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REPORT

SUPPLEMENTAL INVESTIGATION RESULTS STILL DISCHARGE AREA

Envirotek II Site

Tonawanda, New York

November 1992

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

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TONAWANDA, NEW YORK

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EXECUTIVE SUMMARY

The supplemental investigation program was implemented to obtain the information necessary to support an Interim Remedial Program for addressing the soil in the still discharge area (SDA) at the Envirotek II Site. Specifically, the components of this investigation were designed to:

- Define horizontal extent of soil requiring remediation;
- Characterize the hydraulic properties of the shallow water bearing materials; and
- Evaluate ground-water and soil conditions below the water table which could effect the implementation of an interim remedial program.

Previous investigation activities in the SDA have included a soil gas survey, a soil boring program, and the installation and testing of a number of monitoring wells in the vicinity of the SDA. The results of the previous investigation activities were presented in the reports "Evaluation of Interim Remedial Alternatives, Still Discharge Area," dated March 1991, and "Results of Sampling Plan, Envirotek II Superfund Site," dated June 1991.

The scope of work for the implementation of these activities included the following components:

- Collection and analysis of soil samples from 14 soil borings to complete the delineation of residual soil contamination in the SDA;
- Installation and development of a recovery well in the SDA;
- Performance of a pump test of the recovery well in the SDA to characterize the hydraulic properties of the shallow water-bearing materials in this area; and

- Collection and analysis of ground-water samples from two existing monitoring wells in the SDA (ENV-2 and ENV-3) and from the new recovery well.

The conclusions which may be drawn from the results of the supplemental investigation in conjunction with the results of the previous investigations, include the following;

- The horizontal extent of the soil which has been impacted by the SDA within the water table fluctuation zone appears to be limited based on the progressive attenuation of volatile organic concentrations in the soil samples collected from this area.
- The horizontal extent of observed impacts to the soil within the unsaturated zone appear to be even more limited, based on the field screening results and the descriptions of materials encountered.
- The extent of residual hydrocarbons in the subsurface were found to extend beyond the limits of the SDA, both upgradient and downgradient of this area. These residual hydrocarbons have been observed to extend vertically from the water table fluctuation zone to the top of the first confining unit in the saturated overburden materials. The identification of residual hydrocarbons within the saturated soil, upgradient as well as downgradient of the SDA, indicates these residual hydrocarbons are part of a wide-spread problem associated with the surrounding Roblin Steel site. These wide-spread residual hydrocarbons do not appear to be related to former Envirotek operations.
- The vertical extent of impacts associated with the SDA were observed to extend below the water table to the top of a silty clay unit identified as forming the base of the shallow water-bearing unit.

- The silty clay confining unit appears to be continuous under the SDA and separates a shallow overburden water bearing zone from a deep overburden water bearing zone.
- Actions implemented under the interim remedial program to remediate the soil within the water table fluctuation zone would be ineffective, as the impacted soil within the underlying saturated zone would recontaminate this zone.
- As the water table fluctuation zone would not be effectively addressed through the interim remedial program, the purpose of the ground-water recovery system would be limited to counteracting the upwelling of ground water anticipated in association with the possible operation of a vapor extraction system.
- Several important hydrogeologic characteristics of the shallow water-bearing zone of the overburden aquifer have been estimated based on the pump test results including: transmissivity of 8.08×10^{-2}; storativity of 0.038; and hydraulic conductivity of 3.1×10^{-2}.
- Results of the 2D analytical ground-water flow model confirmed that the anticipated upwelling associated with the operation of a vapor extraction system may be counteracted by pumping from four new 10-inch-diameter wells at 2 gpm each in conjunction with pumping from the existing 6-inch diameter well at 1 gpm.

SECTION 1 - INTRODUCTION

1.1 General

This report presents the results of the supplemental investigation implemented by Blasland & Bouck Engineers, P.C., at the Envirotek II Site located in Tonawanda, New York. This supplemental investigation program was implemented to obtain the information necessary to support an Interim Remedial Program for addressing the soil in the still discharge area (SDA) at the Envirotek II Site.

1.2 Background

Previous investigation activities in the SDA have included a soil gas survey, a soil boring program, and the installation and testing of a number of monitoring wells in the vicinity of the SDA. The results of the previous investigation activities were presented in the reports "Evaluation of Interim Remedial Alternatives, Still Discharge Area," dated March 1991, and "Results of Sampling Plan, Envirotek II Superfund Site," dated June 1991.

The results of the soil gas samples collected from the SDA in September 1990 confirmed the presence of volatile organic constituents in the soil vapor. These results were used to assist in designing the subsequent soil boring program.

To further characterize the existing conditions of the soil in the SDA, a soil boring program was performed in October 1990 involving a total of six soil borings (Figure 1). Each boring was continuously sampled from the ground surface to the water table and each sample was screened for relative concentrations of volatile organic constituents. Based on the results of the field observations and Organic Vapor Analyzer (OVA) screening, selected samples were

analyzed for volatile organics, semivolatile organics, total petroleum hydrocarbons, PCBs, metals, and cyanide.

Four of the six soil samples collected from the zone immediately above the water table (approximately 6 to 8 feet) in the SDA were observed to contain residual hydrocarbons. The samples from this zone also exhibited the highest OVA readings, indicating that volatile compounds are present in association with these residual hydrocarbons.

The results of the volatile organic analyses (USEPA Method 8240) indicate the presence of a number of both chlorinated and aromatic hydrocarbon compounds, including tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, toluene, and xylenes. The dramatic decrease in OVA readings, as well as the laboratory analytical results for boring B-3, suggest that this boring is near the northern horizontal extent of the area impacted by the former still discharge. The analytical results of the samples collected on the western side of the concrete walkway (B-4, B-5, and B-6), as shown on Figure 1, indicate the presence of volatile organics at considerably lower concentrations than the area on the eastern side of the walkway (B-1, B-2, and B-3).

Although no soil borings were performed directly adjacent to the building foundations in this area, the levels of VOCs observed in the samples from borings B-1, B-2, B-3, and B-4 indicated that the soil impacted by VOCs and residual hydrocarbons probably extends beneath the building foundations to the south and east of this area.

Although a number of semivolatile organic compounds were identified at concentrations below their quantitation limits, only one sample from boring B-2 was found to contain semivolatile compounds at concentrations in excess of the quantitation limits of the analytical method. The semivolatile compounds observed with the highest concentrations in this soil sample include pyrene, phenanthrene, bis(2-ethylhexyl)phthalate, and fluoranthene. These base neutral

compounds probably are constituents of the residual hydrocarbons observed in this sample. The results of the PCB analyses indicated no detectable PCBs in any of the samples analyzed. The results of the metals, cyanide, and petroleum hydrocarbon analyses indicate the presence of some metals, including iron, magnesium, and calcium, at slightly higher concentrations than would be typical of naturally occurring levels. However, no background data exists with which to compare these results. There is no indication that these inorganics are related to Envirotek's past solvent recovery operations. The petroleum hydrocarbon analyses indicate the soil in this area contains concentrations of total recoverable petroleum hydrocarbons ranging from 230 mg/kg to 16,800 mg/kg. The highest concentrations of hydrocarbons were detected in the soil samples collected within the zone immediately above the water table. The source of these hydrocarbons has yet to be determined.

The previous investigations to evaluate potential impacts to ground-water quality in the vicinity of the site involved the installation and sampling of six monitoring wells (ENV-1 through ENV-6) in November of 1990, at the locations indicated on Figure 1. These wells include two monitoring wells located in the immediate vicinity of the SDA (ENV-2 and ENV-3). The ground-water samples collected from each of these wells were submitted for Target Compound List (TCL) volatile organics, TCL semivolatile organics, TCL pesticides and polychlorinated biphenyl (PCBs), and Target Analyte List (TAL) metals. The analyses for the inorganics included the analysis of unfiltered and filtered samples from each well to determine total metals and dissolved metals concentrations in the ground water. The presence of a layer of floating separate phase hydrocarbons (SPH) was observed in the well ENV-3 shortly after its installation. In addition, an oily sheen was also observed on the water surface in ENV-2. However, further monitoring of these wells indicated no continuous presence of SPH layer on the water table in this area.

The results of the volatile organic analyses indicate the presence of a number of VOCs dissolved in the ground water at the site. The observed concentrations of total volatile organics ranged from not detected in both ENV-1 and ENV-6, up to approximately 167 mg/L in ENV-2. This well is located in the immediate vicinity of the former SDA. The volatile constituents present in the highest concentrations in this ground-water sample include tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, and 1,2-dichloroethane. The concentrations of volatile compounds observed in ENV-3, located immediately downgradient of the SDA, were several orders of magnitude lower than those observed in the center of the SDA (ENV-2).

Although the results of the OVA screening performed on the soil samples collected during the drilling of the upgradient monitoring well (ENV-1) suggests the presence of volatile organic constituents in the subsurface soils upgradient of the site, the analytical results of the ground-water sample collected from this well showed no detectable levels of volatile or semivolatile compounds. The results of the semivolatile organic analyses performed on the ground-water samples indicate no detectable levels of semivolatile organics above the Method Quantification Limit in any of the ground-water samples, except the one from ENV-2. The results of the ENV-2 sample show the presence of a number of semivolatiles, including 2-methylphenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, and naphthalene. However, the concentrations of the semivolatiles observed in this sample were limited to the relatively low part per billion concentrations.

A vapor extraction pilot test was also performed in the SDA during October of 1990 to provide data necessary to evaluate the potential effectiveness of a vapor extraction system in remediating the soil in this area. A detailed discussion of the activities performed in connection with this pilot test and the results of this test were originally presented in the Report "Evaluation of Interim Remedial Alternatives, SDA," dated March 1991.

1.3 Investigation Objectives

The overall objective of the supplemental investigation program was to provide the information needed to support the design of an interim remedial program for the SDA. The specific objectives of each component of this investigation include the following:

- To adequately define horizontal extent of soil requiring remediation under an interim remedial program;
- To characterize the hydraulic properties of the shallow water bearing materials in this area sufficiently to evaluate the potential for addressing the soil within the water table fluctuation zone with an interim remedial program; and
- To further evaluate ground-water and soil conditions below the water table which could effect the implementation of an interim remedial program.

SECTION 2 - INVESTIGATION ACTIVITIES

2.1 General

This section of the report presents a detailed discussion of the activities performed as part of the supplemental investigation. The scope of activities performed was in accordance with the Conceptual Interim Remedial Program Work Plan, dated December 1991. The scope of work for the implementation of these activities included the following components:

- Implementation of a soil boring program to complete the delineation of residual soil contamination in the SDA;
- Installation and development of a recovery well in the SDA;
- Performance of a pump test of the recovery well in the SDA to characterize the hydraulic properties of the shallow water-bearing materials in this area; and
- Collection and analysis of ground-water samples from two existing monitoring wells in the SDA (ENV-2 and ENV-3) and from the new recovery well.

The work performed for each of these tasks are detailed below.

2.2 Soil Boring Program

A total of 14 new soil borings (B-7 through B-20) were completed at the Envirotek II site between May 12 and 14, 1992. The location of each new boring is indicated on Figure 1. The figure also indicates the locations of six existing soil borings in the SDA and six previously drilled monitoring wells. The soil borings were drilled by Empire Soils Investigations, Inc. The borehole at each location was advanced using a Mobile CME-55 truck-mounted drill rig, equipped with 2 1/2-inch-I.D. hollow-stem augers.

Each boring was continuously sampled from the ground surface to the bottom of the borehole, except B-18, B-19, and B-20. In boring B-18, continuous samples were taken for the first 10 feet and then increased to 5-foot intervals to the bottom of the borehole. Borings B-19 and B-20 were sampled at 5-foot intervals from the ground surface to the bottom of the borehole. All soil samples were obtained with standard 2-inch O.D., 2-foot-long split-spoon samplers driven with a 140-lb. hammer falling 30-inches in accordance with ASTM D-1586. To insure sample integrity, the split-spoon samplers were decontaminated prior to each use by washing with a detergent solution, then rinsing sequentially with distilled water, 10 percent methanol solution, 10 percent nitric acid solution and triple rinsing with distilled water. Each sampler was allowed to air dry prior to use.

Upon retrieval of each split-spoon sampler, a representative sample was placed directly into two separate laboratory-provided sample containers for possible laboratory analysis (a small container for VOCs and a larger for semivolatile organic compounds). No soil sample was submitted for analysis from B-18, B-19, and B-20. A second representative portion of each sample was placed into a clean jar covered with aluminum foil and left standing for at least five minutes to allow volatile organics present in the soil to volatilize into the head space of the jar. A Photovac MicroTip meter equipped with a 11.7 eV probe (MicroTip) calibrated using a 1:1 ratio of 99.7 parts per million isobutylene at span setting 2.90 was then used to screen each sample for relative concentrations of volatile organic constituents by inserting the probe of the MicroTip through the aluminum foil and directly reading the maximum concentration from the field instrument. Each sample collected was also visually inspected in the field to determine the color, grain size, classification, and moisture content of the materials encountered. This information was recorded on logs that were maintained for each borehole. Any evidence of contamination

(i.e., staining, odor, etc.) was also recorded on the boring log. The boring logs are presented in Appendix A.

