



# REPORT

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## RESULTS OF SAMPLING PLAN ENVIROTEK II SUPERFUND SITE

Technical Committee  
Participating Potentially Responsible Parties

Tonawanda, New York

June 1991



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

REPORT

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ENVIROTEK II SUPERFUND SITE  
TONAWANDA, NEW YORK

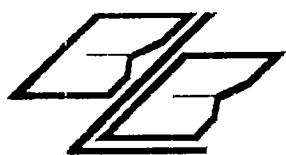
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## Introduction

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## SECTION 1 - INTRODUCTION

### 1.1 General

This report presents the results of an investigative program implemented by Blasland & Bouck Engineers, P.C. (Blasland & Bouck), at the Envirotek II Superfund site, located in Tonawanda, New York (Figure 1). The scope of the activities implemented as part of this investigation were in accordance with the USEPA-approved Sampling Plan, dated June 1990. This investigation was performed on behalf of the participating Potentially Responsible Parties of the Envirotek II site (PRPs) in partial fulfillment of the requirements of the Administrative Order on Consent (Index No. CERCLA-00206) between participating PRPs and the United States Environmental Protection Agency (USEPA), signed on May 14, 1990.

### 1.2 Background

The Envirotek II site includes a 2.5-acre facility once leased by Envirotek, Ltd., as well as the southeast portion of the hangar building located immediately east of the property formerly leased by Envirotek. This site is located within the former Roblin Steel complex at 4000 River Road in Tonawanda, New York (Figure 2). The Roblin Steel complex is bounded on the west by the Niagara River; on the east by River Road; on the south by vacant land; and on the north by a site currently under investigation by the New York State Department of Environmental Conservation (NYSDEC), referred to as the River Road site (NYSDEC #915031).

The Envirotek II site was operated by Envirotek, Ltd., as a solvent recovery operation from 1981 until June 1989. Envirotek was issued a permit as a hazardous waste treatment, storage, and disposal (TSD) facility by the

NYSDEC in 1984. The current owners of the site, Niagara River World, Inc., evicted Envirotek in June 1989. Envirotek's permit as a TSD facility was subsequently revoked by the NYSDEC in November 1989.

The land on which the surrounding Roblin Steel complex is located is believed to have once been a low-lying swampy area and included a small island that was separated from the mainland by a creek. Prior to development, fill was used to bring the site to its present grade. An iron and steel production plant was then constructed by the Wickwire Spencer Steel Company in the early 1900s. In 1945, the property was sold to Colorado Fuel and Iron Corporation, which subsequently merged with Wickwire Spencer Steel. The plant was operated by this corporation until it went bankrupt in 1963. The plant was then purchased by Roblin Steel in the mid to late 1960s and was used by Roblin for storage purposes. Roblin Steel also subleased portions of the Roblin Steel Complex to various companies, including Ascension Chemical, Rupp Rental, Freightways Transportation, Booth Oil, and Envirotek. The entire Roblin Steel facility, including the Envirotek II site, are currently owned by Niagara River World, Inc.

### 1.3 Investigation Objectives

The specific objectives of this investigation of the Envirotek II site include the following:

- Determine the direction and rate of ground-water flow in the shallow overburden aquifer underlying the site;
- Evaluate the nature of any chemical compounds present in the ground water associated with the former activities at the Envirotek II site;

- Identify other areas at the site at which spills or releases of chemical compounds may have occurred; and

The overall objective of this investigative program was to provide a preliminary characterization of the site. The information developed through this investigation provides a basis for evaluating whether further investigation and remedial actions are warranted for this site.





# Scope of Investigation Activities

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## SECTION 2- SCOPE OF INVESTIGATION ACTIVITIES

### 2.1 General

This section of the report presents a detailed discussion of the investigation activities performed as part of the sampling and analysis program implemented at the Envirotek II site. These investigation activities were performed under the following two tasks:

- Site Reconnaissance Activities, and
- Hydrogeologic Investigation Activities.

In addition to these activities, Blasland & Bouck implemented a supplementary soil sampling and analysis program as part of an evaluation of potential interim remedial alternatives for the Still Discharge Area. The activities implemented for each of these tasks are detailed below.

### 2.2 Site Reconnaissance Activities

The site reconnaissance activities that were performed at the Envirotek site as part of the sampling and analysis program included the following:

- Visual inspection of the surface conditions;
- Soil gas survey of the open areas;
- Identification of utility lines on-site; and
- Assessment of site topography and drainage.

The purpose of these site reconnaissance activities was to provide information pertaining to the existing conditions at the site that may be used to assist in identifying additional areas of concern associated with Envirotek's

activities at the site. In addition, the information generated was used to assist in directing the subsequent investigation activities.

The visual inspection performed of the surface conditions at the site concentrated on identifying any additional areas that exhibit evidence of previous use as disposal locations. During this walk-through inspection, an assessment of site topography and drainage was also performed to identify the possible routes of surface-water runoff from the site. An attempt was also made to locate any underground utilities that could have interfered with the subsurface investigation activities that were subsequently performed. This was accomplished through the review of existing construction blueprints of the site by the on-site geologist from Blasland & Bouck and a representative of Niagara River World, Inc.

The soil gas survey implemented as part of the site reconnaissance activities was performed to evaluate the open areas of the site for evidence of additional material disposal areas and/or other potential releases that might have been associated with the Envirotek site. In addition to the soil gas survey activities performed to evaluate the open areas, soil gas samples were also collected and analyzed as part of a supplementary investigation implemented to support the evaluation of potential interim remedial actions for the Still Discharge Area. These soil gas survey activities involved the collection of soil gas samples from a total of 32 locations at the site. These soil gas samples were located throughout the unpaved portions of the site based on a grid spacing of approximately 50 feet. The actual locations from which these soil gas samples were collected are illustrated on Figure 3. The collection and analysis of soil gas samples was performed by Tracer Research Corporation (Tracer) in accordance with the protocols presented in Appendix A.

### 2.3 Hydrogeologic Investigation Activities

To further characterize the nature of the aquifer underlying the Envirotek II site, Blastand & Bouck implemented the following hydrogeologic investigation activities:

- Monitoring Well Installation
- In-situ Hydraulic Conductivity Testing
- Measurements of Ground-Water Elevations
- Ground-Water Sampling and Analysis.

A detailed discussion of each hydrogeologic investigation component is presented below.

#### 2.3.1 Monitoring Well Installation

A total of six monitoring wells (ENV-1, ENV-2, ENV-3, ENV-4, ENV-5, and ENV-6) were installed at the Envirotek II site between November 6 and 9, 1990. The location of each new monitoring well is indicated on Figure 4. This figure also indicates the location of the seven existing monitoring wells (GW-1 through GW-7), which were previously installed in the site vicinity as part of the NYSDECs investigation of the Roblin Steel Complex. Drilling and well installation services associated with this investigation were provided by Empire Soils Investigations, Inc. Boreholes at each location were advanced using a Mobile CME-45B truck-mounted drill rig, equipped with 4¼-inch I.D. hollow-stem augers. Soil samples were obtained at 5-foot intervals from each borehole using standard 2-inch I.D., 2-foot long split-spoon samplers in accordance with ASTM D-1586.

A representative portion from each split-spoon sample was retained in clean glass jars. The jars were immediately covered with aluminum foil and capped with a lid. Headspace gases in each of these jars were then screened using an OVA by piercing the foil seal with the OVA probe tip. The results of this OVA headspace screening were recorded and are included on the subsurface logs prepared for each boring (Appendix B). The OVA was also utilized during drilling activities to monitor the breathing zone at and around the drill rig in accordance with the Site-Specific Health & Safety Plan. 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 (e.g., staining, odor) was also recorded on the boring logs. The boring logs are presented in Appendix B.

All downhole equipment and associated drilling equipment, including augers, drill rods, auger plugs, split-spoon samplers, and other equipment, were decontaminated prior to the start of each borehole. This equipment was also decontaminated prior to leaving the site at the completion of the project. The equipment was decontaminated by high pressure hot water (i.e., steam cleaning). The split-spoons were decontaminated prior to each use by scrubbing in soapy (Alconox) water, scrubbing in a water rinse, a hexane rinse, a methanol rinse, and a final rinse with distilled water.

Each borehole was completed as an overburden monitoring well through the installation of 15 feet of 2-inch I.D. Schedule 40 PVC well screen (0.010-inch slot). The well column was completed with

solid PVC, flush threaded riser pipe to above grade. A No. 4-Q graded quartzite sand pack was installed from the bottom of the well column to a minimum of one foot above the top of the screened interval. A minimum one-foot hydrated bentonite seal was placed above the sand pack. The remainder of the annulus was filled to within 18 inches of the surface with grout. All of the wells, except for ENV-1, were completed above the ground surface with a 4-inch diameter steel protective casing, with locking cap, installed in a 2-foot by 2-foot by 1.5-foot thick concrete pad. Due to the location of monitoring well ENV-1 on an access road, this well was completed with a flush-mount curb box. The well construction details for each of the new monitoring wells are included with the boring logs in Appendix B.

Upon completion, each newly installed well was developed to improve hydraulic communication between the well and the surrounding aquifer formation to the degree possible. The development methodology involved the use of a bottom-loading, stainless steel bailer to surge and purge each well. Well development continued until the turbidity levels of the ground water showed no noticeable improvement.

#### 2.3.2 In-Situ Hydraulic Conductivity Testing

In-situ hydraulic conductivity tests (slug tests) were performed on each of the newly installed monitoring wells to further characterize the hydrogeologic properties of the water table aquifer at the site. These tests were conducted as rising head tests. Initially, a solid slug was lowered into the water column of the well to displace a known volume of water. After the water level in the well returned to its static level, the slug was removed to create a hydraulic differential between the well and the surrounding aquifer. Water levels were then measured and

recorded as the water in the well equilibrated with the surrounding aquifer. A hydraulic conductivity value for the aquifer at each well location was then calculated from this data using the Bouwer-Rice method. The data developed through the performance of these slug tests is presented in Appendix C.

### 2.3.3 Measurement of Ground-Water Elevations

As part of the hydrogeologic investigation activities performed at this site, two rounds of static water level measurements were recorded from each of the six newly installed monitoring wells (ENV-1 through ENV-6). Water level measurements were also recorded for the seven existing monitoring wells (GW-1 through GW-7) located on the surrounding site. Each of the wells were also checked for the presence of either light non-aqueous phase liquids (LNAPLs) or dense non-aqueous phase liquids (DNAPLs) using an interface probe capable of sensing phase separated materials at either the top or bottom of the water column in the wells.

To allow for the calculation of ground-water elevations from the static water level measurements recorded from these wells, a reference elevation of the top of each new monitoring well was surveyed to within 0.01 feet by licenced land surveyors from Blasland & Bouck. The reference elevation for two of the existing wells located on the surrounding site (GW-1 and GW-2) were also determined. This allowed the elevations of the new monitoring wells to be tied to a common datum with the existing wells for the calculation of ground-water elevation data for all the existing wells. The survey methods utilized conformed to standards and performance criteria for a second order, Class 2 survey as specified in Standards and Specifications for Geodetic

Control Network, Federal Geodetic Control Committee, September 1989, as well as standard professional surveying practices and procedures. These reference elevations are summarized in Table 1, along with the calculated ground-water elevations for each round of water level measurements.

#### 2.3.4 Ground-Water Sampling and Analysis

To evaluate potential impacts to ground-water quality in the vicinity of the site, ground-water samples were collected from the six newly installed monitoring wells (ENV-1 through ENV-6).

Prior to sampling, each well was purged of approximately six well volumes. Ground-water samples were collected using stainless steel bottom-loading bailers, which were decontaminated prior to each sampling event. The decontamination process included washing with a solution of laboratory-grade detergent (Alconox) and water, followed by a distilled water rinse, methanol rinse, hexane rinse, and finally a distilled water rinse. Field measurements of the pH, temperature, and conductivity were taken of each sample and recorded along with a description of the appearance of the sample. A summary of the field measurements is presented in Table 2. Samples were placed directly into laboratory-provided sample containers immediately upon collection, and maintained at approximately 4°C until delivery to the laboratory for analysis.

#### 2.4 Supplementary Soil Sampling and Analysis Program

This section presents the scope of the supplementary soil sampling and analyses performed in the Still Discharge Area. This program was designed to evaluate the nature and extent of any impacts associated with the former



still discharges and to support the evaluation of the potential interim remedial alternatives for this area. This soil sampling and analysis program was performed under the Removal Action Work Plan, and the results were presented in our report "Evaluation of Interim Remedial Alternatives, Still Discharge Area," dated March 1991. The results are restated in this report, given their relevance to the objectives of this sampling program.

On October 11 and 12, 1990, a total of six soil borings were drilled at the locations indicated on Figure 5. Each boring was continuously sampled from the ground surface to the water table using 2-inch diameter split-spoon sampling devices. To insure sample integrity, the split-spoon samplers were decontaminated prior to each use by washing with a detergent solution then rinsed sequentially with potable water, methanol, and triple rinsed with distilled water. Each sampler was then allowed to air dry prior to use. Immediately following retrieval of each split-spoon sampler, a representative sample of the soil was placed directly into a laboratory-provided sample container for possible laboratory analysis. A second representative portion of the sample was placed into a clean jar, covered with aluminum foil, and left standing for at least several minutes to allow volatile organics present in the soil to volatilize into the head space of the jar. An Organic Vapor Analyzer (OVA) was then used to screen each sample for relative concentrations of volatile organic constituents by inserting the probe of the OVA 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 (e.g., staining, odor) was also recorded on the boring logs. The boring logs are presented in Appendix B.

Based on the results of the field observations and OVA screening, one sample was selected from each borehole for laboratory analysis. In general, the samples with the highest OVA readings were selected for analysis. The samples that were selected were analyzed for volatile organics, semi-volatile organics, total petroleum hydrocarbons, PCBs, metals, and cyanide.

## 2.5 Quality Assurance/Quality Control Activities

This section of the report summarizes the key Quality Assurance/Quality Control (QA/QC) activities, which were implemented as part of the sampling and analysis program to assure that the objectives of data quality were achieved for the site investigation results.

### 2.5.1 QA Objectives for Measurement Data

The overall QA objective was to develop and implement procedures that would result in the generation of a data base of adequate quality to support the identification, screening, and selection of appropriate remedial actions for this site.

### 2.5.2 Level of QA Effort

As part of the QA program, a number of QA/QC samples were prepared or collected during the implementation of the field investigation. The three types of QA/QC samples included: 1) trip blanks; 2) field blanks; and 3) duplicate samples. The specific location and frequency of the QA/QC samples performed in association with the field sampling program are discussed in Section 4.

### 2.5.3 Field Measurements

Measurement data were collected during many of the field activities incidental to collecting samples for analytical testing. These activities included, but are not limited to, the following:

- Documenting time and weather conditions;
- Determining pH, conductivity, and temperature of aqueous samples;
- Determining depths of boreholes and depth to ground water in monitoring wells; and
- Recording hydraulic data in association with slug test performance.

The general QA objective for such measurement data was to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through documental use of standardized procedures. The procedures utilized in performing these activities were in accordance with the Sampling Plan.

### 2.5.4 Calibration Procedures and Frequency

Calibration procedures utilized for the field measurement instruments including the pH meter, conductivity meter, and temperature meter, were in accordance with the respective manufacturers' instruction manuals. The OVA (FID) and the HNU (PID) were checked for appropriate calibration on a daily basis. Any required calibration was performed by the manufacturers according to their respective standard procedures. Instrument calibrations and calibration checks were recorded in the field logs.

#### 2.5.5 Analytical Procedures

The laboratory analytical procedures for the TCL analysis of aqueous samples collected from the site were in accordance with either the current revision of USEPA CLP Statement of Work for Organic Analyses (10/86) or USEPA CLP Statement of Work for Inorganic Analyses (7/87).

The procedures for the field measurements of pH, conductivity, and temperature were performed in accordance with the protocols detailed in the Sampling Plan.

#### 2.5.6 Data Validation and Assessment

All laboratory analytical data was assessed for accuracy, precision, and completeness by the analytical laboratory performing the analyses prior to submission of the analytical reports to Blasland & Bouck.

Upon receipt of the analytical reports from Galson Technical Services, the reports were submitted to OBG Laboratories, Inc., for independent data validation. The complete report summarizing the results of the data validation performed by OBG Laboratories is presented in Appendix D. Although this report identifies several minor excursions from the method protocols, none of these minor deviations would affect the validity of the data presented in the package. Therefore, all of the analytical data generated through the performance of the sampling and analysis program are determined to be acceptable.

All field data were also reviewed for completeness and accuracy by the Field Manager. The Field Manager also cross-checked the field data with the validated analytical data to ensure the two sets of data represent a cohesive set of measurements.



# Characterization of Site Conditions

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## SECTION 3 - CHARACTERIZATION OF SITE CONDITIONS

### 3.1 General

This section presents a summary of the existing site conditions based on our observations of stratigraphy and ground-water occurrence during the implementation of the field investigation, as well as our evaluation of existing data regarding conditions in the site vicinity. The information obtained regarding the subsurface stratigraphy at the site was primarily developed through the sampling of soil borings drilled for the monitoring well installations, as well as the borings performed during the evaluation of the Still Discharge Area.

### 3.2 Topography and Drainage

The topography of the site is generally flat, as is the topography of the surrounding area. There are also no readily apparent surface-water drainage features at this site. Therefore, run-off associated with precipitation is expected to be minimal, and the majority of precipitation is expected to percolate into the ground. Any precipitation occurring at the site would be anticipated to eventually discharge to the Niagara River, given the proximity of the site to the river.

### 3.3 Geology

The site is located in the Erie-Ontario Lake Plain physiographic province of western New York. The regional geology in the vicinity of the site may be generally characterized as consisting of unconsolidated materials consisting of recently deposited alluvium and sediments of glacial origin overlying various consolidated bedrock units.

The native unconsolidated overburden materials that would be anticipated in the site vicinity based on our review of available literature include: alluvial silts, sands and gravels; lacustrine sediments composed primarily of silts sands and clays; and glacial till consisting of a heterogeneous mixture of silt, clay, sand, and gravel deposited above the bedrock.

Regionally, the bedrock underlying Erie County is composed of interbedded units of shale, mudstone, limestone, and dolomite of the Silurian to Upper Devonian periods. These bedrock units strike generally in an east-west orientation and dip to the south-southeast. The upper-most bedrock unit underlying the site vicinity is believed to be the Camillus Shale. This formation is approximately 400 feet thick and is locally reported to be composed of a massive gray dolomitic limestone (LaSala, 1968). None of the borings drilled during this investigation, however, penetrated to the top of the bedrock.

The near surface materials encountered during drilling of the monitoring wells were comprised of approximately 3 to 10 feet of fill materials ranging from silt to coarse sand, with traces of concrete, glass and brick fragments, cinders, and wood chips. This fill material was thickest in borings ENV-4, ENV-5, and ENV-6. Underlying the fill material was 10 to 15 feet of alluvial deposits consisting mostly of silt and clay. The water table was encountered between 6 and 12 feet below ground surface in the borings drilled for the new monitoring wells at the site.

Although none of the boreholes drilled for this investigation penetrated the base of the alluvial/lacustrine deposits, data regarding the subsurface materials encountered during previous investigations of the Roblin Steel Site and the River Road Site located immediately to the north, were presented in the NYSDECs Phase II Investigation Report of the Roblin Steel site. This

information suggests that the depth of the top of the bedrock in the site vicinity is approximately 50 feet. This data also indicates the glacial till unit overlying the sediment in the site vicinity ranges in thickness up to approximately 15 feet.

### 3.3 Hydrogeology

Ground water underlying the site and vicinity occurs primarily within two water bearing zones; the shallow alluvial sands and the shale bedrock units. These water bearing zones are reported to be hydraulically separated by lacustrine silt and clay deposits and/or glacial till deposits. The ground water encountered within the shallow overburden materials is unconfined, while the bedrock aquifer is anticipated to be under confined conditions in the site vicinity based on subsurface data from the Phase II Investigation of the Roblin Steel Site. The monitoring wells installed for this investigation penetrate only the shallow water table aquifer at this site.

The elevations of the ground-water surface at each of both the newly installed wells and the DEC's wells installed in the site vicinity as calculated from the two rounds of static water level measurements, are summarized in Table 1. These ground-water elevations were used in the development of the two water table contour maps presented as Figure 6 (November 19, 1990) and Figure 7 (January 22, 1991). These contour maps illustrate the presence of a modest hydraulic gradient of approximately 0.004 across the site. The direction of ground-water flow in the vicinity of the Envirotek II site is generally toward the Niagara River. As the site is located on a point that extends into the river, the direction of ground-water flow appears to be in a semiradial pattern from north to southwest. The ground-water elevation at monitoring well ENV-2 was consistently lower than ENV-3. This is reflected



on the contour maps as an apparent ground water trough oriented toward the north near the Still Discharge Area.

The hydraulic conductivity values calculated for the shallow water table aquifer based on the slug tests performed on the new monitoring wells range from  $1.6 \times 10^{-6}$  cm/sec. to  $1.1 \times 10^{-3}$  cm/sec. However, two of the wells in which slug tests were performed (ENV-4 and ENV-5) recovered too quickly for adequate data to be recorded. Therefore, hydraulic conductivity values for these wells could not be calculated. The rapid response observed in these two wells suggests that the hydraulic conductivity of the materials screened by these wells is considerably higher than the highest conductivity measured ( $1.1 \times 10^{-3}$  cm/sec.). This indicates that an even greater variability in hydraulic conductivity of the water table aquifer materials. The slug test data summary sheets and graphs illustrating the recovery curves for each test are presented in Appendix C.

It should be noted that a measurable thickness of separate phase hydrocarbons (SPH) was observed to be present on the water table surface in two of the new monitoring wells (ENV-2 and ENV-3) within a few days of their installation. The thickness of the SPH measured at that time was 0.3 feet at both well locations. However, when both the complete rounds of water level measurements were recorded on November 19, 1990, and January 22, 1991, no SPH was measured any of the monitoring wells. The observation of SPH in ENV-2 and ENV-3 immediately following well installation activities are attributed to the disturbance occurring to the soils in the immediate vicinity of these locations during drilling. Apparently the residual hydrocarbons are bound to the soil matrix such that it does not drain freely into the wells.



## Discussion of Analytical Results

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## SECTION 4 - DISCUSSION OF ANALYTICAL RESULTS

### 4.1 General

This section presents a discussion of the analytical data developed during this investigation and its implications regarding the apparent nature and extent of contamination identified in the subsurface environment at the Envirotek II site. The available data considered in this evaluation includes the soil gas survey results and ground-water quality data, as well as the data developed through the supplemental soil sampling and analysis program implemented as part of the Removal Action Program.

### 4.2 Soil Gas Survey Results

Each of the soil vapor samples collected as part of the combined survey were analyzed on-site by Tracer with a portable gas chromatograph utilizing both a photoionization detector and an electron capture detector in order to quantify concentrations of tetrachloroethylene (PCE), trichloroethylene (TCE), 1,1,1-Trichloroethane (TCA), as well as benzene, toluene, ethylbenzene, and xylenes (BTEX).

The analytical results generated through the on-site analysis of the soil gas samples are presented in Table 3. These analytical results generated during the soil gas survey identified two general areas in which elevated levels of volatile organic constituents were observed in the soil vapor. These areas include the Still Discharge Area and an area to the west of Building 153.

The compound that was detected at the highest concentrations in each of these areas was PCE. Both TCE and TCA were also consistently detected in the same samples where PCE was present. However, the concentration of

TCE and TCA were typically much lower than the PCE concentrations. The analytical results did not indicate the presence of benzene in any of the samples collected. Toluene, ethylbenzene, and xylenes were also observed in the majority of samples collected in the Still Discharge Area. However, these compounds were not detected in any of the samples collected outside the Still Discharge Area. To illustrate the distribution of volatile constituents detected through the performance of the soil gas surveys, isoconcentration contour maps were prepared by Tracer based on the observed PCE, TCE, TCA, benzene, toluene, and xylene concentrations. These figures are included in Appendix B of Tracer's report, which is presented in Appendix A of this report.

The soil gas survey performed in the immediate vicinity of the Still Discharge Area included the collection of soil gas samples from multiple depths. The results of these samples have been used to evaluate the vertical extent of volatile organic compounds in the soil. These results indicate that the volatile organic compounds in the soil in this area extend vertically to the water table. The highest concentrations of many of these volatile organic compounds (VOCs) were detected at the sampling locations immediately adjacent to the building foundations within the Still Discharge Area. A second area in which elevated levels of volatile constituents were observed in the soil gas is located along the western side of Building 153. Two of the possible sources of the observed volatile constituents in this area are the preferential migration of volatile compounds from the Still Discharge Area along the building foundation or an isolated spill or release in this vicinity unrelated to the Still Discharge Area.

Volatile constituents were also observed adjacent to Building 13, located west-northwest of the first area. Given the much lower concentrations of

volatiles observed in this area and its location directly downgradient of the other two areas, the presence of the volatile constituents identified in this area probably represents the western extent of volatile organic vapors associated with the Still Discharge Area and the area adjacent to Building 153. As potential results of the soil gas survey did not identify the presence of any additional source areas associated with the site, the primary source area identified is localized within the site discharge area.

#### 4.3 Ground-Water Quality Results

Each of the ground-water samples collected during this investigation were submitted to Galson Laboratories, Inc., to be analyzed for Target Compound List (TCL) volatile organics, TCL semi-volatile organics, TCL pesticides and polychlorinated biphenyl (PCBs), and Target Analyte List (TAL) metals. The analyses for the inorganics included the analysis of unfiltered samples from each well to determine total metals concentrations and the analysis of filtered samples from each well to determine concentrations of dissolved metals in the ground water. The total number of samples analyzed included one sample from each of the six new monitoring wells, as well as a duplicate sample (from ENV-5), an equipment (field) blank, and a trip blank. The trip blank was analyzed only for volatile organics. The complete set laboratory analytical reports is presented in Appendix E.

