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Woodward-Clyde Consultants

April 11, 1984
83 C 2236-7

E.I. duPont de Nemours & Co., Inc.
Niagara Plant
P.O. Box 787
Niagara Falls, New York 14302

Attention: Mr. Timothy D. VanDomelen

GEOPHYSICAL INVESTIGATIONS
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

Gentlemen:

We are pleased to present herein our Final Report of Geophysical Investigations conducted for the Niagara Plant site, Niagara Falls, New York. This study was conducted in accordance with your request and our Budget Estimate/Scope of Work letter dated January 9, 1984. It was originally planned to utilize both terrain conductivity and surface resistivity techniques in order to determine the applicability of each in investigating the source and extent of subsurface contamination. Verification of the technique applicabilities would result from test pit excavations and chemical analysis of soil samples. Three of the seven test pits were utilized to install recovery wells for possible future use. The resistivity survey was not performed because frozen ground precluded the installation of the necessary probes.

In summary, it is concluded that the contaminant concentrations in the soils correlate to the locations of prior site process areas. It is also concluded that the use of terrain conductivity to determine the location and extent of subsurface contamination is not applicable for widespread use at the plant site. Finally, based on a comparison of the data obtained from Test Pits TP-1 and TP-2, Monitoring Well 21A and the manmade passageway test pit, it would appear that, because of the relatively low concentration of both C-2 and C-1 compounds at the manmade passageway test pit, the Gill Creek Outfall 006 is not a preferred passageway for contaminant transport.

We sincerely appreciate the opportunity of providing these services to you on this project. If you have any questions, please contact us.

Very truly yours,

WOODWARD-CLYDE CONSULTANTS

Jeffrey C. Evans, P.E.
Project Manager

Arthur H. Dvinoff, Ph.D., P.E.
Associate

JCE/AHD/gmb

Attachment

cc: Mr. Richard J. Gentilucci, DuPont
Mr. Joseph R. Kolmer, Woodward-Clyde Consultants
Mr. Mark N. Gallagher, Woodward-Clyde Consultants
Mr. Vydas Brzygis, Woodward-Clyde Consultants
Mr. Craig R. Calabria, Woodward-Clyde Consultants
Mr. Wayne R. Saunders, Woodward-Clyde Consultants

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NIAGARA PLANT
NIAGARA FALLS, NEW YORK

Submitted to:

E. I. DUPONT DE NEMOURS & CO., INC.

Niagara Falls, New York

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Plymouth Meeting, Pennsylvania

INTRODUCTION

This report describes the geophysical surveys, test pit excavations, soil chemistry analyses, and installation of recovery wells at selected locations within the E.I. duPont de Nemours Niagara Plant in Niagara Falls, New York. Conclusions resulting from the studies described herein are also presented. This report has been completed in conjunction with and as followup to our "Geohydrologic Investigations Report" dated December 23, 1983 and "Manmade Passageways Investigations" dated February 17, 1984.

GEOPHYSICAL SURVEY

The areas selected for investigation by the terrain conductivity geophysical technique are shown on Plate 1. The geophysical survey was completed after horizontal control was established through the use of a survey grid on 10-foot center-to-center control points. The areas studied included:

- Vicinity of Well Cluster 13 - (Area G-1)
- Vicinity of Well Cluster 1 - (Area G-2)
- Vicinity of Well Cluster 15 - (Area G-3)
- Vicinity of Well Cluster 8 - (Area G-4)
- Vicinity of Well Cluster 13 - (Area G-5)
- Vicinity of Well Cluster 16 - (Area G-6)

Additional areas were surveyed without the close horizontal control provided by the establishment of a grid. For these regions, control was established through the use of a continuously operating strip chart recorder with notations to indicate landmarks. These areas included:

- Full Length of DuPont Road
- Full Length of Riverside Ave.
- Chemical Road between Dupont Road & Riverside Ave.
- Vicinity of Buildings 31 and 33.
- Vicinity of Well Cluster 10

These additional areas were geophysically surveyed as an aid to the interpretations presented in this report.

TERRAIN CONDUCTIVITY SURVEY-THEORY AND LIMITATIONS

A Geonics EM31 terrain conductivity meter was used to perform the survey. Terrain conductivity is a geophysical technique that allows relatively rapid acquisition of subsurface conductivity values. The instrument induces an electrical current in the ground by means of a primary magnetic field. The resultant secondary magnetic field is measured and evaluated in terms of conductivity in millimhos per meter. The terrain conductivity is dependent upon the nature of the soil, subsurface porosity, permeability, moisture content, depth to and type of bedrock, concentration of dissolved electrolytes, and the presence of interferences such as electric lines, pipes, buldings, tanks, buried metal and foundations. Thus, the actual magnitude of the conductivity values measured are less important than the trends and anomalies in the measurements,. Therefore, to be meaningful, the survey results must be correlated with subsurface data from test borings or test excavations.

In general, soil would be expected to have a higher conductivity than rock. For example, a saturated clay possesses a higher conductance than massive bedrock and clay saturated with a low conductivity organic liquid could have a lower conductance than uncontaminated clay. These differences in material which affect the conductivity values to a varying degree depend on the site-specific conditions.

Since the conductivity values are of a relative nature, the interpretation is based upon choosing limits within which "low", "high", or "background" values will fall. Once "background" conductivity is chosen, any value greater or less than background can be designated as a "high" or "low" anomaly, respectively. Thus, the interpretation is based on an evaluation of background conductivity values, and the measure of the consistency of those values throughout the area.

TERRAIN CONDUCTIVITY FIELD SURVEY

The results of the conductivity survey, which was performed during the period from January 10 through 13, 1984, are presented on Plates 2 through 7. Delineated

on each plate are the areas interpreted as having low conductivity. These areas could potentially contain the greatest concentrations of organic contaminants. Areas not designated as low conductivity can be interpreted to be either areas of background conductivity with lesser contamination or no contamination, or areas where interference resulted in a high conductivity.

Conditions are present at the Niagara Plant site which affect the terrain conductivity data. The non-homogeneous nature of the overburden at the site (mostly fill which contains sand, clay, bricks, cinders, shot rock, metal, etc.) has an effect on recorded conductivity values, as does the presence of electric lines, overhead and subsurface pipes, railroad tracks and cars, automobiles, trash dumpsters, manholes, and buildings. During the survey, the conductivity meter was frequently off scale due to the presence of such anomalies, and at times the conductivity meter was observed to swing back and forth erratically in response to nearby electric power lines, making interpretation of the conductivity data difficult. These factors were considered in the interpretations presented in this report.

At the Niagara Plant site, background values were affected by the conductivity of the overburden plus the conductivity of the bedrock. These, in turn, were affected by soil moisture, porosity, and the other factors discussed in the previous section. The EM31 conductivity meter configuration used in this survey, with a maximum exploration depth of 20 feet (vertical dipole), yields the peak response of the instrument coming from materials at a depth below the ground surface of approximately 40 percent of the coil spacing. Therefore, at a coil spacing of about 12 feet, the peak response of the EM31 is at a depth of approximately 5 feet. The materials above this depth make a small contribution to the total conductance value. The materials below 5 feet depth to a depth of about 20 feet constitute the majority of the conductance value with the response decreasing monotonically.

The stratigraphic sections shown on Plate 8 indicate that bedrock is at an average depth of approximately 10 feet at the plant site areas selected for geophysical investigations. Calculations indicate that approximately 50 percent of the response of the EM31 would come from the overburden, with the remaining response coming from the underlying bedrock. Therefore, the terrain conductivity survey interpretation depends

upon the nature of both the soil and the bedrock at the site. For the interpretations presented herein, anomalies were assumed to result from changes in the terrain conductivity in the overburden. Conductivity of the bedrock was assumed to be constant over each of the survey areas.

Since approximately 50 percent of the conductivity value results from the contribution of the underlying bedrock, additional data on the conductivity properties of the bedrock would enhance the reliability of the interpretations. This data was to be obtained by the resistivity survey, which would have provided detailed information relating to vertical changes in the electrical properties of the subsurface. However, the resistivity survey could not be conducted because of frozen ground conditions.

TEST PIT EXCAVATIONS

The subsurface conditions at selected areas were investigated by means of seven test pits, located as shown on Plate 1, and also on Plates 2 through 4. These test pits were excavated to evaluate physical and chemical properties of the materials encountered and for correlation with the terrain conductivity survey. The specific test pit locations were chosen in order to provide a comparative analysis between areas of higher and lower conductivity. Due to the organic nature of the contaminants, the concentration of contaminants would be expected to be inversely proportional to the terrain conductivity. Thus, areas of lower conductivity would be expected to contain higher concentrations of organics than areas of higher conductivity. Field observations of the excavated material and readings from an organic vapor analyzer instrument were utilized to determine whether or not a recovery well was to be installed at a given test pit location. The excavation and backfill methods, and the materials encountered, are described in the following sections.

EXCAVATION PROCEDURES

The test pits were excavated by O.H. Materials Co. of Findlay, Ohio, using a Caterpillar 215 backhoe. At Test Pit Locations TP-5 and TP-6, a Dynahoe was used to begin the excavations by breaking through the surficial material. A daily work permit was obtained by the contractor prior to commencement of work each day.

The excavations were advanced to the top of bedrock as determined by backhoe bucket refusal. All excavated material not retained for chemical analysis was placed in water-tight dumpsters (luggers) at the the time of excavation and subsequently hauled for disposal to Cecos Landfill in Niagara Falls. The water in the test pits was not pumped. Personnel did not enter the excavation except for sampling the soil at a depth of 1 foot. A log of each test pit was prepared in the field at the time of the excavation by Woodward-Clyde Consultants.

Clay was used to backfill the excavations where a recovery well was not installed (Test Pits TP-2, TP-4, TP-6 and TP-7). At Test Pit TP-6, crushed stone was used for approximately the top foot of the backfill material. The backfill material was placed using the backhoe bucket without compaction, except for the upper layer of clay which received nominal compaction. Backfill at recovery well locations is described in a subsequent section.

MATERIALS ENCOUNTERED

The subsurface conditions and materials encountered in the test pits are similar to those descibed in Woodward-Clyde Consultants' report entitled "Geohydrologic Investigations, Niagara Plant, Niagara Falls, New York," dated December 23, 1983. The materials encountered during this study consisted of fill materials and natural clay. A brief description of these materials is presented below. For additional detail, the test pit logs are contained in Appendix A.

OVERBURDEN: Fill material consisting of shot rock, brick, and cinders, was encountered in all seven test pits. A natural material of mottled gray clayey silt to silty sandy clay with organic matter was encountered just above bedrock at Test Pits TP-1 and TP-2. The depth of the overburden in the test pits ranged from 7.5 to 11.5 feet and averaged 9.4 feet. The thickness of the overburden encountered in Test Pits TP-1, TP-2, TP-5, TP-6 and TP-7 was within 0.5 feet of that estimated on the "Isopach Map of Fill/Overburden", from the December 23, 1983 report. The thickness at Test Pits TP-3 and TP-4 was within about two feet of the estimated thickness.

GROUNDWATER: Groundwater was encountered in all of the test pits at depths ranging from 3.5 to 6.3 feet and averaging 5.0 feet. A summary of groundwater

depths is presented in Table 1. There was no attempt to dewater any of the excavated test pits.

AIR MONITORING: The air quality at each excavation was monitored by Woodward-Clyde Consultants using a Century 128 Organic Vapor Analyzer (OVA). Respirators were required at Test Pits TP-1, TP-2, TP-4, TP-5 and TP-6 where organic vapors exceeded 1 ppm above background levels. Rain on February 3 hampered use of the OVA to monitor air quality at Test Pit TP-2, thus respirators were used. On that date, DuPont personnel using an MSA tube registered 5 ppm downwind of the excavation. The OVA readings are presented on the test pit logs.

SOIL SAMPLING AND ANALYSIS

At each test pit, soil samples were obtained for selected chemical parameter analyses. O.H. Materials Co., collected and retained all soil samples for chemical analysis.

The soil samples generally were collected at intervals of 3 feet, beginning at 1 foot below ground surface. Usually the 1 foot sample was taken from the test pit by hand excavating. The subsequent samples were taken from the backhoe bucket. A sample of the material just above bedrock was also collected. All soil samples were placed in VOA vials. Table 2 presents a list of soil samples collected by O.H. Materials, Co., during this investigation.

It should be noted that the soil samples collected were grab samples. Because the test pits were not dewatered once the groundwater table was encountered, visibility was impaired from the groundwater encounter depth to completion. Thus, it was difficult to determine the amount of wall sloughing, and it is likely that some mixing of material from different depths occurred.

In conjunction with each VOA vial sample collected, a mason jar sample was also collected in order to do a headspace analysis using the OVA. Approximately 2 to 3 minutes was allowed to elapse before the headspace analysis was performed. The organic vapor concentration was recorded as parts per million and is included on the test

pit logs. Later each day, gas chromatographs were run on the same samples, again using the OVA. This information was used to quantify the number of compounds present. Elution times ranged from 60 seconds to 30 minutes. The majority of the gas chromatographs were run for 20 to 30 minutes. The gas chromatograph data were given to DuPont for use in selecting samples to be analyzed.

