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*REPORT*

# HYDROGEOLOGIC EVALUATION

Carrier Corporation

Syracuse, New York

January 1991

**BLASLAND & BOUCK ENGINEERS, P.C.**
**BLASLAND, BOUCK & LEE**
*ENGINEERS & GEOSCIENTISTS*

# HYDROGEOLOGIC EVALUATION REPORT

CARRIER CORPORATION
SYRACUSE, NEW YORK

DECEMBER 1990

BLASLAND & BOUCK ENGINEERS, P.C.
6723 TOWPATH ROAD, BOX 66
SYRACUSE, NEW YORK 13214

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# EXECUTIVE SUMMARY

This report presents a hydrogeologic evaluation for the Carrier Corporation (Carrier) manufacturing complex located on Thompson Road in the Town of Dewitt, New York. The report has been prepared to satisfy the requirements of Items II.A.2 and II.B. of the Consent Order (Case No. R7-0486-90-03) entered into between the New York State Department of Environmental Conservation (NYSDEC) and Carrier. The effective date of the Consent Order (Appendix A) is October 10, 1990.

The data presented in the SPDES Permitted Outfall Evaluation Report (Blasland & Bouck Engineers, 1989) and the Storm Sewer System Report (Blasland & Bouck Engineers, 1990) identified PSA-1 and PSA-2 as two potential source areas. During the hydrogeologic evaluation, two soil borings were installed and halogenated volatile organic compounds were confirmed in soils B-1 (PSA-1) and B-2 (PSA-2).

Three monitoring wells were installed during this evaluation to supplement the existing five monitoring wells. Halogenated volatile organic compounds were confirmed in ground water at MW-3S at the top of the water table (PSA-1), but not deeper than 17-feet to 22-feet below the water table (MW-3D). Low levels of halogenated volatile organic compounds were found in ground water at only one other location, MW-9, at the water table. These compounds were not detected in ground water at any of the other six monitoring wells, including the farthest upgradient (MW-1) and the two downgradient (MW-5, MW-7) wells.

The ground-water flow system at the site is shallow flow and found in a lacustrine silt and silty sand. The lower boundary to this unit is a silty sand till confining unit located at a depth of approximately 50-feet below the ground surface. Because of the strong stratification within the water bearing unit, horizontal ground-water flow dominates vertical ground-water flow. Shale bedrock of low permeability underlies the lower silty sand till confining unit.

The average ground-water flow is towards the north-north west (towards Sanders Creek). The ground-water flow rate is very slow, 2 to 23-feet per year, because of both the shallow hydraulic gradient (0.003) and low hydraulic conductivity (0.3 feet/day to 4.3 feet/day) of the lacustrine silt and silty sand unit.

An extensive system of storm sewers underlies the site. Those sewers are generally located at or up to approximately six-feet below the water table. These sewers locally intercept shallow ground-water flow. The potential source areas, therefore, are generally confined by the geology at the site and are greatly influenced by the storm sewer system.

UNITED TECHNOLOGIES
CARRIER

**Carrier Corporation**

P.O. Box 4808
Carrier Parkway
Syracuse, New York 13221
315 / 432-6000

VIA REGISTERED MAIL/RETURN RECEIPT REQUESTED

January 8, 1991

Mr. Steven P. Eidt, P.E.
Associate Sanitary Engineer
New York State Department
of Environmental Conservation
615 Erie Boulevard, West
Syracuse, New York 13204-2400

**RE: Consent Order R7-0486-90-03**
**Hydrogeologic Evaluation**

Dear Mr. Eidt:

Enclosed are three (3) copies of the Hydrogeologic Evaluation report required by items II.A.2 and II.B. of consent order R7-0486-90-03.

If you have any questions regarding this report, please call me at 432-7719.

Sincerely,

Darcy A. Sachs

Darcy A. Sachs
Environmental Engineer

c: A. Kanerviko - Carrier
R. Bianchi - Carrier
D. Sweet - Carrier
D. Sauda - Blasland, Bouck & Lee

(c: no attachments)

# Section 1

# SECTION 1 - INTRODUCTION

## 1.1 General

This report presents a hydrogeologic evaluation for the Carrier Corporation (Carrier) manufacturing complex located on Thompson Road in the Town of Dewitt, New York. The Carrier complex is shown on the site location map (Figure 1).

This report has been prepared to satisfy the requirements of Items II.A.2 and II.B. in Schedule A of the Consent Order (Case No. R7-0486-90-03) entered into between the New York State Department of Environmental Conservation (NYSDEC) and Carrier. The effective date of the Consent Order (Appendix A) is October 10, 1990.

## 1.2 Report Organization

This report is organized into three sections as follows:

- Section 1 presents the purpose and scope of this report;
- Section 2 details the field and laboratory methodologies used to complete the evaluation; and
- Section 3 presents the results of the Blasland & Bouck hydrogeologic evaluation.

## 1.3 Background

On August 1, 1989, Carrier was issued a five-year State Pollutant Discharge Elimination System (SPDES) permit (No. NY 0001163) by the NYSDEC. The permit covers six outfalls designated as 001, 002, 005, 006, 007, and 008 that discharge into Sanders Creek just north of the Carrier facility (see Figure 1). In the initial Discharge Monitoring Report (DMR) submitted to NYSDEC on September 18, 1989, Carrier reported trichloroethylene (TCE) levels in outfalls 002 and 007 in excess of the concentration-based effluent limits specified in the SPDES permit.

On September 29, 1989, Blasland & Bouck Engineers, P.C., was retained by Carrier to perform an evaluation of the existing storm sewer system that discharges through permitted outfalls 001, 002, 005, 006, 007, and 008. The scope of services included an evaluation and review of historical outfall data, a reconnaissance of the storm sewer system and permitted outfalls, the development and implementation of a water and sediment sampling plan, and the preparation of a report summarizing the work. The review of the existing outfall data was presented in SPDES Permitted Outfall Evaluation Report (Blasland & Bouck Engineers, P.C., December 1989) and is not included as part of this report. The results of the storm sewer investigation and sampling program were presented in the Storm Sewer System Report (Blasland & Bouck Engineers, P.C., August 1990) which is also not included as part of this report.

From the data presented in the SPDES Permitted Outfall Evaluation Report and the Storm Sewer System Report, the highest TCE concentrations were found in the discharges from outfalls 002 and 007. Individual manholes from the sewer systems discharging to these two outfalls were sampled and analyzed for TCE. Based on these sampling results, PSA-1 and PSA-2 were identified as two potential TCE source areas (see Figure 2). The potential source area to Outfall 002, PSA-1, is associated with the location of a former underground storage tank. The potential source area to Outfall 007, PSA-2, was identified by TCE concentrations in an adjacent manhole. No known existing or former site features are known to be associated with this potential source.

## 1.4 Purpose and Scope

Based upon the results of the Storm Sewer System Report, potential TCE source areas were identified adjacent to the storm sewer system 002 and 007 outfall piping. This Hydrogeologic Evaluation report presents data required by the Consent Order. To develop the necessary data, a specific approach was outlined:

Existing published information on the local ground water, geologic, and soil regime was reviewed to develop an initial assessment of stratigraphy, regional ground-water flow direction, soil permeability, and rock permeability. Well installation details for the existing five monitoring wells were reviewed to assess their suitability for ground-water monitoring, to develop an understanding of the character of the soils underlying the site, to determine the depth to the water table, and to estimate ground-water flow direction.

The existing five monitoring wells were approximately located along a straight line. The three new wells, therefore, were installed at the two corners and the eastern edge of the site so that a more representative ground-water flow direction could be characterized. In-situ permeability testing was conducted in the three new monitoring wells to obtain hydraulic conductivity values. These values were to be used in the calculation of average ground-water flow rate. Ground-water elevations in all existing and new monitoring wells were obtained on two dates to develop a ground-water elevation contour map. The ground-water elevation contour map was used to evaluate the average ground-water flow direction across the site and to obtain a value of average hydraulic gradient to be used in the ground-water flow rate calculation.

Two soil borings in the potential TCE source areas were sampled at 5-foot intervals. Analyses of the soil samples were conducted to characterize the potential source areas.

Ground-water samples from all existing and new monitoring wells were analyzed to characterize the effect of the potential source areas on ground water.

# Section 2

## SECTION 2 - INVESTIGATION PROCEDURES

### 2.1 General

This section describes the field and laboratory procedures used for the hydrogeologic investigation, the drilling of two borings to obtain the soil sampling for analyses from the two potential source areas, and the sampling and analyses of site ground water.

### 2.2 Hydrogeologic Evaluation

Five existing monitoring wells, MW-1, MW-3S, MW-3D, MW-5, and MW-6, were used in this evaluation (see Figure 3 for locations). The installation details for these monitoring wells were reviewed to identify the depth of the well screen, the formation screened, and the location of the monitoring wells (Dames & Moore, 1986, 1987, 1987).

Four of these monitoring wells, MW-1, MW-3S, MW-5, and MW-6, are screened near the top of the water table. MW-3D is screened approximately 15-to 20-feet below the water table. MW-1 is the most upgradient monitoring well. MW-3S and MW-3D are located within PSA-1. MW-5 is located at the northwest corner of the site and is the farthest downgradient monitoring well. The remaining monitoring well, MW-6, is located approximately halfway between MW-3S and MW-5 (see Figure 3). Boring logs for these monitoring wells are presented in Appendix B. The monitoring well construction details are summarized on Table 1.

To provide additional data for the hydrogeologic evaluation, three new monitoring wells were installed to supplement the existing five monitoring wells. Hydraulic conductivity tests were performed in the three new monitoring wells, and water levels were obtained on two occasions from all eight wells in order to obtain parameters for estimating the average ground-water flow rate and direction.

Three monitoring wells, MW-7, MW-8, and MW-9, were installed by Parratt-Wolff, Inc., East Syracuse, New York, from October 11 to October 12, 1990. The three new wells were located as shown in the site map in Figure 3. MW-7 was installed as a downgradient well at the northeast corner of the site. MW-8 was installed at the eastern edge of the site, while MW-9 was placed towards the southwestern corner of the site. These locations were chosen to better evaluate average ground-water levels across the entire site. All three new monitoring wells were screened at the top of the uppermost water bearing unit (lacustrine silt and silty sand).

The three monitoring wells were constructed with 2-inch diameter, 10-foot long, stainless steel 0.01-inch slot screen and stainless steel riser. A detailed discussion of and protocols for the installation and development of the new monitoring wells are presented in appendices C and D. The monitoring well construction details are presented in Appendix B and summarized on Table 1.

Soil samples were collected at each monitoring well location to characterize the subsurface conditions. Each soil sample was also screened for total organic vapors using a photoionization meter (HNU). In addition, two soil samples from the screened interval of each newly installed monitoring well were collected for gradation analysis. All soil samples were collected in accordance with the protocols in Appendix E.

The visual characterization of soils and HNU screening are presented on the Subsurface and Well Construction Logs in Appendix B. Gradation curves are presented in Appendix F. Subsurface characteristics are discussed in Section 3.2.

In-situ hydraulic conductivity tests were performed in MW-7, MW-8, and MW-9 to obtain hydraulic conductivity values for estimating the average rate of ground-water flow at the site. The in-situ permeability tests were conducted consistent with the procedures provided in Appendix G. A discussion of the analytic methodology and the calculations are presented in Appendix H. The hydrogeology of the site is discussed in Section 3.3.

Two complete rounds of ground-water level measurements were taken by Blasland & Bouck personnel in all eight wells on October 15, 1990, and November 16, 1990. These data were obtained to evaluate the average ground-water flow direction and hydraulic gradient for the site. The well survey elevation data and ground-water elevation data are provided in Table 2. A discussion of site hydrogeology is presented in Section 3.3.

## 2.3 Soil Boring Sampling and Analysis

On October 15, 1990, two soil borings, B-1 and B-2, were completed by Parratt-Wolff, Inc. The approximate location of these borings is shown on Figure 3. The borings were drilled to characterize the subsurface conditions at the two potential source areas. B-1 was placed within potential source area PSA-1, and B-2 was placed in potential source area PSA-2.

The criteria used to terminate the borings was in accordance with Section II.A.(2) of the consent order, which states that the boring would be terminated when one of the following was first encountered:

- the bottom of the contaminated zone (as defined with a photoionization meter (HNU));

- o a confining layer; or
- o to fifty feet.

Soil boring B-1 encountered a confining layer of silty sand till (the lower confining layer) and was terminated at 50.9 feet. Soil boring B-2 encountered a local confining layer of lacustrine silty clay and was terminated at 22 feet. Upon completion, the borings were grouted with neat Portland cement to the ground surface.

The soil borings were sampled at five-foot intervals and whenever a significant change in stratigraphy was encountered. The soil samples were collected consistent with the protocols in Appendix E.

The subsurface soil characteristics and HNU measurements are recorded on the Subsurface Logs in Appendix B.

Thirteen soil samples were collected from soil boring B-1 and five soil samples were collected from soil boring B-2 for chemical analyses. One blind duplicate from soil boring B-1, designated B-3 from the 25-to 27-foot interval, was also collected.

The soil samples were submitted to Upstate Laboratories, Inc., Syracuse, New York, for analyses of the following parameters using the following methodologies:

| Parameter | Methodologies |
|---|---|
| Volatile Organics | EPA Method 8240 |
| EP toxicity for lead, selenium, total chromium, hexavalent chrome, manganese, and sodium; | EPA Method 1310, 303A and 304 |
| Phenols | EPA Method 420.1 |
| PCBs | EPA Method 8080 |

One aqueous trip blank accompanied the samples and was analyzed for volatile organics only. The laboratory reports for soils analyses are contained in Appendix I. Summaries of the soils analyses are presented on Tables 3A, 3B, 4A, and 4B. The soil analytical results are discussed in Section 3.4.

## 2.4 Ground-Water Sampling and Analysis

Ground-water samples were collected on November 16, 1990, by Blasland & Bouck from all eight monitoring wells; MW-1, MW-3s, MW-3d, MW-5, MW-6, MW-7, MW-8, and MW-9. Two blind duplicate samples were taken; one at MW-3s designated as sample MW-11, and another from MW-1 designated as sample MW-10. Ground-water samples were obtained in accordance with the methodology and protocols in Appendix J.

The ground-water samples were analyzed by Advanced Environmental Services, Inc., Niagara Falls, New York, for the following parameters using the following methodologies:

| Parameter | Methodologies |
|---|---|
| PCBs | EPA Method 608 |
| Volatile Organics | EPA Method 624 |
| Total and Soluble Metals | EPA Methods 7191, 7421, 7460, 7740, and 9066 |
| Phenols | SW846 9066 |

Laboratory reports for the ground-water analyses are contained in Appendix K. Summaries of ground-water analytical results are presented on Tables 5, 6, and 7. The results of the ground-water sampling are presented in Section 3.5.

# Section 3

# SECTION 3 - PRESENTATION OF DATA

## 3.1 General

This section presents a discussion of the local ground water and soil regime at the Carrier site. The analytical results from the soil boring and ground-water sampling programs are also discussed. Finally, this section presents a data summary of the hydrogeologic evaluation based on the information presented in this report.

