

907015

REPORT

Remedial Investigation

**Former Essex Specialty Products, Inc.
Jamestown, New York**

October 1992



O'BRIEN & GERE
ENGINEERS, INC.

REPORT

**REMEDIAL INVESTIGATION
FORMER ESSEX SPECIALTY PRODUCTS, INC.
JAMESTOWN, NEW YORK**

OCTOBER, 1992

**O'BRIEN & GERE ENGINEERS, INC.
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SECTION 1 - INTRODUCTION

1.01 Introduction

This report presents the results of a Remedial Investigation (RI) conducted by O'Brien & Gere Engineers, Inc. at the former Essex Specialty Products, Inc. facility located on 125 Blackstone Avenue in Jamestown, NY as shown on Figure 1. Previous investigations performed by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) and others (ERM-Midwest Inc., May 1989 and June 1989) have found portions of the site to contain residual chemical compounds related to past uses of the site. Based on the results of these activities and pursuant to the Consent Order between the New York State Department of Environmental Conservation (NYSDEC) and Essex Specialty Products, Inc. dated October 1991, the NYSDEC has directed that a Remedial Investigation/Feasibility Study (RI/FS) of the site be performed. This report presents the results of the RI conducted in accordance with the NYSDEC-approved RI/FS Work Plan dated November 1991.

1.02 Project Background and Previous Studies

1.02.1 Site Description and Location

The former Essex Specialty Products, Inc. Facility (currently owned and operated by Lilly Jamestown, Inc.), henceforth referred to as "the site", occupies about 4.7 acres in Jamestown, New York. As shown on Figure 1, the site is located in an area which is described by the New York State Department of Health as zoned for industrial. The site is bordered to the south by Blackstone Avenue. Located on the south side of Blackstone Avenue are

neighboring industries: Jamestown Metal Corp., Jamestown Pipe and Supply, and Emerson Glass Corp. Hope's Architectural Products, Inc. (Hope's) is located to the northwest of the site. The Chadakoin River is located 800 feet to the north of the site.

Physical characteristics of the site include the presence of a number of brick and concrete block buildings and aboveground tanks. An access road which is a former railroad right-of-way, reportedly used by large vehicles for deliveries, passes through the center of the site. Approximately 36% of the total ground cover is comprised of asphalt pavement; including parking lots and roads; and cement foundations. The rest of the site is covered by medium sized gravel or grass. Access to the site is only partially restricted by a fence.

1.02.2 Site History and Usage

Essex Specialty Products, Inc. had operated the manufacturing operations at the site from about 1982 to 1989, at which time the manufacturing operations were sold to Lilly Jamestown, Inc. In 1985, Essex Specialty Products, Inc. purchased the north parking lot area and building (Plant 5) from Hope's who had previously used that land for various different operational activities (Refer to Figure 1).

The former Essex Specialty Products, Inc. and its various predecessors were principally involved in the production of surface coatings. Naphtha-type, non-chlorinated hydrocarbon solvents were utilized in the manufacturing processes. Based on information contained in the ERM Site Assessment

Report, the more common chemicals used in the production processes consisted of toluol, xylol and similar type chemicals.

Prior to 1984, heating fuel oil was stored in an underground tank, located in the southwest part of the site in the former above ground storage tank area. In 1986, this underground tank was closed and filled with cement. The above ground storage tank area was installed, as shown on Figure 2, to store materials used during production, but was removed from operation in 1986. Currently, an above ground tank farm (diked on all sides) used for storage of production materials, exists in the northeast part of the site, as shown on Figure 2.

Lilly Jamestown, Inc. currently operates an active paint formulation facility on the site.

1.02.3 Past Investigations

ERM performed a site assessment in 1988 of the former Essex Specialty Products, Inc. facility as a part of the 1989 real estate transaction between Lilly Jamestown, Inc. and Essex Specialty Products, Inc. This assessment is summarized in a document entitled Site Investigation at Essex Specialty Products, Inc.¹ (dated May 1989).

The site assessment was completed in two phases. The first phase consisted of a soil boring program and monitoring of ground water via installation, sampling, and analysis of the monitoring wells. The second phase

¹ *Site Investigation at Essex Specialty Products, Inc.*, ERM-Midwest, Inc. May 2, 1989.

of the program included the installation of additional monitoring wells and additional ground water sampling of the existing wells.

During the first phase of the investigation, ERM advanced ten soil borings and three ground water monitoring wells on the site from April 14 to April 19, 1989. A total of four ground water samples (from three wells) and 11 soil samples were submitted for laboratory analysis. Analytical results of these ground water samples detected the presence of various compounds including toluene, ethylbenzene, trichloroethene, t-1,2-dichloroethene, vinyl chloride, and the plasticizer bis (2-ethylhexyl) adipate.

Three surface soil samples were obtained and analyzed for chemical residues. The sampling locations were pre-selected by ERM based on visually identified areas. Surface soil sample 1 was located in the area of the existing tank farm. Analysis of this sample indicated the presence of toluene, ethylbenzene, bis (2-ethylhexyl)phthalate, and di-n-octyl phthalate. The presence of these compounds was thought to be representative of a plasticizer spill². Analysis of surface soil sample 2, taken from near an abandoned coal pit (associated with the Erie Railroad) and a utility pole, and former boiler house and coal silo operated by Hope's, exhibited petroleum distillate residues including naphthalene (21 ppm), pyrene (300 ppm) and anthracene (61 ppm). These compounds are characteristic of coal pile leachate. Surface soil sample 3 was collected in the area of a suspected PCB transformer. This soil sample was analyzed and exhibited low levels (4.2 ppm) of polychlorinated biphenyls.

² ERM-Midwest, Inc. May 2, 1989.

This level is below the New York State regulatory threshold PCB concentration limit for classification as a PCB.

The second phase of the ERM Investigation of the site verified and supplemented the data generated during the first phase of the investigation. Two additional wells were installed during this phase of work and a second round of sampling (May 24, 1989) was completed. The sampling program included analysis of samples from all of the site wells and confirmed the presence of organic residues in site ground water. Volatile organic compounds detected during the ERM investigations consisted of benzene (0.440 ppm), 1,1-dichloroethane (0.330 ppm), ethylbenzene (2.8 ppm), tetrachloroethene (0.480 ppm), 1,1,1-trichloroethane (0.06 ppm), trichloroethene (1,540 ppm), vinyl chloride (2.5 ppm), and toluene (113 ppm).

The results of the investigation identified four areas of the site requiring further study. These areas are identified on Figure 2, and included the following:

- 1) Former aboveground storage tank (AST) area;
- 2) Previously closed underground storage tank (UST) area;
- 3) North parking lot sump area (MW-3); and
- 4) Stained soils area.

These areas were further investigated in 1989 and 1990 to further define the extent of site residues. These investigation efforts consisted of the following activities as presented in the Draft RI/FS Report prepared by O'Brien & Gere Engineers, Inc. (dated December 1990).

1. A soil vapor survey in the vicinity of the north parking lot sump area and former aboveground storage tank areas;
2. Installation of seventeen soil borings on-site with analysis of two samples from each boring for VOCs;
3. Installation of nine ground water¹² monitoring wells and two piezometers on-site in the vicinity of MW-3 to assess the downgradient and vertical extent of VOCs and assess ground water flow direction;
4. A test excavation between the north parking lot sump area and MW-3 to evaluate the potential for the sump to provide for the past introduction of VOCs into on-site ground water;
5. A review of historical aerial photographs of the site to identify past operational activities which may be associated with the VOCs exhibited in the ground water;
6. Completion of test excavations near the previously closed underground storage tanks located in the eastern section of the property as shown on Figure 2. Soil samples were collected from the excavations for analysis to evaluate the potential impact of any tank contents to the soil and ground water;
7. Collection of surface soil samples from the stained soils area (Refer to Figure 2); and
8. Completion of the NYSDEC Hazard Ranking System at the site.

The results of these investigation efforts are presented in this RI Report, which supplements the draft RI/FS Report dated December 1990.

1.03 Purpose and Scope

Previous investigations of the site by ERM identified VOC-impacted ground water. While the presence of VOCs at the site had been detected, their source and extent had not been defined. The purpose of this RI was to further characterize the distribution of VOCs in the ground water and provide field data to enable an evaluation of potential remedial options. In order to accomplish this purpose, the RI was initiated in accordance with the NYSDEC-approved RI/FS Work Plan dated November 1991 which included the following scope of work:

1. Installation of three additional ground water monitoring well nests (one shallow well and one deep well) off-site on the Hope's property, and one deep ground water monitoring well on-site to assess the downgradient and vertical extent of VOCs associated with ground water at the site. Installation of one ground water monitoring well upgradient from the site on the north side of Blackstone Avenue to characterize background water quality.
2. Sampling and analysis of existing and newly installed ground water monitoring wells for Target Compound List parameters in accordance with the Quality Assurance Project Plan (QAPP), contained as an appendix within the November 1991 RI/FS Work Plan. This task also included validation of the monitoring well data utilizing a NYSDEC certified validator.
3. Performance of *in situ* hydraulic conductivity (K) tests on all monitoring wells to assist in the evaluation of site hydrogeologic conditions.