The soil samples collected were tested for seven chemical parameters by O.H. Materials Co. The results of this testing are summarized in Table 2. The detailed report by O.H. Materials Co. is included as Appendix B.

RECOVERY WELL INSTALLATIONS

Recovery wells were installed by O.H. Materials Co. in Test Pits TP-1, TP-3 and TP-5. The recovery wells consisted of 30-inch I.D. reinforced concrete pipes with each section of pipe 7.5 feet in length. Before placement in the test pits, four semi-circular openings roughly at 90 degrees from each other were broken out from the bottom lip of each pipe with a sledgehammer. The breaks were approximately one foot in length and 8 inches in height.

Prior to placement of the reinforced concrete pipes in the test pit, an approximate six-inch layer of clay was placed on top of bedrock. A four to six-inch layer of #4 crushed stone (passing 5-inch and retained on 4-inch sieve) was placed on top of the clay. The pipe was then placed in the test pit. The remainder of the test pit around the collector was backfilled, in ascending order, with approximately four feet of #4 crushed stone (Recovery Well No. 3 had approximately six feet of #4 stone), one to two feet of #1 crushed stone, and then clay to the surface. The top foot of backfill at Recovery Well No. 5 consisted of #4 stone. It is noted that the test pits were not dewatered during the placement of these materials. A schematic diagram of each recovery well is included as Appendix C.

DATA ANALYSES

The following discussion addresses each of the test pit locations with respect to the contaminants encountered and their relationship to previous plant activi-

ties. As a basis for comparison, the analytical results from the test pit sampling, manmade passageway bedding material sampling, (WCC Report dated February 17, 1984) and the October 1983 groundwater sampling (WCC Report dated December 23, 1983) of selected "A" wells were plotted on a base map that shows the locations of historical processes and events. The analytical results are presented in terms of total C-2 compound concentrations and total C-1 compound concentrations, and are shown superimposed on this base map on Plates 9 and 10, respectively. The C-2 compounds are organic compounds that contain two carbon atoms in the molecular structure. They include tetrachloroethylene, trans-1,2-dichloroethylene, trichloroethylene, vinyl chloride and 1,1,2,2-tetrachloroethane. The C-1 compounds contain one carbon atom and include chloroform and methylene chloride (Dichloromethane).

TEST PITS TP-1 AND TP-2

Test Pits TP-1 and TP-2 were located north of DuPont Road and between Gill Creek and the Building 82, 83, 86 complex. The results of the analyses for C-2 compounds (Plate 9) indicate relatively high total concentrations at each level (depth) of sampling. However, the concentrations of C-1 compounds (Plate 10) were below detection limits. The analytical results may be considered to reflect the previous C-2 solvent process operations that occurred at the Building 82, 83, 86 complex, including the tank storage area.

Based on field observations including a "black sheen" or "black slick" on the water in each of the pits, the presence of a nonaqueous phase liquid would appear to be indicated. The presence of a nonaqueous phase liquid would appear to be consistent with the total C-2 concentration values. In addition, analyses of duplicate samples from Test Pit TP-1 at the seven-foot depth resulted in total Halogenated Volatile concentrations (of the compounds shown in Table 2) of 85,115 ppm and 4,062 ppm. Such differences in analytical results would be expected for samples containing nonaqueous phase liquid. Non-aqueous phase liquid has also been observed, during previous sampling operations, at Monitoring Well 21A. It was postulated that the source may have been the Building 82, 83, 86 complex. The results of the test pit analyses appear to be consistent with this concept.

Previous investigations of potential contaminant transport along manmade passageways indicated that the data for the Gill Creek Outfall 006, along DuPont Road

just west of Gill Creek, were inconclusive with respect to the presence of a preferred pathway of migration along this passageway. Based on a comparison of the data obtained from Test Pits TP-1 and TP-2, Monitoring Well 21A and the manmade passageway test pit, it would appear that, because of the relatively low concentration of both C-2 and C-1 compounds at the manmade passageway test pit, the Gill Creek Outfall 006 is not a preferred passageway for contaminant transport.

The results of the EM31 terrain conductivity survey are shown on Plate 2 with the location of Test Pits TP-1 and TP-2 in the low conductivity and background conductivity areas, respectively. On Plate 8, the sectional views of each test pit is shown with: (1) the total concentration of halogenated volatile compounds (HVC) analyzed in ppm; (2) the contribution of two foot intervals to the conductivity; (3) a generalized soil profile; and (4) contribution of the stratigraphic material to the conductivity. It is noted that Test Pit TP-1 had the highest concentration of HVC of any of the test pits excavated. Test Pit TP-2 had a maximum HVC of about 2,700 ppm at 7 feet. Test Pit TP-1 represented an area of low conductivity, while Test Pit TP-2 represented an area of high conductivity.

The fill materials in Test Pit TP-1 were generally granular with a clayey matrix from 4 to 7 feet, then sand and gravel with a noticeable amount of vegetative matter from 7 to 9 feet. Test Pit TP-2 encountered a fill consisting of granular material to about 7 feet, with a noticeable amount of vegetative matter from 7 to 7.5 feet. Based upon these data the terrain conductivity does not appear to correlate with either the overburden material type or the overburden soil chemistry.

TEST PITS TP-3 AND TP-4

Test Pits TP-3 and TP-4 were located in the vicinity of the former B-107 Landfill. The results of the analyses for C-2 compounds (Plate 9) indicate apparently higher concentrations at Test Pit TP-4 than Test Pit TP-3. The analyses for C-1 compounds (Plate 10) indicate that higher concentrations of C-1 compounds were reported only for the deeper samples (11 feet at Test Pit TP-3 and 7, 10 and 11.5 feet at Test Pit TP-4), with an apparent trend of increasing concentrations with depth.

Nonaqueous phase liquid has been observed at nearby Monitoring Well 1A during previous sampling operations. The presence of nonaqueous phase liquid at Test Pit TP-4 also appears to be indicated at a depth of 11.5 feet on the basis of field observations of "black liquid globules" on the backhoe bucket. In addition, the analytical results indicate the highest apparent concentrations of C-2 compounds at this depth.

The results of the analyses may be indicative of residual concentrations of contaminants associated with the former B-107 Landfill. However, because the C-1 compounds were reported to have been detected only at depth, a migration of contaminants from the north (see Plates 9 and 10, Monitoring Well 13A) may also be contributing to the observed contamination in this area.

The results of the EM31 terrain conductivity survey in the vicinity of Test Pits TP-3 and TP-4 are depicted on Plate 3. As shown, areas of low conductivity are separated by a zone of higher conductivity. Test Pit TP-4, located in the high conductivity area, encountered sandy clay/clayey sand in the overburden material and had OVA® readings increasing to 850 ppm with depth. Test Pit TP-3, located in the low conductivity area, encountered shotrock, sand and gravel in the overburden material and had OVA readings generally less than 10 ppm except at the bedrock interface where a value of 850 ppm was recorded. The total HVC concentration for Test Pit TP-4 was considerably greater than that for Test Pit TP-3. Thus, the results of the geophysical survey did not correlate to the test pit chemistry. There appears, however, to be a correlation between the conductivity survey and the test pit soils. The clayey soils were encountered in areas of high conductivity, whereas the shot rock soils were encountered in areas of low conductivity, as would be expected.

The results of the geophysical survey were also compared with maps previously prepared by DuPont.[1] The referenced report included details of a testing program that was performed at the B-107 landfill area. As part of that study, a map was prepared indicating concentrations of total chlorinated organics in soils at the site. Areas containing a total chlorinated organic concentration greater than 5,000 ppm were reportedly excavated to bedrock. These areas were then backfilled with virgin clayey

(1) "Cleanup of Interagency Task Force Priority I and II Disposal Sites, Building 107 Area, Final Report" written by W.J. Kilgore, Jan. 26, 1981.

materials from an off-site source and "clean" stockpile materials from the west bank of Gill Creek. Fill materials from Gill Creek were tested prior to selection as a "clean" material. Areas containing a total chlorinated organic concentration greater than 500 ppm were excavated to a depth of 6 feet in clay. It is not clear what materials were used as backfill in these areas. The shape of the excavation to bedrock, as shown on a map entitled, "Plan View as Excavated and Backfilled" included in the cleanup report, does not correlate with the results of the terrain conductivity survey shown on Plate 3.

TEST PITS TP-5, TP-6 AND TP-7

Test Pits TP-5, TP-6, and TP-7 were located in the immediate vicinity of the B-64 complex, which included major C-1 compound processes. Test Pits TP-5 and TP-6 were located in the northwestern portion of the complex, south of Adams Avenue; Test Pit TP-7 was located in the south-central portion of the complex, north of DuPont Road. The results of the analyses for C-1 compounds (Plate 10) appear to reflect an impact of the former process area, and may be considered to be consistent with the analytical results at Monitoring Well 15A, as exemplified by the results from the October 1983 sampling. The highest apparent concentrations would appear to be expected at Test Pit TP-5, based upon the results of the October 1983 sampling.

The analytical results also indicate relatively high C-2 compound concentrations, particularly at Test Pit TP-5 (Plate 9). The highest apparent concentration is indicated at the 1-foot depth at Test Pit TP-5, with an apparent trend of decreasing concentrations with depth. This trend suggests a surficial source of C-2 compounds.

Data from Test Pits TP-5, TP-6, and TP-7 excavated in the vicinity of Well Cluster 15 were compared with the results of the EM31 terrain conductivity survey, shown on Plate 4 for this area. Test Pits TP-5 and TP-7 were excavated in areas of low conductivity and Test Pit TP-6 was excavated in the background conductivity area. On

Plate 8 the test pits are each shown with a generalized soil profile, the total HVC concentration (in ppm) and the contribution of the various layers to the conductivity. Test Pit TP-5 was found to have the highest concentration of HVC while TP-6 was found to have the lowest. The OVA readings for the test pits were generally less than 300 ppm. At a depth of 7 feet, an OVA reading of 1,000 ppm generally corresponds to an HVC concentration of 1,121 ppm. Thus, the terrain conductivity appears to roughly correlate to the concentrations of volatile organics for this survey area.

SUMMARY AND CONCLUSIONS

A terrain conductivity survey was conducted at selected areas of the plant site in order to investigate the applicability of geophysics in the definition of contaminant distribution and migration. Verification test pit excavations with chemical analyses of soil samples were then performed. Three test pits were then selected for recovery well installation.

It is concluded that the contaminant concentrations in the soil samples correlate to the locations of prior site process areas. This is consistent with a similar conclusion presented in the Site Assessment Report dated December 23, 1983.

It is concluded that the utilization of terrain conductivity to determine the location and extent of subsurface contamination is not applicable for widespread use at the Niagara Plant site. It is believed that the use of a resistivity survey in conjunction with the terrain conductivity survey would likely improve the reliability of the geophysical data interpretations, but probably not significantly. Further investigations with these geophysical techniques is not recommended at this time.

It is concluded that further testing using the recovery wells is not required at this time. Recommendations for further utilization of these recovery wells are pending the outcome of the Phase II Remedial Technologies study, which is in progress by Woodward-Clyde Consultants.

LIMITATIONS

The findings and conclusions presented in this report are based upon the interpretations developed from the available geologic, subsurface, and groundwater chemistry data. These findings and conclusions are subject to confirmation and/or revision as additional information becomes available. Factors which influence the terrain conductivity have been discussed in this report and local anamolies should be expected.