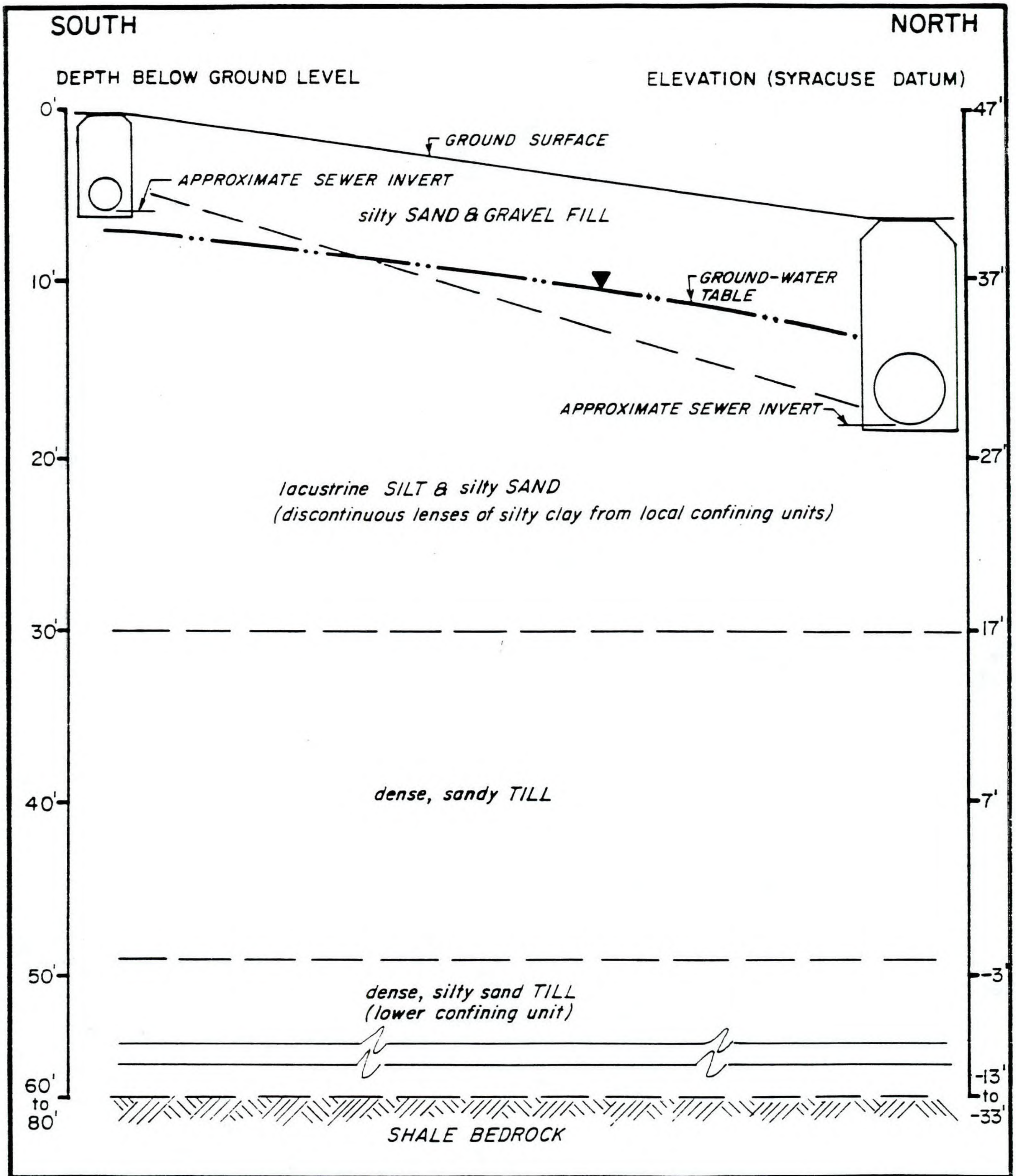
## 3.2 Local Geology

The geology beneath the Carrier site consists of fill and unconsolidated deposits overlying shale bedrock. The unconsolidated deposits consist of lacustrine silt and silty sand, sandy till, and silty sand till. (See Generalized Cross Section on the following page).

The fill is comprised of silty sand and gravel. The fill is generally about 5-feet thick but increases in thickness towards the north to approximately 10-feet (the vicinity of monitoring wells MW-7 and MW-5).

Underlying the fill is a lacustrine (lake deposited) unit consisting mainly of silt and silty sand with discontinuous lenses of sand and varved silty clay. The thickness of this unit may vary beneath the site; however, based on soil boring B-1, we believe that the thickness of this unit is approximately 25-feet thick (see the Subsurface Log in Appendix B).

Underlying the lacustrine silt and silty sand unit is a sandy till unit comprised of fine to coarse sand with traces of rounded pebbles. This unit is approximately 30-feet thick. Underlying this sandy till is a silty sand till comprised of silt and fine to coarse sand with traces of gravel. This silty



# GENERALIZED CROSS-SECTION

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sand till appears to be a confining layer based on the high silt content, high density, and low apparent moisture content observed in soil boring B-1.

Red shale bedrock (Vernon Shale) underlies the silty sand till. Based on published information, the top of bedrock is 60-to 80-feet below ground level. The Vernon Shale is estimated to range between 500-to 600-feet thick and is reported to be almost impermeable to water. (Soil Conservation Service, 1969; Winkley, 1986).

## 3.3 Hydrogeology

Regionally, the unconsolidated units beneath the site do not readily yield ground water. According to Kantrowitz (1970), the lacustrine silt and silty sand unit underlying the fill unit has a yield of 0.1 and 0.5 gallons per minute (GPM). The till units underlying the silt and clay generally have the same magnitude of ground-water yield ranging between 0.1 and 2.0 GPM. No major unconsolidated or bedrock aquifers are known to be present within a three-mile radius of the site.

Sanders Creek borders the site on the north and is a tributary to Ley Creek which discharges directly into Onondaga Lake. The site surface drainage discharges into Sanders Creek. Regional surface-water drainage flows toward the west-northwest into Onondaga Lake.

In general, the depth to the water table is about seven feet. The upper most water-bearing unit is, therefore, the lacustrine silt and silty sand unit which may include the lower 1 to 3 feet of fill. The lacustrine silt and silty sand contains discontinuous layers of clay and silty clay, such as was found at boring B-2, that act as local confining units. The sandy till is also a water-bearing unit, but the silty till appears to be a lower confining layer.

Based upon available literature, the bedrock below the silty till does not appear to be an important water-bearing unit.

Ground-water elevation contours shown on the site map (approximate scale 1 inch = 250 feet) in Figure 4 were constructed using the November 16, 1990, water level data from the eight monitoring wells (the data for October 15, 1990 were very similar). The average ground-water flow direction is north-northwest toward Sanders Creek. The ground-water elevations obtained from monitoring wells located in the center of the site are strongly influenced by drainage into the extensive underground storm-water systems. For example, the ground-water elevations measured in MW-8 in October and in November 1990 appear to be 2- to 3-feet below the expected ground-water elevation (Table 2). Therefore, the ground-water elevation contours in Figure 4 were inferred in the vicinity of MW-8.

Monitoring wells MW-7, MW-8, and MW-9 were screened in the lacustrine silt and silty sand unit. The in-situ permeability test results from MW-7, MW-8, and MW-9 were used to determine the average hydraulic conductivity of that unit. Those hydraulic conductivities were: MW-7, 4.3 feet/day; MW-8, 0.3 feet/day and MW-9, 1.9 feet/day.

An average hydraulic gradient of 0.003 was calculated from the ground-water contours plotted for November 16, 1990. Average ground-water flow velocities for the site are estimated to range from 2 to 23 feet per year. These values are calculated using the formula $V_{feet/year} = 365.25\ K_{feet/day}\ i/ne$, where:

V = average ground-water velocity (feet/year)

K = hydraulic conductivity (feet/day)

i = hydraulic gradient (unitless)

ne = effective porosity

and an estimated effective porosity of 0.2, the range 0.3 feet/day to 4.3 feet/day of hydraulic conductivity values, and the average hydraulic gradient of 0.003.

## 3.4 Soil Analytical Results

A total of 19 soil samples from borings B-1 and B-2 were analyzed for PCBs, total phenols, metals (hexavalent chromium, total chromium, EP Toxicity lead, EP Toxicity selenium, total manganese, and total sodium), and volatile organic compounds. Fourteen soil samples were submitted from B-1, and five soil samples were submitted from B-2. B-3 was a blind duplicate of the 25 to 27 feet sample from B-1.

No PCBs were detected in any of the soil samples (detection limit 2 mg/kg). Total phenols were not detected above the detection limit of 0.5 mg/kg in soil boring B-2. Total phenols were detected in B-1; 1.4 mg/kg at 20-to 22-feet and 50-to 51-feet below grade (Table 3A). All metal results were considered to be within background concentrations. A summary of the metals detected from B-1 and B-2 are provided in Tables 3A and 3B.

Volatile organic compounds were detected at both boring locations (see Tables 4A and 4B). Boring B-1 was drilled at PSA-1 to a depth of 50.9 feet. Acetone was found in two samples (5-to 7-feet at 3200 ppb, 16-to 17-feet at 1300 ppb). Acetone is not a compound known to be currently or previously used at the site. Trichloroethylene was found in a single soil sample (45 to 46 feet at 770 ppb). No organic compounds were detected in the lowest confining unit (silty sand till 50-feet below grade) at this location. B-2 was drilled at PSA-2 to a depth of 22 feet. Vinyl chloride was found at two depths (89 ppb at 15 to 17 feet and 200 ppb at 20 to 22 feet). The compounds 1,1 dichloroethane (130 ppb) and 1,1,1-trichloroethane (33 ppb) were detected in the soil sample from the local clay confining unit at 20 to 22 feet.

## 3.5 Ground-Water Analytical Results

A total of 10 ground-water samples were analyzed for PCBs, phenols, total and soluble metals, and volatile organic compounds. Ground-water samples were collected from each of the three new monitoring wells and the five existing monitoring wells. One blind duplicate sample identified as MW-10 was collected from MW-1, and a second blind duplicate sample identified as MW-11 was collected from MW-3S. The laboratory results are provided in Appendix K.

No PCBs were detected in any of the ground-water samples. As shown on Table 5, phenols were detected in concentrations only slightly above the detection limit of 0.002 mg/l. While the total metals in MW-5 and MW-9 were slightly elevated compared to the other monitoring wells, the soluble metals were at or below the quantifiable detection limits, indicating that the total metals are associated with the native soils. A summary of the metals analysis is provided in Table 6.

A summary of volatile organic analyses is presented in Table 7. Volatile organic compounds were detected above the method detection limit of 1 ppb to 2 ppb in MW-3S and MW-9. MW-3S was located at potential source PSA-1 and was screened across the water table. Nine halogenated volatile organic compounds and one non-halogenated organic compound (toluene) were detected at MW-3S in concentrations ranging from 6.4 ppb (trans-1,2-dichlorethane) to 1600 ppb (vinyl chloride). MW-9 was screened across the water table in the southwest quadrant of the site. Five halogenated organic compounds were detected at MW-9 in concentrations ranging from 1.6 ppb (1,2-dichloroethane) to 8.8 ppb (1,1,1-trichloroethane). Volatile organic compounds were not detected in ground water at any other location, including the two downgradient wells (MW-5 and MW-7).

## 3.6 Data Summary

Halogenated volatile organic compounds were found in soils from both borings B-1 and B-2. In B-1, those compounds were found in soils approximately 39-feet below the water table and just above, but not in, the silty sand till confining unit. In B-2, those compounds were found in soils approximately 9-feet below the water table and at a local confining unit (gray-brown clay) 13-feet below the water table. Halogenated volatile organic compounds were also found in MW-3S, screened 0-to 9-feet below the water table, but not in MW-3D located adjacent to MW-3S and screened 22- to 27-feet below the water table. Low levels of these compounds were found only at one other location, MW-9. These compounds were not detected in ground water at any of the other six monitoring wells, including the farthest upgradient (MW-1) and the two downgradient (MW-5, MW-7) monitoring wells.

In B-1, acetone was found in soils at a depth of 5 to 7 feet and 16 to 17 feet, or at 10-feet below the water table. The source of the acetone is not known; acetone is not a compound known to be currently or previously used at the site, nor was acetone used for decontaminating the sampling equipment.

The ground-water flow system at the site is a shallow flow system in a silt and silty sand water bearing unit, bounded above by the water table at a depth of 7 feet and below by a silty sand till confining unit at a depth of approximately 50 feet. Discontinuous layers of clay and silty clay within the water bearing unit form localized confining units. Because of the strong stratification within the water bearing unit, horizontal ground-water flow predominates over vertical ground-water flow. The silty sand confining unit is approximately 10-to 20-feet thick and underlain by low-permeable red shale.

The average ground-water flow is towards the north-north west (towards Sanders Creek), and approximately parallels the topography and presumed regional flow direction. The ground-water flow rate is very slow, 2-to 23-feet per year, because of both the shallow hydraulic gradient (0.003) and the low hydraulic conductivity (0.3 to 4.3 ft/day) of the water bearing unit.

An extensive system of storm sewers underlies the site. Those sewers are located at and up to approximately 6-feet below the water table. Anomalously depressed water levels in some monitoring wells indicate that these sewers locally intercept shallow ground-water flow. The potential source areas, therefore, are generally confined by the geology at the site and are greatly influenced by the storm sewer system.

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# Tables

## Table 1

### Monitoring Well Construction Details
### Carrier Corporation
### Syracuse, New York

| Well No. | Well Depth (feet) | Type of Well Construction | Well Diameter (inch) | Type of Filter Pack | Screen Interval Elevation (feet) | Screen Length (feet) | Screen Slot Size (inch) | Filter Pack Elevation (feet) | Bentonite Seal Elevation (feet) | Grout Interval Elevation (feet) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 13.8 | PVC | 2 | NA | 43.2-33.2 | 10 | .01 | NA | NA | NA | locked, above grade protective steel casing |
| MW-3s | 13.9 | PVC | 2 | NA | 37.5-27.5 | 10 | .01 | NA | NA | NA | locked, above grade protective steel casing |
| MW-3d | 27.0 | PVC | 2 | NA | 19.5-14.5 | 5 | .01 | NA | NA | NA | locked, above grade protective steel casing |
| MW-5 | 15.2 | PVC | 2 | NA | 28.2-18.2 | 10 | .01 | NA | NA | NA | locked, above grade protective steel casing |
| MW-6 | 15.2 | PVC | 2 | NA | 37.4-27.4 | 10 | .01 | NA | NA | NA | locked, above grade protective steel casing |
| MW-7 | 15 | SS | 2 | grade 0 | 36.6-26.6 | 10 | .01 | 38.1-24.6 | 38.6-38.1 | 41.6-38.6 | locked, flushmount protective casing |
| MW-8 | 15 | SS | 2 | grade 0 | 37.9-27.9 | 10 | .01 | 39.4-22.2 | 39.9-39.4 | 42.9-39.9 | locked, flushmount protective casing |
| MW-9 | 15.2 | SS | 2 | grade 0 | 38.2-28.2 | 10 | .01 | 39.7-21.2 | 40.2-39.7 | 43.2-40.2 | locked, above grade protective steel casing |

Notes:

1. NA = not available
2. All elevations are in feet and referenced to the City of Syracuse Datum.
3. All wells are screened in the lacustrine silt and silty sand unit.
4. See Table 2 for ground and casing elevations.

# TABLE 2

# GROUND-WATER ELEVATIONS
CARRIER CORPORATION
SYRACUSE, NEW YORK

| Monitoring Well No. | Ground Elevation | Protective Casing Elevation | Monitoring Well Elevation | Ground-Water Elevations 10/15/90 | 11/16/90 |
|---|---|---|---|---|---|
| MW-1 | 47.00 | 49.46 | 49.44 | 40.44 | 40.45 |
| MW-3s | 41.53 | 44.38 | 43.13 | 36.78 | 36.82 |
| MW-3d | 41.55 | 44.50 | 44.23 | 36.00 | 36.59 |
| MW-5 | 33.40 | 35.91 | 35.70 | 32.88 | 33.02 |
| MW-6 | 42.60 | 45.04 | 44.80 | 33.62 | 33.78 |
| MW-7 | 41.60 | 41.57 | 41.40 | 35.20 | 34.98 |
| MW-8 | 42.90 | 42.87 | 42.59 | 36.45 | 35.83 |
| MW-9 | 43.20 | 44.94 | 44.79 | 38.22 | 37.88 |

NOTES:
1) All elevations are in feet and referenced to the City of Syracuse Datum.
2) Survey of ground elevation, protective casing elevation, and monitoring well elevation performed by Phillips & Associates, Surveyors, P.C., Syracuse, New York.
3) Ground-water elevation measurements taken by Blasland & Bouck, Engineers, P.C.

