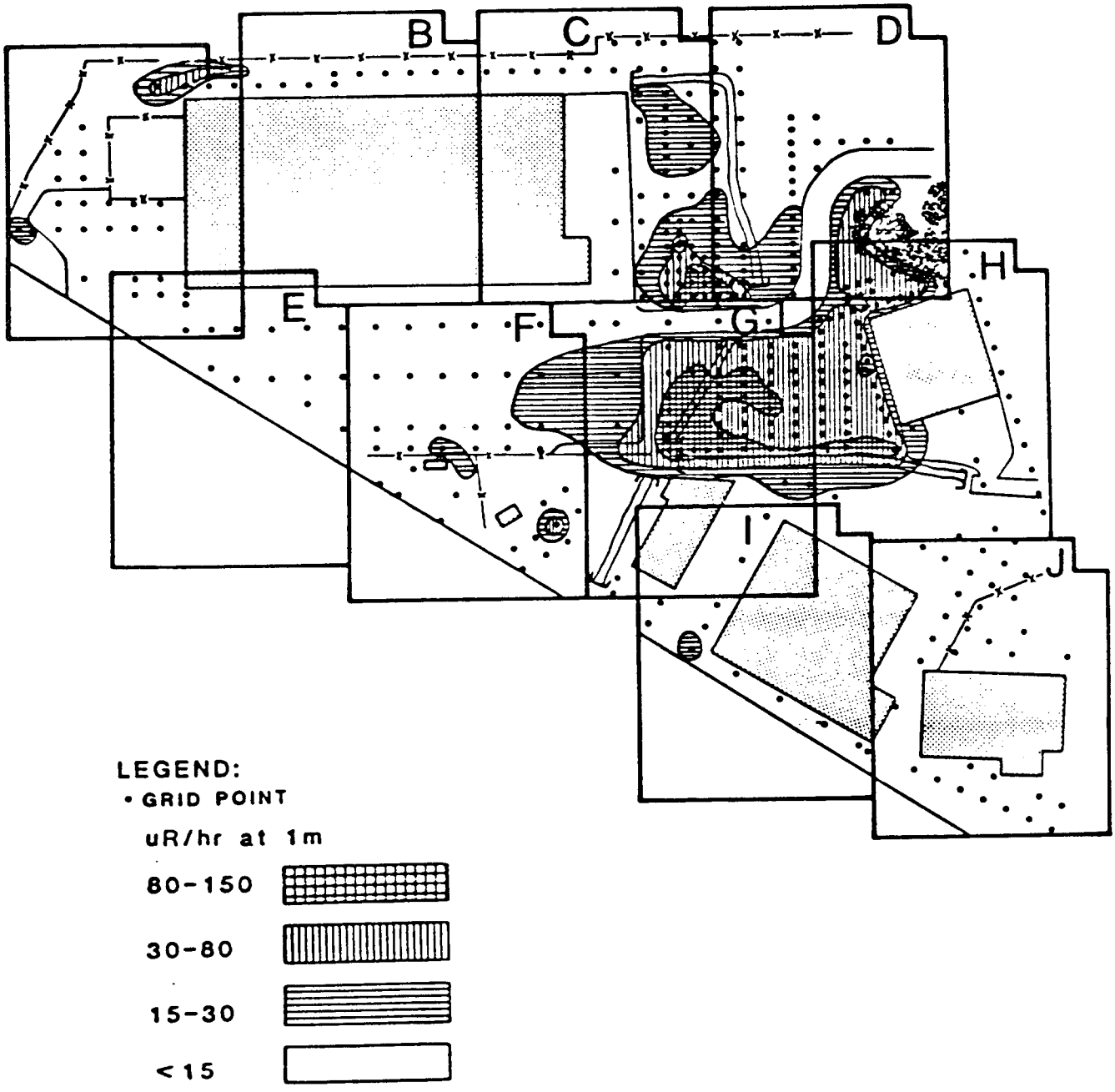
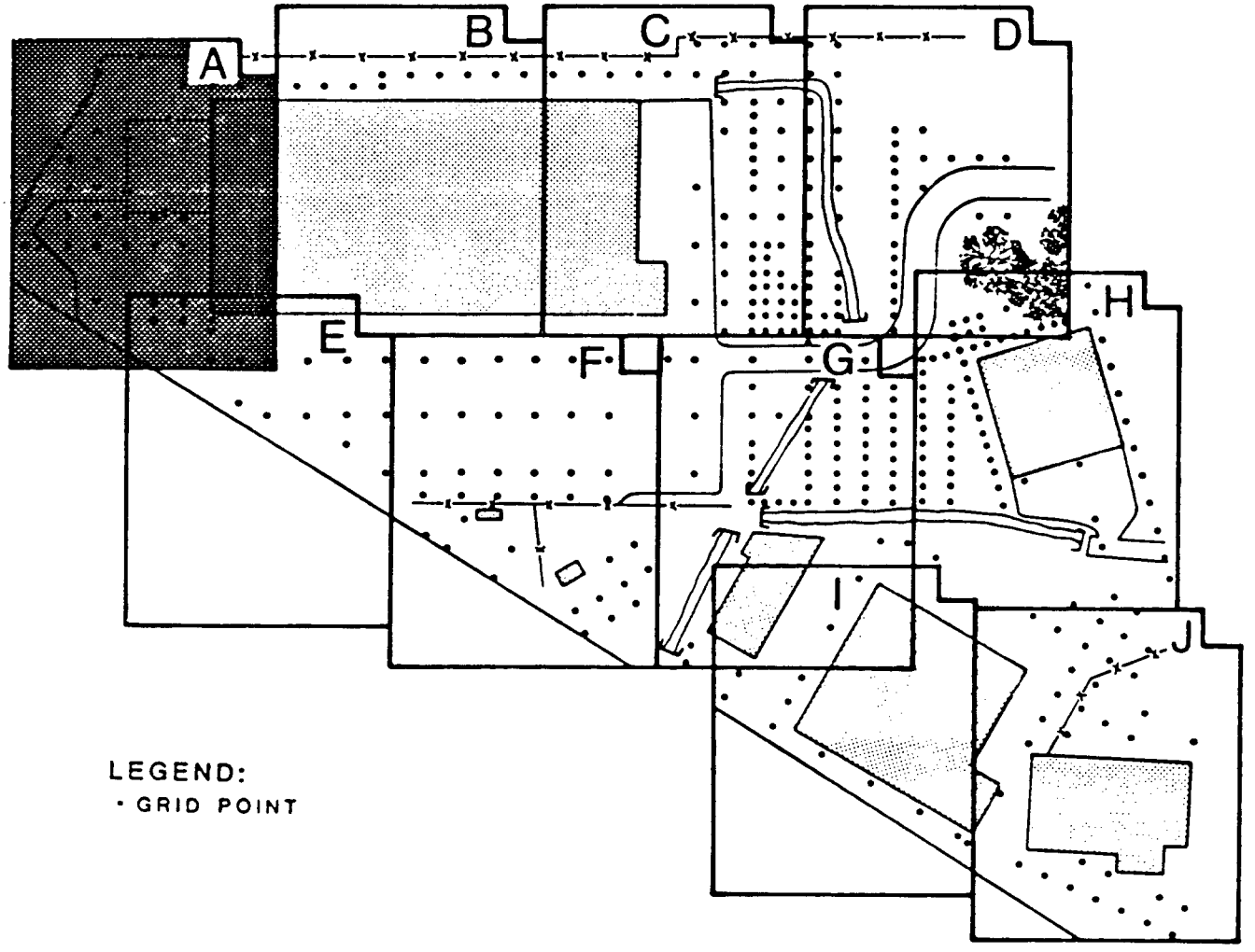


FIGURE 3-B

ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER(SEARS SITE) MAYWOOD CHEMICAL, MAYWOOD N.J.

NUS CORPORATION
A Halliburton Company



LEGEND:
· GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

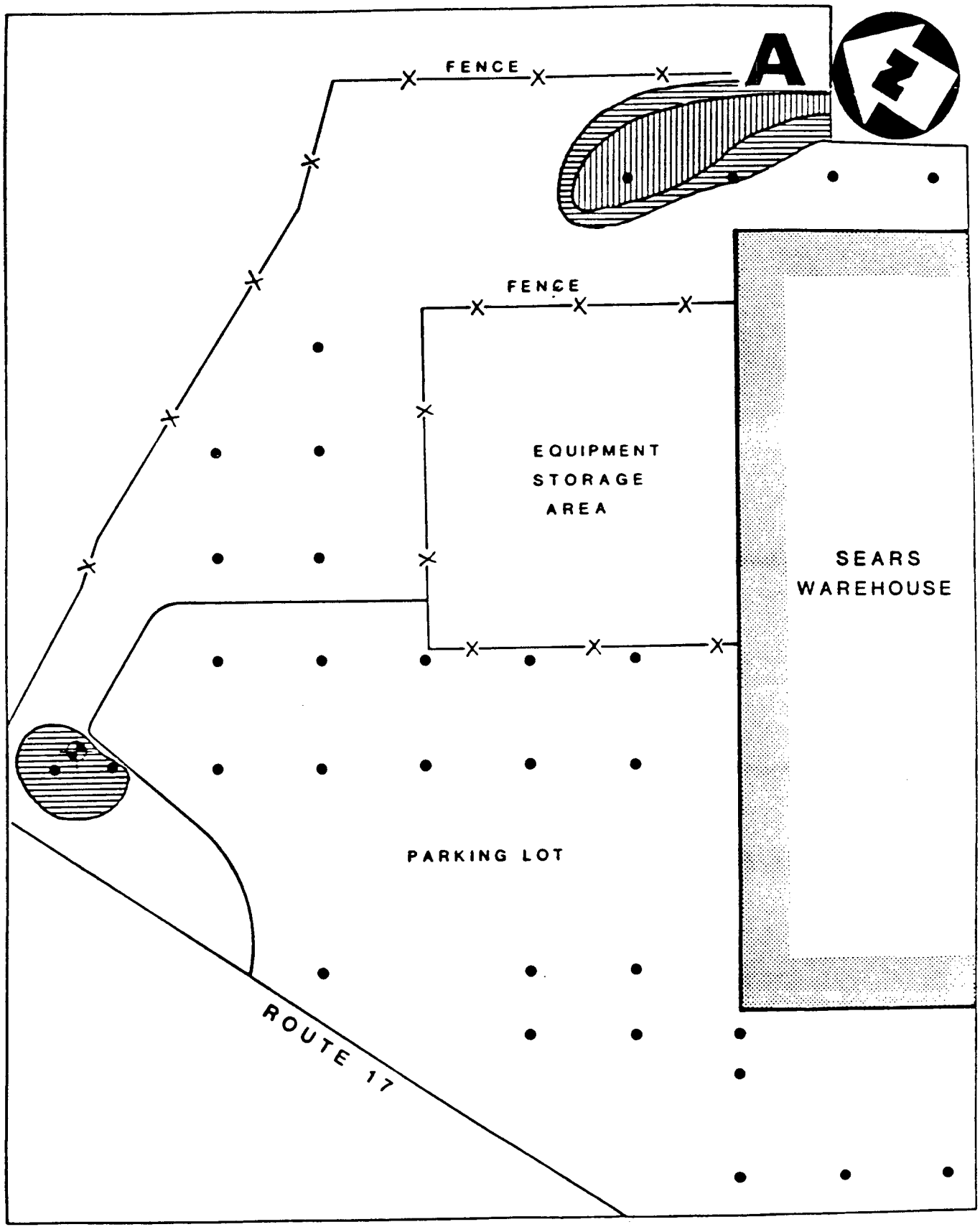
30-80

15-30

<15

GRID POINT ●

BOREHOLE LOCATION



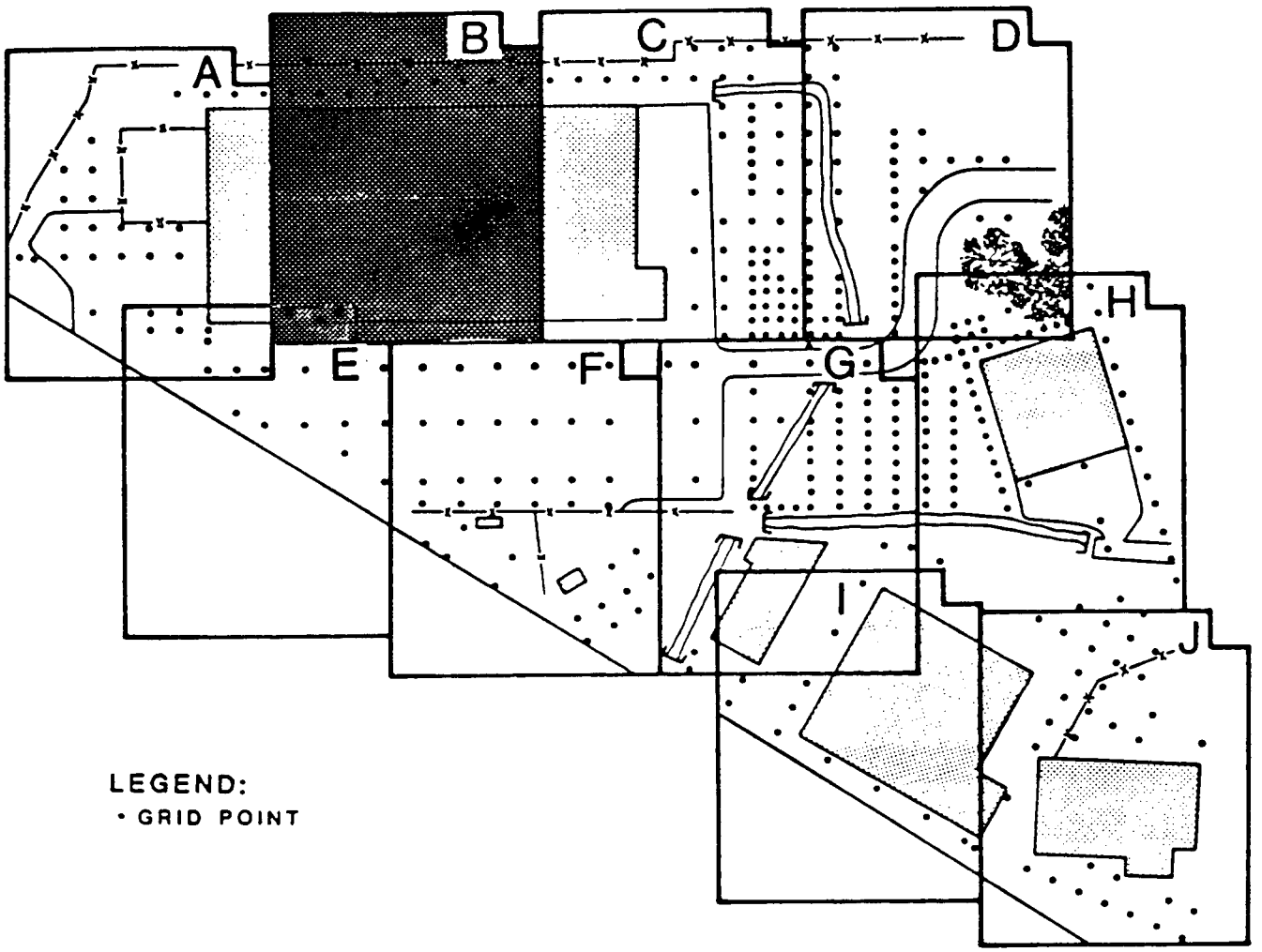
ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT A MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 3-C

NUS CORPORATION

A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

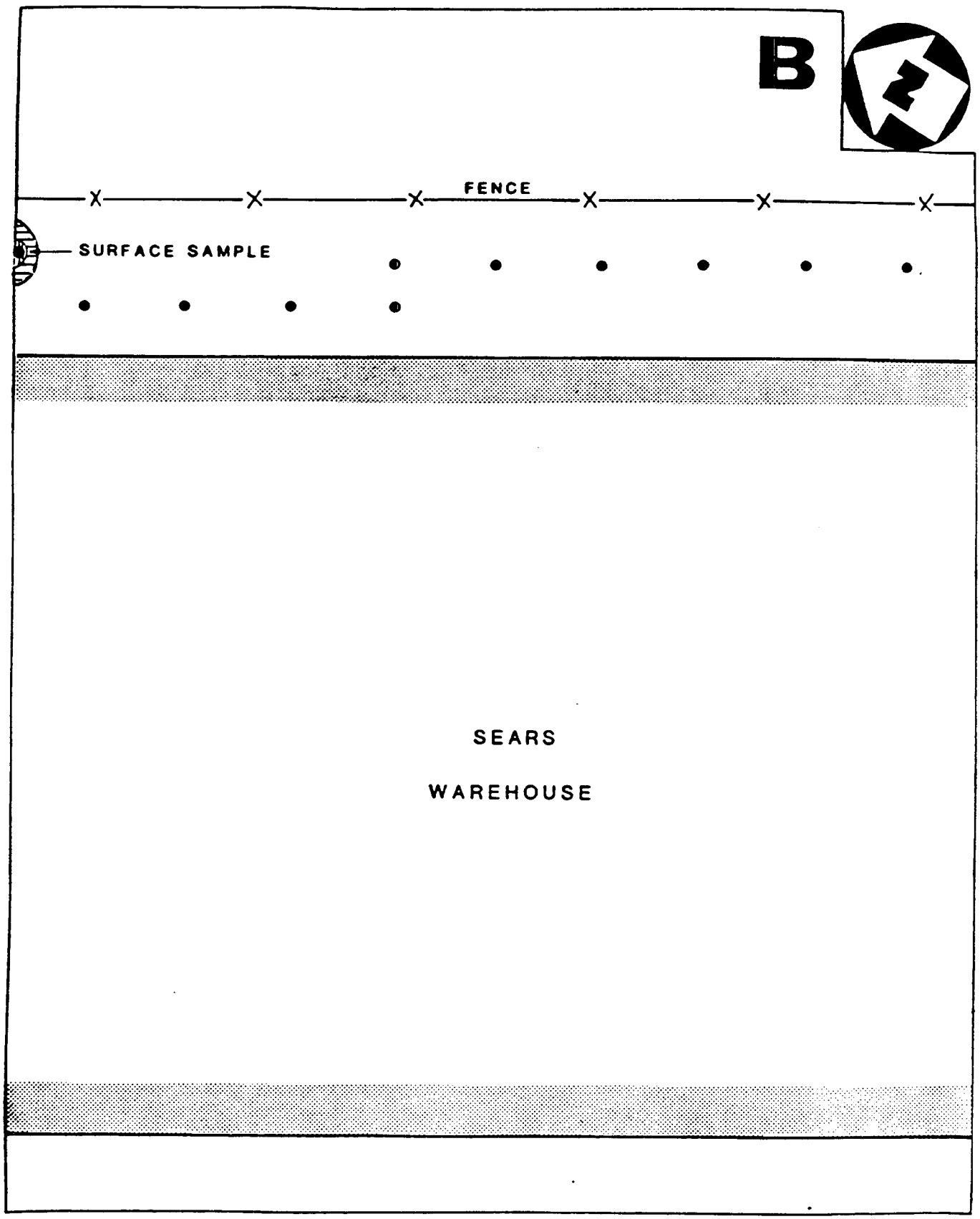
30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION

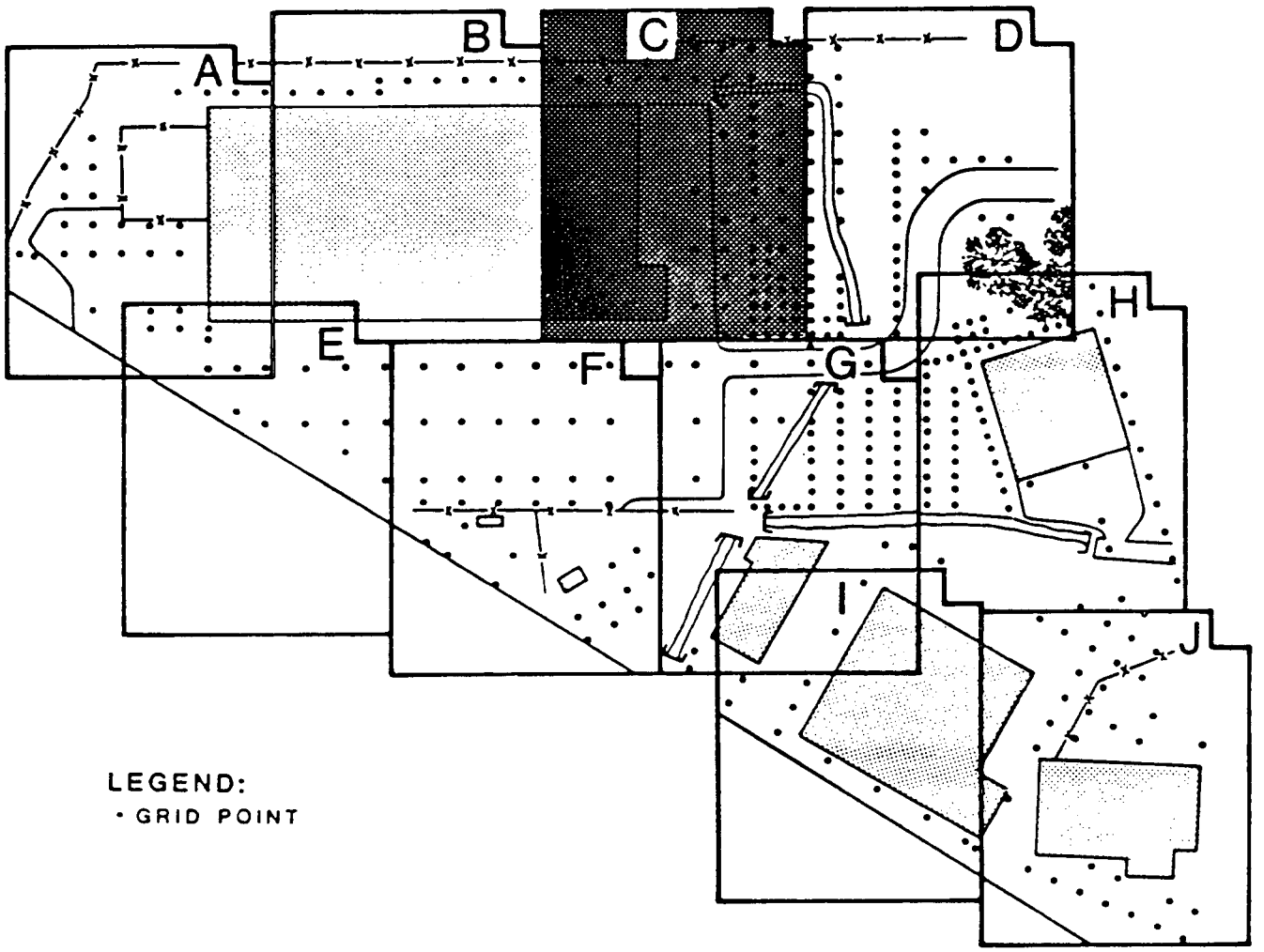


ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT B MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 3-D