4. Review of available historical aerial photographs of the site to identify past site operational activities which may be associated with the presence of VOCs in ground water.
5. Performance of a qualitative and quantitative risk assessment.
6. Conductance of a Phase I Habitat Based Ecological Assessment at the site.
7. Evaluation of subsurface structures and utility bedding within areas of site contamination to assess the potential for off-site migration of site contaminants through these materials.
8. Redevelopment, resampling and analysis of monitoring wells MW-4, MW-7DD, MW-13, MW-14S, MW-15D, MW-7D, MW-14D, and MW-15S for VOCs by EPA Method 8240.
9. Completion of soil gas surveys in the vicinity of MW-2 and the off-site area north of Hopkins Avenue on Hope's property to further investigate the potential for an additional source of VOCs and to investigate the downgradient extent of VOCs within the ground water.
10. Installation of an additional monitoring well within the railroad right-of-way and sampling and analysis for VOCs to assess the extent of any VOCs within the ground water adjacent to the former AST Area.

As part of the RI for the site, Interim Remedial Measures (IRM) were identified for the previously closed UST Area and the stained soils area. In addition, an IRM was proposed to investigate and remediate the north parking lot sump area. This RI report incorporates the results of the additional field efforts and presents the status of those IRM efforts completed or proposed for the site.

1.04 Report Organization

This Report is divided into eight sections and includes tables, figures, and appendices (separately bound). A brief overview of these sections follows:

Section 1 provides the purpose and scope of the investigation, property use, and previous investigations conducted.

Section 2 presents a detailed description of the study area investigations completed during the RI. Field techniques used to collect the data including a summary of the methods used to complete the test borings, ground water monitoring wells, and soil vapor surveys are also described.

Section 3 provides a discussion of the physical characteristics of the study area. More specifically, descriptions of the area, meteorology, land use, surface features, soils, surface water, geology, hydrogeology, and results of an aquifer performance test conducted on-site are provided.

Section 4 presents the results of the chemical analyses completed during the RI to assess the nature and extent of contamination in on-site soil, ground water, sediment and surface water as it relates to site residuals. The results and status of the IRMs proposed or completed for the site are also discussed in this section.

Section 5 presents an ecological assessment which includes topographic and covertype maps of the site and areas surrounding the site, and a description of the fish and wildlife resources around the site.

Section 6 presents a qualitative and quantitative risk assessment. This includes an evaluation of compounds present on the site, the related exposure pathways and the potential endangerment to human health and the environment

associated with each complete exposure pathway, according to U.S. EPA methodology.

Section 7 presents the NYSDEC Hazard Ranking System for the site using the MITRE system.

Section 8 presents a summary of the RI and conclusions. This includes the field efforts conducted at the site, findings and conclusions as related to the data validation and recommended remedial action objectives.

The Report is structured in accordance with New York State TAGM HWR-89-4025 (March 31, 1989) which presents Guidelines for Remedial Investigations/Feasibility Studies, and with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. Environmental Protection Agency, Interim Final, October, 1988), and Part 300.68 of the National Contingency Plan, CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

SECTION 2 - STUDY AREA INVESTIGATIONS

2.01 Introduction

As presented in Section 1, a series of investigations was performed on the site prior to the establishment of a Consent Order for the conductance of an RI/FS at this site. The Consent Order and associated Work Plan identified additional investigative efforts. The focus of this section of the report is to present the results of these additional analytical characterizations of the site consistent with the NYSDEC-approved RI/FS Work Plan dated November 1991. Where applicable, discussions of the results takes into consideration and incorporates the previous work efforts performed on the site.

2.02 Topographic Survey

A topographic and boundary survey was performed at the site using a licensed land surveyor. As part of the survey, all existing and new ground water monitoring wells associated with the RI were surveyed for location and elevation using conventional instrument survey techniques. The elevation of the ground surface, top of protective casing, and top of well casing were measured to the nearest 0.01 foot for the monitoring wells and tied to a USGS Benchmark. Ground surface and well casing elevations are presented in Table 1.

2.03 Soil Vapor Study

Soil vapor surveys were conducted at the site on the dates of July 24-27, 1989, August 14-16, 1989, May 13, 1992, and July 7-9, 1992. Implementation of the soil

vapor survey involved the collection and in-field gas chromatographic (GC) analysis of vapor samples from subsurface soils. Low molecular weight volatile organic compounds tend to partition into the vapor phase from associated soils and ground water. Sampling and analysis of this soil vapor therefore provides a qualitative indication of the nature, magnitude, and extent of potential volatile organic contamination.

The objective of the soil vapor survey was to evaluate the nature, magnitude, and distribution of VOCs within the vapor phase associated with potentially contaminated soils and ground water at both on-site and off-site areas. The soil vapor survey was also utilized to screen the site to identify the need, and location, if appropriate, of additional monitoring wells. Based on previous ground water sampling and analyses conducted by ERM (Phase II Site Investigation at Essex Specialty Products, Inc., June 1989) and subsequent investigations by O'Brien & Gere, the on-site areas of concern were identified in the vicinity of MW-2 and MW-3, and off-site areas include the following:

1. North of the previously closed USTs;
2. The right-of-way; and
3. The area north of Hopkins Avenue on the Hope's property.

Sample Locations

Fifty-one (51) soil vapor samples were collected on-site in July and August 1989, and 49 soil vapor samples were collected off-site during May and July 1992. A plot illustrating the various sample locations from the soil vapor study is provided as Figure 3. In-field analysis of samples from these areas allowed for the establishment of a chromatographic "fingerprint" characteristic of each area. The chromato-

graphic fingerprint is described as the output from the gas chromatograph that exhibits peaks and valleys representing relative concentrations of VOC species in a characteristic pattern. For example, in the vicinity of the parking lot sump, a simple chromatographic pattern, or "fingerprint", consisting of trichloroethylene and its degradation products t-1,2-dichloroethene. Also, 1,1,1-trichloroethane and its degradation products 1,1-dichloroethane, 1,2-dichloroethane were observed. The chlorinated "fingerprint", in most cases, contained five peaks corresponding to these five compounds. Conversely, in the vicinity of MW-2, a complex chromatographic "fingerprint" characteristic of a petroleum hydrocarbon residue was observed. The petroleum hydrocarbon "fingerprint" was characterized by several early eluting peaks followed by benzene, toluene, ethylbenzene, and m-and-xylenes. Subsequent sampling proceeded outward from these areas to delineate both the on-site and off-site areal extent of VOCs associated with each of these areas.

Sample Collection

Samples were collected by aluminum sample points installed to a depth of three to six feet below grade, using a stainless steel slide hammer. A peristaltic pump was connected to a teflon vapor probe by a six-inch length of tygon tubing to draw the soil vapor from depth up through the teflon probe assembly and into a tedlar sample bag. A precise aliquot of vapor sample was drawn from the tedlar bag by a gastight, graduated 100 μ l syringe and injected into the gas chromatograph (GC).

Sample Analysis

Analysis of samples and standards was accomplished on a Photovac 10S-series gas chromatograph (GC) equipped with a CPSIL-5 capillary column and a 10.6 Ev photoionization detector (PID). The analysis is effected via injection of a precise aliquot of vapor sample into the GC. Qualitative identification of sample components is achieved via comparison of sample chromatographic behavior (retention time) to that of known standards. Quantification of sample components is achieved by comparison of sample chromatographic response (peak area) to response for the corresponding standard. Sample components which exhibit chromatographic behavior inconsistent with that of field calibration standards (dissimilar retention time) are identified as unknown. Such compounds are quantified via comparison to the average instrument response for the known calibration standards. In some cases, a chromatographic "fingerprint" may be identified which, although containing a complex mixture of unknown constituents, exhibits a characteristic behavior typical of petroleum hydrocarbon residues. Quantification of such samples is achieved by comparison of total instrument response (the sum of all peak areas detected in the GC scan) to the average response for known calibration standards.

GC Calibration

Calibration of the GC was conducted in-field, using standards of benzene, toluene, xylene, and trichloroethylene (TCE). The benzene, toluene, and xylene standard was obtained in gaseous form from Scott Specialty Gasses, Inc. TCE standards were prepared in-field from pure solvent. Calibration was achieved via analysis of five levels of calibration standards for each of the soil vapor indicator parameters throughout the course of the investigation. For purposes of sample

quantification, as discussed above, a least squares regression was performed on the calibration data. Results of the regression analysis indicated that consistent response was achieved throughout the course of the investigation (r^2 for each indicator parameter was >0.9).

Results of the soil vapor analyses are presented in Table 2, and are discussed in Section 4.01.

2.04 Meteorological Investigations

The Chautauqua Airport, Jamestown Public Works Department, National Climate Center and National Oceanic and Atmospheric Administration were contacted to obtain information for meteorological investigations.

Results of the investigation are provided in Section 3.01.

2.05 Human Populations Surveys

The Jamestown Chamber of Commerce was contacted for population information. Based on verbal communications with the Chamber of Commerce, the population of Jamestown is approximately 35,700.