# TABLE 3A
# SUMMARY OF SUBSURFACE SOILS ANALYTICAL RESULTS
# INORGANICS
# CARRIER CORPORATION
# SYRACUSE, NEW YORK

## SOIL BORING B-1

| Soil Depth Interval (feet) | Total Phenols (mg/kg) | Hexavalent Chromium (mg/kg) | Total Chromium (mg/kg) | EP Toxicity Lead (mg/l) | Total Manganese (mg/kg) | EP Toxicity Selenium (mg/l) | Total Sodium (mg/kg) |
|---|---|---|---|---|---|---|---|
| 1 to 3 | <0.5 | <1 | 13 | <0.1 | 300 | <0.001 | 300 |
| 5 to 7 | <1 | <1 | 5.4 | <0.1 | 220 | 0.001 | 210 |
| 10 to 11 | <0.5 | <1 | 3.4 | <0.1 | 200 | 0.001 | 180 |
| 11 to 12 | <0.5 | <1 | 4.2 | <0.1 | 180 | <0.001 | 160 |
| 15 to 16 | <0.5 | <1 | 7.6 | <0.1 | 180 | <0.001 | 180 |
| 16 to 17 | <0.5 | <1 | 5.2 | <0.1 | 250 | 0.003 | 150 |
| 20 to 22 | 1.4 | <1 | 6.5 | <0.1 | 240 | <0.001 | 200 |
| 25 to 27 | <0.5 | <1 | 6.1 | <0.1 | 150 | 0.002 | 160 |
| 25 to 27 Dup. (B-3, 25 to 27) | <0.5 | <1 | 7.9 | <0.1 | 400 | 0.004 | 170 |
| 30 to 32 | <0.5 | <1 | 4.1 | <0.1 | 230 | <0.001 | 150 |
| 35 to 36 | <0.5 | <1 | 15 | <0.1 | 360 | <0.001 | 150 |
| 40 to 42 | <0.5 | <1 | 11 | <0.1 | 290 | 0.001 | 160 |
| 45 to 47 | <0.5 | <1 | 6.2 | <0.1 | 140 | 0.004 | 99 |
| 50 to 51 | 1.7 | <1 | 13 | <0.1 | 350 | 0.001 | 280 |

NOTES:

1) < - less than detection limit.
2) Soil boring B-1 terminated at 51 feet.
3) The blind duplicate sent to laboratory labeled B-3, 25 to 27 feet, was a duplicate soil sample obtained from B-1 at the 25 to 27 foot interval.
4) Soil boring samples collected by Blasland & Bouck Engineers, P.C. on October 15, 1990.
5) Analyses performed by Upstate Laboratories, Inc., Syracuse, New York.

# TABLE 3B
# SUMMARY OF SUBSURFACE SOILS ANALYTICAL RESULTS
# INORGANICS
# CARRIER CORPORATION
# SYRACUSE, NEW YORK

## SOIL BORING B-2

| Soil Depth Interval (feet) | Total Phenols (mg/kg) | Hexavalent Chromium (mg/kg) | Total Chromium (mg/kg) | EP Toxicity Lead (mg/l) | Total Manganese (mg/kg) | EP Toxicity Selenium (mg/l) | Total Sodium (mg/kg) |
|---|---|---|---|---|---|---|---|
| 0 to 2 | <0.5 | <1 | 12 | <0.1 | 510 | <0.001 | 350 |
| 5 to 7 | <0.5 | <1 | 13 | <0.1 | 340 | 0.003 | 290 |
| 10 to 12 | <0.5 | <1 | 15 | <0.1 | 300 | <0.001 | 330 |
| 15 to 17 | <0.5 | <1 | 13 | <0.1 | 310 | 0.002 | 370 |
| 20 to 22 | <0.5 | <1 | 8.7 | <0.1 | 220 | <0.001 | 270 |

NOTES:

1) < - less than detection limit.
2) Soil boring B-2 terminated at 22 feet at confining clay layer.
3) Soil boring samples collected by Blasland & Bouck Engineers, P.C. on October 15, 1990.
4) Analyses performed by Upstate Laboratories, Inc., Syracuse, New York.

## TABLE 4A
## SUMMARY OF SUBSURFACE SOILS ANALYTICAL RESULTS
## VOLATILE ORGANIC COMPOUNDS
## CARRIER CORPORATION
## SYRACUSE, NEW YORK

### SOIL BORING B-1

| Soil Depth Interval (feet) | Acetone (ppb) | Vinyl Chloride (ppb) | 1,1-Dichloroethane (ppb) | 1,1,1-Trichloroethylene (ppb) | Trichloroethylene (ppb) | Total Volatile Organic Compounds (ppb) | HNU Measurement (ppm) |
|---|---|---|---|---|---|---|---|
| 1 to 3 | <100 | <30 | <30 | <30 | <30 | <100 | 2 |
| 5 to 7 | 3,200 | <30 | <30 | <30 | <30 | 3,200 | 1 |
| 10 to 11 | <100 | <30 | <30 | <30 | <30 | <100 | 1.8 |
| 11 to 12 | <100 | <30 | <30 | <30 | <30 | <100 | 13 |
| 15 to 16 | <100 | <30 | <30 | <30 | <30 | <100 | 60 |
| 16 to 17 | 1,300 | <30 | <30 | <30 | <30 | 1,300 | 12 |
| 20 to 22 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| 25 to 27 | <100 | <30 | <30 | <30 | <30 | <100 | 0.2 |
| 25 to 27 Dup. (B-3 25 to 27) | <100 | <30 | <30 | <30 | <30 | <100 | 0.2 |
| 30 to 32 | <100 | <30 | <30 | <30 | <30 | <100 | 1 |
| 35 to 36 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| 40 to 42 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| 45 to 47 | <100 | <30 | <30 | <30 | 770 | 770 | 0.2 |
| 50 to 51 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| Trip Blank | <100 | <30 | <30 | <30 | <30 | <100 | --- |

NOTES:

1) < - less than detection limit.
2) Soil boring terminated at 51 feet.
3) The blind duplicate sent to the laboratory labeled B-3, 25 to 27 feet was a duplicate soil sample obtained from B-1 at the 25 to 27 foot interval.
4) Soil boring samples collected by Blasland & Bouck Engineers, P.C. on October 15, 1990.
5) Analyses for volatile organic compounds (EPA Method 8240) were performed by Upstate Laboratories, Inc., Syracuse, New York. Only compounds found above detection limits are shown. See Appendix I for complete list of compounds.

### TABLE 4B
### SUMMARY OF SUBSURFACE SOILS ANALYTICAL RESULTS
### VOLATILE ORGANIC COMPOUNDS
### CARRIER CORPORATION
### SYRACUSE, NEW YORK

### SOIL BORING B-2

| Soil Depth Interval (feet) | Acetone (ppb) | Vinyl Chloride (ppb) | 1,1-Dichloroethane (ppb) | 1,1,1-Trichloroethane (ppb) | Trichloroethylene (ppb) | Total Volatile Organic Compounds (ppb) | HNU Measurement (ppm) |
|---|---|---|---|---|---|---|---|
| 0 to 2 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| 5 to 7 | <100 | <30 | <30 | <30 | <30 | <100 | <.2 |
| 10 to 12 | <100 | <30 | <30 | <30 | <30 | <100 | 3 |
| 15 to 17 | <100 | 89 | <30 | <30 | <30 | 89 | 2 |
| 20 to 22 | <100 | 200 | 130 | 33 | <30 | 363 | 2 |
| Trip Blank | <100 | <30 | <30 | <30 | <30 | <100 | --- |

NOTES:

1) < - less than detection limit.
2) Soil boring B-2 terminated at 22 feet at confining clay layer.
3) Soil boring samples collected by Blasland & Bouck Engineers, P.C.
4) Analyses for volatile organic compounds (EPA Method 8240) were performed by Upstate Laboratories, Inc., Syracuse, New York. Only compounds found above detection limits are shown. See Appendix I for complete list of compounds.

## Table 5
## Summary of Ground-Water Analytical Results
## Phenols (mg/l or ppm)
## Carrier Corporation
## Syracuse, New York

| Monitoring Well No. | Phenols |
|---|---|
| MW-1 | 0.003 |
| MW-1 (dup)<br>(MW-10) | 0.002 |
| MW-3s | 0.002 |
| MW-3s(dup)<br>(MW-11) | 0.002 |
| MW-3d | 0.003 |
| MW-5 | 0.009 |
| MW-6 | BQL |
| MW-7 | 0.005 |
| MW-8 | 0.002 |
| MW-9 | 0.002 |
| Methods/Laboratory Blank | BQL |
| Detection Limits | 0.002 |

Notes:

1. BQL = below quantifiable detection limits of .002.
2. The blind duplicates sent to laboratory labeled MW-10 and MW-11 were duplicate ground-water samples obtained from monitoring wells MW-1 and MW-3s, respectively.
3. Ground-water sampling conducted by Blasland & Bouck Engineers, P.C. on November 16, 1990.
4. Analyses performed by Advanced Environmental Services, Inc., Niagara Falls, New York.

## Table 6
## Summary of Ground-Water Analytical Results
## Metals (mg/l or ppm)
## Carrier Corporation
## Syracuse, New York

| Monitoring Well No. | Total Chromium | Soluable Chromium | Total Lead | Soluable Lead | Total Manganese | Soluable Manganese | Total Selenium | Soluable Selenium | Total Sodium | Soluable Sodium |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | BQL | BQL | 0.028 | 0.013 | 0.43 | BQL | BQL | BQL | 105.0 | 104.0 |
| MW-1(dup) | 0.008 | BQL | 0.031 | 0.008 | 0.32 | BQL | BQL | BQL | 121.0 | 107.0 |
| MW-3s | 0.033 | BQL | 0.031 | 0.012 | 1.15 | 0.32 | BQL | BQL | 204.0 | 202.0 |
| MW-3s(dup) | 0.016 | BQL | 0.038 | 0.013 | 1.05 | 0.32 | BQL | BQL | 210.0 | 206.0 |
| MW-3d | 0.019 | 0.005 | 0.018 | 0.006 | 0.98 | 0.18 | BQL | BQL | 30.7 | 28.9 |
| MW-5 | 0.440 | BQL | 0.094 | 0.022 | 5.98 | 0.12 | BQL | BQL | 79.4 | 53.1 |
| MW-6 | 0.014 | BQL | 0.022 | BQL | 0.31 | BQL | 0.005 | BQL | 12.4 | 12.4 |
| MW-7 | BQL | BQL | 0.030 | 0.018 | 0.40 | 0.33 | 0.005 | BQL | 74.2 | 66.0 |
| MW-8 | 0.062 | BQL | 0.057 | BQL | 1.50 | 0.11 | 0.006 | 0.006 | 103.0 | 102.0 |
| MW-9 | 0.132 | BQL | 0.083 | 0.005 | 7.35 | BQL | BQL | BQL | 43.6 | 43.6 |
| Quantifiable Detection Limits | 0.005 | 0.005 | 0.005 | 0.005 | 0.01 | 0.01 | 0.005 | 0.005 | 5.0 | 5.0 |

Notes:

1. BQL = below quantifiable detection limits.
2. The blind duplicates sent to laboratory labeled MW-10 and MW-11 were duplicate ground-water samples obtained from monitoring wells MW-1 and MW-3s, respectively.
3. Ground-water sampling conducted by Blasland & Bouck Engineers, P.C. on November 16, 1990.
4. Analyses performed by Advanced Environmental Services, Inc., Niagara Falls, New York.

# TABLE 7
# SUMMARY OF GROUND-WATER ANALYTICAL RESULTS
# VOLATILE ORGANICS (ug/l or ppb)
# CARRIER CORPORATION
# SYRACUSE, NEW YORK

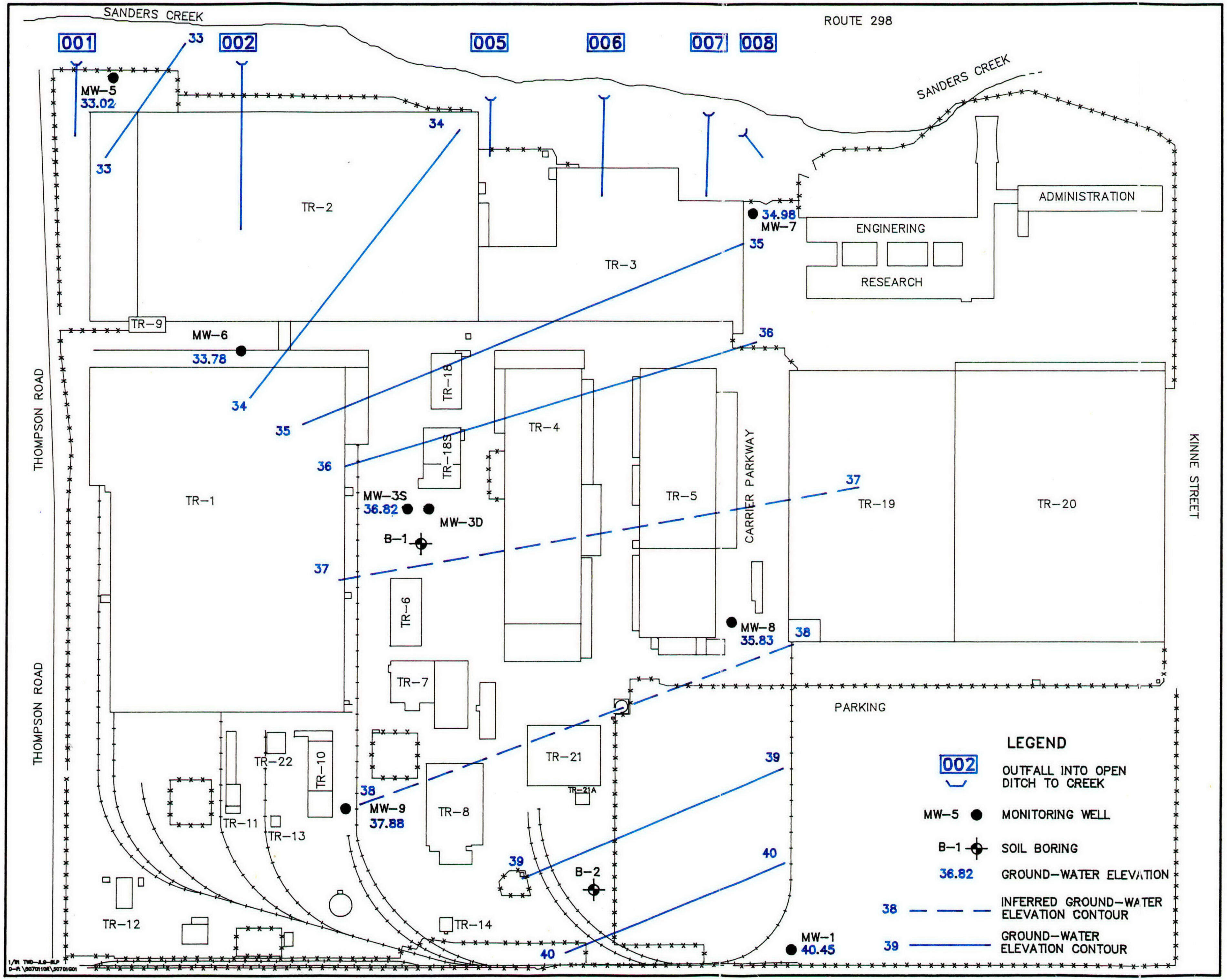
| Monitoring Well No. | Vinyl Chloride | Methylene Chloride | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | trans-1,2-Dichloro-ethylene | 1,2-Dichloro-ethane | 1,1,1-Tri-chloroethane | Trichloro-ethylene | 1,1,2-Tri-chloroethane | Toluene | Total Volatile Organics |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-1 (DUP) | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-3s | 1600.0 | 120.0 | 100.0 | 490.0 | 6.4 | 7.6 | 17.0 | 11.0 | 9.5 | 14.0 | 2375.5 |
| MW-3s (DUP) | 1200.0 | 3.3 | 250.0 | 1100.0 | 12.0 | 12.0 | BQL | 15.0 | 10.0 | 20.0 | 2622.3 |
| MW-3d | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-5 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-6 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-7 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-8 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| MW-9 | BQL | 3.0 | BQL | 2.4 | BQL | 1.6 | 8.8 | 2.8 | BQL | BQL | 18.6 |
| Trip Blank | BQL | 2.8 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | 2.8 |
| Laboratory Method Blank | BQL | 3.5 | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | 3.5 |
| Laboratory Method Blank | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL | BQL |
| Quantifiable Detection Limits | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

NOTES:

1) BQL - below quantifiable detection limits.
2) The blind duplicates sent to laboratory labeled MW-10 and MW-11 were duplicate ground-water samples obtained from monitoring wells MW-1 and MW-3s, respectively.
3) Ground-water sampling conducted by Blasland & Bouck Engineers, P.C. on November 16, 1990.
4) Analyses for volatile organic compounds (EPA Method 624) were performed by Advanced Environmental Services, Inc., Niagara Falls, New York. Only compounds found above detection limits are shown. See Appendix K for complete list of compounds.