All downhole equipment and associated drilling equipment, including augers, drill rods, auger plugs, and other equipment, were decontaminated prior to the start of each borehole. The equipment was decontaminated by high pressure hot water (i.e., steam cleaning).

The boring program involved the drilling of four lines of boring radiating out from the SDA. In an effort to expeditiously delineate the extent of residual soil contamination, the first boring performed in each line of borings was drilled approximately 40 feet from the center of the SDA. Additional borings were performed if evidence of impacts associated with the SDA (i.e. staining or electrical organic vapor concentrations) were found at the previous boring location.

Based on the results of the field observations and MicroTip screening, one sample was selected from each borehole for laboratory analysis. The samples that were selected were analyzed for VOCs and semivolatile organic compounds. The samples selected for laboratory analysis include five samples that were obtained at or above the water table and six samples that were obtained below the water table. Residual hydrocarbons were observed within the water table fluctuation zone in seven of the eight borings to the east and all of the borings to the east. None of the borings to the south were observed to contain residual hydrocarbons. The residual hydrocarbons observed in the borings located east of the SDA (B-7, B-8, B-9, B-10, B-11, B-12, and B-17) appeared brown to black. However, only the borings located close to the SDA exhibited the high MicroTip readings, indicating that concentrations of volatile compounds are dissolved in the residual hydrocarbons in the immediate vicinity of the SDA. The residual hydrocarbons in the west borings (B-15 and B-16) were black and only B-15 had high MicroTip readings. There were no evidence of residual

hydrocarbons observed in the two borings (B-13 and B-14) drilled in building 53, but these locations did exhibit MicroTip readings during field screening.

The findings from the shallow borings are generally consistent with the past investigations. However, to classify the deeper soils and determine the depth to bedrock, borehole B-18 was extended vertically to the top of bedrock. At a depth of approximately 20 feet, a confining layer of very dense clay and silt was encountered and the MicroTip readings dropped to zero. This layer extended to a depth of 26 feet where this layer started grading into a coarser material. In response to this finding, soil borings B-19 and B-20 were drilled to the northwest of the SDA to determine whether this confining layer extends beneath the SDA. The clay layer was observed in both B-19 and B-20 at approximately 15 feet below ground surface. Evidence of a dense oily material was observed in the water column on top of the clay layer in both soil borings. Because of the concern of possibly creating a downward pathway for the dense oil to follow, the clay layer was not penetrated. It was observed that the oily materials at the top of the clay saturated the top inch or so of the clay.

To illustrate the approximate thickness and sequence of the various materials encountered in the subsurface in the vicinity of the still discharge area a geologic cross section was prepared (Figure 2). This cross section was based on the available boring logs and extends from the southeast (B-18) to the northwest (B-19).

2.3 Recovery Well Installation and Development

A recovery well (RW-1) was completed in the SDA on May 15, 1992. The location of the recovery well is indicated on Figure 1. The recovery well was completed by Empire Soils Investigations, Inc., with a CME-55 truck-mounted drill rig equipped with 8 1/4-inch-I.D. hollow-stem augers. The boring was continuously sampled from the ground surface to the top of the clay confining

layer also encountered in B-18, B-19, and B-20. The soil samples were obtained with standard 2-inch-I.D., 2-foot long split-spoon samplers driven with a 140-lb. hammer with a 30-inch fall in accordance with ASTM D-1586. The split-spoon samplers were decontaminated prior to each use by washing with detergent solution, then rinsed sequentially with distilled water, 10 percent methanol solution, 10 percent nitric acid solution, and triple rinsing with distilled water. A representative portion of each sample was placed into a clean jar, covered with aluminum foil, and left standing for at least five minutes to allow volatile organics present in the soil to volatilize into the head space of the jar. An MicroTip reading was taken by inserting the probe of the MicroTip through the foil and directly monitoring the head space in the jar. Each sample was also visually inspected in the field to determine the color, grain size, classification, and moisture content of the materials encountered. The boring log for recovery well RW-1 is presented in Appendix A.

The original scope of the supplemental investigation anticipated installation of the recovery well such that the screened interval would extend from above the water table to the top of the glacial till, which was believed to form the base of the overburden in this vicinity. However, due to the presence of a silty clay unit that appears to separate the overburden into shallow and deep zones and the apparent presence of a dense oily material at the top of this shallow confining unit, the recovery well was screened only to the top of the first apparent confining unit. Care was taken not to penetrate the confining layer.

The borehole was completed as an overburden recovery well through the installation of 15 feet of 0.010 slot, 6-inch, stainless steel, wire-wound, threaded, flush joint well screen. The well column was completed with 5 feet of solid, stainless steel-threaded, flush joint riser pipe to above grade. A #0 graded sand pack was installed from the bottom of the well column to 2 feet below ground surface. A one-foot hydrated seal was placed from 1 to 2 feet below

ground surface. The remaining foot was filled with grout consisting of two 94-lb. bags of Type I Portland cement and approximately 12 gallons of water.

Upon completion, the recovery well (RW-1) was developed to improve hydraulic communication between the well and the surrounding aquifer formation. The development methodology involved the use of the mud pump on the rig owned by Empire Soils Investigations, Inc., and a steel block used to surge the water in and out of the screened interval. Well development continued until five well volumes of water were extracted from the well and the turbidity levels of the ground water showed no noticeable improvement. The water removed from the well during development was contained in 55-gallon drums and stored on site for future disposal.

2.4 Aquifer Testing Activities

A pump test was conducted on the new recovery well (RW-1) on May 19 and 20, 1992, to further characterize the hydrogeologic properties of the water table aquifer.

A brief step-test was conducted to determine an appropriate rate of ground-water withdrawal at which a constant rate pump test may be preformed. It was determined that a rate of approximately 0.80 gallons per minute would accomplish the appropriate drawdown results. Therefore, the eight hour pump test was performed at a pumping rate of 0.83 gallons per minute. Prior to initiating the test, a round of static water level measurements were recorded for each of the existing wells at the site. Pressure transducers and a data logger were used to automatically record water level changes within the test well (RW-1) and the nearest observation well (ENV-2) throughout the duration of the pump test. The recovery of water levels in these wells were also recorded following the end of the pump test. Water levels were also manually measured in each of the on-site monitoring wells periodically through the test. However, no

drawdown of the water table was observed in any of the other monitoring wells at the site.

2.5 Ground-Water Sampling Activities

To further evaluate the characteristics of the water that would be handled by any ground-water treatment system, two samples were collected from the recovery well (RW-1) during the pump test. One sample was collected directly from the well, and the other was collected from the pump discharge hose. A water sample was also collected from the two previously installed monitoring wells in the SDA (ENV-2 and ENV-3). All the samples were analyzed for VOCs, semivolatile organic compounds, calcium, iron, magnesium, manganese, total dissolved solids, total suspended solids, and pH.

To confirm our previous understanding regarding the direction of ground-water flow under static conditions, a complete round of water levels was measured in the existing wells at this site. These water level measurements are summarized on Table 1. This table also presents two previous rounds of water level data for this site. A comparison of these data suggest that ground-water elevations appear to vary less than one foot seasonally at this site. A ground-water elevation contour map based on the latest water level data is presented as Figure 3. This figure shows the direction of ground-water flow in the vicinity of the SDA is generally toward the west, in the direction of the Niagara River.

SECTION 3 - INVESTIGATION FINDINGS

3.1 General

This section presents the results of the supplemental investigation activities. The data generated through the performance of the supplemental investigation activities includes: visual observations and field screening results of the soil samples collected during the soil boring program; analytical data of the selected soil samples submitted for laboratory analysis; data regarding the geologic conditions in the subsurface in the vicinity of the SDA; data related to the hydrogeologic characteristics of the shallow aquifer in the SDA; and water quality data relevant to the ground water which may be recovered as part of the interim remedial program. The data obtained through the implementation of each component of the supplemental investigation are presented below.

3.2 Results of the Soil Boring Program

The soil boring program implemented in connection with this investigation involved the drilling of 14 borings (B-7 through B-20). The primary purpose of these borings was to further define the extent of impacted soil associated with the SDA. In addition, these boring have provided further insight into the subsurface conditions in the site vicinity.

The visual observations of the materials encountered in each soil boring are described in detail within the boring logs presented in Appendix A. These boring logs also include the results of the field screening performed for each soil sample collected during the boring program. The visual observations of dark staining and oily sheens within the soil samples collected from the water table fluctuation zone at all but three of the boring locations (B-13, B-14, and B-18) indicate the presence of residual hydrocarbons that are present beyond the limits of the SDA. The two borings which extended vertically through the

saturated zone to the top of the first apparent confining unit downgradient of the SDA (B-19 and B-20) were observed to have dark staining and oily sheens associated with the soil from the water table to the top of this apparent confining unit. The cross section, presented as Figure 2, also illustrates our revised understanding as to the extent of residual hydrocarbons in the subsurface based on these supplemental investigation results.

One soil sample was selected from each of the soil borings to be submitted for analysis of volatile and semivolatile organic compounds. The results of the volatile organic analyses are summarized on Table 2. A complete set of the laboratory analytical reports are presented in Appendix C. The results of the volatile organic analyses confirm the limited horizontal extent of the VOCs within the soil in the vicinity of the SDA. The analytical results of the soil samples collected furthest away from the SDA toward the northeast (B-17), southeast (B-12), south (B-13), and west (B-16) all show that VOCs are being attenuated. This attenuation of VOC concentrations is illustrated toward the northeast by the decrease in total VOC concentrations from 1144 ug/kg in B-8 to 161 ug/kg in B-17. Similarly, the total concentration of VOCs decreased toward the southeast from 14,420 ug/kg in B-11 to 4364 ug/kg in B-12. Comparable decreases in VOC concentrations were also observed toward the south and west. The attenuation of VOCs, as indicated by the soil sample analytical results are illustrated on Figure 4. The results of the field screening of soil samples for their relative concentrations of VOCs also indicate the attenuation of VOCs horizontally away from the center of the SDA. The lack of significant VOC concentrations associated with the more wide spread residual hydrocarbons observed at the site suggest that these residual hydrocarbons are not associated with the SDA. A review of the VOC field screening results and the description of the soil encountered in each boring indicate that the extent of soil that has been impacted by the SDA above the water table fluctuation

zone is even more limited. The apparent distribution of VOCs, based on this field screening data, in the unsaturated soil zones from 0 to 2, 2 to 4, and 4 to 6 feet below the ground surface is illustrated on Figures 5, 6, and 7 respectively.

The results of the semivolatile organic analyses performed on the soil samples submitted to the laboratory from the soil boring program are summarized on Table 3. The analytical results indicate the presence of a number of semivolatile organic compounds in the soil at several locations. The compounds with the highest concentrations include naphthalene, phenanthrene, anthracene, and di-n-butylphthalate. However, none of these compounds were detected at concentrations exceeding the sample quantification limit, with the exception of 4.2 ppm of anthracene detected in the sample from boring B-8.

3.3 Evaluation of Pump Test Results

The data generated through the performance of the constant rate pump test on RW-1 includes ground-water drawdown measurements recorded for the pumped well. Drawdown measurements were also obtained for monitoring well ENV-2, which is located within 25 feet of the pumped well. Although water level measurements were recorded for each of the other monitoring wells at this site, no measurable drawdown was observed in any of these wells. Tables summarizing the drawdown data from RW-1 and ENV-2 are presented in Appendix B. A graph of the drawdown measurements verses time is also presented in the this appendix.

A review of the drawdown data from the pumped well indicates that a barrier boundary resulted in a significantly increased rate of drawdown after several hundred minutes of pumping. The data from the pumped well also appear to have been impacted by slight variations in pumping rate over the course of the test. To avoid concerns regarding the influence of minor pumping

rate variations and/or inefficiencies of the pumped well, the drawdown data from the observation well ENV-2 were used with Jacob's straight-line method to calculate estimates of the transmissivity and storativity of the shallow water-bearing unit at the site. In time-drawdown analysis, time is plotted semilogarithmically with respect to the drawdown observed at a single observation well. The data should ideally define a straight line whose slope is proportional to transmissivity, according to the following equation:

$$T = 264\ Q\ /\ \text{delta s.}$$

where:

T = Transmissivity

Q = Pumping Rate

Delta s = drawdown of water level over one log cycle.