2.06 Geological Investigation

2.06.1 Test Boring Installations and Soil Sampling

Based on the results of the soil vapor survey, a soil boring program was initiated to assess the extent of VOCs in the unsaturated zone of the soils. A total of 17 soil borings were installed at the locations illustrated on Figure 4 using hollow stem auger drilling methods. Soil samples were collected

continuously throughout the entire depth of the borings to evaluate the vertical and horizontal extent of VOCs in the soils. A representative portion of each sample was placed into an appropriate sample container and screened with a photoionization detector (PID) to assess the relative amounts of total volatile organic vapors. Two samples from each boring that exhibited the highest PID readings were submitted to OBG Laboratories in Syracuse, New York for VOC analysis using EPA Method 8010/8020. Chain of custody forms were completed and accompanied the sample shipments to the laboratory. An O'Brien and Gere hydrogeologist supervised the installation of each soil boring, and prepared a descriptive log based on the soil samples. Table 3 presents the results of the soil boring analyses. These results are also illustrated on Figure 4 and are discussed in Section 4.02. Boring logs and soil boring procedures are included in Appendices A and B, respectively.

2.06.2 Monitoring Well and Piezometer Installation

A total of 22 ground water monitoring wells and two piezometers have been installed on behalf of Essex Specialty Products at the site to date. Five ground water monitoring wells, designated MW-1 through MW-5, were installed in April 1989 under the supervision of ERM. Nine ground water monitoring wells, designated MW-6 through MW-12 (except MW-7DD), and two piezometers, designated P-1 and P-2, were installed by Parratt-Wolff, Inc. under the supervision of O'Brien and Gere in August 1989 and February 1990 in accordance with the protocols presented in Appendix D. Monitoring well MW-9 was installed as a temporary well and was removed at the request of

Essex Specialty Products, Inc., following the collection of ground water samples. The well was removed since long-term usage of the well as a ground water monitoring well was not necessary due to the presence of other monitoring wells in the vicinity of MW-9. Eight additional ground water monitoring wells, designated as MW-7DD and MW-13 through MW-16D, were installed by Parratt-Wolff, Inc. under the supervision of O'Brien and Gere in January and February 1992 in accordance with the QAPP. The location of the ground water monitoring wells and piezometers are illustrated on Figure 5.

The ground water monitoring wells were installed at three different depth ranges designated as shallow, intermediate, and deep, based on the well depth. The shallow ground water monitoring wells include MW-1 through MW-7S, MW-10, MW-11S, MW-12, MW-13, MW-14S, MW-15S, and MW-16S and were installed at depths ranging from approximately 13 to 23 feet. Intermediate ground water monitoring wells include MW-7D, MW-8, MW-11D, MW-14D, MW-15D, and MW-16D and were installed at depths ranging from 45 to 50 feet. One deep ground water monitoring well, MW-7DD, was installed at a depth of approximately 100 feet.

The monitoring wells were constructed using a 5- to 10-foot section of 2-inch diameter, 0.010-inch to 0.020-inch slotted, PVC well screen attached to an appropriate length of 2-inch diameter PVC riser casing. The well construction details and ground water elevation data for the ground water monitoring wells are summarized on Table 1. Test well geologic logs and well construction diagrams for the ground water monitoring wells are included in

Appendix C. The installation procedures for MW-1 through MW-12, excluding MW-7DD, are included in Appendix D. Monitoring wells MW-7DD and MW-13 through MW-16D were installed in accordance with the Quality Assurance Project Plan (QAPP) included as Appendix A in the RI/FS Work Plan (O'Brien & Gere, 1991). Following installation, the ground water monitoring wells were developed in accordance with the QAPP to remove the fine grained material in the well and to allow representative ground water elevations and samples to be collected.

As part of a supplemental investigation performed by Hope's on the site, GZA Geoenvironmental, Inc. directed Buffalo Drilling, Inc. in the installation of seven additional ground water monitoring wells in March and April 1992. The work by GZA conducted on behalf of Hope's was not a component of the Consent Order or RI/FS and, therefore, is not included in this report. An O'Brien and Gere hydrogeologist was on site to observe the monitoring well installation and prepare boring logs for Essex Specialty Products, Inc. The monitoring wells installed were designated by GZA Environmental as HW-4 through HW-10 at the locations illustrated on Figure 5. Geologic logs prepared by the on-site O'Brien and Gere hydrogeologist for these wells are included in Appendix C.

2.06.3 Test Well Installation and Aquifer Performance Test

One test well (RW-1), as shown on Figure 5, was installed in February 1991 under the supervision of an O'Brien and Gere hydrogeologist in accordance with the well installation protocols provided in Appendix D. The

test well was constructed of a 15-foot section of 8-inch diameter stainless steel, continuous wire wound, 0.020-inch slot well screen set at 47 feet to 32 feet below the ground surface. As part of well installation, soil samples were collected at 5-foot intervals from the ground surface to the bottom of the well. The boring log is included in Appendix C.

Following installation and development, a 24-hour aquifer performance test (pump test) was conducted on February 12 and 13, 1991 to assess hydrogeologic characteristics of the aquifer. A submersible pump was placed at the bottom of the test well such that the pump intake was 2 feet below the bottom of the well screen. The pump was throttled to provide a flow rate of approximately 2 gallons per minute (gpm) for the duration of the pump test. The flow rate was checked periodically during the test. Drawdown values were measured in the test well and selected monitoring wells periodically during the test. Aquifer performance test data and the results of the test are included in Appendix E.

2.06.4 In situ Hydraulic Conductivity Tests

In situ hydraulic conductivity tests (K-tests), were performed on the ground water monitoring wells to evaluate the hydraulic conductivity of the aquifer material in which the wells were screened. The K-tests were performed by removing a volume of water from the well, thereby lowering the hydraulic head (rising head test) in the well. Water elevations were recorded at timed intervals as the water from the surrounding aquifer material flowed into the monitoring well until the water elevation in the well returned to near

static conditions. The recorded measurements of the water recovery rate in the monitoring well are a function of the hydraulic conductivity of the aquifer material in the vicinity of the monitoring well. The collected data was interpreted using either the Hvorslev's method or the Bower and Rice method to provide a numerical estimate of the hydraulic conductivity. The estimated hydraulic conductivities are summarized on Table 1, and the field test data are included in Appendix F.

2.07 Ground Water Sampling and Analysis

Ground water samples were collected from MW-1 through MW-12, on August 24, 1989 and January 29, 1990. The ground water sampling procedures for these sampling events are included in Appendix G. These ground water samples were submitted to OBG Laboratories for VOCs analysis using EPA method 601/602. Monitoring wells MW-4 and MW-5 were not sampled during the January 1990 sampling round due to the presence of ice and sediment frozen within the well caps which prevented access for sampling.

An equipment field blank, a trip blank, and a duplicate sample were collected to evaluate the sampling and analytical techniques.

Following the installation of MW-7DD, and MW-13S through MW-16D, one complete round of ground water samples was collected from MW-1 through MW-16D on February 6 to 13, 1992 in accordance with the QAPP. The samples were submitted to OBG Laboratories for VOC analysis using EPA Method 8240, Base/Neutral/Acid Extractables (semi-volatiles) using EPA Method 8270, Pesticides/PCBs using EPA Method 8080, TCL-Cyanide, and TCL-Metals analysis.

Chain-of-custody forms were completed and accompanied each shipment of ground water samples. Trip blanks, duplicate samples, matrix spike samples, and matrix spike duplicate samples were also collected in accordance with the QAPP. The ground water sampling forms are included in Appendix H and chain-of-custody forms are included with the laboratory analytical data in Appendix I.

The results of the ground water sampling and analyses for VOCs, semi-volatiles and pesticides/PCBs, and inorganics are illustrated on Figures 6, 7, and 8 respectively, and are also discussed in Section 4.03.

As part of the supplemental investigation performed by Hope's the former Essex Specialty Products, Inc. Site, ground water samples from wells HW-4 through HW-10 were collected by GZA personnel in April 1992. The samples were split with O'Brien and Gere personnel and submitted to OBG Laboratories for VOC analysis by EPA Method 8240. In addition, ground water samples from HW-4, HW-5, HW-7, and HW-10 were analyzed for semi-volatile organics by EPA Method 8270. The results of these sampling events are discussed in Section 4.03.

2.08 Sump Area Test Excavation

During the course of initial site activities, a sump was identified in the north parking lot sump area in the immediate vicinity of MW-3 (Figure 2). Given the presence of elevated levels of Trichloroethene (TCE) exhibited in MW-3, this sump was identified as a potential source of TCE to the ground water. To further evaluate this potential, a test excavation was completed on February 2, 1990 between the sump and MW-3, to visually and chemically characterize the subsurface environment in the vicinity of the sump.

Initial observation of the sump revealed it to be approximately 6 ft x 6 ft x 4 ft depth, with walls shored in part by wooden planks. A grated manhole (flush mounted) covered the opening to the surface. Two subsurface conduits were initially identified entering the sump from the south. A sample of exposed soils within the sump (0-6" depth interval) was collected during the initial observation for analysis of VOCs.