# Figures

# FIGURE 4

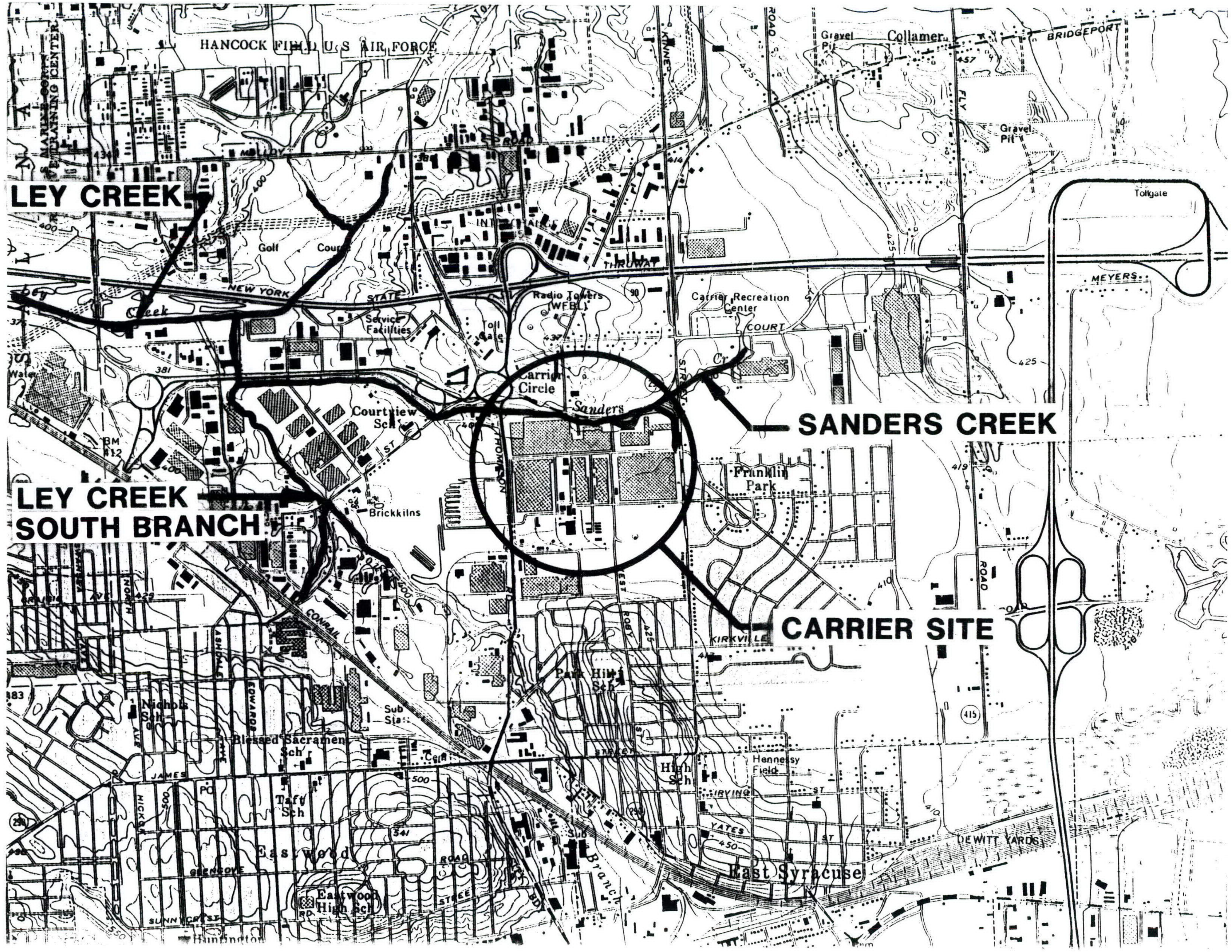


CARRIER CORPORATION
SYRACUSE, NEW YORK

## APPROXIMATE GROUND-WATER ELEVATION CONTOUR MAP

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

# FIGURE 1



SCALE

2000′ 1000′ 0 1000′ 2000′

CARRIER CORPORATION
SYRACUSE, NEW YORK

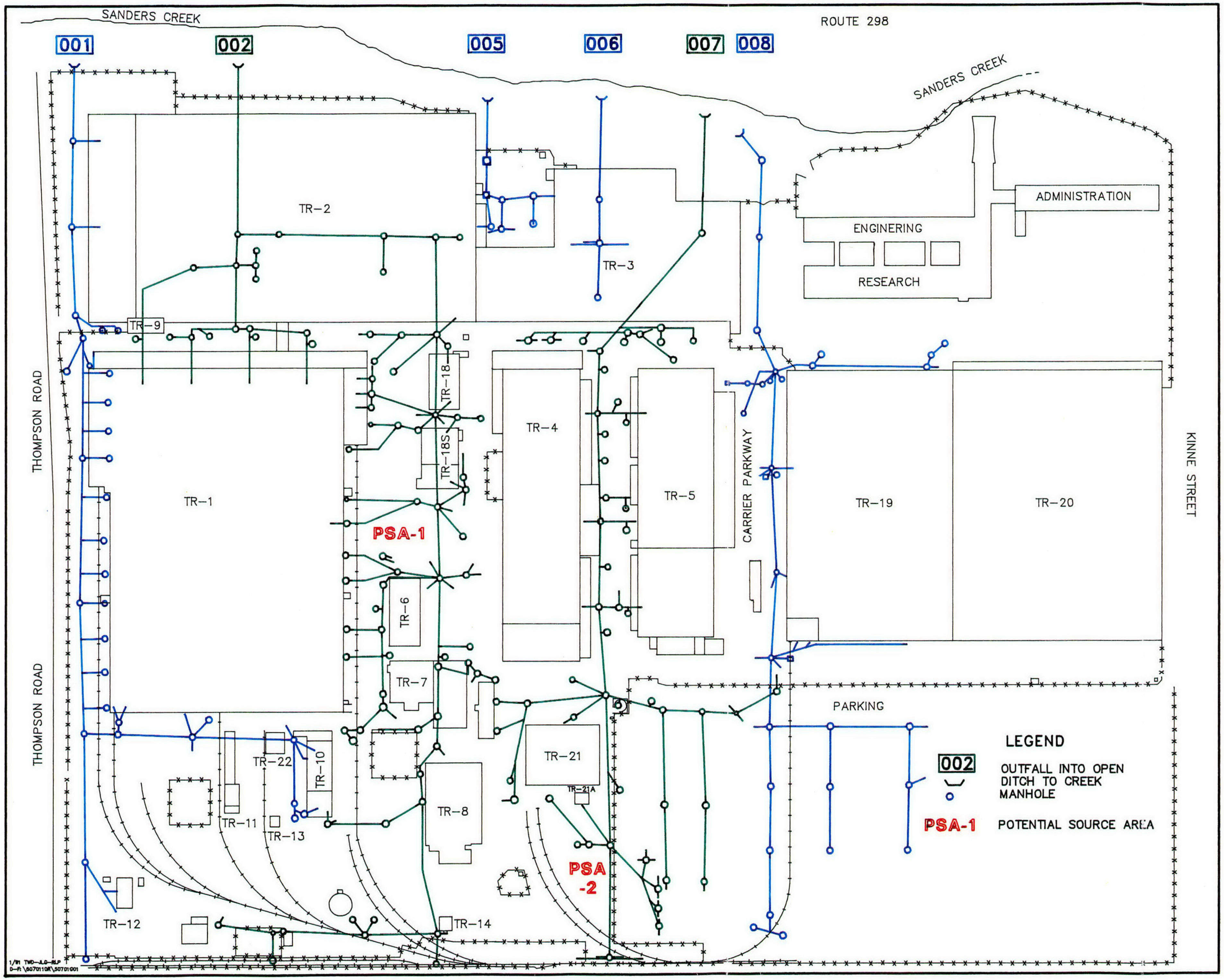
## SITE LOCATION MAP

NOV. 1989
507.01.05

BASE MAP: U.S.G.S. ONONDAGA COUNTY, N.Y. QUADRANGLE

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

FIGURE 2

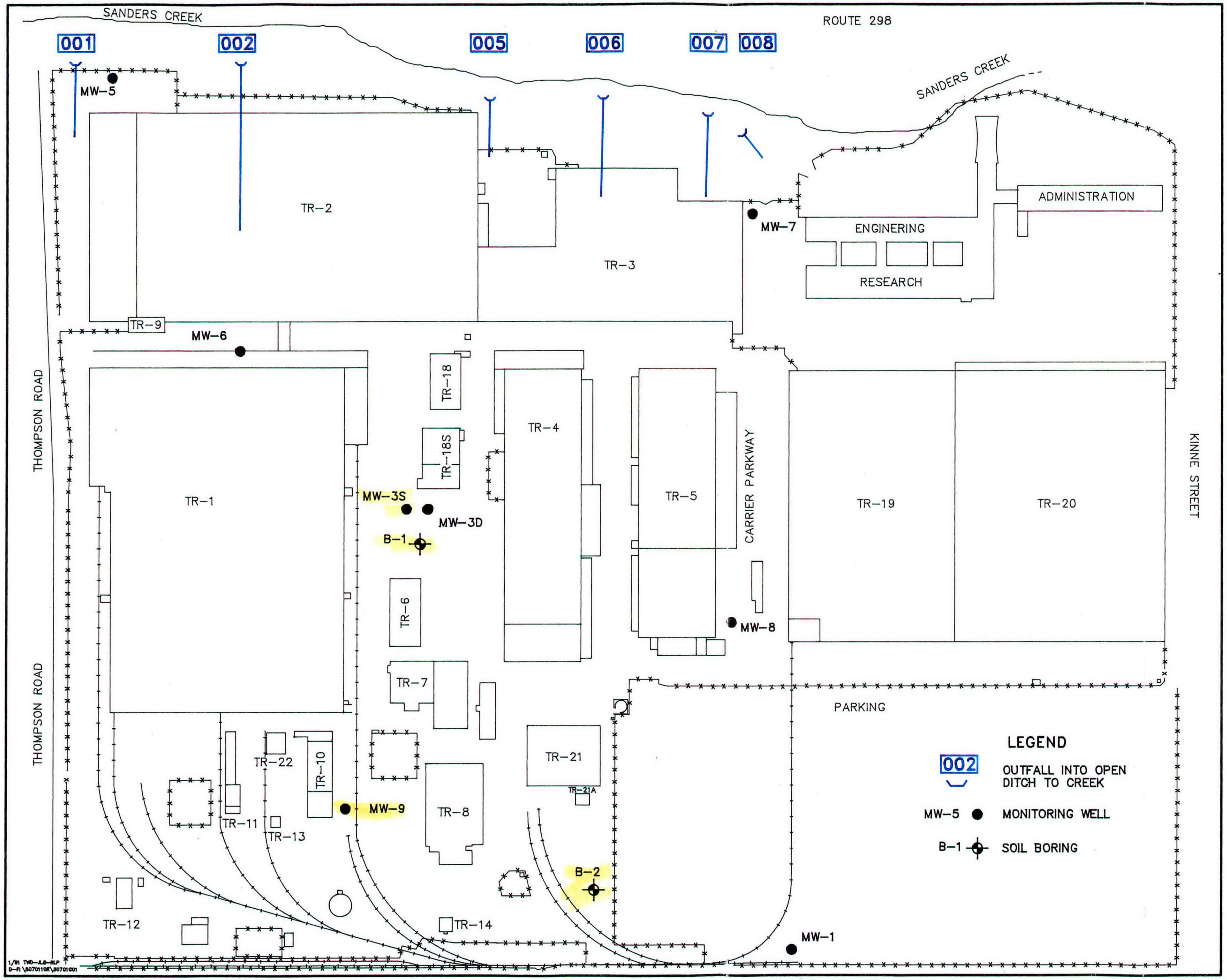


CARRIER CORPORATION
SYRACUSE, NEW YORK

## APPROXIMATE LOCATION OF POTENTIAL SOURCE AREAS

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

# FIGURE 3



CARRIER CORPORATION
SYRACUSE, NEW YORK

## APPROXIMATE MONITORING WELL AND SOIL BORING LOCATION MAP

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

# Appendices

# APPENDIX A

# CONSENT ORDER NO. R7-0486-90-03

(EFFECTIVE OCTOBER 10, 1990)

ENTERED INTO BETWEEN NYSDEC

AND CARRIER CORPORATION

**New York State Department of Environmental Conservation**
**615 Erie Blvd. W., Syracuse, NY 13204-2400**
Region 7 Headquarters
(315) 426-7400

**Thomas C. Jorling**
**Commissioner**

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

October 9, 1990

Richard M. Whiston, Esq.
Vice President and General Counsel
Carrier Corporation
426 Colt Highway
Farmington, Connecticut 06032

Mr. Jess R. Walrath, Jr.
Manager, Environmental Assurance
Carrier Corporation
Carrier Parkway
P.O. Box 4808
Syracuse, New York 13221

RE: DEC v. CARRIER CORPORATION
CASE NO. R7-0486-90-03

Gentlemen:

Enclosed to each of you please find a conformed copy of the Consent Order in the above referenced matter which has been executed by the Regional Director on behalf of the Department.

If you have any questions, please advise.

Very truly yours,

William F. Gallagher

William F. Gallagher
Assistant Regional Attorney

WFG/dlb
Enc.
cc w/enc: Richard Bianchi, Jr., Carrier Corporation
Bond, Schoeneck & King
Attn: H. Dean Heberlig, Jr./Virginia C. Robbins
Leland Flocke, NYSDEC, Syracuse
Steven Eidt, NYSDEC, Syracuse
Frank Bifera, NYSDEC, Albany

**STATE OF NEW YORK**
**DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

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**In the Matter of Alleged Violations of Environmental Conservation Law (ECL) Article 17 and of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Parts 750 to 757, by**

**Carrier Corporation**
**Dewitt (T)**
**Onondaga County, New York,**

**Respondent.**

**CONSENT ORDER**
**Case No.**
**R7-0486-90-03**

---

1. The New York State Department of Environmental Conservation (the Department) is responsible for the administration and enforcement of Article 17 of the Environmental Conservation Law (ECL), and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Parts 750 to 757 promulgated thereunder.