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION

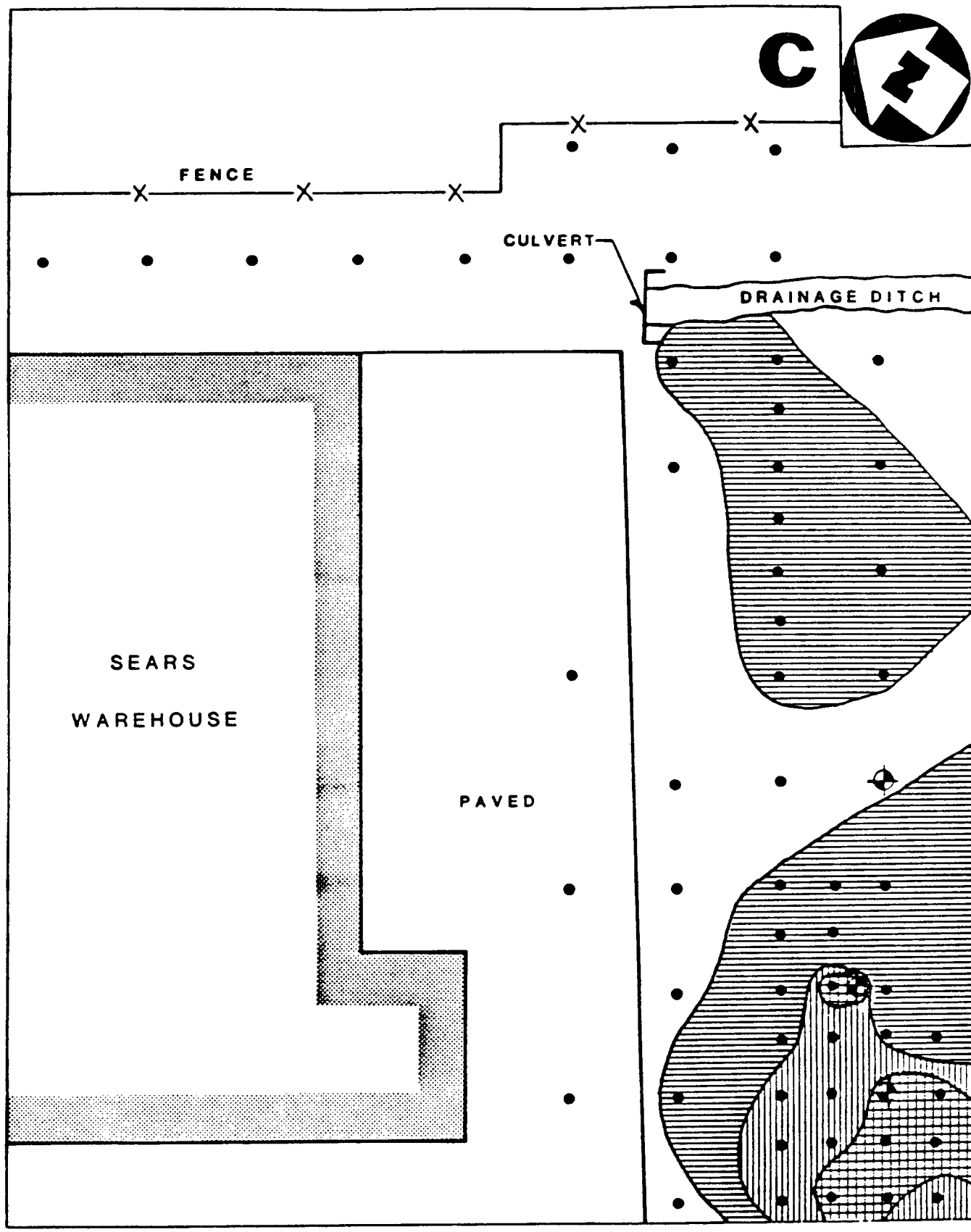
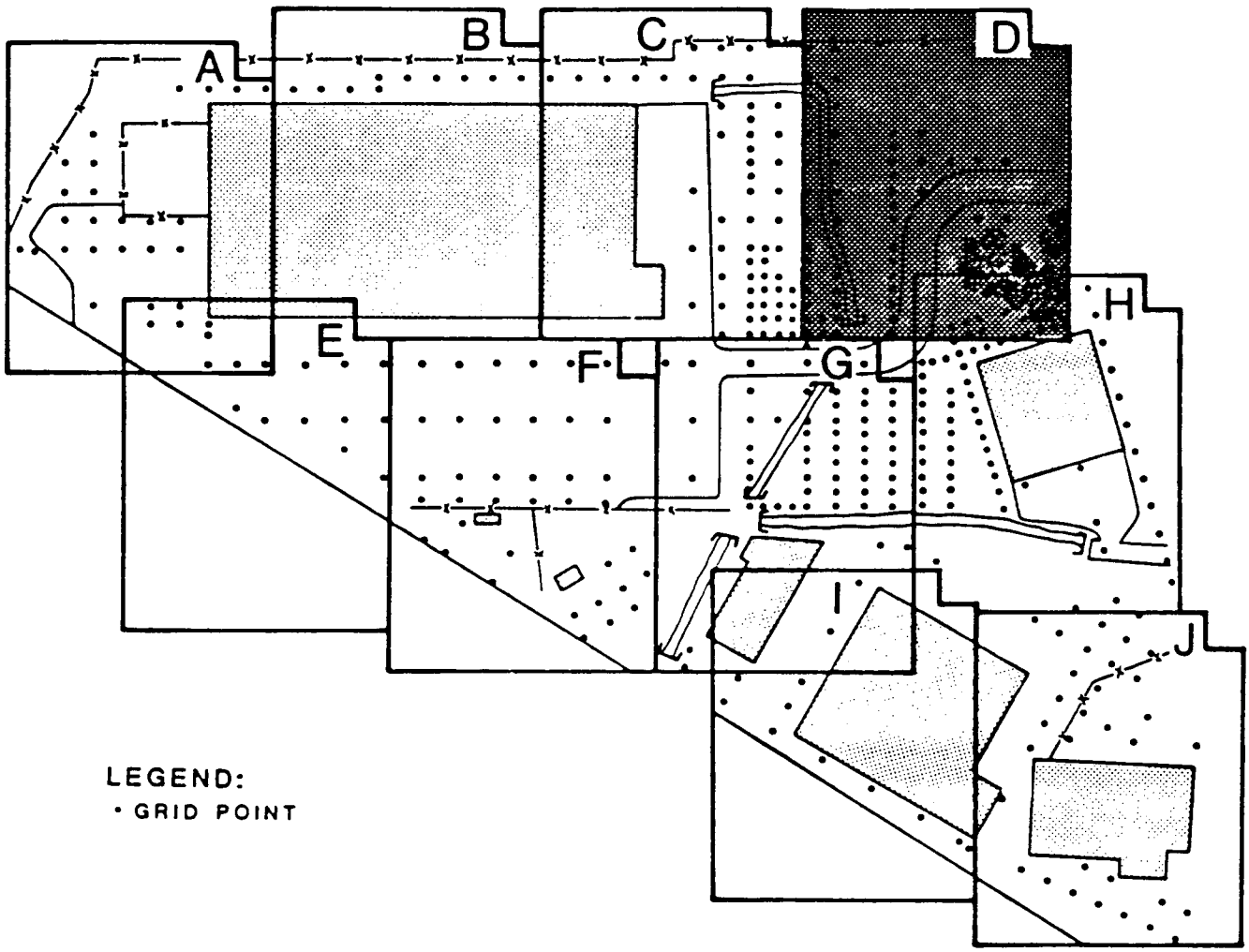


FIGURE 3-E

ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT C MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

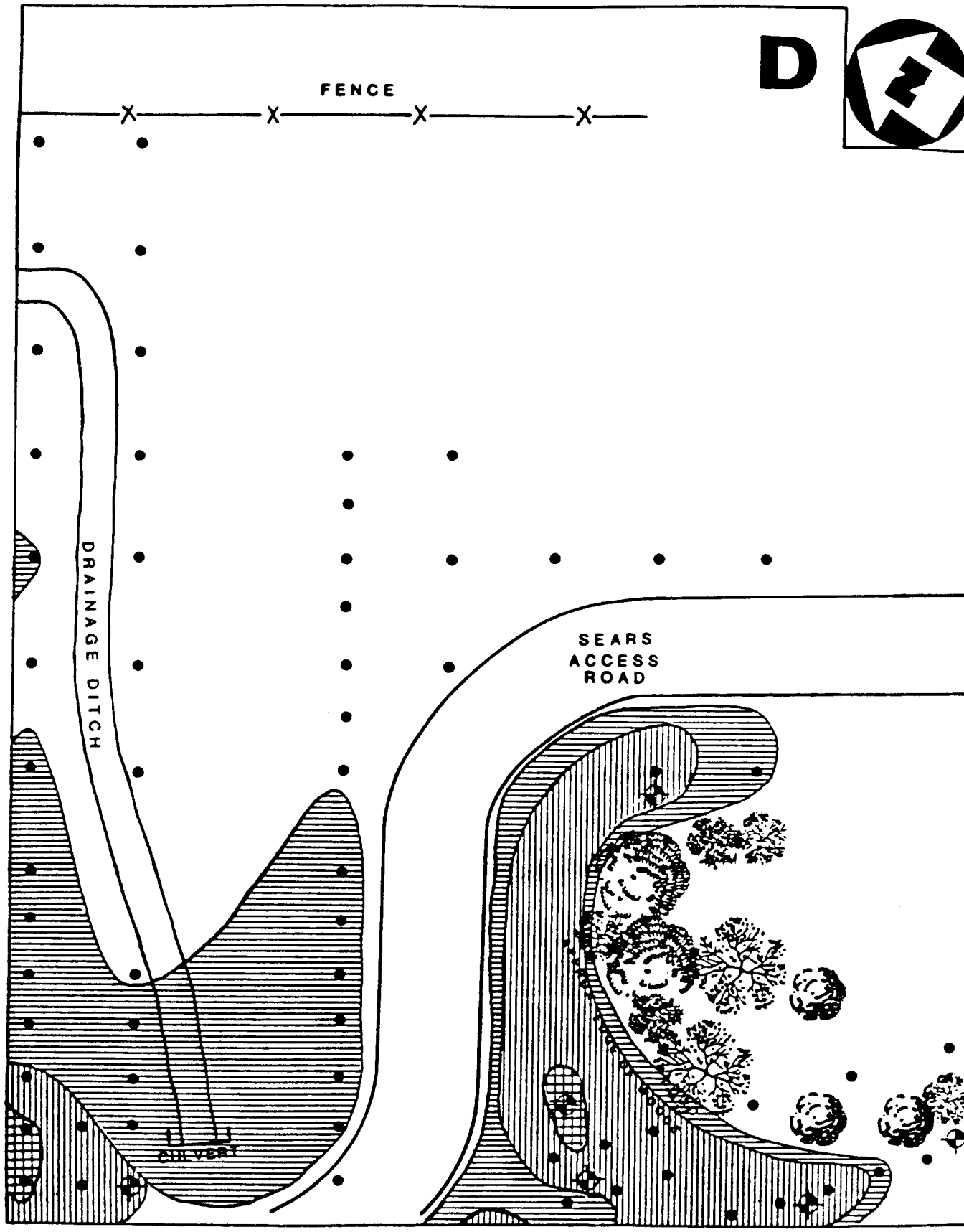
30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION



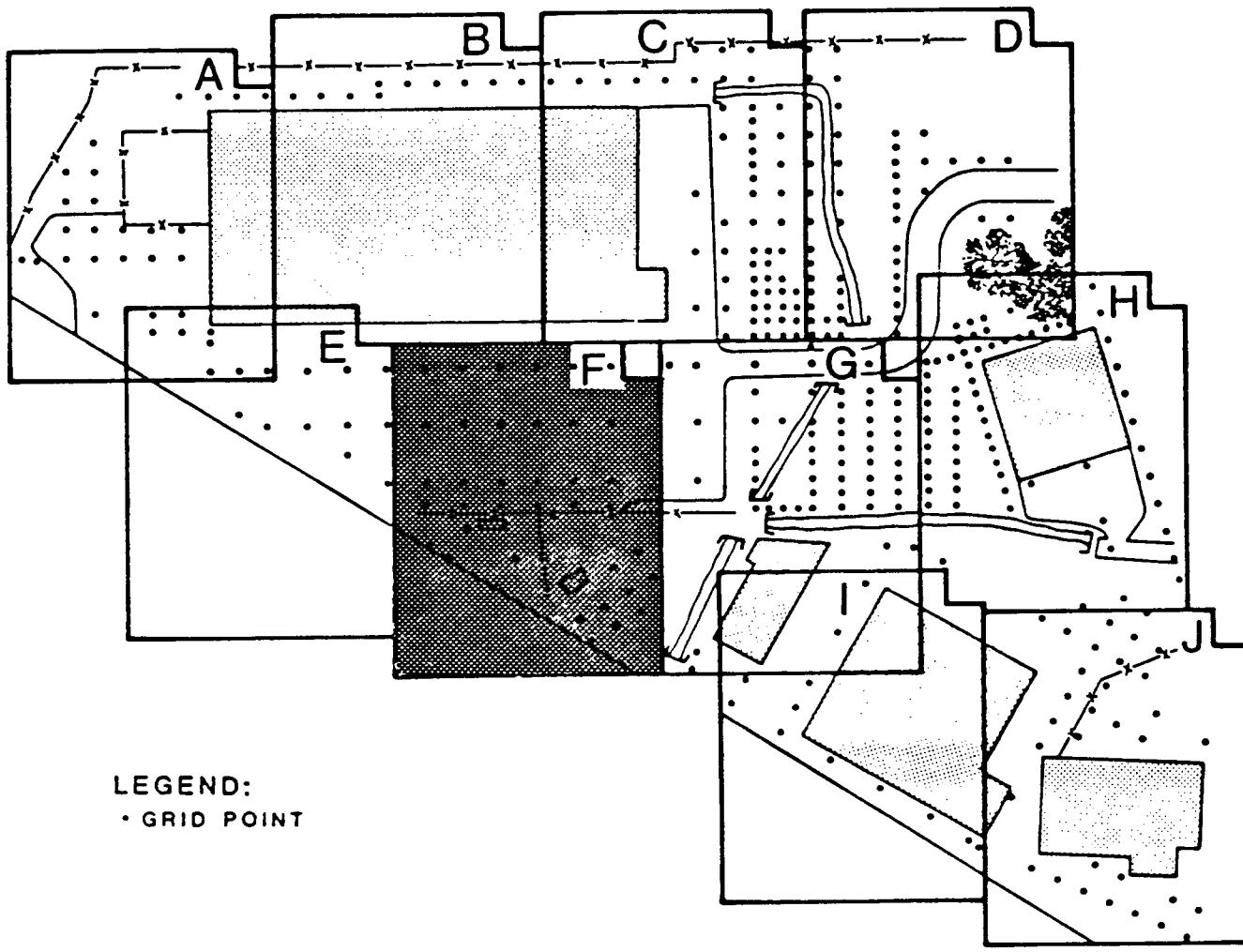
ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT D MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 3-F

NUS CORPORATION

A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION

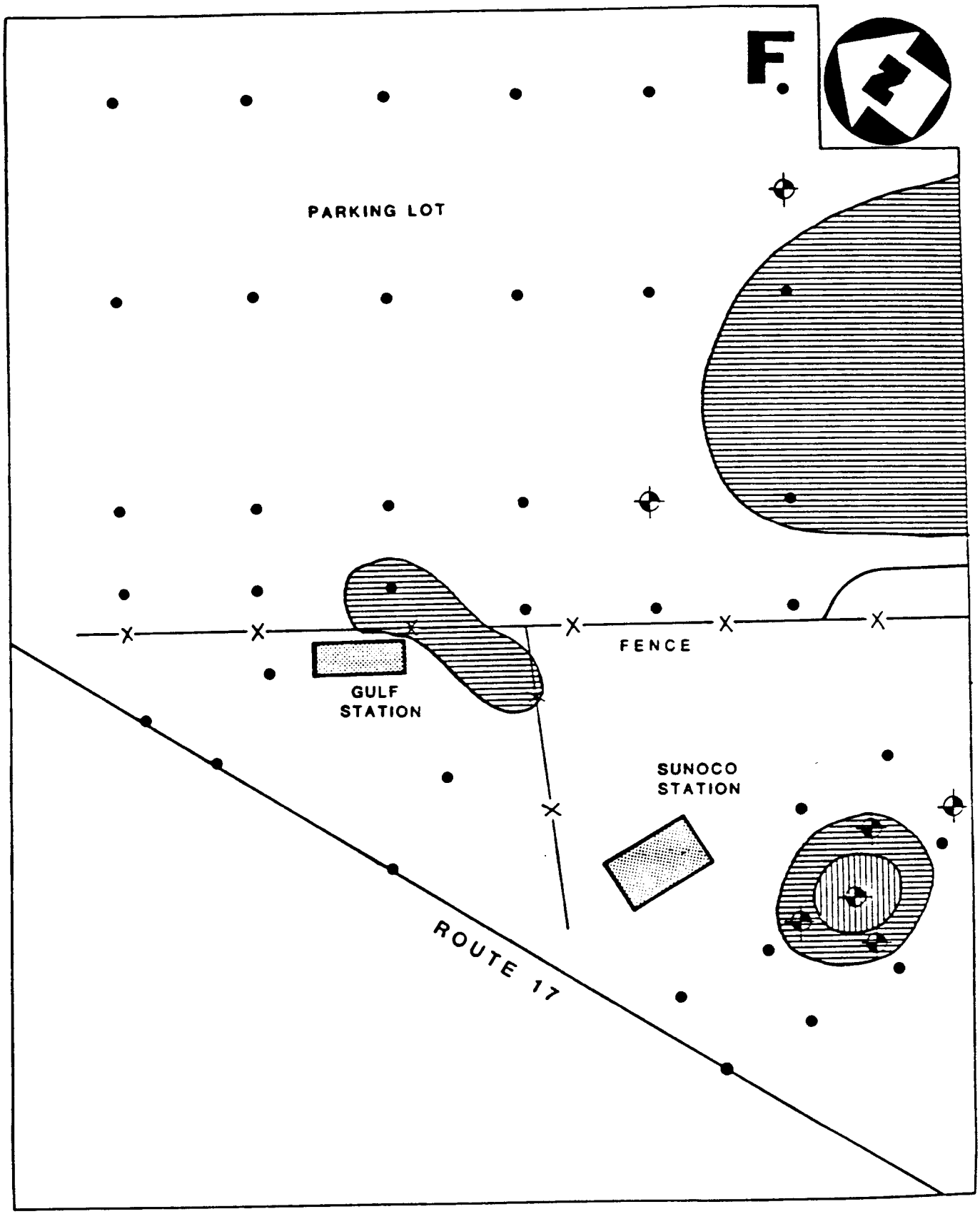
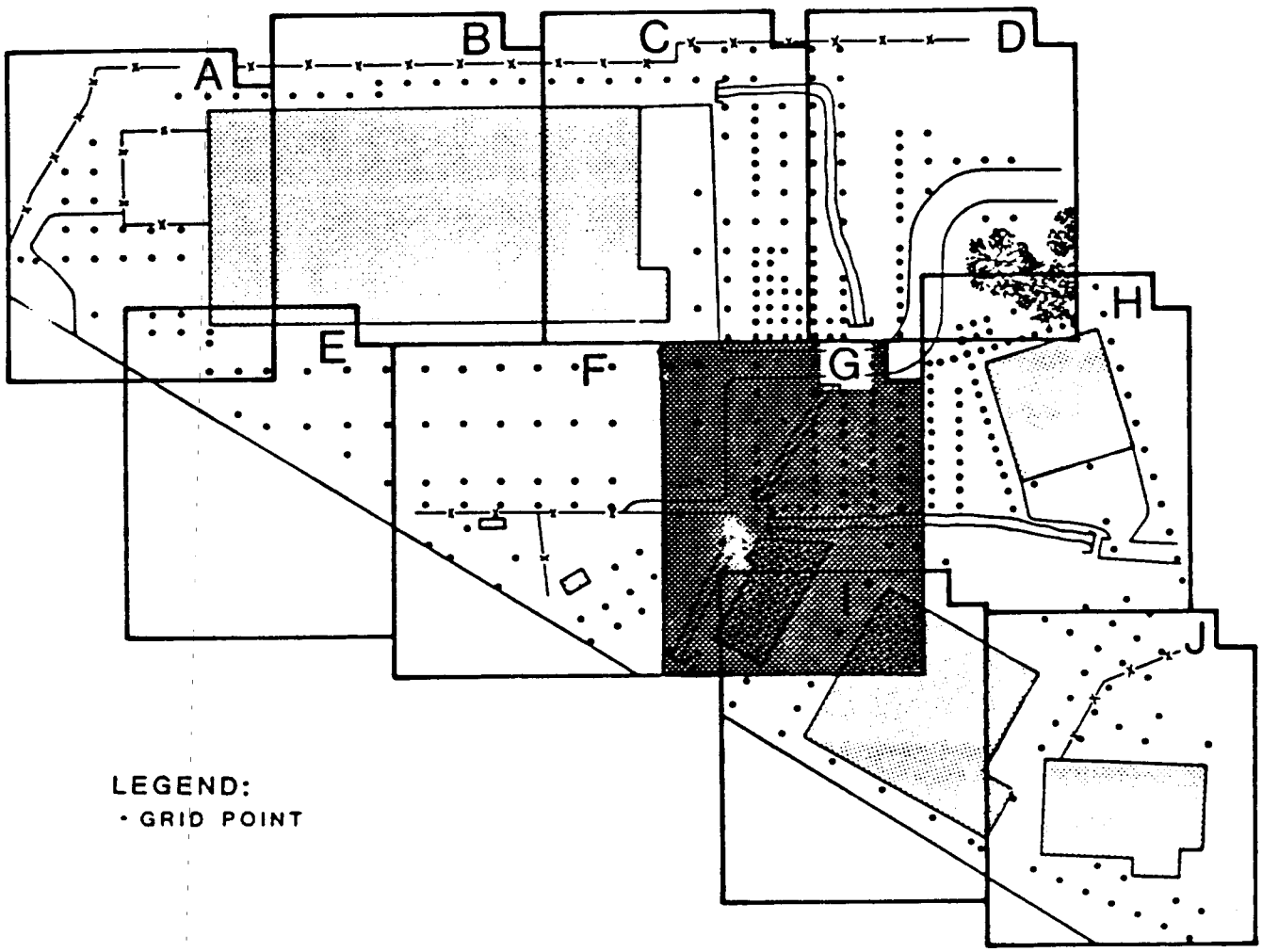


FIGURE 3-G

ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT F MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company



LEGEND:
· GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

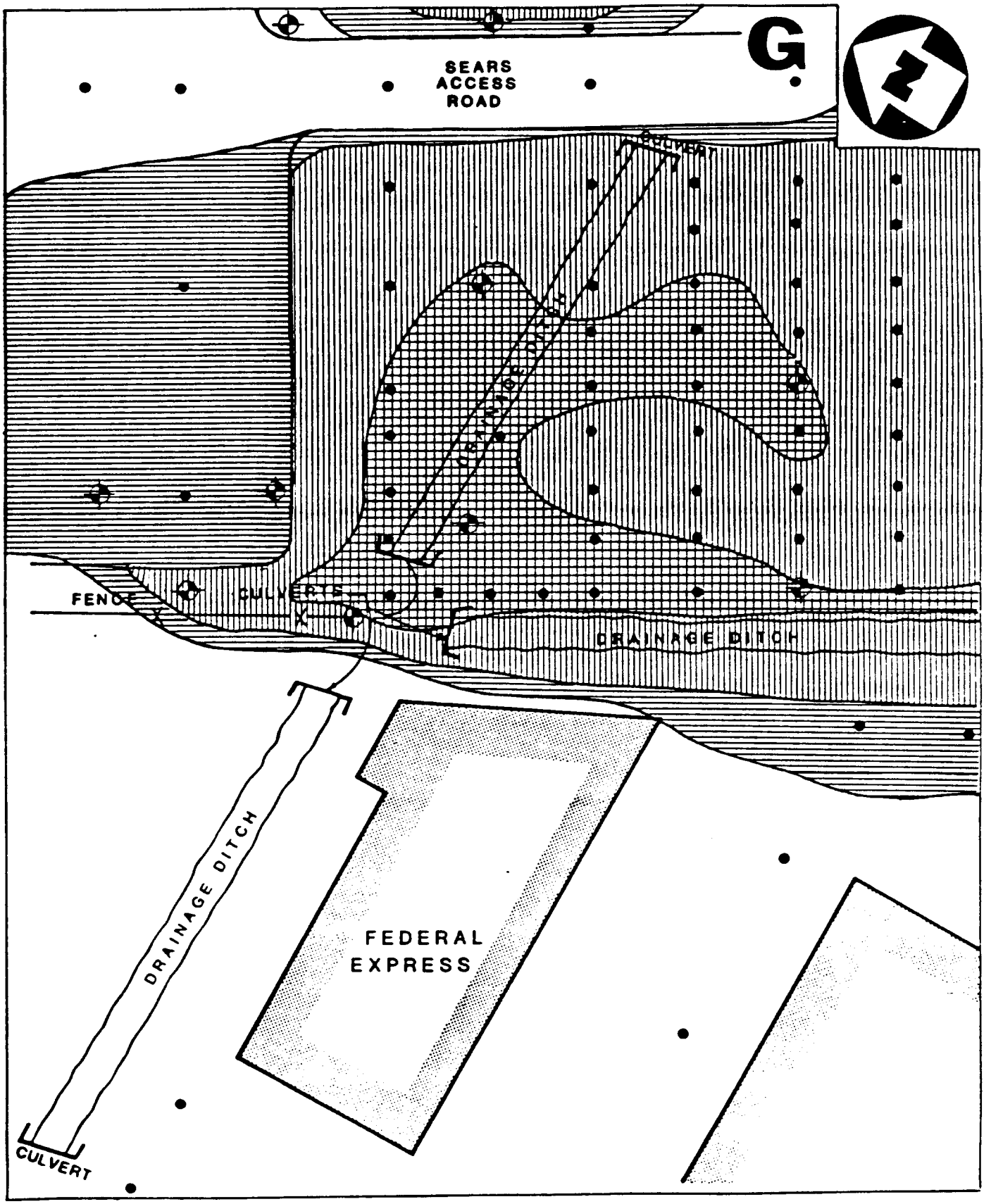
30-80

15-30

< 15

GRID POINT ●

BOREHOLE LOCATION

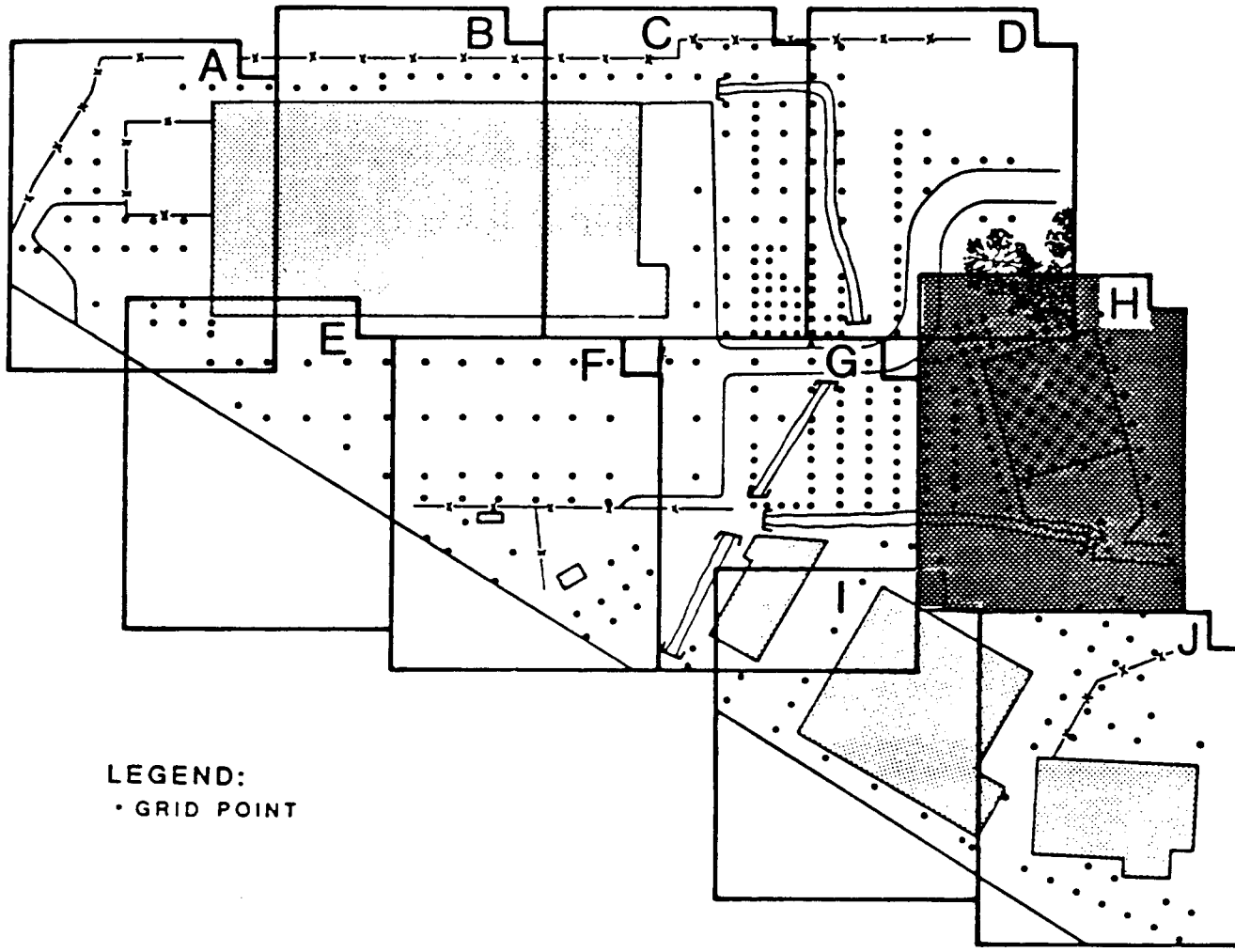


ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT G MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 3-H