The time-drawdown plot using the data from ENV-2 indicate an increased rate of drawdown beginning several hundred minutes into the test. This effect is probably caused by a barrier boundary of some kind in the site vicinity. A best-fit line through the data points was selected and the resulting delta s value of 0.038 was obtained from the plot.

The transmissivity of the shallow water-bearing unit is estimated to be approximately 8.08 x 10^{-2} cm^2/sec and the storativity was estimated to be approximately 0.038. Given a saturated thickness for the shallow water-bearing unit of about 8.5 feet, the hydraulic conductivity of this unit is approximately 3.1 x 10^{-2} cm/sec.

3.4 Analysis of Ground-Water Depression Requirements

The aquifer parameters calculated above were used as the basis for developing the preliminary design parameters for a ground-water recovery system capable of counteracting the ground-water upwelling anticipated in connection

with the use of a vapor extraction system. The design parameters that need to be defined include the number, location, and size of the recovery wells, as well as the pumping rate at which each must be operated to accomplish the above stated objective.

As approximately 18 inches of upwelling would be anticipated, the maximum drawdown capability of the recovery wells must sufficiently exceed this to allow the average drawdown achieved across the area of concern to be approximately 18 inches. The maximum theoretical drawdown of recovery wells of various diameters was calculated using Kozeny's Equation. This indicated that a 10-inch-diameter well would be required to produce a drawdown of approximately 2.5 feet, whereas, the newly installed 6-inch-diameter recovery well has a maximum theoretical drawdown of 1.7 feet. The estimated pumping rates that would be anticipated based on Kozeny's equation then had to be adjusted to account for interference effects of multiple pumping wells.

An analytical 2D ground-water flow model ("Quickflow," Geraghty & Miller, 1991) was then used to confirm that the pumping of four new 10-inch-diameter recovery wells at a rate of 2 gpm in conjunction with the pumping of the existing 6-inch-diameter recovery well at a rate of 1 gpm would achieve the desired effect of depressing the water table across the area of interest by approximately 1.5 feet.

3.5 Ground-Water Quality Results

Ground-water samples were collected from the recovery well during the pump test to provide information regarding the possible constituent loading anticipated for any ground-water treatment system. Ground-water samples were also collected from the monitoring wells in the SDA (ENV-2 and ENV-3) to confirm our understanding of ground-water quality in this vicinity. Each of these water samples was analyzed for volatile organic and semivolatile organic

compounds as well as for selected inorganics. The analytical results of the ground-water samples collected during the supplemental investigation are summarized on Tables 4, 5, and 6. A complete set of the laboratory analytical reports is presented in Appendix C.

The results of the volatile organic analyses (Table 4) indicate the presence of several volatile compounds in each of the ground-water samples. The concentrations of the volatile compounds detected in the two samples collected from the recovery well RW-1 at two different times during the pump test are very similar. Therefore, an average of these concentrations may be used to anticipate the likely loading for the ground-water treatment system. The results of the semivolatile organic analyses (Table 5) indicate that only trace concentrations of a few compounds are present in the ground water. This would suggest that the semivolatile compounds detected in the soil samples are not significantly leachable to the ground water. The results of the inorganic analyses are summarized on Table 6. These results would also be used to assist in the design of any ground-water treatment system, should it be necessary.

SECTION 4 - CONCLUSIONS

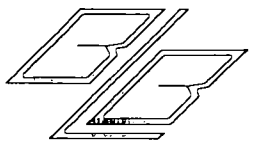
4.1 General

This section of the report presents the conclusions drawn from the results of this supplemental investigation.

- The horizontal extent of the soil which has been impacted by the SDA within the water table fluctuation zone appears to be limited based on the progressive attenuation of volatile organic concentrations in the soil samples collected from this area.
- The horizontal extent of observed impacts to the soil within the unsaturated zone appear to be even more limited, based on the field screening results and the descriptions of materials encountered.
- The extent of residual hydrocarbons in the subsurface were found to extend beyond the limits of the SDA, both upgradient and downgradient of this area. These residual hydrocarbons have been observed to extend vertically from the water table fluctuation zone to the top of the first confining unit in the saturated overburden materials. The identification of residual hydrocarbons within the saturated soil, upgradient as well as downgradient of the SDA indicates these residual hydrocarbons are part of a wide-spread problem associated with the surrounding Roblin Steel site. These wide-spread residual hydrocarbons do not appear to be related to former Envirotek operations.
- The vertical extent of impacts associated with the SDA were observed to extend from the water table to the top of a silty clay unit identified as forming the base of the shallow water-bearing unit.
- The silty clay confining unit appears to be continuous under the SDA and separates a shallow overburden water bearing zone from a deep

overburden water bearing zone. It should be noted necessary precautions (i.e., reducing the depth of the proposed recovery well) have been taken as not to compromise the integrity of this unit.

- Actions implemented under the interim remedial program to remediate the soil within the water table fluctuation zone would be ineffective, as the impacted soil within the underlying saturated zone would recontaminate this zone.
- As the water table fluctuation zone would not be effectively addressed through the interim remedial program, the purpose of the ground-water recovery system would be limited to counteracting the upwelling of ground water anticipated in association with the possible operation of a vapor extraction system.
- Several important hydrogeologic characteristics of the shallow water-bearing zone of the overburden aquifer have been estimated based on the pump test results including: transmissivity of 8.08×10^{-2}; storativity of 0.038; and hydraulic conductivity of 3.1×10^{-2}.
- Results of the 2D analytical ground-water flow model confirmed that the anticipated upwelling associated with the proposed operation of the vapor extraction system may be counteracted by pumping from four new 10-inch-diameter wells at 2 gpm each in conjunction with pumping from the existing 6-inch diameter well at 1 gpm.



Tables

TABLE 1

ENVIROTEK II SITE
TONAWANDA, NEW YORK

SUMMARY OF GROUND-WATER ELEVATION MEASUREMENTS

Well ID	Reference Elevation*	November 19, 1990 Depth to Ground Water	November 19, 1990 Ground-Water Elevation in Feet	January 21, 1991 Depth to Ground Water	January 21, 1991 Ground-Water Elevation in Feet	May 11, 1992 Depth to Ground Water	May 11, 1992 Ground-Water Elevation in Feet
ENV-1	579.49	6.58	572.91	5.96	573.53	6.41	573.08
ENV-2	582.94	11.89	571.05	11.19	571.75	11.26	571.68
ENV-3	582.59	11.38	571.21	10.40	572.19	10.64	571.95
ENV-4	581.55	12.14	570.41	10.61	571.94	10.67	571.88
ENV-5	581.38	10.95	570.43	9.50	571.88	9.48	571.90
ENV-6	582.03	13.40	568.63	10.21	571.82	10.19	571.84
GW-1	576.80	6.63	570.17	6.15	570.65	6.26	570.54
GW-2	582.01	13.11	568.90	12.24	569.77	12.24	569.77
GW-3	578.45 **	9.86	568.59	8.72	569.73	8.87	569.58
GW-4	576.44 **	10.32	566.12	9.68	566.76	9.92	566.52
GW-5	574.22 **	8.43	565.79	7.86	566.36	8.18	566.04
GW-6	573.96 **	6.80	567.16	6.24	567.72	6.20	567.76
GW-7	581.96 **	12.35	569.61	11.48	570.48	11.58	570.38

Notes:
* = Measuring point elevation. Measuring point is top of inner casing (PVC).
** = Reference elevations of these existing wells were adjusted based on difference in previous and current elevation measurements for GW-1 and GW-2.

TABLE 2

ENVIROTEK II SITE
TONAWANDA, NEW YORK

SUMMARY OF VOLATILE ORGANIC ANALYTICAL RESULTS
SOIL SAMPLES

MAY 1992

Sample I.D.:	NORTHEAST				SOUTHEAST			SOUTHWEST		WEST		FIELD	TRIP	TRIP
Soil Depth:	B-7 (6-8)	B-8 (8-10)	B-9 (8-10)	B-17 (8-10)	B-10 (6-8)	B-11 (8-10)	B-12 (8-10)	B-13 (6-8)	B-14 (6-8)	B-15 (6-8)	B-16 (8-10)	BLANK	BLANK (5-13)	BLANK (5-13)
Date:														
Compound:														
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	16 J	8 J	280 J	5 J	330 BJ	250 BJ	18 J	--	300 BJ	260 JB	--	--	2 J	1 J
Acetone	120 B	200 B	--	130 B	140 B	--	--	--	--	--	--	--	7 J	--
Carbon Disulfide	--	--	--	26 J	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	17 J	390 J	--	28 J	--	16 J	--	--	--	--	--	--	--
1,2-Dichloroethene(total)	12 J	--	--	--	53	370 J	150	370 J	320 J	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	670 J	--	--	--	--	--
1,1,1-Trichlorethane	140	340	--	--	1600	600 J	270	--	--	660 J	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	54	100	--	--	740 J	1200	310	550 J	740 J	780	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	6 J	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	230	39	--	--	740 J	12000	3600	2800	6000	8300	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	820	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	11 J	170	--	--	--	--	--	--	--	550 J	91 J	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	29 J	270	--	--	--	--	--	--	--	8500	--	--	--	--
Total VOCs	612	1144	670	161	3637	14420	4364	3720	8030	19870	91		9	1

Notes:
All concentrations reported in ug/kg (ppb)
J - Compound determined to be present at an estimated value less than the minimum detection limit.
B - Compound determined to be present in the blanks as well as in the sample.
D - Compounds identified in an analysis at a secondary dilution factor.

TABLE 3

ENVIROTEK II
TONAWANDA, NEW YORK

SUMMARY OF SEMIVOLATILE ORGANIC ANALYTICAL RESULTS
SOIL SAMPLES

MAY 1992

	NORTHEAST							SOUTHEAST					
BORING I.D.	B-7	B-7 RE	B-8	B-8 RE	B-9	B-9 RE	B-17	B-10	B-10 RE	B-11	B-11 RE	B-12	B-12 RE
DEPTH SAMPLED	(6-8)	(6-8)	(8-10)	(8-10)	(8-10)	(8-10)	(8-10)	(6-8)	(6-8)	(8-10)	(8-10)	(8-10)	(8-10)
Compounds													
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroethyl) ether	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroisopropyl)ethe	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitroso-di-n-propylar	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Isophorone	--	--	--	1600 J	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroethoxy)methar	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylpheno	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	3100 J	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	710 J	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
4-chlorophenyl-phenyleth	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	1000 J	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-methylphe	--	--	--	1400 J	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (1	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl-phenylet	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	5000 J	4100 J	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	4200	--	--	--	--	--	--	--	--	--
Di-n-butylphthalate	--	--	--	630 J	6000 J	710 J	--	530 J	--	600 J	840 BJ	530 J	--
Flouranthene	--	--	--	480 J	--	1700 J	--	--	--	--	--	--	--
Pyrene	--	--	--	420 J	--	1900 J	--	--	--	--	--	--	--
Butylbenzylphhtalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	1400 J	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	1600 J	--	2100 J	--	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)flouranthene	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)flouranthene	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	2100 J	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 3
(Cont'd.)
ENVIROTEK II
TONAWANDA, NEW YORK

SUMMARY OF SEMIVOLATILE ORGANIC ANALYTICAL RESULTS
SOIL SAMPLES

MAY 1992

	SOUTHWEST		WEST					
BORING I.D.	B-13	B-14	B-15	B-15 RE	B-16	FIELD BLANK	TRIP BLANK	TRIP BLANK
DEPTH SAMPLED	(6-8)	(6-8)	(6-8)	(6-8)	(8-10)			
Compounds								
Phenol	--	--	--	--	--	--	--	--
bis(2-Chloroethyl) ether	--	--	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--
Benzyl alcohol	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--
bis(2-Chloroisopropyl) ethe	--	--	--	--	--	--	--	--
4-Methylphenol	--	--	--	--	--	--	--	--
N-Nitroso-di-n-propylar	--	--	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--
Isophorone	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--
Benzoic acid	--	--	--	--	--	--	--	--
bis(2-Chloroethoxy) methar	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--
Naphthalene	3500 J	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--	--	--
4-Chloro-3-methylpheno	--	--	--	--	--	--	--	--
2-Methylnaphthalene	430 J	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--
Dimethylphthalate	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--	--	--
4-Chlorophenyl-phenyleth	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	--
4,6-Dinitro-2-methylpher	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (1	--	--	--	--	--	--	--	--
4-Bromophenyl-phenylet	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--
Phenanthrene	1100 J	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--
Di-n-butylphthalate	460 BJ	530 BJ	--	--	410 J	--	--	--
Flouranthene	2100 J	--	390 J	--	560 J	--	--	--
Pyrene	1800 J	--	490 J	510 J	1400 J	--	--	--
Butylbenzylphhtalate	--	--	--	--	--	--	--	--
Benzo(a)anthracene	1200 J	--	--	--	--	--	--	--
bis(2-Ethylhexyl) phthalate	--	--	1300 J	--	--	--	--	--
Chrysene	1300 J	--	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	--	--	--	--	--
Benzo(b)flouranthene	1700 J	--	--	--	2100 J	--	--	--
Benzo(k)flouranthene	530 J	--	--	--	--	--	--	--
Benzo(a)pyrene	440 J	--	--	--	--	--	--	--
indeno(1,2,3-cd)pyrene	550 J	--	--	--	1200 J	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	1100 J	--	--	--

Notes:
All concentrations in ug/kg (ppb).
No concentrations were detected in any of the field or trip blanks, therefore, they have not been included in this table.
B = Compound detected in the associated blank as well as in the sample.
J = Estimated value; concentration less than the sample quantitation limit but greater than zero.
-- = Not detected.