The results of the volatile organic analyses are summarized in Table 4. These analytical results 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 Still Discharge Area. The volatile constituents present

in the highest concentrations in this ground-water sample include DCE, PCE, TCA, and TCE. The well that contained the next highest level of total volatile organics was ENV-4 (1.86 mg/l total volatile organics). This well is located within the hanger building forming the western limit of the Envirotek II site and northwest (hydraulically downgradient) of the open pits recently addressed as part of the Removal Action. The other two monitoring wells installed along the western boundary of the site were ENV-5 and ENV-6. The sample from ENV-5 contained only trace concentrations of dichloroethenes, while there were no detectable levels of volatile constituents in ENV-6.

Although the results of the OVA screening performed on the soil encountered during the drilling of the upgradient monitoring well (ENV-1) suggests the presence of volatile organics constituents in the subsurface upgradient of the site, the analytical results of the ground-water sample collected from this well showed no detectable levels of any volatile or semi-volatile constituents. The total volatile organic concentrations detected in each of the wells are presented on Figure 8 to illustrate the distribution of volatile organics in the ground water across the site. This figure demonstrates that the occurrence of the dissolved VOCs in the ground water at this site is generally localized to the area of the still discharge.

The results of the semi-volatile organic analyses performed on the ground-water samples are presented in Table 5. These results showed no detectable levels of semi-volatile organics above the Method Quantitation Limit in any of the ground-water samples except the sample from ENV-2. The results of the sample from ENV-2 show the presence of a number of semi-volatiles, including 2-methylphenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, and naphthalene. However, the concentrations of the semi-volatiles observed in this sample were limited to relatively low part per billion concentrations.

The results of the inorganic analyses of both dissolved and total metals in the ground-water samples are summarized in Table 6. The results of the inorganic analyses performed on the unfiltered samples show that the total concentrations for a number of metals exceeded the ground-water quality standards established by NYCRR Title 6, Part 703. However, elevated concentrations of most of these metals were also observed in the upgradient monitoring well indicating that presence of these inorganics is not associated with the activities of the Envirotek facility. These inorganic constituents may be attributable to the historical steel making operations. It should also be noted that the analytical results of the filtered ground-water samples showed only three inorganic chemicals to be dissolved in the ground water at concentration exceeding the Part 703 standards. These inorganics include antimony, manganese, and sodium. The fact that these three constituents were also detected at elevated concentrations in the upgradient well further indicates that the inorganics observed in the subsurface at this site are not attributable to the former operations of the Envirotek II facility.

No PCBs or pesticides were detected in any of the ground-water samples collected from the site. Therefore, it does not appear that either PCBs or pesticides are constituents of concern at this site.

#### 4.4 Soil Sampling and Analysis Results

The soil samples selected for laboratory analysis included three samples collected immediately above the water table (8 to 10 feet below ground surface) from borings B-4, B-5, and B-6, which are located at various distances away from Building 153. This zone immediately above the water table appears to have been impacted the most based on both OVA screening results and visual observations. Four of the six soil samples collected from

this zone immediately above the water table were observed to contained residual hydrocarbons. These residual hydrocarbons appeared to consist of an oil that has a consistency similar to motor oil. The samples from this zone also exhibited the highest OVA readings indicating that significant concentration of volatile compounds are present in the residual hydrocarbons.

To evaluate the distribution of chemical constituents of concern within the soil above the water table fluctuation zone, the samples selected for analysis from each of the three remaining soil borings (B-1, B-2, and B-3) were collected from the depth interval above the water table fluctuation zone that exhibited the highest OVA readings. These three borings were also located at various distances from Building 153.

The results of the volatile organic analyses (USEPA Method 8240) performed on the soil samples from the Still Discharge Area are summarized in Table 7. These results indicate the presence of a number of both chlorinated and aromatic hydrocarbon compounds, including PCE, TCE, TCA, toluene, and xylenes. A review of the OVA screening data in conjunction with the laboratory analytical results suggests that the soil containing the highest levels of volatiles are located in the vicinity of borings B-1, B-2, and B-5. The predominance of OVA reading in excess of 1,000 ppm in the shallow soil from boring B-1 and B-2 may indicate that the immediate area in which surficial discharges occurred was primarily on the eastern side of the concrete sidewalk that bisects this area. The dramatic decrease in OVA readings, as well as the laboratory analytical results for boring B-3, suggest the boring is approaching 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 indicate the presence of volatile organics at considerably lower concentrations than the area on the eastern



side of the walkway. However, additional investigation of the area toward the west would be necessary to delineate the horizontal extent of the VOCs in this direction.

Although no soil borings were performed directly adjacent to the building foundations in this area, the levels of VOCs observed in the soil in borings B-1, B-2, B-3, and B-4 suggest that the soil impacted by VOCs and residual hydrocarbons probably extends beneath the building foundations to the south and east of this area. The lack of observable residual hydrocarbons in either B-3 and B-6 indicates the extent of the residual hydrocarbons present in the soil is limited to within 30 feet of the north side of Building 153. However, the extent of the residual hydrocarbons that may be present under the buildings toward the south and east, as well as toward the west, have yet to be determined.

The results of semi-volatile organic analyses are also presented in Table 7. Although these analyses tentatively identified the presence of a number of semi-volatile compounds at concentrations below the quantitative limits in each of the soil samples collected, only the sample from boring B-2 was found to contain semi-volatile compounds at concentrations in excess of the quantitative limits of the analytical method. The semi-volatile compounds observed in 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 are also summarized in Table 7. These results indicate the presence of some metals, including iron, magnesium, and calcium, at slightly higher levels than would be typical of naturally occurring

levels of **these** inorganics. However, no background data exists with which to compare **these** results. There is no indication that these inorganics are related to **the** former still discharge or Envirotek's 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. As would be anticipated, 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**.



## Conclusions

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## SECTION 5 - CONCLUSIONS

This section of the report presents the conclusions that have been drawn from the data developed through the implementation of this sampling and analysis program and other background information identified during this investigation.

The conclusions that may be reached based on the results of this program include the following:

- The visual inspection of the site did not identify any additional on-site discharge or disposal areas.
- Given the relatively flat topography of the site and the lack of observed surface drainage features, the primary route of migration for precipitation is percolation vertically downward into the shallow aquifer.
- The direction of ground-water flow in the shallow water table aquifer underlying the site appears to be generally toward the Niagara River. Given the location of the site on a point extending into the river (Figure 1), the direction of ground-water flow varies across the site. Based on the hydraulic gradient illustrated in Figures 6 and 7 the direction of ground-water flow across the site is anticipated to be in a semi-radial pattern from northwest to southwest. The observed pattern of ground-water flow is further complicated by the presence of an apparent depression in the water table extending from the vicinity of the still discharge area toward the north.
- The results of the soil gas survey confirmed the presence of volatile organic constituents in the subsurface within the former

still discharge area. The results of the soil gas survey also indicated the presence of VOCs in the subsurface along the western side of Building 153. This may be attributable to preferential horizontal migration of vapors along the foundation of Building 153. The soil gas survey results do not suggest the presence of any other areas where disposal activities occurred at the site.

- The ground-water analytical results indicate the presence of various halogenated and aromatic hydrocarbons dissolved in the ground water in the vicinity of the former still discharge area (ENV-2). Although present at much lower concentrations, some volatile organic constituents were also observed in wells ENV-3 and ENV-4 located northwest of the still discharge area (Figure 8). While the downgradient extent of these dissolved volatile organics in the ground water underlying this site needs to be further defined, the available data suggests dissolved VOCs attenuate rapidly downgradient of the still discharge area.
- A number of semi-volatile organic compounds were detected in the ground-water sample from the monitoring well ENV-2. However, as no semi-volatiles were detected above their method detection limits in any of the other monitoring wells, including ENV-3 located immediately downgradient of the still discharge area, concern regarding the semi-volatiles organic compounds is localized to the still discharge area.
- The analytical results of the soil samples from the still discharge area confirm that the soil in this area contains levels of various VOCs which appear to be associated with the former still

discharge in this area. These results also tend to confirm that the still discharge area is the primary source of the dissolved organic constituents observed in the ground water underlying the site. The observed vertical extent of these organics in the soil within this area is to the water table. The horizontal extent of these organics in the soil has yet to be determined.

- The analytical results of both the soil and the ground-water samples showed no indication that either PCBs or pesticides are present at the site. Furthermore, although the results of the inorganic analyses indicate the presence of elevated metals, the available data indicate that these inorganics are not attributable to the activities of the Envirotek facility.
- Although recordable thicknesses of Separate Phase Hydrocarbons (SPH) were observed in monitoring wells ENV-2 and ENV-3 immediately following their installation, the fact that no measurable thickness of SPH has been observed in either of these wells since then suggests that SPH is not present across the area.



## Tables

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TABLE 1  
SUMMARY OF GROUND-WATER ELEVATION MEASUREMENTS

ENVIROTEK II SITE  
TONAWANDA, NEW YORK

<u>Well ID</u>	<u>Reference Elevation*</u>	November 19, 1990		January 21, 1991	
		<u>Depth to Ground Water</u>	<u>Ground-Water Elevation in Feet</u>	<u>Depth to Ground Water</u>	<u>Ground-Water Elevation in Feet</u>
ENV-1	579.49	6.58	572.91	5.96	573.53
ENV-2	582.94	11.89	571.05	11.19	571.75
ENV-3	582.59	11.38	571.21	10.40	572.19
ENV-4	582.55	12.14	570.41	10.61	571.94
ENV-5	581.38	10.95	570.43	9.50	571.88
ENV-6	582.03	13.40	568.63	10.21	571.82
GW-1	576.80	6.63	570.17	6.15	570.65
GW-2	582.01	13.11	568.90	12.24	569.77
GW-3	578.45 **	9.86	568.59	8.72	569.73
GW-4	576.44 **	10.32	566.12	9.68	566.76
GW-5	574.22 **	8.43	565.79	7.86	566.36
GW-6	573.96 **	6.80	567.16	6.24	567.72
GW-7	581.96 **	12.35	569.61	11.48	570.48

Notes:

- \* = Measuring point elevation. Measuring point is top of inner casing (PVC)
- \*\* = Reference elevations of these existing wells were adjusted based on the difference between the previous and recent surveyed elevation measurements for GW-1 and GW-2.



TABLE 2  
SUMMARY OF FIELD PARAMETERS AND OBSERVATIONS  
GROUND-WATER SAMPLES

ENVIROTEK II SITE  
TONAWANDA, NEW YORK

<u>Monitoring Well ID</u>	<u>Temperature</u>	<u>pH</u>	<u>Conductivity</u>	<u>Color</u>	<u>Turbidity</u>	<u>Remarks</u>
ENV-1	12	6	500	Lt. Brown	Low-Moderate	
ENV-2	10	9	510	Drk. Gray	Moderate-High	Sulfurous odor and oily sheen present
ENV-3	11	7	410	Drk. Gray	Moderate-High	Strong sulfurous odor and oily sheen present
ENV-4	10	8.0	900	Drk. Gray	High	Sulfurous odor
ENV-5	10	8	490	Drk. Gray	High	Sulfurous odor
ENV-6	9	9	700	Drk. Gray	High	Sulfurous odor

Note:

Field measurements and observations were made on November 19, 1990 during the collection of the ground-water samples.

TABLE 3  
SUMMARY OF  
SOIL VAPOR SAMPLES - ANALYTICAL RESULTS

ENVIROTEK II SITE

Sample	TCA ug/l	TCE ug/l	PCE ug/l	Benzene ug/l	Toluene ug/l	EthylBen ug/l	Xylene ug/l
Air Sample	0.005	0.003	0.02	<0.2	<0.1	<0.1	<0.1
GP-1-2'	5000	3100	19000	<35	340	400	370
GP-1-5.5'	2100	1100	4800	<18	10	<12	17
GP-2-6'	1600	540	2400	<34	<2	<2	<2
GP-2-2'	12000	1500	8500	<420	1300	340	500
GP-3-2'	8100	2400	6000	<68	140	14	82
GP-3-6'	830	260	1800	<17	<2	<2	<2
GP-5-2'	1100	210	740	<17	6	<2	7
GP-5-6'	450	77	400	<7	<2	<2	<2
GP-6-2'	450	290	2500	<4	<2	<2	<2
GP-6-6'	1100	290	5300	<4	<2	<2	<2
GP-6-9'	2100	680	16000	<35	160	120	72
GP-7-2'	670	830	26000	<4	8	2	57
GP-7-6'	1100	440	2500	<4	<2	<2	<2
GP-7-9'	1000	680	2000	<17	12	<2	8
GP-8-2'	700	980	9600	<17	4	<2	7
GP-8-6'	770	240	1400	<17	<2	<2	<2
GP-8-9'	820	140	1200	<17	15	<4	36
GP-10-2'	930	340	2800	<17	6	<2	<2
GP-11-3'	3	0.5	2	<0.3	<0.2	<0.2	<0.2
GP-12-4'	0.7	0.3	0.9	<0.2	<0.1	<0.1	<0.1
GP-13-3'	0.2	0.06	0.6	<0.2	<0.1	<0.1	<0.1
GP-14-4'	21	57	320	<2	<1	<1	<1
GP-15-4'	58	<49	610	<2	<1	<1	<1
GP-16-4'	350	110	1900	<3	<2	<2	<2
GP-17-4'	270	170	1300	<3	<2	<2	<2
GP-18-4'	130	57	260	<2	<0.2	<0.2	<0.2
GP-19-4'	67	21	61	<2	<0.2	<0.2	<0.2
GP-20-3'	136	14	40	<0.8	2	<0.6	4
GP-21-4'	0.2	0.4	4	<0.3	<0.2	<0.2	<0.2
GP-22-4'	0.04	0.1	0.8	<0.3	<0.2	<0.2	<0.2
GP-23-3'	0.1	0.005	0.7	<0.2	<0.1	<0.1	<0.1
GP-24-2.5'	0.01	0.03	0.1	<0.2	<0.1	<0.1	<0.1
GP-25-4'	0.01	0.08	0.2	<0.2	<0.1	<0.1	<0.1
GP-26-4'	0.1	<0.01	2	<0.2	<0.1	<0.1	<0.1
GP-27-4'	0.4	0.005	0.8	<0.2	<0.1	<0.1	<0.1
GP-28-4'	2	2	16	<0.3	<0.2	<0.2	<0.2
GP-29-4'	4	8	23	<0.3	<0.2	<0.2	<0.2
GP-30-4'	1	2	6	<0.2	<0.1	<0.1	<0.1
GP-31-3'	23	15	25	<0.3	<0.2	<0.2	<0.2
GP-32-4'	23	20	7	<0.3	<0.2	<0.2	<0.2
GP-33-4'	5	76	4	<0.3	<0.2	<0.2	<0.2
GP-34-2.5'	2	2	0.3	<0.2	<0.1	<0.1	<0.1

TABLE 4

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS  
VOLATILE ORGANIC ANALYSISENVIROTEK II SITE  
TONAWANDA, NEW YORK

Compound	ENV-1	ENV-2	ENV-3	ENV-4	ENV-5	Duplicate ENV-5	ENV-6	Trip Blank	Equipment Blank
Vinyl Chloride	--	3400	--	--	--	--	--	--	--
Chloroethane	--	--	79	--	--	--	--	--	--
Methylene Chloride	--	6100	--	--	--	--	--	--	--
Acetone	--	1600	--	--	--	--	--	--	--
1,1-Dichloroethene	--	300	--	--	--	--	--	--	--
1,1-Dichloroethane	--	4800	250	--	8	9	--	--	--
1,2-Dichloroethene	--	46000	--	110	36	37	--	--	--
1,2-Dichloroethane	--	750	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	21000	--	--	--	--	--	--	--
Trichloroethene	--	29000	--	560	--	--	--	--	--
4-Methyl-2-pentanone	--	--	82	110	--	--	--	--	--
Tetrachlorethene	--	40000	--	--	--	--	--	--	--
Toluene	--	8600	11	760	--	--	--	--	--
Ethylbenzene	--	840	--	58	--	--	--	--	--
Xylene (Total)	--	5100	14	260	--	--	--	--	--
TOTAL VOCs	--	167490	436	1858	44	46	--	--	--

Notes:

Results are reported in ug/L.

Only compounds detected above detection limits in at least one sample are presented.

-- = Undetected.

Samples collected on 11/19/90.

TABLE 5

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS  
SEMIVOLATILE ORGANIC ANALYSISENVIROTEK II SITE  
TONAWANDA, NEW YORK

Compound	ENV-1	ENV-2	ENV-3	ENV-4	ENV-5	Duplicate ENV-5	ENV-6	Equipment Blank
2-Methylphenol	--	21	BMQL	BMQL	--	--	--	--
4-Methylphenol	--	30	--	BMQL	--	--	--	--
Isophorone	--	10	--	--	--	--	--	--
2,4-Dimethylphenol	--	15	--	--	--	--	--	--
Benzoic Acid	--	13	BMQL	BMQL	BMQL	BMQL	BMQL	--
Naphthalene	--	19	--	--	--	--	--	--
2-Methylnaphthalene	--	BMQL	--	--	--	--	--	--
Phenanthrene	--	BMQL	--	--	--	--	--	--
Anthracene	--	BMQL	--	--	--	--	--	--
Fluoranthene	BMQL	--	BMQL	--	--	--	--	--
Pyrene	BMQL	BMQL	BMQL	--	--	--	--	--
Benzo(a)anthracene	BMQL	--	BMQL	--	--	--	--	--
Bis(2-Ethylhexyl)-phthalate	--	25	--	--	--	--	--	--
Chrysene	--	--	BMQL	--	--	--	--	--
Benzo(a)pyrene	--	--	BMQL	--	--	--	--	--

Notes:

Results are reported in ug/L.

Only compounds detected above detection limits in at least one sample are presented.

BMQL = Below Method Quantitation Limit.

-- = Undetected.

Samples collected on 11/19/90.

TABLE 6

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS  
INORGANIC ANALYSISENVIROTEK II SITE  
TONAWANDA, NEW YORK

Analyte	ENV-1 Total	ENV-1 Dissolved	ENV-2 Total	ENV-2 Dissolved	ENV-3 Total	ENV-3 Dissolved	ENV-4 Total	ENV-4 Dissolved	NYSDEC Ground-Water Standards**
Aluminum	20900	54.0 B	84500	294	29200	--	133000	107 B	--
Antimony	--	11.1 BW	5.4 B	4.9 B	15.1 BN	15.0 BW	14.2 BN	24.0 B	--
Arsenic	12.8 N	5.2 BW	27.8 NS	2.5 BW	15.6 N	--	41.0 BN	2.0 BW	25.0
Barium	195 B	53 B	1120	43.0 B	355	115 B	1590	52.0 B	1000
Beryllium	21.0	--	43.0	--	56.0	--	71.0	--	--
Cadmium	--	--	9.0	--	3.0 B	--	8.0	--	10.0
Calcium	233000	112000	445000	125000	91100	49300	701000	261000	--
Chromium	52.0	--	71.0	--	70.0	--	105	--	50.0
Cobalt	27.0 B	--	35.0 B	--	30.0 B	--	66.0	--	--
Copper	73.0 *	8.0 B	119 *	8.0 B	173 *	--	178 *	--	200
Iron	54800	79.0 B	101000	41.0 B	159000	96.0 B	127000	74.0 B	300
Lead	53.1 SN	4.2 S	8400 N	2.1 B	460 N	1.4 B	220 BN	3.2	25
Magnesium	41900	13700	54600	548 B	40200	26100	145000	7400	--
Manganese	4520	3270	6680	6.0 B	3960	366	5930	12.0 B	300
Mercury	--	--	--	--	--	--	--	0.26	2.0
Nickel	94.0	11.0 B	97.0	--	90.0	9.0 B	203	--	--
Potassium	7750	5980	10100	7980	17200	16900	24500	22200	--
Selenium	1.0 BWN	--	7.6 N +	1.0 BW	1.0 BWN	1.6 BW	13.5 BN	2.7 BW	10
Silver	--	--	--	--	--	--	--	--	50.0
Sodium	21200	23400	7860	8210	12600	14200	19500	21900	20000
Thallium	--	--	--	--	--	--	--	--	--
Vanadium	139	39.0 B	247	43.0 B	155	28.0 B	422	91.0	--
Zinc	249	20.0	1360	15	401	--	743	23.0	300
Cyanide	--	NR	--	NR	--	NR	10.8 N	NR	100

Notes: See next page

TABLE 6  
(Cont'd)

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS  
INORGANIC ANALYSIS

ENVIROTEK II SITE  
TONAWANDA, NEW YORK

Analyte	Duplicate		Duplicate		ENV-6 Total	ENV-6 Dissolved	Equipment Blank Total	Equipment Blank Dissolved	NYSDEC Ground-Water Standards**
	ENV-5 Total	ENV-5 Dissolved	ENV-5 Total	ENV-5 Dissolved					
Aluminum	77000	76.0 B	70700	96.0 B	31300	78.0 B	67.0 B	--	--
Antimony	16.9 B	3.7 BW	--	9.5 BW	12.9 B	14.3 B	--	10.5 BWM	--
Arsenic	35.6	2.0 BW	33.1 N	1.0 B	20.0 N	2.7 BW	--	3.4 BW	25.0
Barium	1010	48.0 B	921	46.0 B	284	29.0 B	19.0 B	--	1000
Beryllium	18.0	--	18.0	--	8.0	--	--	--	--
Cadmium	2.0 B	--	--	--	--	--	--	--	10.0
Calcium	281000	99800	263000	96100	251000	173000	--	--	--
Chromium	120	--	87.0	--	63.0	--	7.0 B	--	50.0
Cobalt	55	--	50.0	--	25.0 B	--	--	--	--
Copper	193 *	--	148 *	--	90.0 *	7.0 B	8.0 B	--	200
Iron	98100	104	95300	94.0 B	58500	54.0 B	169	19.0 B	300
Lead	89.6 N	2.6 B	90.2 N	2.3 B	52.4 N	1.5 B	3.6 N	2.8 B	25
Magnesium	89300	21100	83700	20500	29100	7060	45.0 B	--	--
Manganese	4160	50.0	3860	41.0	1320	21.0	4.0 B	1.0 B	300
Mercury	0.47	--	0.28	--	0.30	--	--	--	2.0
Nickel	171	--	141	--	90.0	--	16.0 B	--	--
Potassium	20900	17300	21400	19200	32500	26200	--	--	--
Selenium	14.0 N+	--	9.9 NS	--	17.5 NS	7.3 S	--	2.0 BW	10
Silver	--	--	--	--	--	--	--	--	50.0
Sodium	11200	12300	11900	13700	24000	21200	95.0 B	308 B	20000
Thallium	--	--	--	--	--	--	--	--	--
Vanadium	239	41.0	224	39.0 B	144	56.0	--	--	--
Zinc	501	10.0 B	486	11.0 B	280	22	--	--	300
Cyanide	23.4 N	NR	--	NR	--	NR	--	NR	100

Notes:

Results are reported in ug/l.

\*\* - Standard and guidance values obtained from "Part 703, Groundwater Classifications, Quality Standards, and Effluent and/or Limitations" (Environmental Conservation Law, 17-0301, 17-0809).

- - The analyte was analyzed for, but not detected.

B - The reported value was obtained from a reading that was less than the Contract Required Detection Limit, but greater than or equal to the Instrument Detection Limit.

M - Duplicate injection precision not met.

N - Spike sample recovery not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

+ - Correlation coefficient for the MSA is less than 0.995.

NR - Analyte not required to be analyzed.

Total - Analysis of non-filtered samples.

Dissolved - Analysis of samples filtered with a 0.45 micron field filter.

Samples collected on 11/19/90.

TABLE 7  
 ENVIROTEK II SITE  
 TONAWANDA, NEW YORK  
 SUMMARY OF SOIL BORING ANALYTICAL RESULTS  
 STILL DISCHARGE AREA  
 OCTOBER 1990

<u>VOLATILE ORGANIC COMPOUNDS</u>	<u>B-1 (4-6)</u>	<u>B-2 (6-8)</u>	<u>B-3 (6-8)</u>	<u>B-4 (8-10)</u>	<u>B-5 (8-10)</u>	<u>B-6 (8-10)</u>
1,2-Dichloroethene (total)	--	--	--	2.2	14	--
1,1,1-Trichloroethane	BMDL	--	BMDL	1.2	14	BMDL
Trichloroethene	BMDL	--	BMDL		3.6	BMDL
Tetrachloroethene	145	128	7.8	1.3	13	121
Toluene	--	--	--	1.2	82	BMDL
Ethylbenzene	9.9	BMDL	--	10	27	--
Xylene (total)	106	397	--	50	126	41
<u>SEMI VOLATILE ORGANIC COMPOUNDS</u>						
2-Methylphenol	--	--	--	BMDL	--	--
2,4-Dimethylphenol	--	--	--	--	--	BMDL
Napthalene	--	1.8	--	--	--	BMDL
2-Methylnapthalene	--	BMDL	--	--	--	--
Acenaphthene	--	BMDL	--	--	--	--
Fluorene	--	2.9	--	--	--	--
Phenanthrene	BMDL	18.0	--	BMDL	--	--
Anthracene	--	BMDL	--	--	--	--
Di-n-Butylphthalate	--	BMDL	--	--	--	--
Fluoranthene	--	3.7	--	--	--	--
Pyrene	BMDL	24.0	--	BMDL	BMDL	BMDL
Benzo(a)Anthracene	--	BMDL	--	--	--	--
Chrysene	--	1.7	--	BMDL	BMDL	BMDL
Bis(2-Ethylhexyl)Phthalate	4.0	9.0	BMDL	BMDL	BMDL	BMDL
Benzo(b)Fluoranthene	--	1.8	--	--	--	--
Benzo(k)Fluoranthene	--	BMDL	--	--	--	--
Benzo(a)Pyrene	--	BMDL	--	--	--	--
Indeno (1,2,3-cd)Pyrene	--	BMDL	--	--	--	--
Benzo(g,h,i)Perylene	--	BMDL	--	--	--	--

Notes:

Concentrations presented in mg/kg.