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION

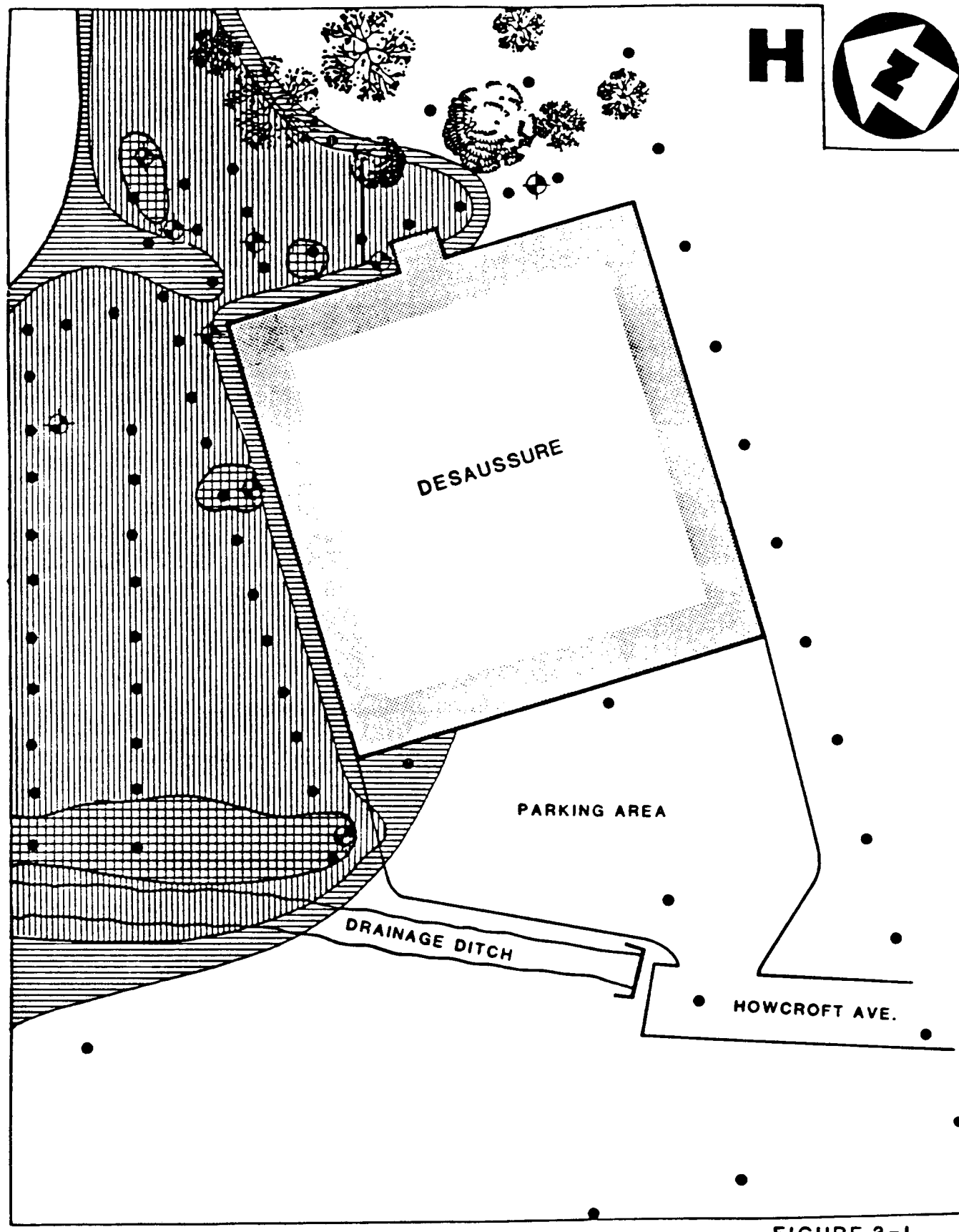
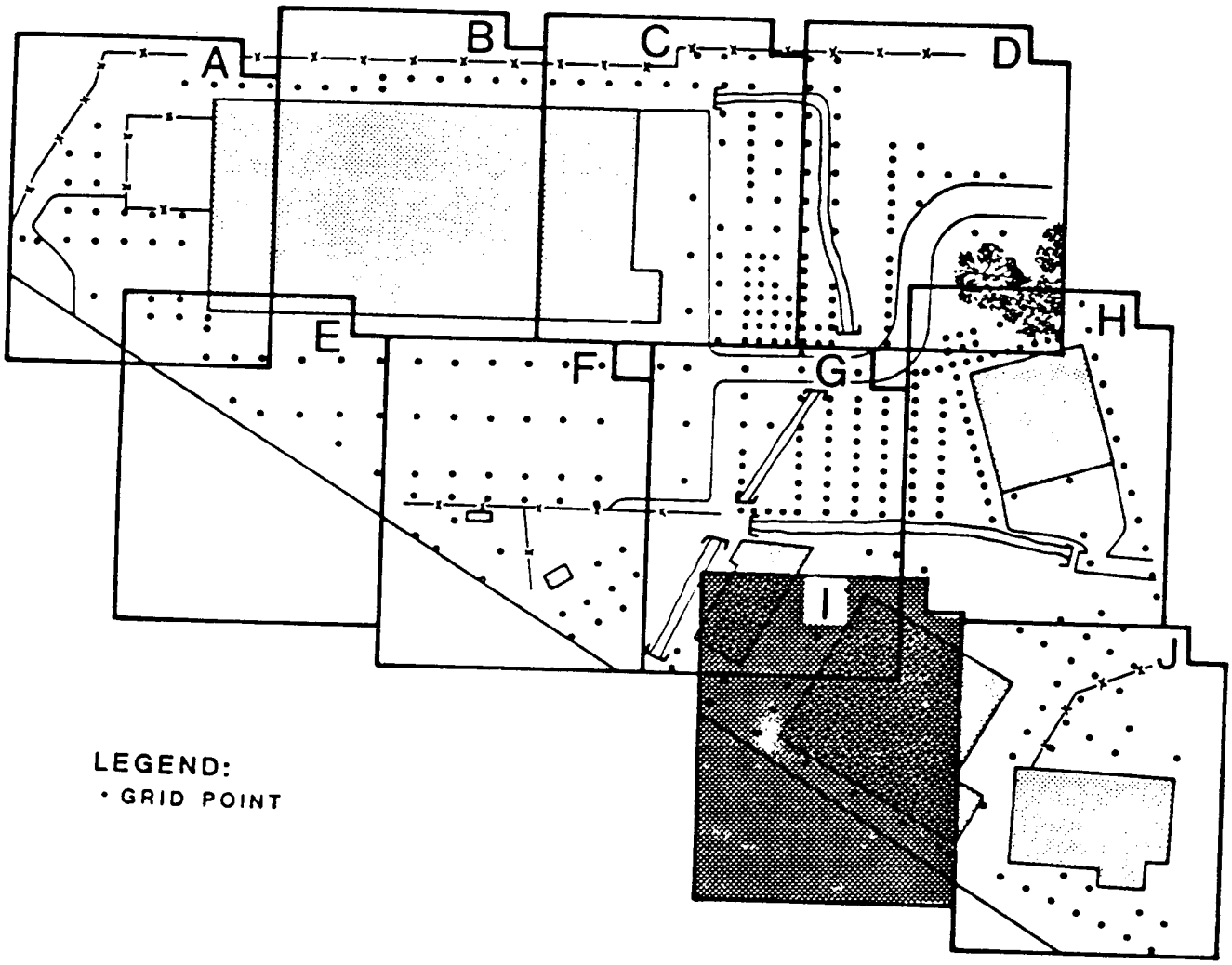


FIGURE 3-1

ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT H MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

LEGEND: (PERTAINS TO ADJACENT DRAWING)

uR/hr at 1m

80-150

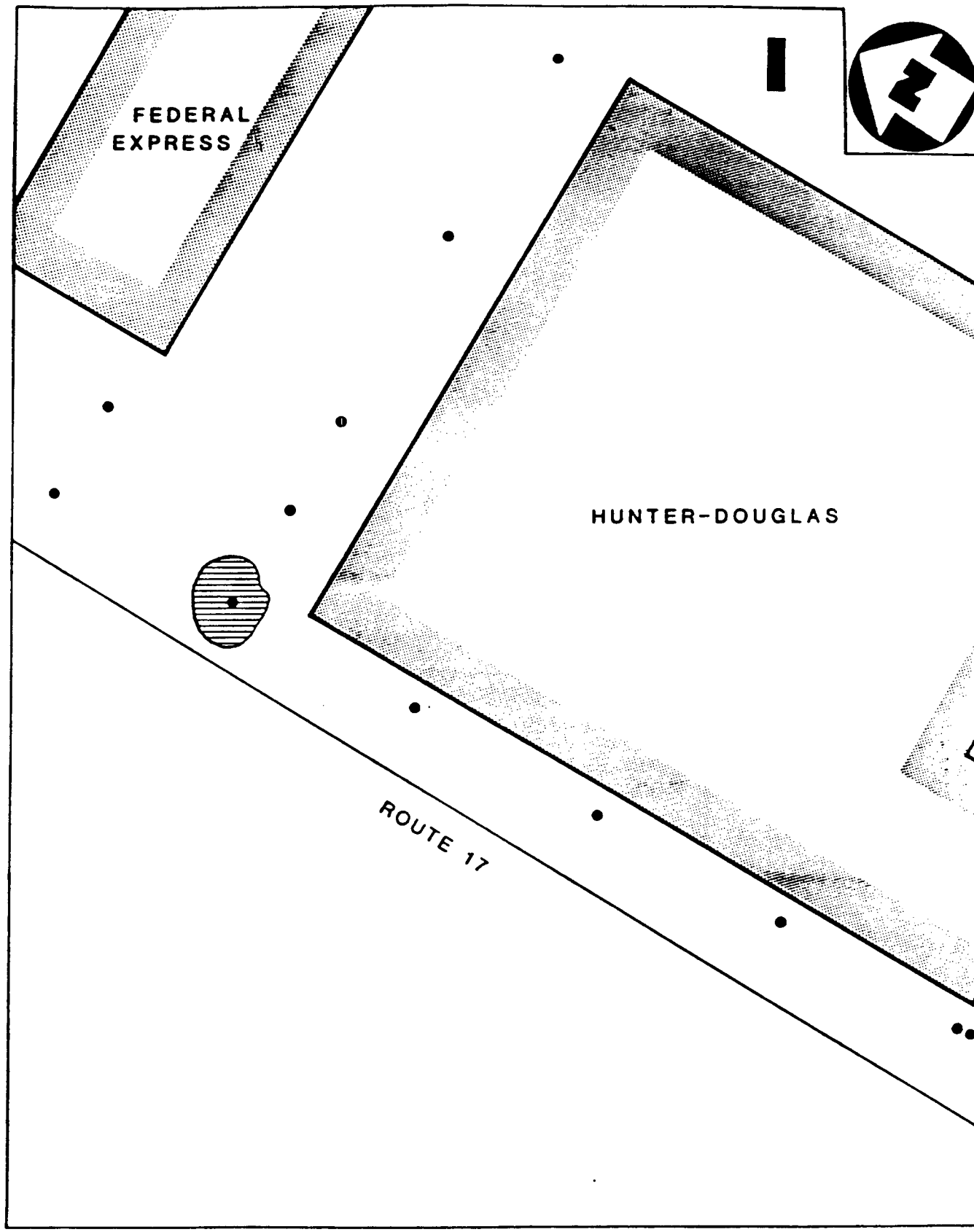
30-80

15-30

< 15

GRID POINT •

BOREHOLE LOCATION

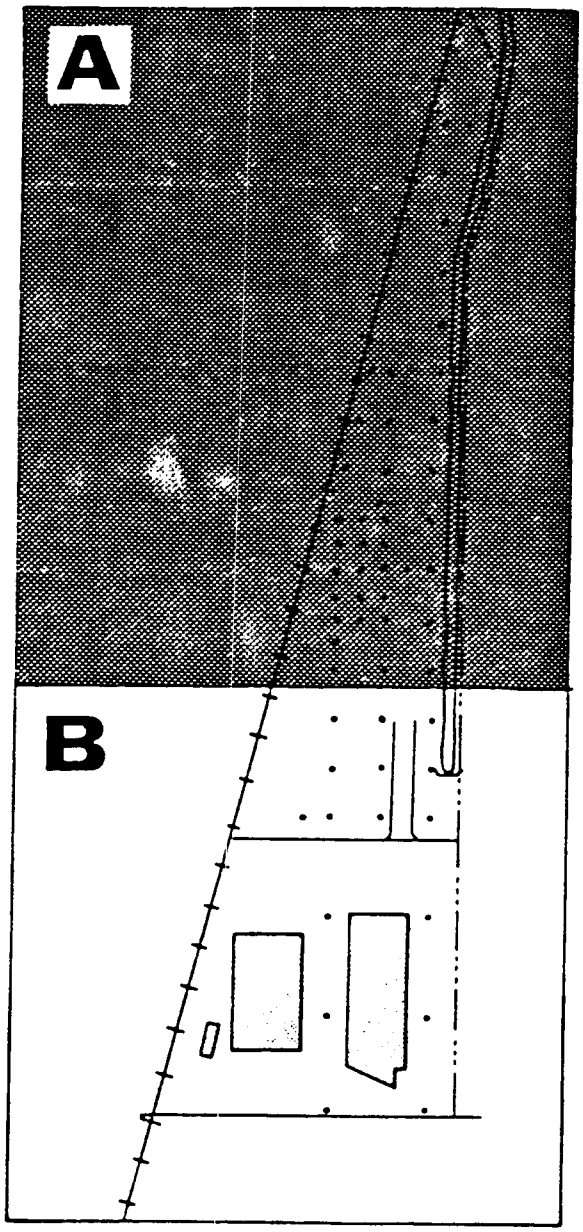


ISOPACH PLAN OF EXTERNAL GAMMA RADIATION LEVELS AT 1 METER-SEGMENT I MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 3-J

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

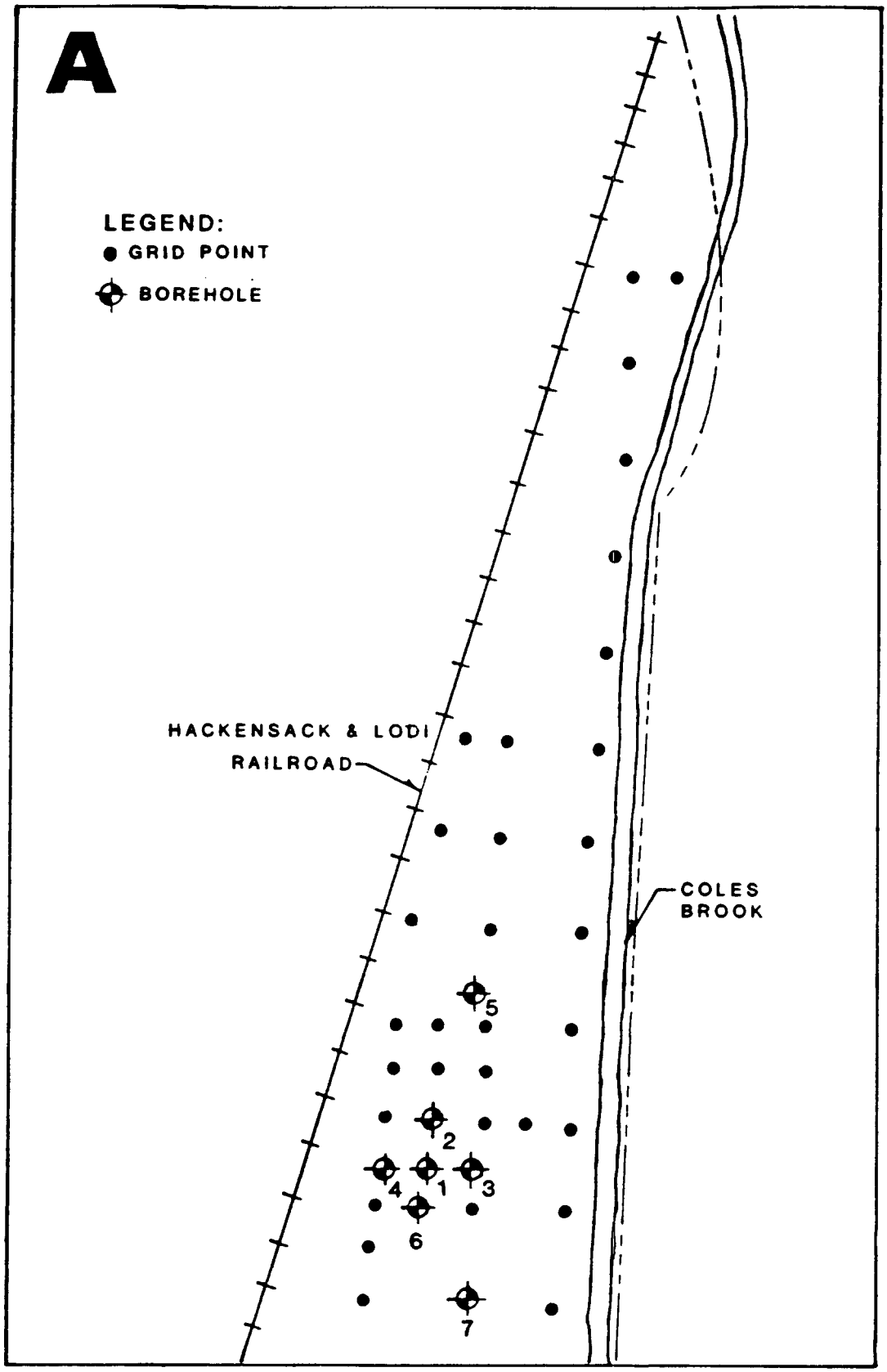
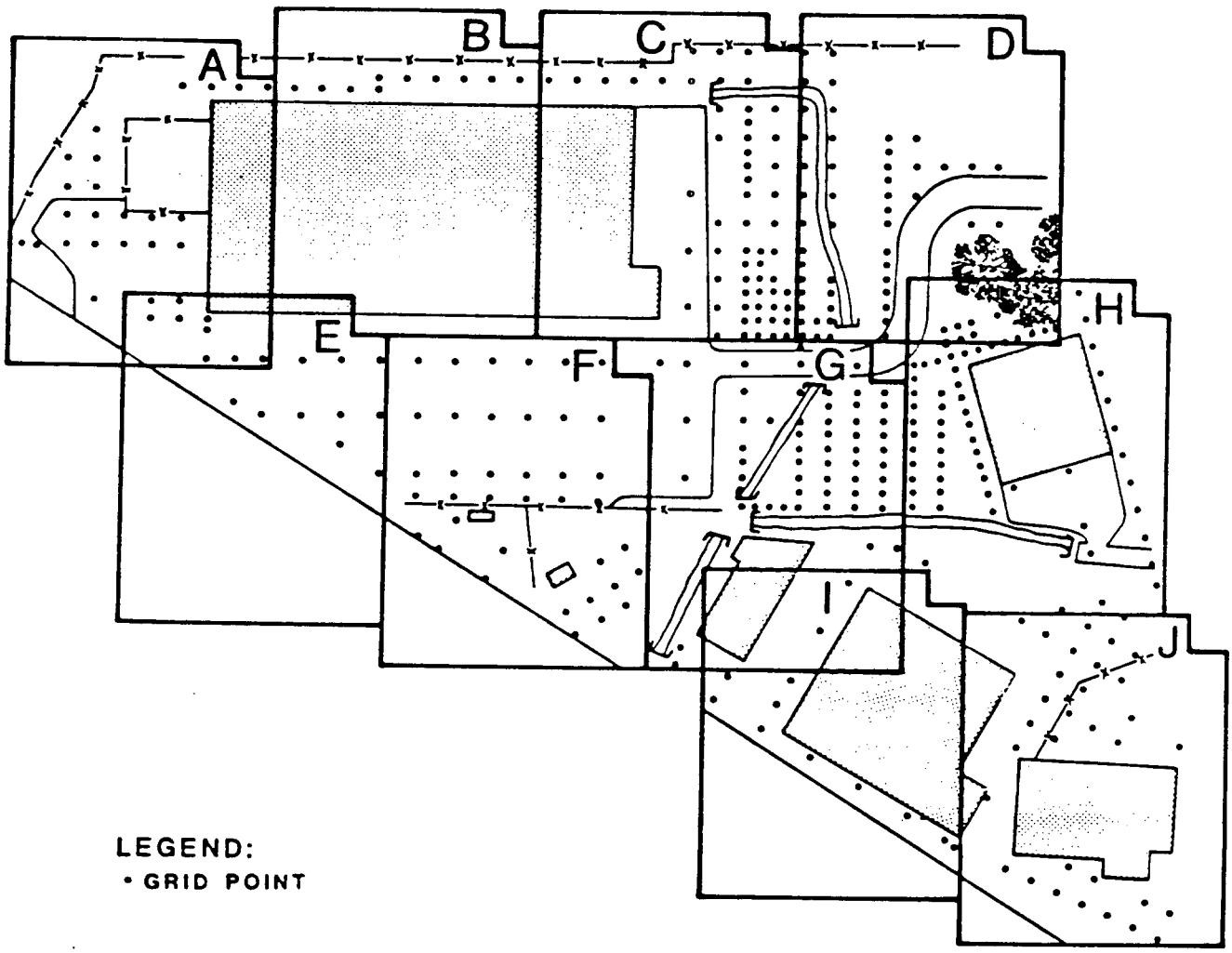


FIGURE 4-A

BOREHOLE LOCATIONS
SEGMENT A
SCANEL SITE, MAYWOOD, N.J.

NUS CORPORATION
A Halliburton Company



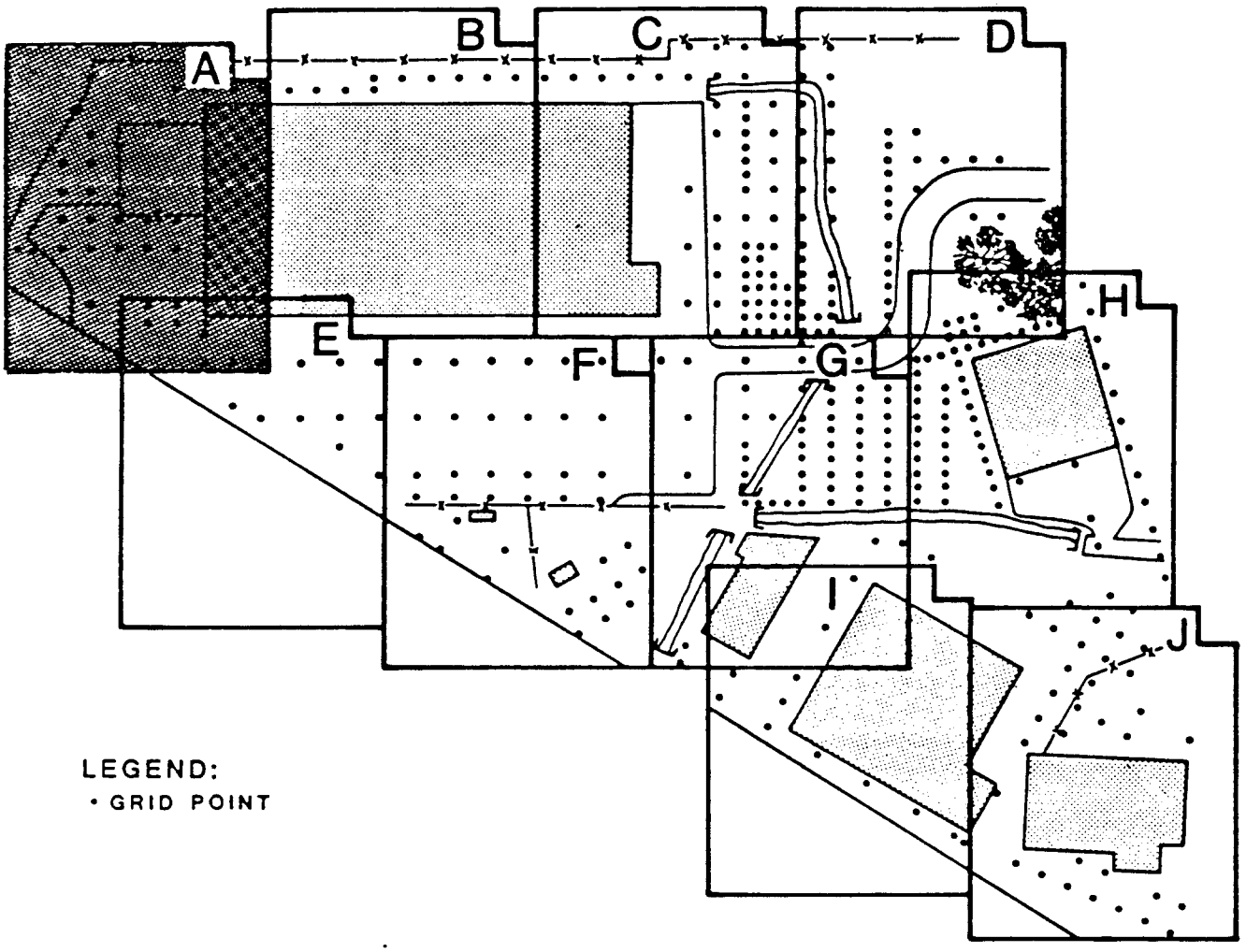
SEGMENT LOCATION MAP (SEARS SITE)

MAYWOOD CHEMICAL, MAYWOOD N.J.