TABLE 4

ENVIROTEK II SITE
TONAWANDA, NEW YORK

SUMMARY OF VOLATILE ORGANIC ANALYTICAL RESULTS
GROUND-WATER SAMPLES

MAY 1992

Sample I. D.:	RW-1		RW-1		ENV-2		ENV-3		FIELD BLANK		TRIP BLANK	
Time:	10:00		13:40									
Compound												
Chloromethane	--		--		--		--		--		--	
Bromomethane	--		--		--		--		--		--	
Vinyl Chloride	700		780		2700		--		--		--	
Chloroethane	--		--		--		53		--		--	
Methylene Chloride	23	J	100	J	600	B	2	BJ	1	J	0.9	J
Acetone	--		--		240	J	--		--		--	
Carbon Disulfide	--		--		--		--		--		--	
1,1-Dichloroethene	--		--		120	J	--		--		--	
1,1-Dichloroethane	460		510		1700		120		--		--	
1,2-Dichloroethene(total)	1900		2500		18000	D	8		--		--	
Chloroform	--		--		--		--		--		--	
1,2-Dichlorethane	--		--		170		--		--		--	
2-Butanone	--		--		--		--		--		--	
1,1,1-Trichlorethane	280		270		4300		9		--		--	
Carbon Tetrachloride	--		--		--		--		--		--	
Bromodichloromethane	--		--		--		--		--		--	
1,2-Dichloropropane	--		--		--		--		--		--	
cis-1,3-Dichloropropene	--		--		--		--		--		--	
Trichloroethene	81		81	J	5700	D	12		--		--	
Dibromochloromethane	--		--		--		--		--		--	
1,1,2-Trichloroethane	--		--		--		--		--		--	
Benzene	--		--		--		2	J	--		--	
trans-1,3-Dichloropropene	--		--		--		--		--		--	
Bromoform	--		--		--		--		--		--	
4-Methyl-2-Pentanone	--		--		--		13		--		--	
2-Hexanone	--		--		--		--		--		--	
Tetrachloroethene	270		260		12000	D	8		--		--	
1,1,2,2-Tetrachloroethane	--		--		--		--		--		--	
Toluene	520		590		2900		1	J	--		--	
Chlorobenzene	--		--		--		--		--		--	
Ethylbenzene	240		250		380		--		--		--	
Styrene	--		--		--		--		--		--	
Total Xylenes	1300		1400		2500		5		--		--	

Notes:
All concentrations reported in ug/L (ppb)
J - Compound determined to be present at an estimated value less than the minimum detection limit.
B - Compound determined to be present in the blanks as well as in the sample.
D - Compounds identified in an analysis at a secondary dilution factor.

TABLE 5

ENVIROTEK II
TONAWANDA, NEW YORK

SUMMARY OF SEMIVOLATILE ORGANIC ANALYTICAL RESULTS
GROUND-WATER SAMPLES

MAY 1992

WELL I.D.	RW-1	RW-1	ENV-2	ENV-3	FIELD BLANK	TRIP BLANK
SAMPLE TIME	10:00	13:40				
Compounds						
Phenol	--	--	--	--	--	--
bis(2-Chloroethyl) ether	--	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--
Benzyl alcohol	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--
2-Methylphenol	8 J	9 J	9 J	3 J	--	--
bis(2-Chloroisopropyl)ether	--	--	--	--	--	--
4-Methylphenol	3 J	3 J	--	--	--	--
N-Nitroso-di-n-propylamine	--	--	--	--	--	--
Hexachloroethane	--	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--
Isophorone	--	--	4 J	--	--	--
2-Nitrophenol	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	10	--	--	--
Benzoic acid	--	--	--	--	--	--
bis(2-Chloroethoxy)methane	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--
Naphthalene	1 J	1 J	8 J	--	--	--
4-Chloroaniline	--	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--	--
4-Chloro-3-methylphenol	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--
Hexachlorocyclopentadiene	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	--	--	--
2-Chloronaphthalene	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--
Dimethylphthalate	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--

TABLE 5
(Cont'd.)
ENVIROTEK II
TONAWANDA, NEW YORK

SUMMARY OF SEMIVOLATILE ORGANIC ANALYTICAL RESULTS
GROUND-WATER SAMPLES

MAY 1992

WELL I.D.	RW-1	RW-1	ENV-2	ENV-3	FIELD BLANK	TRIP BLANK
SAMPLE TIME	10:00	13:40				
Compounds						
4-chlorophenyl-phenylether	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--
4,6-Dinitro-2-methylphenol	--	--	--	--	--	--
N-Nitrosodiphenylamine (1)	--	--	--	--	--	--
4-Bromophenyl-phenylether	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--
Phenanthrene	--	--	2 J	--	--	--
Anthracene	--	--	--	--	--	--
Di-n-butylphthalate	1 J	4 J	4 J	2 J	2 J	--
Flouranthene	--	--	--	2 J	--	--
Pyrene	--	--	2 J	1 J	--	--
Butylbenzylphhtalate	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	11	17	30	12	8 J	--
Chrysene	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	--	--	--
Benzo(b)flouranthene	--	--	--	--	--	--
Benzo(k)flouranthene	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--

Notes:
All concentrations in ug/L (ppb).
No concentrations were detected in any of the field or trip blanks, therefore, they have not been included in this table.
B = Compound detected in the associated blank as well as in the sample.
J = Estimated value; concentration less than the sample quantitation limit but greater than zero.
-- = Not detected.

TABLE 6

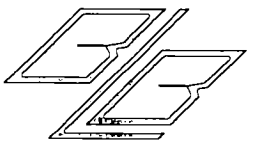
ENVIROTEK II SITE
TONAWANDA, NEW YORK

SUMMARY OF FIELD PARAMETERS AND INORGANIC ANALYTICAL RESULTS
GROUND-WATER SAMPLES

MAY 1992

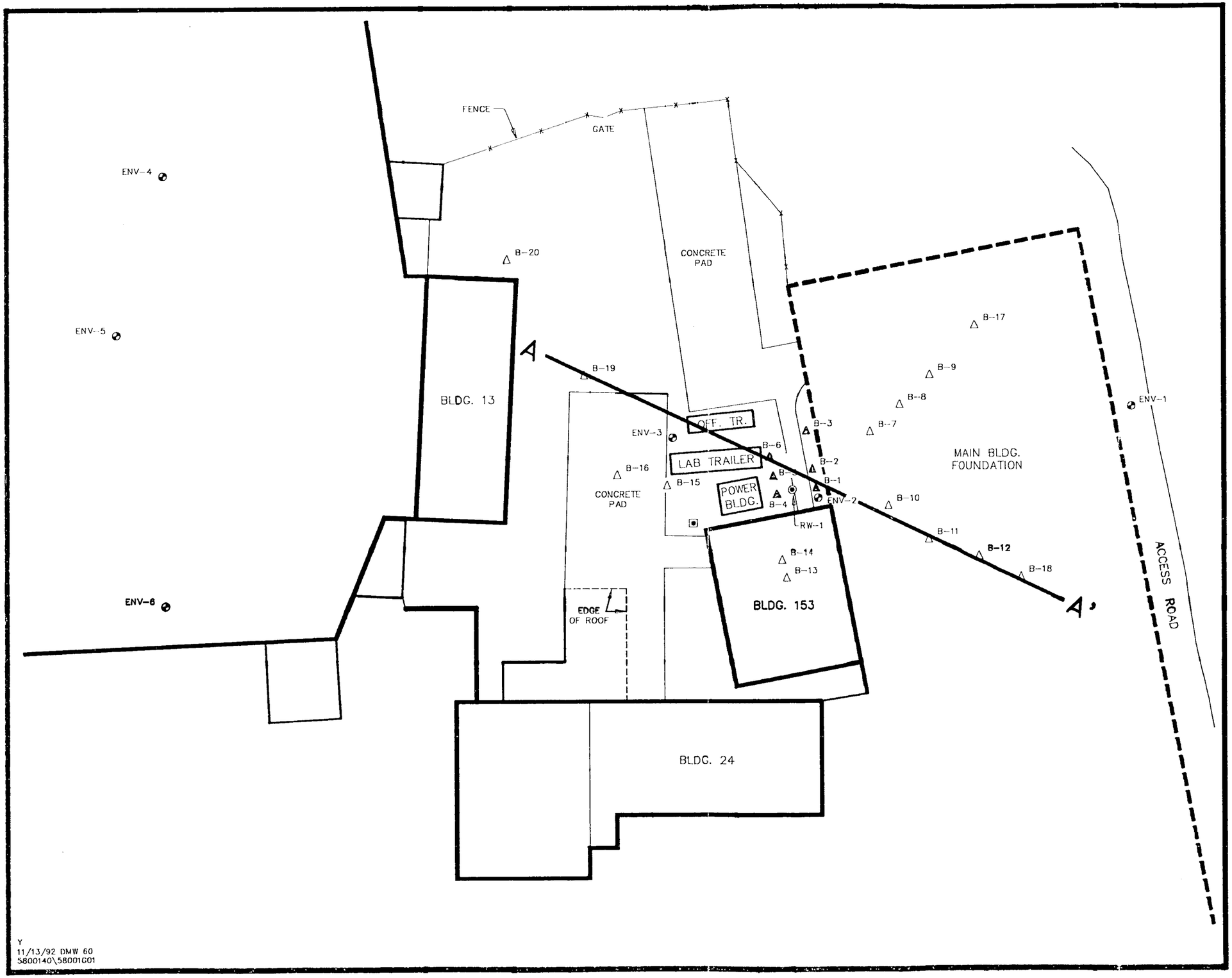
Sample ID:	RW-1	RW-1	ENV-2	ENV-3	Field Blank
Sample Time:	10:00	13:40			
Field Parameters					
pH Std Units	7.7	7.7	9.4	7.8	6.6
TDS	600	600	530	550	15
TSS	6	13	1,400	2,700	<1
Inorganics					
Calcium	110	110	210	180	<1
Iron	0.94	1.4	45	380	<0.05
Magnesium	33	32	28	84	<1
Manganese	0.16	0.17	7.2	7.2	<0.05

Note:
All concentrations measured in mg/L (ppm).