-- = Not detected.

BMDL = Below Method Detection Limit

Only compounds detected above detection limits in at least one sample are presented.



## Figures

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FIGURE 1

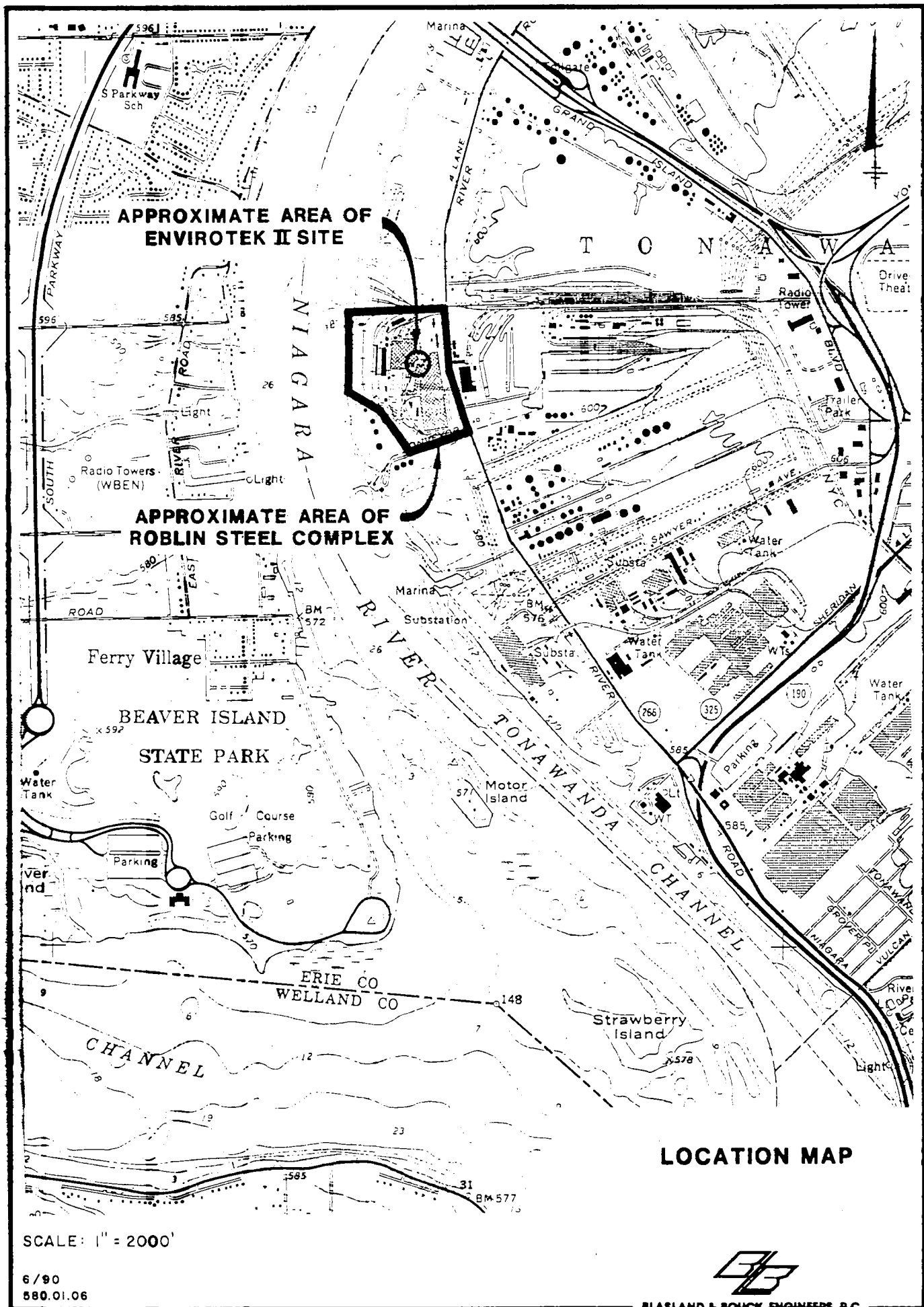
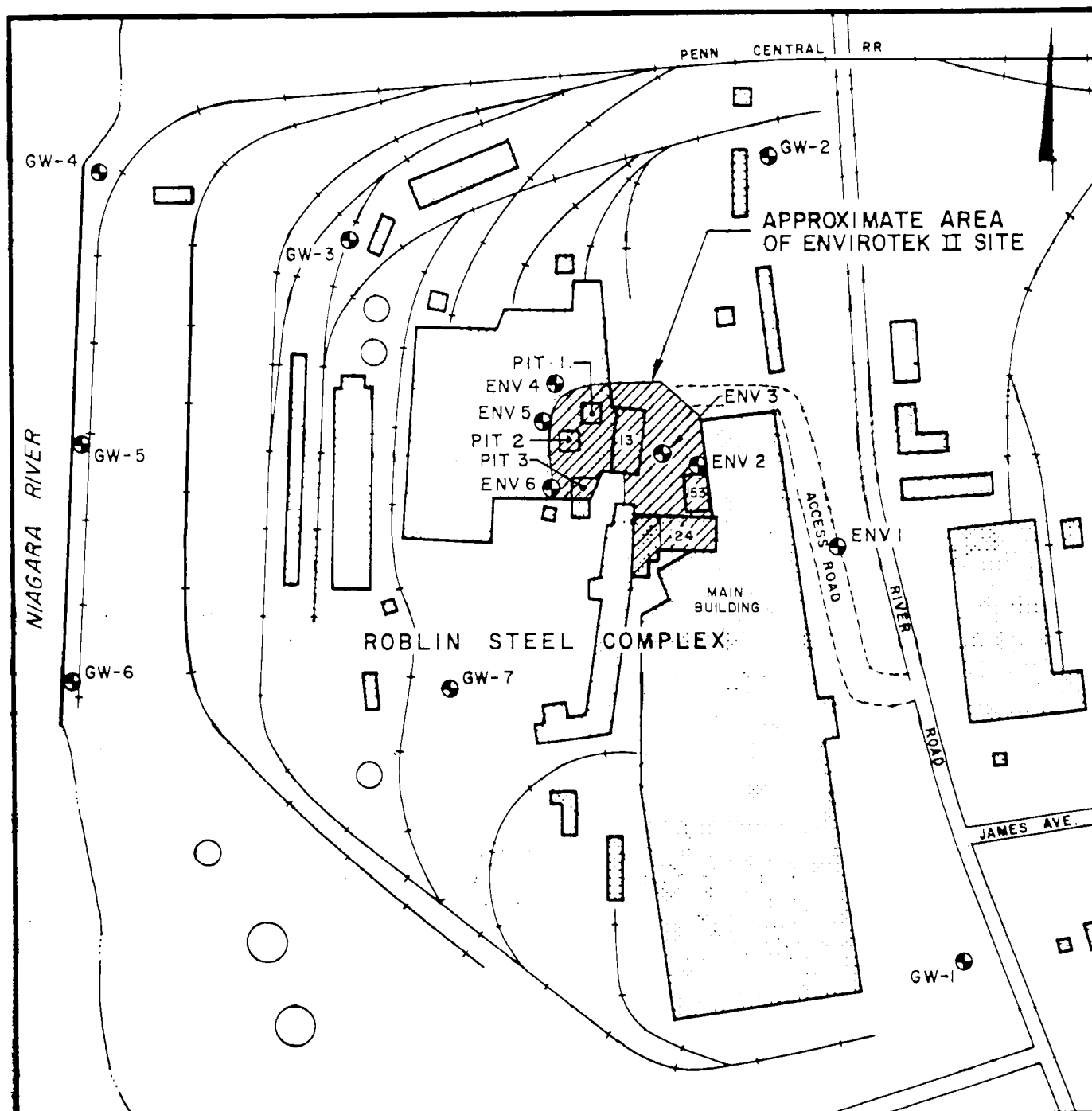


FIGURE 2



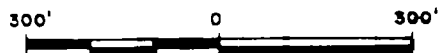
**LEGEND**

● MONITORING WELL LOCATION

ENVIROTEK II SITE  
TONAWANDA, NEW YORK

**SITE VICINITY MAP**

SCALE



6/90  
580.01.06



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

FIGURE 3

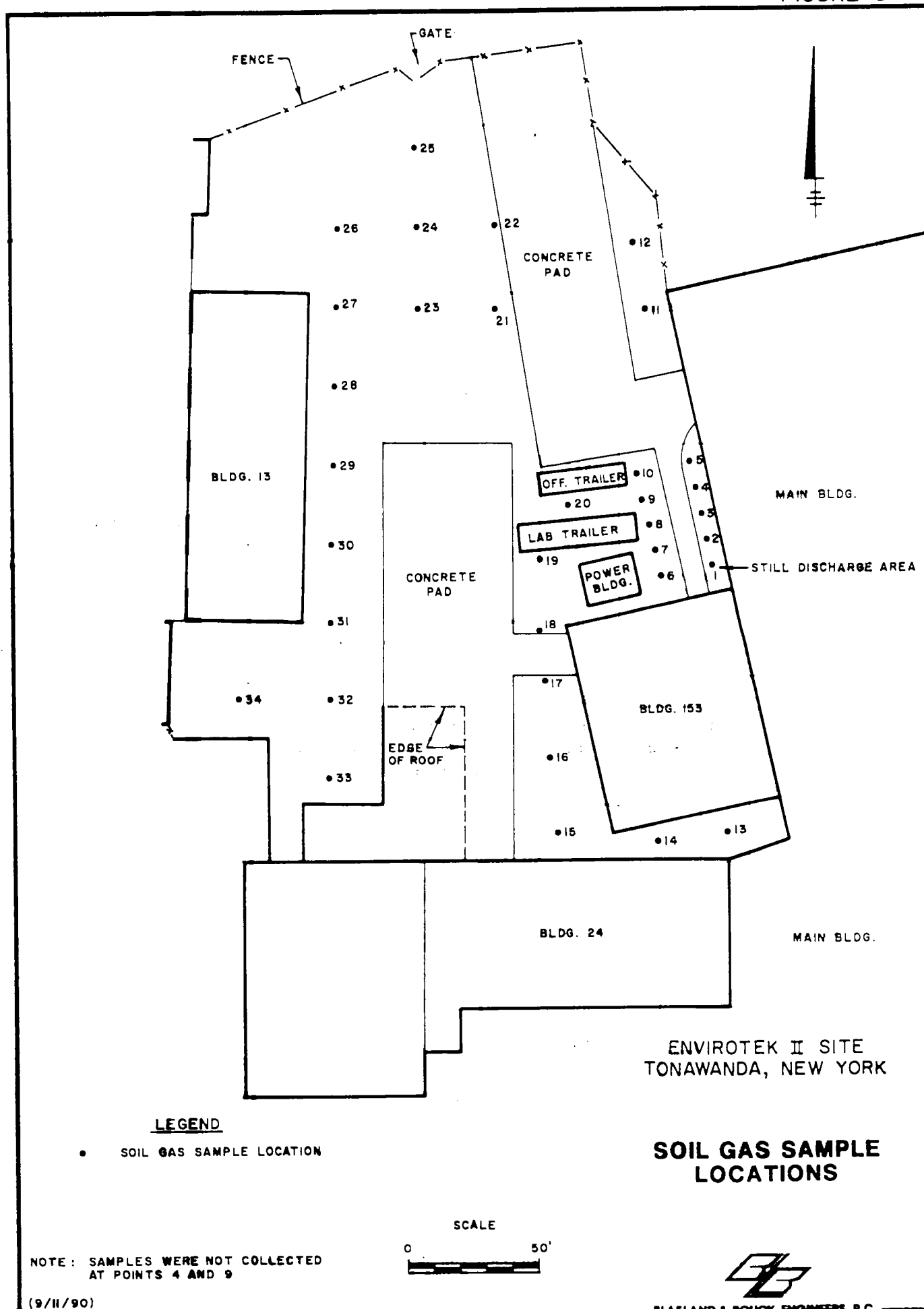
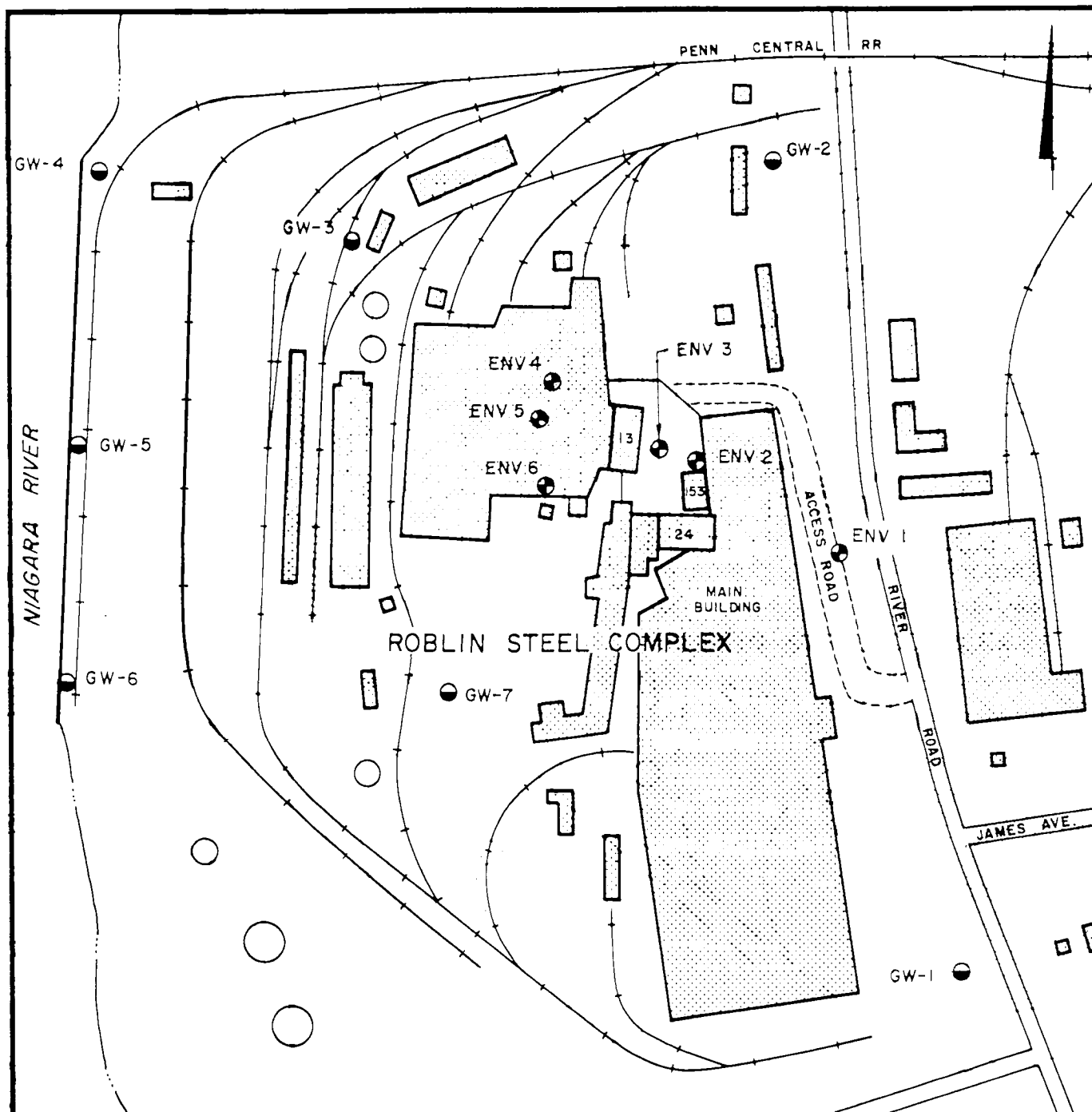


FIGURE 4

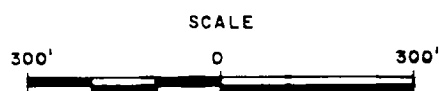


LEGEND

- GW-6 ● DEC MONITORING WELL
- ENV 1 ● MONITORING WELL INSTALLED NOVEMBER 1990

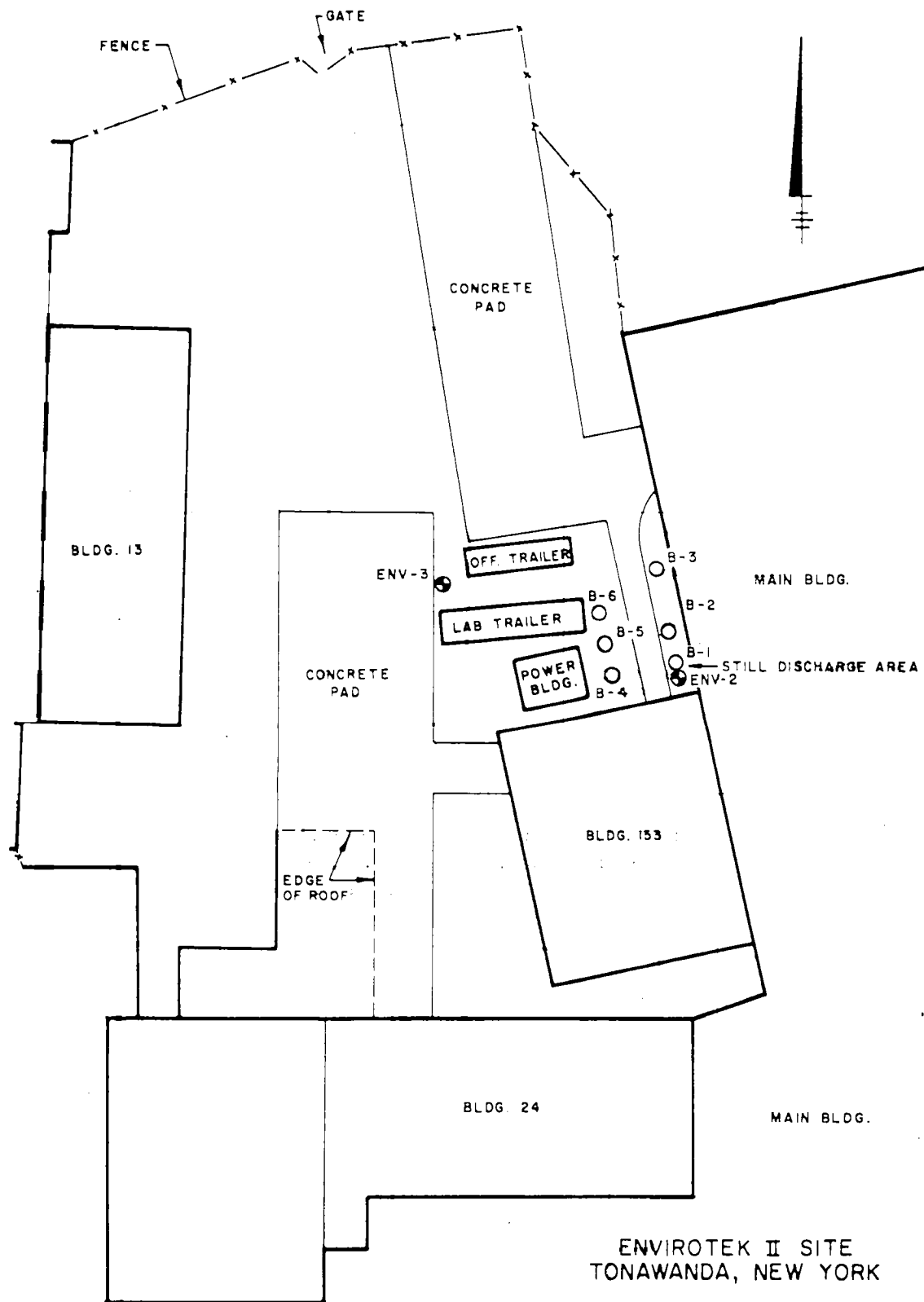
ENVIROTEK II SITE  
TONAWANDA, NEW YORK

**MONITORING WELL  
LOCATION MAP**



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

FIGURE 5



**LEGEND**

- SOIL BORING LOCATION
- EXISTING MONITORING WELL

SCALE



ENVIROTEK II SITE  
TONAWANDA, NEW YORK

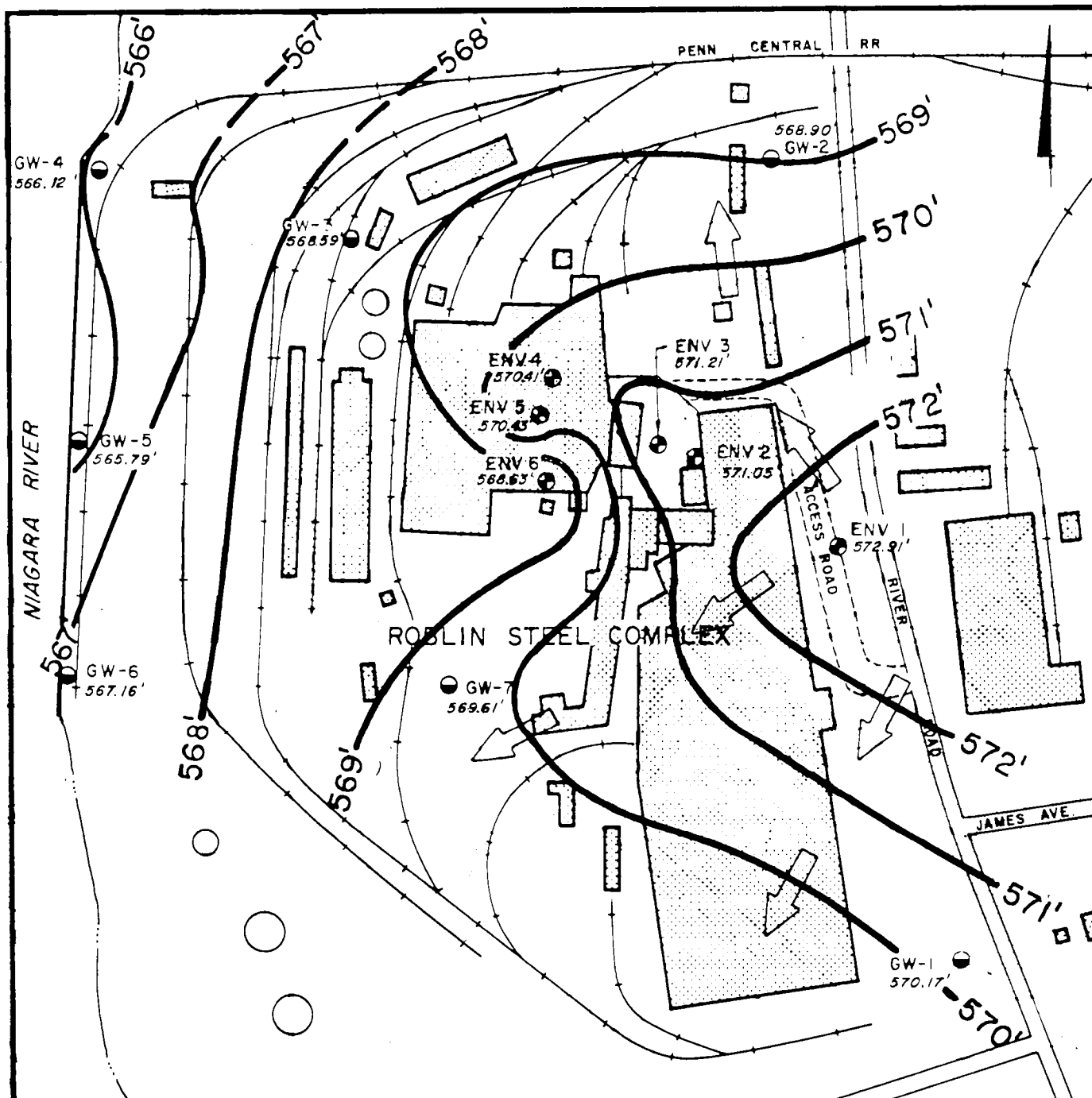
**SOIL BORING  
LOCATION MAP**

(10/22/90)



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

FIGURE 6



**LEGEND**

- GW-6 ● DEC MONITORING WELL
- ENV 1 ● MONITORING WELL INSTALLED NOVEMBER 1990
- 568.82' GROUND-WATER ELEVATION
- 570' — GROUND-WATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED
- ← GROUND-WATER FLOW DIRECTION (APPROX.)