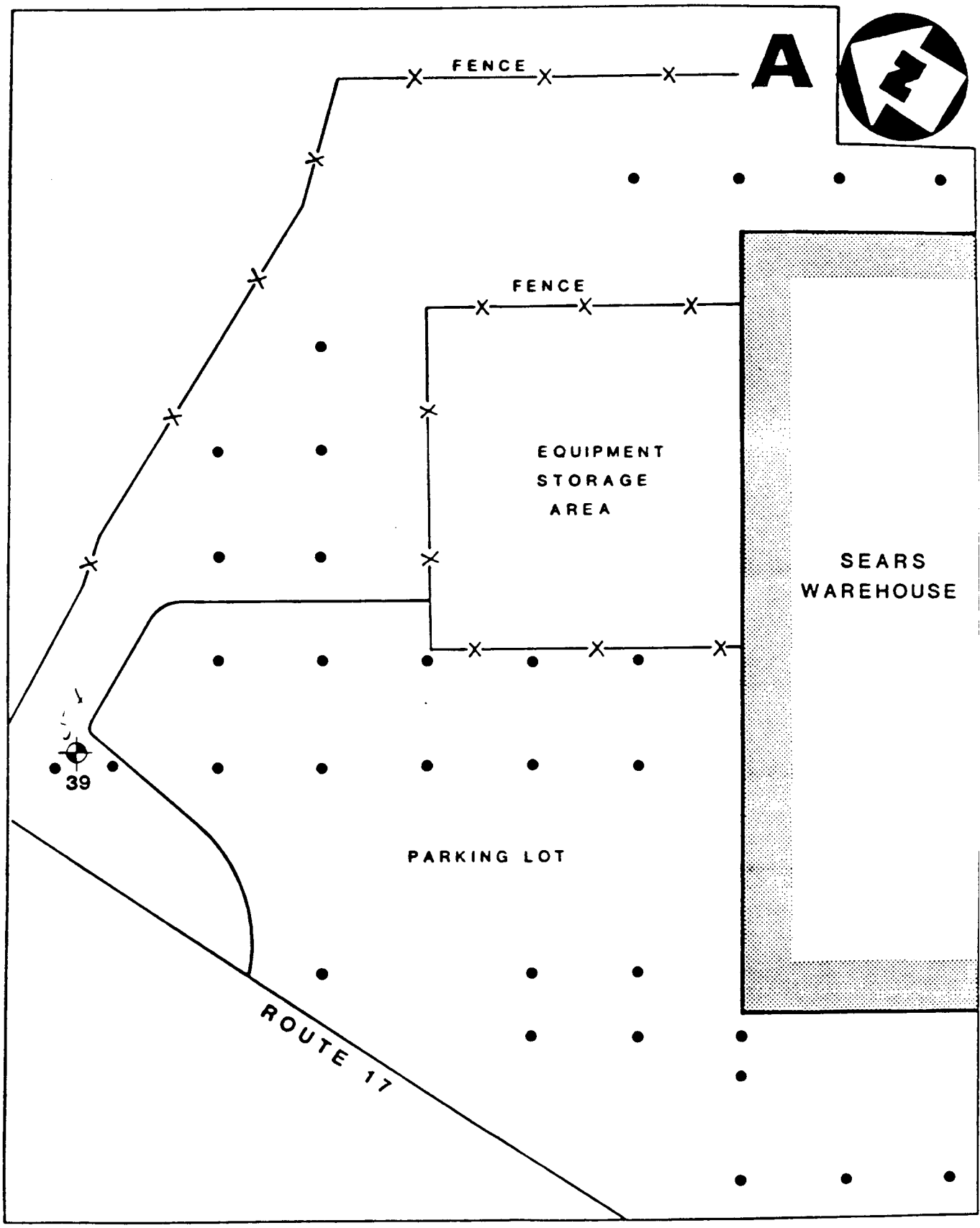
FIGURE 4-B

NUS CORPORATION

A Halliburton Company



LEGEND:
• GRID POINT

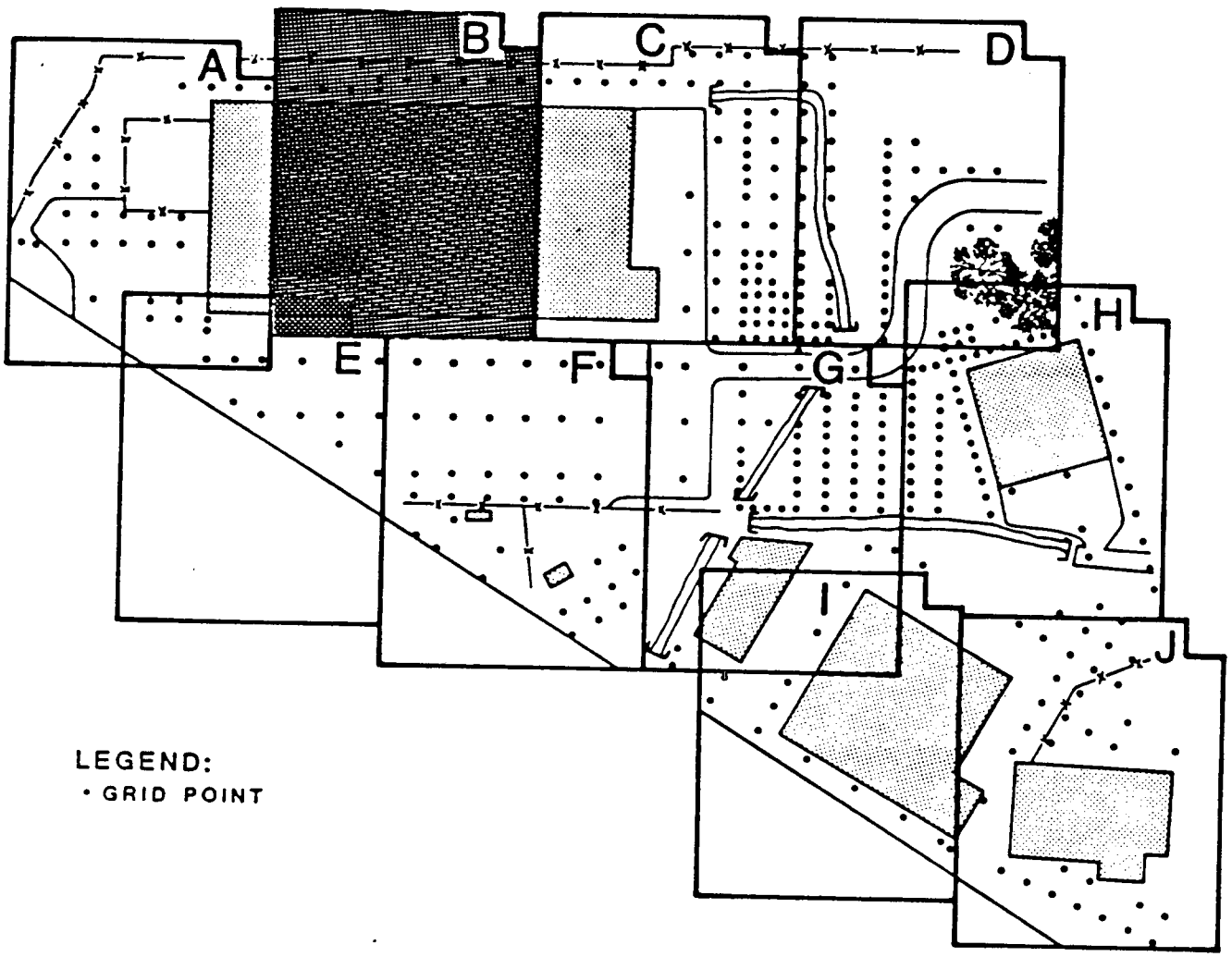


BOREHOLE LOCATIONS-SEGMENT A
MAYWOOD CHEMICAL, MAYWOOD N.J.

SCALE: 1"=67'

FIGURE 4-C

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

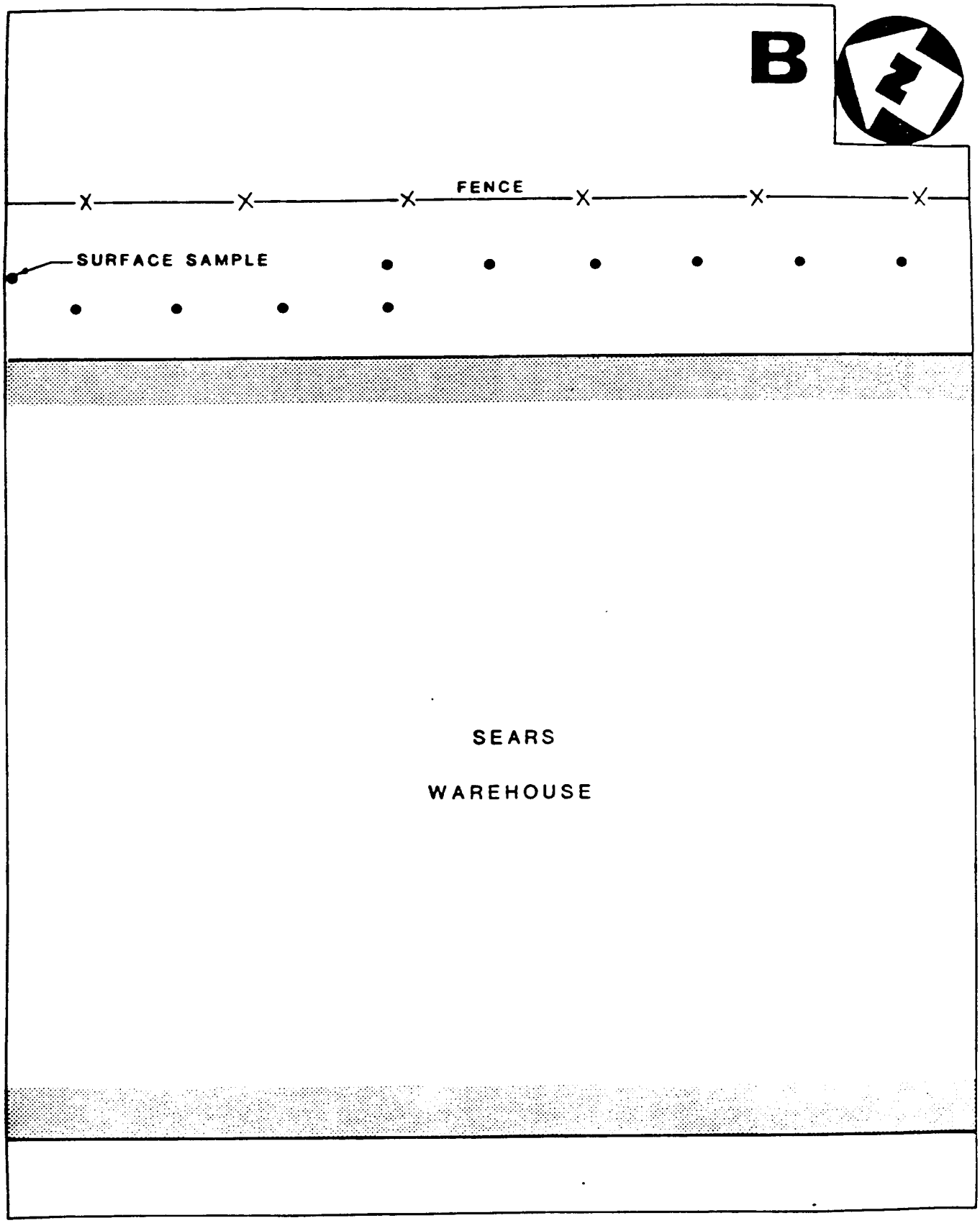


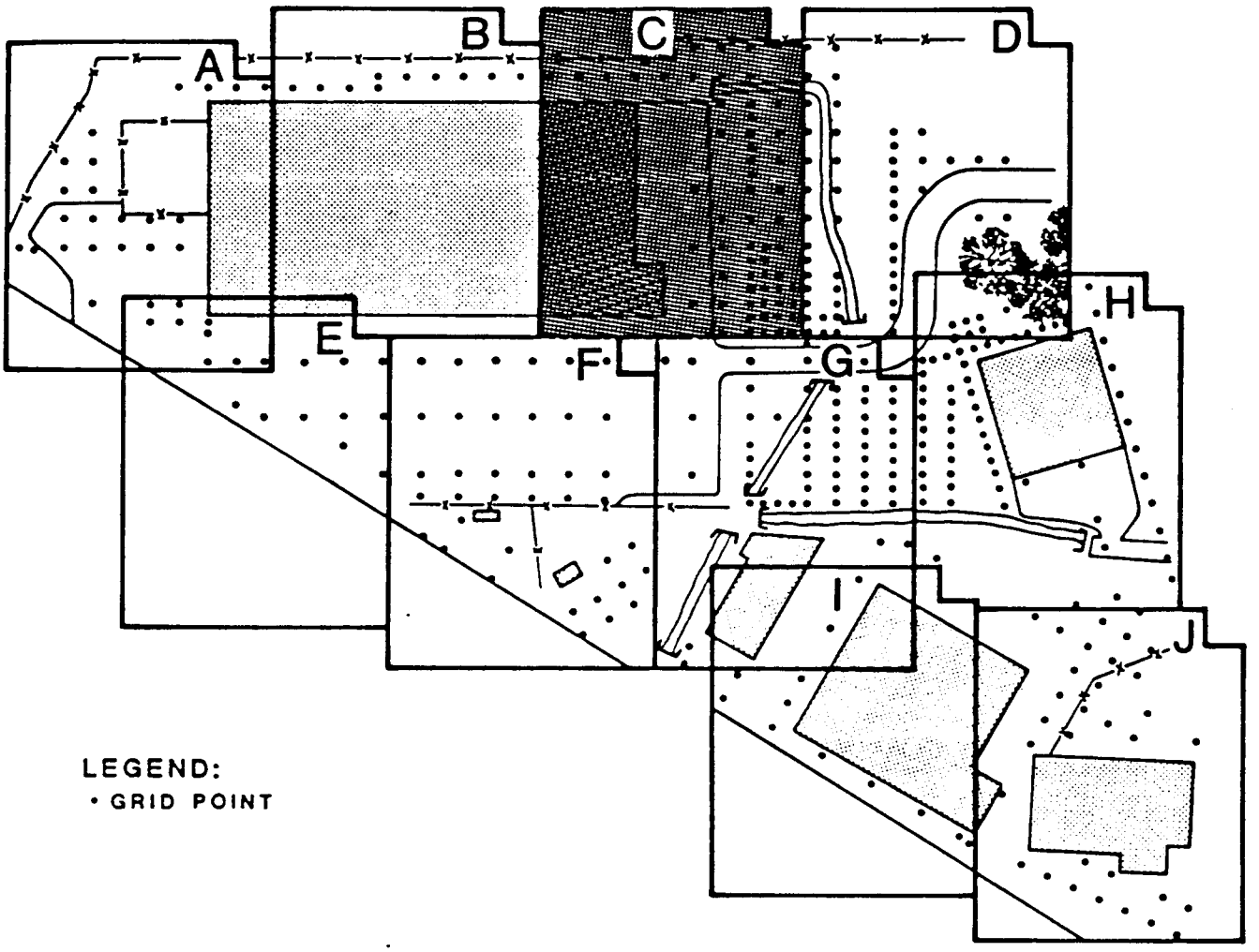
FIGURE 4-D

BOREHOLE LOCATIONS-SEGMENT B

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company


A
B
C
D
E
F
G
H
I
J
LEGEND:
• GRID POINT

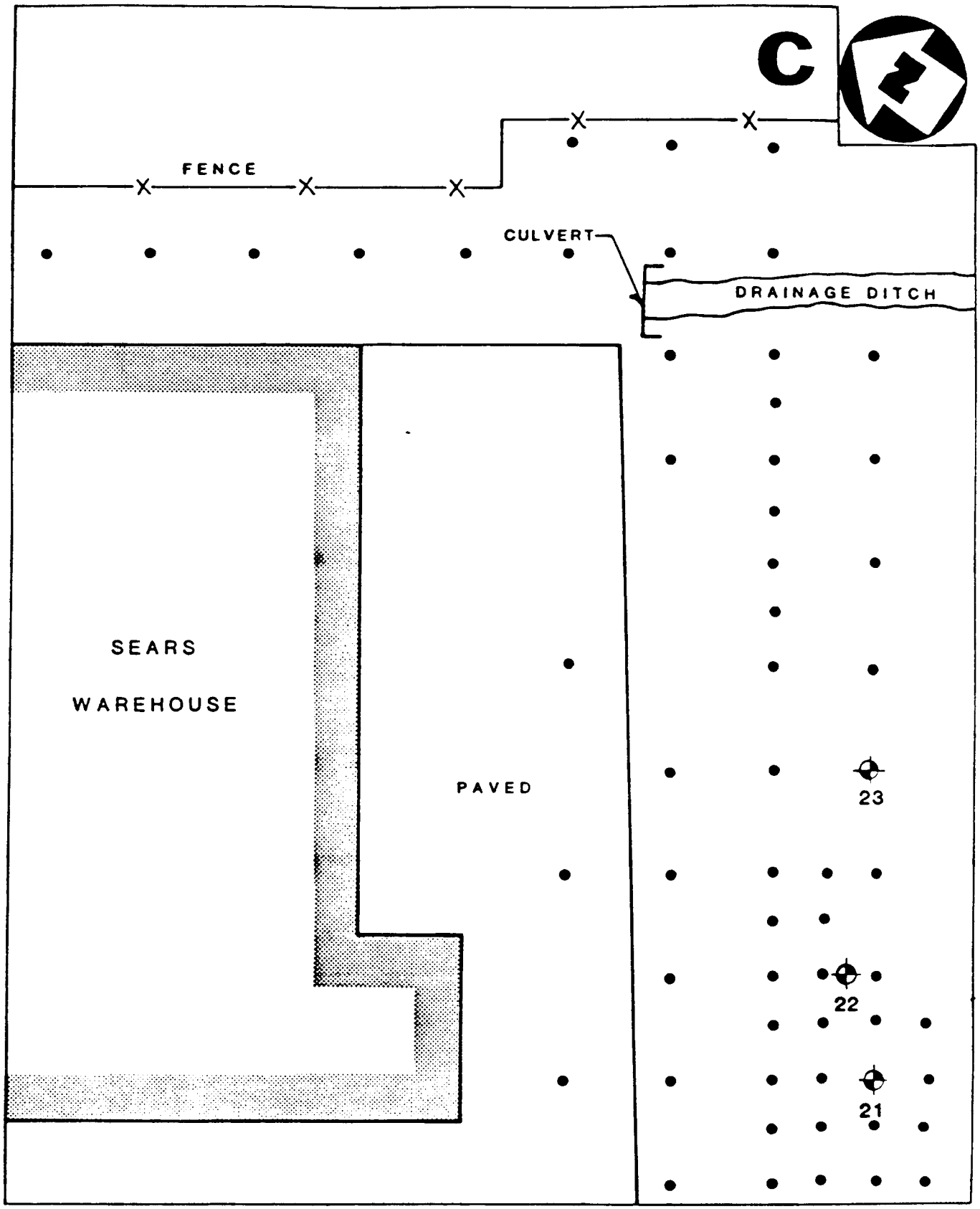
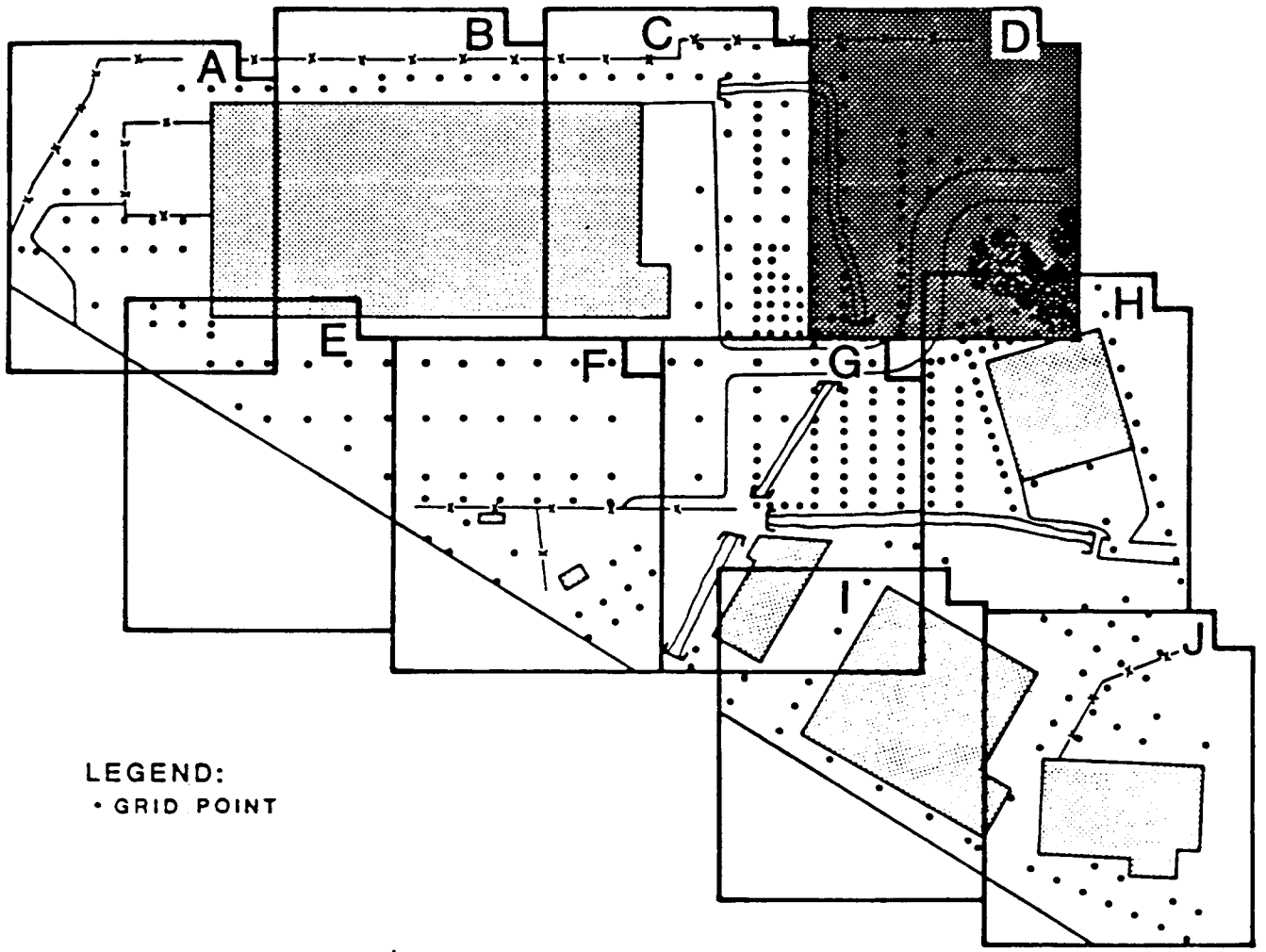


FIGURE 4-E

BOREHOLE LOCATIONS-SEGMENT C
MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION
A Halliburton Company