2. The making or use of outlets or point sources discharging into the waters of the State and the operation or construction of disposal systems are regulated by State Pollutant Discharge Elimination System (SPDES) permits issued by the Department pursuant to ECL Article 17, Titles 7 and 8, and 6 NYCRR Parts 750 to 757.

3. Section 17-0803 of the ECL and 6 NYCRR Section 751.1(a) prohibit persons from discharging pollutants into the waters of the State except in conformance with a SPDES permit issued by the Department.

4. Respondent, Carrier Corporation, is a Delaware corporation duly authorized to do business in New York, with offices and manufacturing facilities at Thompson Road, in the Town of Dewitt, Onondaga County, New York (the Facility).

5. On August 1, 1989, the Department issued to Respondent SPDES permit no. NY-0001163 for the Facility, which authorized discharges through outlets or point sources specifically numbered as Outfalls at the Facility into the waters of the State.

6. 6 NYCRR Part 754 specifies provisions to be included in issued SPDES permits, including effluent standards and limitations and other requirements.

7. Respondent's SPDES permit, having an effective date of August 1, 1989, as modified by the Department on January 30, 1990, specifies effluent limitations for, among other parameters, Trichloroethylene for discharges at specified Outfalls at the Facility, numbered 002 and 007.

8. Respondent's SPDES permit also specifies certain action level requirements for, among other parameters, Trichloroethylene, 1,1,1-Trichloroethane and Vinyl Chloride for discharges at specified Outfalls at the Facility, numbered 001, 002, 005, 006, and/or 008.

9. The Department has determined that:

(a) based upon a review of Respondent's Discharge Monitoring Reports for the period September 1989 through August 1990, Respondent's Facility, for some reporting periods, exceeded its SPDES permit effluent limitations for Trichloroethylene at specified Outfalls at the Facility; and

(b) based upon a review of Respondent's Discharge Monitoring Reports, Respondent's Facility exceeded its SPDES permit action level requirements for Trichloroethylene and 1,1,1-Trichloroethane for the first quarter of 1990 and for Trichloroethylene, 1,1,1-Trichloroethane and Vinyl Chloride for the second quarter of 1990 at specified Outfalls at the Facility.

10. The Department and Respondent acknowledge that this is an administrative Order issued by the Department under the authority of Article 17 of the ECL and Title 6 NYCRR Parts 750 to 757 and that the goal of this Order shall be that Respondent investigate the source of the referenced SPDES permit exceedences and evaluate, select, and implement Facility modification(s) and/or treatment alternatives in accordance with the terms of the attached Schedule A, the Schedule for Compliance, in order to achieve compliance with SPDES permit effluent limitations.

11. Without any admission of law or fact, Respondent has affirmatively waived its right to notice and hearing on this matter as provided by law and consents to the issuance and entry of this Order and agrees to be bound by the provisions, terms and conditions contained in it.

**NOW,** having considered this matter and being duly advised, IT IS ORDERED THAT:

I. Compliance. Respondent shall fully comply with the terms, conditions and provisions of the Schedule for Compliance, Schedule A, annexed to and made a part of this Order. The failure of Respondent to comply with any provision of this Order shall constitute a default and a violation of this Order.

II. Interim Limitations and Action Levels. Immediately upon the effective date of this Order and for so long as Respondent complies with the provisions of this Order, the interim effluent limitations and interim action level requirements set forth in paragraph I of Schedule A attached shall be in effect until the effluent limitations specified in Respondent's SPDES permit are achieved in accordance with subparagraph IV.D. of Schedule A. All other effluent limitations and action level requirements in Respondent's SPDES permit shall remain in effect.

III. Penalties.

(a) If Respondent fails to meet a performance date set forth in Schedule A annexed to this Order, Respondent shall pay a penalty to the Department which shall accrue at the rate of $500.00 per day for days 1 through 30 and at the rate of $1,000.00 per day for day 31 and each day thereafter in which such noncompliance continues. It is provided, however, that if Respondent fails to comply with one or more of the following provisions of the Schedule for Compliance, Schedule A annexed, to wit: II.A. (1) -Source Investigation, submittal of storm sewer sampling report within 15 days of the Effective Date; II.B. -

Source Investigation, submittal of Hydrogeologic Evaluation within 90 days of the Effective Date; III.A. Storm Water System Improvements, submittal of SPDES permit modification request within 15 days of the Effective Date; and IV.A. Construction of Treatment System, submittal of the Engineering Report within 120 days of the Effective Date; and such non-compliance consists solely of a failure to make the required submittal by the date or within the time period specified in the Schedule for Compliance, if Respondent makes the required submittal within 30 days thereafter, the penalty accrued by reason of such late submittal shall be waived.

Any penalty under this paragraph shall become due and payable within 30 calendar days after Respondent receives written notice from the Department that it was or is in violation of this Order. If payment is not received by the Department within such 30-day period, Respondent shall pay interest on the penalty at the annual rate set forth under CPLR § 5004 on the overdue amount from the day on which it was due through the date of payment.

(b) Penalties shall be paid to the "New York State Department of Environmental Conservation", at the Office of the Regional Director, 615 Erie Boulevard West, Syracuse, New York 13204-2400, or such other address as may be designated by the Department.

## IV. Other Remedies.

(a) This Order and the contents of this Order shall not be construed as barring or diminishing any of the Department's or the United States Environmental Protection Agency's (EPA) rights, including, but not limited to, the right to seek performance of any activities deemed necessary to obtain remediation and/or corrective action at the Facility, whether pursuant to ECL Article 17 or Article 27, Titles 7, 9 or 13, the Clean Water Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response Compensation, and Liability Act, amendments thereto and reauthorizations thereof, implementing regulations, permit requirements, or any other statutory, regulatory or common law authority available to such agencies, and the right to bring any action at law or in equity against Respondent and/or any other person, party or legal entity with respect to areas or resources that may have been or will be affected or contaminated as a result of the alleged release or migration of hazardous wastes and/or other substances at or from the Facility including, but not limited to claims for the remediation of natural resources, appropriate remedial investigations and claims for natural resources damages. The right is reserved to issue further Orders against the Respondent, consistent with legal authority, if the Department or EPA determines that additional investigations and/or remedial activities, whether on the Facility property or off-site, are required to fully assess and/or remediate any threat to public health and/or the environment.

(b) This Order and the contents of this Order shall not be construed as barring or diminishing the Department's right to take any enforcement action, including the imposition of penalties to which it may be entitled by law for any violations of the ECL, any rules or regulations promulgated thereunder, or any orders, permits or other authorizations issued thereunder, including, in the event Respondent fails to comply with the provisions of this Order, this Order (other than a temporary failure to meet a performance date set forth in Schedule A annexed to this Order for which stipulated penalties are provided in paragraph III(a)) and those violations which are the subject of this Order. So long as Respondent is in compliance with the provisions of this Order, Respondent shall not be subject to any enforcement action with respect to the alleged SPDES violations which are the subject of this Order. Nothing in this Order shall be construed so as to bar or prohibit the Department from utilizing the statements in this Order or the facts underlying it in any subsequent enforcement or other action against the Respondent for any violations not described herein.

(c) Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting Respondent's right to defend against any action or proceeding initiated by the Department pursuant to this paragraph IV or any other action or proceeding.

V. Modification. No change in this Order shall be made or become effective except as specifically set forth by a further written Order of the Department, being made either upon written application to the Department by the Respondent setting forth the grounds for the relief sought, or upon the Department's own findings after an opportunity for the Respondent to be heard, or pursuant to the summary abatement powers of the Department.

VI. Force Majeure. Respondent shall not suffer any penalty under this Order, or be subject to any action or proceeding for any remedy or relief, if it cannot or fails to comply with any requirements of this Order, because of a cause beyond Respondent's control, including but not limited to, the action or omission of a national, state, or local government body, or court, or because of an act of God, including, but not limited to, unseasonable weather conditions, or strike, labor disruptions, or other conditions beyond Respondent's control so long as the proximate cause of the event of force majeure was not the willful misconduct, negligence, or other action or failure to act on the part of Respondent; provided, however, that Respondent shall promptly notify the Department in writing when it obtains knowledge of any such condition and shall request an extension or modification of the provisions hereof.

VII. Written Communications Among the Parties.

(a) All written communications to the Department shall be made to:

New York State Department
of Environmental Conservation
615 Erie Boulevard West
Syracuse, New York 13204-2400

Attn: Steven P. Eidt, P.E.
Associate Sanitary Engineer

(b) All written communications to Respondent shall be made to:

Richard M. Whiston, Esq.
Vice President and General Counsel
Carrier Corporation
426 Colt Highway
Farmington, Connecticut 06032

With a copy to:

Mr. Jess R. Walrath, Jr.
Manager, Environmental Assurance
Carrier Corporation
P.O. Box 4808
Syracuse, New York 13221

(c) Both the Department and Respondent shall have the right to designate substitute names and addresses for receipt of notice upon written notification to the other.

(d) If Respondent mails to the Department any submittal required under this Order, the submittal shall be deemed made as of the date of mailing.

VIII. <u>Effective Date</u>. The effective date of this Order shall be the date that a fully executed copy of this Order is served upon Respondent, in accordance with the CPLR or by certified mail, return receipt requested.

IX. Merger. The provisions set forth in this Order shall constitute the complete and entire Order between Respondent and the Department. No terms, conditions, understandings or agreements purporting to modify or vary the terms of this Order shall be binding unless made in accordance with the terms of this Order.

DATED: Syracuse, New York
Oct. 4, 1990

THOMAS C. JORLING
COMMISSIONER
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION

By: William Krichbaum
William Krichbaum
Regional Director

TO:

Richard M. Whiston, Esq.
Vice President and General Counsel
Carrier Corporation
426 Colt Highway
Farmington, Connecticut 06032

Mr. Jess R. Walrath, Jr.
Manager, Environmental Assurance
Carrier Corporation
Carrier Parkway
P.O. Box 4808
Syracuse, New York 13221

Mr. Richard Bianchi, Jr.
Manager, Plant
Engineering
Carrier Corporation
Carrier Parkway
P.O. Box 4808
Syracuse, New York 13221

Bond, Schoeneck & King
Attorneys for Respondent

One Lincoln Center
Syracuse, New York 13202-1355

Attn: H. Dean Heberlig, Jr., Esq.

**CONSENT BY RESPONDENT**

Respondent hereby consents to the issuing and entering of the foregoing Order without further notice and waives the right to a hearing herein and agrees to be bound by the provisions, terms and conditions contained therein.

CARRIER CORPORATION

BY:

TITLE: Vice President & General Counsel

DATE: 9/28/90

STATE OF ~~NEW YORK~~ Connecticut )
) SS.: Farmington
COUNTY OF ~~ONONDAGA~~ Hartford )

On the 28th day of September in the year 1990, before me personally came Richard M. Whiston to me known, who, being by me duly sworn did depose and say that he/~~she~~ resides in Simsbury, CT ; that he/~~she~~ is the V.P. and Gen. Counsel of CARRIER CORPORATION, the corporation described in and which executed the above instrument; and that he/~~she~~ signed his/~~her~~ name thereto as authorized by the board of directors of said corporation.

Andrea M Quercia
Notary Public

ANDREA M. QUERCIA
*NOTARY PUBLIC*
MY COMMISSION EXPIRES MARCH 31, 1992

# SCHEDULE A
# SCHEDULE FOR COMPLIANCE

## I. INTERIM EFFLUENT LIMITATIONS AND ACTION LEVEL REQUIREMENTS

A. Immediately upon the effective date of the attached Consent Order (the "Effective Date"), Respondent shall comply with the interim effluent limitation for Trichloroethylene set forth below for the referenced SPDES Outfalls until the effluent limitation specified in Respondent's SPDES permit is achieved, in accordance with subparagraph IV.D. of Schedule A:

| | | Discharge Limitation | | Measurement | Sampl |
|---|---|---|---|---|---|
| Effluent Parameter | Outfall Number | Daily Avg. | Daily Max. | Frequency | Type |
| Trichloroethylene | 002 and 007 | N/A | 0.750 mg/l | Monthly | Gra |

B. Immediately upon the Effective Date of the attached Consent Order, Respondent shall comply with the interim action level requirements for Trichloroethylene, 1,1,1-Trichloroethane and Vinyl Chloride set forth below for the referenced SPDES Outfalls until the effluent limitations specified in Respondent's SPDES permit are achieved, in accordance with subparagraph IV.D. of Schedule A:

| Effluent Parameter | Outfall Number | Action Level | Minimum Monitoring Requirements Measurement Frequency | Sample Type |
|---|---|---|---|---|
| Trichloroethylene | 001, 005, 006 and 008 | 0.750 mg/l | Monthly | Grab |
| 1,1,1-Trichloroethane | 002 | 0.035 mg/l | Monthly | Grab |
| Vinyl Chloride | 005 | 0.075 mg/l | Monthly | Grab |

C. The interim effluent limitation for Trichloroethylene and the interim action level requirements for Trichloroethylene, 1,1,1-Trichloroethane and Vinyl Chloride set forth in subparagraphs A and B of this paragraph I shall apply to discharges from Respondent's Outfalls designated in Respondent's existing SPDES permit and as designated after the SPDES permit modification referenced in paragraph III of Schedule A is in effect.

II. SOURCE INVESTIGATION

A. Within 15 days of the Effective Date of the attached Consent Order, Respondent shall:

(1) Submit a storm sewer sampling report to the Department identifying potential source areas impacting storm sewer water quality relative to the Facility; and

(2) Begin a hydrogeologic evaluation (the "Hydrogeologic Evaluation") of Respondent's Thompson Road facility (the "Facility" and/or the "Site") to assess the impact of source

areas identified in the storm sewer sampling report on groundwater. The Hydrogeologic Evaluation shall include:

- Reviewing installation details for all existing Site monitoring wells;
- Installing three additional groundwater monitoring wells and two soil borings, which will be advanced to the bottom of the contaminated zone, a confining layer, or 50 feet, whichever is encountered first. If neither the bottom of the contaminated zone nor a confining layer is encountered, Respondent shall commence additional field activities to install and sample soil borings until one of the foregoing is encountered;
- Sampling of soil borings as follows: Split spoon samples shall be taken at 5 feet intervals and whenever a significant change in lithology is encountered. These samples shall be analyzed for volatile organic compounds using EPA Method SW8240, EP toxicity for lead and selenium, and total and

hexavalent chrome, manganese, sodium, phenols, and PCBs.

- Collecting and analyzing groundwater samples from all existing and new monitoring wells. Samples shall be analyzed using EPA Method 624 for volatile organic compounds with a detection limit of 1 part per billion or less. Groundwater samples shall also be analyzed for (1) temperature; (2) pH; and (3) lead, selenium, sodium, manganese, chrome, phenols, PCBs, with a detection limit equal to or less than applicable State groundwater standards or guidelines; provided, however, that PCBs shall be analyzed using EPA Method 608 with a detection limit of 65 parts per trillion.
- In the event the sample matrix interferences will not allow for analysis to the stated method detection limit, the Department shall accept data showing the lowest achievable detection limit for the specific sample. Respondent's inability to provide analyses of samples to the stated method

detection limit because of sample matrix interferences shall not invalidate Respondent's data nor shall it be construed as a default and violation of this Order.