SCALE



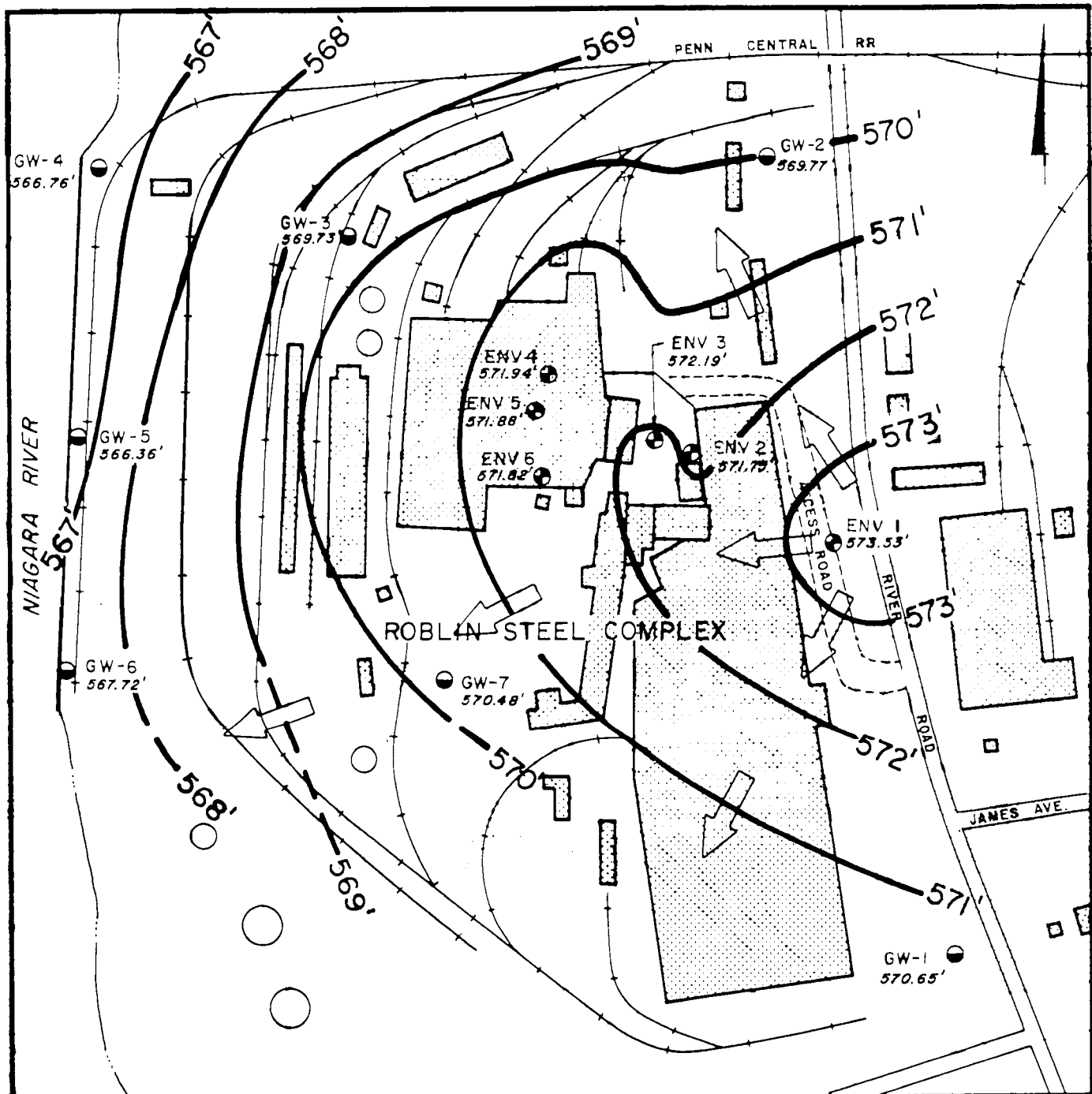
ENVIROTEK II SITE  
TONAWANDA, NEW YORK

**GROUND-WATER  
ELEVATION  
CONTOUR MAP  
NOVEMBER 19, 1990**



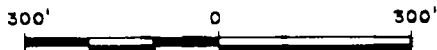
BLASLAND & BOUCK ENGINEERS, P.C.  
ENGINEERS & GEOSCIENTISTS

FIGURE 7

**LEGEND**

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

SCALE



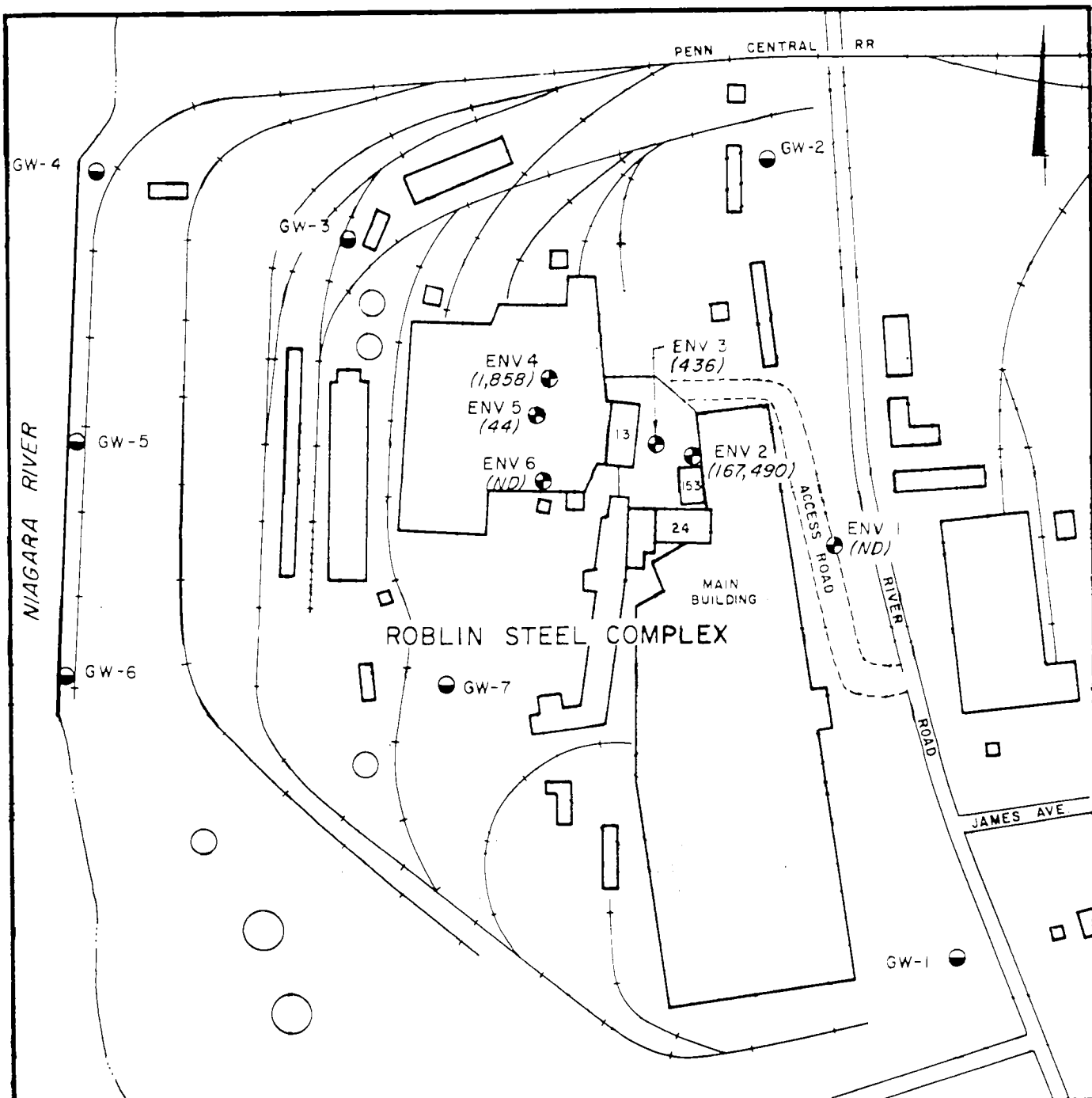
ENVIROTEK II SITE  
TONAWANDA, NEW YORK

**GROUND-WATER  
ELEVATION  
CONTOUR MAP**  
JANUARY 22, 1991



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

FIGURE 8



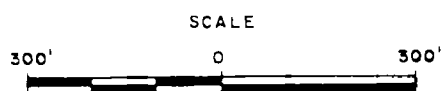
LEGEND

GW-6 ● DEC MONITORING WELL

ENV 5 ● MONITORING WELL INSTALLED NOVEMBER 1990  
(44) (TOTAL VOLATILE ORGANIC CONCENTRATION in ppb)

ENVIROTEK II SITE  
TONAWANDA, NEW YORK

**DISTRIBUTION OF VOC  
IN GROUND WATER**



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



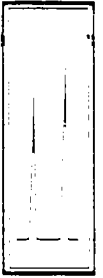


## Appendices

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APPENDIX A

REPORT OF SHALLOW SOIL GAS INVESTIGATION  
TRACER RESEARCH CORPORATION



PREPARED FOR:

Blasland and Bouck Engineers, P.C.  
6723 Towpath Road  
Box 66  
Syracuse, New York, 13214  
(315)446-9120  
FAX (315)449-0017

SHALLOW SOIL GAS INVESTIGATION  
ENVIROTEK II SITE  
TONAWANDA, NEW YORK

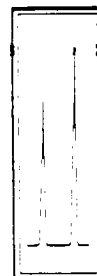
SEPTEMBER 1990

SUBMITTED BY:

*Karen L. Shess*

Tracer Research Corporation

750ENVIR.MSG  
2-90-750-S



## TABLE OF CONTENTS

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## INTRODUCTION

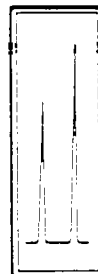
A shallow soil gas investigation was performed by Tracer Research Corporation (TRC) at the Envirotek II site located in Tonawanda, New York. The investigation was conducted September 7-9, 1990 under contract to Blasland & Bouck Engineers, P.C. The purpose of the investigation was to determine the areal extent of possible shallow subsurface contamination near a solvent recovery overspill area.

During this survey, a total of forty-two soil gas samples were collected and analyzed. Samples were analyzed for volatile organic compounds from the following suite:

- benzene
- toluene
- ethylbenzene
- xylene
- total hydrocarbons (THC)
- 1,1,1-trichloroethane (TCA)
- trichloroethene (TCE)
- tetrachloroethene (PCE)

Xylenes are reported as the total of the three xylene isomers and total hydrocarbons are reported as gasoline range compounds consisting of approximately C<sub>4</sub>-C<sub>9</sub> aliphatic, alicyclic and aromatic compounds.

The compounds in this suite were chosen as target compounds because of their suspected presence in the subsurface and amenability to soil gas technology. Soil gas samples were screened on a gas chromatograph equipped with a flame ionization detector (FID) and electron capture detector (ECD).



## SHALLOW SOIL GAS INVESTIGATION - METHODOLOGY

Shallow soil gas investigation refers to a method developed by TRC for investigating underground contamination from volatile organic chemicals (VOCs) such as industrial solvents, cleaning fluids and petroleum products by looking for their vapors in the shallow soil gas. The method involves pumping a small amount of soil gas out of the ground through a hollow probe driven into the ground and analyzing the gas for the presence of volatile contaminants. The presence of VOCs in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large data base. The presence of geologic obstructions on a small scale tends to create anomalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.

Soil gas contaminant mapping helps to reduce the time and cost required to delineate underground contamination by volatile contaminants. The soil gas investigation does this by outlining the general areal extent of contamination. Conventional bore holes or observation wells are used to verify both the presence and extent of the subsurface contamination as indicated in the soil gas survey. In this manner, soil gas contaminant mapping can assist in determining the placement of monitoring wells. Thus, the likelihood



of drilling unnecessary monitoring wells is reduced. The soil gas survey is not intended to be a substitute for conventional methodology, but rather to enable conventional methods to be used efficiently.

## EQUIPMENT

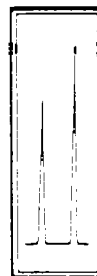
Tracer Research Corporation utilized a one ton Ford analytical field van that was equipped with one gas chromatograph and two Spectra Physics computing integrators. In addition, the van has two built-in gasoline powered generators that provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. There was not sufficient access to the sampling locations for the field van. Therefore, the sampling probes were hand pounded into the ground.

## SAMPLING PROCEDURES

Sampling probes consist of 7-14 foot lengths of 3/4 inch diameter hollow steel pipe that are fitted with detachable drive tips. Soil gas probes were advanced 2-9 feet below grade. Once inserted into the ground, the above-ground end of the sampling probes were fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. Gas flow is monitored by a vacuum gauge to insure that an adequate flow is obtained.

To adequately purge the volume of air within the probe, 2 to 5 liters of gas is evacuated with a vacuum pump. During the soil gas evacuation, samples are collected in a glass syringe by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas are collected for immediate analysis in the TRC analytical field van. Soil gas is subsampled (duplicate injections) in volumes ranging from 1 uL to 2 mL, depending on the VOC concentration at any particular location.

Sample probe vacuums ranged from four to eight inches Hg. The maximum pump vacuum was measured at twenty-four inches Hg.



## ANALYTICAL PROCEDURES

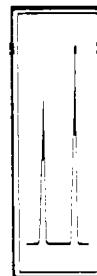
A Varian 3300 gas chromatograph, equipped with a flame ionization detector (FID) and an electron capture detector (ECD), was used for the soil gas analyses. The FID was used for the analysis of benzene, toluene, ethylbenzene, xylenes, and total hydrocarbons. The ECD was used for the analysis of TCA, TCE, and PCE. Compounds were separated on a 3' or 6' by 1/8" OD packed column with OV-101 as the stationary phase in a temperature controlled oven of 50°C. Nitrogen was used as the carrier gas.

Hydrocarbon and halocarbon compounds detected in the soil gas were identified by chromatographic retention time. Quantification of compounds was achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). Instrument calibration checks were run periodically throughout the day and system blanks were run at the beginning of the day to check for contamination in the soil gas sampling equipment. Air samples were also routinely analyzed to check for background levels in the atmosphere.

Detection limits for the compounds of interest are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the analytical equipment. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses.

The detection limits for the selected compounds were approximately 0.2 ug/L (0.05 ppm) for hydrocarbons and 0.01 ug/L (0.002 ppm) for halocarbons, depending on the conditions of the measurement, in particular, the sample size. Some of the detection limits are large due to the high concentrations of detected compounds which requires small injection sizes. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.1 ug/L). Detection limits obtained from GC analyses are calculated from the current response factor, the sample size,





and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.

### QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples.

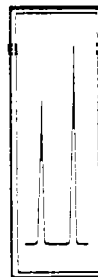
- . Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.

- . Probe adaptors (TRC's patented design) are used to connect the sample probe to the vacuum pump. The adaptor is designed to eliminate the possibility of exposing the sample stream to any part of the adaptor. Associated tubing connecting the adaptor to the vacuum pump is replaced periodically as needed during the job to insure cleanliness and good fit. At the end of each day the adaptor is cleaned with soap and water and baked in the GC oven.

- . Silicone tubing (which acts as a septum for the syringe needle) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.

- . Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.

- . Injector port septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.



. Analytical instruments are calibrated each day by analytical standards from Chem Service, Inc. Calibration checks are also run after approximately every five soil gas sampling locations.

. Subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.

. Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled ambient air analysis.

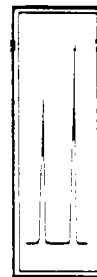
. All sampling and subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

. Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A reliable gas sample can be obtained if the sample vacuum gauge reading is at least 2 inches Hg less than the maximum pump vacuum.

## RESULTS

A total of forty-two soil gas samples were collected and analyzed in the field at the Envirotek II site. Analytical data is condensed in Appendix A. Isoconcentration contour maps with sampling locations and compound concentrations (Figures 1-7) are in Appendix B. Figure 1 is a map showing the sampling locations.

Ambient air samples were collected during the course of the investigation to help evaluate the level of significance for the selected VOC's. The level of significance is simply the level above which concentrations are considered to be significant in terms of groundwater or soil contamination. TCA, TCE and PCE were detected in the ambient air samples. TCA concentrations were detected at 0.002, 0.003, and 0.004 ug/L; TCE



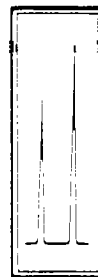
concentrations were detected at 0.003 ug/L in two of the samples. PCE concentrations ranged from 0.0005 to 0.02 ug/L. The level of significance for each target compound is based on several factors; concentrations in ambient air, background levels, and TRC's past experience. Based on the evaluation of these factors, the level of significance for the selected target compounds was determined to be approximately 0.1 ug/L (0.1 ppm). In other words, soil gas concentrations of benzene, toluene, ethylbenzene, xylenes, THC, TCA, TCE, and PCE greater than 0.1 ug/L (0.1 ppm) may indicate possible VOC contamination in the vicinity.

All of the selected compounds, except for benzene, were detected in soil gas samples. TCA, TCE, and PCE were detected in significant concentrations over the entire survey area. The highest concentrations of halocarbons were detected in the vicinity of sampling locations 1-10. TCA concentrations ranged from 0.002 to 2,200 ppm at GP-2. TCE concentrations ranged from non-detect (<0.002 ppm) to 590 ppm at GP-1. PCE concentrations ranged from 0.02 to 3,900 ppm at GP-7. The eastern boundary of these plumes are not defined due to insufficient sampling locations.

Toluene, ethylbenzene, and xylenes were only detected in sampling locations 1-10, and 20. Concentrations at these locations ranged from 0.5 to 350 ppm for toluene, 0.5 to 94 ppm for ethylbenzene, and 0.9 to 120 ppm for xylenes. Hydrocarbons were non-detect at all remaining sampling locations. The eastern boundary of these plumes are also not defined due to insufficient sampling locations.

## CONCLUSIONS

Significant concentrations of TCA, TCE, PCE, toluene, ethylbenzene, xylenes, and THC were detected in the soil gas at the Envirotek II site. The isoconcentration contours for all of the selected compounds indicate a possible source area, for subsurface contamination, to the north of Building 153. This area may coincide with the location of the solvent recovery overspill area. Further investigations are needed to define the extent of subsurface contamination to the east of Building 153.



## APPENDIX A: ANALYTICAL DATA

BLASLAND & BOUCK/ENVIROTEK II/TONAWANDA, NEW YORK JOB#2-90-750-S

09-09-90

CONDENSED DATA

SAMPLE	TCA ug/l	TCE ug/l	PCE ug/l	BENZENE ug/l	TOUENE ug/l	ETHYL BENZENE ug/l	XYLENE ug/l	THC ug/l
AIR	0.004	0.003	0.01	<0.2	<0.1	<0.1	<0.1	<0.5
GP-21-4'	0.2	0.4	4	<0.3	<0.2	<0.2	<0.2	4
GP-22-4'	0.04	0.2	0.8	<0.3	<0.2	<0.2	<0.2	<1
GP-25-4'	0.01	0.08	0.2	<0.2	<0.1	<0.1	<0.1	<0.5
GP-24-2.5'	0.02	0.03	0.2	<0.2	<0.1	<0.1	<0.1	<0.5
GP-23-3'	0.1	0.005	0.8	<0.2	<0.1	<0.1	<0.1	5
GP-27-4'	0.4	0.005	0.8	<0.2	<0.1	<0.1	<0.1	<0.5
GP-26-4'	0.1	<0.01	2	<0.2	<0.1	<0.1	<0.1	<0.5
GP-28-4'	2	2	16	<0.3	<0.2	<0.2	<0.2	8
GP-29-4'	4	8	22	<0.3	<0.2	<0.2	<0.2	11
GP-30-4'	1	2	6	<0.2	<0.1	<0.1	<0.1	5
GP-31-3'	23	14	25	<0.3	<0.2	<0.2	<0.2	40
GP-34-2.5'	2	2	0.2	<0.2	<0.1	<0.1	<0.1	1
GP-32-4'	23	20	8	<0.3	<0.2	<0.2	<0.2	22
GP-33-4'	5	80	4	<0.3	<0.2	<0.2	<0.2	34
GP-19-4'	70	22	61	<2	<0.2	<0.2	<0.2	60
GP-18-4'	130	57	270	<2	<0.2	<0.2	<0.2	170
GP-17-4'	270	170	1300	<3	<2	<2	<2	530
GP-16-4'	350	110	1900	<3	<2	<2	<2	1300
GP-15-4'	60	<49	610	<2	<1	<1	<1	290
GP-14-4'	20	60	320	<2	<1	<1	<1	130
GP-13-3'	0.2	0.06	0.6	<0.2	<0.1	<0.1	<0.1	3
GP-12-4'	0.7	0.3	0.9	<0.2	<0.1	<0.1	<0.1	2

Analyzed by: K. Ptak

Checked by: S. Cherba

Proofed by: *R. J. Judd*



BLASLAND & BOUCK/ENVIROTEK II/TONAWANDA, NEW YORK JOB#2-90-750-S

09/07/90

CONDENSED DATA

SAMPLE	TCA ug/l	TCE ug/l	PCE ug/l	BENZENE ug/l	TOLUENE ug/l	ETHYL BENZENE ug/l	XYLENE ug/l	TIC ug/l
AIR	0.005	0.003	0.02	<0.2	<0.1	<0.1	<0.1	<0.5
GP-1-2'	5000	3100	19000	<35	340	400	370	9100
GP-1-5.5'	2100	1100	4800	<18	10	<12	17	2700
GP-6-2'	450	290	2500	<4	<2	<2	<2	1200
GP-6-6'	1100	290	5300	<4	<2	<2	<2	1800
GP-6-9'	2100	680	16000	<35	160	120	72	4100
GP-7-2'	670	830	26000	<4	8	2	57	5400
GP-7-6'	1100	440	2500	<4	<2	<2	<2	1700

09/08/90

AIR	0.002	<0.0004	0.0005	<0.2	<0.1	<0.1	<0.1	<0.5
GP-7-9'	1000	680	2000	<17	12	<2	8	1400
GP-2-6'	1600	540	2400	<34	<2	<2	<2	2200
GP-2-2'	12000	1500	8500	<420	1300	340	500	16000
GP-3-2'	8100	2400	6000	<68	140	14	82	6300
GP-3-6'	830	260	1800	<17	<2	<2	<2	880
GP-8-2'	700	980	9600	<17	4	<2	7	940
GP-8-6'	770	240	1400	<17	<2	<2	<2	1200
GP-8-9'	820	140	1200	<17	15	<4	36	900
GP-10-2'	930	340	2800	<17	6	<2	<2	300
GP-5-2'	1100	210	740	<17	6	<2	7	1100
GP-5-6'	450	77	400	<7	<2	<2	<2	310
GP-11-3'	3	0.5	2	<0.3	<0.2	<0.2	<0.2	6
GP-20-3'	136	14	40	<0.8	2	<0.6	4	100

Analyzed by: K. Ptak

Checked by: S. Cherba

Proofed by: *K. Ptak*



BLASLAND & BOUCK/ENVIROTEK II/TONAWANDA, NEW YORK JOB#2-90-750-S

09/07/90

CONDENSED DATA

SAMPLE	TCA ppm	TCE ppm	PCE ppm	BENZENE ppm	TOLUENE ppm	ETHYL BENZENE ppm	XYLENE ppm
GP-1-2'	940	590	2900	<11	92	94	87
GP-1-5.5'	390	210	720	<6	3	<3	4
GP-6-2'	84	55	380	<1	<0.5	<0.5	<0.5
GP-6-6'	210	55	800	<1	<0.5	<0.5	<0.5
GP-6-9'	390	130	2400	<11	43	28	17
GP-7-2'	120	160	3900	<1	2	0.5	13
GP-7-6'	210	84	380	<1	<0.5	<0.5	<0.5
09/08/90							
GP-7-9'	190	130	300	<5	3	<0.5	2
GP-2-6'	300	100	360	<11	<0.5	<0.5	<0.5
GP-2-2'	2200	280	1300	<130	350	80	120
GP-3-2'	1500	460	900	<22	38	3	19
GP-3-6'	160	49	270	<5	<0.5	<0.5	<0.5
GP-8-2'	130	190	1400	<5	1	<0.5	2
GP-8-6'	140	46	210	<5	<0.5	<0.5	<0.5
GP-8-9'	150	27	180	<5	4	<0.9	8
GP-10-2'	170	65	420	<5	1	<0.5	<0.5
GP-5-2'	210	40	110	<5	1	<0.5	2
GP-5-6'	84	15	60	<2	<0.5	<0.5	<0.5
GP-11-3'	0.6	0.1	0.3	<0.1	<0.05	<0.05	<0.05
GP-20-3'	25	3	6	<0.2	0.5	<0.1	0.9

Analyzed by: K. Ptak

Checked by: S. Cherba

Proofed by: *K. Ptak*



BLASLAND & BOUCK/ENVIROTEK II/TONAWANDA, NEW YORK JOB#2-90-750-S

09-09-90

CONDENSED DATA

SAMPLE	TCA ppm	TCE ppm	PCE ppm	BENZENE ppm	TOLUENE ppm	ETHYL BENZENE ppm	XYLENE ppm
GP-21-4'	0.04	0.08	0.6	<0.1	<0.05	<0.05	<0.05
GP-22-4'	0.007	0.02	0.1	<0.1	<0.05	<0.05	<0.05
GP-25-4'	0.002	0.02	0.03	<0.06	<0.03	<0.02	<0.02
GP-24-2.5'	0.002	0.006	0.02	<0.06	<0.03	<0.02	<0.02
GP-23-3'	0.02	0.001	0.1	<0.06	<0.03	<0.02	<0.02
GP-27-4'	0.07	0.001	0.1	<0.06	<0.03	<0.02	<0.02
GP-26-4'	0.02	<0.002	0.3	<0.06	<0.03	<0.02	<0.02
GP-28-4'	0.4	0.4	2	<0.1	<0.05	<0.05	<0.05
GP-29-4'	0.7	2	3	<0.1	<0.05	<0.05	<0.05
GP-30-4'	0.2	0.4	0.9	<0.06	<0.03	<0.02	<0.02
GP-31-3'	4	3	4	<0.1	<0.05	<0.05	<0.05
GP-34-2.5'	0.4	0.4	0.04	<0.06	<0.03	<0.02	<0.02
GP-32-4'	4	4	1	<0.1	<0.05	<0.05	<0.05
GP-33-4'	0.9	14	0.6	<0.1	<0.05	<0.05	<0.05
GP-19-4'	12	4	9	<0.6	<0.05	<0.05	<0.05
GP-18-4'	24	11	39	<0.6	<0.05	<0.05	<0.05
GP-17-4'	50	32	200	<1	<0.5	<0.5	<0.5
GP-16-4'	66	21	290	<1	<0.5	<0.5	<0.5
GP-15-4'	11	<9	92	<0.6	<0.3	<0.2	<0.2
GP-14-4'	4	11	48	<0.6	<0.3	<0.2	<0.2
GP-13-3'	0.04	0.01	0.09	<0.06	<0.03	<0.02	<0.02
GP-12-4'	0.1	0.06	0.1	<0.06	<0.03	<0.02	<0.02