TABLE 1

TEST PIT SAMPLING SUMMARY

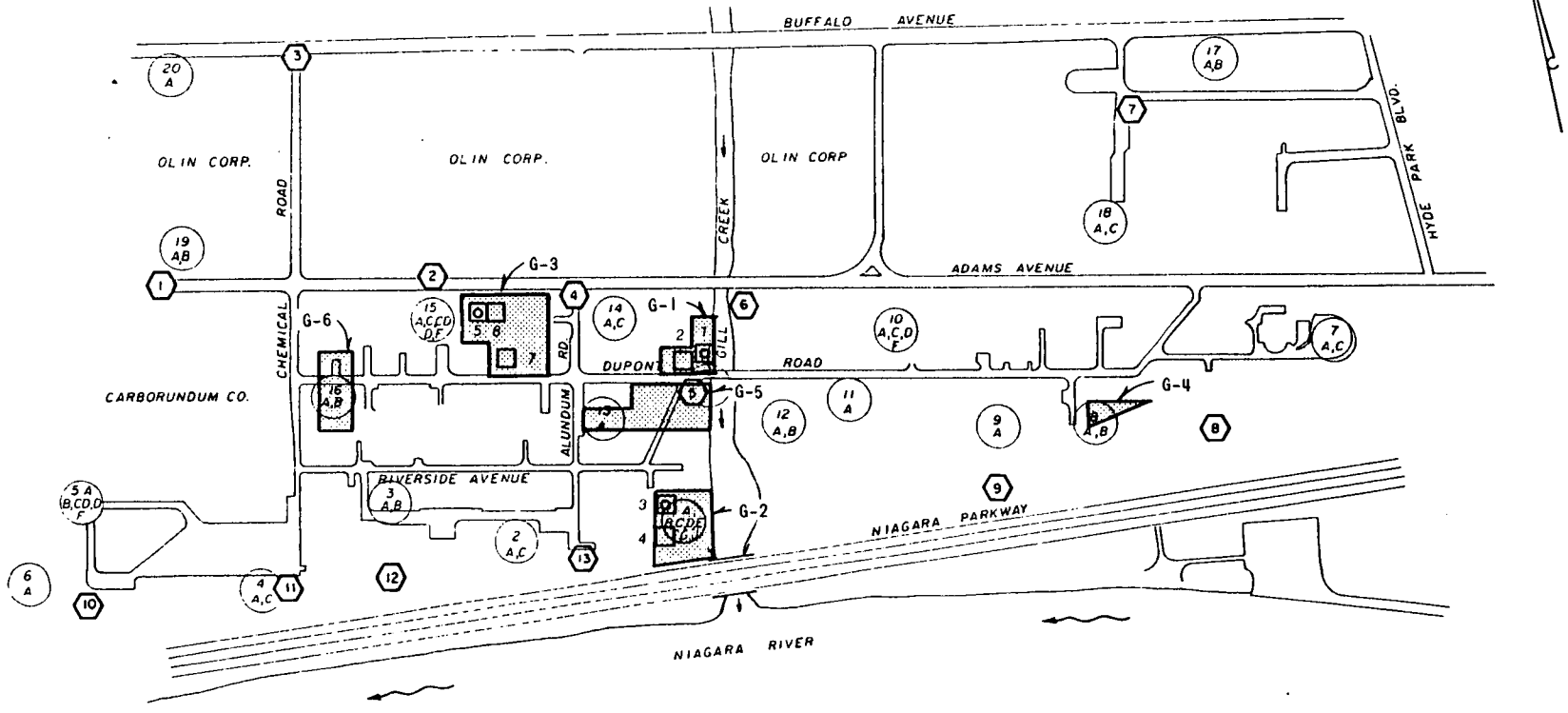
DUPONT NIAGARA PLANT

VOA VIAL SAMPLES COLLECTED BY OHM

Test Pit	Depth (Feet)	Date	Water Depth (Feet)
TP-1	1	2/2	5.2
	4	2/2	
	7	2/2	
	9.5	2/2	
*(2) water samples		2/2	
TP-2	1	2/2	5.5
	4	2/2	
	7	2/2	
	8.5	2/3	
*(2) water samples			
TP-3	1	1/31	4.8
	4	1/31	
	7	1/31	
	**9.6	2/1	
	11	2/1	
TP-4	1	2/1	6.3
	4	2/1	
	7	2/1	
	10	2/1	
	11.5	2/1	
(2) water samples			
TP-5	1	2/7	3.5
	4	2/7	
	7	2/7	
	8	2/7	
TP-6	1	2/7	4.0
	4	2/7	
	7	2/7	
	7.5	2/7	
TP-7	1	2/6	6.0
	4	2/6	
	7	2/6	
	9.5	2/6	

* Water samples collected from bucket @ final scoop.
** O.H. Materials Co. (OHM) logged sample as 9'.

Plates



LEGEND:

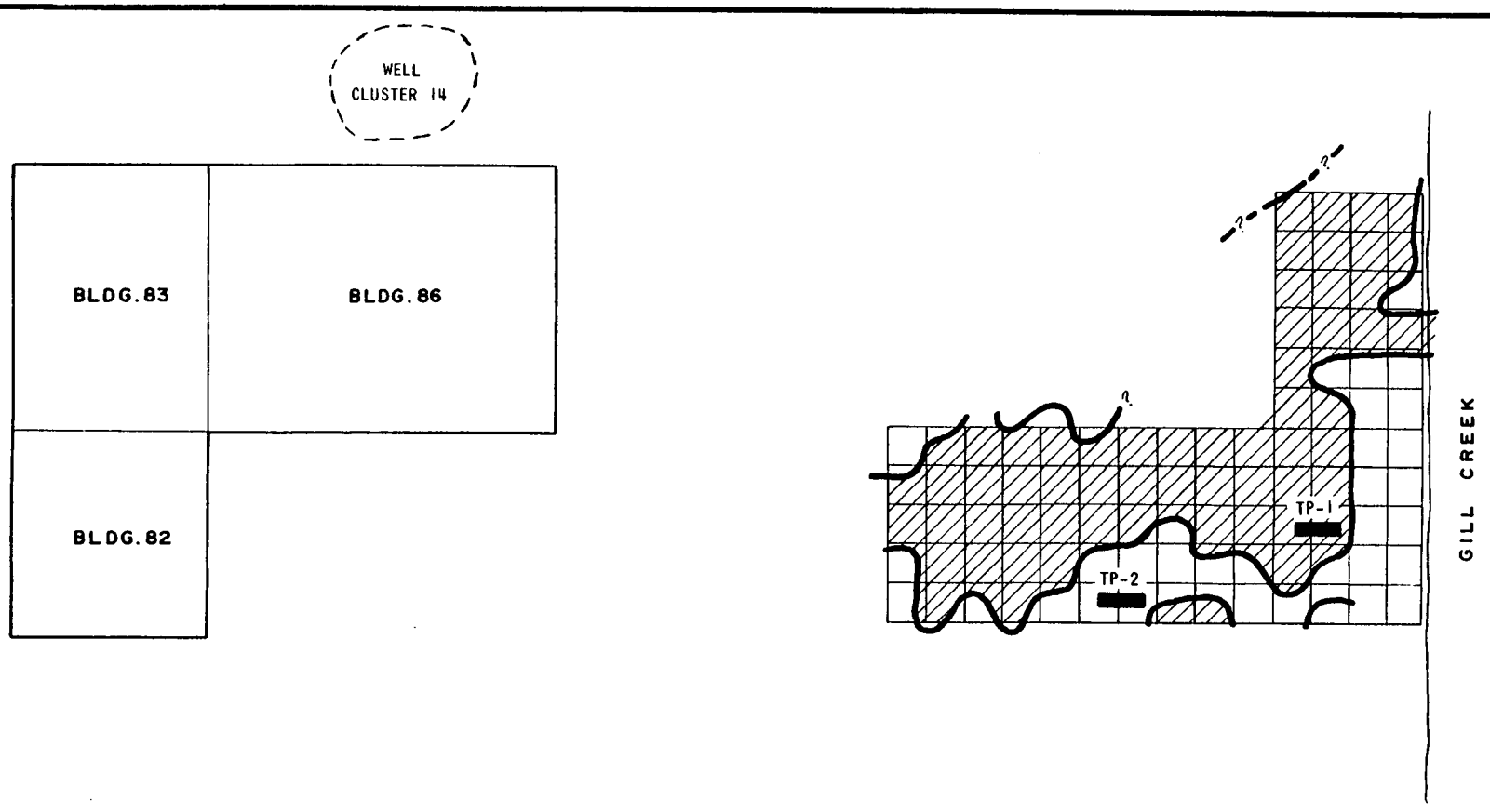
- 17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- (1) — TEST PIT / UTILITY WELL LOCATION
- TEST PIT LOCATION
- TEST PIT/RECOVERY WELL LOCATION
- GEOPHYSICAL SURVEY LOCATION

LOCATION PLAN
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE is FEET 0 300	DATE: 2/9/84
CHECKED: J.C.E.		JOB: 83C2236

PLATE 1



LEGEND:

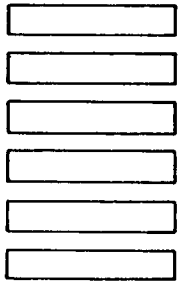
- AREA OF LOW CONDUCTIVITY
- ? BOUNDARY AREA QUESTIONABLE
- TEST PIT LOCATION

AREA G-1
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
E. I. DUPONT DE NEMOURS
NIAGARA PLANT SITE

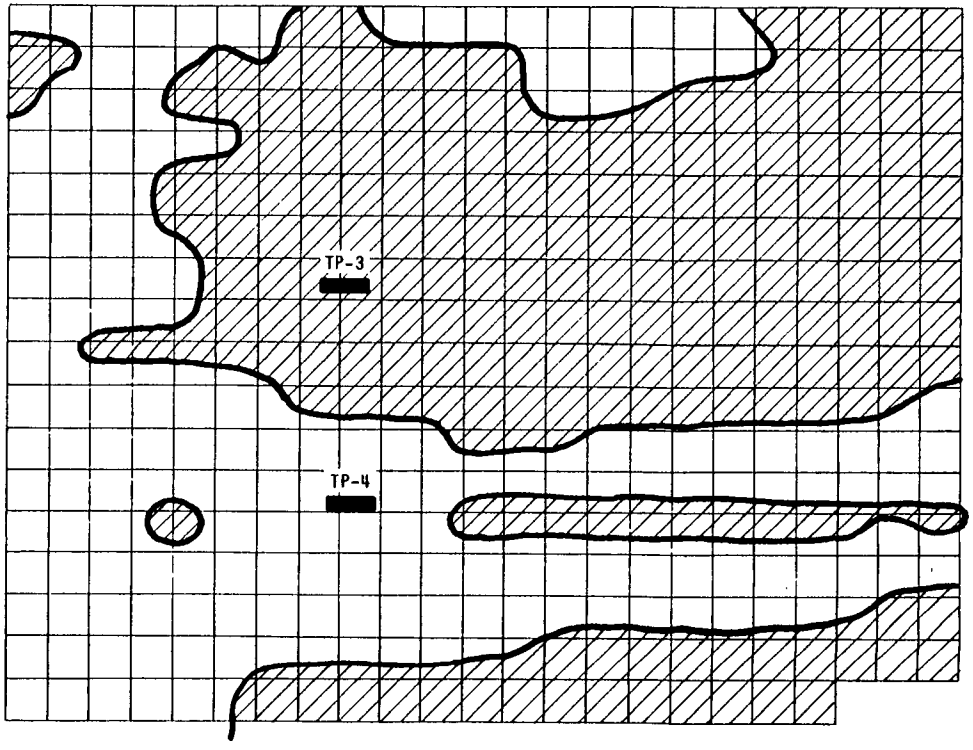
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T. P.	SCALE in FEET 0 30	DATE: 1/20/84
CHECKED : W.S.		JOB : 82C2236-7

PLATE 2



107 TANK FARM



GILL CREEK

LEGEND:

AREA OF LOW CONDUCTIVITY

TEST PIT LOCATION

AREA G-2
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
E.I.DUPONT DE NEMOURS
NIAGARA PLANT SITE

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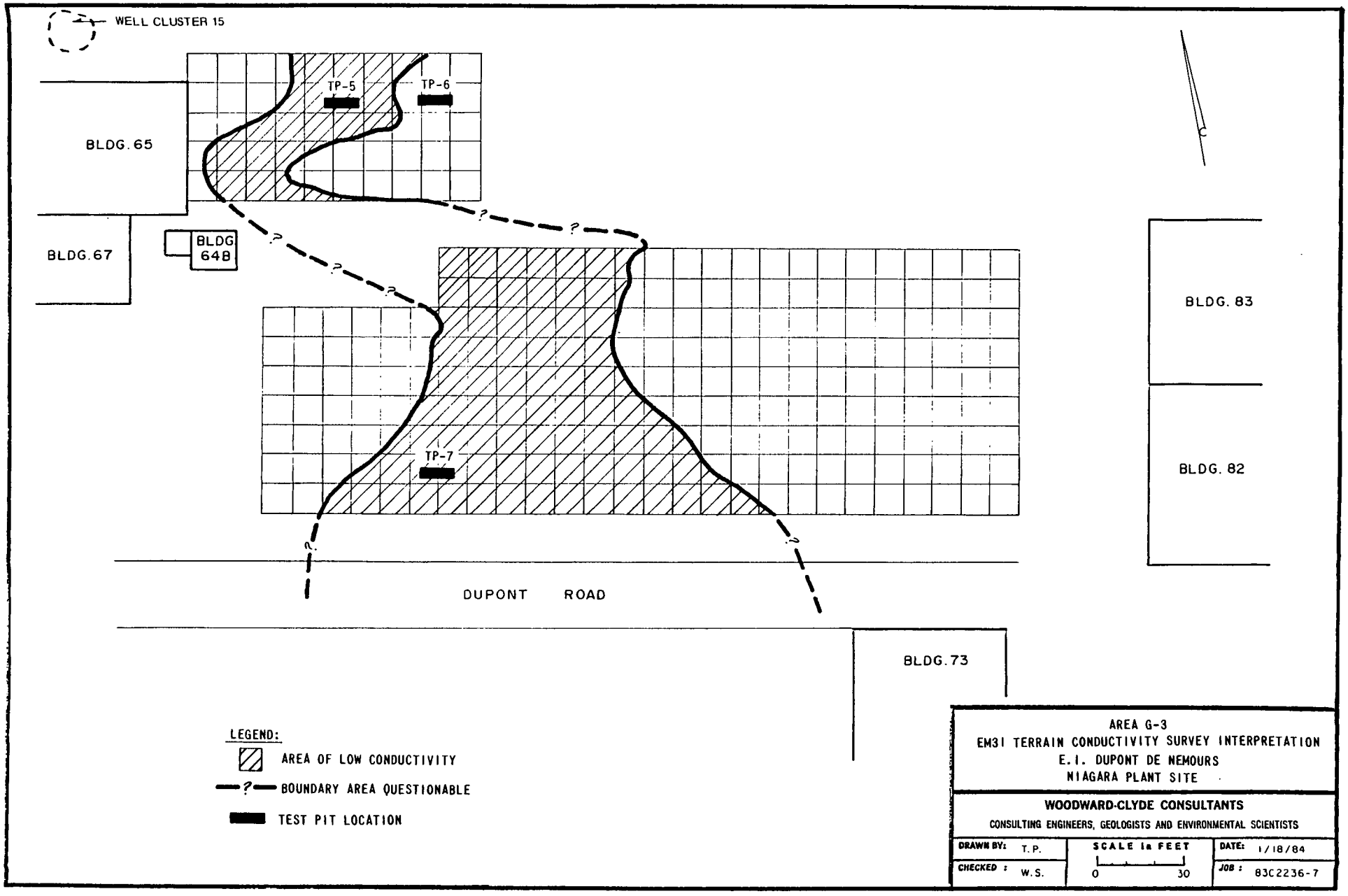
DRAWN BY: T.P.	SCALE in FEET 0 30	DATE: 1/20/84
CHECKED : W.S.		JOB : 82C2236-7