- Surveying and measuring groundwater elevations in all monitoring wells to determine the general direction and velocity of groundwater flow at the Site; and
- Reviewing existing published information on the local groundwater regime.

B. Within 90 days of the Effective Date, Respondent shall complete the Hydrogeologic Evaluation and submit a report to the Department for review and approval as to completeness. Such report shall include and discuss all data developed.

## III. STORM WATER SYSTEM IMPROVEMENTS

A. Within 15 days of the Effective Date, Respondent shall submit a request to the Department for modification of Respondent's current SPDES permit to allow combining impacted discharges, thereby reducing the number of discharge locations and facilitating discharge treatment (the "Storm Water System Improvements").

B. Within 15 days of receipt of the Department's approval of Respondent's SPDES permit modification and accompanying plans and specifications for construction, Respondent shall begin construction of the Storm Water System Improvements.

C. Within 150 construction days of receipt of the Department's approval referenced in subparagraph III.B., Respondent shall complete construction and start-up of the Storm Water System Improvements; provided, however, that if winter seasonal and/or weather conditions prevent construction activities, Respondent shall so notify the Department and request an appropriate extension or modification of the provisions hereof; the period from December 15 to March 15, inclusive, shall be construed as the winter season.

## IV. CONSTRUCTION OF TREATMENT SYSTEM

A. Within 120 days of the Effective Date, Respondent shall submit an engineering report to the Department, including the basis of design for a proposed treatment system and permit modifications (the "Engineering Report").

B. Within 30 days of receipt of the Department's approval of the Engineering Report, Respondent shall submit contract plans and specifications for the treatment system to the Department for approval.

C. Within 30 days of receipt of the Department's approval of Respondent's contract plans and specifications referenced in subparagraph IV.B., Respondent shall begin construction of the approved treatment system.

D. Within 150 construction days of receipt of the Department's approval of Respondent's contract plans and specifications referenced in subparagraph IV.B., Respondent's treatment system shall be in operation and the Facility shall be in compliance with SPDES permit limitations within 30 days after start-up; provided, however, that if winter seasonal and/or weather conditions prevent construction activities, Respondent shall so notify the Department and request an appropriate extension or modification of the provisions hereof; the period from December 15 to March 15, inclusive, shall be construed as the winter season.

## V. <u>PROGRESS REPORTS</u>

During implementation of this schedule for compliance, Respondent shall submit monthly progress reports to the Department. The first progress report shall be submitted by the

10th day of the month following the Effective Date. In its progress reports, Respondent shall:

(1) describe the compliance activities it has completed during the preceding calendar month;

(2) describe activities scheduled for the calendar month following the report;

(3) submit any analytical data developed during the calendar month covered by the report; and

(4) describe the compliance activities scheduled for the preceding calendar month that were not undertaken and/or completed and specify the problems encountered, condition or other reasons therefor.

# APPENDIX B

# SUBSURFACE AND WELL

# CONSTRUCTION LOGS

| | |
|---|---|
| Borings: | B1, B2 |
| New Wells: | MW-7, MW-8, MW-9 |
| Existing Wells: | MW-1, MW-3S, MW-3D, MW-5, and MW-6 |

# SUBSURFACE SOIL LOG

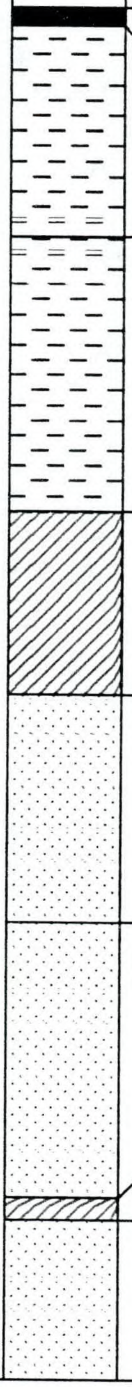
(Page 1 of 2)

## B-1

| RECOVERY (FEET) | N | HNU (ppm) | SAMPLES | TOTAL VOLATILE ORGANIC COMPOUNDS (ppb) |
|---|---|---|---|---|
| 0.8 | 14 | 2 | 1 | ND |
| 2.0 | 9 | 1 | 2 | 3200 |
| 2.0 | 3 | 2 | 3A | ND |
| 2.0 | 3 | 13 | 3B | ND |
| 2.0 | 7 | 60 | 4A | ND |
| 2.0 | 7 | 12 | 4B | 1300 |
| 1.5 | 10 | 0 | 5 | ND |
| 1.8 | 25 | 0 | 6 | ND |
| 1.0 |  | 1 |  |  |

DEPTH: 5, 0, -5, -10, -15, -20, -25, -30

GEOLOGIC COLUMN



## SOIL CLASSIFICATION

ASPHALT.

Brown SILT, some fine sand, moist, firm.

Brown SILT, some clay with silt and clay varves, orange mottling, cohesive, wet to moist.

NOTE:
3200 ppb - Acetone

Gray/brown CLAY, trace to little silt, plastic texture, wet, soft [Lacustrine].

Brown fine SAND, wet, loose.
- Grades to gray/brown Silt and clay, trace sand at 16.0'.
- Grades to gray Silt at 17.0'.

NOTE:
1300 ppb - Acetone

Red/brown fine to coarse SAND, trace rounded pebbles, wet, loose.

CLAY.

Grades to medium to coarse SAND, moist, firm.

# SUBSURFACE SOIL LOG

(Page 2 of 2)

B-1

## SOIL CLASSIFICATION

| RECOVERY (FEET) | N | HNU (ppm) | SAMPLES | DEPTH | TOTAL VOLATILE ORGANIC COMPOUNDS (ppb) | SOIL CLASSIFICATION |
|---|---|---|---|---|---|---|
| | | | | -30 | | |
| 1.0 | 98/.8 | 1 | 7 | | ND | Red/brown fine to coarse SAND and gray/black fine to medium GRAVEL, moist, very compact. |
| | | | | | | Red/brown and black fine to coarse SAND, granular, wet, very compact. |
| | | | | -35 | | |
| 1.7 | 60/.5 | 0 | 8 | | ND | |
| 1.7 | 75/.4 | 0 | 9 | -40 | ND | Red/brown fine SAND, wet, very compact.<br>- Grades with trace medium gravel at 45.0'.<br>NOTE:<br>770 ppb - Trichloroethylene |
| 1.2 | 50/.4 | 0 | 10 | -45 | 770 | |
| | | | | | | Red SILT and fine to coarse SAND, trace fine to medium gravel, trace green medium sand, moist, very compact [Glacial Till]. |
| | | | | | | Red/brown and gray fine to coarse SAND, wet, very compact. |
| 0.9 | 50/.4 | 0 | 11 | -50 | ND | |
| | | | | | | Boring terminated at 51.0'.<br>BORING COMPLETION:<br>Boring grouted with neat portland cement from 51.0 feet to surface.<br>NOTE: ND - None detected |
| | | | | -55 | | |
| | | | | -60 | | |
| | | | | -65 | | |

# SUBSURFACE SOIL LOG B-2

## SOIL CLASSIFICATION

| RECOVERY (FEET) | N | HNU (ppm) | SAMPLES | DEPTH | TOTAL VOLATILE ORGANIC COMPOUNDS (ppb) | GEOLOGIC COLUMN | SOIL CLASSIFICATION |
|---|---|---|---|---|---|---|---|
| | | | | 5 | | | |
| | | | | 0 | | | |
| 1.8 | 17 | 0 | 1 | | ND | | Brown Silt, little fine sand, trace fine to medium gravel, damp, firm [FILL]. |
| | | | | -5 | | | |
| 1.8 | 6 | 0 | 2 | | ND | | Brown SILT, some orange mottling, cohesive, moist, medium dense.<br>- Grades with some clay, cohesive, wet, medium dense at 10.0'. |
| | | | | -10 | | | |
| 1.6 | 7 | 3 | 3 | | ND | | Gray/brown fine SAND, some silt, moist, loose.<br>- Grades with trace silt at 15.0'. |
| | | | | -15 | | | |
| 1.5 | 6 | 2 | 4 | | 89 | | NOTE:<br>89 ppb - Vinyl Chloride |
| | | | | | | | Gray/brown CLAY, trace silt, plastic texture, wet, medium dense.<br>- Grades with little silt. |
| | | | | -20 | | | |
| 1.8 | 7 | 2 | 5 | | 363 | | NOTE:<br>200 ppb - Vinyl Chloride, 130 ppb - 1, 1- Dichloroethane, 33 ppb - 1, 1, 1- Trichloroethane. |
| | | | | | | | Boring terminated at 22.0'. |
| | | | | -25 | | | BORING COMPLETION:<br>Boring grouted with neat portland cement from 22.0 Feet to surface.<br>NOTE: ND - None detected |
| | | | | -30 | | | |

# DAMES & MOORE
# BORING LOG

CLIENT: Carrier
LOCATION: Syracuse, NY

BORING NO.: MW-1
SURFACE ELEV: 409.16'

DRILLING METHOD: Hollow-Stem Auger

SAMPLING METHOD: Split Spoon

DATE STARTED: 12/19/85

DATE FINISHED: 12/19/85

| SAMPLE NO. | BLOWS/FT | SAMPLE TYPE | DEPTH IN FT. | SOIL GRAPH | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| | | | 0 | ML | Silt, little fine sand, (fill); brown |
| 1 | 30 | SS | 1 | FILL | |
| | | | 2 | ML | Silt, little fine sand, brown |
| 2 | 42 | SS | 3 | | |
| | | | 4 | ▤ | Silty fine sand; trace clay, brown<br>Top of screen at 4 feet |
| 3 | 16 | SS | 5 | ▤ | |
| | | | 6 | ▤ | |
| 4 | 12 | SS | 7 | ▤ | |
| | | | 8 | ▤ | |
| | | | 9 | SM ▤ | |
| | | | 10 | ▤ | |
| 5 | 13 | SS | 11 | ▤ | |
| | | | 12 | ▤ | |
| | | | 13 | ▤ | |
| | | | 14 | CL | Bottom of screen at 14 feet<br>Clay, little silt |
| 6 | 17 | SS | 15 | ML | |
| | | | 16 | | Boring terminated at a depth of 16.0 feet on 12/19/85. |

EXPLANATION:

▤ SCREENED AREA

# DAMES & MOORE
# BORING LOG

CLIENT: Carrier
LOCATION: Syracuse, NY

BORING NO.: MW-3D
SURFACE ELEV: 403.46'

DRILLING METHOD:Hollow-Stem Auger

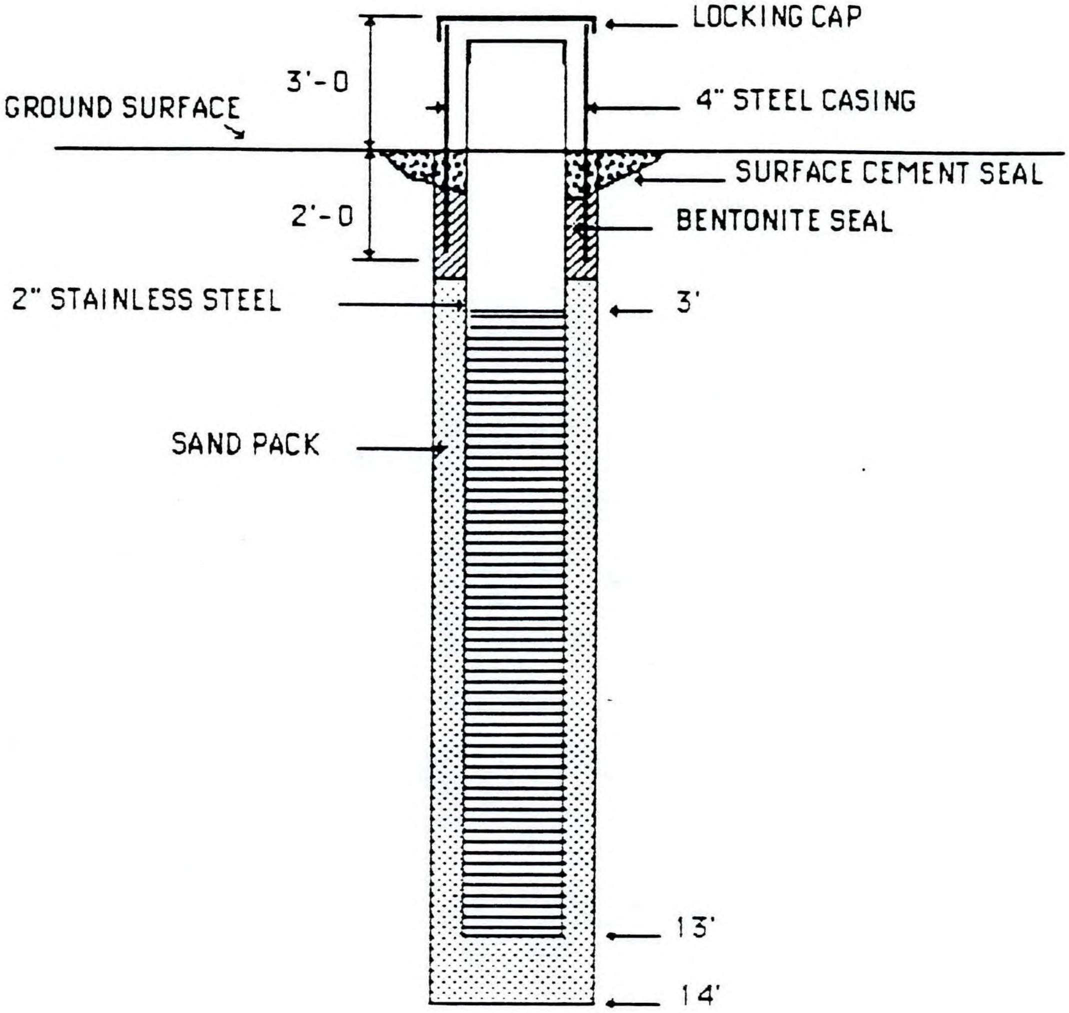
SAMPLING METHOD: Split Spoon

DATE STARTED:12/18/85

DATE FINISHED: 12/18/85

| SAMPLE NO. | BLOWS/FT | SAMPLE TYPE | DEPTH IN FT. | SOIL GRAPH | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| | | | 0 | ----- | 1" Asphalt |
| 1 | 12 | SS | 1 | | Silt, little fine sand, some fine sand layers; brown |
| | | | 2 | | |
| | | | 3 | ML | |
| | | | 4 | | |
| 2 | 18 | SS | 5 | | |
| | | | 6 | | Fine sand, little silt; brown |
| 3 | 34 | SS | 7 | SM | |
| | | | 8 | | |
| 4 | 23 | SS | 9 | | |
| | | | 10 | | Silt, some clay, trace fine sand; brown |
| 5 | 4 | SS | 11 | | |
| | | | 12 | | |
| 6 | 7 | SS | 13 | | |
| | | | 14 | | |
| | | | 15 | ML | |
| 7 | 6 | SS | 16 | | |
| | | | 17 | | |
| | | | 18 | | |
| | | | 19 | | |
| | | | 20 | | Fine sand and silt; brown |
| 8 | 8 | SS | 21 | SM | Top of screen at 22 feet |
| | | | 22 | ML | |
| | | | 23 | | |
| | | | 24 | | |
| | | | 25 | | Sand, little fine to medium gravel and silt; brown (this layer correspondsto till noted on other on-site boring logs) |
| | | | 26 | SM | Bottom of screen at 27 feet |
| | | | 27 | | Boring terminated at a depth of 27.o feet on 12/18/85. |