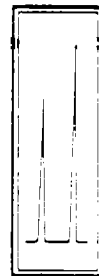
Analyzed by: K. Plak

Checked by: S. Cherba

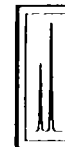
Proofed by: R. Luess





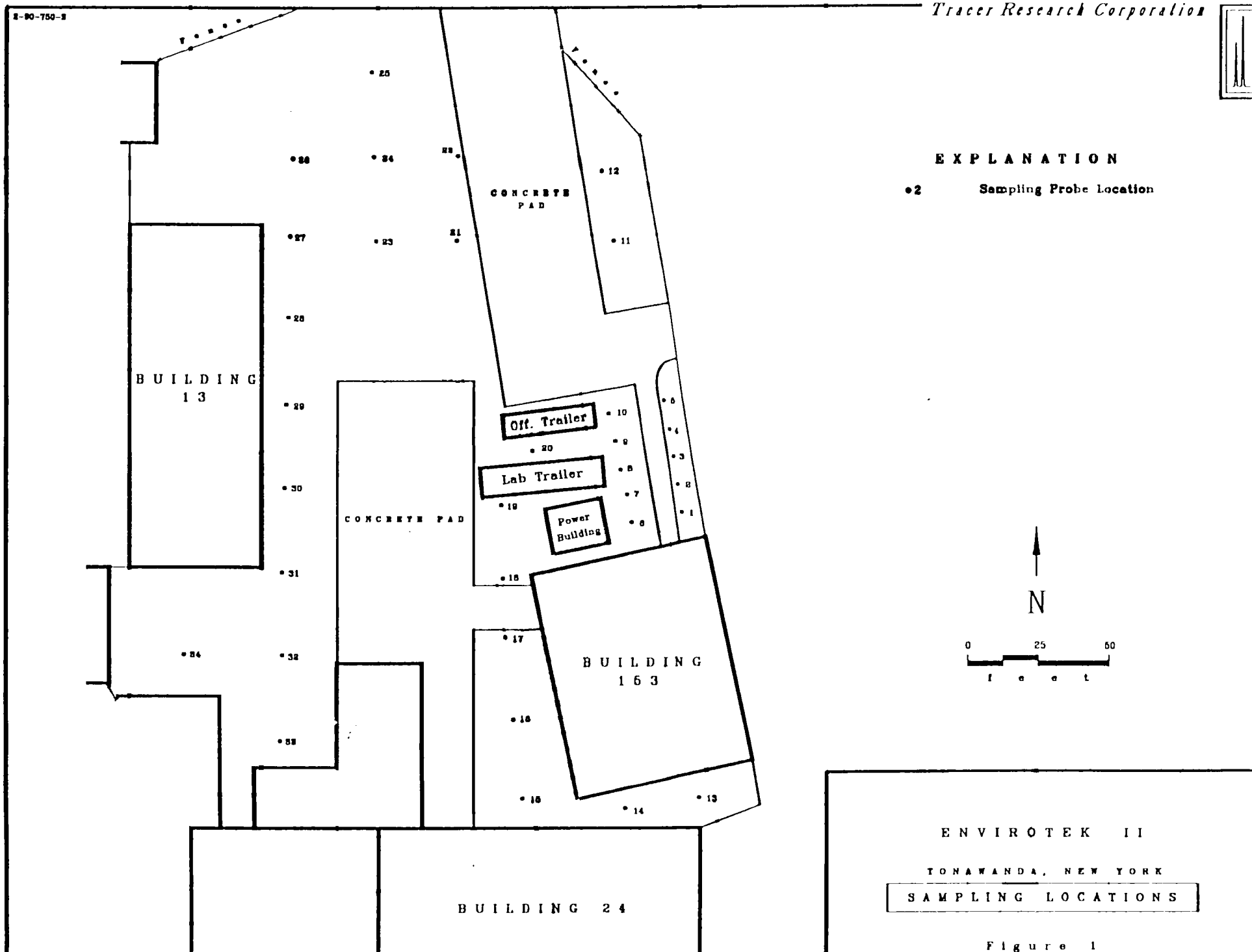


APPENDIX B: FIGURES



# EXPLANATION

• 2 Sampling Probe Location



ENVIROTEK II

TONAWANDA, NEW YORK

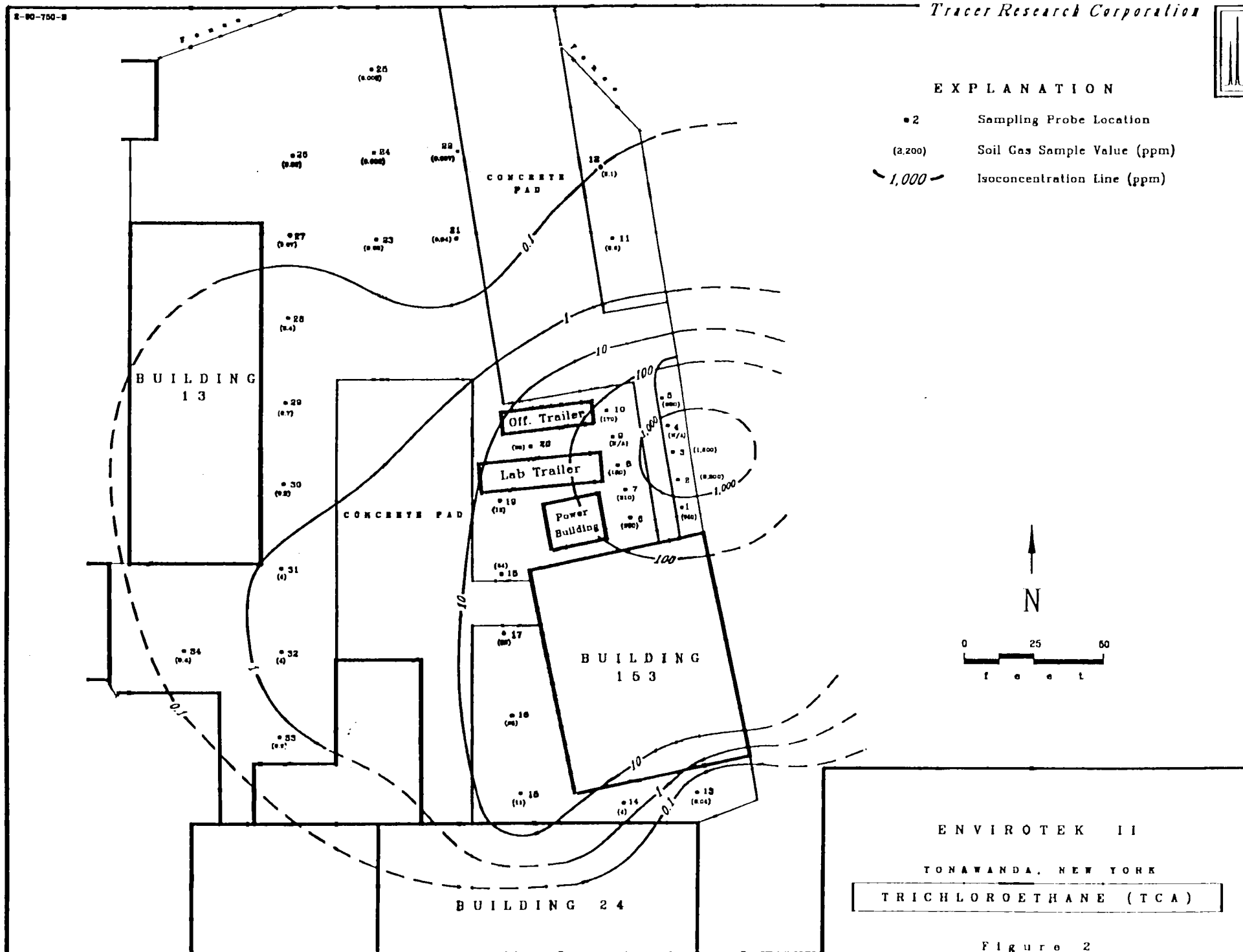
SAMPLING LOCATIONS

Figure 1



## EXPLANATION

- 2 Sampling Probe Location
- (2,200) Soil Gas Sample Value (ppm)
- 1,000 — Isoconcentration Line (ppm)



ENVIROTEK II

TONAWANDA, NEW YORK

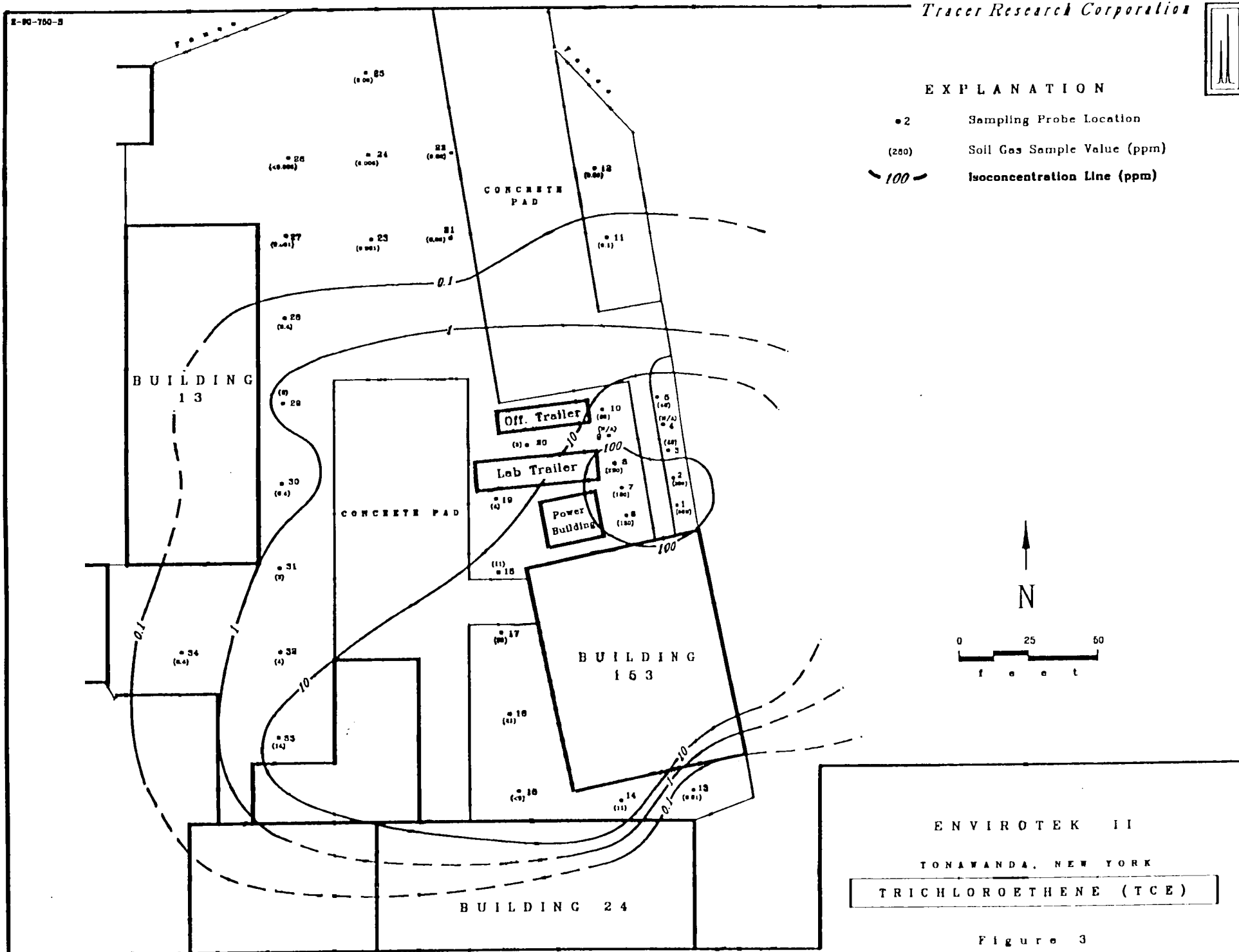
TRICHLOROETHANE (TCA)

Figure 2



# EXPLANATION

- 2 Sampling Probe Location
- (200) Soil Gas Sample Value (ppm)
- 100 Isoconcentration Line (ppm)



ENVIROTEK II

TONAWANDA, NEW YORK

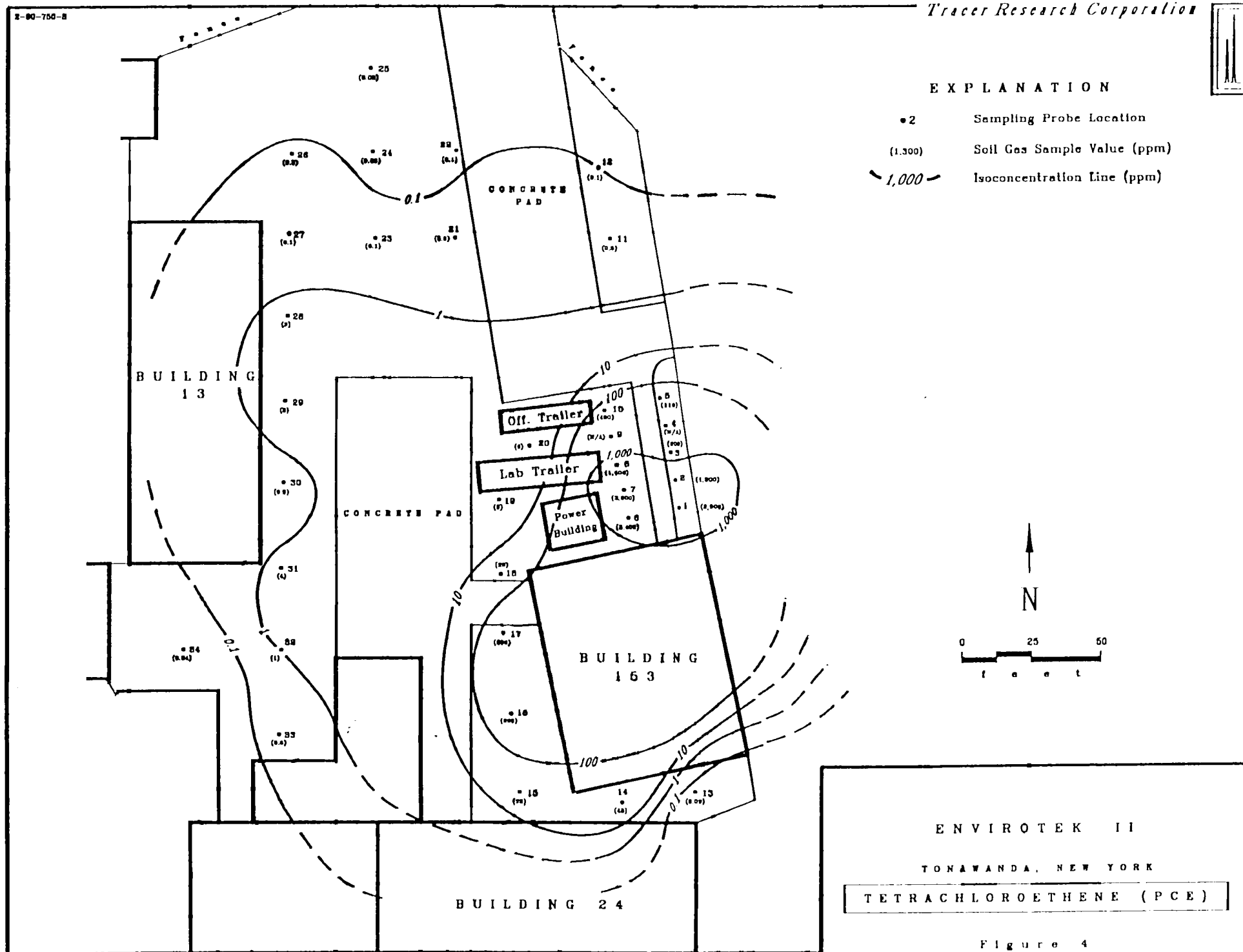
TRICHLOROETHENE (TCE)

Figure 3



# EXPLANATION

- 2 Sampling Probe Location
- (1,300) Soil Gas Sample Value (ppm)
- 1,000 Isoconcentration Line (ppm)



ENVIROTEK II

TONAWANDA, NEW YORK

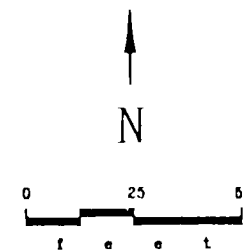
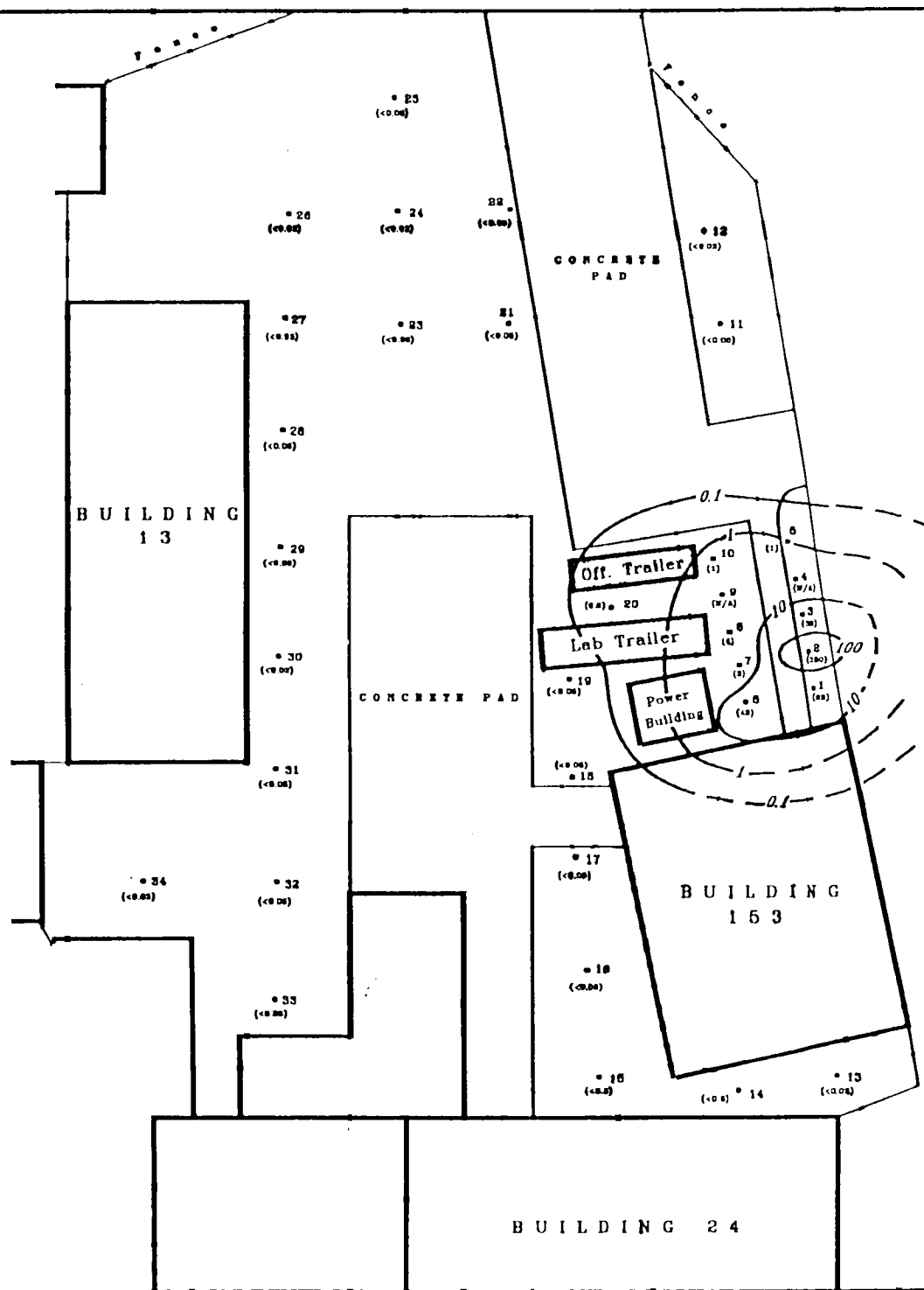
TETRACHLOROETHENE (PCE)

Figure 4



## EXPLANATION

- 2 Sampling Probe Location
- (500) Soil Gas Sample Value (ppm)
- 100 — Isoconcentration Line (ppm)



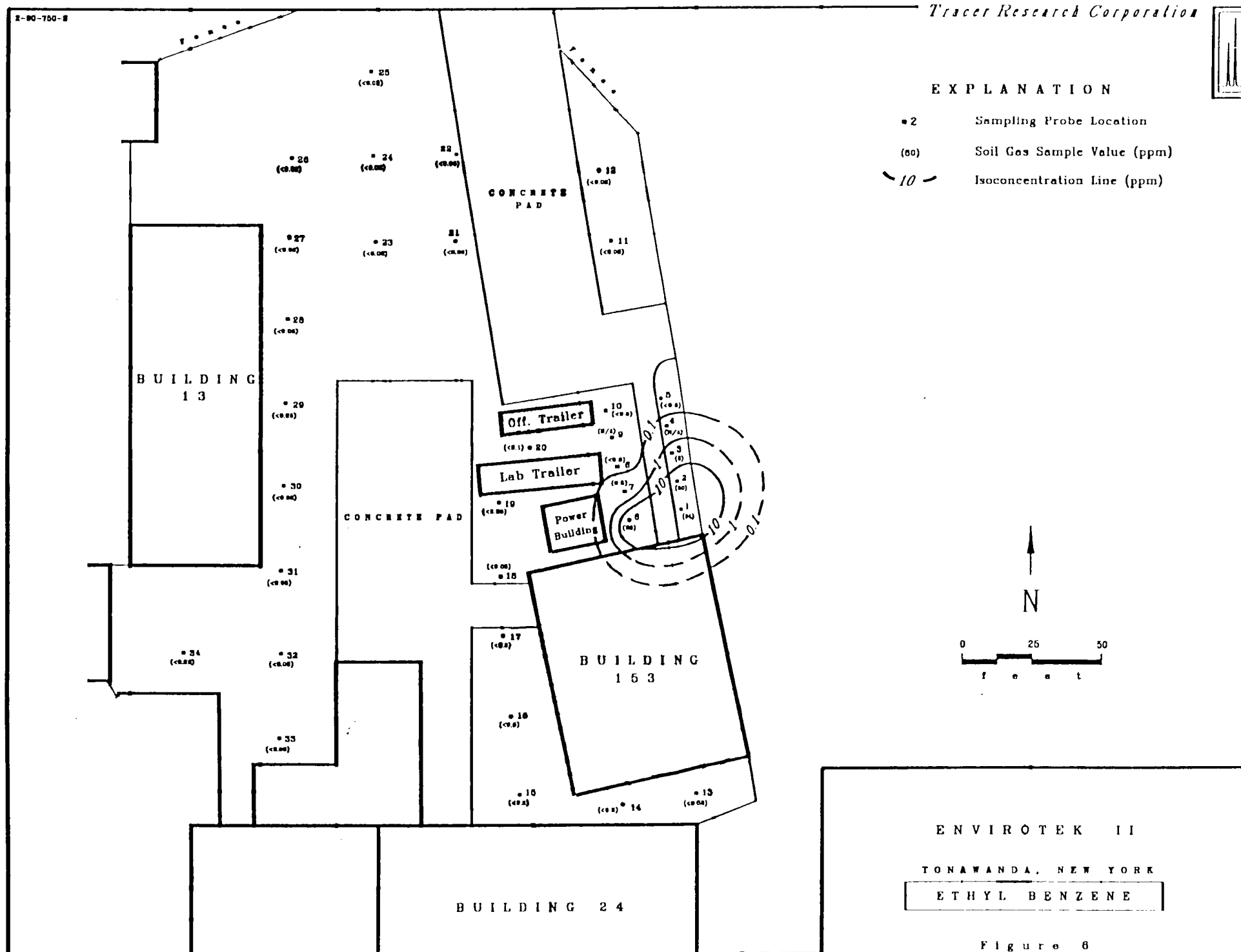
ENVIROTEK II  
 TONAWANDA, NEW YORK  
 TOLUENE

Figure 6



# EXPLANATION

- 2 Sampling Probe Location
- (80) Soil Gas Sample Value (ppm)
- 10 — Isoconcentration Line (ppm)