An excavation was performed using a backhoe along an east-west transect (approximately 25 feet in length) immediately south of the sump as shown on Figure 9. The depth of the excavation ranged from 3 to 7 feet. During the excavation, the subsurface environment was visually characterized, including types of soils/fill encountered and orientation of the conduits extending from the sump. Additionally, soils were screened for the presence of volatile photoionizable organic compounds using an HNu photoionization screening detector equipped with a 10.2 Ev lamp.

The excavation was initiated east of the sump and was advanced east to west to a depth of approximately three feet. Two 8- to 10-inch diameter clay pipes which were observed entering the sump were uncovered and their orientation documented. The tops of these pipes were approximately 2.5 ft below ground level. The easternmost pipe was inadvertently broken during excavation. The inside of this pipe consisted of silty materials with a grease-like substance. Additionally, a 3-inch diameter PVC pipe was encountered at approximately 1 to 1.25 feet below grade. West of the pipes, the excavation was deepened to approximately 7.5 feet in depth. Trenching efforts were terminated at this depth upon interception of the water table.

Four samples were collected from within the test pit for laboratory analysis of volatile organic compounds by EPA Method 601/602. Sample S1 was collected

near the eastern-most location within the test pit, at a depth of 0 to 2 feet. Sample S2 was collected from the materials found inside the ruptured clay pipe. Sample S3 was collected from among the deeper (western) portion of the excavation, at a depth of 5.5 feet. Sample S4 was collected from the deeper portion of the excavation at a depth of 7 feet, just above the water table. Samples were placed in 120 ml teflon lined jars and stored at 4°C for transportation to the laboratory. Results of the sump investigation are presented in Table 9, and discussed in Section 4.04.

2.09 Review of Historic Aerial Photographs of the Site

A series of historic aerial photographs were obtained of the site to evaluate the relationship between historic site use patterns and current site contamination patterns. Photographs depicting the site were obtained for the years 1938, 1956, 1966, and 1985. Copies of these photographs are included as Appendix J and results of the aerial photograph review are presented in Section 4.05.

2.10 Underground Storage Tank Area - Test Pit Investigation

Five underground storage tanks (T1-T5) were located in the eastern section of the site as shown on Figure 9. The tanks reportedly stored non-chlorinated materials used in plant processes. A preliminary investigation was conducted to evaluate the nature and extent of contamination, if any, in the vicinity of these tanks on January 25-26, 1990. This investigation involved completion of a test excavation alongside each tank location, observation of subsurface conditions, and collection of soil samples for laboratory analysis.

Approximate tank locations were determined based on interviews with facility personnel and use of a metal detector. According to Lilly Jamestown, Inc. personnel, the tanks were previously covered by platforms. Test excavations were advanced along the sides of each tank location, using the platform foundation as a guide. These foundations were encountered around the perimeter of each tank, and were constructed of concrete masonry blocks approximately 1.5 ft thick, at a depth of 2 feet below grade.

During each excavation, visual observations of subsurface soil conditions were recorded by the O'Brien & Gere representative on-site. Additionally, soils were screened for the presence of volatile photoionizable organic compounds using a Photovac TIP photoionization detector, equipped with a 10.2 Ev lamp.

Samples were collected from two locations within each excavation for analysis of VOCs by EPA method 601/602. Samples were collected from both the east and west ends of tanks T3, T4, and T5, and labeled T3-E, T3-W, T4-E, T4-W, T5-E, and T5-W. Tanks T1 and T2 were of a shorter and deeper configuration than the others, therefore samples were collected from two discrete depths (6 ft and 9 ft) within each of these excavations. Shallow and deep samples were labeled T1-A, T2-A and T1-B, T2-B, respectively. Following collection, samples were stored at 4°C for transportation to the laboratory. Analytical results of the underground storage tank sampling are illustrated on Figure 10, and are presented in Table 10 and discussed in Section 4.06.

2.11 Stained Soils Investigation/IRM

An area of visibly stained soils (approximately 3 ft x 6 ft) was observed immediately east of the current aboveground tank farm (Figure 9). This staining was reportedly due to a past spill of bis (2-ethylhexyl) adipate over the area. A preliminary investigation was conducted to evaluate the extent of semi-volatile organic compound (SVOC) residues in the soil within this area. This investigation involved the collection of surface and shallow soil samples and analysis for SVOCs. The results of this investigation revealed elevated levels of SVOCs, particularly bis(2-ethylhexyl) adipate, in this area. As a result, an Interim Remedial Measure (IRM) was implemented in May 1992 to address the SVOC contamination in the stained soils area and involved removal of the SVOC-contaminated soils and disposal of the soils off-site.

Results of the Stained Soils Area IRM work efforts are presented in Table 11 and discussed in Section 4.07.

2.12 Subsurface Utilities/Structures Investigation

An investigation of subsurface utilities and structures was conducted at the site to evaluate the potential for preferential off-site migration routes of contamination through subsurface utility bedding materials. This investigation included a meeting with NYSDEC personnel on site and interviews with facility personnel to identify piping routes, depths below grade, and potential discharge points, and a review of facility drawings supplied by Lilly Jamestown, Inc. to evaluate the layout of subsurface structures on-site. In addition, a "Topographic and Boundary Survey" of the former Essex Specialty Products, Inc. Facility and adjacent areas, conducted by

Michael J. Rodgers and Associates on April 15, 1992, was also reviewed to determine the location of both on-site and off-site subsurface utilities and structures. Figure 12 illustrates the location of subsurface structures and utilities identified at the site.

Based on these activities and the available information, no known subsurface structures or utilities were identified as being installed to a depth that would intersect the ground water table and provide a preferential route for off-site migration of contamination at the site.

SECTION 3 - PHYSICAL CHARACTERISTICS OF STUDY AREA

3.01 Meteorology

According to the Jamestown Public Works Department, the annual precipitation for Jamestown area averages 49.14 inches. In addition, mean temperatures for the area range from 8 degrees Fahrenheit in December to 85.5 degrees in July (Jamestown Public Works Department, 1989).

3.02 Regional Hydrogeology

The former Essex Specialty Products, Inc. Facility lies within the Chautauqua Valley of the Appalachian Plateau in western New York State. The area is characterized by moderately to steeply sloping uplands and narrow undulating valleys. The Chadakoin River, which drains the local area, exists approximately 800 feet north of the site and flows to the northeast. Glacial processes have modified the region by rounding hilltops, steepening valley walls, and partially filling the Chautauqua Valley with unconsolidated sedimentary deposits. Based on the local topography and the hydrogeologic conditions, the regional ground water flow is likely to the north toward the Chadakoin River.

3.03 Site Geology

The subsurface soils at the site consist primarily of glacially-derived silt, sand and gravel. The subsurface investigations conducted to date at the site indicate that the soils occur in a complex system of layers and lenses likely related to varying depositional energies of a glacial environment. In order to better understand the

relationship between the various soil layers and lenses at the site, two geologic cross-sections (A-A' and B-B') were developed for the locations shown on Figure 13. The cross-sections were prepared based on a review of the existing boring logs for the monitoring wells installed at the site. Interpretation of the subsurface conditions was based on boring logs prepared by O'Brien and Gere hydrogeologists, where possible, and well depths and screened intervals were taken from the original boring logs. The boring logs are included in Appendix A. The following presents an interpretation of the subsurface soils, based primarily on cross-sections A-A' and B-B' which are illustrated on Figures 14 and 15, respectively.

With the exception of the occasional occurrence of up to 7 feet of fill material, the uppermost soil layer consists primarily of sand and gravel occurring at depths up to 18.5 feet. This sand and gravel layer was found to be continuous across most of the site. However, at the southeastern portion of the site in the vicinity of MW-13 and MW-1, the sand and gravel layer thins and a fine sand layer up to 16 feet thick is encountered. The ground water table was encountered within the sand and gravel or fine sand layer in all of the monitoring wells, as indicated on the cross-sections.

Directly beneath the sand and gravel layer is an upper silt layer that was found continuously across the site. The upper silt layer consists of finely laminated silt with occasional lenses of very fine sand. Where assessed, the thickness of this upper silt layer varied from 8 to 22 feet, and appeared to be the thickest in the vicinity of the north parking lot sump area. The borings along the southern portions of the site were not advanced through the base of this layer, therefore interpretation of the thickness of the silt and the occurrence of other soil layers below the silt could

not be evaluated in those areas. The upper silt layer may be limiting the movement of ground water between the overlying sand and gravel and the deeper water bearing zones. Ground water occurring within the upper silt layer would tend to migrate horizontally within the fine sand lenses and stringers occurring in the silt.

The remainder of the interpretation of the subsurface soils is limited to the area in the vicinity of the north parking lot sump area and the area north of Hopkins Avenue due to the depth of the boring log data available for the site. Based on the continuity of the sand and gravel layer and the upper silt layer encountered across the site, it is anticipated that the subsurface soils in the southern portions of the site would be similar to the remainder of the site.

Underlying the upper silt layer is a fine sand layer which was found continuously in the north parking lot sump area and the area north of Hopkins Ave. The thickness of this layer varies from 12 to 24 feet. As shown on cross-section B-B', the fine sand layer thins slightly and occurs at a greater depth to the south toward MW-8 and RW-1 with the increasing thickness of the upper silt layer. At MW-14D, a medium sand layer, approximately 8 feet thick, was encountered under the fine sand layer. This layer was not encountered in the other soil borings in the area.