## DAMES & MOORE
## INSTALLATION DETAIL



MONITORING WELL MW-3S

**DATE COMPLETED: 5/20/87**

# DAMES & MOORE
# BORING LOG

CLIENT: Carrier
LOCATION: Syracuse, NY

BORING NO.: MW-5
SURFACE ELEV: 395.46'

DRILLING METHOD: 4 1/4" Hollow Stem Auger

SAMPLING METHOD: Split Spoon

DATE STARTED: 10/13/86

DATE FINISHED: 10/13/86

| SAMPLE NO. | BLOWS/FT | SAMPLE TYPE | DEPTH IN FT. | SOIL GRAPH | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
|  |  |  | 0 | ML | Extremely moist, black sand-silt-clay fill with little gravel and wood fragments |
| 1 | 13 | SS | 1 | FILL |  |
|  |  |  | 2 | SM | Extremely moist to wet, reddish-brown fine to coarse sand, some silt, trace fine fine gravel, loose |
|  |  |  | 3 | FILL |  |
| 2 | 10 | SS | 4 |  | Top of screen at 5 feet |
|  |  |  | 5 | ML | Extremely moist, gray sand-silt-clay with little fine gravel, medium stiff |
| 3 | 5 | SS | 6 |  |  |
|  |  |  | 7 | ML | Extremely moist, black organic richsilt and fine sand, numerous roots and wood fragments |
| 4 | 4 | SS | 8 |  |  |
|  |  |  | 9 |  | Extremely moist, black silt and fine to medium sand with organic debris, roots, wood chips, some bedding apparent |
| 5 |  | SS | 10 |  |  |
|  |  |  | 11 | SM |  |
| 6 | 4 | SS | 12 |  | grading to fine sand, some silt, little organic debris, occasional dark stained beds, loose, slight tendency to liquify when disturbed |
|  |  |  | 13 |  |  |
| 7 | 2 | SS | 14 | CL | Wet, grayish-brown silty clay<br>Bottom of screen at 15 feet |
|  |  |  | 15 |  | Boring terminated at a depth of 15.0 feet on 10/13/86. |

EXPLANATION:

☰ SCREENED AREA

# DAMES & MOORE
# BORING LOG

CLIENT: Carrier
LOCATION: Syracuse, NY

BORING NO.: MW-6
SURFACE ELEV: 404.68'

DRILLING METHOD: 4 1/4" Hollow Stem Auger

SAMPLING METHOD: Split Spoon

DATE STARTED: 10/13/86

DATE FINISHED: 10/13/86

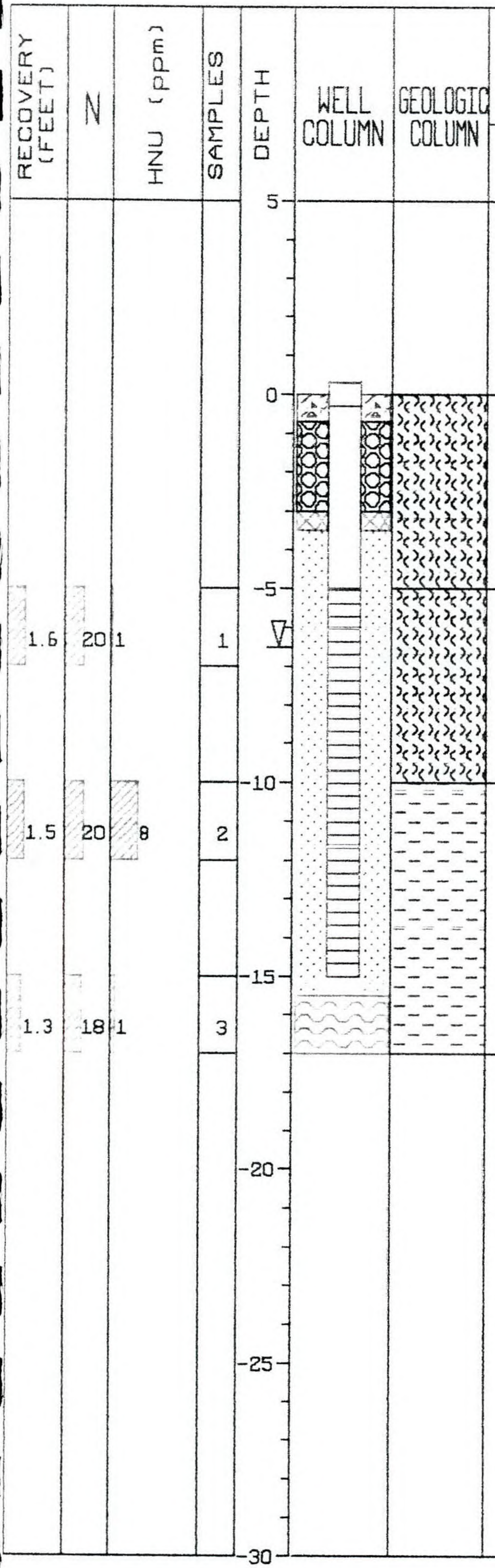
| SAMPLE NO. | BLOWS/FT | SAMPLE TYPE | DEPTH IN FT. | SOIL GRAPH | MATERIAL DESCRIPTION |
|---|---|---|---|---|---|
| | | | 0 | | Auger to 1' and began sampling at 1' |
| | | | 1 | | Moist, reddish-brown silt with little fine gravel and occasional thin (<1"thick) sand lens, stiff, becoming very stiff below 3.0 feet |
| 1 | 10 | SS | 2 | | |
| | | | 3 | ML | |
| 2 | 24 | SS | 4 | | |
| | | | 5 | ▤ | Top of screen at 5 feet |
| 3 | 24 | SS | 6 | ▤ | |
| | | | 7 | ▤ | |
| 4 | 51 | SS | 8 | ▤ | Moist, reddish-brown, fine to medium sand, some silt, little to trace fine gravel, very dense in place |
| | | | 9 | ▤ | |
| 5 | 19 | SS | 10 | ▤ | grades at 9.0 feet to extremely moist with a slight tendency to liquify when disturbed, medium dense |
| | | | 11 | SM ▤ | |
| 6 | 12 | SS | 12 | ▤ | grades to trace fine gravel below 11' |
| | | | 13 | ▤ | grades to fine to coarse sand, some silt, occasional thin (<2") silt beds, medium dense |
| 7 | 20 | SS | 14 | ▤ | grades to gray, very fine sand with some silt, dense |
| | | | 15 | | Bottom of screen at 15 feet<br>Boring terminated at a depth of 15.0 feet on 10/13/86. |

EXPLANATION:

▤ SCREENED AREA

# SUBSURFACE AND WELL CONSTRUCTION LOG MW-7

## SOIL CLASSIFICATION



From auger cuttings - Dark brown Silt and fine gravel, little fine to coarse sand, damp [FILL].

Brown Silt, little fine gravel, trace orange clay mottles, trace wood, red brick, moist to wet, firm [FILL].

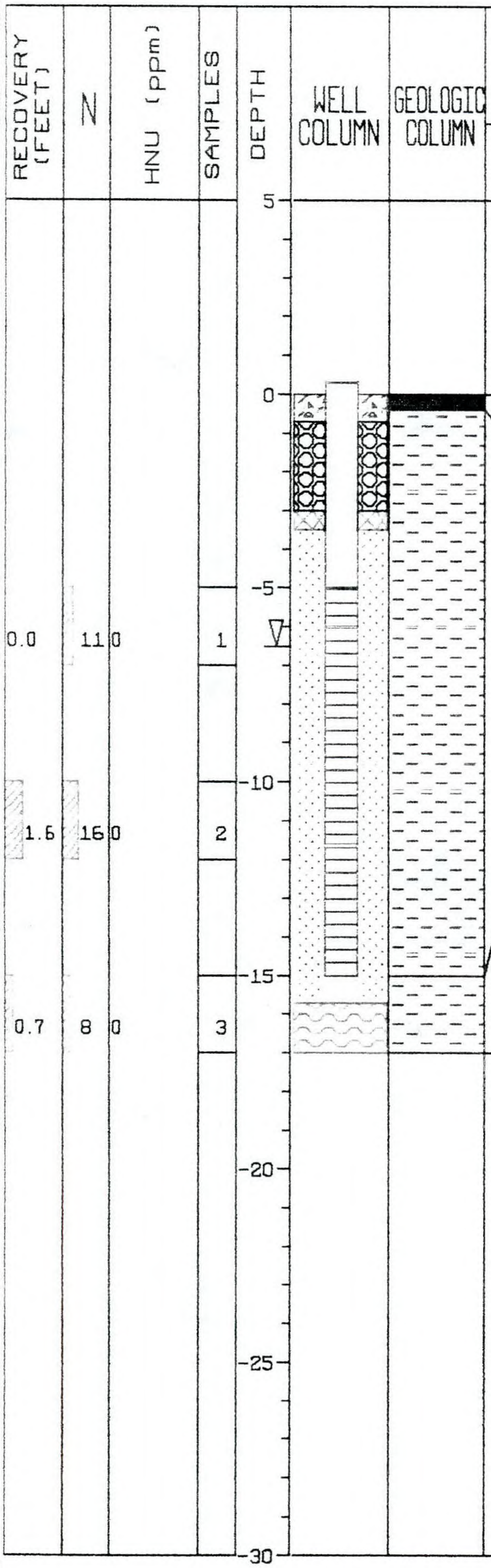
Gray/brown SILT with clay varves, trace orange and red clay mottles, trace roots, damp to moist, firm.

Boring terminated at 17.0'.

MONITORING WELL CONSTRUCTION DETAILS
2 inch diameter stainless steel riser 0.3' - 5.0'
2 inch diameter stainless steel with 0.010-inch slot screen 5.0' - 15.0'
Bottom of well set at 15.0'
Natural soil collapse 15.5' - 17.0'
Grade '0' sand filter pack 3.5' - 15.5'
Bentonite pellet seal 3.0' - 3.5'
Portland/cement grout backfill 0.7' - 3.0'
Cement surface seal 0' - 0.5'
9 inch diameter flush mount curbbox installation
Top of stainless steel well elevation - 41.40 Feet
Ground surface elevation - 41.60 Feet

# SUBSURFACE AND WELL CONSTRUCTION LOG

## SOIL CLASSIFICATION



| | | | |
|---|---|---|---|
| RECOVERY (FEET) | N | HNU (ppm) | SAMPLES |
| 0.0 | 11 | 0 | 1 |
| 1.6 | 16 | 0 | 2 |
| 0.7 | 8 | 0 | 3 |

ASPHALT.

From auger cuttings - Brown SILT, some fine Sand, trace Gravel.

NOTES:
- Due to humidity no measurement with HNU was possible.
- No recovery from 5 to 7 feet.

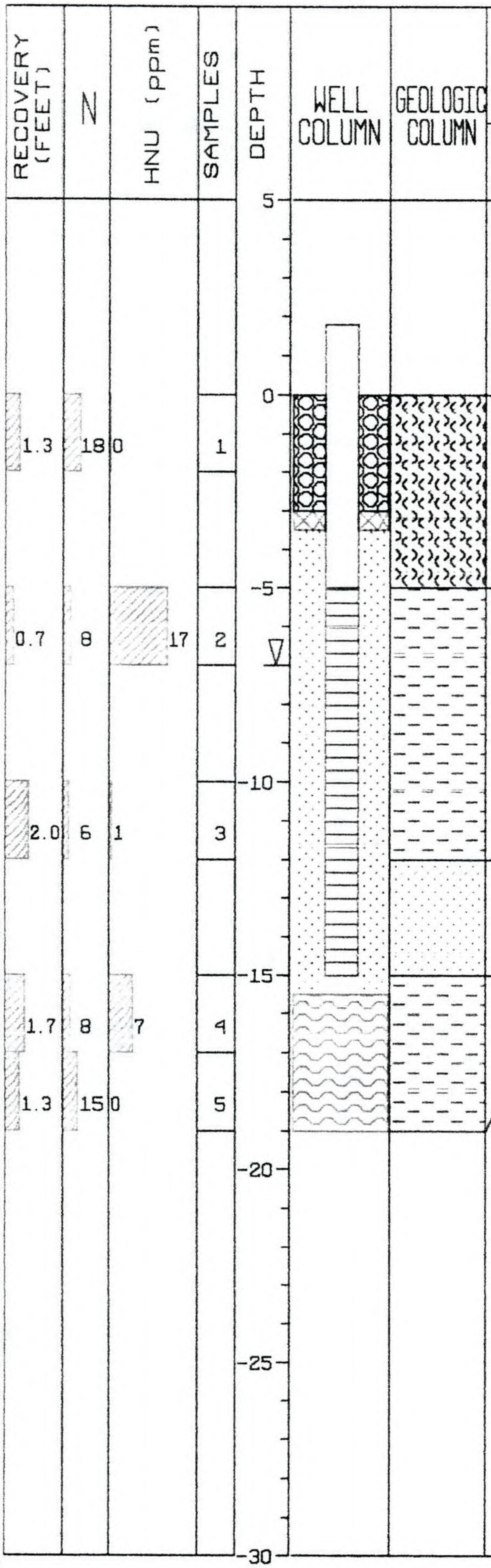
Gray/brown clayey SILT with orange mottles, plastic texture, moist, stiff.
- Grades to gray/brown silt, some fine sand with silt and clay varves, plastic texture, medium dense, wet. [Lacustrine].

Boring terminated at 17.0'.

MONITORING WELL CONSTRUCTION DETAILS
2 inch diameter stainless steel riser 0.3' - 5.0'
2 inch diameter stainless steel with 0.010-inch slot screen 5.0' - 15.0'
Bottom of well set at 15.0'
Natural soil collapse 15.5' - 17.0'
Grade '0' sand filter pack 3.5' - 15.7'
Bentonite pellet seal 3.0' - 3.5'
Portland/cement grout backfill 0.7' - 3.0'
Cement surface seal 0' - 0.5'
9 inch diameter flush mount curbbox installation
Top of stainless steel well elevation - 42.59 feet
Ground surface elevation - 42.90 feet

# SUBSURFACE AND WELL CONSTRUCTION LOG MW-9

## SOIL CLASSIFICATION



Dark brown fine to coarse Sand, little fine to medium gravel, slag, coal, brick fragments, damp, firm [FILL].

Brown SILT, little clay with orange mottles, plastic texture, moist, medium dense.

Brown fine SAND, moist, medium dense.

Gray SILT, some gray clay lenses, plastic texture, moist to wet, medium dense [Lacustrine].

Boring terminated at 19.0'.

MONITORING WELL CONSTRUCTION DETAILS
2 inch diameter stainless steel riser 1.8' - 5.0'
2 inch diameter stainless steel with 0.010-inch slot screen 5.0' - 15.0'
Bottom of well set at 15.0'
Natural soil collapse 15.5' - 19.0'
Grade '0' sand filter pack 3.5' - 15.5'
Bentonite pellet seal 3.0' - 3.5'
Portland/cement grout 0.0 - 3.0'
4 inch diameter outer protective steel casing with locking cover
Top of stainless steel well elevation - 44.79 feet.
Ground surface elevation - 43.20'

# APPENDIX C

## MONITORING WELL INSTALLATION PROCEDURES

# APPENDIX C

## MONITORING WELL INSTALLATION PROCEDURES

### I. Introduction

The three monitoring wells MW-7, MW-8, and MW-9 were constructed with two-inch diameter, ten foot long, stainless steel 0.01-inch slot screen and approximately five feet of stainless steel casing. The annular space of the monitoring well (the space between the inside wall of borehole created by the hollow stem augers and the outer wall of the stainless steel well screen) was filled with a grade "0" (a medium to fine sand) filter pack to a distance of two feet above the well screen. The annular space above the sand filter pack was filled with six inches of bentonite pellets then by neat Portland Type I cement grout to the ground surface.