PLATE 3



AREA G-3
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
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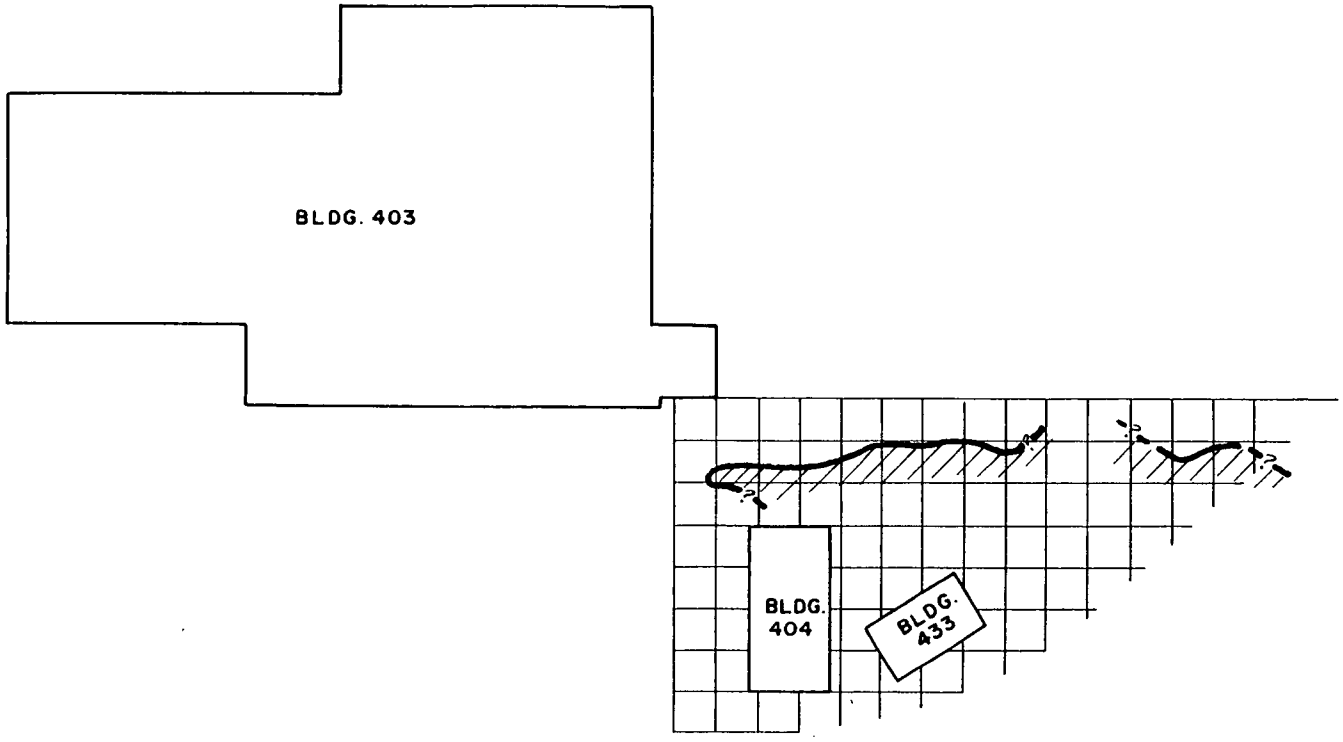
DRAWN BY: T.P.	SCALE in FEET 0 30	DATE: 1/18/84
CHECKED: W.S.		JOB: 83C2236-7

PLATE 4



LEGEND:

AREA OF LOW CONDUCTIVITY

—?— BOUNDARY AREA QUESTIONABLE

AREA G-4
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
E.I.DUPONT DE NEMOURS
NIAGARA PLANT SITE

WOODWARD-CLYDE CONSULTANTS

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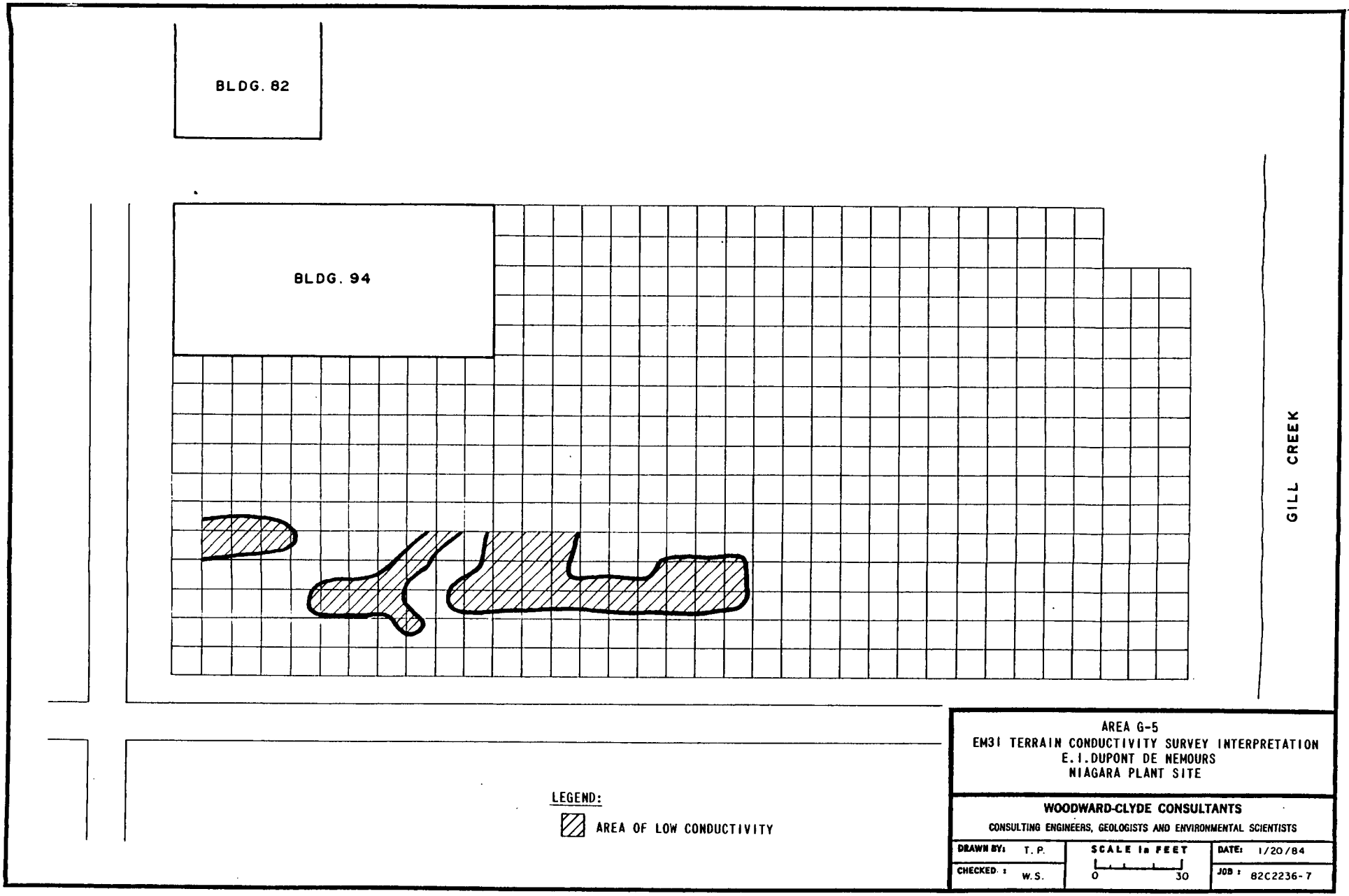
CHECKED : W.S.		JOB : 82C2236-7

PLATE 5

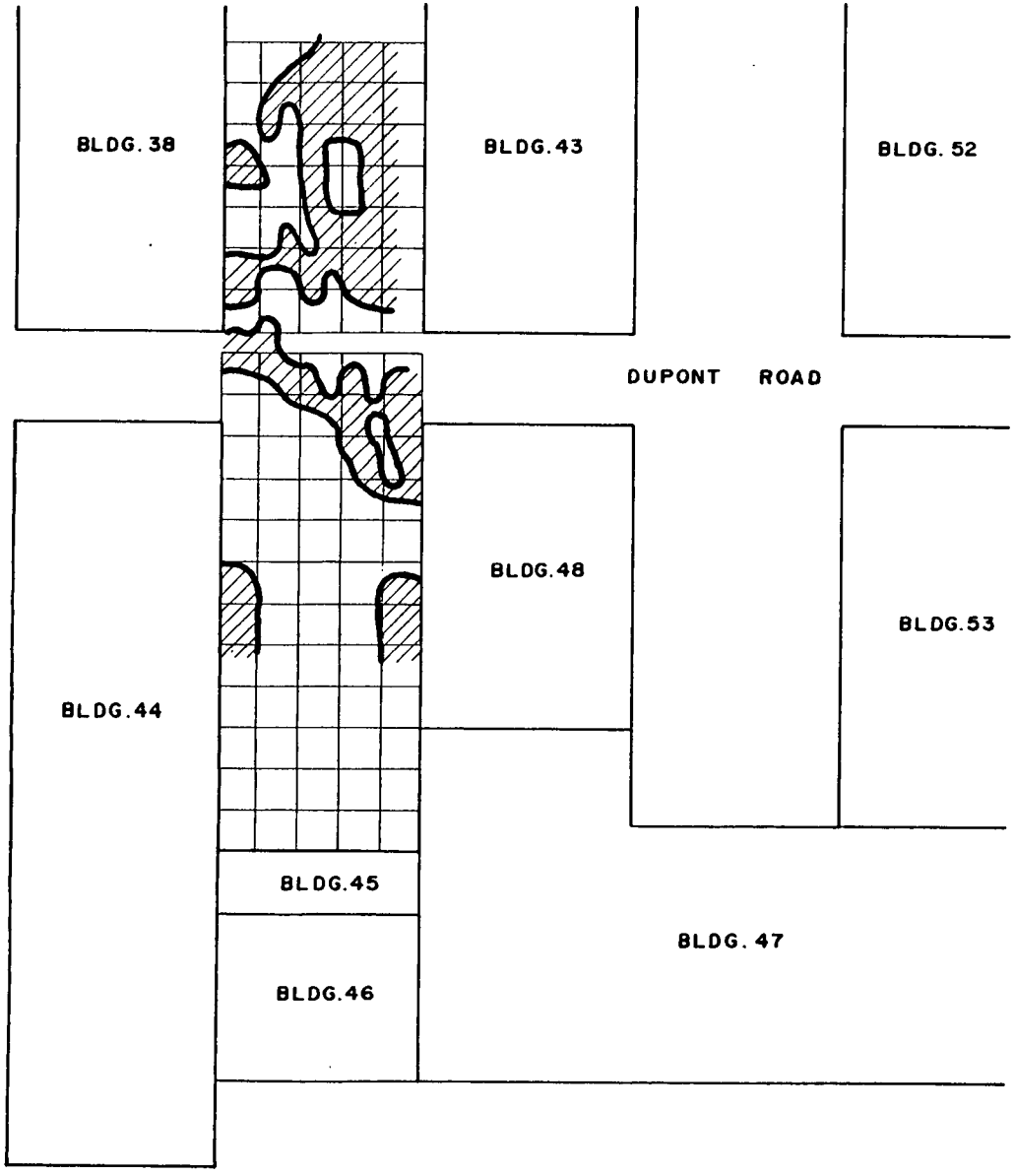


AREA G-5
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
E.I.DUPONT DE NEMOURS
NIAGARA PLANT SITE

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T. P.	SCALE In FEET		DATE: 1/20/84
CHECKED: W.S.	0 30		JOB: 82C2236-7