ENVIROTEK II

TONAWANDA, NEW YORK

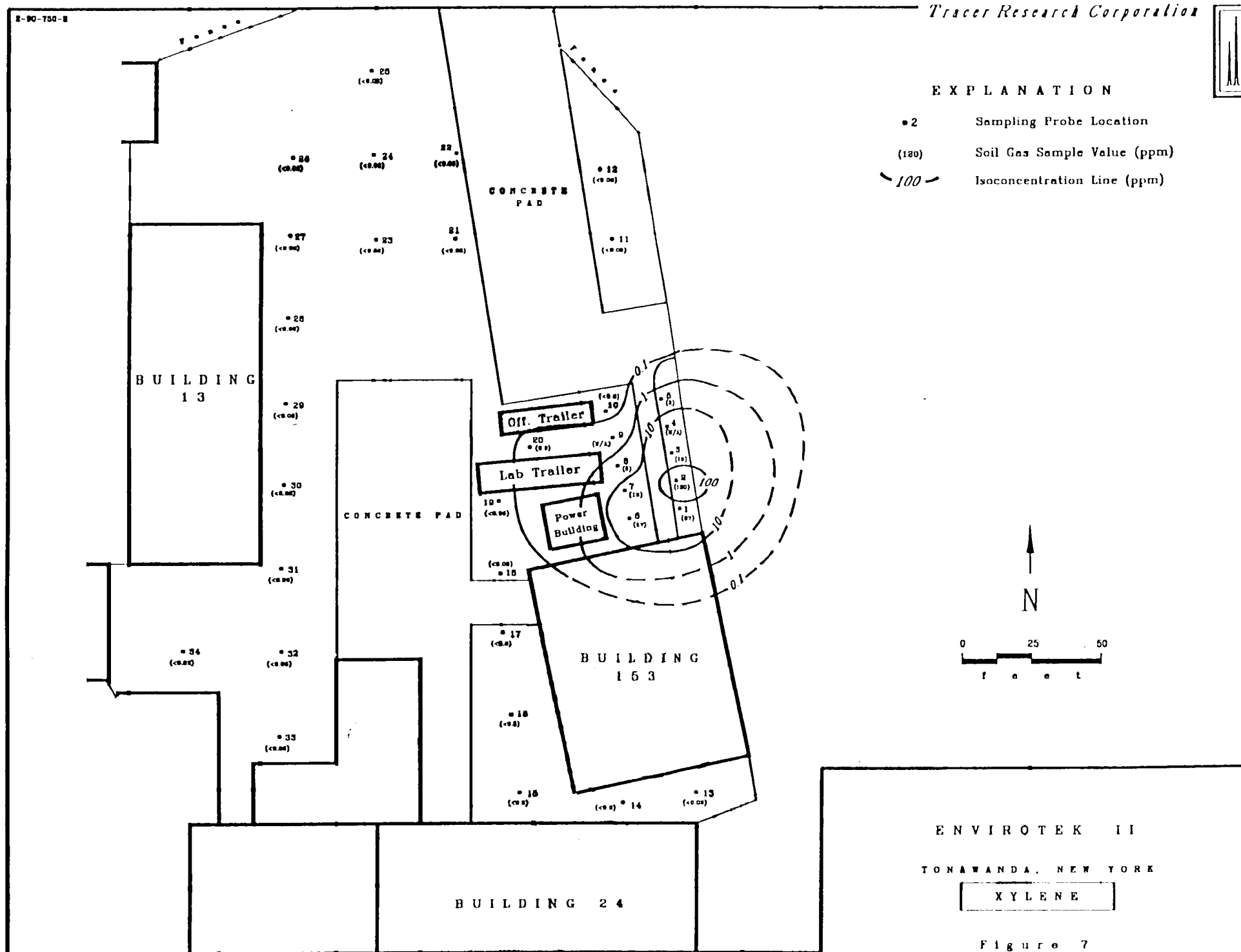
ETHYL BENZENE

Figure 6



## EXPLANATION

- 2 Sampling Probe Location
- (120) Soil Gas Sample Value (ppm)
- 100 Isoconcentration Line (ppm)





APPENDIX B

BORING LOGS AND WELL CONSTRUCTION DETAILS

# SUBSURFACE LOG ENV 1

## DESCRIPTION

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	QVA (ppm) HEALING / BACK / GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.7	10	5/1			ASPHALT
1				6				Dark brown-black, medium to coarse SAND, some medium gravel, some coal cinders, loose, dry, FILL.
2				4				
3								Gray-black CLAY and SILT, some fine sand, moist, loose, ALLUVIUM.
4								
5		2	1.1	2	1/1			
6				2				Wet at 5.5 feet
7				2				
8								
9								
10		3	1.7	1	10,000/			Slight hydrocarbon odor, black staining.
11				2				
12				2				
13				4				Grades to SILT and medium SAND, trace clay, loose, wet.
14								
15		4	1.4	1	2,000/1			
16				2				
17				3				
18				3				Green-gray CLAY and SILT, some fine sand, loose, wet, ALLUVIUM.
19								
20		5	2.0	5	90/1			
21				2				
22				2				

SURFACE ELEVATION 580.0 ft.  
 DATE STARTED 11/6/90  
 DATE COMPLETED 11/6/90  
 CLASSIFIED BY DLC

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 1  
 SHEET 1 OF 2



BLASLAND & BOUCK  
ENGINEERS, P.C.

# SUBSURFACE LOG ENV 1

## DESCRIPTION

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm)	READING / BACK / GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
23									
24									
25		6		4	25/1				
26				2					
27				2					
									Bottom of boring at 25 feet; sampled to 27 feet.
									<p><u>Well Completion Details</u></p> <p>2-inch diameter 0.010 machine slotted PVC screen at 24.5 to 10.2 feet; 2-inch diameter PVC riser at 10.2 to 0.4 feet.</p> <p>#4 0 sand 25 to 8 feet.</p> <p>Hydrated bentonite pellets at 8 to 6 feet.</p> <p>Type I Portland cement 6 ft. to 1 ft.</p> <p>Sand drain 1 foot to 0.8 foot.</p> <p>Concrete 0.8 ft. to surface with flushmount curbbox completion.</p> <p><u>Note:</u></p> <ol style="list-style-type: none"> <li>1. Installed with 4½" I.D. hollow-stem auger.</li> <li>2. OVA readings were taken directly from soil sample jars within 6 hours of collection.</li> <li>3. Water level taken 11/19/90.</li> </ol>

SURFACE ELEVATION 580.0 ft.

DATE STARTED 11/6/90

DATE COMPLETED 11/6/90

CLASSIFIED BY DLG

PROJECT Envirotek

PROJECT NO 580.01

NO. ENV 1

SHEET 2 OF 2



BLASLAND & BOUCK  
ENGINEERS, P.C.

# SUBSURFACE LOG ENV 2

## DESCRIPTION

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm) READING / BACK GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.2	1	4,000/1			Brown to black, fine to coarse SAND, some silt, some black cinders, loose, moist, slight brown staining, FILL.
1				2				
2				4				
3				5				
4								
5		2	0.8	9	5,000/1			Grades to gray, medium to coarse SAND, medium gravel, some silt, loose, moist to wet, oily sheen, brown staining, chemical odor.
6				7				
7				4				
8				5				
9								
10		3	1.3	6	10,000/1			Separate phase hydrocarbons in soil from 10 ft. to 10.5 ft., black staining.
11				16				Wet at 11 feet.
12				16				
13				20				
14								
15		4	0.8	16	2,000/1			Gray, coarse SAND and medium GRAVEL, some silt, trace clay, loose, wet, oil sheen, chemical odor, some staining.
16				11				
17				3				
18				3				
19								
20		5	1.3	2	2,000/1			Gray to black, fine SAND, some silt and clay, loose, wet, discontinuous film on water, slight chemical odor, ALLUVIUM.
21				1				
22				2				
22				2				Bottom of boring at 21 ft.; sampled to 22 ft.

SURFACE ELEVATION 580.8 ft.

DATE STARTED 11/7/90

DATE COMPLETED 11/7/90

CLASSIFIED BY DLG

PROJECT Envirotek

PROJECT NO 580.01

NO. ENV 2

SHEET 1 OF 2



BLASLAND & BOUCK  
ENGINEERS, P.C.

# SUBSURFACE LOG ENV 2

## DESCRIPTION

### Well Completion Details

2-Inch diameter 0.010 machine-slotted PVC screen 20.6 to 6.1 feet; 2-inch diameter PVC riser 6.1 to 2.3 feet above grade.

#4 0 sand 21 to 5.1 feet.

Hydrated bentonite pellet seal 5.1 to 3.1 feet.

Type I Portland cement 3.1 to 2.1 feet.

Concrete 2.2 feet to grade.

4-inch diameter, 5-foot long protective steel casing was placed around PVC riser finished with a locking top.

### Notes:

1. Installed with 4 1/4" ID hollow-stem auger.
2. OVA readings were taken directly from soil sample jars within 6 hours of collection.
3. Water level taken on 11/19/90.

SURFACE ELEVATION 580.8 ft.

DATE STARTED 11/7/90

DATE COMPLETED 11/7/90

CLASSIFIED BY DLG

PROJECT Envirotek

PROJECT NO 580.01

NO. ENV 2

SHEET 2 OF 2



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

# SUBSURFACE LOG ENV 3

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm) READING / BACK / GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	1.0	4	5/1			Brown to black, medium to coarse SAND, some gravel and cinders, loose, dry, FILL.
1				14				
				15				
2				9				
3								
4								
5		2	1.2	4	5/1			Grading moist at 5 feet, with slight and brown staining and hydrocarbon odor.
6				5				
				50				
7				98				
8								
9								Black, fine to medium SAND, some silt and gravel, traces of hydrocarbon odor and staining, loose, saturated.
10		3	1.0	7	10,000/1			
11								Wet at 11.5 feet.
12								
13								
14								
15		4	1.7	3	10,000/1			
16				2				
				2				
17				3				Gray-brown, CLAY and SILT, some fine to medium sand, loose, wet, strong odor, black staining.
18								
19								
20		5	1.2	2	10,000/1			
21				2				
				2				
22				2				Bottom of boring at 21 feet; sampled to 22 feet.

SURFACE ELEVATION 580.4 ft.  
 DATE STARTED 11/8/90  
 DATE COMPLETED 11/8/90  
 CLASSIFIED BY DLG

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 3  
 SHEET 1 OF 2



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

# SUBSURFACE LOG ENV 3

## DESCRIPTION

### Well Completion Details

2-inch diameter 0.010 machine-slotted PVC screen 20.6 to 6.1 feet; 2-inch diameter PVC riser 6.1 to 2.2 feet above grade.

#40 sand 21 to 5.1 feet.

Hydrated bentonite pellet seal 5.1 to 3.1 feet.

Type I Portland cement 3.1 to 2.0 feet.

Concrete 2.0 feet to grade.

4-inch diameter, 5-foot long protective steel casing was placed around PVC riser finished with a locking top.

### Notes:

1. Installed with 4 1/2" ID hollow-stem auger.
2. OVA readings were taken directly from soil sample jars within 6 hours of collection.
3. Water level taken on 11/19/90.

SURFACE ELEVATION 580.4 ft.  
 DATE STARTED 11/8/90  
 DATE COMPLETED 11/8/90  
 CLASSIFIED BY DLC

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 3  
 SHEET 2 OF 2



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

# SUBSURFACE LOG ENV 4

## DESCRIPTION

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm)	HEADING / BACK / GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.5	1	1/1				Dark brown to gray, medium to coarse SAND, some silt, loose, moist, FILL.
1				8					
				9					
2				6					
3									
4									
5		2	0.3	5	20/1				Grades to coarse SAND and GRAVEL.
6				7					
				7					
7				7					
8									
9									
10		3	1.0	12	12/1				Light gray, coarse SAND and medium GRAVEL, some concrete and slag, firm, wet, FILL.
11				25					
				35					
12				40					
13									Dark gray CLAY and SILT, some fine to medium sand, slight hydrocarbon odor, loose, wet, ALLUVIUM.
14									
15		4	1.3	3	100+/1				
16				2					
				2					
17				3					
18									
19									
20		5	1.3	2	60/1				
21				1					
				3					
22				4					
Bottom of boring at 20 feet; sampled to 22 feet.									

SURFACE ELEVATION 580.2 ft

DATE STARTED 11/7/90

DATE COMPLETED 11/7/90

CLASSIFIED BY DLC

PROJECT Envirotek

PROJECT NO 580.01

NO ENV 4

SHEET 1 OF 2



BLASLAND & BOUCK  
ENGINEERS, P.C.



# SUBSURFACE LOG ENV 4

## DESCRIPTION

### Well Completion Details

2-inch diameter 0.010 machine-slotted PVC screen 19.6 to 5.1 feet; 2-inch diameter PVC riser 5.1 to 2 feet above grade.

#40 sand 20 to 4.1 feet.

Hydrated bentonite pellet seal 5.1 to 3.1 feet.

Concrete 2.6 feet to grade.

4-inch diameter, 5-foot long protective steel casing was placed around PVC riser finished with a locking top.

### Notes:

1. Installed with 4 1/4" ID hollow-stem auger.
2. OVA readings were taken directly from soil sample jars within 6 hours of collection.
3. Water level taken on 11/19/90.

SURFACE ELEVATION 580.2 ft.  
 DATE STARTED 11/7/90  
 DATE COMPLETED 11/7/90  
 CLASSIFIED BY DLC

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 4  
 SHEET 2 OF 2



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

# SUBSURFACE LOG ENV 5

## DESCRIPTION

DEPTH (FT)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm) READING / BACK GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.4	1	2/1			Dark brown, medium to coarse SAND and GRAVEL, trace brick fragments, moist, loose, FILL.
1				2				
2				3				
3				1				
4								
5		2	0.5	54	20/1			Light gray to red-brown, coarse SAND and GRAVEL, SLAC and CONCRETE, fragments, slight odor, moist, FILL.
6				80				
7				80				
8				94				
9								
10		3	0.3	50	20/1			Grading wet.
11				76				
12				--				
13				--				Gray-brown CLAY, SAND, and SILT, some fine to medium sand, loose, wet, slight odor, ALLUVIUM.
14								
15		4	1.4	4	500/1			
16				2				
17				2				
18				3				
19								Grades to fine SAND and SILT, some clay.
20								
21		5	1.2	1	500/1			
22				1				
				3				
				4				
22								Bottom of boring at 22 feet.

SURFACE ELEVATION 579.5 ft.  
 DATE STARTED 11/8/90  
 DATE COMPLETED 11/8/90  
 CLASSIFIED BY DLG

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO ENV 5  
 SHEET 1 OF 2



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

# SUBSURFACE LOG ENV 5

## DESCRIPTION

### Well Completion Details

2-inch diameter 0.010 machine-slotted PVC screen 21.6 to 7.1 feet; 2-inch diameter PVC riser 7.1 to 2 feet above grade.

#4 Q sand 22 to 5.5 feet.

Hydrated bentonite pellet seal 5.5 to 3.5 feet.

Type I Portland cement 3.5 to 2.5 feet.

Concrete 2.5 feet to grade.

4-inch diameter, 5-foot long protective steel casing was placed around PVC riser finished with a locking top.

### Notes:

1. Installed with 4 1/4" ID hollow-stem auger.
2. OVA readings were taken directly from soil sample jars within 6 hours of collection.
3. Water level taken on 11/19/90.

SURFACE ELEVATION 579.5 ft.

DATE STARTED 11/8/90

DATE COMPLETED 11/8/90

CLASSIFIED BY DLG

PROJECT Envirotek

PROJECT NO 580.01

NO ENV 5

SHEET 2 OF 2



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

# SUBSURFACE LOG ENV 6

## DESCRIPTION

DEPTH (FT.)	SAMPLES	SAMPLE NO	RECOVERY (FEET)	BLOWS (PER 0.5 FT)	OVA (ppm) WEAVING / BACK / GROUND	GEOLOGIC COLUMN	WELL COLUMN	DESCRIPTION
0		1	0.7	1	5/1			Brown, medium to coarse SAND, some silt and medium gravel, little black cinders, loose, moist, FILL.
1				1				
2				2				
3				5				
4								
5		2	1.0	30	10/1			Grading to light gray-brown with some slag and concrete, fragments, slight odor.
6				42				
7				72				
8				78				
9								
10		3	0.2	40	10/1			Grading wet with slight brown staining and oil sheen.
11				90				
12				--				
13								Gray to light brown, fine to medium SAND, SILT and CLAY, slight chemical odor, brown staining, loose, wet, ALLUVIUM.
14								
15		4	1.0	4	30/1			
16				5				
17				5				
18				4				
19								
20		5	1.0	1	20/1			
21				3				
22				3				
22				3				Bottom of boring at 21 feet; sampled to 22 feet.

SURFACE ELEVATION 579.6 ft.  
 DATE STARTED 11/8/90  
 DATE COMPLETED 11/9/90  
 CLASSIFIED BY DLG

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 6  
 SHEET 1 OF 2



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

# SUBSURFACE LOG ENV 6

## DESCRIPTION

### Well Completion Details

2-inch diameter 0.010 machine-slotted PVC screen 20.6 to 6.1 feet; 2-inch diameter PVC riser 6.1 to 2.2 feet above grade.

#4 Q sand 21 to 5.1 feet.

Hydrated bentonite pellet seal 5.1 to 3.1 feet.

Type I Portland cement 3.1 to 2.0 feet.

Concrete 2.0 feet to grade.

4-inch diameter, 5-foot long protective steel casing was placed around PVC riser finished with a locking top.

### Notes:

1. Installed with 4 1/2" ID hollow-stem auger.
2. OVA readings were taken directly from soil sample jars within 6 hours of collection.
3. Water level taken on 11/19/90.

SURFACE ELEVATION 579.6 ft.  
 DATE STARTED 11/8/90  
 DATE COMPLETED 11/9/90  
 CLASSIFIED BY DLG

PROJECT Envirotek  
 PROJECT NO 580.01  
 NO. ENV 6  
 SHEET 2 OF 2



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

APPENDIX C

RESULTS OF IN-SITE HYDRAULIC  
CONDUCTIVITY TESTING

SUBSUMP. Well      c. S. S. Russell, March 1988  
                     modified 12/21/89  
 Project:            ENVIROTEK  
 Project No.:        580.01  
 Well No.:           ENV-2      TEST 2  
 Test Date:          NOVEMBER 20, 1990  
 Formation Tested: OVERBURDEN  
 Rising (R) or Falling (F) Head Test: (R)

		(cm)
Stickup (ft)	2.38	71.93
Static Water Level (ft)	11.96	364.54
Depth to bottom of screen (ft from ground level)	20.60	627.89
Boring Diameter (in)	6.00	20.32
Casing Diameter (in)	2.00	5.08
Screen Diameter (in)	2.00	5.08
Screen Length (ft)	14.40	438.91
Depth to Boundary	35.00	1066.80
Delta H at time 0 (ft)	0.40	12.19
Delta H at Time t (ft)	0.03	0.91
Time t (seconds)	57.3	
Ratio Kh/Kv	1	
Porosity of Filter Pack	0.3	

	cm/sec	gpd/ft <sup>2</sup>
K (Bouwer-Rice)	5.5E-03	117.6
K (Hvorslev Time Lag)	1.5E-03	32.4
K (Hvorslev Variable Head)	1.5E-03	32.2

File: ENV-2  
 NOVEMBER 20. 1990  
 SLUG TEST DATA REDUCTION  
 ENVIROTEK  
 RISING HEAD TEST

ENV-2  
 TEST 2

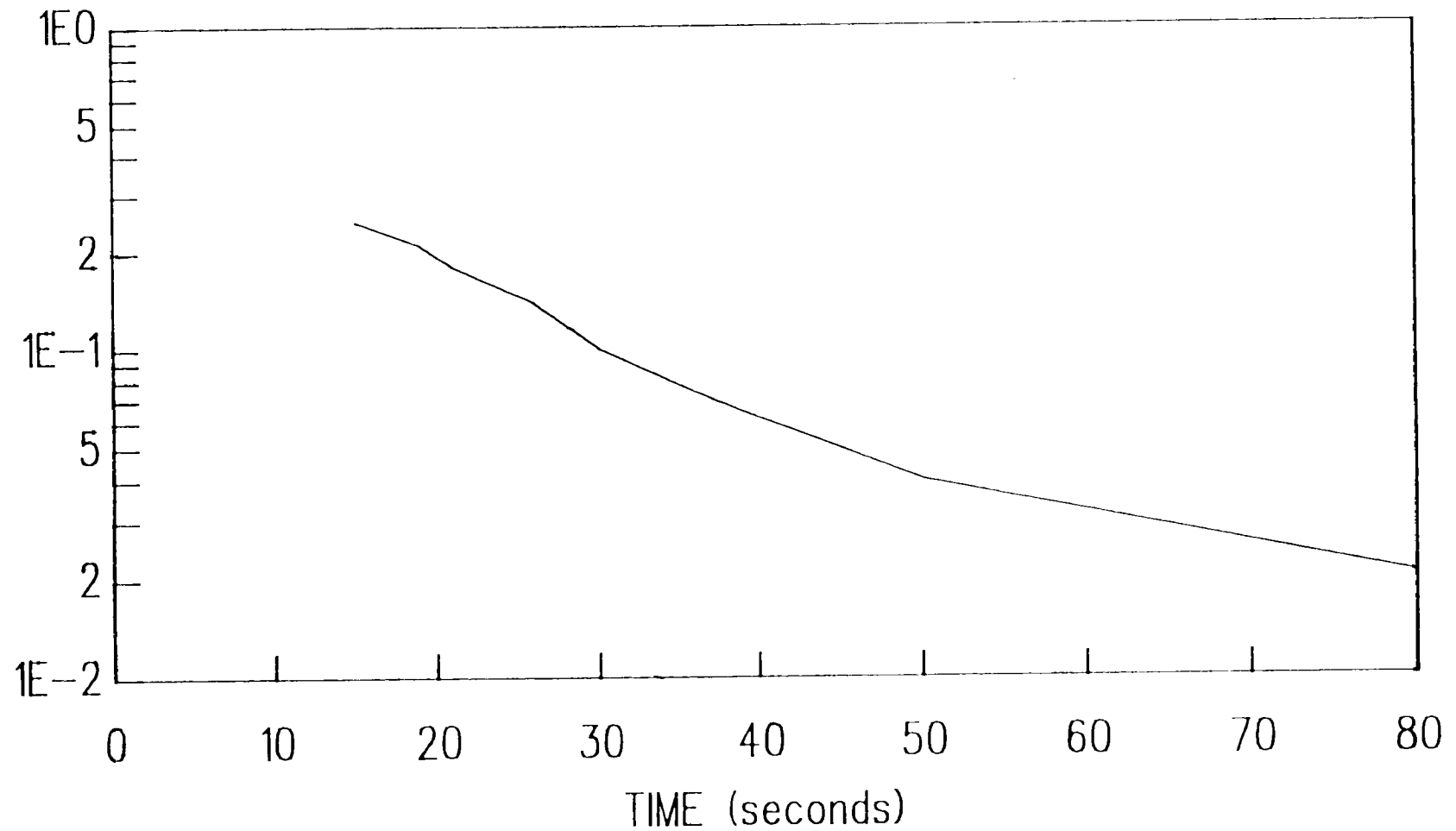
Initial Depth to water (ft): 11.96  
 Initial Time (seconds): 0.00

Clock Time			Depth to water		Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
HR	MM	Sec	FT	IN			
		0	11.96		0.00	0.00	0.00
		15	12.21		15.00	0.25	7.60
		19	12.17		19.00	0.21	6.38
		21	12.14		21.00	0.18	5.47
		26	12.10		26.00	0.14	4.25
		30	12.06		30.00	0.10	3.04
		37	12.03		37.00	0.07	2.13
		50	12.00		50.00	0.04	1.22
1	21		11.98		81.00	0.02	0.61



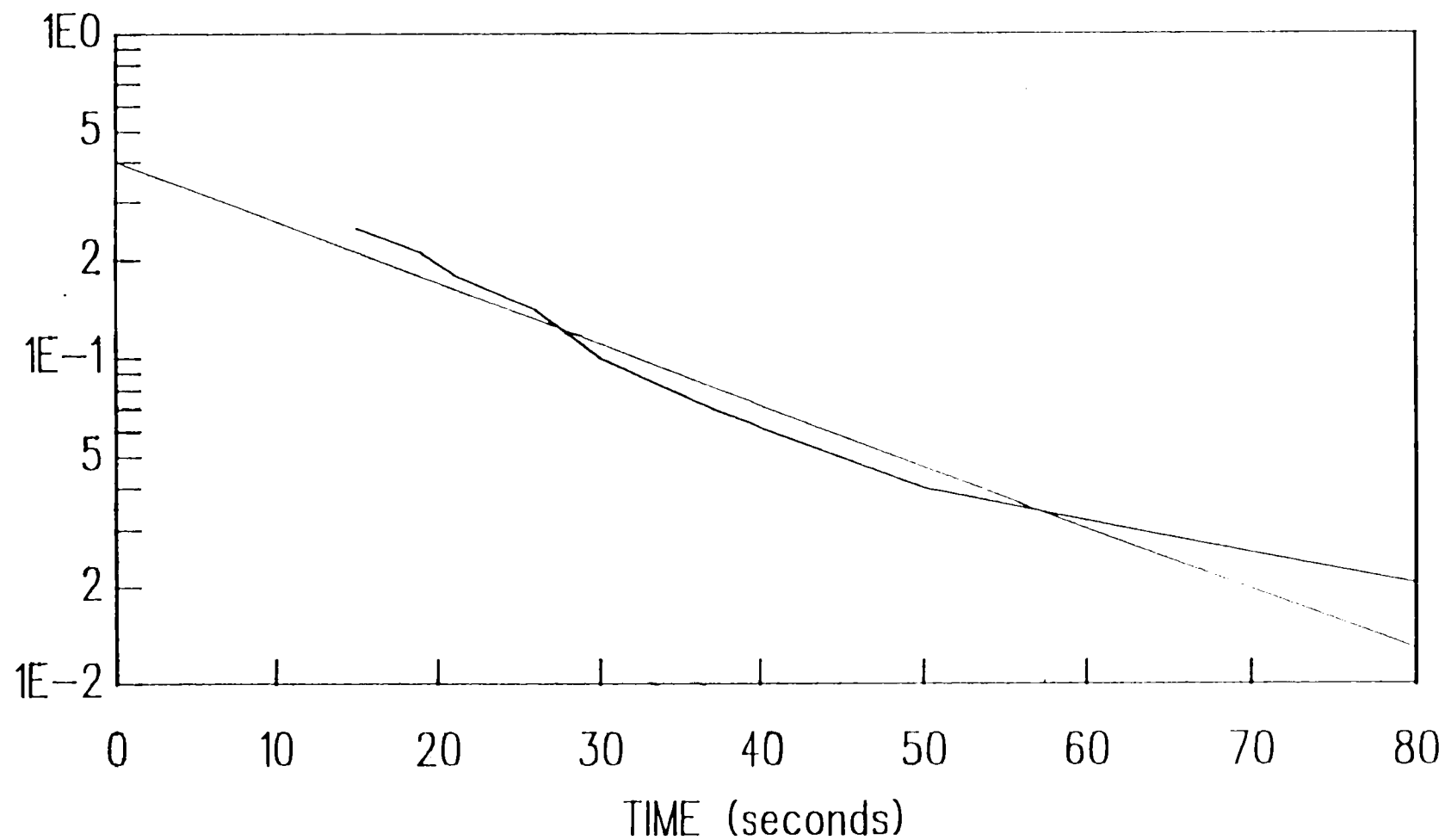
ENV-2 TEST 2  
ENVIROTEK  
RISING HEAD TEST---NOVEMBER 20, 1990

DELTA HEAD (ft)