Figures

FIGURE 1



LEGEND

- MONITORING WELL
- RECOVERY WELL
- SOIL BORING (10/90)
- SOIL BORING (5/92)
- A—A' CROSS SECTION LOCATION
- APPROXIMATE LOCATION OF ABANDONED PRODUCTION WELL

ENVIROTEK II SITE
TONAWANDA, NEW YORK

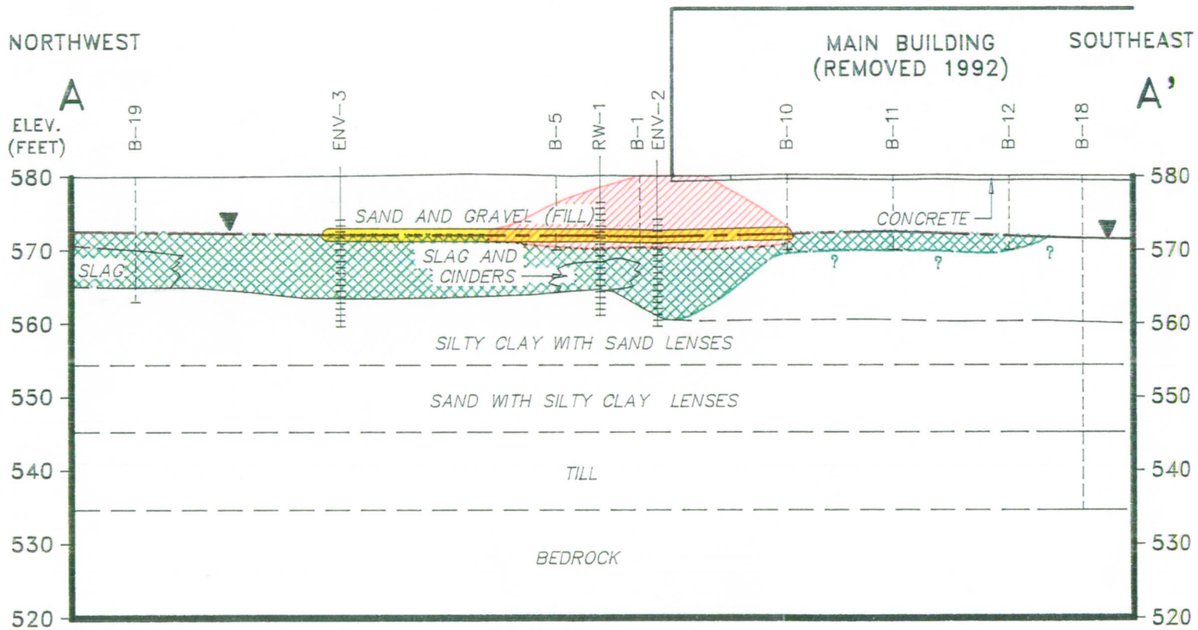
SITE MAP

SCALE:
50' 0 50'

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

Y
11/13/92 DMW 60
58001401\58001G01

FIGURE 2



LEGEND

- ESTIMATED RESIDUAL HYDROCARBON EXTENT OCTOBER 1990
- APPARENT EXTENT OF FLOATING SEPARATE PHASE HYDROCARBONS-MARCH 199
- ADDITIONAL EXTENT OF RESIDUAL HYDROCARBON SEPTEMBER 1992

NOTE: ABSENCE OF FLOATING SEPARATE PHASE HYDROCARBONS CONFIRMED IN JUNE 1991.

ENVIROTEK II SITE
TONAWANDA, NEW YORK

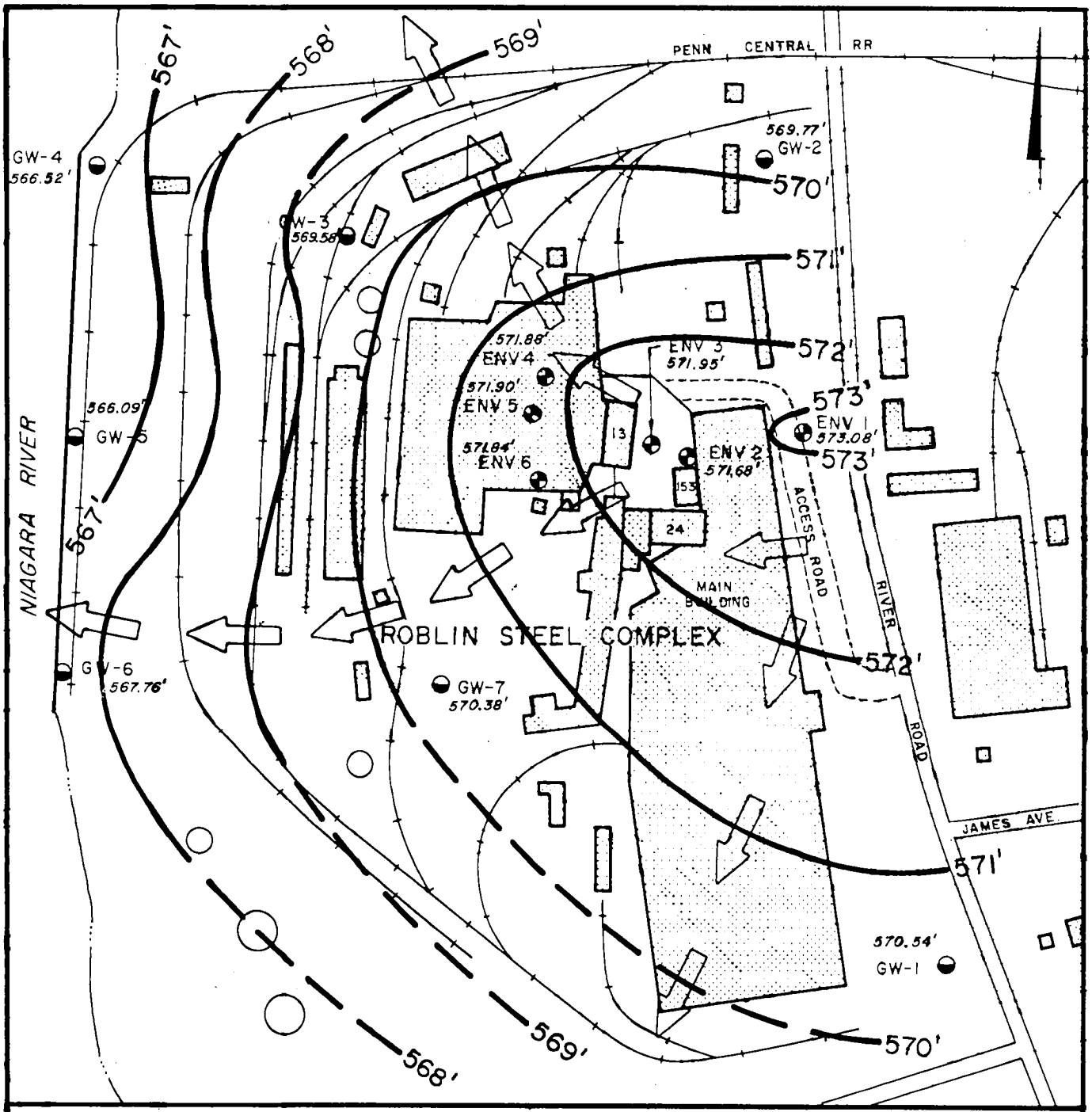
GEOLOGIC CROSS SECTION A-A'

HORIZONTAL SCALE:
40' 0 40'

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

11/5/92 DMW 60
5800140\58001X01

FIGURE 3



LEGEND

GW-6 ◒	DEC MONITORING WELL
ENV 1 ◒	MONITORING WELL INSTALLED NOVEMBER 1990
570.38'	GROUND-WATER ELEVATION
571' ——	GROUND-WATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED
⇦	GROUND-WATER FLOW DIRECTION (APPROX.)

SCALE

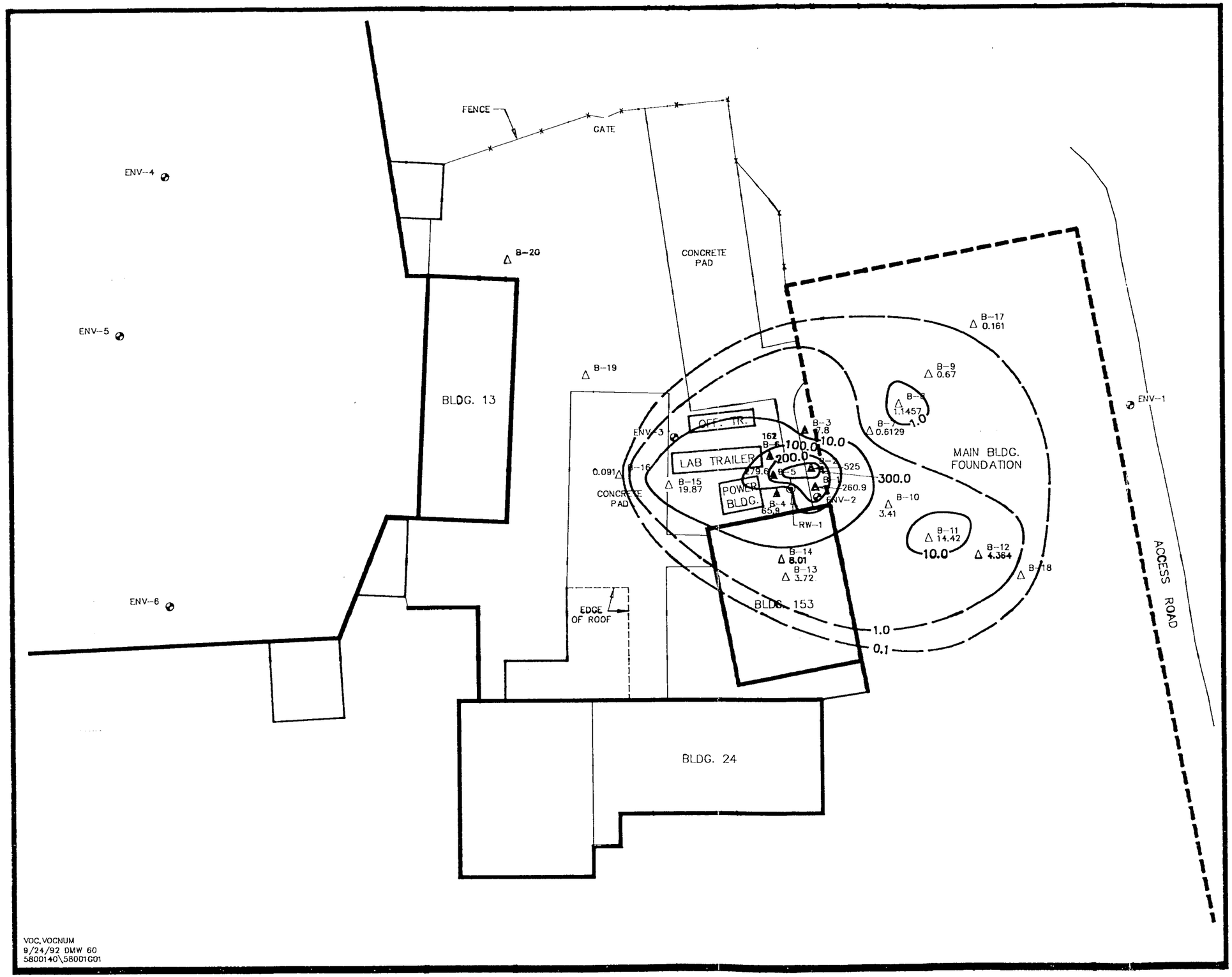
300' 0 300'

ENVIROTEK II SITE
TONAWANDA, NEW YORK

GROUND-WATER ELEVATION CONTOUR MAP MAY 11, 1992

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

FIGURE 4



VOC, VOCNUM
9/24/92 DMW 60
5800140\58001G01

LEGEND

- MONITORING WELL
- RECOVERY WELL
- ▲ SOIL BORING (10/90)
- △ SOIL BORING (5/92)
- 4.364 TOTAL VOC's CONCENTRATION (ppm)
- —1.0— TOTAL VOC's CONCENTRATION CONTOUR LINE (ppm), DASHED WHERE INFERRED

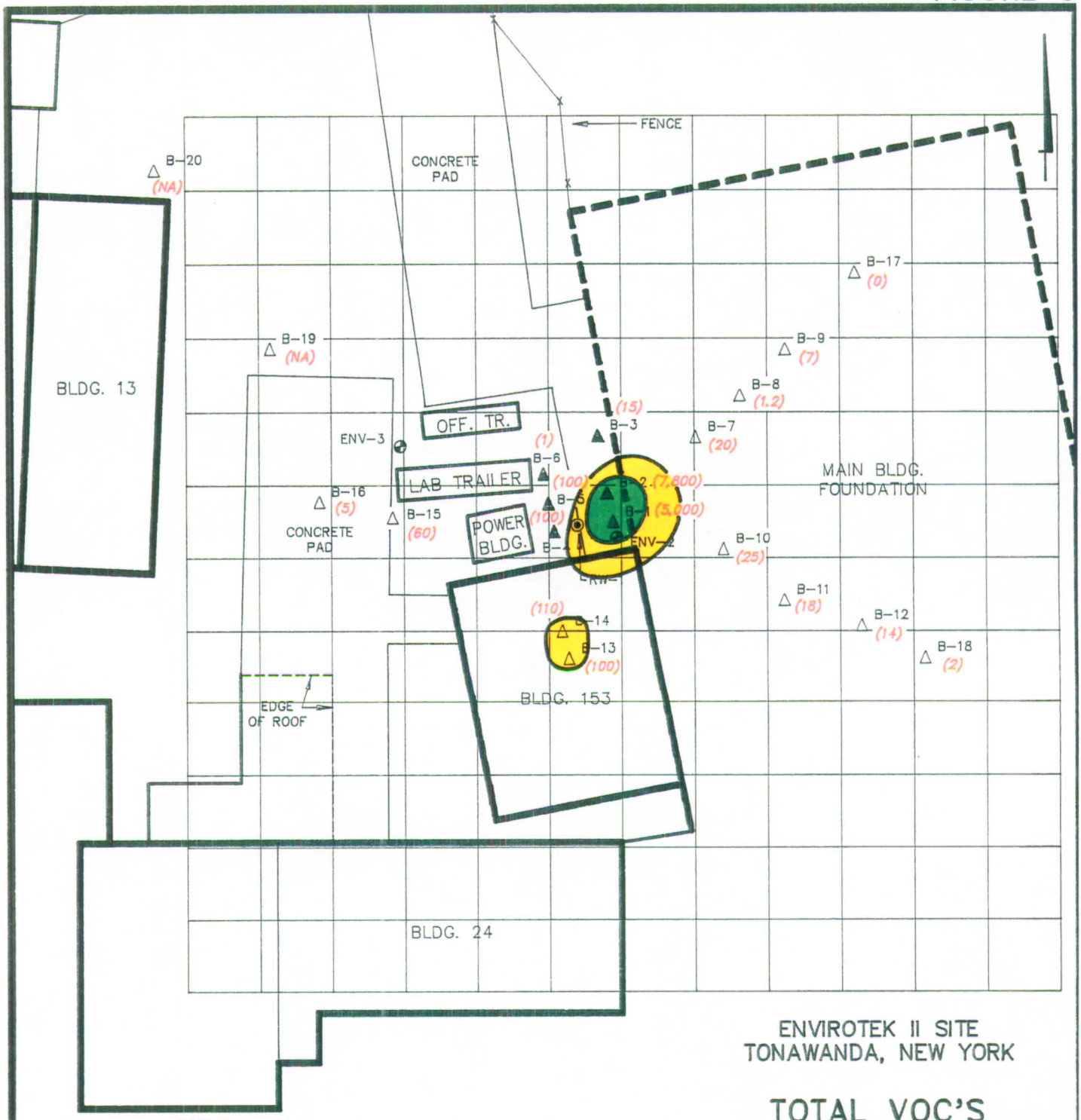
ENVIROTEK II SITE
TONAWANDA, NEW YORK

DISTRIBUTION OF TOTAL VOC'S IN SOIL MAY 1992

SCALE:
50' 0 50'