PLATE 6



LEGEND:

AREA OF LOW CONDUCTIVITY

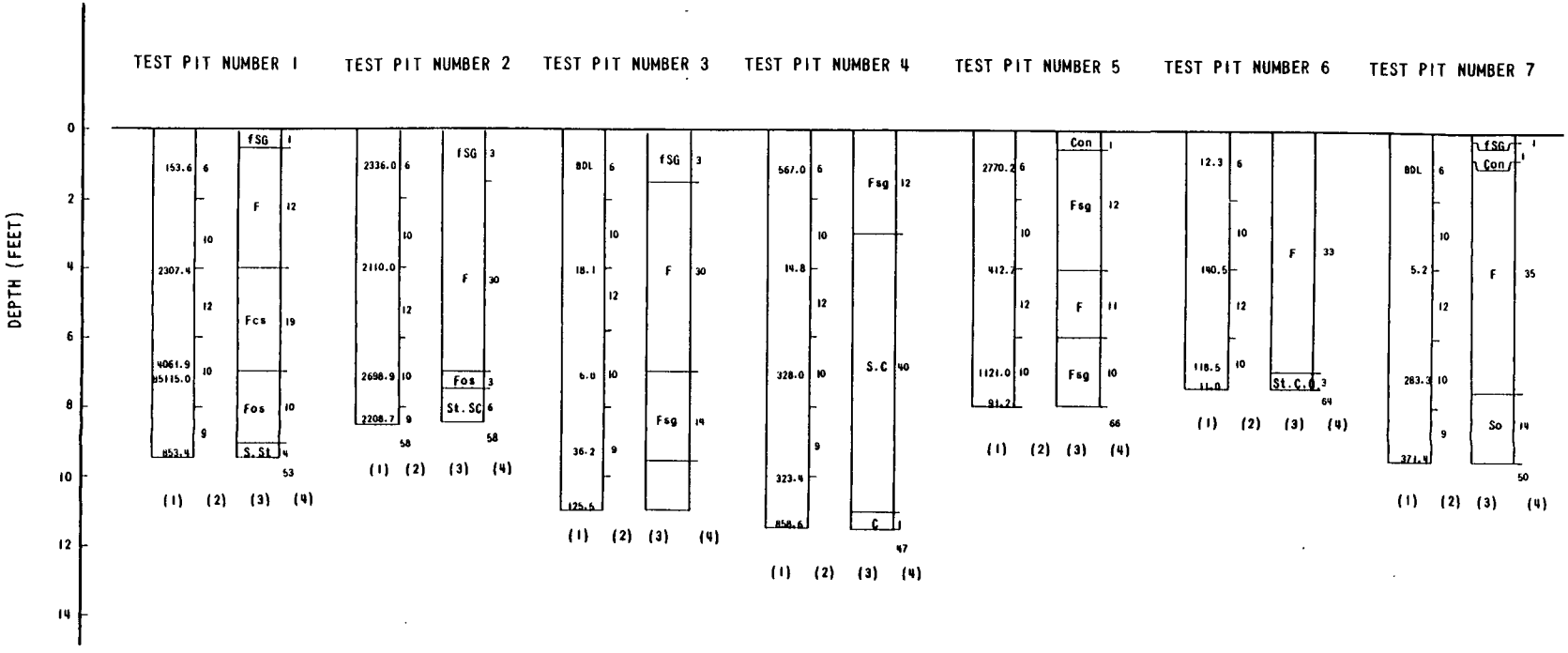
AREA G-6
EM31 TERRAIN CONDUCTIVITY SURVEY INTERPRETATION
E. I. DUPONT DE NEMOURS
NIAGARA PLANT SITE

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 30	DATE: 1/20/84
CHECKED : W.S.		JOB : 82C2236-7

PLATE 7



LEGEND:

fSG - FROZEN SAND AND GRAVEL
F - FILL CONSISTING OF BRICKS, CINDERS, WOOD PIECES, CONCRETE, METAL, SAND, GRAVEL, ETC.
Fsr - FILL CONSISTING OF SHOT ROCK
Fcs - FILL CONSISTING OF CLAY AND SAND
Fos - FILL CONSISTING OF VEGITATIVE ORGANIC-RICH SAND
Fsg - FILL CONSISTING OF SAND AND GRAVEL
S - SAND
St - SILT
C - CLAY
G - GRAVEL
Con - CONCRETE
O - VEGITATIVE ORGANIC-RICH
BDL - BELOW DETECTION LIMIT

NOTES:

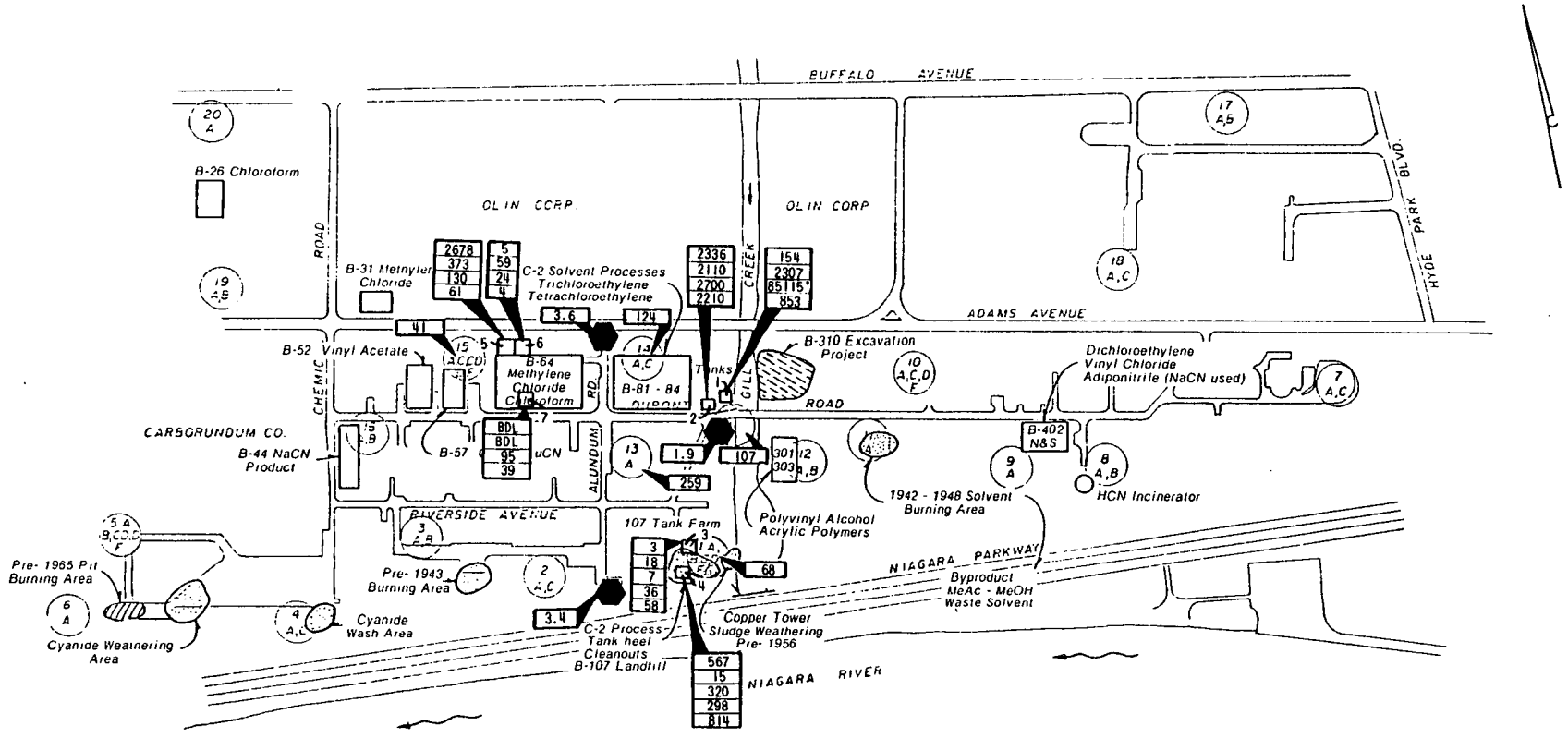
(1) TOTAL HALOGENATED VOLATILE CONCENTRATIONS IN ug/g (SEE TABLE 2)
(2) PERCENT CONTRIBUTION TO TERRAIN CONDUCTIVITY VALUE, 2 FEET INTERVAL
(3) SOIL PROFILE
(4) PERCENT CONTRIBUTION TO TERRAIN CONDUCTIVITY VALUE, STRATIGRAPHIC INTERVAL

TEST PIT LOGS, CHEMICAL ANALYSES AND CONDUCTIVITY
NIAGARA PLANT SITE
E.I.DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: D.B.	SCALE in FEET	DATE: 3/15/84
CHECKED: J.C.E.	NTS	JOB: 83C2236

PLATE 8



LEGEND:

RESULTS OF OCTOBER 1983 GROUND-WATER SAMPLING OF "A" WELL

RESULTS OF BEDDING MATERIAL SAMPLING FROM UTILITY TEST PIT

RESULTS OF MATERIAL SAMPLING FROM TEST PITS, WITH INCREASING DEPTHS

40 CONCENTRATION IN PPM

* DUPLICATE ANALYSIS 85115 PPM AND 4062 PPM

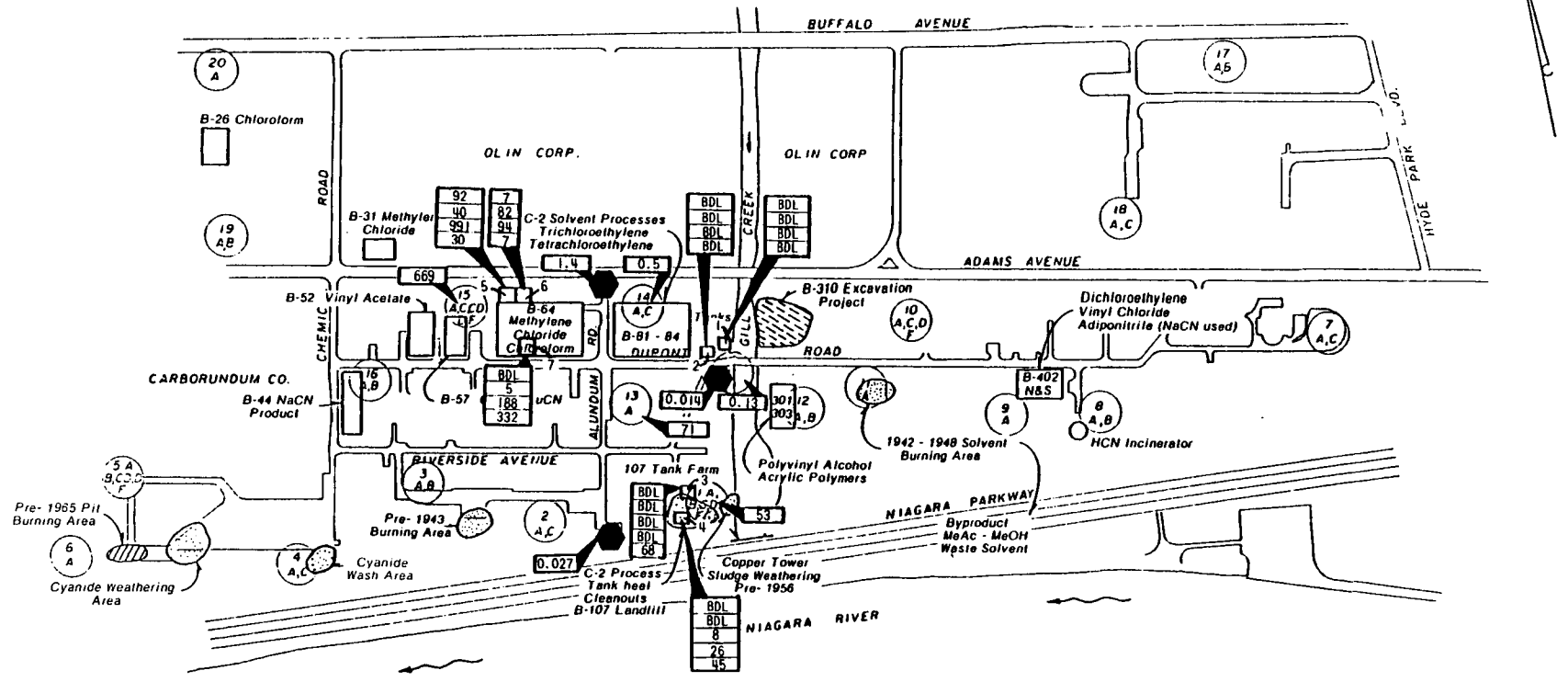
BDL BELOW DETECTION LIMIT

TOTAL C-2 COMPOUND CONCENTRATIONS
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 2/9/84
CHECKED: J.C.E.	0 300	JOB: 83C2236