A lower silt layer occurs beneath the fine sand layer and the medium sand layer in MW-14D and consists of finely interbedded layers of silt and clay. The clay content tends to increase with increasing depth. The thickness of this lower silt layer, assessed at MW-7DD, is 44 feet. The lower silt layer may be acting as an aquitard, limiting the movement of ground water between the overlying fine sand and the deeper water bearing zones.

In MW-7DD, a till layer was encountered at a depth of approximately 100 feet below ground surface. The till layer consists of an unsorted mixture of clay, silt, fine to coarse sand and fine gravel.

3.04 Ground Water Flow Conditions

The ground water elevation data at the site indicates that the local ground water flow is consistent with the regional flow conditions. Ground water elevation data were collected on several occasions; the dates and ground water elevation data are summarized on Table 1. Ground water elevation maps have been constructed from these data to estimate the ground water flow direction and hydraulic gradient. Figure 16 illustrates the ground water elevation data from the shallow ground water aquifer obtained February 5, 1992. A review of Figure 16 indicates the ground water flow in the water table aquifer is primarily to the north toward the Chadakoin River under a hydraulic gradient of approximately 0.02 ft/ft.

A localized depression in the ground water table is indicated on Figure 16 around MW-3. This depression in the water table, which is consistent with ground water elevation maps prepared for other dates, is likely due to the depths and strata in which the monitoring wells are screened. A review of cross section B-B' on Figure 15 illustrates that MW-3 is screened within a silt layer that occurs below the sand and gravel, whereas the other shallow monitoring wells in the area are screened within the sand and gravel. The downward vertical gradient from the sand and gravel to the silt layer is responsible for the differences in ground water elevations that result in the apparent depression indicated on Figure 16. The ground water elevations in the sand and gravel would indicate a ground water flow direction consistently to the

north. However, because of the downward vertical gradient from the sand and gravel layer to the silt layer, a localized depression appears in the vicinity of MW-3. This depression is not reflective of a downward flow component in this area as the silt is less permeable than the sand and gravel. Therefore, an apparent localized sink as might be interpreted simply based on the ground water flow maps, does not exist.

In situ permeability tests (K-tests) were performed on the monitoring wells and the hydraulic conductivity data are summarized on Table 1. The hydraulic conductivities across the site range from 0.05 GPD/ft² to 40.5 GPD/ft². For monitoring wells screened within the sand and gravel aquifer, the hydraulic conductivities range from 0.47 GPD/ft² to 40.5 GPD/ft². For monitoring wells screened in the upper silt layer, hydraulic conductivities range from 0.139 GPD/ft² to 19 GPD/ft², whereas hydraulic conductivities for monitoring wells screened in the lower fine sand layer range from 0.61 GPD/ft² to 32.46 GPD/ft². The hydraulic conductivity of the monitoring well screened in the till layer is 0.05 GPD/ft².

3.05 Aquifer Performance Test Results and Analysis

The 24 hour aquifer performance test was conducted on test well RW-1 to assess the aquifer characteristics in the fine sand layer in which the test well was screened. The time-drawdown and time-recovery data, included in Appendix E, was interpreted using the Jacob straight-line method to estimate the transmissivity and storativity of the fine sand aquifer in the vicinity of the north parking lot sump area. Straight line plots are also included in Appendix E. Estimates of transmissivity based on time-drawdown and time-recovery plots range from 88 GPD/ft to 307 GPD/ft for monitoring wells screened in the fine sand aquifer in the vicinity of RW-1 and 590

GPD/ft to 6,034 GPD/ft for monitoring wells screened in the sand and gravel aquifer. Storativity estimate values based on the monitoring well data range from 0.0001 to 0.0012 for monitoring wells screened in the fine sand aquifer and range from 0.0095 to 0.114 for monitoring wells screened in the sand and gravel aquifer.

SECTION 4 - NATURE AND EXTENT OF CONTAMINATION

4.01 Soil Vapor Survey Results

As described in Section 2.03, the soil vapor survey was conducted at the locations presented in Figure 3 to screen for the presence of VOCs on-site and off-site of the former Essex Specialty Products, Inc. facility. The field data of the soil vapor survey are presented in Table 2. The areas screened include the following:

1. North parking lot sump area.
2. Former AST area.
3. Area north of Hopkins Avenue on the Hope's Property.
4. Previously closed UST area.

This section presents the results of the soil vapor survey within those areas.

North Parking Lot Sump Area

TCE was detected in the soil vapor within the north parking lot sump area at concentrations ranging from less than 0.1 ppm (volume/volume) at the periphery of the north parking lot sump area, to 3.5 ppm near MW-3. Peak soil vapor concentrations of TCE at this location are consistent with ground water quality data from MW-3 (Table 5), which indicate the highest on-site ground water concentration of TCE (approximately 530 ppm) at this location.

Former AST Area

The results of the soil vapor survey conducted in the former AST area exhibited a chromatographic response typical of that expected for a petroleum product. Additionally, the highest concentrations were detected in the vicinity of the former underground fuel tank, indicating that the soil vapor VOCs associated with

the petroleum-type fingerprint most likely originated in this area. Outside of the immediate area of the tank farm, however, on-site soil vapor VOC concentrations are one to two orders of magnitude lower.

An additional fourteen soil vapor samples were collected in the right-of-way adjacent to the former AST area to assess the migration of VOCs from the former AST area through the right-of-way downgradient of the site. Sampling was initiated approximately 20 feet south of MW-2 at location SV-13. The remaining samples were placed along the eastern and western sides of the right-of-way, using a 50-foot spacing, extending from Blackstone Avenue to Hopkins Avenue. In addition, sample SV-46 was situated off the right-of-way to evaluate subsurface VOC concentrations adjacent to the right-of-way (Figure 3).

Results of the sampling performed in the right-of-way are summarized in Table 2. The highest concentrations in soil vapor were observed in the proximity of MW-2. Samples SV-13 and SV-14, situated 20 feet to the south and west, respectively, of MW-2 exhibited elevated concentrations of VOCs, as shown in Table 2. The chromatographic pattern was consistent with that expected for a petroleum hydrocarbon residue. TCE, 1,1,1-TCA and 1,2-DCE were also detected in samples SV-13 through SV-16, SV-22 and SV-23 located in the vicinity of MW-2 and the former AST area. The concentration of total VOCs decreased considerably as sampling proceeded into the right-of-way in both the north and south directions. Sample SV-46, situated 35 feet east of sample SV-19, exhibited a substantial decrease in total VOC concentration when compared to samples in the right-of-way.

Previously Closed UST Area

A soil vapor survey was conducted in the parking lot owned by Johnson Machine and Fibre Products Co. north of the previously closed UST area to evaluate the potential for off-site migration of petroleum hydrocarbon residues originating from these tanks. A total of 12 soil vapor samples were collected and analyzed for VOCs at the locations shown on Figure 3.

Results of the soil vapor sampling performed in the parking lot north of the previously closed UST area are summarized in Table 2. The highest total VOC concentration was observed in sample SV-1 located in the southwest corner of the parking lot, closest to the previously closed UST area (Figure 3). A total VOC concentration of 232 ppm was observed in sample SV-1 and the chromatographic fingerprint was consistent with that of a petroleum hydrocarbon residue. Benzene, toluene and ethylbenzene could not be positively identified in sample SV-1 due to the high concentration present in the sample coupled with the complexity of the chromatogram. Other than samples SV-6 and SV-9, which exhibited concentrations of VOCs from 4 to 6 ppm, the remaining samples collected from the parking lot revealed near background concentrations of VOCs.

Area North of Hopkins Avenue on Hopes Architectural Products Property

Twenty-one soil vapor samples were collected from the area north of Hopkins Avenue, as shown on Figure 3, to assess any suggested downgradient extent of chlorinated VOCs detected in ground water at MW-3 and to determine if a separate source of chlorinated VOCs was present north of Hopkins Avenue.

Results of the soil vapor sampling in the area north of Hopkins Avenue are summarized in Table 2. These results indicate that low levels of chlorinated VOCs

are present in the area, in addition to low levels of aromatic hydrocarbons, which were observed at select locations across the area. There was no particular pattern of detection observed. The advancement of soil vapor probes to a full depth of six feet was inhibited by the presence of a former building foundation. The foundation was encountered at approximately three feet below grade, situated northwest of well cluster MW-16. The building foundation prevented sampling of the deeper zones for potential source areas beneath the foundation. The downgradient extent of VOCs identified in this area appears to coincide with the approximate limits of the subsurface structure. Based on the even distribution of subsurface VOCs detected across this area, additional sources of TCE could not be positively identified.

4.02 Soils Analysis

As described in Section 2.06.1, a total of thirty-eight soil samples were collected and analyzed for VOCs to identify potential source areas and to evaluate the vertical and horizontal extent of VOCs in the soils. The results of the soils analysis are summarized on Table 3, and the complete laboratory reports are included in Appendix I. Figure 4 illustrates the locations of the soil borings and the concentrations of VOCs detected at various depths in the soils in the unsaturated zone.