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

FIGURE 5



ENVIROTEK II SITE
TONAWANDA, NEW YORK

TOTAL VOC'S DISTRIBUTION WITH DEPTH (0-2 FEET)

LEGEND

- MONITORING WELL
- RECOVERY WELL
- SOIL BORING (10/90)
- SOIL BORING (5/92)
- (18) TOTAL VOC's CONCENTRATION (ppm) IN SOIL HEADSPACE

APPROXIMATE DISTRIBUTION OF VOC's:

- 100 – <1,000 ppm
- 1,000 – <10,000 ppm

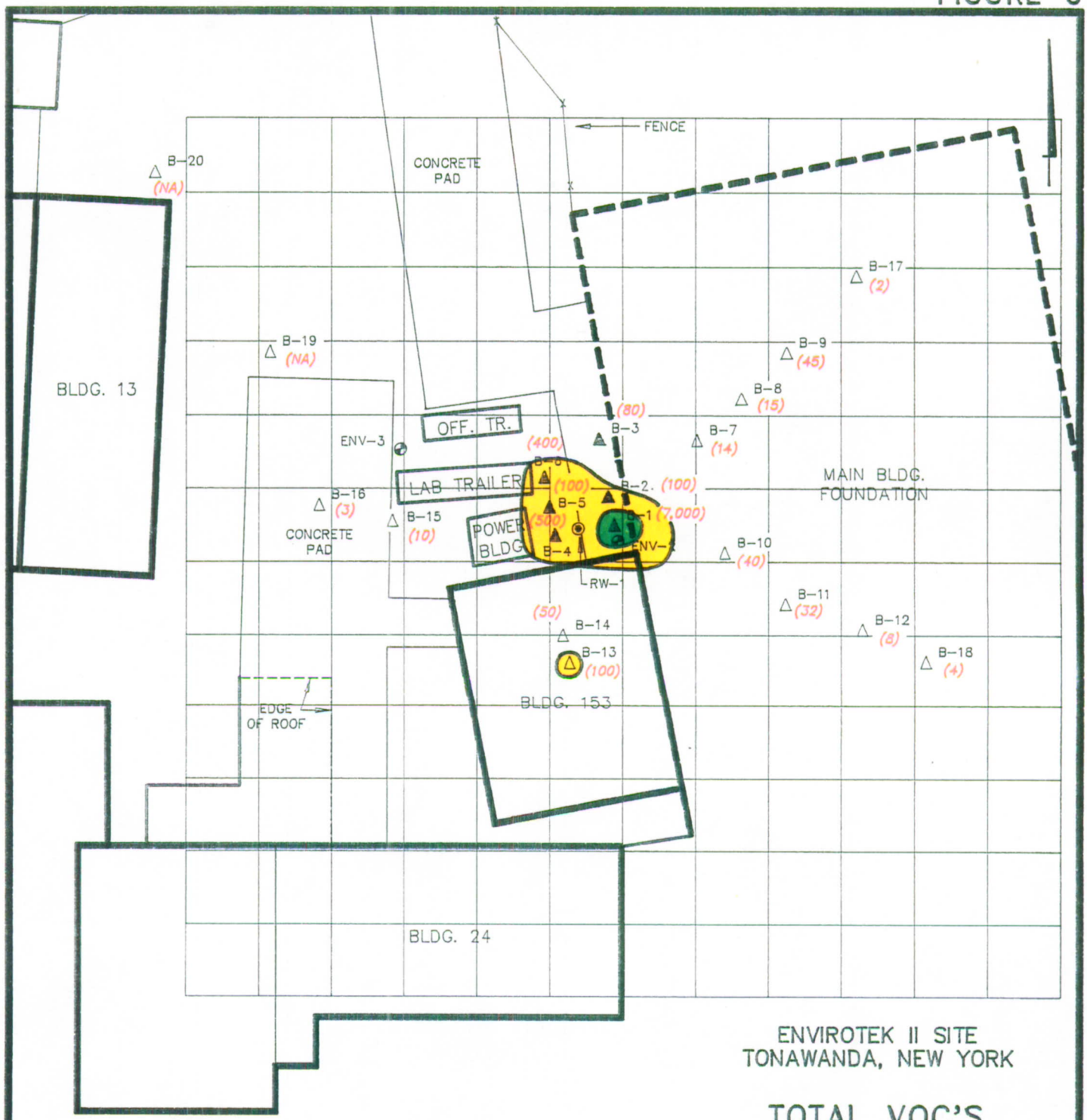
SCALE:

50' 0 50'

11/12/92 DMW 60 VOC2
5800140\580VOCP

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

FIGURE 6



ENVIROTEK II SITE
TONAWANDA, NEW YORK

TOTAL VOC'S DISTRIBUTION WITH DEPTH (2-4 FEET)

LEGEND

- MONITORING WELL
- RECOVERY WELL
- SOIL BORING (10/90)
- SOIL BORING (5/92)
- (15) TOTAL VOC's CONCENTRATION (ppm) IN SOIL HEADSPACE

APPROXIMATE DISTRIBUTION OF VOC's:

- 100 – <1,000 ppm
- 1,000 – <10,000 ppm

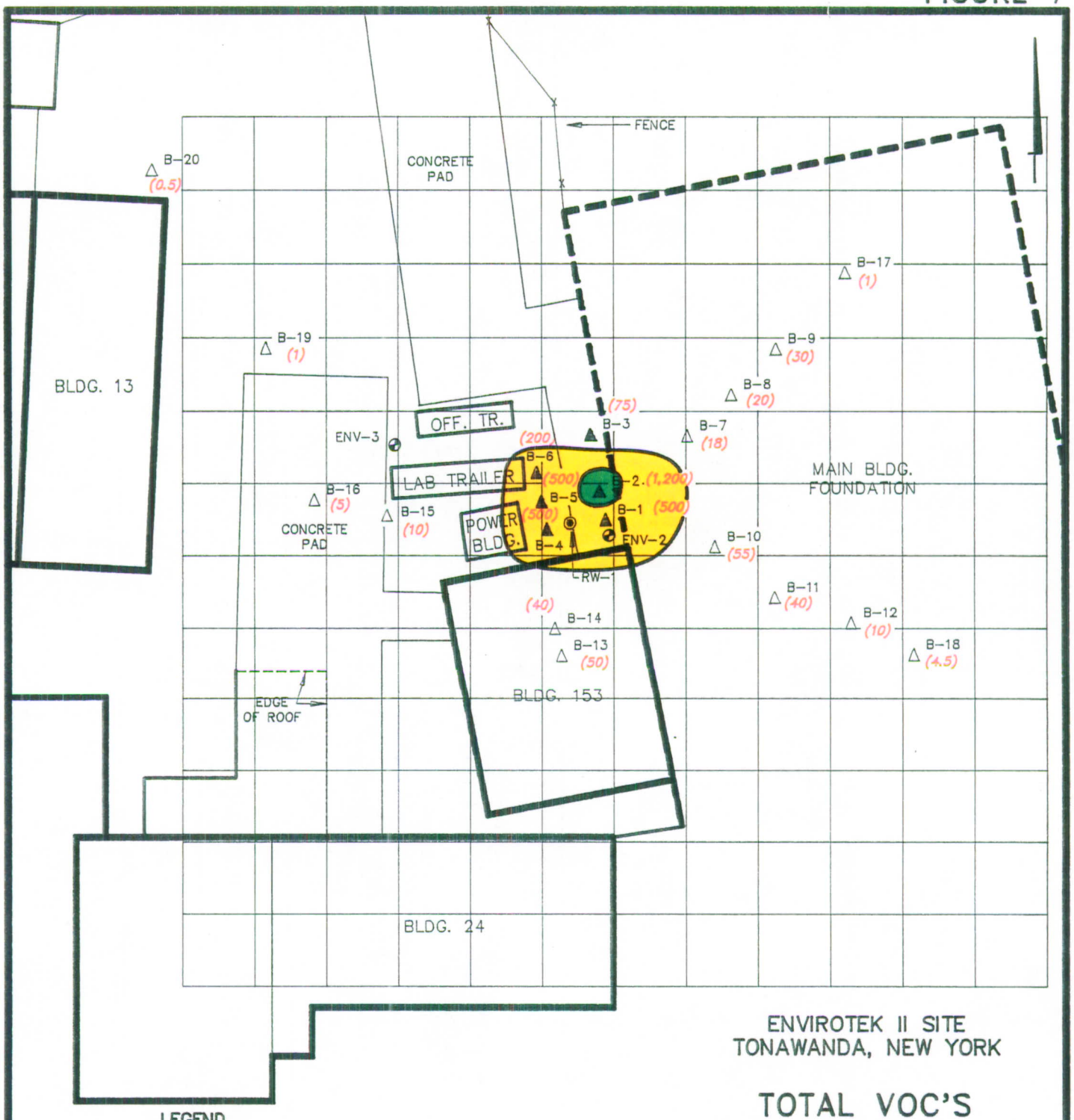
SCALE:

50' 0 50'

11/12/92 DMW 60 VOC2
5800140\580VOCP

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

FIGURE 7



ENVIROTEK II SITE
TONAWANDA, NEW YORK

TOTAL VOC'S DISTRIBUTION WITH DEPTH (4-6 FEET)

LEGEND

- MONITORING WELL
- RECOVERY WELL
- SOIL BORING (10/90)
- SOIL BORING (5/92)
- (18) TOTAL VOC's CONCENTRATION (ppm) IN SOIL HEADSPACE

APPROXIMATE DISTRIBUTION OF VOC's:

- 100 – <1,000 ppm
- 1,000 – <10,000 ppm

SCALE:

50' 0 50'

11/12/92 DMW 60 VOC2
5800140\580VOCP

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

Appendices

APPENDIX A

BORING LOGS AND WELL CONSTRUCTION DETAILS

SUBSURFACE LOG RW-1

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	4	250ppm			Brown to gray, fine GRAVEL, some fine to medium sand, loose, dry, FILL.
1				31				
				14				
2				12				
		2	1.2	11	60 ppm			Black staining and chemical odor at 2.0 feet to 7.0 feet.
3				12				
				14				
4				15				
		3	0.2	7	6.0 ppm			
5				6				
				6				
6				10				
		4	0.8	5	6.5 ppm			
7				5				
				6				Wet at 7.0 feet.
				8				
8		5	1.0	6	95 ppm			Oily film at 8.0 feet, some slag at 8.0 feet.
9				6				
				9				
10				7				
		6	0.6	4	90 ppm			
11				6				
				4				Black at 10.0 feet.
12				6				
		7	1.1	5	20 ppm			Black SLAG and CINDERS, little fine sand, loose, wet, hydrocarbon odor and film.
13				6				
				4				
14				7				
		8	1.1	3	100 ppm			
15				3				
				2				Black staining SILTY CLAY with sand stringers, MOIST.
16				2				
		9	1.2	2	20 ppm			Brown at 16.0 feet, ALLUVIUM.
17				2				
				3				
18		10		3				
19								Bottom of boring at 18.5 feet.
20								

SURFACE ELEVATION _____
DATE STARTED 5/15/92
DATE COMPLETED 5/15/92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO RW-1
SHEET 1 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG RW-1

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION

Well Completion Details

6-inch diameter 0.010 continuous wire - wound stainless steel screen;
screen: 18.1 feet to 8.5 feet
joint: 8.5 feet to 8.1 feet
screen: 8.1 feet to 3.5 feet
6-inch diameter stainless steel riser, 3.5 feet to 1.9 feet above grade.