PLATE 9



LEGEND:

RESULTS OF OCTOBER 1983 GROUND-WATER SAMPLING OF "A" WELL

RESULTS OF BEDDING MATERIAL SAMPLING FROM UTILITY TEST PIT

RESULTS OF MATERIAL SAMPLING FROM TEST PITS, WITH INCREASING DEPTHS

40 CONCENTRATION IN PPM

BDL BELOW DETECTION LIMIT FOR EACH COMPOUND

TOTAL C-1 COMPOUND CONCENTRATIONS
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE IN FEET 0 300	DATE: 2/9/84
CHECKED: J.C.E.		JOB: 83C2236

PLATE 10

Tables

TABLE 1

TEST PIT SAMPLING SUMMARY

DUPONT NIAGARA PLANT

VOA VIAL SAMPLES COLLECTED BY OHM

Test Pit	Depth (Feet)	Date	Water Depth (Feet)
TP-1	1	2/2	5.2
	4	2/2	
	7	2/2	
	9.5	2/2	
*(2) water samples		2/2	
TP-2	1	2/2	5.5
	4	2/2	
	7	2/2	
	8.5	2/3	
*(2) water samples			
TP-3	1	1/31	4.8
	4	1/31	
	7	1/31	
	**9.6	2/1	
	11	2/1	
TP-4	1	2/1	6.3
	4	2/1	
	7	2/1	
	10	2/1	
	11.5	2/1	
(2) water samples			
TP-5	1	2/7	3.5
	4	2/7	
	7	2/7	
	8	2/7	
TP-6	1	2/7	4.0
	4	2/7	
	7	2/7	
	7.5	2/7	
TP-7	1	2/6	6.0
	4	2/6	
	7	2/6	
	9.5	2/6	

* Water samples collected from bucket @ final scoop.
** O.H. Materials Co. (OHM) logged sample as 9'.

TABLE 2
HALOGENATED VOLATILE CONCENTRATIONS[1]
DUPONT NIAGARA PLANT
NIAGARA FALLS, NEW YORK

Test Pit	Depth (feet)	vinyl chloride	dichloro methane	trans-1,2-dichloro ethylene	chloroform	trichloro ethylene	tetra-chloro ethylene	1,1,2,2-tetra chloro ethane
TP-1	1	BDL[2]	BDL	BDL	BDL	51.1	71.1	31.4
	4	BDL	BDL	5.44	BDL	527	1210	565
	7	BDL	BDL	20.9	BDL	1180	1490	1371
	7	BDL	BDL	315	BDL	25100	36100	23600
	9.5	BDL	BDL	15.4	BDL	233	296	309
TP-2	1	BDL	BDL	BDL	BDSL	691	894	751
	4	BDL	BDL	BDL	BDL	1090	1020	BDL
	7	BDL	BDL	48.9	BDL	1160	1490	BDL
	8.5	BDL	BDL	19.7	BDL	786	615	788
TP-3	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	4	BDL	BDL	BDL	BDL	4.92	8.78	4.43
	7	BDL	BDL	BDL	BDL	BDL	6.86	BDL
	9	BDL	BDL	8.51	BDL	4.75	15.4	7.52
	11	BDL	BDL	BDL	57.9	45.4	12.4	BDL
TP-4	1	BDL	BDL	BDL	BDL	170	271	126
	4	BDL	BDL	BDL	BDL	6.79	8	BDL
	7	BDL	7.92	BDL	BDL	181	96.1	43
	10	BDL	25.9	BDL	BDL	175	85	37.5
	11.5	BDL	23.9	BDL	20.7	459	239	116
TP-5	1	BDL	BDL	BDL	921.1	48.1	2630	BDL
	4	BDL	BDL	BDL	39.8	11.9	361	BDL
	7	BDL	BDL	BDL	991	BDL	130	BDL
	8	BDL	BDL	BDL	29.8	BDL	61.4	BDL
TP-6	1	BDL	BDL	BDL	7.34	BDL	4.99	BDL
	4	BDL	BDL	BDL	82	BDL	58.5	BDL
	7	BDL	BDL	BDL	94.2	BDL	24.3	BDL
	7.5	BDL	BDL	BDL	6.85	BDL	4.20	BDL
TP-7	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	4	BDL	BDL	BDL	5.22	BDL	BDL	BDL
	7	BDL	BDL	BDL	188	26.9	45.6	22.8
	9.5	BDL	BDL	BDL	332	9.87	19.9	9.66

(1) Concentrations in ppm
(2) BDL = Below Detection Limit of 4.0 ppm

Appendix A

LOG of TEST PIT No. TP-1

DATE 2/2/84 SURFACE ELEVATION 569 ± LOCATION See Plate 1

DEPTH, ft.	SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
0			Top 4 inches composed of frozen sand and gravel (surface covering)		
					60
			Fill material consisting of: yellow and red brick, cinders, discarded lime and salt.		
					1000
5			Fill material becomes shale in brown clayey sand matrix.		
					1000
			Fill material becoming a saturated black organic rich material consisting of grey fine sand to sand and gravel and plant material.		
			Light and dark mottled grey fine sandy clayey silt to a silty, clayey fine sand, with plant material on top of bedrock appears to be natural soil, uncertain of thickness.		1000
10					
			Bucket Refusal at Bedrock		
			Slight black slick noticed on pit ground water, first noticed at 7'.		
15					

Completion Depth Approx. 9.5 Feet Water Depth 7.2 Feet Date 2/6/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

WCCHT 2

LOG of TEST PIT No. TP-2

DATE 2/3/84 SURFACE ELEVATION 569 ± LOCATION See Plate 1

DEPTH, ft.	SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
			Top 18 inches composed of frozen sand and gravel		
			Fill material consisting of: yellow and red bricks, cinders, wood pieces, sand and gravel.		600 1000
5			Fill material becoming a saturated black organic rich material consisting of sand gravel and plant material.		
			Light and dark mottled grey fine sandy clayey silt to a silty, clayey fine sand, with plant material, on top of bedrock-appears to be natural soil, uncertain of thickness.		
10			Bucket Refusal at Bedrock		
			Black sheen noticed on test pit water. First noticed at 5'.		
			* OVA readings not taken due to inclement weather on 2/3/84.		
15					
20					

Completion Depth Approx.8.5 Feet Water Depth 5.5 Feet Date 2/6/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

WCC-FP 2

LOG of TEST PIT No. TP-3

DATE 2/1/84 SURFACE ELEVATION 568.5 ± LOCATION See Plate 1

DEPTH, ft.	SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
			Top 18 inches composed of frozen brown and grey mottled clayey sand.		2
			Fill material consisting of shot rock.		8
5					8.5
			Fill material becoming sand and gravel with a trace of grey to white clay on teeth of backhoe. Backhoe bucket contained a grey, black mottled sludge-like material.		2
10			Brown coarse sandy clay to a clayey coarse sand mixed a greenish grey sand-appears to be natural soil, uncertain of thickness.		850
			Bucket Refusal at Bedrock		
15			3' thick concrete foundation on west side of pit.		
20					

Completion Depth approx.11 Feet Water Depth 4.8 Feet Date 2/2/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

LOG of TEST PIT No. TP-4

DATE 2/1/84 SURFACE ELEVATION 568.5 ± LOCATION See Plate 1

DEPTH, ft. / SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
0		Fill material consisting of: brown and grey clayey sandy gravel to sand and gravel.		40
				350
5		Fill material becoming a brown clayey sand to a sandy clay with occasional gravel.		550
				800
10		Trace of grey clay Black liquid globules noticed on backhoe bucket.		850
15				
20				

Completion Depth Approx11.5Feet Water Depth 6.3 Feet Date 2/2/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

WCC-RP 2

Woodward-Clyde Consultants

LOG of TEST PIT No. TP-5

DATE 2/7/84 SURFACE ELEVATION 569+ LOCATION See Plate 1

DEPTH, ft. / SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
0		Top 6 inches is concrete		
		Fill material consisting of: brown to black silt, sand and gravel.		500
		Excavated pipes, bricks, with trace of clay and organics		–
5		Couple pieces of shot rock		
		Fill material becoming gravel with little silt and sand.		1000 250
		Bucket refusal at bedrock		
10				

Completion Depth approx.8.0 Feet Water Depth 3.5 Feet Date 2/7/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

WCC-NY-2

LOG of TEST PIT No. TP-6

DATE 2/7/84 SURFACE ELEVATION 569 ± LOCATION See Plate 2

DEPTH, ft.	SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
0			Fill material consisting of: silt, sand, gravel, metal and brick.		1
					10
5			Trace of black organic clayey sand		300
			Trace of brown clay and slight sheen noticed on soil.		300
			Bucket refusal at bedrock		
10			2½ concrete retaining wall on North side of pit.		
			Slight sheen noticed on soil at 7.5'.		

Completion Depth approx. 7.5 Feet Water Depth 4 Feet Date 2/7/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

WCC-FM-2

LOG of TEST PIT No. TP-7

DATE 2/6/84 SURFACE ELEVATION 569 ± LOCATION See Plate 2

DEPTH, ft.	SAMPLES	POCKET PENETROM. READING (tsf)	DESCRIPTION	ELEVATION	OVA SOIL (ppm)
0			Top 3 inches consists of frozen sand and gravel Concrete from 3" to 9"		ND
			Fill material consisting of: sand, gravel, bricks, sewer pipe, a concrete block cardboard, cinders and wood.		1
5					200
			Fill material becoming a gray black humus like organic material with sand and gravel. Strong septic ordor (sewage) noticed.		200
10			Bucket refusal at bedrock Slight blue to bronze sheen noticed on pit water.		

Completion Depth approx. 9.5 Feet Water Depth 6 Feet Date 2/6/84

Project Name DuPont Niagara Plant Site Project Number 83C2236

Woodward-Clyde Consultants

WCC-HP 2

Appendix B

O. H. Materials Co.
Emergency Response and Environmental Restoration

Regional Offices:
Ottawa, Illinois
Atlanta, Georgia
Washington, D.C.

P.O. Box 551
Findlay, Ohio 45840
Telephone 419/423-3526
1-800-537-9540

PROJECT 1669

PRELIMINARY REPORT OF ANALYTICAL SERVICES

Test Pits (1-4) Soil Samples

TO: Mr. Tim Van Domelen

DATE: February 21, 1984

CLIENT: E.I. DuPont de Nemours Co., Inc.

pc: Lonnie Reese, OHM

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of, the above named client only. O. H. Materials Co. assumes no responsibility or liability for the reliance hereon or use hereof by anyone other than the above named client.

All of the analyses and data interpretation that form the basis of this report were prepared under the direct supervision and control of the undersigned who is solely responsible for the contents and conclusions therein.

2-21-84
(date)

Prepared by: Linda A Abrams

2-21-84
(date)

2-21-84

PROJECT 1669

PRELIMINARY REPORT OF ANALYTICAL SERVICES

Test Pits (1-4) Soil Samples

I. INTRODUCTION

O.H. Materials' technical personnel obtained 30 soil samples during excavation of seven test pits at DuPont's Niagara facility. This report contains results on the first 20 samples for the halogenated volatile organics. The samples were transferred complete with chain of custody records which are attached for reference.

II. ANALYTICAL METHODOLOGY

A. Halogenated Volatile Organics

Soil samples were analyzed according to EPA Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, 2nd edition, 1982; Method 8240, GC/MS Method for Volatile Organics.

Quality assurance, sample custody, and document control procedure were followed which meet EPA requirements.

III. RESULTS

The analytical results are tabulated by Test Pits in Tables I-IV for Pits #1, #2, #3, and #4, respectively.

Analytical results for sample #14 were reported for both sample vials 1669-14A and 1669-14B due to the variance in concentrations of the components found. Replicate analysis of other samples did not show a magnitude order of change and the average concentration values were reported.