The soils analysis indicated up to 2,778 parts per million (ppm in mg/kg dry weight) of total VOCs. The highest concentrations (41.8 to 2,778 ppm) were detected in samples from soil borings B-10 through B-15, which are located in the vicinity of the former above ground and underground storage tank area (Figure 4). The majority of the VOCs detected in this area consisted of petroleum fuel-derived

products benzene, toluene, and xylene (BTX). These compounds were detected in concentrations ranging from 1.8 to 2,700 ppm; the highest concentration of 2,700 ppm for xylenes was in the 0- to 2-foot interval of boring B-10.

Soil samples from piezometers PW-1 and PW-2 also detected levels of total VOCs at concentrations ranging from 7.9 to 16 ppm at the 6- to 8-foot interval. These VOCs comprised of xylenes and ethylbenzene. The locations of the piezometers are illustrated on Figure 5.

Soil samples collected from borings B-1 to B-9 located in the north parking lot sump area surrounding MW-3 exhibited detectable concentrations of total VOCs up to 1.02 ppm. Analyses of surface soil samples collected from the 0- 2-foot interval of borings B-2, B-4, B-6, and B-7 revealed detectable concentrations of total VOCs. Samples from the 2-4 foot interval of borings B-3, B-5, and B-7 had the highest concentrations of total VOCs for this area. TCE is the major component of the VOCs in this area.

In summary, the results of the soil boring program indicated that two significant source areas of VOCs were identified at the site. One source of VOCs was identified by soil samples from borings B-10 through B-15, in the vicinity of the former above ground and underground storage tanks. Elevated levels of BTX compounds and no TCE were exhibited in this area. The second area of elevated VOCs was identified in the vicinity of MW-3, where significantly elevated levels of TCE were detected.

4.03 Ground Water Quality

Ground water samples have been collected from the site monitoring wells on several occasions, as discussed in Section 2.07. Results of the ground water sampling for VOCs during August 1989 and February 1990 are summarized on Table 4, and the laboratory analytical results from the February 1992 sampling and July 1992 resampling events for VOCs are summarized on Tables 5 and 6, respectively. A review of Tables 5 and 6 and Figure 6 reveals the presence of VOCs at various locations on the site. Laboratory analytical results for the semi-volatiles/pesticides/PCBs and inorganics sampling event in February 1992 are included on Tables 7 and 8, respectively. The laboratory reports for each of these analyses and the results of the ground water samples split with GZA from HW-4 through HW-10 are included in Appendix I.

Monitoring wells MW-2 and MW-4, located in the vicinity of the former above ground and underground storage tank area, indicate impacts by toluene, xylene, ethylbenzene, and benzene. Monitoring well MW-2 exhibited higher concentrations of toluene, xylene, and ethylbenzene than MW-4. Toluene concentrations in ground water from MW-2 have ranged from 220 ppm during January 1990 to 93 ppm during July 1992. In addition, total xylene concentrations from MW-2 ranged from 18 ppm in January 1990 to 13 ppm in February 1992. These contaminants are present in the sand and gravel aquifer in which the two monitoring wells are screened and may represent ground water impacts from the former AST area.

The primary VOC detected in the north parking lot sump area is TCE which ranged in concentrations from .027 ppm in August 1989 to 480 ppm during the February 1992 sampling event. The highest concentration of TCE (480 ppm) was

exhibited in MW-3 and was identified as a dense, non-aqueous phase liquid (DNAPL), existing within the lower one to two inches of the well. Due to this concentrated quantity of TCE in the ground water around the north parking lot sump area, a proposed Interim Remedial Measure (IRM) has been prepared to address this issue. The IRM consists of advancing four soil borings and one monitoring well in the immediate vicinity of the sump area to delineate the vertical and horizontal extent of the TCE DNAPL, followed by operation of the existing test well, RW-1, to pump and treat the TCE-contaminated ground water. The IRM is currently undergoing review by the NYSDEC.

Chlorinated alkenes, which would be expected in association with the normal degradation of TCE (including trans - 1,2 dichloroethene (t-1,2 DCE), 1,1 dichloroethene (1,1-DCE), and vinyl chloride, were detected in other monitoring wells around the north parking lot sump area at levels ranging from 4 ppb to 150 ppb during the August 1989 sampling event and .003 ppm to 54 ppm during the February 1992 sampling event. In addition, concentrations of toluene, methylene chloride, xylene, ethylbenzene, and chlorobenzene were detected in samples collected during the February 1992 sampling event.

It should be noted that levels of VOCs decreased significantly (two orders of magnitude) in ground water between MW-3 and the downgradient property boundary at Hopkins Avenue. In addition, the concentration of VOCs decreases significantly vertically across the site from a concentration of 480 ppm of TCE in MW-3 to 12 to .034 ppm of TCE in the intermediate depth (50 foot) wells (MW-7D, MW-8, MW-11D) to .10 ppm of TCE in the deep (100 foot) well (MW-7DD).

The contaminants exhibited in the north parking lot sump area may have been introduced into the ground water from the sump in this area. The elevated concentration of TCE at MW-3 is likely due to the proximity of this well to the sump and that MW-3 is screened entirely within the upper silt layer in which the TCE may be migrating. An indication that the TCE may be migrating within the upper silt layer is illustrated by the TCE concentrations detected in MW-3 and HW-5. Monitoring well HW-5, installed by GZA at the request of Hope's within five feet of MW-3, is screened mainly in the sand and gravel layer and partially in the upper silt layer whereas MW-3 is screened entirely within the upper silt layer. Ground water samples collected from MW-3 exhibited TCE concentrations two orders of magnitude higher than those detected in HW-5. Since the silt has a lower hydraulic conductivity, it would likely exhibit a higher retardation factor that would result in slower contaminant migration rates.

The concentration of TCE tends to decrease in concentration down gradient of the north parking lot sump area such that TCE was not detected in monitoring well MW-16S and MW-16D, as illustrated on cross-section A-A' (Figure 14). Cross-section A-A' also illustrates that monitoring wells screened mainly in the sand and gravel layer and partially in the upper silt layer, such as HW-5 and MW-10, tend to have lower TCE concentrations (6.4 ppm and .004 ppm, respectively) than adjacent monitoring well MW-3 (480 ppm) which is screened mainly in the upper silt layer. This situation suggests that the TCE may be migrating in the sand lenses and stringers within the silt layer. Cross-section B-B' (Figure 15) also illustrates the preferential occurrence of TCE in monitoring wells screened mainly within the upper

silt layer, such as MW-14S (1.2 ppm), as opposed to monitoring wells screened mainly in the sand and gravel layer, such as MW-6 (.026 ppm).

Results of the semi-volatile, pesticides, and PCB analyses are summarized on Table 7 and the results of the inorganics analyses are summarized on Table 8. Bis (2-ethylhexyl) phthalate was detected only in MW-7DD. Naphthalene was also detected in MW-2 (.320 ppm), MW-3 (.031 ppm), and MW-4 (.017 ppm) located in the former AST area and north parking lot sump area. The ground water sample collected from MW-3 contained a PCB concentration of .290 ppm. MW-3 is the only monitoring well which exhibited PCBs above the analytical detection limit.

A review of the inorganics analyses (Table 8) indicates that arsenic, barium, cadmium, chromium, lead, and selenium were detected in the February 1992 ground water samples. The highest concentrations of inorganics tend to occur in the upgradient wells (56.5 to 247 ppm chromium, 3250 ppm barium, 56.5 to 292 ppm lead) and generally decrease in concentration down gradient on-site (10.1 to 101 ppm chromium, 1150 to 1950 ppm barium, 84.4 to 206 ppm lead). In addition, the concentration of inorganics downgradient from the site (65.9 to 195 ppm chromium, 1160 ppm barium, and 51.7 to 206 ppm lead) are lower than upgradient concentrations or comparable to on-site concentrations. This type of distribution of concentrations typically indicates background conditions across the site.

4.03.1 Data Validation Summary

As part of the RI for the site, the analytical data generated during the January and February sampling rounds were validated by H2M Labs, Inc., a NYSDEC Certified Validator. The data validated consisted of the samples

analyzed by OBG Laboratories, Inc. for the Target Compound List parameters consisting of volatile organics, semi-volatile organics, pesticide/PCBs, and total metals and cyanides. H2M Labs, Inc. reviewed the data package to determine if the analyses and deliverables were performed in accordance with NYSDEC Analytical Services Protocol (September 1989) requirements, as well as the project Quality Assurance Project Plan. The validation package, presented in Appendix J, follows the Functional Guidelines for evaluating organic and inorganic analyses by the EPA, the Data Validation requirements of the NYSDEC RI/FS Program, and the NYSDEC memorandum from the Bureau of Hazardous Site Control.

The data summary tables presented in the RI Report incorporate the validated data generated during completion of the RI. Generally, all the data was considered useable, with the exception of the selenium and arsenic parameters within the inorganics analysis, which were rejected by H2M Labs, Inc. because sample recoveries were outside specified limits.

Although sample custody and documentation issues were noted, H2M Labs, Inc. concluded that the issues can be considered minor and should not affect the usability of the data. OBG Laboratories has prepared a response to address the issues identified in the H2M data validation report. A copy of the OBG Laboratories correspondence is included with the data validation package provided in Appendix J.