#0 Grade Quartz sand 18.5 feet to 2.0 feet.
Hydrated bentonite pellets 2.0 feet to 1.0 feet
Type I Portland cement 1.0 feet to grade.

Well was completed with a 6-inch diameter pressure fitted locking cap.

Note:

1. Borehole created with 8¼ I.D. hollow item augers.
2. HNU readings were taken directly from soil sample jars within 4 hours of collection.

SURFACE ELEVATION _____
DATE STARTED 5-15-92
DATE COMPLETED 5-15-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO RW-1
SHEET 2 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-7

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	3	20 ppm			Concrete to 0.5 feet.
1				7				Brown, fine to coarse SAND, some medium to coarse gravel, concrete fragments, trace cinders, loose, dry, slight chemical odor, black staining 0.3 to 5 feet
				8				
2		2	1.5	4	14 ppm			FILL.
				20				
3				22				4.0 - 4.2 feet black staining.
				43				Some slag at 5.5 to 6.0 feet.
4		3	1.6	46	18 ppm			Moist to wet at 7.0 feet.
				10				Black oily sheen at 7.5 feet,
5				27				wet at 8.0 feet.
				13				
6		4	1.7	18	100 ppm			
				27				
7				27				
				20				
8		5	1.7	19	70 ppm			
				8				
9				12				
				27				
10				28				
								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12-92
CLASSIFIED BY TRD

PROJECT Envirotek
PROJECT NO 580.01
NO. B-7
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-8

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.8	4	1.2 ppm			Concrete to 0.4 feet.
1				3				Brown-black, fine to coarse SAND, some silt and medium to coarse gravel, trace cinders, loose, dry, FILL.
				6				
2				18				Chemical odor at 2.0 feet.
		2	1.8	4	15 ppm			
3				62				Grades to brown-gray at 2.0 feet.
				27				
4				16				Slag at 4.0 to 7.0 feet.
		3	1.7	38	20 ppm			
5				18				
				18				
6				18				
		4	1.3	8	50 ppm			
7				12				Wet at 7.0 feet.
				12				Black staining, fine to medium SAND and angular GRAVEL, trace cinders and slag, loose, wet.
				14				
8		5	1.0	5	75 ppm			
9				9				
				8				
10				10				Bottom of borings at 10.0 feet.

Notes:

1. Upon completion, borehole was back filled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12-92
CLASSIFIED BY DLC

PROJECT Envirotek
PROJECT NO 580.01
NO B-8
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-9

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.2	7	7.0 ppm			Concrete to 0.3 feet.
				12				Brown to red brown, medium to coarse SAND, trace fine gravel, trace cinders, some brick fragments, loose, dry, FILL.
1				4				
2				8				
		2	1.4	7	45 ppm			
3				3				
				1				
4				3				
		3	0.9	15	30 ppm			
5				11				Brown to black, fine to medium SAND, some fine gravel, trace silt, trace fine cinders, loose, dry. Wet at 7.0 feet, Black oily staining, strong hydrocarbon odor at 7.0 feet.
				13				
6				15				
		4	0.5	12	50 ppm			Oily sheen at 8.0 feet.
7				17				
				8				
				17				
8		5	1.4	14	85 ppm			
9				32				
				22				
10				14				Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12-92
CLASSIFIED BY DLC

PROJECT Enviroteк
PROJECT NO 580.01
NO B-9
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-10

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	1	25 ppm			Concrete to 0.4 feet.
1				1				Dark brown to brown fine to coarse SAND, some medium gravel, trace brick fragments, loose, moist to dry, FILL.
				12				
2				15				
		2	1.4	30	40 ppm			Light gray to brown, medium to coarse SAND, some fine gravel, trace cinders and silt, crumbly, dry, slight chemical odor, loose, FILL.
3				26				
				30				
4				19				
		3	1.1	11	55 ppm			
5				26				
				15				
6				5				
		4	1.3	11	70 ppm			
7				12				
				15				
				52				Black oily sheen, strong hydrocarbon odor at 7.5 feet.
8		5	1.7	15	50 ppm			
				27				Black at 9.0 feet.
9				36				
				38				
10								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12.92
CLASSIFIED BY DLG

PROJECT Envirotek
PROJECT NO 580.01
NO B-10
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-11

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	5	18 ppm			Concrete to 0.4 feet.
1				5				Brown to gray, fine to coarse SAND and fine to medium GRAVEL, trace silt, trace cinders, loose, dry, FILL.
				4				
2		2	0.8	7				
				13				
3				13				
				8				
4		3	0.4	5	32 ppm			Brown to light gray, medium SAND and medium angular GRAVEL, trace silt, trace slag, loose, moist, slight chemical odor.
				7				
5				3				
				8				
6				8				
		4	0.4	10	40 ppm			
7				9				Wet at 7.0 feet.
				8				
8				8				
		5	0.7	4	58 ppm			Brown, medium SAND and GRAVEL, trace silt, brown staining, slight hydrocarbon odor, wet, oily sheen on water.
9				4				
				5				
10				8				
								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12-92
CLASSIFIED BY DLC

PROJECT Enviroplex
PROJECT NO 580.01
NO. B-11
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-12

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.7	3 3 4 5	14 ppm			Dark brown to black, fine to coarse SAND, some fine to medium gravel, trace cinders, loose, dry, FILL.
2		2	0.6	3 3 5 5	8 ppm			Brown to gray, medium to coarse SAND and GRAVEL, trace silt and cinders, trace brick fragments, loose, moist to dry. Slight chemical odor at 6.0 feet.
4		3	0.4	7 8 11 17	10 ppm			
6		4	0.7	12 5 4 4	7 ppm			
8		5	0.9	5 13 13 7	25 ppm			Brown to rust brown, medium to coarse SAND, some medium gravel (angular), trace silt, slight chemical odor, sheen and staining on water, loose, wet.
10								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-12-92
DATE COMPLETED 5-12-92
CLASSIFIED BY DLC

PROJECT Envirotek
PROJECT NO 580.01
NO B-12
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-13

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.8	10	100 ppm			Concrete to 0.3 feet.
1				29				Brown to gray, fine to coarse SAND, some fine to medium gravel, some slag, loose, dry, FILL.
2				29				
				100/3				
		2	0	100/3				
3								
4								Septic odor at 4.0 feet.
		3	1.2	29	50 ppm			
5				69				
				82				
6				50				Red to brown at 6.0 feet.
		4	1.7	30	50 ppm			
7				19				
				19				
8				32				
		5	1.5	24	25 ppm			
9				20				Wet at 9.0 feet.
				18				
10				10				Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2¼" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO. B-13
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-14

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.5	8	110 ppm			Concrete to 0.3 feet.
1				4				Brown, medium to coarse SAND, trace gravel, trace slag, loose, dry, FILL.
				8				
				14				
2		2	1.1	14	50 ppm			Dark staining 2.5 feet to 3.0 feet.
3				10				
				17				
4				10				
		3	1.0	5	40 ppm			Brown to gray at 4.0 feet, strong chemical odor.
5				11				
				13				
6				22				
		4	1.8	51	120 ppm			
7				58				
				21				
8				25				Brown to red 8.0 feet to 8.5 feet.
		5	1.7	17	40 ppm			Wet at 8.5 feet.
9				14				
				12				
10				13				Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY IRC

PROJECT Environtek
PROJECT NO 580.01
NO B-14
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-15

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	7	60 ppm			Brown to dark brown fine to coarse SAND, trace medium gravel, trace clay, loose, moist, FILL.
1				7				
				10				
2				7				
		2	0.5	8	10 ppm			
3				10				
				7				
4				5				
		3	1.1	8	10 ppm			
5				9				Brown, fine to medium GRAVEL, some sand, little slag, loose, moist.
				8				
6				6				
		4	0.3	8	80 ppm			
7				9				Red to brown fine to medium SAND, some medium gravel, some slag, loose, moist to we. wet at 7.0 feet.
				10				
				7				
8		5	0.8	8	10 ppm			SLAG, black oily film.
				9				
9				7				
				4				
10								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-15
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-16

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.4	24	5 ppm			Concrete to 0.4 feet.
1				34				Brown to gray, fine to coarse SAND, some gravel, loose, dry, FILL.
				22				
2				15				
		2	1.0	10	3 ppm			Brown to red at 1.5 feet to 2.0 feet. Stained dark brown 3.0 feet to 5.0 feet.
3				15				
				18				
4				29				
		3	1.1	18	5 ppm			
5				10				
				10				Brown to black SLAG loose, dry.
6				10				
		4	1.2	10	8 ppm			Chemical odor at 6.0 feet. Wet at 8.0 feet.
7				12				
				18				
8				15				
		5	1.5	14	9 ppm			
9				15				Black, fine to medium SAND, some large slag, loose, wet oily film.
				18				
10				20				
								Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-16
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-17

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	5	0 ppm			Concrete to 0.3 feet.
1				6				Brown to red brown, medium to coarse SAND, some medium gravel loose, dry, FILL.
				7				
2				13				
		2	0.5	10	2 ppm			
3				13				
				11				
4				18				
		3	1.1	10	1 ppm			Chemical odor at 4.0 feet.
5				10				
				6				
6				13				
		4	0.8	11	14 ppm			Brown to gray at 6.0 feet.
7				6				
				6				
8				6				
		5	0.8	63	6 ppm			Gray, fine to medium GRAVEL, loose wet septic odor, slight oily film.
9				65				
				10				
10				3				Bottom of boring at 10.0 feet.

Notes:

1. Upon completion, borehole was backfilled with cuttings.
2. Borehole was created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-17
SHEET 1 OF 1

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-18

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.8	5	2 ppm			Concrete to 0.3 feet.
1				3				Black, fine to medium GRAVEL, some medium to coarse sand, loose dry, FILL.
				3				
2				4				
		2	1.1	5	4 ppm			Brown to gray, medium to coarse SAND and fine to medium GRAVEL, loose, dry.
3				4				FILL
				4				
4				4				
		3	0.8	22	4.5 ppm			Brown to gray, fine to medium GRAVEL, some sand and slag, loose, dry.
5				20				
				10				FILL
6				11				
		4	0.8	11	7 ppm			
7				10				
				7				
				7				
8		5	0.8	7	3 ppm			Wet at 8.0 feet.
9				23				
				22				
10				10				Brown, medium to coarse SAND, trace medium gravel, loose, wet.
11								FILL
12								
13								
14								
15								
		6	N/C	3	-			
16				1				
				2				
17				2				
18								
19								
20								
		7	1.5	1	0 ppm			Gray to brown SILTY CLAY, sand stringers, moist, very plastic, ALLUVIUM.
21				1				
22				1				

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-14-92
CLASSIFIED BY TRO

PROJECT Environtek
PROJECT NO 580.01
NO B-18
SHEET 1 OF 3

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-18

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
23								
24								
25		8	1.5	4	0 ppm			Grades to fine to medium SAND, several lenses of silty CLAY.
26				5				
				7				
27				10				
28								
29								
30		9	1.7	4	0 ppm			Lenses of fine to medium gravel.
31				9				
				12				
32				15				
33								
34								
35								
		10	1.2	9	0 ppm			Brown, SILT and Fine SAND, little medium gravel, some clay, slightly plastic moist, compact, TILL.
36				11				
				16				
37				19				
38								
39								
40								
		11	1.8	50	0 ppm			
41				53				
				53				
42				57				
43								
44								
45		12	.2	100/3	0 ppm			
46								Auger refusal at 45.7 feet. (Weathered rock in end of spoon).
47								

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-13-92
CLASSIFIED BY TRC

PROJECT Envirotek
PROJECT NO 580.01
NO B-18
SHEET 2 OF 3

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-18

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
48								

Notes:

1. Grouted to the surface with 15 gallons of water and two 94 lb bags of Type I Portland cement.
2. Borehole created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-13-92
DATE COMPLETED 5-14-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-18
SHEET 3 OF 3

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-19

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0								Brown, fine to medium GRAVEL, some sand, loose, dry, FILL.
5		1	1.0	41	1 ppm			
6				4				Stained black at 6.0 feet.
7				3				
				5				Wet at 7.0 feet.
10		2	1.1	5	3 ppm			Black SLAG, trace sand, loose, wet.
11				6				
				13				Water is black and has hydrocarbon odor.
12				13				
15		3	1.0	3	5 ppm			Dark brown Silty-CLAY, sand stringers, loose, moist, ALLUVIUM. Hydrocarbon odor.
16				2				
				2				
17				3				
		4	0.6	1	5 ppm			
18				3				
				4				
19				3				
20		5	1.1	1	.5 ppm			Grades to dark brown to black, fine sand and silt, some clay, moist to wet. Black staining with hydrocarbon odor.
21				1				
				2				
22				2				Bottom of Boring at 22.0 feet.