PROJECT 1669

TABLE I

Pit #1 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)				
Depth	1669-12 1'	1669-13 4'	1669-14A* 7'	1699-14B* 7'	1669-15 9.5'
Vinyl Chloride	BDL	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene	BDL	5.44	20.9	315	15.4
Chloroform	BDL	BDL	BDL	BDL	BDL
Trichloroethylene	51.1	527	1180	25100	233
Tetrachloroethylene	71.1	1210	1490	36100	296
1,1,2,2-Tetrachloroethane	31.4	565	1371	23600	309

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g
*SEE RESULTS SECTION

PROJECT 1669

TABLE II

Pit #2 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)			
Depth	1669-17 1'	1669-18 4'	1669-19 7'	1669-20 8.5'
Vinyl Chloride	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene	BDL	BDL	48.9	19.7
Chloroform	BDL	BDL	BDL	BDL
Trichloroethylene	691	1090	1160	786
Tetrachloroethylene	894	1020	1490	615
1,1,2,2-Tetrachloroethane	751	BDL	BDL	788

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

PROJECT 1669

TABLE III

Pit #3 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)				
Depth	1669-01 1'	1669-02 4'	1669-03 7'	1669-04 9'	1669-05 11'
Vinyl Chloride	BDL	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL	9.85
Trans-1,2-Dichloroethylene	BDL	BDL	BDL	8.51	BDL
Chloroform	BDL	BDL	BDL	BDL	57.9
Trichloroethylene	BDL	4.92	BDL	4.75	45.4
Tetrachloroethylene	BDL	8.78	6.86	15.4	12.4
1,1,2,2-Tetrachloroethane	BDL	4.43	BDL	7.52	BDL

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

PROJECT 1669

TABLE IV

Pit #4 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)				
Depth	1669-06 1'	1669-07 4'	1669-08 7'	1669-09 10'	1669-1C 11.5'
Vinyl Chloride	BDL	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	7.92	25.9	23.9
Trans-1,2-Dichloroethylene	BDL	BDL	BDL	BDL	BDL
Chloroform	BDL	BDL	BDL	BDL	20.7
Trichloroethylene	170	6.79	181	175	459
Tetrachloroethylene	271	8.00	96.1	85.0	239
1,1,2,2-Tetrachloroethane	126	BDL	43.0	37.5	116

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

O.H. Materials Co.
P.O. Box 551
Findlay, Oh 45840
419-423-3526

CHAIN-OF—CUSTODY RECORD

№ 7147

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO	PROJECT NUMBER
Niagra Falls, N.Y.	DuPont / Niagra Falls Works	———	1669

ITEM NUMBER	SAMPLE NUMBER	NUMBER & SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER & CHECK 1	2	3	4	5	6	7
1	1669-01	2-40 ml. vile	Pit #3 depth: 1' soil 1/31/84 1550 hrs LM/RT	✓	✓					
2	1669-02	2-40 ml. viles	Pit #3 depth: 4' soil 1/31/84 1614 hrs LM/RT	✓	✓					
3	1669-03	2-40 ml viles	Pit #3 depth: 7' soil 1/31/84 1702 hrs. LM/RT	✓	✓					
4	1669-04	2-40 ml. viles	Pit #3 depth: 9' multi colored sludge 2/1/84 1050 hrs. LM/CH	✓	✓					
5	1669-05	2-40 ml. viles	Pit #3 depth: 11' soil, fine gravel + water 2/1/84 1112 hrs. LM/CH (Bedrock)	✓	✓					
6	1669-06	2-40 ml. viles	Pit #4 depth: 1' soil, gravel + ice 2/1/84 1240 hrs. LM/CH	✓	✓					
7	1669-07	2-40 ml. viles	Pit #4 depth: 4' soil 2/1/84 1357 hrs.	✓	✓					

Person Responsible for sample	Affiliation	Date	Time
Lowell W. Metzger	O.H.M.	2/3	1210

Purpose of analysis (use back of front sheet if necessary)

Volatile scan

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	1-7	Lowell W. Metzger	Refridgerator	2/3	2358
2		refridgerator	Shapiro	2/6	1000
3					
4					
5					
6					
7					

O.H. Materials Co.
P.O. Box 1022
Findlay, Oh 45340
419-423-3526

CHAIN-OF—CUSTODY RECORD

No. 4686

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO	PROJECT NUMBER
Niagra Falls, N.Y.	DuPont/Niagra Falls Works	———	1669

ITEM NUMBER	SAMPLE NUMBER	NUMBER & SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER & CHECK 1	2	3	4	5	6	7
~~8~~ 1	1669-08	1-40 ml. vile	Pit #4 depth: 7' soil 2/1/84 1431 hrs LM/CH	✓	✓					
~~9~~ 2	1669-09	2-40 ml. viles	Pit #4 depth: 10' clayey soil 2/1/84 1446 hrs LM/CH	✓	✓					
~~10~~ 3	1669-10	2-40 ml. viles	Pit #4 depth: 11.5' soil + water 2/1/84 1514 hrs. LM/CH	✓	✓					
~~11~~ 4	1669-11	1-40 ml. vile	Pit #4 depth: 11.5' liquid 2/1/84 1524 hrs. LM/CH	✓	✓					
~~12~~ 5	1669-12	2-40 ml. viles	Pit #1 depth: 1' ice, gravel, soil 2/2/84 1346 hrs AH/RT	✓	✓					
~~13~~ 6	1669-13	2-40 ml. viles	Pit #1 depth: 4' pieces of slate, rust + sludge 2/2/84 1428 hrs. LM/CH	✓	✓					
~~14~~ 7	1669-14	2-40 ml. viles	Pit #1 depth: 7' black sludgey soil 2/2/84 1452 hrs LM/CH	✓	✓					
~~15~~ 8	1669-15	2-40 ml. viles	Pit #1 depth: 9.5' (Bedrock) clay w/ black sludge 2/2/84 1536 hrs LM/CH	✓	✓					
~~16~~ 9	1669-16	2-40 ml. viles	Pit #1 depth: 9.5' (Bedrock) liquid 2/2/84 1547 hrs. LM/CH	✓	✓					

Person Responsible for sample	Affiliation	Date	Time
Lowell W. Metzger	O.H.M.	2/3	1220

Purpose of analysis (use back of front sheet if necessary)

Volatile scan

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	1-9	Lowell W. Metzger	Refridgerator	2/3	2358
2			Shapiro	2/6	1000
3					
4					
5					
6					
7					

O.H. Materials Co.
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419-423-3526

CHAIN-OF—CUSTODY RECORD

Nº 4687

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO	PROJECT NUMBER
Niagra Falls, NY	DuPont / Niagra Falls Works	—	1669

ITEM NUMBER	SAMPLE NUMBER	NUMBER & SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER & CHECK 1	2	3	4	5	6	7
1	1669-17	2-40 ml. viles	Pit #2 Depth: 1' gravel, soil, ice 2/2/84 1648 hrs. LM/RT	✓	✓					
2	1669-18	2-40 ml. viles	Pit #2 Depth: 4' fine stones + soils 2/2/84 1707 hrs. LM/RT	✓	✓					
3	1669-19	2-40 ml. viles	Pit #2 Depth: 7' wet soil + small stones 2/3/84 0938 hrs. CH/RT	✓	✓					
4	1669-20	2-40 ml. viles	Pit #2 Depth: 8.5' (bedrock) black sludgey soil + water 2/3/84 0953 hrs. CH/RT	✓	✓					
5	1669-21	2-40 ml. vile	Pit #2 Depth: 8.5' (Bedrock) liquid 2/3/84 1001 hrs CH/RT	✓	✓					

Person Responsible for sample	Affiliation	Date	Time
Lowell W. Metzger	OHM	2/3	1230

Purpose of analysis (use back of front sheet if necessary)

Volatile scan

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	1-5	Lowell W. Metzger	Refridgerator	2/3	2358
2		Refrigerator	Magna	2/6	1000
3					
4					
5					
6					
7					

O. H. Materials Co.
Emergency Response and Environmental Restoration

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PROJECT 1669

PRELIMINARY REPORT OF ANALYTICAL SERVICES

Test Pits (5-7) Soil Samples

TO: Mr. Tim Van Domelen

DATE: February 23, 1984

CLIENT: E.I. DuPont de Nemours Co., Inc.

pc: Lonnie Reese, OHM

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of, the above named client only. O. H. Materials Co. assumes no responsibility or liability for the reliance hereon or use hereof by anyone other than the above named client.

All of the analyses and data interpretation that form the basis of this report were prepared under the direct supervision and control of the undersigned who is solely responsible for the contents and conclusions therein.

2-23-84
(date)

Prepared by: Linda D. Moore

2-23-84
(date)

2-23-84

PROJECT 1669

PRELIMINARY REPORT OF ANALYTICAL SERVICES

Test Pits (5-7) Soil Samples

I. INTRODUCTION

O.H. Materials' technical personnel obtained 30 soil samples during excavation of seven test pits at DuPont's Niagara facility. This report contains results on the second 10 samples for the halogenated volatile organics. The samples were transferred complete with chain of custody records which are attached for reference.

II. ANALYTICAL METHODOLOGY

A. Halogenated Volatile Organics

Soil samples were analyzed according to EPA Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, 2nd edition, 1982; Method 8240, GC/MS Method for Volatile Organics.

Quality assurance, sample custody, and document control procedure were followed which meet EPA requirements.

III. RESULTS

The analytical results are tabulated by Test Pits in Tables V-VII for Pits #5, #6, and #7 respectively.

PROJECT 1669

TABLE V

Pit #5 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)			
Depth	1669-27 1'	1669-28 4'	1669-29 7'	1669-30 8'
Vinyl Chloride	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene	BDL	BDL	BDL	BDL
Chloroform	92.1	39.8	991	29.8
Trichloroethylene	48.1	11.9	BDL	BDL
Tetrachloroethylene	2630	361	130	61.4
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	BDL

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

PROJECT 1669

TABLE VI

Pit #6 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm) 1669-31	1669-32	1669-33	1669-34
Depth	1'	4'	7'	7.5'
Vinyl Chloride	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene	BDL	BDL	BDL	BDL
Chloroform	7.34	82.0	94.2	6.85
Trichloroethylene	BDL	BDL	BDL	BDL
Tetrachloroethylene	4.99	58.5	24.3	4.20
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	BDL

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

PROJECT 1669

TABLE VII

Pit #7 Halogenated Volatile Results

Sample #	Concentrations in ug/g (ppm)			
Depth	1669-23 1'	1669-24 4'	1669-25 7'	1669-26 9.5'
Vinyl Chloride	BDL	BDL	BDL	BDL
Dichloromethane	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene	BDL	BDL	BDL	BDL
Chloroform	BDL	5.22	188	332
Trichloroethylene	BDL	BDL	26.9	9.87
Tetrachloroethylene	BDL	BDL	45.6	19.9
1,1,2,2-Tetrachloroethane	BDL	BDL	22.8	9.66

BDL = Below Detection Limit
Limit of Detection (LOD) = 4.0 ug/g

[redacted]H. [redacted]erial[redacted]o.
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CHAIN-OF—CUSTODY RECORD

No. 6594

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO	PROJECT NUMBER
NIAGRA FALLS, N.Y.	Du pont	———	1669

ITEM NUMBER	SAMPLE NUMBER	NUMBER & SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER & CHECK 1 2 3 4 5 6 7
1	1669-22	3 - 40 ml. viles	Soil Blank 2/6/84 1102 hrs. LM/RB (Clay)	
2	1669-23	2 - 40 ml. viles	Pit #7 Depth: 1' frozen soil + gravel 2/6/84 1444 hrs. LM/RB	
3	1669-24	2 - 40 ml. viles	Pit #7 Depth: 4' soil + gravel 2/6/84 1457 hrs LM/RB	
4	1669-25	2 - 40 ml. viles 1 Brake	Pit #7 Depth: 7' soil + sludge 2/6/84 1515 hrs. LM/RB	
5	1669-26	2 - 40 ml. viles	Pit #7 Depth: 9.5' (Bedrock) Blk. sludge + soil 1524 hrs. 2/6/84 LM/RB	
6	1669-27	2 - 40 ml. viles	Pit #5 Depth: 1' frozen soil + gravel 2/7/84 0937 hrs LM/RB	
7	1669-28	2 - 40 ml. viles	Pit #5 Depth: 4' muddy soil 2/7/84 1028 hrs. LM/RB	

Person Responsible for sample	Affiliation	Date	Time
Lowell W. Metzger	OHM	2/9	0850

Purpose of analysis (use back of front sheet if necessary)

Volatile scan

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	1-7	Lowell W. Metzger	Bryan Shapiro	2/9	0905
2					
3					
4					
5					
6					
7					

[redacted] Materials [redacted].
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CHAIN-OF—CUSTODY RECORD

№ 6595

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO	PROJECT NUMBER
Niagra Falls, NY	Dupont	———	1669

ITEM NUMBER	SAMPLE NUMBER	NUMBER & SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER & CHECK 1 2 3 4 5 6 7
1	1669-29	2-40ml. viles	Pit #5 Depth: 7' rocks, sml. stones, sand 2/7/84 1043 hrs. LM/RB	✓
2	1669-30	2-40 ml. viles	Pit #5 Depth: 8' (Bedrock) liquid clay 2/7/84 1107 hrs. LM/RB	✓
3	1669-31	2-40ml. viles	Pit #6 Depth: 1' frozen soil + sml. stones 2/7/84 1427 hrs. LM/RB	✓
4	1669-32	2-40 ml. viles	Pit #6 Depth: 4' liquid, soil, sml. rock 2/7/84 1441 hrs. LM/RB	✓
5	1669-33	2-40 ml. viles	Pit #6 Depth: 7' rock, water, slurry. 2/7/84 1456 hrs. LM/RB	✓
6	1669-34	2-40 ml. viles	Pit #6 Depth: 7.5' (bedrock) clay + sand 2/7/84 1503 hrs LM/RB	✓