MW-9 was completed with a four-inch diameter locking protective steel casing. Monitoring wells MW-7 and MW-8 were completed with nine-inch diameter flush mount curb box covers. Each well was provided with a pressure-seal locking well cap.

The wells were developed to flush any silt from the well screens and to establish a good hydraulic connection to the aquifer. At least ten well volumes were purged from each of the wells.

In November 1990, the monitoring well locations were surveyed by Phillips & Associates Surveyors, P.C., Syracuse, New York. The elevation of the top of the protection casing, the top of the monitoring well casing, and the ground surface were determined using the City of Syracuse datum.

The drill rig was decontaminated using a steam cleaner between each well. The soil sampling equipment was decontaminated between each sample using a soapy water wash, tap-water rinse, and distilled water rinse. The cuttings from each boring were contained in drums and disposed of by Carrier.

## II. Procedures

Test borings shall be completed using the hollow-stem auger drilling method or driven casing drilling method to a depth specified by the supervising geologist/engineer. No oils will be used on equipment lowered in the boring (eg., drill rod, casing or sample tools). A collection system for water or cuttings may be placed around the well to divert water from the well to a collection pit.

All monitoring wells installed in unconsolidated deposits will be constructed PVC, stainless steel, teflon or appropriate material, flush joint threaded well screen and riser casing that will extend from the screened interval to two to three feet above existing grade or flush with grade. Well screen slot size will be determined from appropriate grain size analyses. The bottom of the well screens will be plugged with a PVC, stainless steel, or teflon plug of appropriate size. Other materials utilized for completion will be washed silica sand, neat cement, bentonite pellets and a locking protective steel well casing and cap.

The installation method for a monitoring well will be to place the screen and casing assembly into the auger string once the screen interval has been selected. At that time, a washed silica sand pack will be placed if required to prevent screen plugging to at least two (2) feet above the well screen. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse two to three above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger wall for .5 to 1 foot via a tremie pipe and tamped to insure proper sealing. A neat cement grout will then be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite, frequent measurements will be made to check the height of the sand pack and thickness of bentonite by a weighted tape measure.

A vented protective steel casing shall be located when possible, over the standpipe, extending two feet below grade and two to three feet above grade secured by a neat cement seal. The cement seal shall extend laterally at least one foot in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented slip on steel cap will be fitted on and around the protective casing and a steel hasp shall be welded on one side of the steel casing so the cap may be secured with a brass lock. When protective steel casings are not possible, a flush mount casing with a pressure lock well cap will be installed.

A typical monitoring well detail is shown at the end of this appendix. The supervising geologist shall specify the monitoring well design to the Drilling Contractor before installation.

The supervising geologist is responsible for recording the exact well details as relayed by the drilling contractor and actual measurement. Both the supervising geologist and drilling contractor are responsible for tabulating all well materials used such as footage of casing and screen or bags of grout, cement or sand.

## III. Survey

A field survey control program will be conducted using standard instrument survey techniques to document well location, ground, inner and outer casing elevations.

## IV. Well Development

All monitoring wells will be developed or cleared of fine grain materials that have settled in or around the well during installation. Well development procedures are found in Appendix E.

## V. Decontamination

All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches and any other equipment or tools that may have come in contact with contaminated materials shall be decontaminated using a high pressure steam cleaning equipment using a controlled water source followed by a solvent rinse and controlled water rinse. The control water shall be obtained from a source approved by the supervising geologist. The primary choice of a controlled water source will be a municipal supply. A sample may be collected for analytical testing prior to its use.

All well materials and well development materials will be washed with soapy water, swabbed with a solvent and rinsed with controlled water before emplacement in the borehole or well.

The drilling equipment will be decontaminated for each well in an area designated by the supervising geologist. No equipment will leave a drilling site at any time without first being decontaminated as described above unless otherwise specified in the field by the geologist.

# APPENDIX F

# LABORATORY REPORT FOR GRAIN SIZE ANALYSES

parratt wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

Project No. L-90025

Project Title Laboratory Testing-Carrier Corporation File #507.01.15

Date: November 26, 1990

Sieve Analysis ASTM D422

| | | Sieve Size - Percent Passing Sieve | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | Depth (In feet) | 3/4" | 1/2" | 3/8" | 1/4" | #4 | #10 | #30 | #40 | #60 | #100 | #200 | | | | |
| MW-7 | 5.0-7.0 | 100 | 98.3 | 89.5 | 79.5 | 75.2 | 67.3 | 63.0 | 61.7 | 59.5 | 57.8 | 54.0 | | | | |
| MW-7 | 10.0-12.0 | -- | -- | -- | -- | 100 | 99.3 | 98.5 | 98.4 | 98.3 | 98.2 | 95.0 | | | | |
| MW-8 | 10.0-12.0 | -- | -- | -- | -- | -- | -- | 100 | 99.9 | 99.8 | 97.6 | 74.3 | | | | |
| MW-8 | 15.0-17.0 | -- | -- | -- | -- | -- | -- | -- | -- | 100 | 99.9 | 99.4 | | | | |
| MW-9 | 5.0-7.0 | -- | -- | 100 | 99.0 | 98.5 | 97.4 | 96.3 | 96.1 | 95.8 | 95.5 | 94.0 | | | | |
| MW-9 | 10.0-12.0 | -- | -- | -- | 100 | 99.8 | 99.3 | 99.1 | 99.0 | 98.3 | 94.1 | 89.8 | | | | |

Remarks:

Prewashed ASTM D1140
Yes X No
Performed By AFI

# APPENDIX G

# IN-SITU PERMEABILITY TEST PROCEDURES

# APPENDIX G

## IN-SITU PERMEABILITY TEST PROCEDURES

### I. Introduction

In-situ permeability tests will be conducted at selected wells. The permeability tests will be used to evaluate the integrity of the well screen of cased wells for all types of well construction to determine the responsiveness of the well to change in static water levels.

The type of permeability tests conducted will be a falling head test accomplished by using a "slug." A slug is a solid cylinder that will be submerged below the water table in a well to displace a known volume of water. By monitoring the rate of changing water levels, a permeability value may be assigned to a well.

### II. Materials

- Cement slug
- Polypropylene rope
- Water level indicator
- Masking tape
- Waterproof marker
- Engineer's rule
- Distilled water
- Stopwatch
- Laboratory-type Soap
- Cleaning solvent (if necessary)
- In-situ permeability test field log

## III. Procedures

A. Identify site and well number on the In-Situ Permeability Test Log (Attachment 1) along with date, time personnel and weather conditions. (Two persons will be required to conduct this test.)

B. Record the static water level of the well with a water level recorder.

C. While the water level recorder probe is still at static water level, place masking tape on the water level recorder cable from reference point to 5 feet above the reference point.

D. Using a waterproof pen, mark the masking tape where static water level is reached from the reference point. Label the mark "S" for static water level.

E. Remove the cable and probe from the well and place it in the plastic sheeting.

F. Measure out a length of rope ten feet greater than the depth to static water level.

G. Clean the slug and the rope according to the decontamination protocol and place on a plastic sheet near the well.

H. Secure one end of the rope to the bailer and the other end to the well casing using bowline knots.

I. Assign one person responsible for lowering the slug into the well; recording times and water levels are found in the log. Assign another person responsible for lowering the water level probe into the well and finding water levels.

J. Lower the slug into the well slowly until water level is reached. Before lowering the slug into the water, lower the water level probe into the well to the top of the slug.

K. Set stop watch.

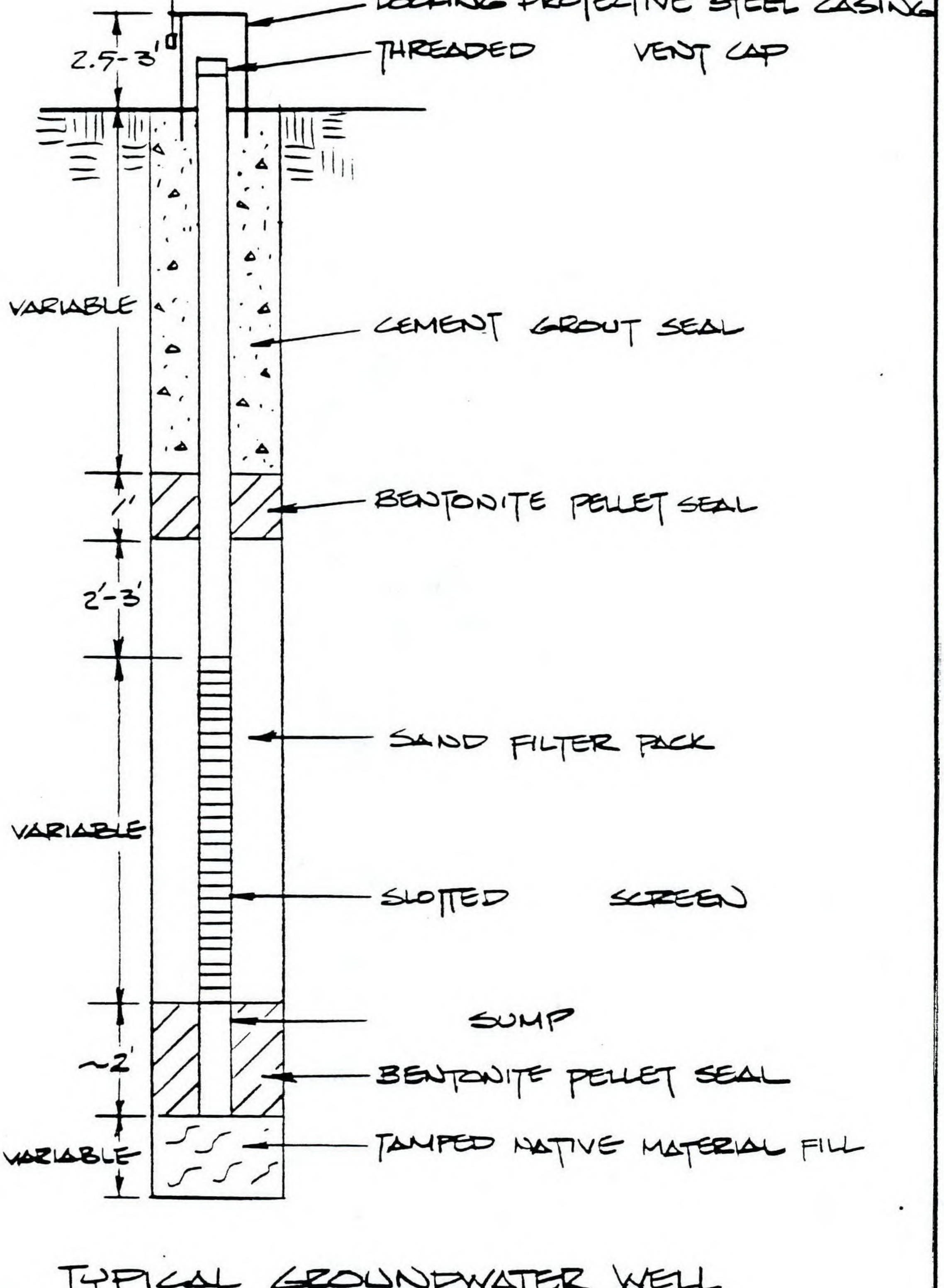
L. When both people are ready, lower the slug into the well, start the stop watch at the same time.

M. Measure water levels at approximately five second intervals. When the water level is found, mark the tape at the reference point and record the time.

N. After 3 minutes, measure water levels at approximately 15 second intervals for 5 minutes and then at 1 minute intervals for 10 minutes. When readings, start to stabilize, they may be taken at longer time increments until the water level reaches static level.

O. When test is completed, changes in water levels will be measured to the nearest hundredth from the masking tape and recorded with its corresponding change in time reading.

P. Remove the masking tape from the water level probe cable and decontaminate the probe with soapy water, distilled water and/or cleaning solvent if necessary.



TYPICAL GROUNDWATER WELL

(NOT TO SCALE)

BLASLAND, BOUCK & LEE

# APPENDIX D

## MONITORING WELL DEVELOPMENT PROCEDURES

# APPENDIX D

## MONITORING WELL DEVELOPMENT PROCEDURES

### I. Introduction

All monitoring wells will be developed (i.e., cleared of fine-grained materials and sediments that have settled in or around the well during installation), to ensure the screen is transmitting ground water representative of the surrounding formation waters. The development may be by air surging or bailing ground water from the well until it yields relatively sediment-free water.

When developing a well using the air surging method, clean decontaminated polypropylene tubing is extended to the screened portion of the well, attached to an oil-less air compressor and allowed to surge until the ground water yields clear samples. A procedure that may be used for monitoring well development entails surging ground water through the well screen and air lifting the ground water from the well. To surge the wells, two hoses will be used, one small diameter hose telescoped inside a second, larger hose with an annular space between the hoses for water to flow through. At the bottom of the larger hose, a foot valve will be secured. Both hoses will be manually lifted and lowered two feet within the screened interval to pull in silt. To lift ground water from the well, air will be forced down the inner tube pushing the foot valve closed and forcing silty ground water up the annular space inside the outer tube. After the air is turned off, hydrostatic pressure present within the water bearing formation will push the foot valve open allowing the ground water to enter the tubes. Surging and air lifting will be repeated several times within the well screen interval until the ground water is silt free.

## II. Materials

A. Materials for monitoring well development using an air hose and air compressor include:

- Hard Hat
- Safety Glasses
- PVC or tyvex Coveralls
- Inner Vinyl Gloves
- Outer Nitrile Gloves
- Steel Toed Boots
- Chemical Resistant Cover Boots
- Air Hose
- Air Compressor
- Development Equipment
- Field Book
- Graduated Pails

B. Materials for monitoring well development using a bailer include:

- Bottom Loading Bailer
- Polypropylene Rope
- Plastic Sheeting
- Purge Water Containers
- Graduated Pails
- Field Book

## III. Development Procedures

A detailed procedure for ground-water monitoring well development using the air surging method will be as follows:

A. Don appropriate safety equipment.

B. All equipment entering each well will be decontaminated as specified in the Decontamination Procedures.

C. The air hose from the air compressor will be attached to the top of the inside hose of the development equipment. The developing equipment will be lowered to the bottom of well.

D. The air compressor will be turned on for 15 seconds and then the well will be allowed to recover for 15 seconds; this will be repeated several times.

E. Surging by raising and lowering the developing tool in the well will be performed several times to pull in fine grained material.

F. Steps C and D will be repeated until ground water is silt free.

G. The developing equipment will be raised two feet and then Step C through Step E will be repeated.

H. Step F will be repeated until entire well screen has been developed.

The detailed procedures for developing a well using the bailer method is outlined below:

A. Bailers and new rope will be decontaminated.

B. Place five- by five-foot plastic sheeting around well.

C. Determine length of well through examination drilling log data and measure at least ten feet greater than the total depth of the well.

D. Secure one end of the rope to the well casing, secure the other end of the rope to the bailer with bowline knots. Test the knots and make sure the rope will not loosen. Check bailers to be sure all parts are intact and will not be lost in the well.

E. Lower bailer into well until bailer reaches total depth of well.

F. Surge by raising and lowering the bailer at two-foot interval at least ten times.

G. Pull bailer from well and empty bailer contents into a leak-proof portable purge water container. (Be sure rope stays on the plastic sheeting).

H. Lower bailer back into well and repeat raising and lowering at an interval two feet above the previously surged interval.

I. Repeat Step F through Step H until entire screen has been surged.

J. If silt is still in purge water after surging entire screen repeat Step E through Step I.

K. Upon completion of surging and purging of the well, remove bailer and remove the rope from the bailer and the well.

L. Secure lid and lock back on well.

M. Dispose of plastic sheeting and polypropylene rope in double lined garbage bags and decontaminate bailer.