4.04 Sump Area Investigation Results

As described in Section 2.08, a test excavation was completed in the vicinity of the north parking lot sump area (Figure 9) to visually and chemically characterize the subsurface environment in this area. Laboratory reports of VOC analyses of soil samples are included in Appendix I and are summarized in Table 9.

Analysis of the exposed soils sample from within the sump did not reveal detectable levels of VOCs. Of the four samples (S1 to S4) collected during the test excavation and submitted for analysis, samples S1 and S4 revealed detectable concentrations of VOCs. Analysis of sample S1, collected from the 0- to 2-foot interval of the excavation, revealed the presence of 50 ppb t-1,2 DCE and 66 ppb of TCE. Analysis of sample S4, collected from just above the water table in the western portion of the excavation, revealed the presence of 26 ppb TCE. Analysis of samples S2 (collected from within a clay pipe leading into the sump) and S3 (collected from a depth of 5 feet in the western portion of the excavation) did not reveal detectable concentrations of VOCs. Screening measurements of volatile photoionizable soil constituents recorded during the excavation activities did not reveal detectable levels of VOCs above background except in the lowest (7 foot depth) interval of the excavation (coincident with the collection of sample S4).

During the test excavation, three underground pipes were identified in the sump area. The orientation of the three pipes encountered was documented as follows:

- The eastern-most pipe extended from the sump toward MW-3.
- The PVC pipe (centrally located) extended from the sump area to the south (toward Building 13-A) (Refer to Figure 12).

- The western-most pipe extended from the sump in a south-southwest-erly direction.

4.05 Aerial Photograph Review Results

Copies of aerial photographs obtained for the site from 1938, 1956, 1966, and 1985 are included as Appendix K. A review of these photographs indicates the past presence of two structures not currently standing in the vicinity of the former Essex Specialty Products, Inc. north parking lot sump area. The following presents a summary of the information obtained from the areal photographs.

- Plant 5 does not appear in the 1938 photograph, but is evident in the 1956 photograph. Plant 5 previously contained a dip tank for degreasing and coating processes, that was operated by Hope's. However, the Hope's buildings to the north of Hopkins Avenue and to the west of the former Essex Specialty Products, Inc. property are evident in the 1938 photo.
- A structure approximately 75 feet long, 20 feet wide (est. 10 feet height) is observed in the photograph from 1956. This structure is situated along a north-south axis in the center of the north parking lot sump area. Foundation remnants of this building are still visible in the 1966 photo. The southern end of the structure is located in the immediate vicinity of the zone of maximum TCE concentration observed in on-site ground water. The nature of operations conducted at the facility is currently undetermined.

The 1956 photo also shows a lighter circular patch of unknown origin immediately south of the 75 feet by 20 feet structure at the current location of the sump within the north parking lot sump area.

- Review of the 1956 and 1966 photographs indicates the presence of a large structure across Hopkins Avenue from the north parking lot sump area. The nature of operations conducted at this facility is currently undetermined.
- Review of the 1985 photograph did not show the 75 feet, by 20 feet structure in the north parking lot sump area that was observed in the 1956 and 1966 photographs.

4.06 Underground Storage Tank Investigation Results

As described in Section 2.10, test excavations were advanced along five previously closed underground storage tanks situated in the eastern portion of the former Essex Specialty Products, Inc. facility to evaluate the nature and extent of potential VOC contamination in the vicinity of the tanks. Two subsurface soil samples were collected for analysis of VOCs from alongside each tank location. Laboratory analytical results for soil sample analyses are included in Appendix I. These data are summarized in Table 10 and Figure 10.

As shown by the analytical data and presented in Figure 10 and Table 10, analysis of subsurface soils in the immediate vicinity of the tanks revealed the presence of VOCs up to 250 ppm toluene, 3600 ppm xylenes, and 1000 ppm ethylbenzene.

Essex Specialty Products, Inc. is currently considering removal of the contents of the tanks and treatment of the VOC - contaminated soils as part of an IRM for the former bulk storage areas at the site.

4.07 Stained Soils Investigation Results

In accordance with the NYSDEC-approved IRM Work Plan, seven soil borings were advanced to a depth of four feet in the vicinity of the stained soils area to further define the vertical and horizontal extent of contamination in this area. Samples collected from each boring were analyzed for semi-volatiles by EPA Method 8270, following ASP-CLP protocols and indicated the presence of semi-volatiles at various concentrations and depths at each boring location, predominantly in the two-foot to three-foot depth intervals. Based on the results of this analysis, an excavation plan and performance specifications were developed for the removal of soils exhibiting semi-volatiles in the stained soils area. Following excavation, samples of soils remaining in the excavation were collected and analyzed for semi-volatiles. The results of that analysis are presented in Table 11 and Figure 11. The laboratory reports are included in Appendix I. The documentation of completion of the IRM is provided in the summary report prepared by O'Brien & Gere entitled Interim Remedial Measure, Soils Excavation, Stained Soils Area, dated July 1992.

SECTION 5 - ECOLOGICAL ASSESSMENT

5.01 Introduction

A Phase I Habitat Based Assessment (HBA) of the area adjacent to the site was conducted in accordance with the NYSDEC guidance document entitled Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1991a).

The objectives of this HBA were to:

1. Characterize each habitat/cover type within a 0.5-mile radius of the site;
2. Identify all special resources including significant habitats, endangered species, regulated wetlands, streams, lakes, and wild and scenic rivers (NYSDEC, 1989) within an area of study consisting of a 2-mile radius of the site;
3. Provide an overall description of ecological conditions in on-site and adjacent areas through a cover type analysis according to the ecological community classification system of the NYSDEC (1988);
4. Identify sources of contaminants and the chemicals of concern at the site;
5. Identify potential pathways of contaminant migration that may impact fish and wildlife resources;
6. Identify fish and wildlife receptors that are potentially effected by site-related contaminants; and
5. Quantify the extent of impact, if any, on fish and wildlife receptors.

5.02 Special Resources

According to the NYSDEC, special resources consist of significant habitats, endangered species, regulated wetlands, streams, lakes, and wild and scenic rivers (NYSDEC, 1989). The presence of special resources within the area of study was evaluated by contacting the NYSDEC Natural Resources Office (NRO), NYSDEC Significant Habitat Unit (SHU) and NYSDEC Natural Heritage Program (NHP),

reviewing NYSDEC Freshwater Wetland and U.S. Fish and Wildlife Service (U.S.FWS) National Wetland Inventory (NWI) maps, researching the NYS surface water classifications, and performing an on-site biota census.

The NYSDEC NHP was contacted regarding the presence of 1) significant wildlife habitats (i.e. deer wintering yards); 2) rare, threatened, or endangered plant and animal species; and 3) aquatic communities associated with surface waters within 2 miles of the site. The NHP maintains records of the locations of protected habitats, plants and animals in New York State.

5.02.1 Significant Habitats

The NYSDEC NRO was contacted for information concerning fish and wildlife resources in the Jamestown vicinity. NRO records indicate that there are no deer wintering areas nor other significant wildlife habitats within 2 miles of the former Essex Specialty Products, Inc. Facility, which would be expected considering the extensive industrial activity in this area.

5.02.2 Rare, Threatened, or Endangered Species

The NYSDEC NRO was contacted with a request for information regarding rare, threatened, or endangered plants or animals that may exist within 2 miles of the site. A NYSDEC NRO review of the SHU and NHP files identified that a rare plant, the spreading globeflower (*Trollius laxus* sp. *laxus*) has historically occurred in the vicinity of Jamestown, NY (Buffington, 1992). This threatened plant, G4T3Q S3 (plant ID number), though last recorded in the area in 1843, may still be present in Chautauqua County. It

generally ranges from western Connecticut south to Pennsylvania and west to Michigan. It is an inhabitant of moist meadows and swamps, and it flowers from April to June (Britton and Brown, 1970). The site could not support spreading globeflower. Except for the along the stream bank of the Chadakoin River, however, suitable habitat for the spreading globe flower does not exist within a 2-mile radius of the site. A search of both the upland forest and stream bank areas (see Section 5.3.4 and 5.3.5, respectively, for a description of these habitat types) was made on April 13, 1992. Spreading globe flower was not sighted among either vegetative community.

Information on the presence of rare, threatened, or endangered species was also requested from U.S. Department of the Interior (DOI) FWS. Upon U.S. DOI FWS review, federally listed or proposed endangered or threatened species are not known to exist within 2 miles of the site. Several listed and proposed endangered and threatened species under federal jurisdiction, however, have a distribution that includes New York State (Corin, 1992). A complete list is provided in Table 12.

5.02.3 Wetlands

Wetlands are regulated at both the state and federal level. Wetlands within a 2-mile radius were identified using current state and federal wetland maps.

5.02.3.1 New York State Wetlands

The 1975 New York State Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law) was promulgated in order that the State of New York might "preserve, protect, and conserve freshwater wetlands and the benefits derived therefrom...". The NYSDEC regulates wetlands that are greater than 12.4 acres in size and designates their boundaries on Freshwater Wetlands Maps. The study area was included on NYSDEC Freshwater Wetland Maps for the Jamestown, Lakewood, Ellery, and Gerry Quadrangles. Figure 17 shows the locations of protected freshwater wetlands within 2 miles of the site and their classifications.