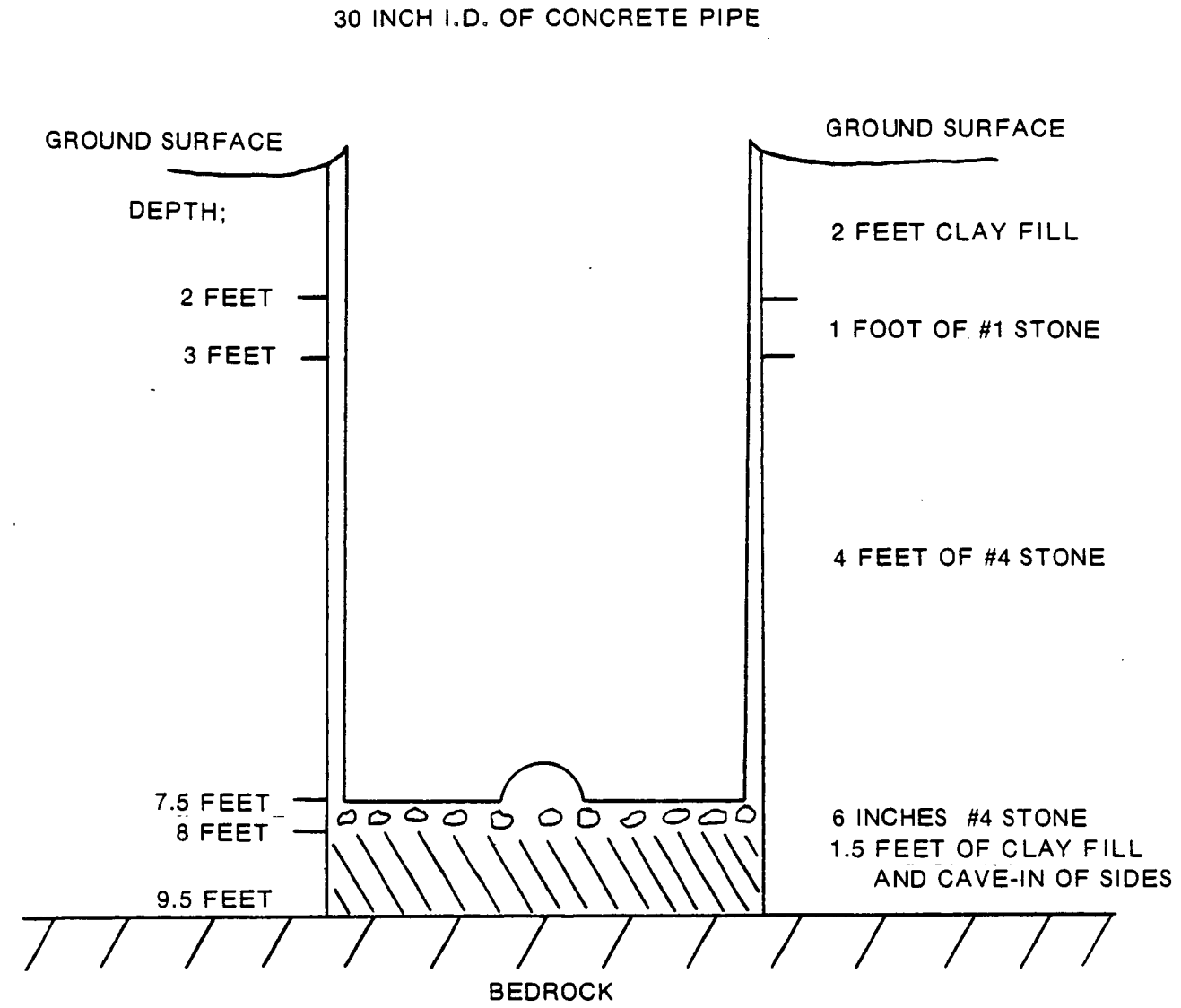
Person Responsible for sample	Affiliation	Date	Time
Lowell W. Metzger	OHM	2/9	[redacted]

Purpose of analysis (use back of front sheet if necessary) 2/9 0850

Volatiles scan

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	1-6	Lowell W. Metzger	Benjie Major	2/9	0905
2					
3					
4					
5					
6					
7					

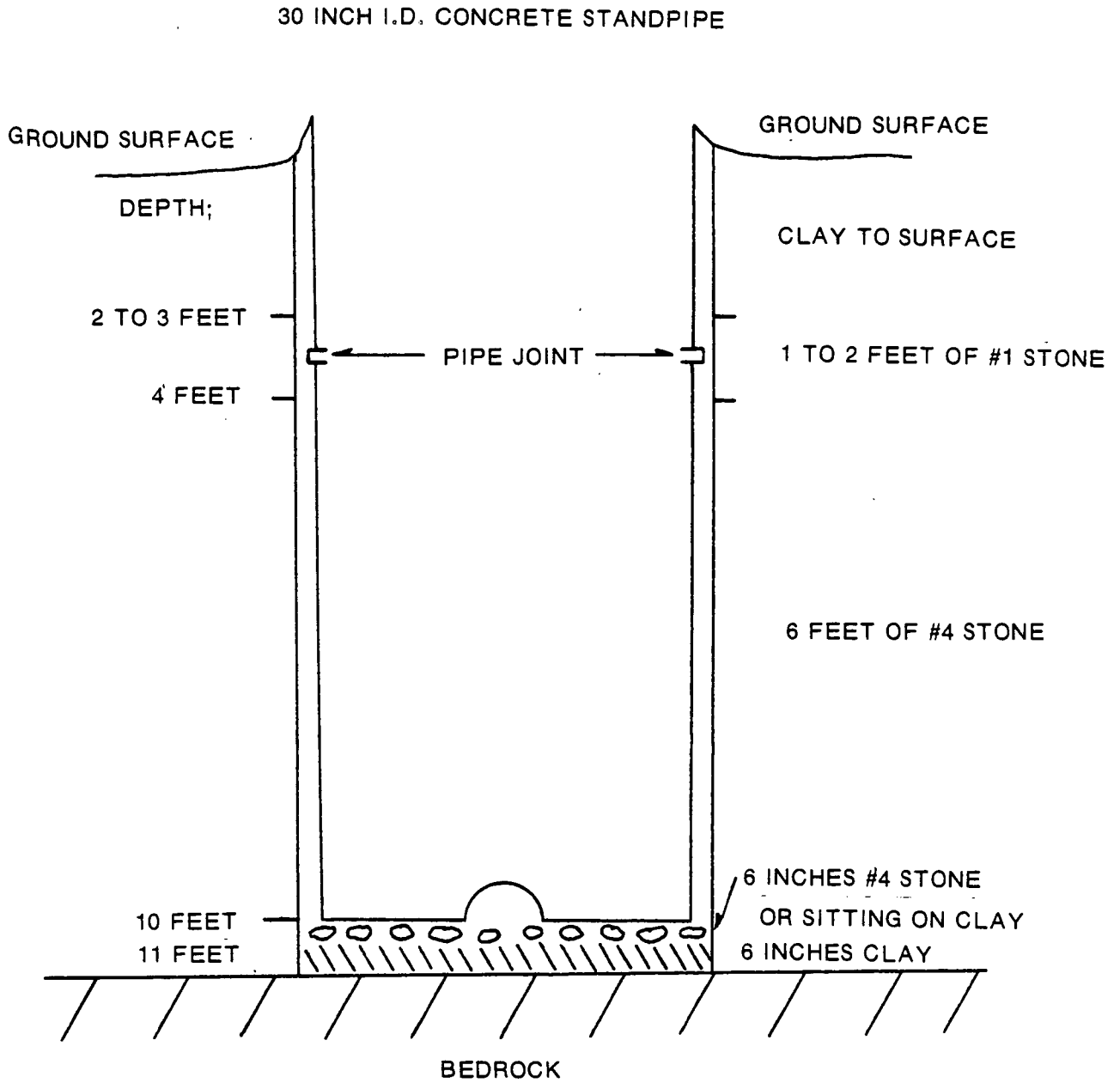
Appendix C



ALL MEASUREMENTS APPROXIMATE

LOG FOR RECOVERY PIPE AT TEST PIT #1
E.I. DUPONT DE NEMOURS & CO.
NIAGARA PLANT SITE

FIGURE C-1

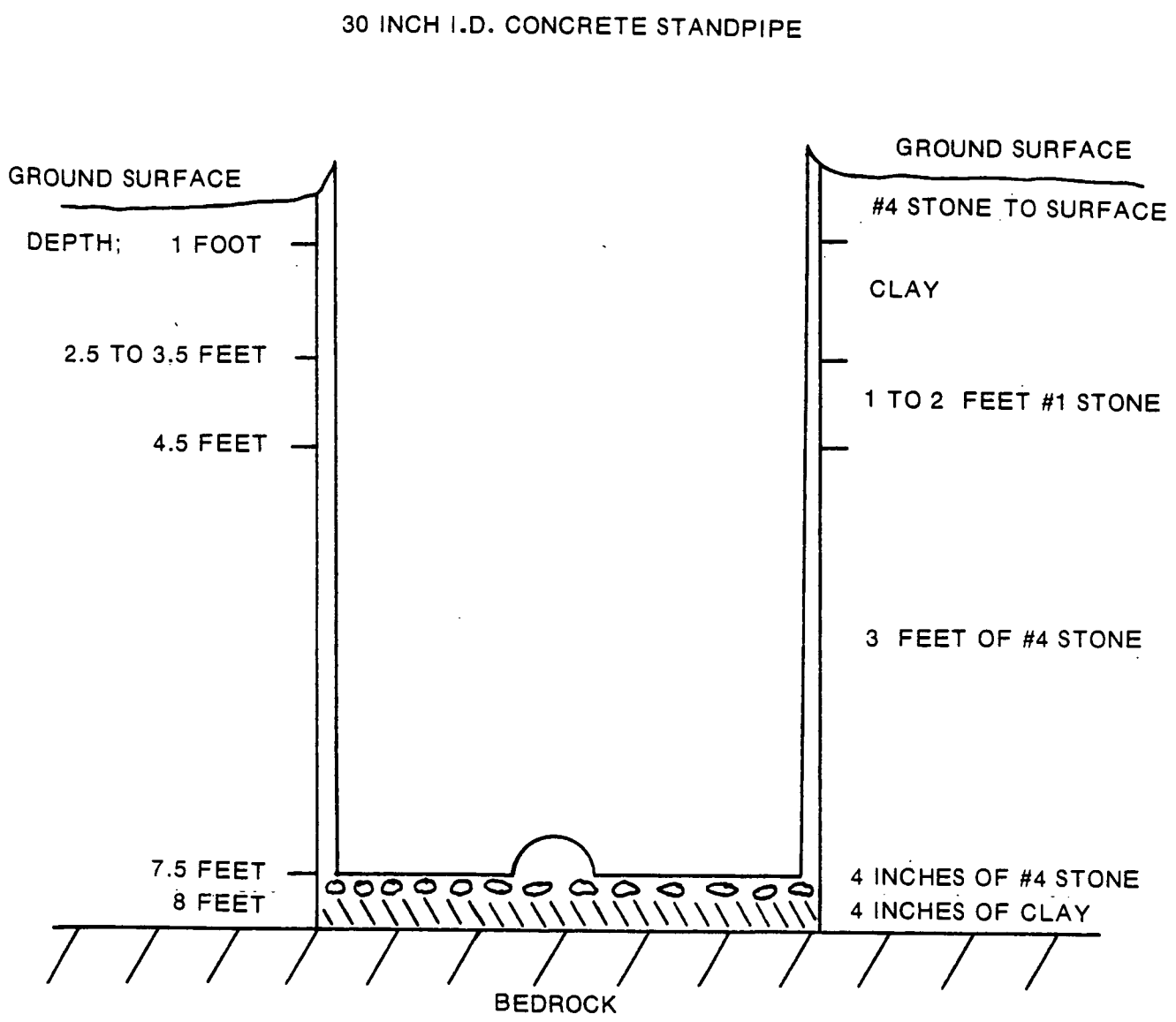


ALL MEASUREMENTS APPROXIMATE

NOTE: ONE SECTION OF CONCRETE PIPE IS 7.5 FEET IN LENGTH

LOG FOR RECOVERY PIPE AT TEST PIT #3
E.I. DUPONT DE NEMOURS & CO.
NIAGARA PLANT SITE

FIGURE C-2



ALL MEASUREMENTS APPROXIMATE

LOG FOR RECOVERY PIPE AT TEST PIT #5
E.I. DUPONT DE NEMOURS & CO.
NIAGARA PLANT SITE

FIGURE C-3

#17