SURFACE ELEVATION _____
DATE STARTED 5-14-92
DATE COMPLETED 5-14-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-19
SHEET 1 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-19

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION

Notes:

1. Borehole grouted to the surface with 20 gallons of water, two 94 lb. bags of Type I Portland cement and 5 lbs. bentonite, using tremie pipe.
2. Borehole created with 2½" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-14-92
DATE COMPLETED 5-14-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-19
SHEET 2 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-20

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0								
1								Brown to dark gray, fine to medium GRAVEL, some medium to coarse sand, loose, dry, FILL.
2								
3								
4								
5		1	0.3	48	.5 ppm			
6				12				
7				12				
				10				Wet at 7.0 feet.
8								
9				-				
10		2	0.3	100/6	16 ppm			Oil beads on gravel at 10.0 feet.
11								
12								
13								
14								
15		3	0.3	6	.75 ppm			Gray to black SILT and CLAY some fine sand, lenses of black and gray fine sand, loose, wet, ALLUVIUM.
16				2				
				3				Black staining at top of material, lenses or stringers of sand stained black. Hydrocarbon odor.
17				4				
18								
19								
20								
		4	1.3	3	.75 ppm			
21				1				
				2				
22				2				
								Bottom of Boring at 22.0 feet.

SURFACE ELEVATION _____

DATE STARTED 5-14-92

DATE COMPLETED 5-14-92

CLASSIFIED BY TRO

PROJECT Envirotek

PROJECT NO 580.01

NO. B-20

SHEET 1 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

SUBSURFACE LOG B-20

DEPTH (FT.)	SAMPLES	SAMPLE NO.	RECOVERY (FEET)	BLOWS (PER 0.5 FT.)	HNU (HEADSPACE)	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION

Notes:

1. Grouted borehole to the surface with 30 gal of water, 2-94 lb. bags of Type I Portland cement and 5 lbs. bentonite, using tremie pipe.
2. Borehole created with 2¼" I.D. hollow-stem augers.

SURFACE ELEVATION _____
DATE STARTED 5-14-92
DATE COMPLETED 5-14-92
CLASSIFIED BY TRO

PROJECT Envirotek
PROJECT NO 580.01
NO B-20
SHEET 1 OF 2

BLASLAND & BOUCK ENGINEERS, P.C.

APPENDIX B

AQUIFER TEST DATA SUMMARIES

TABLE B-1

ENVIROTEK II SITE
TONAWANDA, NEW YORK

AQUIFER TEST DATA-RECOVERY WELL 1

ELAPSED MINUTES	DRAWDOWN (FEET)	WATER LEVEL
0.00	0.00	11.04
0.43	0.06	11.10
0.53	0.29	11.33
0.67	0.46	11.50
1.23	0.56	11.60
1.67	0.66	11.70
1.97	0.71	11.75
2.53	0.78	11.82
3.00	0.86	11.90
3.83	0.95	11.99
4.33	1.00	12.04
4.90	1.06	12.10
5.28	1.10	12.14
5.78	1.14	12.18
6.15	1.16	12.20
6.68	1.21	12.25
7.28	1.25	12.29
8.18	1.31	12.35
9.27	1.36	12.40
9.67	1.38	12.42
13.50	1.40	12.44
14.35	1.46	12.50
14.90	1.49	12.53
15.33	1.51	12.55
16.32	1.54	12.58
16.73	1.56	12.60
17.17	1.59	12.63
17.67	1.61	12.65
18.50	1.64	12.68
19.32	1.67	12.71
20.48	1.70	12.74
21.33	1.72	12.76
22.25	1.74	12.78
23.28	1.76	12.80
24.13	1.79	12.83
25.58	1.82	12.86
26.87	1.84	12.88
28.25	1.86	12.90
29.48	1.88	12.92
31.00	1.90	12.94
32.83	1.92	12.96
36.08	1.94	12.98
38.67	1.96	13.00
41.25	1.98	13.02
44.38	2.01	13.05
47.17	2.03	13.07
50.03	2.06	13.10
52.03	2.08	13.12

TABLE B-1
(Cont'd)
ENVIROTEK II SITE
TONAWANDA, NEW YORK

AQUIFER TEST DATA-RECOVERY WELL 1

ELAPSED MINUTES	DRAWDOWN (FEET)	WATER LEVEL
57.60	2.10	13.14
63.22	2.12	13.16
66.52	2.15	13.19
69.57	2.17	13.21
75.58	2.22	13.26
82.72	2.25	13.29
91.48	2.56	13.60
97.70	2.47	13.51
102.67	2.45	13.49
109.30	2.45	13.49
118.50	2.47	13.51
129.05	2.50	13.54
144.33	2.54	13.58
154.85	2.64	13.68
161.03	2.63	13.67
165.30	2.63	13.67
172.42	2.64	13.68
180.10	2.63	13.67
189.00	2.64	13.68
208.50	2.71	13.75
221.68	2.71	13.75
231.02	2.72	13.76
243.50	3.09	14.13
246.28	3.03	14.07
248.72	3.01	14.05
266.83	2.95	13.99
259.00	2.87	13.91
267.05	2.80	13.84
282.63	2.77	13.81
295.35	2.79	13.83
326.42	2.93	13.97
344.42	2.93	13.97
365.30	3.17	14.21
379.70	3.16	14.20
398.13	3.31	14.35
414.17	3.51	14.55
420.33	3.56	14.60
430.00	3.60	14.64
440.45	3.59	14.63
451.60	3.63	14.67
460.55	3.78	14.82
478.02	3.92	14.96
486.30	3.97	15.01
493.42	3.99	15.03
499.77	3.99	15.03
504.17	4.00	15.04
506.80	4.01	15.05

TABLE B-1
(Cont'd)
ENVIROTEK II SITE
TONAWANDA, NEW YORK

AQUIFER TEST DATA-RECOVERY WELL 1

ELAPSED MINUTES	DRAWDOWN (FEET)	WATER LEVEL
PUMP OFF		
507.32	3.91	14.95
507.58	3.76	14.80
507.77	3.68	14.72
507.93	3.61	14.65
508.18	3.56	14.60
508.43	3.41	14.45
508.63	3.36	14.40
508.82	3.26	14.30
509.00	3.11	14.15
509.47	2.96	14.00
509.58	2.76	13.80
510.12	2.61	13.65
510.28	2.51	13.55
510.38	2.46	13.50
510.53	2.41	13.45
510.65	2.36	13.40
510.75	2.31	13.35
510.93	2.26	13.30
511.05	2.21	13.25
511.15	2.18	13.22
511.27	2.16	13.20
511.42	2.11	13.15
511.63	2.06	13.10
511.70	2.01	13.05
511.85	1.96	13.00
511.92	1.91	12.95
512.10	1.86	12.90
512.30	1.81	12.85
512.45	1.76	12.80
512.67	1.71	12.75
512.80	1.66	12.70
512.92	1.61	12.65
513.12	1.56	12.60
513.35	1.51	12.55
513.50	1.46	12.50
513.70	1.41	12.45
513.95	1.36	12.40
514.17	1.31	12.35
514.40	1.26	12.30
514.92	1.16	12.20
515.52	1.06	12.10
515.93	0.96	12.00
516.37	0.86	11.90
517.47	0.76	11.80
518.27	0.66	11.70
519.65	0.56	11.60
521.72	0.46	11.50
525.75	0.36	11.40

TABLE B-2

ENVIROTEK II SITE
TONAWANDA, NEW YORK

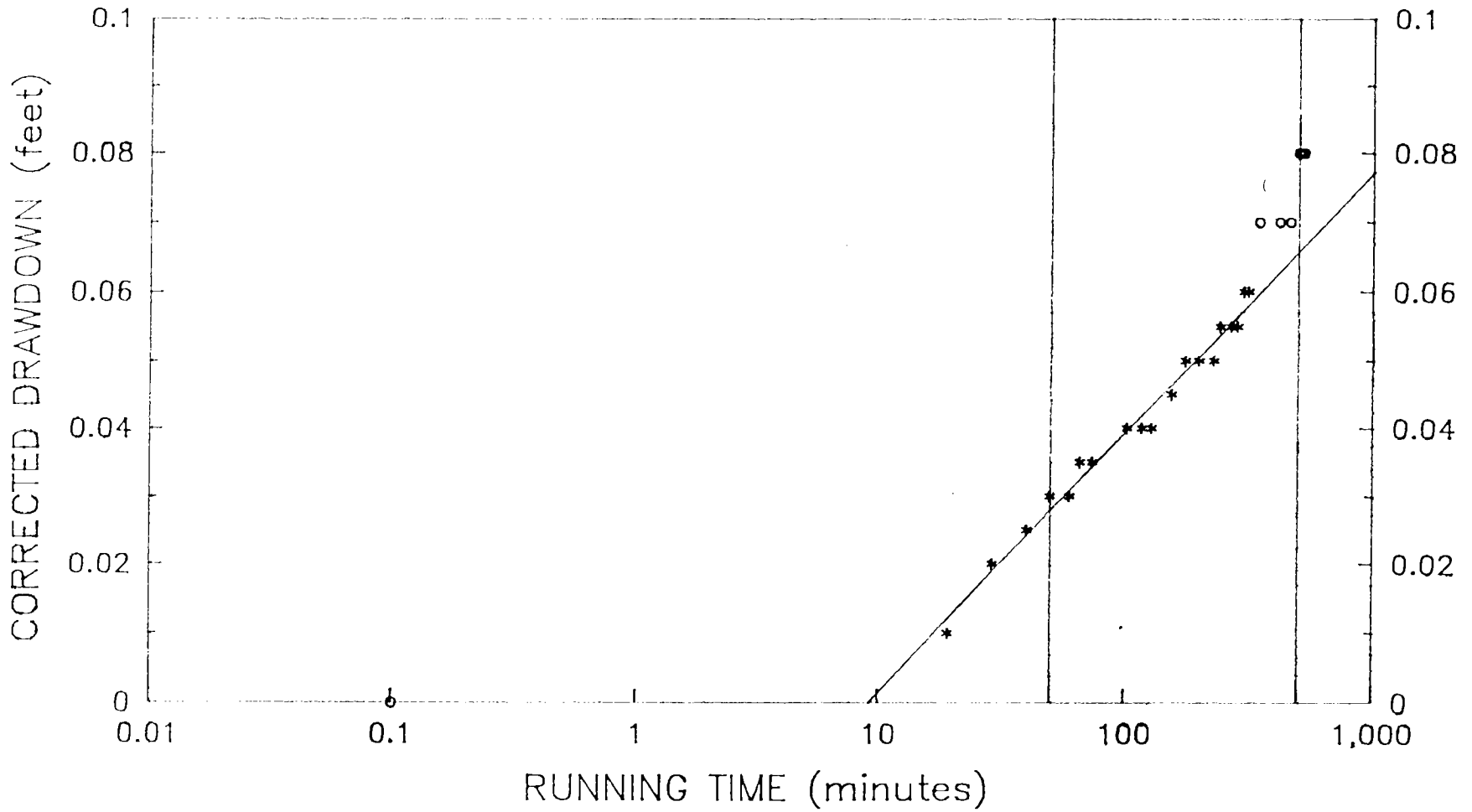
AQUIFER TEST DATA-MONITORING WELL ENV-2

ELAPSED MINUTES	DRAWDOWN (FEET)
0	0
19	0.01
29	0.02
40	0.025
50	0.03
60	0.03
66	0.035
74	0.035
102	0.04
117	0.04
128	0.04
154	0.045
175	0.05
198	0.05
227	0.05
241	0.146
267	0.055
283	0.055
300	0.06
313	0.06
345	0.07
417	0.07
461	0.07
497	0.08
505	0.08
513	0.08
519	0.08
522	0.08
PUMP OFF	
525	0.08
526	0.08
534	0.07
549	0.07
555	0.06
570	0.05
601	0.04
618	0.04

OBSERVATION WELL ENV-2 DRAWDOWN vs. TIME

8 HOUR PUMPING TEST AT ENVIROTEK SITE

TONAWANDA, NEW YORK



APPENDIX C

LABORATORY ANALYTICAL REPORTS

(Submitted Under Separate Cover)