ENV-2 TEST 2  
ENVIROTEK  
RISING HEAD TEST—NOVEMBER 20, 1990

DELTA HEAD (ft)



SLUGCOMP.WK1 c. S.J. Rossello, March 1988  
 Modified 12/21/89  
 Project: ENVIROTEK  
 Project No.: 580.01  
 Well No.: ENV-3 TEST 1  
 Test Date: NOVEMBER 20, 1990  
 Formation Tested: OVERBURDEN  
 Rising (R) or Falling (F) Head Test: (R)

		(cm)
Stickup (ft)	2.75	83.82
Static Water Level (ft)	11.48	349.91
Depth to bottom of screen (ft from ground level)	20.60	627.89
Boring Diameter (in)	8.00	20.32
Casing Diameter (in)	2.00	5.08
Screen Diameter (in)	2.00	5.08
Screen Length (ft)	14.50	441.96
Depth to Boundary	35.00	1066.80
Delta H at time 0 (ft)	0.20	6.10
Delta H at Time t (ft)	0.03	0.91
Time t (seconds)	205	
Ratio Kh/Kv	1	
Porosity of Filter Pack	0.3	

	cm/sec	gpd/ft <sup>2</sup>
K (Bouwer-Rice)	1.1E-03	22.9
K (Hvorslev Time Lag)	3.0E-04	6.3
K (Hvorslev Variable Head)	2.9E-04	6.3

File: ENV-3  
NOVEMBER 20, 1990  
SLUG TEST DATA REDUCTION  
ENVIROTEK  
RISING HEAD TEST

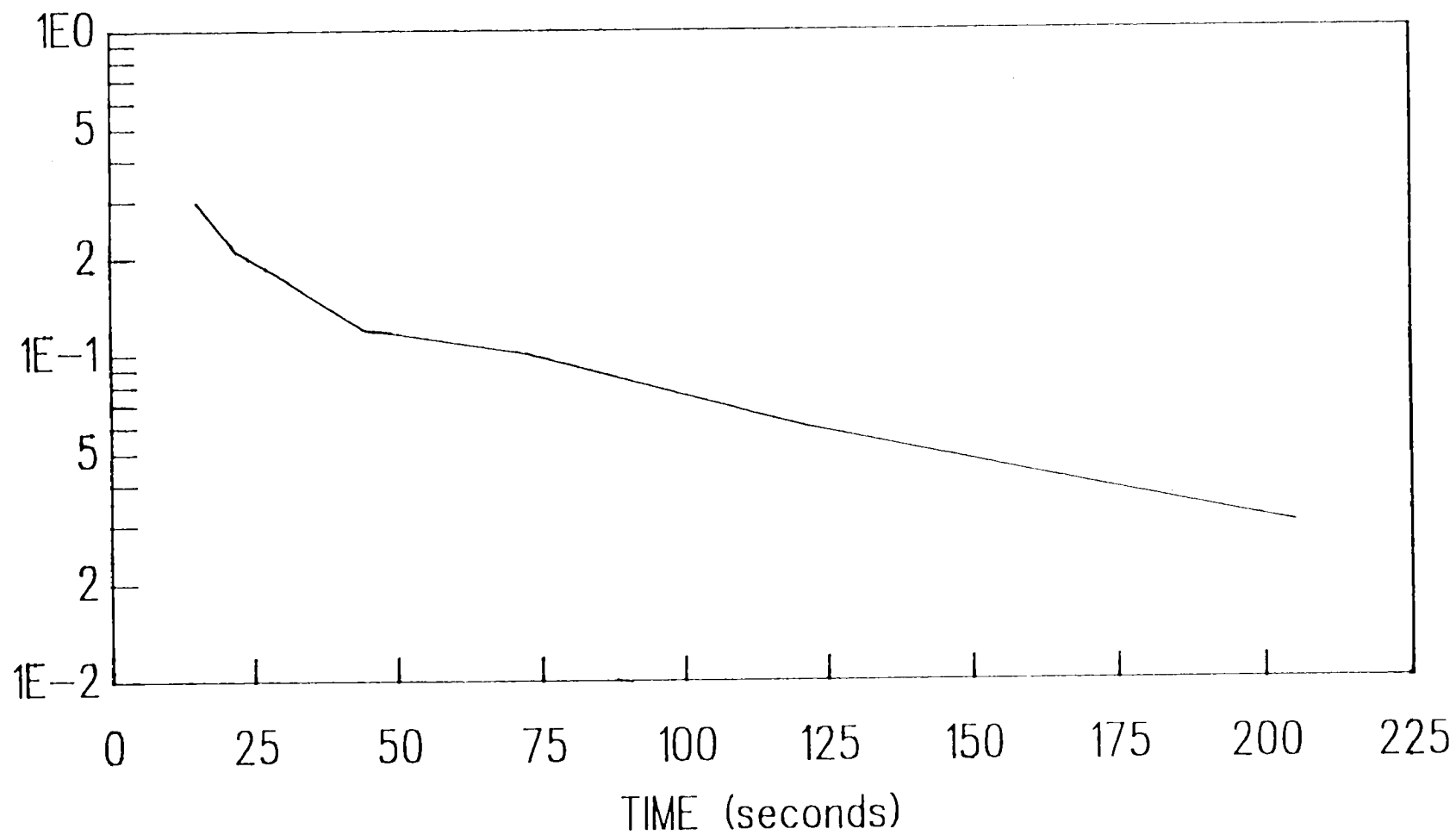
ENV-3  
TEST 1

Initial Depth to water (ft): 11.48  
Initial Time (seconds): 0.00

Clock Time			Depth to water		Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
HR	MM	Sec	FT	IN			
		0	11.48		0.00	0.00	0.00
		15	11.78		15.00	0.30	9.11
		22	11.69		22.00	0.21	6.38
		31	11.65		31.00	0.17	5.16
		44	11.60		44.00	0.12	3.65
1	13		11.58		73.00	0.10	3.04
2	1		11.54		121.00	0.06	1.82
3	25		11.51		205.00	0.03	0.91

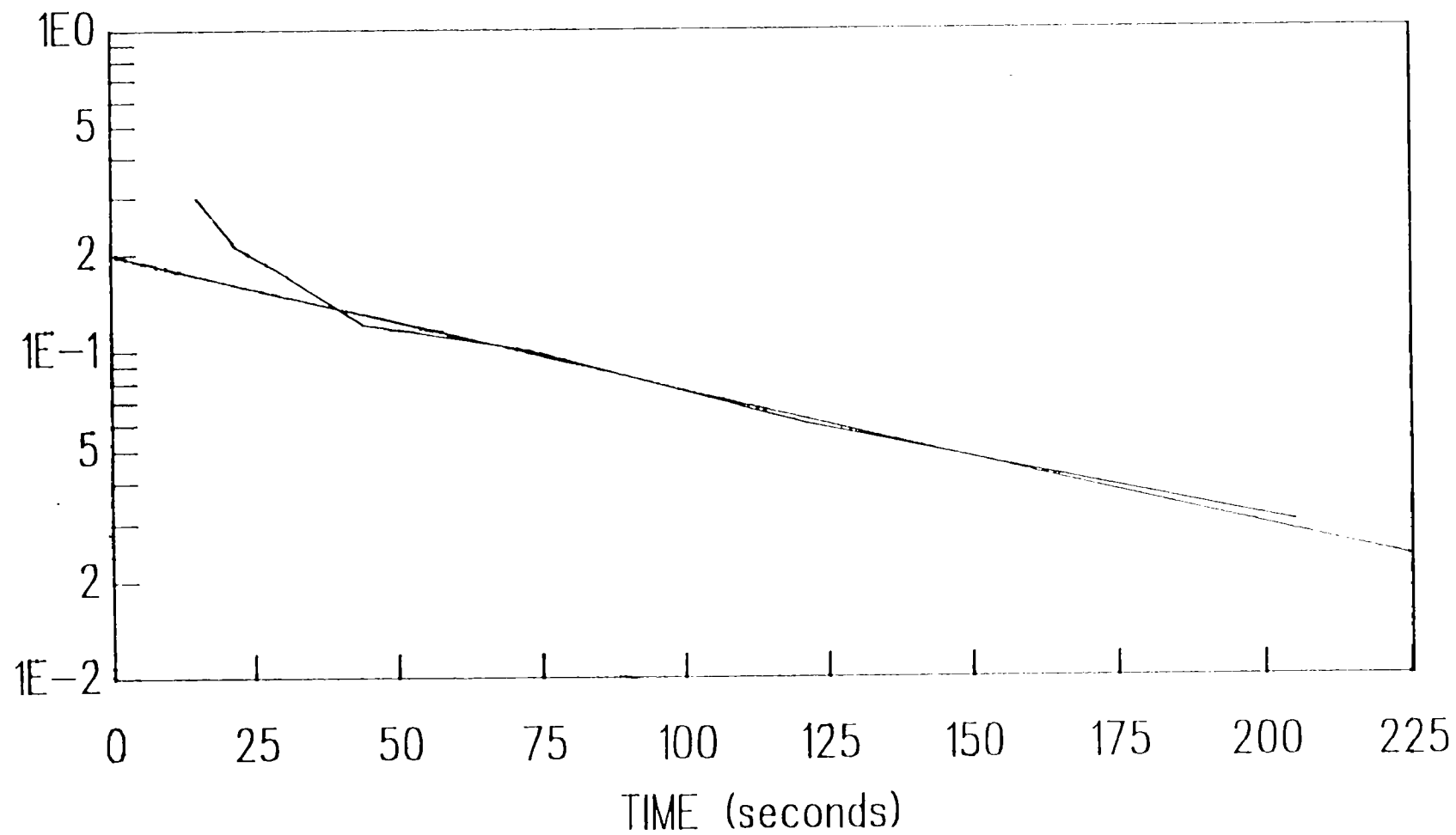
ENV-3 TEST 1  
ENVIROTEK  
RISING HEAD TEST---NOVEMBER 20, 1990

DELTA HEAD (ft)



ENV-3 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD (ft)



SLUGCOMP.WK1      c. S.J. Rossello, March 1988  
 Modified 12/21/89  
 Project:            ENVIROTEK  
 Project No.:        580.01  
 Well No.:           ENV-2      TEST 1  
 Test Date:          NOVEMBER 20, 1990  
 Formation Tested:   OVERBURDEN  
 Rising (R) or Falling (F) Head Test: (R)

		(cm)
Stickup (ft)	2.38	71.93
Static Water Level (ft)	11.96	364.54
Depth to bottom of screen (ft from ground level)	20.60	627.89
Boring Diameter (in)	8.00	20.32
Casing Diameter (in)	2.00	5.08
Screen Diameter (in)	2.00	5.08
Screen Length (ft)	14.40	438.91
Depth to Boundary	35.00	1066.80
Delta H at time 0 (ft)	0.38	11.58
Delta H at Time t (ft)	0.01	0.37
Time t (seconds)	78	
Ratio Kh/Kv	1	
Porosity of Filter Pack	0.3	

	cm/sec	gpd/ft <sup>2</sup>
K (Bouwer-Rice)	5.4E-03	115.2
K (Hvorslev Time Lag)	1.5E-03	31.8
K (Hvorslev Variable Head)	1.5E-03	31.6

File: ENV-2

NOVEMBER 20, 1990

ENV-2

SLUG TEST DATA REDUCTION

TEST 1

ENVIROTEK

RIISING HEAD TEST

Initial Depth to water (ft): 11.96

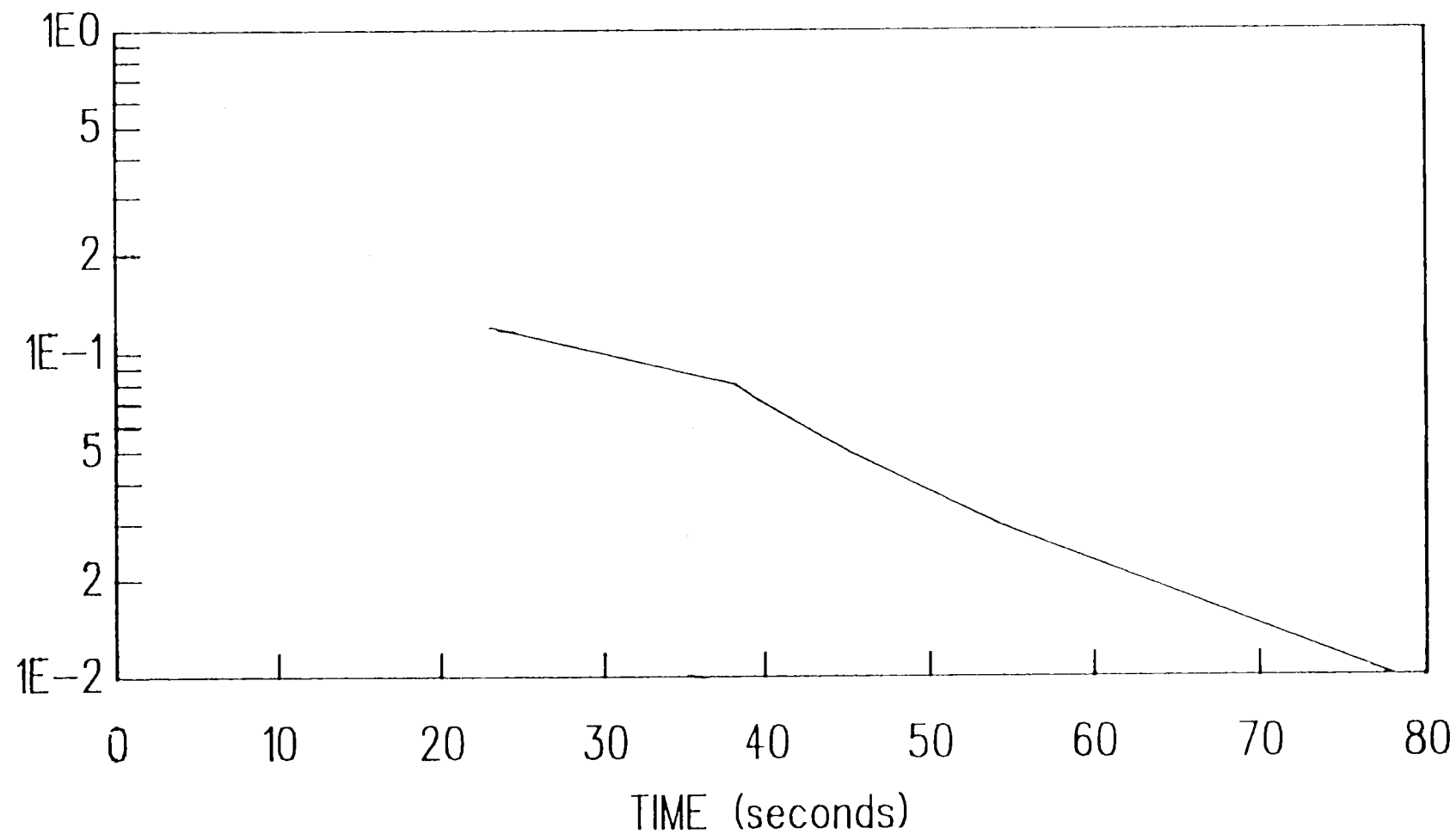
Initial Time (seconds): 0.00

Clock Time			Depth to water		Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
HR	MN	Sec	FT	IN			
		0	11.96		0.00	0.00	0.00
		23	12.08		23.00	0.12	3.65
		38	12.04		38.00	0.08	2.43
		45	12.01		45.00	0.05	1.52
		54	11.99		54.00	0.03	0.91
1	18		11.97		78.00	0.01	0.30
2	26		11.96		146.00	0.00	0.00



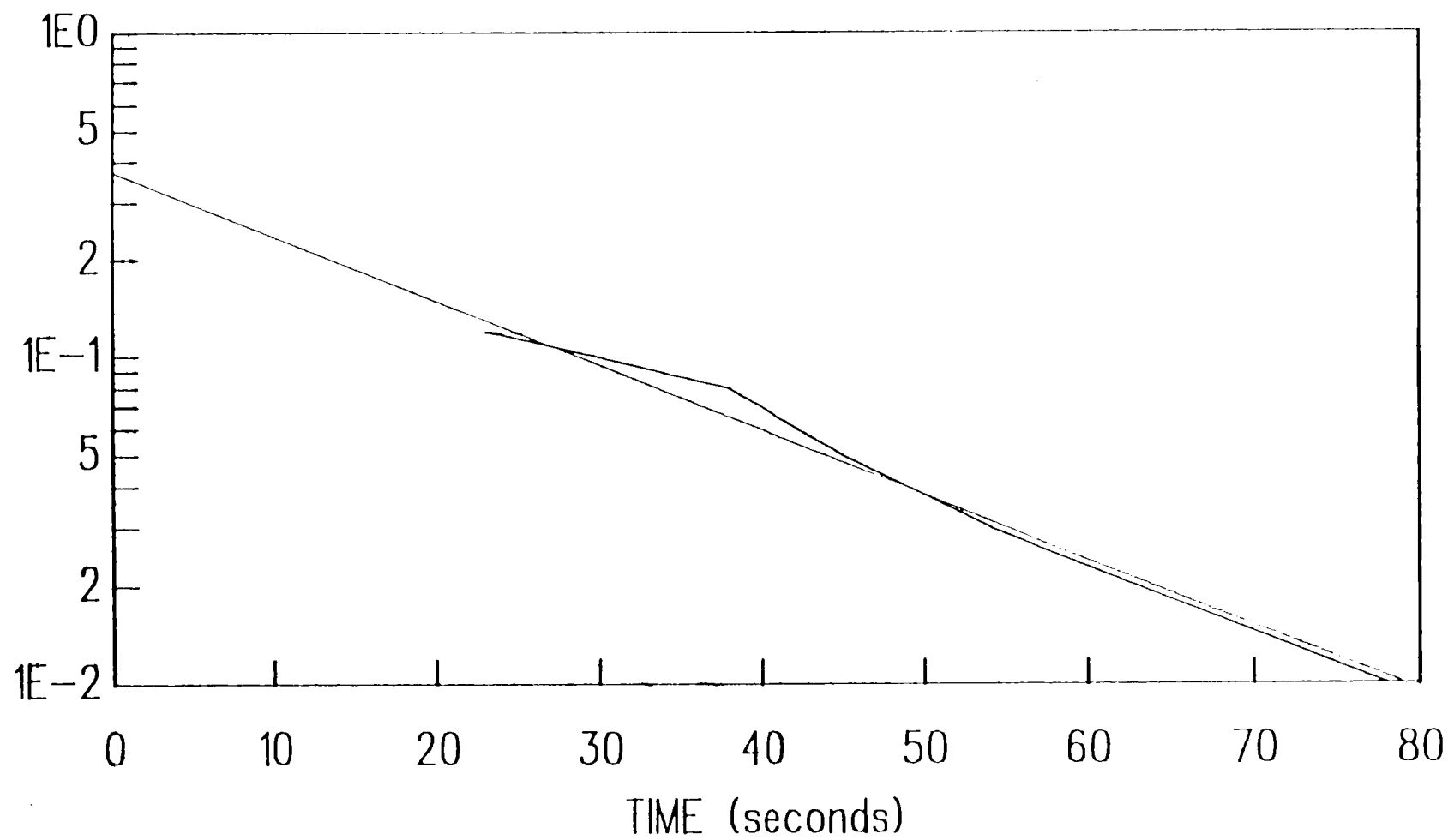
ENV-2 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD(ft)



ENV-2 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD(ft)



SLUGCOMP.WK1            c. S.J. Rossello, March 1986  
                          Modified 12/21/89  
 Project:                ENVIROTEK  
 Project No.:            580.01  
 Well No.:               ENV-1      TEST 1  
 Test Date:              NOVEMBER 20, 1990  
 Formation Tested: OVERBURDEN  
 Rising (R) or Falling (F) Head Test: (R)

		(cm)
Stickup (ft)	0.00	0.00
Static Water Level (ft)	6.95	211.84
Depth to bottom of screen (ft from ground level)	24.50	746.76
Boring Diameter (in)	8.00	20.32
Casing Diameter (in)	2.00	5.08
Screen Diameter (in)	2.00	5.08
Screen Length (ft)	14.30	435.86
Depth to Boundary	35.00	1066.80
Delta H at time 0 (ft)	0.90	27.43
Delta H at Time t (ft)	0.16	4.88
Time t (seconds)	2090	
Ratio Kh/Kv	1	
Porosity of Filter Pack	0.3	

	cm/sec	gpd/ft <sup>2</sup>
K (Bouwer-Rice)	1.6E-05	0.3
K (Hvorslev Time Lag)	2.3E-05	0.5
K (Hvorslev Variable Head)	2.3E-05	0.5

File: ENV-1

NOVEMBER 20, 1990

ENV-1

SLUG TEST DATA REDUCTION

TEST 1

ENVIROTEK

RIISING HEAD TEST

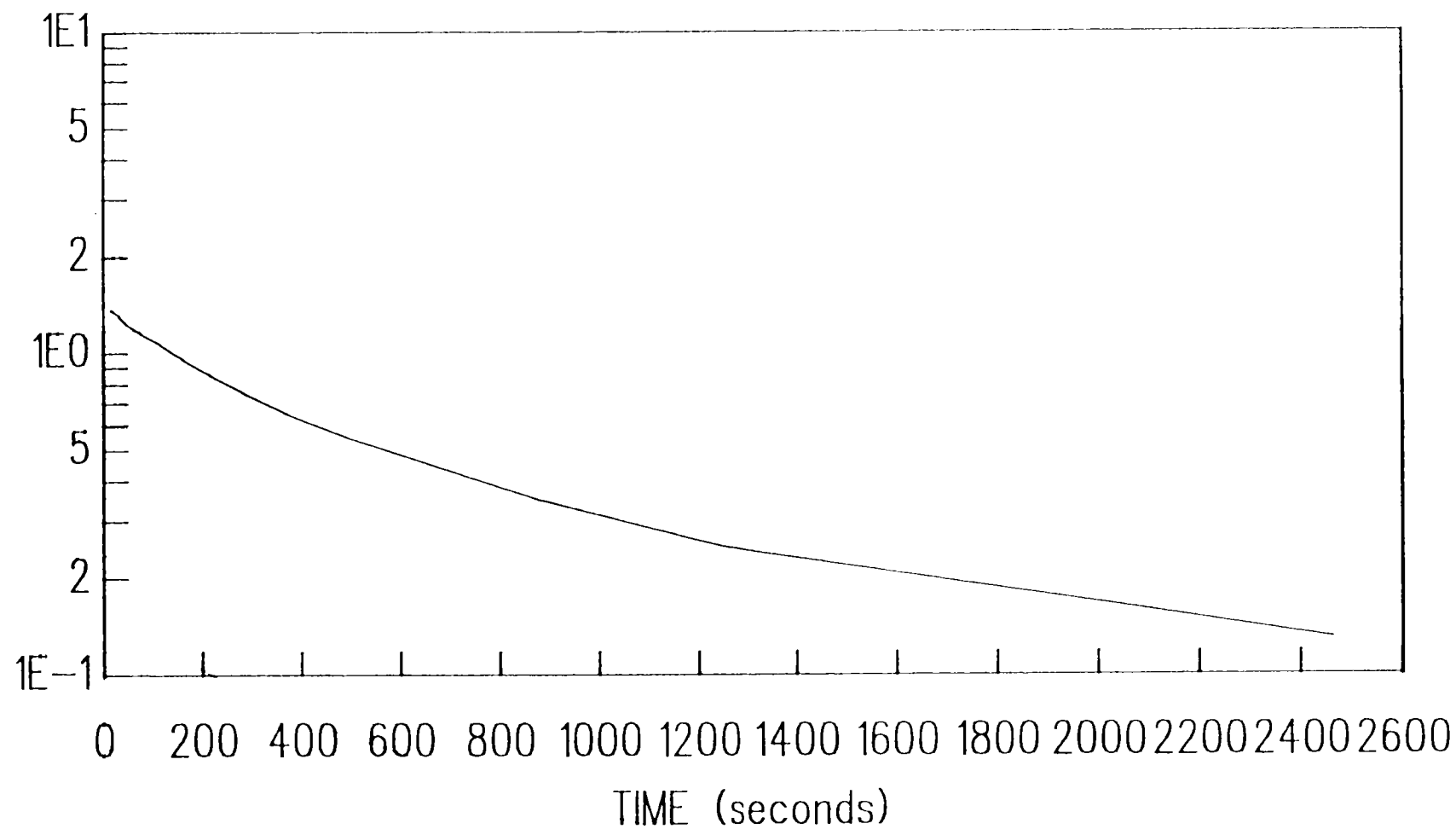
Initial Depth to water (ft): 6.95

Initial Time (seconds): 0.00

Clock Time			Depth to water		Elapsed	Head	Head
HR	MM	Sec	FT	IN	Time in	Change	Change
					Seconds	in feet	in cm.
		0	6.95		0.00	0.00	0.00
		16	8.32		16.00	1.37	41.62
		32	8.26		32.00	1.31	39.80
		45	8.19		45.00	1.24	37.67
1	15		8.10		75.00	1.15	34.94
1	55		8.01		115.00	1.06	32.20
2	42		7.90		162.00	0.95	28.86
3	36		7.80		216.00	0.85	25.82
4	44		7.70		284.00	0.75	22.79
6	8		7.60		368.00	0.65	19.75
8	6		7.50		486.00	0.55	16.71
14	32		7.30		872.00	0.35	10.63
20	45		7.20		1245.00	0.25	7.60
34	50		7.11		2090.00	0.16	4.86
41	3		7.08		2463.00	0.13	3.95