LEGEND:
• GRID POINT

FIGURE 4-F

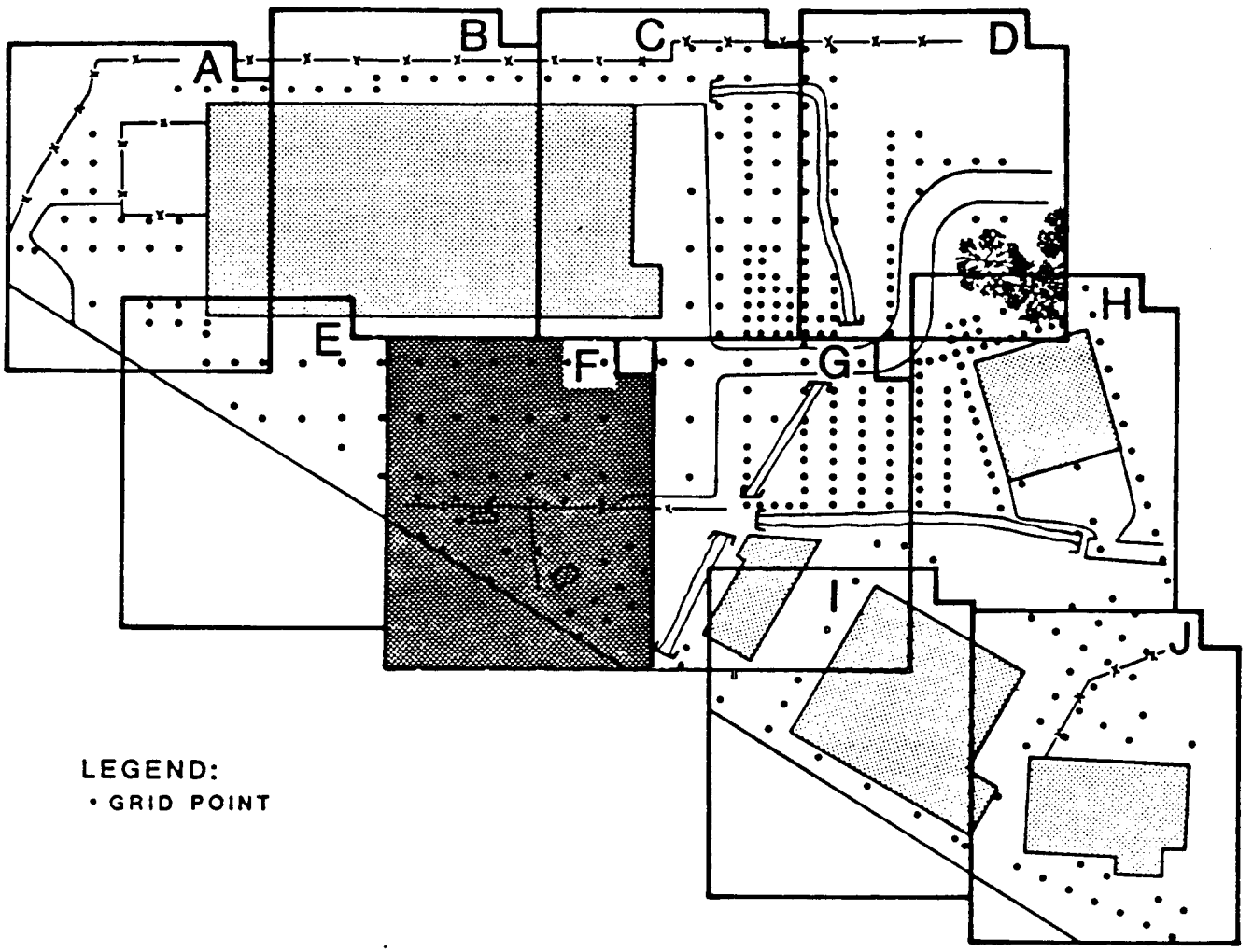
BOREHOLE LOCATIONS-SEGMENT D

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company



LEGEND:
• GRID POINT

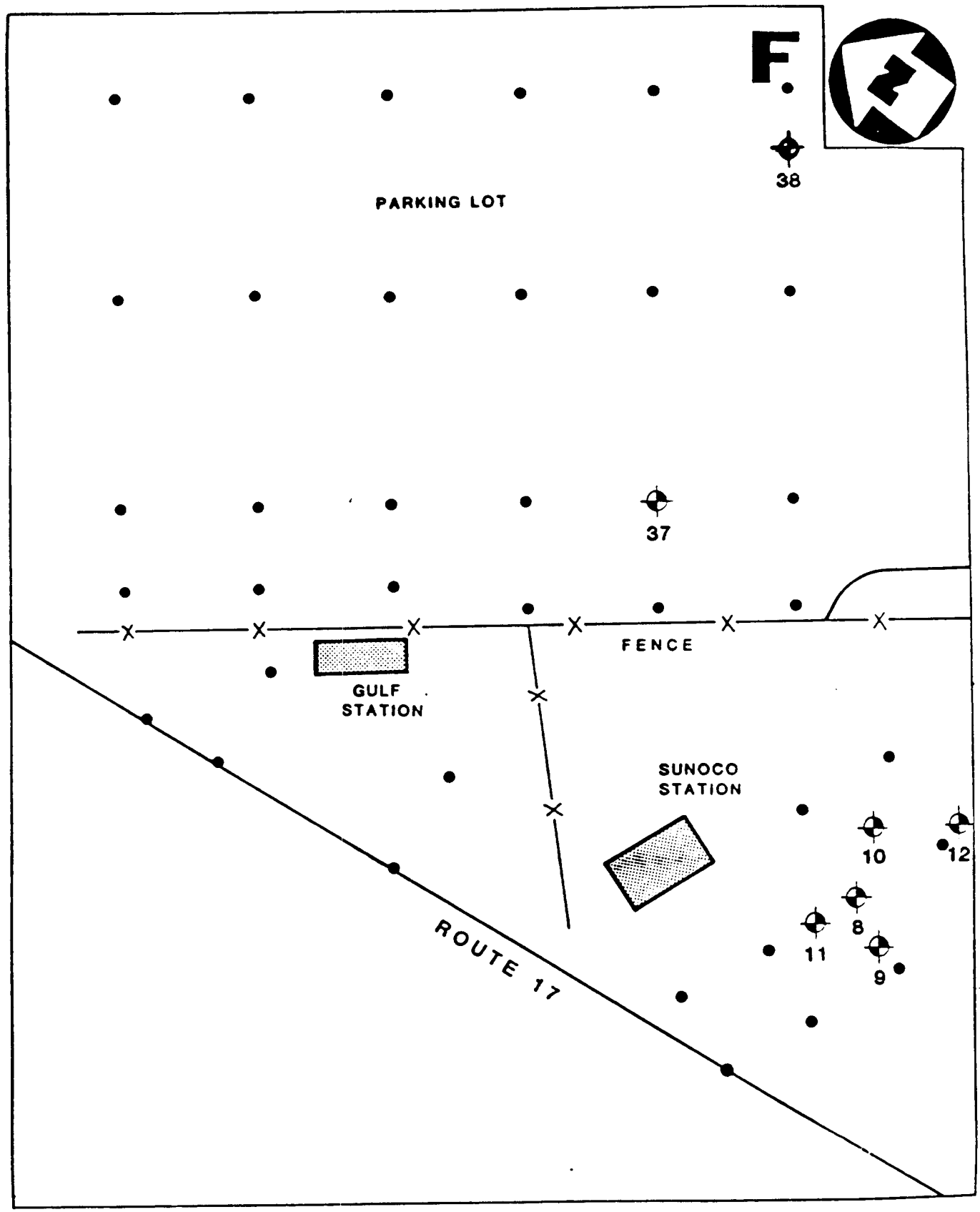


FIGURE 4-G

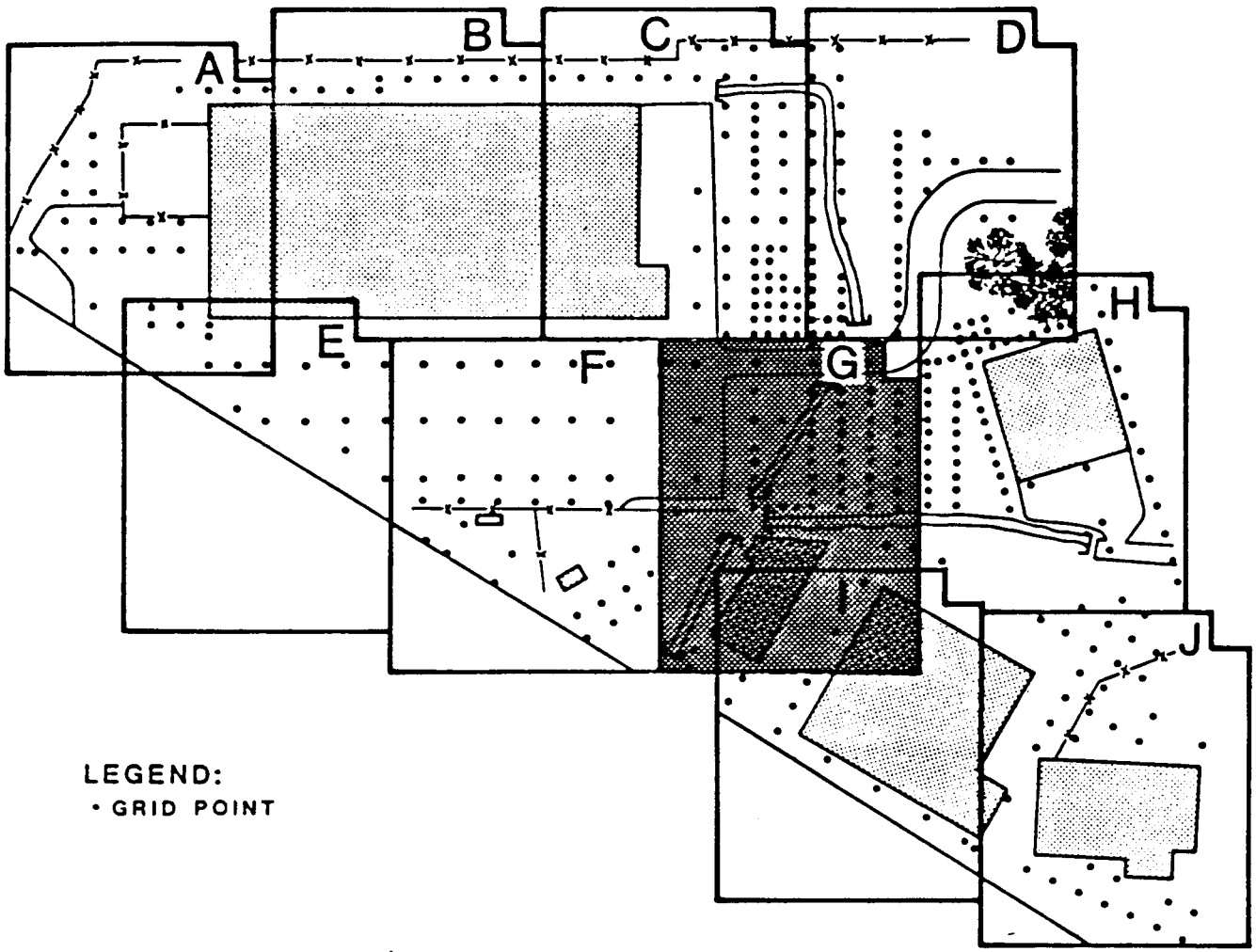
BOREHOLE LOCATIONS-SEGMENT F

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company


A
B
C
D
E
F
G
H
I
J
LEGEND:
• GRID POINT

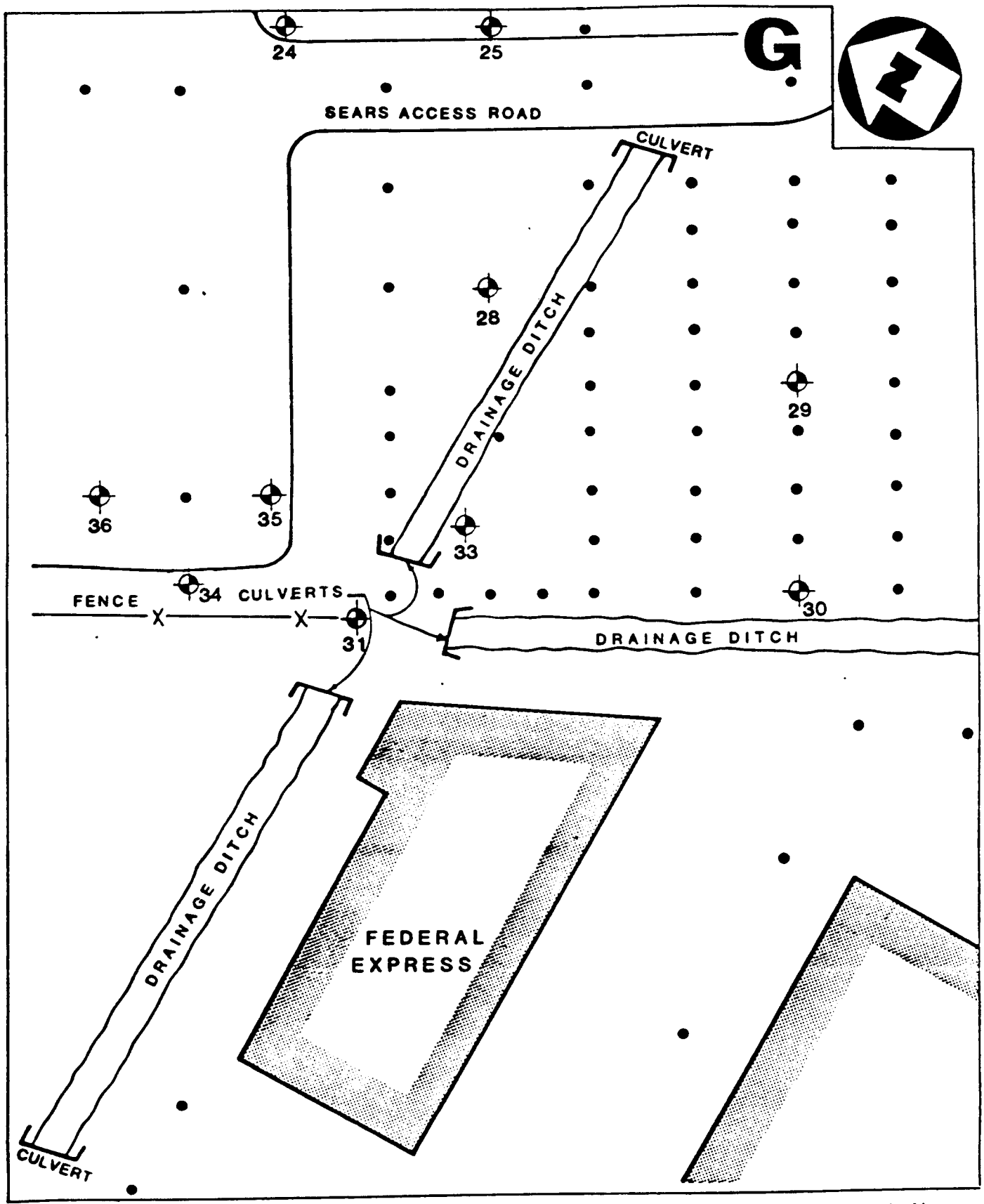


FIGURE 4-H

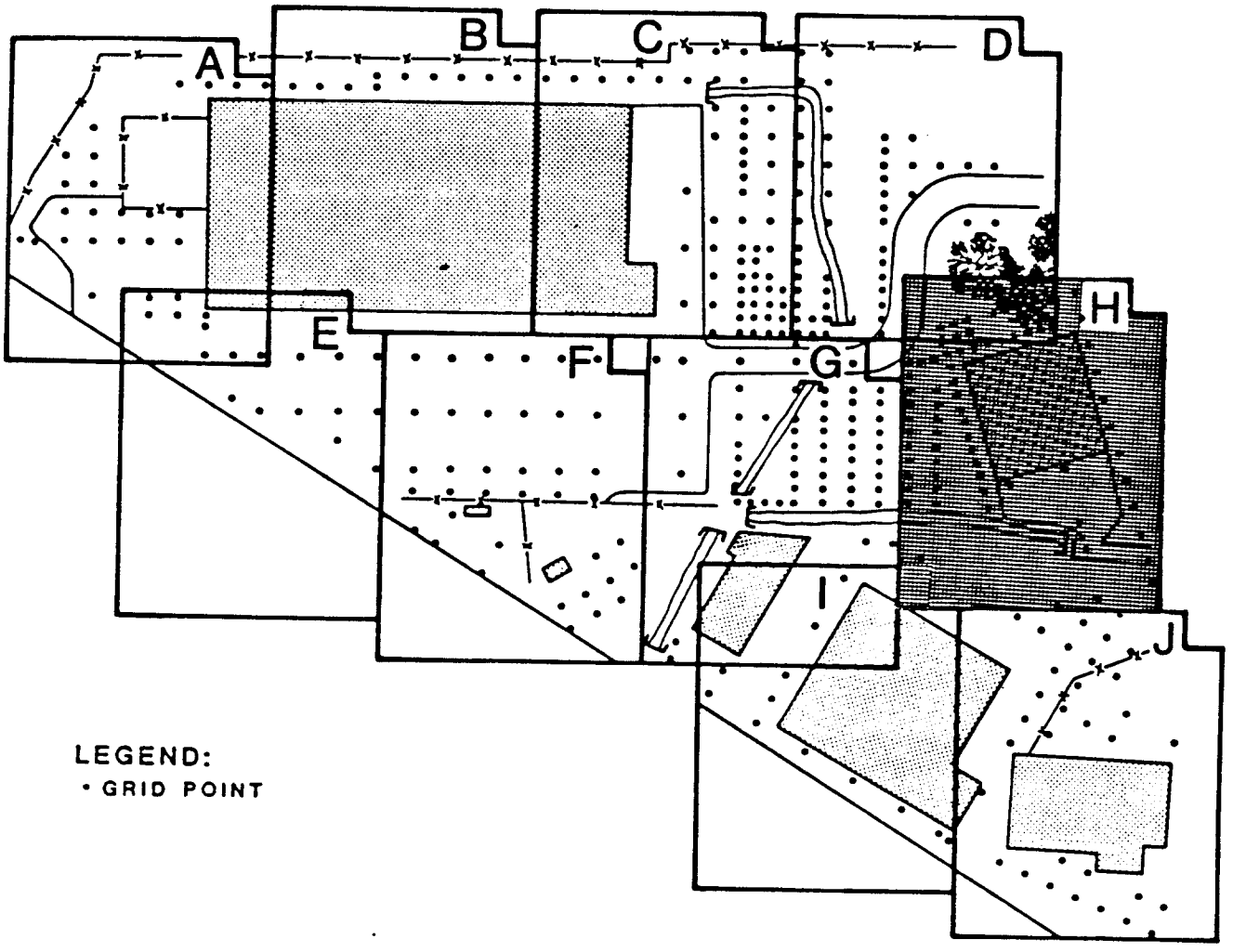
BOREHOLE LOCATIONS-SEGMENT G

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company


A
B
C
D
E
F
G
H
I
J
LEGEND:
• GRID POINT

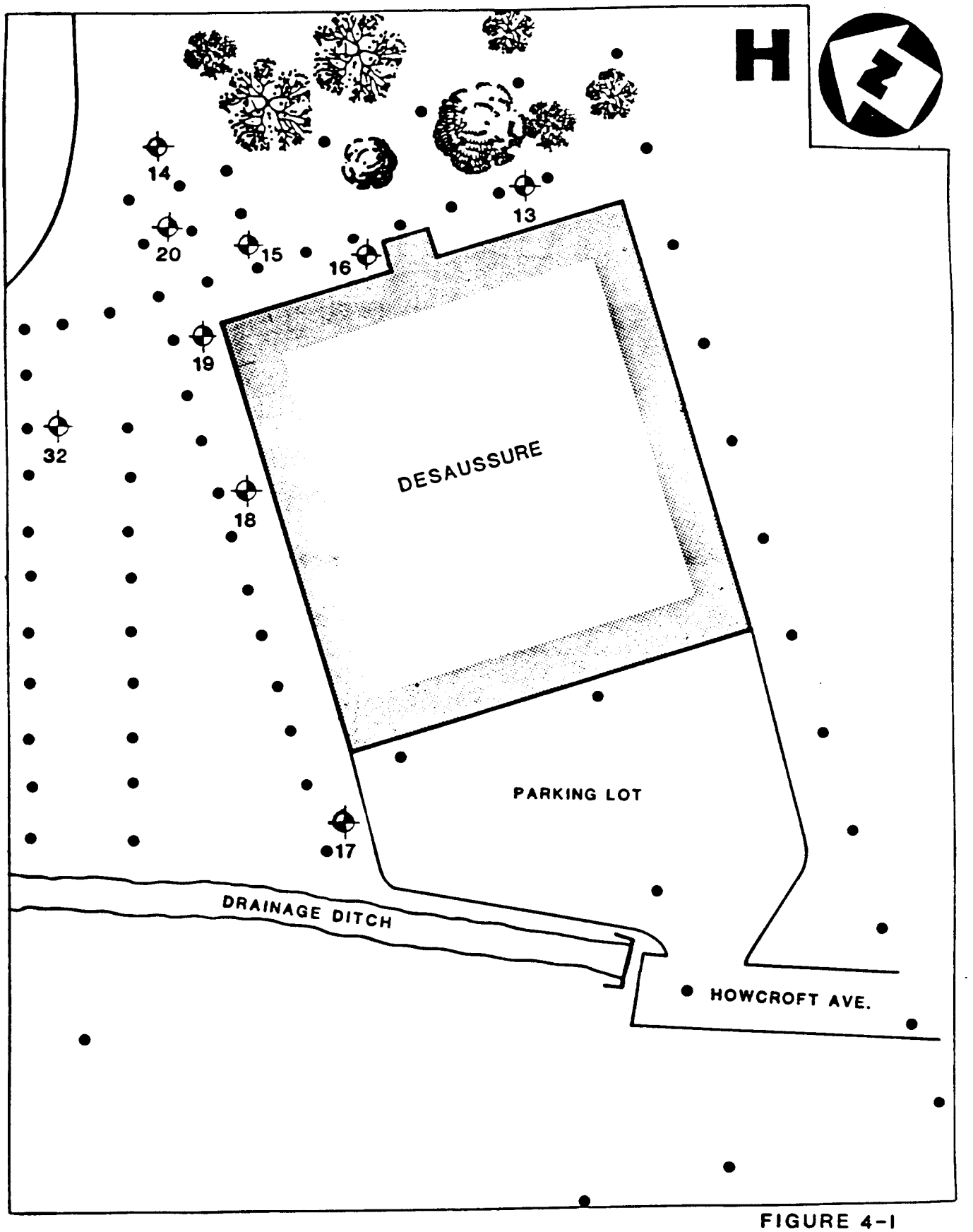


FIGURE 4-1

BOREHOLE LOCATIONS-SEGMENT H

MAYWOOD CHEMICAL, MAYWOOD, N.J.

SCALE: 1"=67'

NUS CORPORATION

A Halliburton Company

APPENDIX B

TABLES

TABLES

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Table 1
(Page 1 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
1	1+0000050L	6	110	6	100	paved
2	1+0000050R	6	90	6	90	"
3	1+0100050L	7	110	7	110	"
4	1+0100050R	6	90	6	100	"
5	1+0200050L	6	110	6	110	"
6	1+0200050R	6	90	8	90	"
7	1+0300070L	4	0	5	0	0
8	1+0300050L	8	100	10	90	110
9	1+030000BL	6	0	7	0	0
10	1+0300050R	6	90	7	90	90
11	1+0350050L	8	90	9	100	100
12	1+035000BL	7	0	6	0	0
13	1+0350050R	6	0	6	0	0
14	1+0400050L	8	90	8	100	100
15	1+040000BL	6	0	8	20	10
16	1+0400050R	6	0	6	0	0
17	1+0450050L	8	10	7	10	10
18	1+045000BL	7	20	7	10	10
19	1+0450050R	10	0	11	0	0
20	1+0475050L	9	10	9	10	10
21	1+0500050L	25	20	39	10	20
22	1+0500025L	11	10	9	10	10
23	1+050000BL	14	25	12	10	10
24	1+0500047R	13	0	13	0	0
25	1+0525050L	75	25	50	20	20
26	1+0525025L	180	40	210	30	85
27	1+052500BL	50	20	40	20	50
28	1+0550050L	75	20	75	20	20
29	1+0550025L	160	10	150	10	25
30	1+055000BL	40	20	21	20	20
31	1+0550025R	19	0	21	0	0
32	1+0550045R	29	0	42	0	0
33	1+0575050L	18	10	12	10	10
34	1+0575025L	110	20	110	25	25
35	1+057500BL	30	20	29	20	20
36	1+0600050L	9	10	11	10	10
37	1+0600025L	30	10	31	10	10
38	1+060000BL	17	20	15	10	10
39	1+0600045R	12	0	12	0	0
40	1+062500BL	21	10	21	10	10

Table 1
(Page 2 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
41	1+0650042L	9	0	9	0	0
42	1+0650006L	22	10	21	10	10
43	1+0650045R	11	0	11	0	0
44	1+0700030L	6	10	8	10	10
45	1+0700006L	12	0	17	10	10
46	1+0700045R	8	0	9	0	0
47	1+0750019L	7	10	7	10	10
48	1+0750006L	7	0	7	0	0
49	1+0750050R	6	0	8	0	0
50	1+0800050R	8	0	8	0	0
51	1+0850050R	7	0	7	0	0
52	1+0900050R	7	0	7	0	0
53	1+0950050R	7	0	8	0	0
54	1+1000050R	6	0	7	0	0
55	1+1000072R	6	0	7	0	0
56	4+1000400R	11	20	11	20	20
57	4+1050350R	11	20	11	20	20
58	4+1000350R	12	20	12	20	20
59	4+1050300R	9	10	10	20	20
60	4+1000300R	13	30	14	30	30
61	4+1050250R	7	10	9	20	paved
62	4+1000250R	7	10	7	10	"
63	4+0950250R	7	10	7	10	"
64	4+0900250R	6	10	6	10	"
65	4+0850250R	5	10	5	10	"
66	4+1125200R	20	40	35	70	50
67	4+1100200R	18	40	35	70	80
68	4+1050200R	8	10	9	10	paved
69	4+1000200R	7	10	7	10	"
70	4+0950200R	5	10	5	10	"
71	4+0900200R	5	10	6	10	"
72	4+0850200R	11	20	9	20	"
73	4+1000100R	8	10	11	20	20
74	4+0900100R	6	10	6	10	paved
75	4+0850100R	5	10	7	10	"
76	4+0900070R	6	10	6	10	"
77	4+0850070R	5	10	5	10	"
78	4+0800070R	5	10	6	10	"
79	4+0800050R	5	10	6	10	"

Table 1
(Page 3 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
80	4+080000BL	6	10	6	10	paved
81	4+075000BL	6	10	6	10	"
82	4+070000BL	5	10	6	10	"
83	4+063000BL	5	10	6	10	"
84	4+056000BL	12	10	15	20	"
85	4+049000BL	6	10	8	20	"
86	4+042500BL	5	10	6	10	"
87	4+036000BL	5	10	6	10	"
88	4+029500BL	5	20	6	10	"
89	4+023000BL	5	10	5	10	"
90	4+016500BL	5	10	6	20	"
91	4+010000BL	5	10	6	10	paved
92	4+000000BL	6	10	8	10	"
93	4-005000BL	7	20	8	10	"
94	4+0750075L	9	20	12	30	"
95	4+0700100L	6	10	6	10	"
96	4+0630100L	5	10	5	10	paved
97	4+0560100L	7	10	7	10	"
98	4+0490100L	5	20	6	20	"
99	4+0425100L	5	10	5	10	"
100	4+0360100L	7	10	6	10	"
101	4+0295100L	10	20	9	20	"
102	4+0230100L	10	10	11	10	"
103	4+0165100L	10	10	10	20	"
104	4+0100100L	19	40	22	50	"
105	4-0050100L	21	30	21	40	"
106	4+0560150L	7	10	7	10	"
107	4+0490200L	6	10	7	20	"
108	4+0425200L	5	10	6	10	"
109	4+0360200L	6	10	6	20	"
110	4+0295200L	6	10	7	10	"
111	4+0230200L	10	20	12	20	"
112	4+0165200L	11	20	12	20	"
113	4+0100200L	15	20	17	30	"
114	4-0050200L	21	20	29	100	"
115	4+0425240L	7	10	7	10	"
116	4+0360240L	7	10	7	10	"
117	4+0295240L	21	40	21	50	"
118	4+0230250L	9	20	9	20	"

Table 1
(Page 4 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
119	4+0165250L	8	20	8	20	paved
120	4+0100250L	12	10	13	20	"
121	4+0850480R	40	60	80	100	100
122	4+0800480R	24	40	27	50	60
123	4+0750480R	12	40	10	40	40
124	4+0700480R	13	40	12	40	40
125	4+0650480R	10	30	10	30	30
126	4+0600480R	7	40	7	40	40
127	4+0550480R	7	30	6	20	20
128	4+0500480R	7	20	6	10	10
129	4+0500500R	11	20	13	30	20
130	4+0450500R	7	20	7	30	20
131	4+0400500R	7	20	6	30	30
132	4+0350500R	7	30	7	30	20
133	4+0300500R	7	10	7	10	10
134	4+0250500R	7	20	7	20	20
135	4+0200500R	9	20	8	30	30
136	4+0150500R	9	20	8	30	30
137	4+0100500R	8	10	9	10	10
138	4+0050500R	8	20	7	20	20
139	4+0000500R	11	40	12	30	30
140	4-0050500R	10	30	10	20	20
141	4-0050550R	10	40	11	30	30
142	4-0100550R	10	10	10	20	20
143	4-0150550R	9	20	11	20	20
144	4-0250550R	9	10	11	10	10
145	4-0300550R	10	30	10	20	20
146	4-0100500R	9	20	10	20	20
147	4-0150500R	7	10	9	20	20
148	4-0250500R	8	10	8	10	10
149	4-0300500R	8	30	8	20	30
150	4-0100450R	20	40	22	60	60
151	4-0150450R	20	50	20	20	40
152	4-0200450R	14	20	15	20	50
153	4-0250450R	11	20	12	20	20
154	4-0300450R	7	10	8	10	20
155	4-0150425R	17	20	19	30	50
156	4-0100400R	14	50	14	40	40
157	4-0150400R	20	20	25	40	40