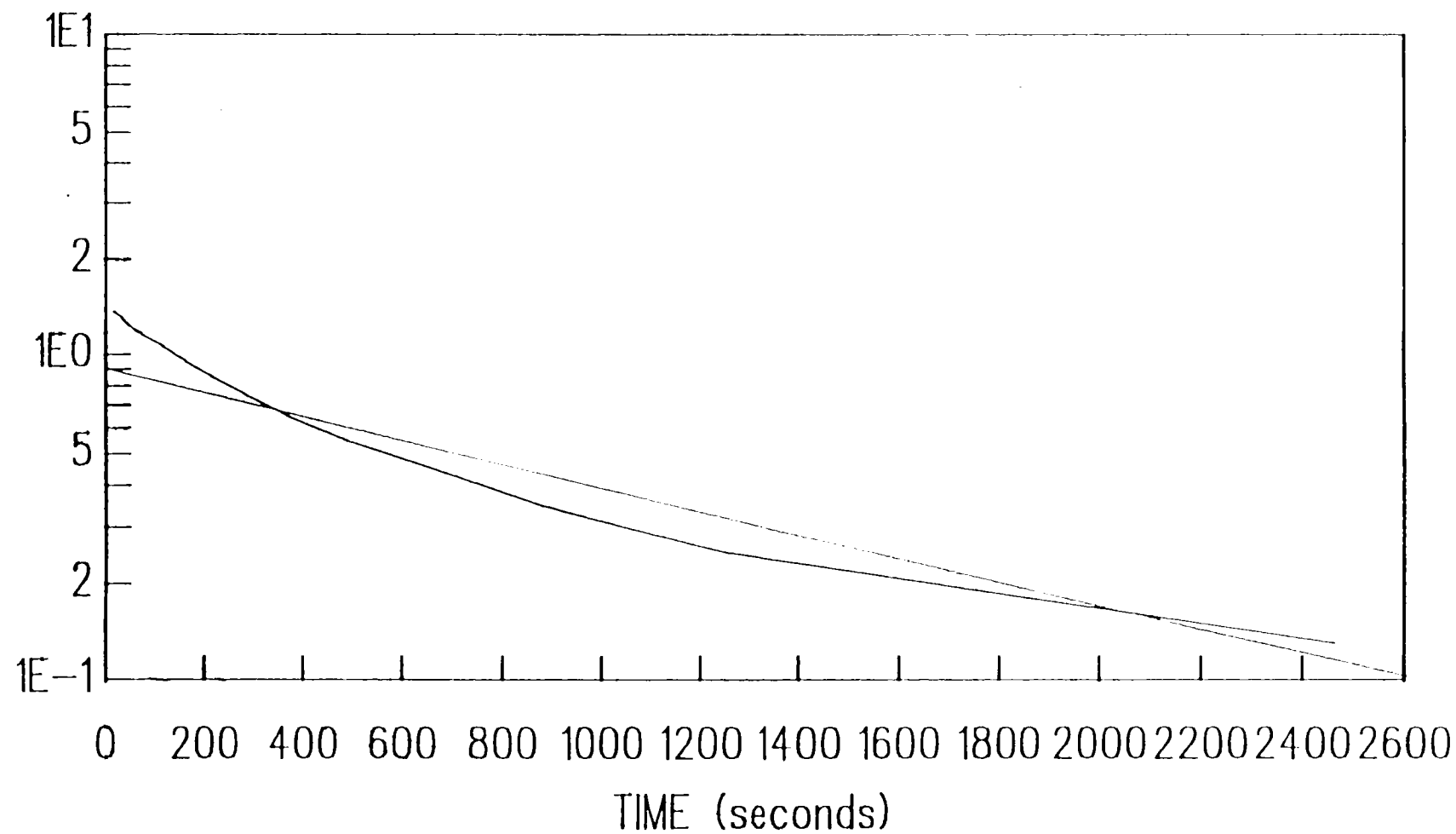
ENV-1 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD(ft)



ENV-1 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD(ft)



SLUGCOMP.WK1      d. S.J. Rossello, March 1986  
 Modified 12/21/89  
 Project:            ENVIROTEK  
 Project No.:        580.01  
 Well No.:           ENV-6      TEST 1  
 Test Date:          NOVEMBER 20, 1990  
 Formation Tested:   OVERBURDEN  
 Rising (R) or Falling (F) Head Test: (R)

		(cm)
Stickup (ft)	3.55	77.72
Static Water Level (ft)	13.29	426.42
Depth to bottom of screen (ft from ground level)	20.60	627.25
Boring Diameter (in)	8.00	20.32
Casing Diameter (in)	2.00	5.08
Screen Diameter (in)	2.00	5.08
Screen Length (ft)	14.50	441.56
Depth to Boundary	35.00	1066.80
Delta H at time 0 (ft)	1.60	48.77
Delta H at Time t (ft)	0.23	7.01
Time t (seconds)	2685	
Ratio Kh/Kv	1	
Porosity of Filter Pack	0.3	

	cm/sec	gpd/ft <sup>2</sup>
K (Bouwer-Rice)	1.0E-04	2.1
K (Hvorslev Time Lag)	2.8E-05	0.6
K (Hvorslev Variable Head)	2.8E-05	0.6

File: ENV-6  
 NOVEMBER 20, 1990  
 SLUG TEST DATA REDUCTION  
 ENVIROTEK  
 RISING HEAD TEST

ENV-6  
 TEST 1

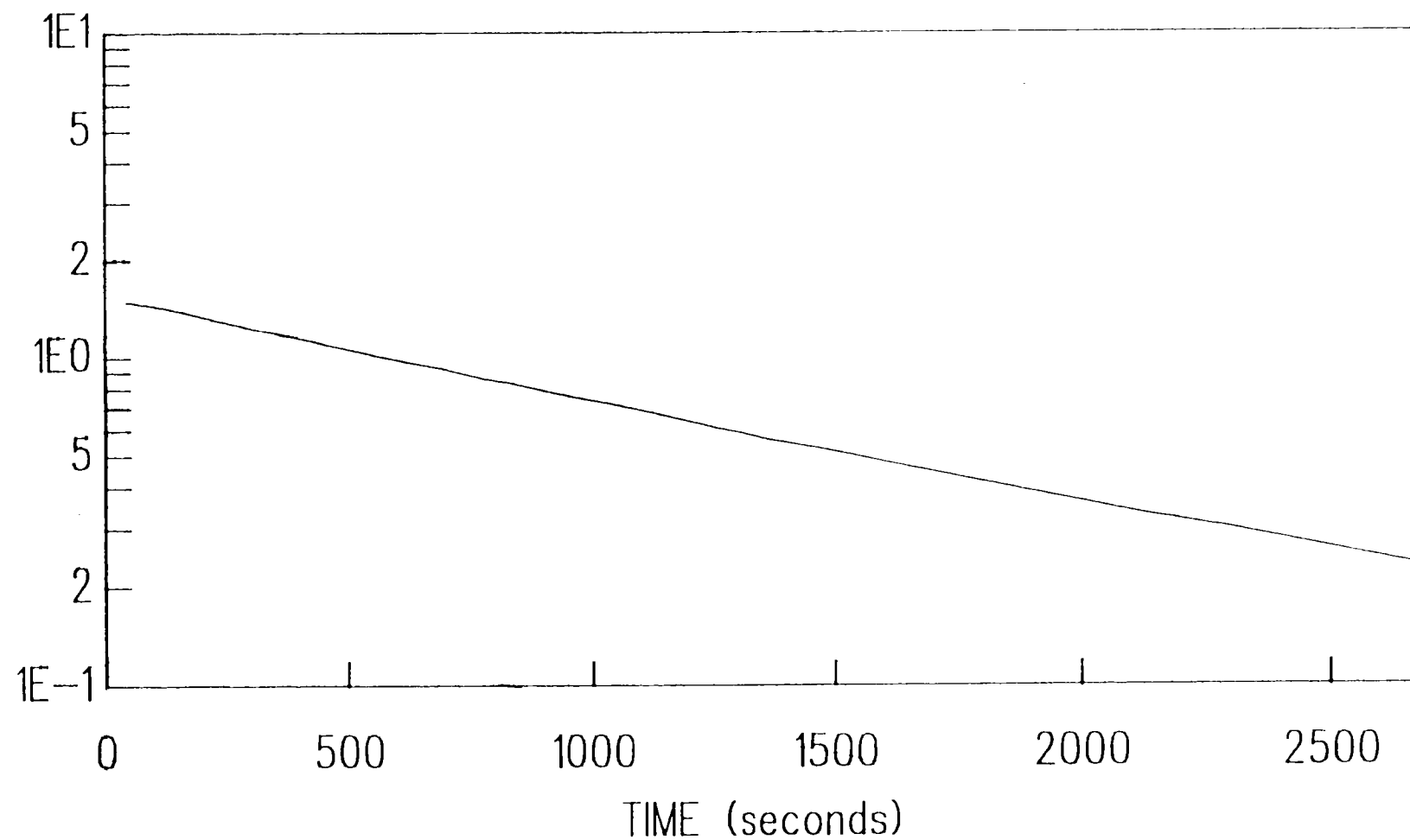
Initial Depth to water (ft): 13.76  
 Initial Time (seconds): 0.00

Clock Time			Depth to water		Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
HR	MN	Sec	FT	IN			
		0	13.76		0.00	0.00	0.00
		44	15.25		44.00	1.49	45.37
1	41		15.20		101.00	1.44	43.75
2	12		15.17		132.00	1.41	42.84
2	41		15.14		161.00	1.38	41.92
3	39		15.07		219.00	1.31	39.80
4	47		15.00		287.00	1.24	37.67
6	2		14.94		363.00	1.18	35.85
7	19		14.87		439.00	1.11	33.72
9	8		14.78		548.00	1.02	30.99
10	16		14.73		616.00	0.97	29.47
11	37		14.68		697.00	0.92	27.95
12	56		14.62		776.00	0.86	26.13
13	57		14.59		837.00	0.83	25.22
15	1		14.55		901.00	0.79	24.00
15	52		14.52		952.00	0.76	23.09
17	38		14.47		1058.00	0.71	21.57
18	57		14.43		1137.00	0.67	20.35
20	52		14.37		1252.00	0.61	18.53
22	45		14.32		1365.00	0.56	17.01
24	45		14.28		1485.00	0.52	15.80
27	30		14.22		1650.00	0.46	13.97
32	8		14.14		1928.00	0.38	11.54
35	34		14.09		2134.00	0.33	10.03
38	22		14.06		2302.00	0.30	9.11
44	45		13.99		2685.00	0.23	6.99



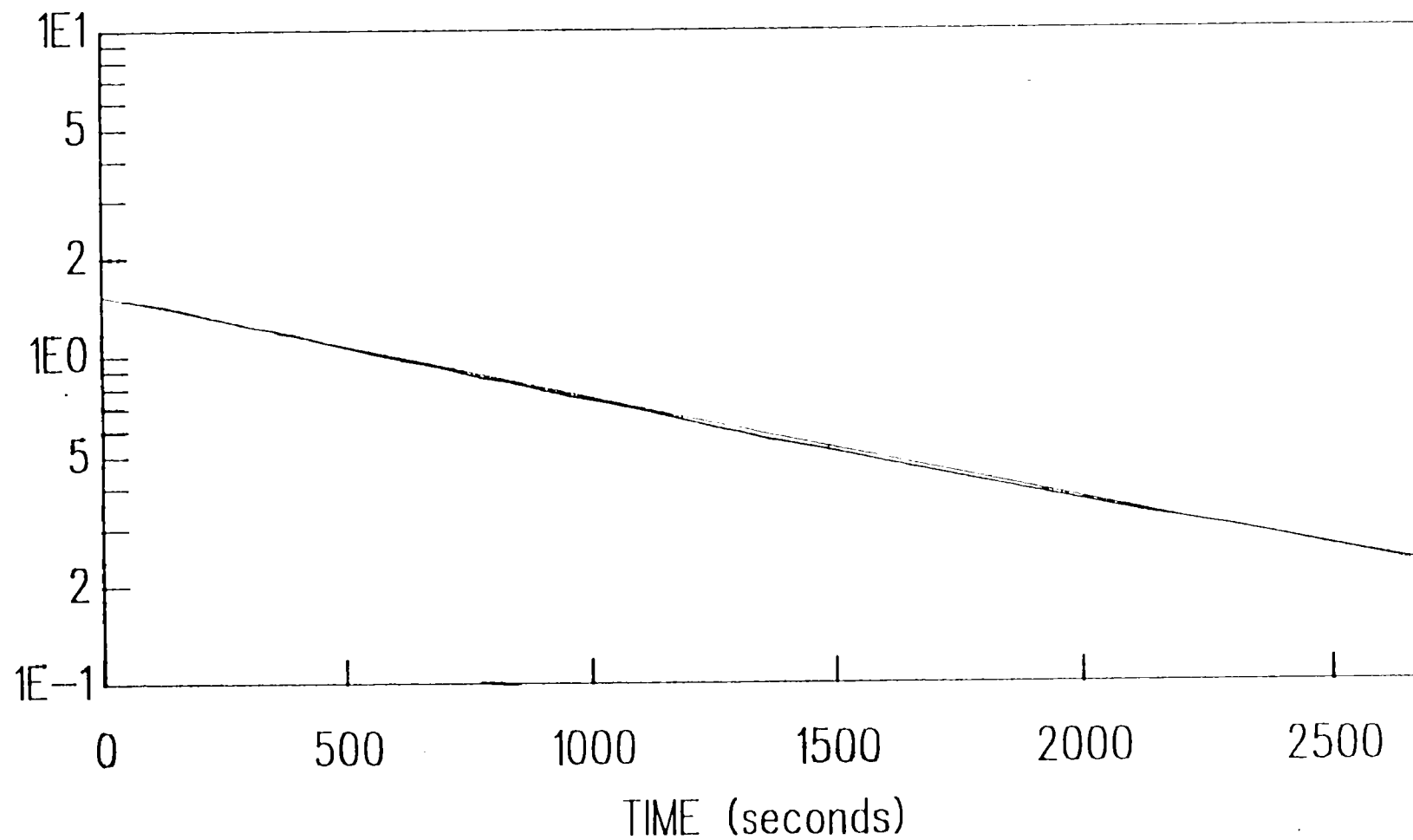
ENV-6 TEST 1  
ENVIROTEK  
RISING HEAD TEST---NOVEMBER 20, 1990

DELTA HEAD(ft)



ENV-6 TEST 1  
ENVIROTEK  
RISING HEAD TEST--NOVEMBER 20, 1990

DELTA HEAD(ft)



APPENDIX D

ANALYTICAL DATA VALIDATION REPORT



February 25, 1991

Mr. William T. McCune  
Blasland & Bouck Engineers, P.C.  
6723 Towpath Road, Box 66  
Syracuse, NY 13214

Re: Data Validation

File: 2887.013.517

Dear Mr. McCune:

Enclosed is the report on the validation of data packages submitted by Blasland & Bouck Engineers, P.C. for work performed by Galson Laboratories. The samples validated were ground waters collected from the Envirotek II Site, Tonawanda, NY.

The review performed by our chemists was in accordance with NYS DEC ASP 1989 Superfund protocols. The data, overall, has minor excursions which should not affect the data useability.

Should you have any questions concerning this data validation, please contact OBG Laboratories.

Very truly yours,

OBG LABORATORIES, INC.

A handwritten signature in dark ink, appearing to read "David R. Hill". The signature is fluid and cursive, written over the typed name.

David R. Hill  
Vice President

DRH/ljw/3:56

Enclosure

February 8, 1991

Blasland, Bouck & Lee/Galson Laboratories

90112012

GC/MS

Volatiles (Waters)

Samples: ENV-1, ENV-2, ENV-3, ENV-4, ENV-5, ENV-6, ENV-7, Equipment Blank, Trip Blank, Hold Blank.

I. Analysis

All samples were analyzed within the 7 days from VTSR NYSDEC ASP 9/89 holding time.

II. Surrogate Recoveries

All surrogate recoveries were within method required QC limits.

III. MS/MSD/MSB

All MS/MSD/MSB recoveries were within required QC limits.

IV. Initial Calibration

All initial calibration criteria were met.

V. Continuing Calibration

All compounds met all continuing calibration QC criteria.

VI. Internal Standard Area Consistency

All internal standard areas met the required QC criteria.

VII. Method Blank

All method blanks meet the required QC criteria.

VIII. Identification of Analytes

All analyte identifications meet the QC criteria.

IX. Instrument Detection Limits

According to NYSDEC ASP Superfund Protocols (B-11, 1.4.1.5) Instrument Detection Limits must be included in the sample data package, Volatiles QC summary section. IDL's were not present in this data package.

X. Miscellaneous

The following observations concern deviations from the method protocol which do not affect the validity of the data presented in this package.

- A. According to NYSDEC ASP 9/89 (B-13 1.4.2.3) the data system report for sample, calibration and blank data should contain the ion used for quantitation. In this package the quantitation ion was only provided on mass spectra of compounds which were detected as positive hits.
- B. According to B-79, the format of the reporting forms must be identical to that shown in the contract unless written approval of the Project Officer is obtained. Several forms (including Form 1) have been altered, however the case narrative did not indicate that these alterations were approved.
- C. When estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, the EPA-defined qualifier "J" should be utilized. Form 1E for ENV-3 contained estimated concentrations of TICS, however no qualifier was reported (See NYSDEC ASP 9/89 B-84).

February 11, 1991

Blasland, Bouck & Lee/Galson Laboratories

90112012

GC/MS

Semi-volatile (Waters)

Samples: ENV-1, ENV-2, ENV-3, ENV-4, ENV-5, ENV-6, ENV-7, Equipment Blank.

I. Analysis

All samples were extracted within the 5 day of VTSR and analyzed within the 40 days of VTSR.

II. Surrogates

All surrogate compounds meet the required QC criteria. 2-Fluorobiphenyl for samples QC1063A-BLNK (123) and QC1063A-B.S.(120) were above the QC limits of 43-116, but were within the acceptable QC criteria.

III. MS/MSD/MSB

The MS/MSD all meet the QC criteria. The % Recovery for 4-Nitrophenol for the MS (82) and MSD (81) were above the QC limits of 10-80, but were within acceptable criteria.

According to NYSDEC ASP 9/89 E-59, the recoveries for all compounds in the MSB shall be 75-125%. The following compounds did not meet this criteria:

<u>MSB QC1063-A</u>	<u>Compound</u>	<u>% Recovery</u>
	Phenol	65
	2-chlorophenol	70
	Acenaphthene	69

The Form 3C did not reflect these excursions. [Samples analyzed during the same 12-hour period include QC1063A-Blank, ENV-1, ENV-2, ENV-3, ENV-4, ENV-4MS, ENV-4MSD, ENV-5.]

IV. Initial Calibration

All QC criteria for the initial calibration were met.

V. Continuing Calibration

All QC criteria for the continuing calibrations meet the QC criteria with the following exceptions:

<u>ID</u>	<u>Calibration Date</u>	<u>Compound</u>	<u>Excursion [QC limit]</u>
>DB543	12/09/90	4,6-Dinitro-2-Methylphenol	29.1%D [25% D]

[Samples analyzed during the same 12-hour period include QC1063-A-Blank. QC 1063-A, B.S., ENV-1, ENV-2, ENV-3, ENV-4, ENV-4MS, ENV-4MSD, ENV-5. This compound was not detected in these analyses].

VI. Internal Standard Area Consistency

All internal standard areas were within QC criteria.

VII. Method Blank

The method blank met the required QC criteria.

VIII. Identification of Analytes

All compound identification met the requirements for qualitative verification [See NYSDEC ASP 9/89 D-III-46] with the following exceptions:

<u>Sample ID</u>	<u>Compound</u>	<u>Excursion</u>
ENV-1	Benzo(a)Anthracene	Ion 228 intensity depressed
ENV-3	Benzo(a)Anthracene	Ion 228 intensity depressed

IX. Instrument Detection Limits

According to NYSDEC ASP 9/89 Superfund Protocols [B-17, 1.5.1.5], Instrument Detection limits should be included in the sample data package Semi-volatiles QC summary section. IDLs were not included in this data package.

X. Miscellaneous

The following observations concern deviations from the method protocol which do not affect the validity of the data presented in this package.

A. According to NYSDEC ASP 9/889 (B-19, 1.5.2.3) the data system report for sample, calibration and blank data should contain the ion used for quanti-



tation. (In this package the quantitation ion was only provided on mass spectra of compounds which were detected as positive hits).

- B. According to B-79, the format of the reporting forms must be identical to that shown in the contract unless written approval of the Project Officer is obtained. Several forms (including Form 1) have been altered, however the case narrative did not indicate that these alternatives were approved.
- C. When estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, the EPA-defined qualifier "J" should be utilized. Several Form 1Es (including ENV1, ENV2, ENV3, ENV4, ENV5, ENV6 and ENV7) contained estimated concentrations of TICS, however no qualifier was reported (see NYSDEC ASP 9/89 B-84).
- D. In several cases (QC1063A-BLNK, ENV1, ENV2 and Equip. Blank) the reported detection limit for benzoic acid was based on 10 ug/L, however the CRQL (contract required quantitation limit) for benzoic acid [NYS DEC ASP 9/89, Exhibit C, C-4] is 50 ug/L.

February 21, 1991

2887-013-517

Blasland & Bouck Engineers/Galson Technical Services

Pesticide/PCB Analysis

Samples: ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, EQP BLK

### Compliance

1) Holding Times

All analyses were conducted within the contract specified holding times.

2) Method Blank Analysis

There were no compounds above the detection limit in the method blanks.

3) Matrix Spike/Matrix Spike Duplicate

The following were outside of control limits:

MS % Recoveries

Compound	% Recovery	Control Limits
Lindane	44	56-123
Dieldrin	46	52-126
Endrin	43	56-121

MSD % Recoveries

Compound	% Recovery	Control Limits
Lindane	39	56-123
Dieldrin	38	52-126
Endrin	40	56-121

RPD's

Compound	RPD	Control Limits
Dieldrin	20	18

4) Surrogate Recoveries

All surrogate recoveries were within control limits.

5) Pesticide Evaluation Standards Summary

4,4'-DDT had a %RSD greater than 10.0% on the primary analysis run. Also on that run, as stated in the data package, Endrin % Breakdown could not be calculated due to coelution of Endrin Ketone and DBC. Endrin Ketone and 4,4'-DDT were quantitated using the confirmation run.

6) Pesticide/PCB Standards Summary

The following conditions apply:

- a) On 12/09/90 at 03:46 on HP#2, Endrin %D > 15.0%.
  - b) On 12/09/90 at 07:07 on HP#2, Endrin %D > 15.0%.
  - c) On 12/10/90 at 17:30 on HP#2, Endrin %D > 15.0%.
- Endrin was not quantitated off of this run.

February 21, 1991

2887-013-517

Blasland & Bouck Engineers/Galson Technical Services

Inorganics Analysis

Samples: ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, EQP BLK - Total  
Metals, Dissolved Metals, Cyanide

### Compliance

- 1) Inorganic Analysis Data Sheet  
All data was contract compliant.
- 2) Initial and Continuing Calibration Verification  
The following ICV's and CCV's were close to the control limits:  
Selenium ICV - 89.5%  
Aluminum CCV4 - 110.4%  
Aluminum CCV6 - 110.2%  
Lead CCV9 - 110.5%  
Arsenic CCV10 - 89.8%
- 3) Initial and Continuing Calibration Blanks  
All data was contract compliant.
- 4) Interference Check Sample  
All data was contract compliant.
- 5) Matrix Spike  
For total metals, the spike recovery was out for the following compounds:  
Arsenic - 73.5%  
Lead - -14.0%  
Selenium - 74.0%  
Thallium - 65.4%  
Antimony - 52.3%  
Cyanide - 61.2%  
Lead was not flagged with an "N" on Form 5.  
For dissolved metals, the spike recovery was out for the following compounds:  
Thallium - 51.8%
- 6) Duplicates  
The RPDs for the duplicate sample for total metals was out for the following compounds:  
Copper  
The RPDs for the duplicate sample for dissolved metals was in control limits for all compounds.
- 7) Laboratory Control Sample  
As stated in the Case Narrative, and LCS was not available and a blank spike was used instead.
- 8) MSAs

The correlation coefficient was less than 0.995 two times for the following samples:

ENV3 - Total Selenium

ENV5 - Total Selenium

9) Serial Dilution

All serial dilution results were within control limits.

10) Comments

There appears to be a lot of instability with the ICP (several resloppings and rerunning of CCV's).

There seems to be a lot of problems with the printers connected to the instruments. All of the printer malfunctions made the data difficult to get through.

APPENDIX E

LABORATORY ANALYTICAL REPORTS  
(SUBMITTAL UNDER SEPARATE COVER)

RECEIVED

DEC 27 1991

ENVIRONMENTAL  
NYS DEPT OF CONSERVATION  
REGION 9

RECEIVED

DEC 27 1991

N.Y.S. DEPT. OF  
ENVIRONMENTAL CONSERVATION  
REGION 1