Table 1
(Page 5 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
158	4-0200400R	16	30	21	20	50
159	4-0250400R	13	20	15	20	40
160	4-0300400R	9	20	8	30	30
161	4-0400400R	7	10	8	10	10
162	4-0450400R	10	10	9	10	10
163	4-0150375R	25	80	30	40	60
164	4-0150350R	30	50	45	80	110
165	4-0200350R	21	40	23	20	20
166	4-0250350R	17	20	17	30	40
167	4-0300350R	11	20	12	30	30
168	4-0400375R	7	20	7	10	15
169	4-0400350R	9	30	9	35	35
170	4-0450350R	9	10	9	10	10
171	4-0500350R	9	20	11	20	20
172	4-0550350R	12	20	12	20	30
173	4-0600350R	20	40	26	40	40
174	4-0050300R	5	0	6	0	paved
175	4-0150325R	19	49	22	40	50
176	4-0150300R	16	20	60	100	100
177	4-0200300R	16	20	16	20	20
178	4-0250300R	14	20	15	20	20
179	4-0300300R	12	30	16	20	20
180	4-0400325R	9	20	9	30	30
181	4-0400300R	8	30	10	20	30
182	4-0450300R	9	10	7	10	10
183	4-0100250R	6	30	7	30	paved
184	4-0150250R	12	20	13	20	20
185	4-0200250R	12	20	13	20	20
186	4-0250250R	15	10	15	20	20
187	4-0300250R	12	20	12	20	20
188	4-0400275R	9	20	7	30	30
189	4-0400250R	12	20	13	40	50
190	4-0550250R	34	60	34	80	80
191	4-0600250R	23	50	25	60	60
192	4-0050200R	6	20	7	20	paved
193	4-0100200R	9	20	10	20	20
194	4-0150200R	15	20	15	20	30
195	4-0175200R	15	20	16	20	20
196	4-0200200R	19	20	23	20	40

Table 1
(Page 6 of 11)

Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
197	4-0250200R	17	20	20	40	40
198	4-0400200R	18	40	19	40	50
199	4-0150175R	17	50	30	50	90
200	4-0175175R	20	20	20	20	40
201	4-0250175R	17	20	17	40	40
202	4-0400175R	17	50	20	60	70
203	4-0100150R	11	20	10	20	20
204	4-0150150R	17	20	15	50	50
205	4-0175150R	110	200	125	180	180
206	4-0200150R	22	30	25	30	50
207	4-0250150R	20	20	22	40	40
208	4-0300150R	14	30	13	20	30
209	4-0400150R	18	40	18	40	40
210	4-0150125R	23	40	23	40	60
211	4-0175125R	60	60	50	40	50
212	4-0200125R	29	40	29	50	50
213	4-0225125R	22	40	22	50	40
214	4-0250125R	22	20	22	40	40
215	4-0300125R	16	50	16	40	40
216	4-0400125R	18	40	20	50	50
217	4-0050100R	6	10	6	10	paved
218	4-0100100R	15	20	15	30	30
219	4-0150100R	35	50	38	50	50
220	4-0175100R	60	50	80	130	150
221	4-0200100R	80	60	90	90	160
222	4-0225100R	85	100	100	100	100
223	4-0250100R	60	80	70	100	150
224	4-0300100R	20	60	22	50	50
225	4-0400100R	18	40	17	50	50
226	4-0150075R	50	100	60	100	100
227	4-0175075R	60	80	60	70	100
228	4-0200075R	110	120	25	200	250
229	4-0225075R	85	100	100	110	110
230	4-0250075R	80	100	90	100	180
231	4-0275075R	30	-	-	-	- (1)
232	4-0300075R	23	60	23	40	40
233	4-0400075R	18	30	20	30	40
234	4-0100050R	13	20	13	30	40
235	4-0150050R	51	100	75	120	120

(1) Complete set of data not obtained.

Table 1
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Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
236	4-0175050R	100	100	150	210	280
237	4-0200050R	100	120	110	110	180
238	4-0225050R	70	50	90	110	150
239	4-0250050R	90	60	90	80	160
240	4-0275050R	45	100	40	50	100
241	4-0300050R	35	40	39	40	40
242	4-0400050R	11	30	8	30	paved
243	4-0250025R	21	20	20	20	20
244	4-0150006L	11	10	11	10	paved
245	4-0250006L	12	10	11	10	"
246	4-0350006L	11	10	10	10	"
247	4-0450006L	29	20	30	20	40
248	4-0150050L	70	-	-	-	- (1)
249	4-0250050L	35	60	34	80	80
250	4-0300050L	50	80	80	100	120
251	4-0350050L	50	80	50	80	100
252	4-0400050L	40	40	40	60	60
253	4-0450025L	34	80	38	60	80
254	4-0450050L	32	70	30	60	70
255	4-0500050L	35	80	31	70	80
256	4-0300075L	70	120	110	130	130
257	4-0350075L	50	100	50	60	60
258	4-0400075L	40	50	45	60	80
259	4-0450075L	38	70	34	60	60
260	4-0500075L	80	90	110	150	160
261	4-0150100L	70	-	-	-	- (1)
262	4-0200100L	90	-	-	-	- (1)
263	4-0250100L	28	50	25	20	40
264	4-0300100L	90	140	115	160	180
265	4-0350100L	50	80	45	50	60
266	4-0400100L	41	80	50	80	80
267	4-0450100L	40	80	44	80	90
268	4-0500100L	70	120	80	130	140
269	4-0250125L	90	100	100	140	160
270	4-0300125L	90	180	100	120	180
271	4-0350125L	70	100	80	110	120
272	4-0400125L	55	70	70	90	100
273	4-0450125L	65	90	70	100	110
274	4-0500125L	55	90	60	90	90

(1) Complete set of data not obtained.

Table 1
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Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
275	4-0150150L	80	120	100	100	160
276	4-0250150L	80	50	80	80	120
277	4-0300150L	85	120	105	160	160
278	4-0350150L	90	100	100	160	160
279	4-0400150L	65	80	70	120	100
280	4-0450150L	55	90	60	70	70
281	4-0500150L	60	90	65	90	100
282	4-0150175L	110	100	125	180	200
283	4-0200175L	90	-	-	-	- (1)
284	4-0250175L	45	60	50	40	80
285	4-0300175L	50	80	60	80	100
286	4-0350175L	85	140	100	120	160
287	4-0400175L	65	150	65	120	120
288	4-0450175L	55	60	60	80	80
289	4-0500175L	55	80	30	70	100
290	4-0150200L	110	180	140	180	280
291	4-0250200L	45	60	41	80	100
292	4-0300200L	40	60	35	50	50
293	4-0350200L	30	40	23	30	50
294	4-0400200L	70	100	70	90	120
295	4-0450200L	65	70	65	110	110
296	4-0500200L	80	120	85	90	100
297	4-0150225L	80	110	110	100	180
298	4-0250225L	110	100	175	150	300
299	4-0300225L	80	90	90	110	110
300	4-0350225L	35	40	35	60	60
301	4-0400225L	70	80	75	130	140
302	4-0450225L	50	90	60	90	90
303	4-0500225L	70	90	75	80	100
304	4-0150250L	140	200	170	200	310
305	4-0175250L	110	110	120	150	180
306	4-0200250L	110	110	160	160	160
307	4-0225250L	140	180	175	200	280
308	4-0250250L	100	80	100	80	100
309	4-0300250L	130	170	160	220	340
310	4-0350250L	150	250	170	250	250
311	4-0400250L	100	150	90	150	150
312	4-0450250L	80	110	65	110	120
313	4-0500250L	90	150	110	175	190

(1) Complete set of data not obtained.

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Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
314	3-0050250R	35	80	37	30	90
315	3-0050225R	110	100	125	180	180
316	3-0050200R	30	50	40	50	80
317	3-0050150R	32	80	26	80	90
318	3-0050100R	7	20	7	30	30
319	3-0050050R	5	10	5	10	10
320	3-005000BL	7	20	5	20	20
321	3-0025250R	21	50	25	30	40
322	3-0025225R	35	60	42	80	80
323	3-0025200R	60	100	100	150	150
324	3-0000300R	39	60	45	80	80
325	3-0000275R	35	60	39	50	60
326	3-0000250R	45	50	50	80	110
327	3-0000225R	25	60	29	60	60
328	3-0000200R	35	60	42	60	100
329	3-0000175R	90	120	110	180	180
330	3-0000150R	75	100	70	50	100
331	3-0000125R	40	100	49	50	100
332	3-0000100R	75	100	120	110	200
333	3-0000075R	11	20	11	30	30
334	3-0000050R	7	20	8	10	10
335	3-000000BL	6	20	7	20	20
336	3+0025250R	50	80	70	80	180
337	3+0050250R	50	80	70	80	150
338	3+0075250R	60	100	70	100	100
339	3+0100250R	90	110	150	200	220
340	3+0125250R	75	100	75	120	120
341	3+0150250R	60	80	70	90	90
342	3+0175250R	60	80	75	80	100
343	3+0200250R	75	100	100	160	160
344	3+0225250R	70	80	75	110	160
345	3+0250250R	75	80	75	80	80
346	3+0283250R	130	150	170	250	280
347	3+0250200R	6	10	6	10	paved
348	3+0250100R	5	10	6	20	"
349	3+005000BL	7	20	7	10	20
350	3+010000BL	6	10	8	30	30
351	3+015000BL	6	10	7	10	10
352	3+020000BL	6	10	7	10	10

Table 1
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Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
353	3+025000BL	6	10	6	10	10
354	3+030000BL	8	20	9	20	20
355	3+035010OR	4	10	4	10	paved
356	3+035000BL	6	10	6	20	20
357	3+040010OR	6	10	6	20	20
358	3+040000BL	5	10	5	20	20
359	3+042500BL	6	10	5	10	10
360	3+045000BL	5	10	5	10	paved
361	+024000BL	11	30	10	10	paved
362	+020005OR	6	10	6	10	"
363	+020000BL	10	10	8	10	"
364	+010005OR	6	10	6	10	"
365	+010000BL	9	10	11	20	"
366	2+000005OL	5	10	5	10	"
367	2+000010OL	8	10	9	10	"
368	2+005004 5R	7	10	8	10	"
369	2+005000BL	5	10	5	10	"
370	2+005005OL	75	100	80	110	"
371	2+005010OL	8	10	8	10	"
372	2+009004 5R	10	20	13	30	"
373	2+009000BL	4	20	4	20	"
374	2+009005OL	8	30	9	20	"
375	+060000BL	5	10	6	20	"
376	+060005OR	5	10	5	10	"
377	+050000BL	5	10	5	20	"
378	+050005OR	5	10	5	10	"
379	+040000BL	17	40	20	50	paved
380	+040005OR	5	10	6	10	"
381	+040010OR	5	10	5	10	"
382	+040020OR	5	10	6	10	"
383	+040030OR	9	20	9	20	"
384	+040037 5R	20	40	20	30	"
385	+035040OR	17	20	14	30	"
386	+030040OR	12	20	10	20	"
387	+010040OR	5	10	5	10	"
388	+005040OR	6	10	7	10	10
389	+005045OR	6	10	6	10	10
390	+030000BL	12	30	12	30	paved
391	+020000BL	12	10	12	10	"

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Directly Measured Beta and Gamma Radiation Levels at Grid Points

Grid Point No.	Location	External gamma radiation level at 1 meter (microR/hr)	GM at 1 m (cpm)	External gamma radiation level at surface (micro R/hr)	GM at surface (cpm) closed (gamma)	GM at surface (cpm) open (beta-gamma)
392	+0100000BL	11	30	14	30	paved
393	+0000000BL	10	20	11	20	"
394	-0007000BL	9	30	11	40	"
395	-0007100R	6	10	7	10	"
396	-0007200R	6	10	6	10	10
397	-0007250R	6	10	6	10	20
398	-0007300R	6	10	6	10	10
399	-0007350R	6	10	6	10	10
400	-0007400R	6	10	6	10	10
401	-0007450R	6	10	7	10	10
402	-0007500R	6	10	6	10	10
403	-0050250R	5	10	6	10	10
404	-0050300R	5	10	5	10	10
405	-0050350R	5	10	5	20	10
406	-0050400R	6	10	7	20	20
407	-0050450R	5	20	6	20	20
408	-0050500R	5	10	5	10	10
409	-0100300R	5	10	5	10	10
410	-0100400R	5	10	5	10	10
411	-0100450R	5	10	6	10	10
412	-0150300R	5	10	5	10	paved
413	-0150350R	5	10	5	10	10
414	-0250350R	5	10	5	10	paved
415	-0100000BL	6	10	6	10	10
416	-0150000BL	6	10	6	10	10
417	-0200000BL	6	10	6	10	10
418	-0200050R	7	10	8	10	10
419	-0250000BL	6	10	6	10	10
420	-0250050R	6	10	8	10	10
421	-0300000BL	6	10	6	10	10
422	-0350000BL	5	10	6	10	10
423	-0350050R	5	10	5	10	10
424	-0400000BL	5	10	6	10	10
425	-0400050R	6	10	6	10	10

Table 2
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Radium-226 and Radium-228 In Soil Samples
pCi/g (dry) ± 2s

Sample#	Date	Location	Hole#	Ra-226	Ra-228
4	07/27/83	1+0525025L0-2	1	17 ± 2	180 ± 20
11	"	" 0-2	1	14 ± 2	100 ± 10
5	"	" 4-6	1	16 ± 3	95 ± 8
1	"	1+0550025L0-2	2	12 ± 2	160 ± 20
2	"	" 2-4	2	68 ± 7	200 ± 20
3	"	" 4-6	2	22 ± 3	200 ± 20
6	"	" 6-7	2	0.76 ± 0.26	LT 1.0
7	"	" 7-8	2	LT 0.5	LT 0.9
8	"	1+0525006L0-2	3	5.1 ± 1.5	25 ± 4
9	"	" 2-4	3	7.9 ± 1.3	62 ± 7
10	"	" 4-6	3	4.3 ± 0.9	15 ± 2
12	"	1+0517050L0-2	4	4.5 ± 2.1	57 ± 6
13	"	" 2-4	4	5.7 ± 1.0	58 ± 6
14	"	" 4-5	4	9.9 ± 2.7	110 ± 20
15	"	" 5-6	4	1.8 ± 0.7	4.3 ± 1.5
16	07/28/83	1+0616005L0-2	5	3.2 ± 1.1	13 ± 3
17	"	1+0500025L2-4	6	33 ± 5	160 ± 20
18	"	" 4-5	6	4.3 ± 0.6	24 ± 3
19	"	" 5-6	6	1.6 ± 0.4	0.48 ± 0.38
20	"	1+0450006L0-2	7	0.73 ± 0.31	LT 1.3
21	"	" 2-4	7	0.87 ± 0.32	1.7 ± 0.6
22	"	" 4-6	7	1.2 ± 0.5	7.6 ± 1.7
23	"	2+0050050L0-2	8	80 ± 8	300 ± 30
24	"	" 2-4	8	28 ± 3	99 ± 10
25	"	" 4-5	8	9.7 ± 1.4	32 ± 4
26	"	" 5-6	8	LT 0.6	LT 1.0
27	"	2+0081050L0-1	9	9.0 ± 1.1	35 ± 4
28	"	" 1-2	9	2.2 ± 0.5	7.2 ± 1.2
29	"	" 2-4	9	2.0 ± 0.7	7.1 ± 1.5

Table 2
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Radium-226 and Radium-228 in Soil Samples
pCi/g (dry) ± 2s

Sample#	Date	Location	Hole#	Ra-226	Ra-228
30	"	2+0035075L1-2	10	0.92 ± 0.30	2.0 ± 0.6
31	"	" 4-5	10	1.5 ± 0.5	7.0 ± 1.3
32	"	" 5-6	10	0.67 ± 0.20	0.68 ± 0.36
33	07/29/83	2+0050033L2-3	11	1.0 ± 0.3	1.2 ± 0.7
34	"	" 3-4	11	1.9 ± 0.5	9.1 ± 1.4
35	07/29/83	2+0050125L3-5	12	1.8 ± 0.6	7.1 ± 1.3
36	07/29/83	3+0000066R2-4	13	1.0 ± 0.4	LT 1.4
37	"	" 4-6	13	0.88 ± 0.28	LT 1.0
38	"	3-0072230R0-1	14	LT 1.6	LT 2.0
39	"	" 1-2	14	17 ± 2	95 ± 10
40	"	3-0011200R0-2	15	4.3 ± 0.8	20 ± 2
42	"	" 2-3	15	6.3 ± 1.3	42 ± 5
41	"	" 3-4	15	3.3 ± 0.6	13 ± 2
43	"	" 4-5	15	1.0 ± 0.4	2.7 ± 0.8
44	"	3+0014136R0-1.5	16	5.3 ± 1.1	30 ± 3
45	"	" 1.5-4	16	2.1 ± 0.7	8.1 ± 1.8
46	"	3+0278243R0-2	17	7.3 ± 1.0	35 ± 4
47	"	" 3-4	17	50 ± 5	240 ± 30
48	"	" 4-5	17	5.6 ± 1.0	19 ± 2
49	"	3+0100240R3-4	18	26 ± 3	170 ± 20
50	"	" 4-5	18	47 ± 5	240 ± 30
53	08/01/83	3+0026238.5R0-2	19	2.1 ± 0.6	12 ± 2
51	"	" 4-6	19	25 ± 3	59 ± 6
52	"	" mix	19	24 ± 3	130 ± 20
54	"	" 6-7	19	23 ± 3	66 ± 7
55	"	3-0030236R3-4	20	13 ± 2	96 ± 10
56	"	" 4-5	20	4.9 ± 1.4	72 ± 8
68	08/02/83	3-0550238R0-3	27	3.0 ± 0.7	20 ± 2
69	"	" 3-4	27	1.9 ± 0.6	5.3 ± 1.4

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Radium-226 and Radium-228 in Soil Samples
pCi/g (dry) ± 2s

Sample#	Date	Location	Hole#	Ra-226	Ra-228
57	08/01/83	4-0200100R0-2	21	14 ± 2	56 ± 6
58	"	" mix	21	4.7 ± 1.2	20 ± 3
60	"	4-0178150R0-1	22	5.3 ± 1.5	120 ± 20
59	"	" 1-2	22	1.5 ± 0.7	24 ± 3
61	"	" 2-4	22	5.9 ± 1.4	22 ± 3
62	"	" 4-6	22	0.50 ± 0.18	LT 0.8
63	"	4-0200250R0-6	23	LT 0.5	LT 1.0
64	"	4-0096044R0-1	24	0.89 ± 0.45	4.3 ± 1.0
66	08/02/83	4-0200037R0-3	25	9.1 ± 1.2	33 ± 4
65	"	" 3-4	25	2.9 ± 1.0	3.0 ± 0.3
67	"	4-0300050R1-2	26	1.1 ± 0.4	3.0 ± 0.8
70	"	4-0200100L0-1	28	8.8 ± 1.2	29 ± 3
71	"	" 1-2	28	17 ± 2	86 ± 9
72	"	" 2-4	28	2.3 ± 0.6	6.6 ± 1.5
73	"	4-0350250L0-1	29	5.3 ± 0.7	22 ± 3
74	"	" 1-1.5	29	3.3 ± 1.0	13 ± 2
75	"	" 1.5-2	29	18 ± 2	60 ± 6
76	"	" 2-3	29	8.3 ± 1.8	43 ± 5
77	"	" 3-4	29	1.0 ± 0.3	LT 1.2
78	"	" 4-5	29	0.68 ± 0.25	1.0 ± 0.4
88	08/03/83	4-0350250L0-2	30	18 ± 2	105 ± 20
79	08/02/83	" 2-3	30	36 ± 5	230 ± 30
80	"	" 3-4	30	15 ± 2	130 ± 20
86	"	" 4-5	30	4.6 ± 1.2	25 ± 3
87	"	" 5-6	30	0.81 ± 0.31	LT 1.0
81	"	4-0126255L0-1	31	.22 ± 3	91 ± 10
82	"	" 1-2.5	31	86 ± 9	390 ± 40
83	"	" 2.5-4	31	6.4 ± 1.1	17 ± 2
84	"	" 4-5	31	4.6 ± 1.2	15 ± 3
85	"	" 5-6	31	1.3 ± 0.3	LT 0.8
89	08/03/83	4-0453050L0-1	32	3.0 ± 0.6	13 ± 2
90	"	" 1-4	32	11 ± 2	47 ± 5
91	"	" 4-5	32	0.85 ± 0.43	LT 1.8

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Radium-226 and Radium-228 in Soil Samples
pCi/g (dry) ± 2s

Sample#	Date	Location	Hole#	Ra-226	Ra-228
92	"	4-0192205L0-1	33	28 ± 3	190 ± 20
93	"	" 1-2	33	37 ± 5	260 ± 30
94	"	" 2-3	33	40 ± 5	200 ± 20
95	"	" 3-4	33	0.95 ± 0.36	1.5 ± 0.6
96	"	" 4-5	33	3.3 ± 0.7	23 ± 3
97	"	" 5-6	33	0.40 ± 0.24	LT 0.8
98	08/03/83	4-0050250L0-1	34	13 ± 2	65 ± 7
99	"	" 1-3	34	6.3 ± 1.3	28 ± 4
100	"	" 3-4	34	9.5 ± 1.8	67 ± 7
101	"	" 4-6	34	0.80 ± 0.38	LT 1.4
102	"	4-0096195L0-3.5	35	8.3 ± 1.4	30 ± 3
104	"	" 3.5-4	35	1.8 ± 0.6	7.0 ± 1.4
103	"	" 4-6	35	5.4 ± 0.9	19 ± 2
105	"	" 5-6	35	0.47 ± 0.28	LT 1.1
106	"	4+0040200L0-2	36	38 ± 4	88 ± 9
107	"	" 2-4	36	40 ± 4	92 ± 10
108	"	" 4-5	36	9.9 ± 1.2	27 ± 3
109	"	" 5-6	36	1.4 ± 0.3	2.4 ± 0.7
110	08/04/83	4+0165200L0-2	37	24 ± 3	73 ± 8
111	"	" 4-5	37	11 ± 2	78 ± 8
113	"	4+0100043L0-6	38	0.70 ± 0.26	LT 1.0
112	"	4+1115202R0-2	39	2.2 ± 0.6	8.4 ± 1.6
115	"	" 2-3	39	1.4 ± 0.4	4.4 ± 0.9
116	"	" 3-5	39	0.55 ± 0.33	LT 1.2
114	"	surface sample(0-2")		28 ± 3	79 ± 8

Table 3
(Page 1 of 3)

Thorium Isotopic and Uranium Isotopic Composition of Soil Samples
pCi/g (dry) ± 2s

Sample No.	Hole No.	Depth (feet)	Th-228	Th-230	Th-232	U-238	U-234	U-235
4	1	0-2'	68 ± 7	4.2 ± 0.7	30 ± 3	6.5 ± 0.7	6.3 ± 0.7	0.42 ± 0.14
1	2	0-2'	80 ± 8	4.1 ± 0.8	33 ± 4	7.5 ± 0.8	7.6 ± 0.8	0.19 ± 0.06
2	2	[illegible]	120 ± 30	12 ± 4	93 ± 23	2.0 ± 0.3	2.3 ± 0.3	.093 ± .076
9	3	[illegible]	48 ± 5	6.5 ± 0.7	27 ± 3	3.4 ± 0.4	3.6 ± 0.4	0.14 ± 0.07
13	4	[illegible]	53 ± 5	.089 ± .067	19 ± 2	2.8 ± 0.5	3.0 ± 0.6	LT 0.2
16	5	[illegible]	32 ± 4	3.8 ± 0.7	21 ± 3	6.3 ± 1.0	5.9 ± 0.9	0.94 ± 0.40
23	8	[illegible]	49 ± 5	2.5 ± 0.3	39 ± 4	16 ± 2	15 ± 2	0.31 ± 0.16
24	8	[illegible]	6.1 ± 0.7	1.2 ± 0.2	2.3 ± 0.3	1.6 ± 0.3	2.4 ± 0.4	0.39 ± 0.17
25	8	[illegible]	61 ± 7	8.4 ± 1.3	51 ± 6	5.2 ± 0.8	6.5 ± 0.9	LT 0.14
26	8	[illegible]	6.7 ± 0.7	1.1 ± 0.2	1.6 ± 0.2	2.5 ± 0.6	2.6 ± 0.6	LT 0.2
30	10	1-2'	5.4 ± 0.6	0.57 ± 0.13	2.4 ± 0.3	0.78 ± 0.16	1.1 ± 0.2	0.14 ± 0.10
38	14	0-1'	15 ± 3	6.0 ± 1.6	4.4 ± 1.3	-	-	-
42	15	[illegible]	56 ± 6	6.1 ± 0.7	41 ± 5	12 ± 2	13 ± 2	1.0 ± 0.4
41	15	[illegible]	20 ± 3	4.2 ± 1.0	16 ± 3	5.1 ± 0.5	5.6 ± 0.6	0.24 ± 0.07
45	16	[illegible]	9.4 ± 1	1.7 ± 0.2	62 ± 7	3.1 ± 0.7	4.2 ± 0.9	0.27 ± 0.18

Table 3
(Page 2 of 3)

Thorium Isotopic and Uranium Isotopic Composition of Soil Samples
pCi/g (dry) ± 2s

Sample No.	Hole No.	Depth (ft)	Th-228	Th-230	Th-232	U-238	U-234	U-235
46	17	0-2'	44 ± 8	6.2 ± 1.5	37 ± 7	7.2 ± 1.4	9.3 ± 1.7	0.64 ± 0.28
47	17	2-4'	49 ± 17	4.7 ± 2.3	4.5 ± 2.1	34 ± 4	35 ± 4	0.42 ± 0.12
48	17	4-6'	10 ± 1	1.4 ± 0.2	6.3 ± 0.7	2.4 ± 0.6	2.5 ± 0.7	LT 0.2
49	18	3-4'	230 ± 80	28 ± 13	190 ± 70	31 ± 6	32 ± 6	0.75 ± 0.44
50	18	4-5'	90 ± 9	3 ± 0.4	32 ± 4	30 ± 6	28 ± 5	0.88 ± 0.49
51	19	4-6'	80 ± 12	9.3 ± 1.8	60 ± 10	16 ± 5	16 ± 5	0.91 ± 0.6
52	19	[illegible]	80 ± 20	? 10 ± 3	62 ± 17	1.2 ± 0.8	1.4 ± 0.9	LT 0.4
55	20	3-4'	43 ± 11	1.8 ± 0.9	37 ± 9	0.75 ± 0.12	1.0 ± 0.1	0.1 ± 0.1
57	21	[illegible]	56 ± 30	4.7 ± 3.4	34 ± 17	6.2 ± 6.0	5.4 ± 4.8	LT 1.7
58	21	[illegible]	21 ± 5	3.1 ± 1.0	14 ± 3	10 ± 6	9.1 ± 5.2	LT 0.8
60	22	0-1'	130 ± 30	12 ± 4	68 ± 7	LT 9	LT 9	LT 7
59	22	1-2'	31 ± 9	3.0 ± 1.5	24 ± 7	20 ± 11	21 ± 12	4.2 ± 3.7
61	22	2-4'	20 ± 4	2.7 ± 1.0	12 ± 3	3.9 ± 0.6	3.9 ± 0.6	LT 0.2
62	22	4-6'	2.3 ± 0.3	0.46 ± 0.07	0.81 ± 0.07	0.78 ± 0.12	0.98 ± 0.14	0.062 ± 0.03
63	23	[illegible]	6.3 ± 0.7	0.75 ± 0.23	1.5 ± 0.3	0.56 ± 0.14	0.56 ± 0.15	LT 0.06
66	25	0-3'	20 ± 2	2.9 ± 0.3	12 ± 2	2.5 ± 0.7	2.5 ± 0.7	LT 0.2
65	25	[illegible]	5.0 ± 0.5	3.4 ± 0.4	2.6 ± 0.3	3.8 ± 0.4	3.7 ± 0.4	0.89 ± 0.04

Table 3
(Page 3 of 3)

Thorium Isotopic and Uranium Isotopic Composition of Soil Samples
pCi/g (dry) ± 2s

Sample No.	Hole No.	Depth (ft)	Th-228	Th-230	Th-232	U-238	U-234	U-235
88	30	0-2'	7.5 ± 0.8	1.3 ± 0.2	3.9 ± 0.4	7.7 ± 0.8	6.9 ± 0.7	0.16 ± 0.04
79	30	[illegible]	25 ± 16	LT 3	9.5 ± 6.9	18 ± 2	19 ± 2	0.26 ± 0.11
81	31	0-1'	61 ± 6	5.4 ± 0.5	12 ± 2	11 ± 2	11 ± 2	0.23 ± 0.15
82	31	1-2.5'	94 ± 46	12 ± 9	95 ± 46	110 ± 40	57 ± 21	9.7 ± 4.3
92	33	0-1'	40 ± 4	1.1 ± 0.2	37 ± 4	29 ± 4	27 ± 4	1.2 ± 0.3
93	33	1-2'	60 ± 7	1.1 ± 0.5	53 ± 6	17 ± 2	17 ± 2	0.7 ± 0.2
98	34	0-1'	32 ± 4	1 ± 0.3	32 ± 4	250 ± 130	44 ± 25	11 ± 7
99	34	1-3'	93 ± 35	LT 5	82 ± 30	7.4 ± 0.8	8.8 ± 1	0.35 ± 0.12
102	35	0-2.5'	58 ± 31	7.7 ± 5.6	38 ± 21	6.8 ± 2.1	6.8 ± 2.1	LT 0.4
107	36	[illegible]	41 ± 3	1.0 ± 0.3	38 ± 4	7 ± 1	8.5 ± 1.4	0.50 ± 0.30
110	37	[illegible]	32 ± 4	1.4 ± 0.3	30 ± 3	7.9 ± 4.7	15 ± 8	LT 1

Table 4

Working Level Measurements in Local Buildings

Location	Date	Observed Working Levels
Car Wash	20 July 1983	0.0047
Chinese Restaurant	25 July 1983	0.0042
Federal Express	26 July 1983	0.0035
Sunoco	28 July 1983	0.0009
Sears (at gate 67)	1 August 1983	0.0019
Gulf	3 August 1983	0.0031
DeSaussure	9 August 1983	0.0031

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Borehole 8	C-11
Borehole 9	C-12
Borehole 10	C-13
Borehole 11	C-14
Borehole 12	C-15
Borehole 13	C-16
Borehole 14	C-17
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NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 525-25L

DATE: START 7/27 FINISH 7/27
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 3.8 feet from ground surface
DEPTH OF HOLE 8 feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 1 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						Grayish red (10 R 4/2) silty sand with fragments of wood and brick.
2			SS-4 SS-11	3-5-72		
3						No recovery. Split spoon blocked by brick fragments.
4			SPT	3-1-2-2		
5						Wet, moderate reddish brown (10 R 4/6) silty sand.
6			SS-5	3-2-2-3		
7						Pale brown (5 YR 5/2) sandy silt, traces of clay.
8			SPT	1-1-2-1		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 550-251

DATE: START 7/27 FINISH 7/27
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 4.0 Ft. from ground surface
DEPTH OF HOLE 8 feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 2 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	RQD %	DESCRIPTION
							Moderate brown (5 YR 4/4) silty sand.
1							
2			SS-1	2-6-5-7			Moderate brown (5 YR 4/4) silty sand.
							Fill consisting of red brick fragments.
							Coal ash and cinders.
3							Red brick fragments in a moderate red (5 R 5/4) sand.
4			SS-2	6-11-35-10			Moderate yellowish brown (10 YR 5/4) sand.
5							
6			SS-3	2-4-7-6			Light brown (5 YR 6/4) sandy silt mottled with medium gray (N_5) clay.
7			SS-6				Light brown (5 YR 6/4) sand, traces of clay, some light gray (N_7) to light brown (5 YR 5/6) stained silty zones.
8			SS-7	2-3-5-4			END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TOD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 525-00 BL
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/27 FINISH 7/27
ELEVATIONS N/A
GROUND SURFACE N/A from ~~ground~~ surface
GROUND WATER 5 feet
DEPTH OF HOLE 6 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 3 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						concrete fragments
						brownish black (5 YR 2/1) clayey soil
1						
2			SS-8	9-11-16-4		
3						Red brick fragments set in a moderate reddish brown (10 R 4/6) sand.
4			SS-9	6-8-3-5		
5						Brownish black (5 YR 2/1) clay
						Moderate brown (5 YR 4/4) sand and clay, scattered quartz pebbles.
6			SS-10	1-6-7-5		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 517-050L

DATE: START 7/27 FINISH 7/27
ELEVATIONS N/A from ~~ground surface~~
GROUND SURFACE N/A
GROUND WATER 5.5 feet
DEPTH OF HOLE 6 feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 4 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						moderate brown (5 YR 3/4) silty soil.
1						red brick fragments.
2			SS-12	2-4-15-10		
3						Red brick fragments set in a matrix of moderate reddish brown (10 R 4/6) gravelly sand.
4			SS-13	8-3-4-4		Red brick fragments set in a matrix of pale reddish brown (10 R 5/4) silty sand.
5			SS-14			Grayish yellow green (5 GY 7/2) to light gray (N_7) silty sand, organic material consisted of root hairs and wood particles.
6			SS-15	9-6-4-5		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 616-5L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/28 FINISH 7/28
ELEVATIONS N/A from ~~ground surface~~
GROUND SURFACE N/A
GROUND WATER 5-6 feet
DEPTH OF HOLE 6 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 5 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE SLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
1						dusky yellowish brown (10 YR 2/2) clayey soil with scattered pale red (10 R 6/2) pebbles. Middle of this zone, concrete material, ranging from white powder to pebbles overlying dark yellowish orange (10 YR 6/6) to light brown (5 YR 5/6) brick fragments.
2			SS-16	4-14-6-10		
						of dark yellowish brown (10YR 2/2) clayey soil.
3						of light gray (N7) to light bluish gray conglomeritic (5B 7/1) concrete fragments and chips.
4			SPT	7-5-11 -6		
5						No recovery. Split spoon blocked by 2" diameter wood chips.
6			SPT	8-10-7 -7		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 500-25L

DATE: START 7/28 FINISH 7/28
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 6 feet from ground surface
DEPTH OF HOLE 7 feet
OVERBURDEN x ROCK
DIP N/A

CONTRACTOR H.F. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 6 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						concrete fragments.
						pale red (5 R 6/2 to 10 R 6/2) sandstone fragments set in a matrix of loose sand and pebbles of the same color. Some scattered white quartz pebbles.
1						
2			SPT	12-17-6-4		
						moderate brown (5 YR 4/4) silty soil with some gray (N_7) coal cinders.
3						
						dusky yellowish brown (10 YR 2/2) silty soil.
4			SS-17	2-3-5-5		
						brownish black (5 YR 2/1) organic rich soil, somewhat gritty, some small pebbles.
						moderate brown (5 YR 4/4) silty sand with traces of clay, scattered dusky yellow brown (10 YR 2/2) stained areas.
			SS-18			
5						
						dusky yellowish brown silty sand.
						medium gray (N_5) to medium light gray (N_6) silty sand, traces of clay.
6			SS-19	2-4-3-2		
			SPT			END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 450-00BL
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/28 FINISH 7/28
ELEVATIONS N/A from ~~ground~~ surface
GROUND SURFACE N/A
GROUND WATER 6 feet
DEPTH OF HOLE 8 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 7 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						Pale red (5 R 6/2) to moderate red (5R 5/4) brick fragments in a moderate red (5 R 5/4) sand matrix.
2			SS-20	9-10-16-19		
						loose pale red (5 R 6/2) gravelly soil.
3						olive gray (5 R 3/2) trap rock fragments, cement and concrete debris, coal cinders and coal ash.
4			SS-21	12-9-8-4		
5						brownish black (5 YR 2/1) stiff clay with some organic material including plant roots and woody chips.
6			SS-22	2-5-11-6		
7						very dusky red (10 R 2/2) to dusky yellow brown (10 YR 2/2) clay with some silt. pale red (5 R 6/2) sand and silt, scattered brick fragments.
8			SPT	1-1-3-5		pale olive (10 Y 6/2) silt and clay. END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0050-050L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A from ground surface
GROUND SURFACE N/A
GROUND WATER 5.5 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 8 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						cement
						a gritty, loose, sandy matix of pale red (5R 6/2) sandstone fragments, concrete, light gray (N7) pebbles.
1						gritty, grayish black (N2) clayey silt mottled with pale reddish brown (1 OR 5/4) to moderate reddish brown (1 OR 4/6) clay and silt.
2			SS-23	10-19-7-9		
3						No recovery, Split spoon blocked
4			SS-24	8-13-7-11		moderate brown (5YR 3/4) to dusky brown (5YR 2/2) silty organic clay, roots and wood chips.
5			SS-25			medium light gray (N6) sand vary to a pale yellowish brown (10 YR 6/2) at depth. Silty and clayey lenses, with moderate yellowish brown (10 YR 5/4) staining
6			SS-26	4-7-12-15		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0081--50L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 9 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						concrete cement
						moderate brown (5 YR 3/4) soil with concrete debris.
1			SS-27			moderate reddish brown (10R 4/6) clay with light brown (5 YR 5/6) sand and pebbles.
2			SS-28	3-1-1-4		light brown (5 YR 5/6) sand with scattered concrete pebbles.
3						dusky brown (5 YR 2/2) to brownish black (5 YR 2/1) silty organic clay, roots & plant remains evident, woody stems.
						dusky yellow brown sand (10YR 2/2).
4			SS-29	2-2-1-4		
5						light olive gray (5Y 5/2) silty sand, trace of clay
6			SPT	7-6-8-8		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-109
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0035-075L

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A from ground surface
GROUND SURFACE N/A
GROUND WATER 4.5 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
SHEET 10 OF 39
DRILLING METHOD Hollow Stem Auger

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						concrete cement
						pale red (5R 6/2) sand and fragments of sandstone, some clay.
			SPT			dark greenish gray (56Y 4/1) clay with a lens of moderate brown (5YR 4/4) sand and pebbles
1						
2			SS-30	9-9-14-12		
3						No recovery, split spoon blocked by wood.
			SPT			
4				10-3-3-2		grayish yellow green (56 Y 7/2) clay with wood fragments. The clay varies in color from moderate yellow brown (10 YR 5/4) to dusky yellow brown (10 YR 2/2).
			SS-31			
5						light olive gray (5 Y 5/2) sand and clay lens.
						At bottom of core (6 foot level) a moderate reddish brown (10R 4/6) light brown (5YR 6/4) silty clay.
6			SS-32	3-8-11-8		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0050--033L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A from ground surface
GROUND WATER 4.5 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 11 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE SLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						concrete cement
						moderate brown (5 YR 3/4) clayey soil.
1						
2			SPT	7-5-4-8		brownish gray (5YR 4/1) silty sand.
3			SS-33			light olive gray (5Y 6/1) to pale yellowish brown (10 YR 6/2) organic clay wood strands & plant roots.
4			SS-34	6-6-4-8		moderate brown (5 YR 3/4) clay, some pebbles. black (N1) gritty, clayey sand.
5						alternating lenses of gray clay (N7) light olive gray (5Y 6/1) at depth. Some traces of moderate reddish orange (10R 6/6) stained sand.
			SPT	7-5-4-7		END OF BORING
6						
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0050-125L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A from ground surface
GROUND WATER 4.5 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 12 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						double layer concrete with 1" of asphalt below.
						coal ash and cinders
1						
2			SPT	7-8-5-7		Loose concrete pebbles, wood chips, glass, rock fragments.
						moderate brown (5YR 3/4) clay with woody strands.
3						
4			SS-35	3-9-2-3		dusky brown (5YR 2/2) clay, pebbles and glass.
5						alternating lenses of light olive gray (5Y 6/1) clay and silty sand, scattered organic remains include plant roots and stems some fragments of grayish red (5R 4/2 pebbles.
6			SPT	6-6-7-10		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0000-066R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A from ~~ground surface~~
GROUND SURFACE N/A
GROUND WATER 5-6
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 13 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						moderate brown (5YR 3/4) soil
1						
2			SPT	3-3-6-4		
						split spoon blocked by a very stiff and gravelly clayey fill, (in trap of spoon) of a very light gray (N8) to white (N9) clay, mottled with a yellow to brown stain.
3						
4			SS-36	5-3-3-4		a light-dark yellow-orange (10 YR 8/6-10YR 6/8) stained silty sand trace of clay. yellowish gray (5Y 7/2) clay and very fine sand.
5						
6			SS-37	4-5-4-4		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -072.230R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A from ~~ground~~ surface
GROUND SURFACE N/A
GROUND WATER 5.5-6 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 14 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						white chalky fill material grades to a very light gray (N8)
						dusky yellow brown (10 YR 2/2) similar white chalky silty clayey fill material.
1			SS-38			light gray (N7) to medium light gray (N6) clay, some plant roots & fibers
2			SS-39	7-4-4-3		
						light gray (N7) clay, traces of blue laminations or impurities.
3						
4			SPT	3-2-2-7		light gray (N7) clayey fill material and more pronounced blue laminations
						dusky brown (5YR 2/2) to dusky yellow brown (10YR 2/2) stiff clay
5						light olive gray (5YR 6/1) clay, some plant roots and woody shreds
6			SPT	2-3-6-13		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -011 200R
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 5.5-6 feet from ~~ground~~ surface
DEPTH OF HOLE 6 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 15 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						6" of moderate brown (5YR 3/4) clayey soil more gravelly & pebbly in last 2" of this layer
1						6" of white to very light gray (N8) chalky clay
2			SS-40	4-11-11-10		dark yellow brown (10 YR 4/2) clayey soil, patches of white, almost powdery grains
3			SS-42			dusky brown (5 YR 2/2) clay with mottled zones of white gritty to powdery granular areas.
4			SS-41	7-8-11-13		dusky brown (5YR 2/2) to brownish black 5YR 2/1 silty clay.
						grayish orange (10 YR 7/4 silty sand.
5			SS-43			stiff clay ranging in color from grayish black (N2) to greenish gray (5G Y 5/1) especially at bottom of core.
6			SPT	10-9-9-13		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 0014-136R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER Not encountered
DEPTH OF HOLE 6 Ft.
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 16 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1			SS-44			moderate brown (5YR 3/4) top soil. of light gray (N_7) to greyish yellow green (5GY 7/2) clay. The top portion is rather gritty and friable. Coal cinders observed.
2				2-3-4-5		
3						dusky yellowish brown clay with clumps of yellowish grey (5Y 7/2 clay)
4			SS-45	4-4-7-8		
5						moderate yellowish brown (10YR 5/4) silty sand, trace of clay and scattered pale red (5R 6/2) pebbles.
6			SPT	10-7-6-7		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

Table 5
(Page 3 of 3)

Comparison of Soil Concentrations and Exposure Rate

Location	Hole #	Ra-226	Ra-228	Th-228	Th-232	U-238	Exposure Rate (micro R/hr)
		[Soil concentrations in pCi/g (dry) ± 2s]					
3-0011200R2-3	15	6.3 ± 1.3	42 ± 5	56 ± 6	41 ± 5	12 ± 2	48
" 3-4	15	3.3 ± 0.6	13 ± 2	20 ± 3	16 ± 3	5.1 ± 0.5	
3-0014136R1.5-4	16	2.1 ± 0.7	8.1 ± 1.8	9.4 ± 1	62 ± 7	3.1 ± 0.7	30
4-0096195L0-3.5	35	8.3 ± 1.4	30 ± 3	58 ± 31	38 ± 21	6.8 ± 2.1	21(3)
1-0616005L0-2	5	3.2 ± 1.1	13 ± 3	32 ± 4	21 ± 3	6.3 ± 1	17
4-0040200L2-4	36	40 ± 4	92 ± 10	41 ± 3	38 ± 4	7 ± 1	15
4-0200250R0-6	23	LT 0.5	LT 1.0	6.3 ± 0.7	1.5 ± 0.3	0.56 ± 0.14	12
4-0165200L0-2	37	24 ± 3	73 ± 8	32 ± 4	30 ± 3	7.9 ± 4.7	11(3)
2-0035075L1-2	10	0.92 ± 0.30	2.0 ± 0.6	5.4 ± 0.6	2.4 ± 0.3	0.78 ± 0.16	12(3)

(1) No samples were taken from 0 to 3 feet. Downhole gamma logs indicated rise in contamination levels after 3 feet. Levels at 0 to 3 feet were, nevertheless contaminated above action levels.

(2) Estimated from contours, actual reading not recorded.

(3) Exposure rate measurements taken over paved area. Hole drilled through paving.

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 278-243R
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 6 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 17 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						top soil
						olive gray (5Y 4/1) clayey soil grading to yellow orange (10 YR 6/6) gritty silt.
1						mottled moderate brown (5 YR 3/4) silty sand and clay, at bottom of this core, a very light gray (N8) to white clay appears.
2			SS-46	3-3-2-2		
			SPT			Light gray (N7) to moderate brown (5YR 4/4) cinder and ash clayey fill, somewhat gritty white to
3						very light grey (N8) stiff clay, mottled with moderate brown (5YR 4/4) clay & misc. fill material such as blacktop, coal ash, & glass
4			SS-47	1-1-1-2		white to very light gray (N8) mixed with a moderate brown (5YR 4/4 clay)
5			SS-48			grayish black (N2) to black (N1) gritty clayey fill material, cinders and coal ash.
6			SPT	8-4-2-6		dusky brown (5YR 2/2) stiff clay, some silt, some plant roots & stems. END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 100-240R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A from ground surface
GROUND WATER 8 Foot
DEPTH OF HOLE 8 Foot
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 18 OF 39

GEOLOGIC PROFILE

DEPTH (FT.)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
						pale yellowish brown (10 YR 5/2) Silty soil, some clay and pebbles.
1						
2			SPT	4-7-5-5		pale yellowish brown (10YR 6/2) silty soil. soil of white to light gray (N7) clayey fill. grayish brown (5YR 3/2) to moderate reddish brown (10R 4/6) fine sand. mottled very light gray (N8) clay of grayish brown (5YR 3/2) clay, top half more mottled.
3						
4			SS-49	3-3-5-4		
			SPT			light gray (N7) clay, darker near bottom, mottled with lens of pinkish gray (5YR 8/1) clay somewhat gritty, some silt.
5						
6			SS-50	4-4-6-3		
						white to very light gray (N8) clay some wood fragments. grayish black (N2) stiff clay, large chips of wood.
7						light gray (N7) clay, plant roots grading to light olive gray (5Y 6/1) to yellowish gray (5Y 7/2) clay.
8			SPT	3-9-16-16		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: W)26-236.5R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A from ground surface
GROUND SURFACE N/A
GROUND WATER 8 Foot
DEPTH OF HOLE 8 Foot
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 19 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) soil
1						moderate brown (5YR 3/4) silty clay, near bottom white to very light gray (N8) clay was observed.
2			SS-53	7-14-10-13		
3						white, clayey fill material mottled with brownish gray (5YR 4/1) silty sand, clay dries to chalky consistency
4			SPT	21-18-16-18		
5						
6			SS-51 SS-52	8-7-4-3		moderate brown (5YR 3/4) silty clay with some white clay near top.
7			SS-54			brownish black (5YR 2/1) stiff clay, some wood fragments & plant roots
						grayish green (10 GY 5/2) to pale olive (10Y 6/2) clay, woodfragments & plant roots.
8			SPT	3-7-12-20		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -030 236R

DATE: START 7/29 FINISH 7/29
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 6 Foot
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 20 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						yellowish gray (5Y 7/2) to dusky yellow (5Y 6/4) silty sand, some rock fragments.
2			SPT	9-27-25-12		grayish brown (5YR 3/2) to moderate brown (5YR 3/4) silty sand.
3						white to very light gray (N8) chalky clay fill, wood strands and plant roots.
4			SS-55	8-7-6-6		
5			SS-56			dusky yellow brown (5YR 2/2) to olive gray (5Y 3/2) clay, some silt, grades into the olive gray (5Y 3/2) clay near bottom, some scattered light brown (5YR 5/6) stained silty areas. grayish green (10 GY 5/2) clay with gradations to a pale olive (10Y 6/2) some plant roots.
6			SPT	4-3-3-3		
7						END OF BORING
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -200 100R
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/1 FINISH 8/1
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 21 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						moderate brown (5YR 3/4) sandy and silty soil, a one inch deep lens of white to very light gray (N8) clay occupies part of this zone. The texture is somewhat chalky, to powdery, forming globules in places.
2			SS-57 SS-58	4-6-7-9		
3						pale brown (5YR 5/2) sandy silt, some clay.
4			SPT	9-5-5-8		pale brown (5YR 5/2) sandy silt, some clay.
						white chalky clay with some pale red (10R 6/2) pebbles
5						pale olive (10Y 6/2) stiff clay traces of silt. Some woody strands and plant roots, some pale red (10R 6/2) stained sand mottles this zone.
6			SPT	5-8-9-10		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0 178-150R

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A
GROUND SURFACE N/A from ~~surface~~ ground
GROUND WATER 7 Feet
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 22 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) silty, clayey soil with pale brown (5 YR 5/2) stained areas.
						white to very light gray clayey fill material, powdery at places, top half is mottled with blacktop fragments & coal cinders, bottom is more homogenous - very light gray clay, less gritty than top half.
1			SS-60			
2			SS-59	2-2-6-8		
3						dusky brown (5YR 2/2) to dusky yellowish brown (10 YR 2/2) clay, some fine silt.
4			SS-61	4-3-4-4		
						dusky brown (5YR 2/2) organic clay, plant roots & wood strands
5						greenish gray (5 GY 6/1) clay, roots and wood pieces, sand at bottom of core.
6			SS-62	4-5-7-7		
7						light brown (5YR 5/4) tight stiff clay, some trace of silt.
8			SPT	5-6-7-9		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0200-250R

DATE: START 8/1 FINISH 8/1
ELEVATIONS N/A from ground surface
GROUND SURFACE N/A
GROUND WATER 4.5 feet
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 23 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
1						grayish brown (5YR 2/2) silty clay soil, some mottled areas of dark yellowish orange (10 YR 5/4) to light brown (5YR 5/6), scattered sandstone pebbles.
2			SPT	2-5-5-5		moderate reddish brown (10R 4/6) to grayish red (10R 4/2) sand, some pebbles.
3						yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) clayey silty sand.
4			SPT	3-7-7-10		light brown (5 YR 5/6) to moderate brown (5YR 4/4) silty sand, trace of clay.
5						Light brown (5 YR 5/6) to moderate brown (5YR 4/4) sand, black mottled area, 1" thick, occurs near top of this zone, consisting of an organic clay.
6			SS-63	14-12-10-15		
7						
8						END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0096-0448

DATE: START 8/1 FINISH 8/1
ELEVATION: N/A
GROUND SURFACE N/A from ~~ground~~ surface
GROUND WATER 7 Feet
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 24 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1			SS-64			olive gray (5Y 4/1) clayey soil to dusky yellowish brown (10 YR 2/2) clay with silt.
2			SPT	6-4-4-6		dusky yellowish brown (10 YR 2/2) clayey silt.
3						brownish black (5 YR 2/1) stiff clay, laminations of light bluish gray (5B 7/1) clay throughout; 1 inch thick near bottom, some silt.
4			SPT	4-6-7-9		
5						dusky yellowish brown (10 YR 2/2) clayey silt, grades into a brownish black (5 YR 2/1) clay and silt, somewhat mottled with moderate brown (5YR 4/4).
6			SPT	7-7-9-8		dusky yellowish brown (10 YR 2/2) stiff clay, near bottom, a 3" lens of pale olive (10Y 6/2) clay occurs.
7						moderate yellow brown (10 YR 5/4) sand, more clayey near bottom of core.
8			SPT	5-8-6-7		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10R
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0200-037R
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A from ~~ground surface~~
GROUND SURFACE N/A
GROUND WATER 6.5 Feet
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 25 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						Loose moderate brown (5 YR 3/4) soil, some angular to subangular pebbles.
1						
2			SS-66	8-9-7-10		moderate brown (5 YR 3/4) silty clay some angular fragments of pale reddish brown (10 R 5/4) sandstone .
3						white chalky clay, light gray (N7) mottled zone near top, more homogenous near bottom.
4			SS-65	10-16-12-12		pale reddish brown (10R 5/4) silty sand.
5						dusky yellow brown (10 YR 2/2) stiff clay. grayish yellow green (5GY 7/2) clay
6			SPT	6-8-8-9		brownish black (5 YR 2/1) organic clay.
7						pale olive (10 Y 6/2) clay, some plant roots.
8			SPT	7-6-9-7		END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0300-050R
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A from ground surface
GROUND SURFACE N/A
GROUND WATER 5 Feet
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 26 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						moderate brown (5 YR 3/4) clayey soil, halfway through this unit, white to very light gray (N8) clayey fill material occurs, light brown (5 YR 6/4) clayey silt.
2			SS-67	2-2-3-4		dusky yellowish brown (10 YR 2/2) stiff organic clay, woody fragments & plant roots.
3						grayish yellow green (5 GY 7/2) silty clay.
4			SPT	3-3-17-18		yellowish gray (5 Y 7/2) clay
5						moderate brown (5 YR 4/4) to moderate yellowish brown (10 YR 5/4) sand.
6			SPT	15-16-16-12		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -550-238R

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 27 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
1						No recovery
2			SPT	6-5-4-7		grayish orange pink sandstone fragments and loose sand. light brown (5YR 5/6) with some clay moderate brown (5YR 4/4) silty sand, some clay, mottled areas of light brown (5 YR 5/6) sand.
3			SS-68			brownish black (5 YR 2/1) organic clay, some silt.
4			SS-69	6-3-2-5		brownish black (5YR 2/1) organic clay. pale olive (10Y 6/2) to greenish gray (5 GY 6/1) clay, plant roots some mottled areas of yellowish orange (10YR 6/6) silty clay.
5						grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6) clay, some silt.
6			SPT	4-12-22-21		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE
SPT STANDARD PENETRATION TEST
SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TOD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0200-100L

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encouuntered
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 28 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT.)	DESCRIPTION
1			SS-70			moderate brown (5YR 4/4) to (5YR 3/4) silty sand, some clay, some plant debris, color varies from light brown (5YR 5/6) to grayish orange (10 YR 7/4) at various depths. black to medium gray (N5) coal cinders. a grayish brown (5YR 3/2) to a dusky brown (5 YR 2/2) silt, some pebbles.
2			SS-71	3-8-7-10		
3						grayish brown (5 YR 3/2) silt and clay. Some moderate brown (5 YR 4/4) sandy areas.
4			SS-72	3-3-5-3		dusky yellowish brown (10 YR 2/2) clay with traces of silt, woody fragments and plant roots.
5						dusky yellow brown (10 YR 2/2) organic clay, trace of silt, woody fragments, plant roots.
6			SPT	3-4-13 13		light gray (N7) clay, some silt, more clayey on top, more silty on bottom, plant roots. END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-6305-10R
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -350-150L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/2 FINISH 8/2
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER Not encountered
DEPTH OF HOLE 6 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 29 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						dark yellowish brown (10 YR 4/2) sandy clayey soil.
						white, powdery to chalky clay, very light gray (N8) to light gray (N7) in places. Near bottom, some fragments of red brick occur.
1			SS-73			
			SS-74			dusky yellowish brown clay with some silt of moderate brown (5R 5/4) color in some places.
						black to grayish black (N2) clay, some silt.
2			SS-75	4-14-18-16		
						black (N1) to grayish black (N2) grades to a grayish yellow green (5GY 7/2) stiff clay
3			SS-76			
4			SS-77	7-15-22		yellowish gray (5Y 7/2) silty clay
						yellowish gray (5Y 7/2) silty sand
5			SS-78			light brown (5 YR 6/4) sand, some quartz pebbles.
						dark yellowish orange (10 YR 6/6) clay.
6			SPT	16-12-7-8		END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -0350-250L
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 9 Feet from ~~ground~~ surface
DEPTH OF HOLE 10 feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 30 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) silty soil
1						white, powdery to chalky clay, scattered coal cinders and ash.
2			SS-88	3-3-3-1		light olive gray (5Y 6/1) clay set in a matrix of white chalky clay. Some coal cinders.
3			SS-79			white chalky clay, yellowish gray (5Y 7/2) clay observed in mottled zones. Pink yellowish orange (10 YR 8/6) silty clay diseminated throughout lower portion of core
						black (N1) coal cinders.
4			SS-80	2-2-2-3		dusky yellowish brown (10YR 2/2) stiff organic clay with plant roots & woody fragments.
						light olive black stiff clay
5			SS-86			light olive gray (5Y 6/1) clay with some silt, grades to a more silty, less clayey unit at bottom of core, plant roots.
6			SS-87	4-6-10-14		
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -126-255L

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 10 Feet from ground surface
DEPTH OF HOLE 10 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 31 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) clayey soil some light brown (5YR 6/4) sandy areas.
1			SS-B1			white to light gray (N7) clay, chalky to powdery, mottled appearance.
2				2-4-3-5		
			SS-B2			white to light gray (N2) clay.
3						grayish black (N2), gritty sand with coal cinders, pebbles, friable, breaks apart easily.
4			SS-B3	2-5-20-11		
5			SS-B4			chalky yellowish brown (10 YR 2/2) clayey silt grades into a grayish yellow green (5GY 7/2) stiff clay, trace of silt, plant roots.
6			SS-B5	3-1-3-6		
7						
			SPT			
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -453-50L

DATE: START 6/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER Not encountered
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 32 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) clayey silty soil some pebbles and rock fragments.
1			SS-89			
						white chalky clay, powdery to gritty.
2			SPT	3-7-9-9		
						white chalky clay, quite mottled in places, from pale blue (5PB 7/2- 5B 6/2) to dusky yellow (5Y 6/4) gritty to powdery, forms clumps, mottled areas near bottom, less mottled near top.
3						
4			SS-90	6-7-7-9		
						yellowish gray (5Y 7/2) to pale yellowish brown (10YR 6/2) clay, some silt.
5			SS-91			
						moderate yellowish brown (10YR 5/4) sand some silt and quartz pebbles.
6			SPT	18-19-14-11		
7						
8						END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -191-205L

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A from ~~ground surface~~
GROUND WATER 4.5 Feet
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 33 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) silty clayey soil of light gray (N7) clay, somewhat mottled, some coal cinders, grades to a white, more homogenous chalky clay
1			SS-92			
2			SS-93	2-3-3-2		white to light gray (N7) chalky clay brownish black (5YR 2/1) stiff organic clay, plant roots. greenish gray (5GY 6/1) silty clay, scattered dusky yellow (5Y 6/4) sand in places.
3			SS-94			
4			SS-95	2-3-5-9		greenish gray (5 GY 6/1) silty clay moderate yellowish brown (10YR 5/4) sand, some layers of silty clay scattered throughout.
5			SS-96			
6			SS-97	9-12-10-11		
7						
8			SPT			END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -052-2501
CONTRACTOR H.P. Drilling
DRILLING METHOD Hollow Stem Auger

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER 6 Feet from ~~ground~~ surface
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A
LOGGED BY J. Cirilli CHECKED BY
SHEET 34 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						moderate brown (5YR 3/4) silty, clay
1			SS-98			light gray (N7) clay, lighter at top, darker at bottom, somewhat mottled appearance, light brown (5YR 5/6) to pale yellowish brown (10 YR 6/2) clay in places.
2				2-2-2-2		white chalky clay, grades into a light gray (N7) clay, gritty to powdery
3			SS-99			greyish black (N7) organic, stiff clay, woody fragments and plant roots occur in this dark layer.
						light olive gray (5Y 6/1) clay, plant roots.
4			SS-100	1-1-2-5		light olive gray (5Y 6/1) clay, plant roots and woody stalks.
5						moderate yellowish brown (10 YR 5/4) sand some quartz pebbles. On the whole rather homogenous.
6			SS-101	5-13-14-12		
7			SPT			
8						END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. G2-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: -096-195L

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 35 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						ashphalt blacktop
1						dusky brown (5YR 2/2) to grayish brown (5YR 3/2) silt and clay, mottled areas of light gray (N7) clay and grayish black (N2) to black (N1) silty clay.
2				1-2-4-5		
3			SS-102			grayish black (N2) clay, loose and brittle, gritty and clumpy.
						olive gray (5Y 4/1) to light olive gray (5Y 6/1) stiff clay, woody fragments, plant roots, grades into a light gray (N7) near bottom
4			SS-104	3-3-4-10		light gray (N7) silty clay
5			SS-103			pale yellowish brown (10 YR 6/2) silty sand, trace of clay
6			SS-105	18-25-24-19		
7						
8			SPT			END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 046-200L

DATE: START 8/3 FINISH 8/3
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling
LOGGED BY J. Cirilli
CHECKED BY
DRILLING METHOD Hollow Stem Auger
SHEET 36 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						asphalt blacktop
						moderate brown (5YR 4/4) silty, clayey soil, color grades to a light brown (5YR 5/6) with depth.
1						
						white to light gray (N2) clay, powdery to chalky, coal ash cinders, quartz pebbles.
						pale olive (10Y 6/2) clay, woody shreds and plant roots.
2			SS-106	1-2-1-1		
						pale olive (10Y 6/2) clay, somewhat mottled.
						light olive gray (5Y 5/2) clay with coal ash cinders and olive gray (5Y 3/2). Some olive brown silt, pebbles, grades into a grayish black (N2) clay at bottom.
3						
4			SS-107	4-7-9-9		grayish black(N2) to olive black(5Y 2/1) stiff organic clay, many woody fragments and plant roots.
						grayish brown (5YR 3/2) clayey silt
						light olive gray (5Y 5/2) to olive gray (5Y 3/2) clayey silt, moderate brown (5YR 4/4) sand and clay.
5			SS-108			pale olive (10Y 6/2) clay and sandy silt, scattered areas of moderate brown (5 YR 4/4) silt and clay.
6			SS-109	6-10-15-20		
7						
8			SPT			END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 165-200L

DATE: START 8/4 FINISH 8/4
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 8 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 37 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						asphalt blacktop
						dusky yellowish brown (10YR 2/2) silt and clay.
1						white to light gray (N7) clay, gritty to powdery, silty in places, scattered coal ash cinders.
2			SS-110	1-1-2-[illegible]		
3						No recovery split spoon blocked by coal ash debris
			SPT			
4				8-7-12-13		dark yellowish brown (10YR 4/2) silty clay and sand, loose moderate brown (5YR 4/4) clay scattered throughout bottom.
						light olive gray (5Y 5/2) sand, trace of clay.
5			SS-111			light brown (5YR 6/4) sand
						moderate yellowish brown (10 YR 5/4) with some moderate red sand (5R 4/6) Sandy in places
6			SPT	16-16-16-19		
7						
8						END OF BORING

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-10B
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: T00-43-L

DATE: START 8/4 FINISH 8/4
ELEVATIONS N/A
GROUND SURACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 7 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 38 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						asphalt blacktop
1						light brown (5YR 5/6) to grayish brown (5YR 3/2) silt and clay, silty on top, clayey on bottom.
						moderate red (5R 5/4) to moderate reddish brown (10R 4/6) silty sand, some clay, red sandstone fragments and gravel.
2			SPT	6-10-31-14		brownish black (5YR 2/1) to grayish black (N2) stiff organic clay.
						olive gray (5Y 2/2) to light olive gray (5Y 6/1) sand, some moderate red (5R 5/4) stained sandy zones.
3						moderate brown (5YR 3/4) silty sand, trace of clay.
4			SPT	20-20-19-19		
5						moderate reddish brown (10R 4/6) silty sand and clay, moderate yellowish brown (10YR 5/4) silty clay lenses in bottom half of core.
6			SS-113	18-17-12-17		
			SPT			
7						Hit shale and sandstone bedrock
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

NUS CORPORATION

TDD NO. 02-8305-108
PROJECT NAME MAYWOOD CHEMICAL
LOCATION Maywood, N.J.
DIAMETER: CASING ID Temporary 4" PVC
ROCK CORE
COORDINATES: 1115-202R

DATE: START 8/4 FINISH 8/4
ELEVATIONS N/A
GROUND SURFACE N/A
GROUND WATER not encountered
DEPTH OF HOLE 7 Feet
OVERBURDEN X ROCK
DIP N/A

CONTRACTOR H.P. Drilling LOGGED BY J. Cirilli CHECKED BY
DRILLING METHOD Hollow Stem Auger SHEET 39 OF 39

GEOLOGIC PROFILE

DEPTH (FT)	ELEV. (FT.)	SYMBOL	SAMPLE TYPE AND No.	SAMPLE BLOWS OR REC.	SAMPLE DEPTH RANGE (FT)	DESCRIPTION
						grayish brown (5YR 3/2) to moderate brown (5YR 3/4) silty, clayey soil.
1						moderate brown (5YR 3/4) to dark yellowish brown (10 YR 4/2) silty, clay, some lighter mottled areas of light brown (5YR 5/6).
						moderate yellowish brown (10 YR 5/4) silty clay.
2			SS-112	4-4-7-8		moderate brown (5YR 3/4) clayey sand dusky brown (5YR 2/2) clay with some silt.
			SS-115			
3						moderate reddish orange (10R 6/6) to moderate reddish brown (10R 4/6) sandstone fragments and loose sand of the same color.
4			SS-116	5-7-19-18		moderate reddish orange (10R 6/6) to moderate reddish brown (10R 4/6) sandstone fragments and loose sand.
5						pale yellowish brown (10 YR 6/2) clayey sand, some quartz pebbles.
6			SPT	11-18-19-22		
						END OF BORING
7						
8						

SOIL AND ROCK TYPE

SAMPLE TYPE

SPT STANDARD PENETRATION TEST

SS SPLIT SPOON SAMPLE

BOREHOLE LOG

APPENDIX D

URANIUM AND THORIUM DECAY SERIES

The contaminated materials on these sites consist of radionuclides of the thorium and uranium decay series. Naturally occurring thorium-232 and uranium-238 were present among the chemical elements which formed the earth. They are still present today because they take a long time to undergo radioactive decay. The half-life is a measure of time required for radioactive decay; in one half-life the amount of radionuclide present will be reduced by half. For uranium-238 this time is 4.5 billion years. As a radionuclide decays, it changes into another nuclide which is called its "daughter". The radionuclide which undergoes the change is called the "parent". As the change occurs, alpha, beta, or gamma radiation may be produced. Tables 6 and 7 show the sequence of changes due to radioactive decay of thorium-232 and uranium-238.

Radioactive contamination may be investigated by measuring the radiation given off during decay or by measuring the activities of parent or daughter nuclides themselves.

Table 5
(Page 2 of 3)

Comparison of Soil Concentrations and Exposure Rate

Location	Hole #	Ra-226	Ra-228	Th-228	Th-232	U-238	Exposure Rate (micro R/hr)
		[Soil concentrations in pCi/g (dry) ± 2s]					
4-0200037R0-3	25	9.1 ± 1.2	33 ± 4	20 ± 2	12 ± 2	2.5 ± 0.7	100
	25	2.9 ± 1.0	3.0 ± 0.3	5.0 ± 0.5	2.6 ± 0.3	3.8 ± 0.4	
3-0100240R3-4	18	26 ± 3	170 ± 20	230 ± 80	190 ± 70	31 ± 6	90(1)
" 4-5	18	47 ± 5	240 ± 30	90 ± 9	32 ± 4	30 ± 6	
4-0200100R0-2	21	14 ± 2	56 ± 6	56 ± 30	34 ± 17	6.2 ± 6.0	80
" mix	21	4.7 ± 1.2	20 ± 3	21 ± 5	14 ± 3	10 ± 6	
1-0517050L2-4	4	5.7 ± 1.0	58 ± 6	53 ± 5	19 ± 2	2.8 ± 0.5	75
2-0050050L0-2	8	80 ± 8	300 ± 30	49 ± 5	39 ± 4	16 ± 2	75
" 2-4	8	28 ± 3	99 ± 10	6.1 ± 0.7	2.3 ± 0.3	1.6 ± 0.3	
" 4-5	8	9.7 ± 1.4	32 ± 4	61 ± 7	51 ± 6	5.2 ± 0.8	
" 5-6	8	LT 0.6	LT 1.0	6.7 ± 0.7	1.6 ± 0.2	2.5 ± 0.6	
3-0030236R3-4	20	13 ± 2	96 ± 10	43 ± 11	37 ± 9	0.75 ± 0.12	70
1-052500BL2-4	3	7.9 ± 1.3	62 ± 7	48 ± 5	27 ± 3	3.4 ± 0.4	50
4-0050250L0-1	34	13 ± 2	65 ± 7	32 ± 4	32 ± 4	250 ± 130	50(2)
" 1-3	34	6.3 ± 1.3	28 ± 4	93 ± 35	82 ± 30	7.4 ± 0.8	
3-0026238.5R4-6	19	25 ± 3	59 ± 6	80 ± 12	60 ± 10	16 ± 5	50
" mix	19	24 ± 3	130 ± 20	80 ± 20	62 ± 17	1.2 ± 0.8	

Table 5
(Page 3 of 3)

Comparison of Soil Concentrations and Exposure Rate

Location	Hole #	Ra-226	Ra-228	Th-228	Th-232	U-238	Exposure Rate (micro R/hr)
		[Soil concentrations in pCi/g (dry) ± 2s]					
3-0011200R2-3	15	6.3 ± 1.3	42 ± 5	56 ± 6	41 ± 5	12 ± 2	48
" 3-4	15	3.3 ± 0.6	13 ± 2	20 ± 3	16 ± 3	5.1 ± 0.5	
3-0014136R1.5-4	16	2.1 ± 0.7	8.1 ± 1.8	9.4 ± 1	62 ± 7	3.1 ± 0.7	30
4-0096195L0-3.5	35	8.3 ± 1.4	30 ± 3	58 ± 31	38 ± 21	6.8 ± 2.1	21(3)
1-0616005L0-2	5	3.2 ± 1.1	13 ± 3	32 ± 4	21 ± 3	6.3 ± 1	17
4-0040200L2-4	36	40 ± 4	92 ± 10	41 ± 3	38 ± 4	7 ± 1	15
4-0200250R0-6	23	LT 0.5	LT 1.0	6.3 ± 0.7	1.5 ± 0.3	0.56 ± 0.14	12
4-0165200L0-2	37	24 ± 3	73 ± 8	32 ± 4	30 ± 3	7.9 ± 4.7	11(3)
2-0035075L1-2	10	0.92 ± 0.30	2.0 ± 0.6	5.4 ± 0.6	2.4 ± 0.3	0.78 ± 0.16	12(3)

(1) No samples were taken from 0 to 3 feet. Downhole gamma logs indicated rise in contamination levels after 3 feet. Levels at 0 to 3 feet were, nevertheless contaminated above action levels.

(2) Estimated from contours, actual reading not recorded.

(3) Exposure rate measurements taken over paved area. Hole drilled through paving.

TABLE 6

THORIUM-232 DECAY SERIES

Parent	Half-Life	Decay Products	Daughter
Thorium-232	14 billion years	alpha	radium-228
Radium-228	6.7 years	beta	actinium-228
Actinium-228	6.1 hours	beta, gamma	thorium-228
Thorium-228	1.9 years	alpha, gamma	radium-224
Radium-224	3.6 days	alpha, gamma	radon-220
Radon-220	55 seconds	alpha, gamma	polonium-216
Polonium-216	0.15 seconds	alpha	lead-212
Lead-212	11 hours	beta, gamma	bismuth-212
Bismuth-212	61 minutes	alpha, beta gamma	polonium-212 (64%) or thallium-208 (36%)
Polonium-212	0.3 millionth of a second	alpha	lead-208
or			
Thallium-208	3.1 minutes	beta, gamma	lead-208
Lead-208	stable	none	none

TABLE 7

URANIUM-238 DECAY SERIES

Parent	Half-Life	Decay Products	Daughter
Uranium-238	4.5 billion years	alpha	thorium-234
Thorium-234	24 days	beta, gamma	protactinium-234
Protactinium-234	1.2 minutes	beta, gamma	uranium-234
Uranium-234	250 thousand years	alpha	thorium-230
Thorium-230	80 thousand years	alpha	radium-226
Radium-226	1,600 years	alpha	radon-222
Radon-222	3.8 days	alpha	polonium-218
Polonium-218[a]	3 minutes	alpha	lead-214
Lead-214[a]	27 minutes	beta, gamma	bismuth-214
Bismuth-214[a]	20 minutes	beta, gamma	polonium-214
Polonium-214[a]	$\frac{2}{10,000}$ second	alpha	lead-210
Lead-210	22 years	beta	bismuth-210
Bismuth-210	5 days	beta	polonium-210
Polonium-210	140 days	alpha	lead-206
Lead-206	stable	none	none

[a]Short-lived radon daughters.

APPENDIX E

REPORTING OF ANALYTICAL RESULTS

In the tables presenting analytical measurements, the calculated value is reported with two standard deviations of the counting error (2S). This value is derived from a statistical analysis of both the sample and background count rates. The precision of the results is influenced by the size of the sample, the background count rate, and the method used to round off the value obtained to reflect the degree of significance of the results. For analytical results obtained from gamma spectral analysis, the precision is also influenced by the composition and concentrations of the radionuclides in the sample, the size of the sample, and the assumptions used in selecting the radionuclides to be quantitatively determined. The two sigma error for the net counting rate is:

$$2S = 2\frac{R_s}{t_s} + \frac{R_b}{t_b}$$

Where:

2S = two standard deviation counting error

R_s = sample counting rate

R_b = background counting rate

t_s = sample counting time

t_b = background counting time

For gamma and alpha spectrometry measurements, the backgrounds are determined by the average count rates in an appropriate number of channels on each side of the peak of interest. For non-spectrometric counting methods, backgrounds are determined by counting blank samples or system backgrounds.

If the measurements on the samples are not statistically significant (i.e., the two sigma count error is equal to or greater than the net measured value), then the radioactivity concentrations in the sample are considered not detected and results are reported as "less than" values.

Results reported as less than ("LT") are below the lower limit of detection (LLD). The LLD is defined as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95 percent probability with only 5 percent probability of falsely concluding that blank observation represents a "real" signal.

For a particular measurement system (that may include radiochemical separation):

- $$LLD = \frac{4.66 \times s_b}{E \times V \times 2.22 \times Y \times \exp(-\lambda \Delta)}$$

Where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume)

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

E is the counting efficiency (as counts per disintegration), this must include an abundance for counting specific gamma or alpha energies not produced for 100 percent of the decays.

V is the sample size (in units of mass or volume)

2.22 is the number of disintegrations per minute per picocurie

Y is the fractional radiochemical yield (when applicable)

λ is the radioactive decay constant for the particular radionuclide

Δt is the elapsed time between sample collection and counting

Table 5
(Page 1 of 3)

Comparison of Soil Concentrations and Exposure Rate

Location	Hole #	Ra-226	Ra-228	Th-228	Th-232	U-238	Exposure Rate (micro R/hr)
		[Soil concentrations in pCi/g (dry) ± 2s]					
1+0525025LO-2	1	17 ± 2	180 ± 20	68 ± 7	30 ± 3	6.5 ± 0.7	180
1+0550025LO-2	2	12 ± 2	160 ± 20	80 ± 8	33 ± 4	7.5 ± 0.8	160
" 2-4	2	68 ± 7	200 ± 20	120 ± 30	93 ± 23	2.0 ± 0.3	
4-0350250LO-2	30	18 ± 2	105 ± 20	7.5 ± 0.8	3.9 ± 0.4	7.7 ± 0.8	150
" 2-3	30	36 ± 5	230 ± 30	25 ± 16	9.5 ± 6.9	18 ± 2	
4-0126255LO-1	31	22 ± 3	91 ± 10	61 ± 6	12 ± 2	11 ± 2	140
" 1-2.5	31	86 ± 9	390 ± 40	94 ± 46	95 ± 46	110 ± 40	
3-0278243RO-2	17	7.3 ± 1.0	35 ± 4	44 ± 8	37 ± 7	7.2 ± 1.4	130
" 3-4	17	50 ± 5	240 ± 30	49 ± 17	4.5 ± 2.1	34 ± 4	
" 4-5	17	5.6 ± 1.0	19 ± 2	10 ± 1	6.3 ± 0.7	2.4 ± 0.6	
3-0072230RO-1	14	LT 1.6	LT 2.0	15 ± 3	4.4 ± 1.3	-	110
4-0178150RO-1	22	5.3 ± 1.5	120 ± 20	130 ± 30	68 ± 7	LT 9	110
" 1-2	22	1.5 ± 0.7	24 ± 3	31 ± 9	24 ± 7	20 ± 10	
" 2-4	22	5.9 ± 1.4	22 ± 3	20 ± 4	12 ± 3	3.9 ± 0.6	
" 4-6	22	0.50 ± 0.18	LT 0.8	2.3 ± 0.3	0.81 ± 0.07	0.78 ± 0.12	
4-0192205LO-1	33	28 ± 3	190 ± 20	40 ± 4	37 ± 4	29 ± 4	110(2)
" 1-2	33	37 ± 5	260 ± 31	60 ± 7	53 ± 6	17 ± 2	

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4-0200100R0-2	21	14 ± 2	56 ± 6	56 ± 30	34 ± 17	6.2 ± 6.0	80
" mix	21	4.7 ± 1.2	20 ± 3	21 ± 5	14 ± 3	10 ± 6	
1-0517050L2-4	4	5.7 ± 1.0	58 ± 6	53 ± 5	19 ± 2	2.8 ± 0.5	75
2-0050050L0-2	8	80 ± 8	300 ± 30	49 ± 5	39 ± 4	16 ± 2	75
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1-0616005L0-2	5	3.2 ± 1.1	13 ± 3	32 ± 4	21 ± 3	6.3 ± 1	17
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4-0165200L0-2	37	24 ± 3	73 ± 8	32 ± 4	30 ± 3	7.9 ± 4.7	11(3)
2-0035075L1-2	10	0.92 ± 0.30	2.0 ± 0.6	5.4 ± 0.6	2.4 ± 0.3	0.78 ± 0.16	12(3)

(1) No samples were taken from 0 to 3 feet. Downhole gamma logs indicated rise in contamination levels after 3 feet. Levels at 0 to 3 feet were, nevertheless contaminated above action levels.

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(3) Exposure rate measurements taken over paved area. Hole drilled through paving.