There are no wetlands on-site. According to the NYSDEC NRO, a 15-acre shrub swamp exists approximately 1.75 miles south of the project site (identified as JA-23 on Figure 17). This wetland is regulated under the New York State Freshwater Wetlands Act. It is a Class II wetland based on its location within an urbanized area, and its association with Allen Brook, a Class B stream. NYSDEC NRO did not acknowledge the existence of other wetlands within 2 miles of the site. However, several other wetlands were identified on the map: LW-10, JA-3, GE-3 and GE-14 (Figure 17). Each of these wetlands is located on the edge of the area of inquiry and none could be impacted by contaminants at the site.

5.02.3.2 Federal Wetlands

The Army Corp of Engineers (ACOE) regulates wetlands in the United States under Section 404 of the Clean Water Act. Federally regulated wetlands do not have a minimum size requirement. The ACOE does not map federally regulated wetlands. However, the U.S. DOI FWS prepares National Wetland Inventory (NWI) maps for the territorial United States. NWI maps present the locations and boundaries of wetlands designated by the DOI. The ACOE criteria for designating wetlands are broader than DOI criteria, thus, more areas qualify as ACOE regulated wetlands than included on NWI maps. However, wetlands identified by the NWI are usually ACOE regulated wetlands. An NWI map has been prepared for the Jamestown, NY area that includes the region about the study site (Figure 18).

5.02.4 Surface Waters

The Chadakoin River is the only major surface water body in Chautauqua County that is located within two miles of the site. The Chadakoin River bisects the study area in meandering arc orientation. The direction of flow is southeast to northwest within the Chadakoin River Drainage Basin. The degree of stream meander (the ratio of stream length to linear distance between two points) is 1.66 for the section of river that traverses the study area. A discussion of the aquatic community associated with the Chadakoin River is provided in Section 5.3.6.

The Chadakoin River is classified according to the NYS Code of Rules and Regulations, Title 6 subchapter B: "Classes and Standards of Quality and Purity assigned to Fresh Surface and Tidal Salt Waters" as a Class C and Standard C body of water. Table 13 lists eight tributaries that enter the Chadakoin River in the Jamestown area. Several tributaries exist within the 2-mile radius of the site. Stream Classifications and Standards are also presented in Table 13.

A 1966 survey of the Chadakoin River at Jamestown, New York by the NYS Department of Health reported toxic concentrations of cyanide, lead, zinc, and copper. These contaminants probably originated from industries along the river. The concentration of substances such as cyanide, exceeded the limit set by the U.S. Public Health Service for human consumption (USGS 1982). Table 14 contains physical-chemical water quality parameters that were measured August 5, 1987 during a NYSDEC fish survey.

5.03 Habitats within 0.5 Miles of the Property

A cover type map was prepared for an area within a 0.5-mile radius of the site (Figure 19). Cover types were characterized based on existing maps and a site visit on April 13, 1992. Very little terrestrial habitat of value to wildlife exists within the 502-acre (0.785 mi²) study region. Only two types of terrestrial habitat were identified that could provide the necessary life-sustaining requirements for indigenous communities. First, there was a thin band of stream bank vegetation along the Chadakoin River within 0.1 miles from the site. Second, a mixed hardwood stand occurred approximately 0.2 miles to the south of the site. Discussion of terrestrial

habitats will largely be limited to these areas. The only aquatic habitat within the study boundary was the Chadakoin River.

Except for the stream bank and forested habitats, land areas were designated by their prominent anthropogenic use. The types of land uses that were mapped on Figure 19 include industrial, commercial-business, and residential classifications. The total area covered by each land use category was calculated from the map. Roads and streets were included in each areal calculation of the surrounding classification.

5.03.1 Industrial Park

A large industrial park, in which the site is located, comprises the largest portion of land. It is bounded by the Chadakoin River to the north and Buffalo Street to the south (Figure 19). Industrial properties extend off the map in both the eastward and westward directions. Industrial and manufacturing facilities account for about 44% of the land within the study area or approximately 221 acres (0.35 mi²). The habitat descriptions of these properties do not differ significantly from that of the site. Railroad tracks are located in the industrial corridor. Significant wildlife habitat does not exist within the industrial sector of the study area.

5.03.2 Residential Neighborhoods

Several residential tracts are situated on about 116 acres (0.18 mi²) or 23% of the study area. The largest area is concentrated to the north of Second Avenue across the Chadakoin River from the site (Figure 19). A much smaller neighborhood occurs along the southern side of Buffalo Street.

Residential areas are typical suburban neighborhoods. The building structures are predominantly single family dwellings, garages and sheds. Yards are primarily grass lawns with an occasional tree. Most properties have a driveway and a sidewalk. A cemetery in the southeast of the study area and the municipal stadium-community college complex in the northwest of the study area account for approximately 1% and 3.5% of the study area, or 5 acres (0.01 mi²) and 18 acres (0.03 mi²), respectively, and both largely consist of manicured lawns. None of these areas could support a diverse ecological community typical of natural habitat.

Despite the lack of natural habitat, residential neighborhoods of municipal Jamestown are likely to possess an urban wildlife population. Human activity can select which organisms exist by creating favorable conditions for organisms that might otherwise be out-competed or exist in low numbers. Bird species such as pigeons and starlings maintain increased populations over those in the absence of human habitation. This is usually due to increased food sources and nesting places, and lack of competition from the absence of niche overlapping species. Insects such as spiders, centipedes, millipedes, flies, bees and wasps may also find favorable conditions in cultural settings. Urban wildlife including mice, vole, squirrel, rabbit, raccoon, opossum and skunk have adapted to survive within cities. Nocturnal activities keep most urban wildlife relatively inconspicuous. In Jamestown, as in other urban centers, these animals are supported by limited vegetative resources and human refuse. Overall, the community is incomplete and could not be considered a healthy natural indigenous community.

5.03.3 Commercial-Business District

A commercial-business district follows along Second Avenue just north across the Chadakoin River from the site (Figure 19). This corridor of business enterprise includes gas stations, restaurants, hotels, bars, stores, repair shops, offices and a few residential houses. Altogether, the district covers about 8% of the study area, or 40 acres (0.06 mi²), with a majority of the space occupied by buildings and parking lots.

The commercial-business district provides little or no viable natural wildlife habitat. As with the residential district, urban wildlife populations probably exist. However, the physical state of the business district limits the existence of autochthonous life. Vegetative resources are deficient and productivity is low. The little autotrophy that occurs is of poor quality and is unable to support most heterotrophic life forms.

5.03.4 Stream Bank Community

The stream bank community occurs along the sides of the Chadakoin River (Figure 19). This narrow strip of voluntary vegetative growth varies in width from several feet to over one-hundred feet. On the average, the stream bank community extends 20-25 feet from the river's bank. Overall, it covers about 2% of the study area or approximately 10 acres (0.02 mi²). The commercial-business district lies directly to the north, while the industrial-manufacturing park is adjacent to the south. In many cases, development has encroached directly to the river's edge. Hence, both the Chadakoin River and the stream bank community are heavily impacted by industrial, commercial

and business activities. For example, litter and debris such as rebar, wood scrap, concrete rubble, car tires, bottles, cans, plastic containers, bags and paper are scattered throughout the environs. A retaining wall of several hundred rubber tires forms the northerly river bank at a Second Avenue garage just west of Hopkins Avenue.

The floral composition along the stream bank most resembles that of the Allegheny Oak Forest according to the guidelines established by the NYSDEC NHP. Table 15 lists the plant species identified during a vegetative census of the streambank community. Tree species are almost exclusively hardwood. Most trees are relatively small in size. Trunk diameters are typically less than 1 foot. Tree ages are estimated to be under 30 years. The largest tree among the stream bank community is a Silver maple. It is located in a mature tree stand composed predominantly of Silver maples between Hopkins and Gidelow Avenues on the southern shore of the River. The trunk circumference measured 8 feet 3 inches (29 dm) at a height of 4 feet from the ground; the calculated diameter equals 36 inches (92 cm). Its age is estimated at over 50 years. A few other Silver maples in this stand have trunk diameters approaching 30 inches.

A cattail marsh of about 10,000 ft² occurs in a depression to the south of the Silver maple stand and to the north of Hopes Architectural Products, Inc. It appears this lowland area floods in the early Spring with high river levels. Likewise, several dried channels of divergent river water were also located within the flood plain between Buffalo Street and Tiffany Avenue.

At its perimeter, the stream bank community resembles an old field community. However, this strip of vegetation is narrow and interrupted where adjacent development and the stream bank are sharply demarcated. In most places, a steep bank either delineates the flood plain or the river's edge.

With the exception of bird species, direct animal sightings were limited. Several animals are inferred to inhabit the locale, however, based upon signs of their presence. These indicators include nesting places, burrows, tracks, scat and browse. Tables 16 and 17 outline the fauna associated with the stream bank community.

Although small local plant and animal populations inhabit the streambank, this thin strip of land is incapable of supporting a rich biological community. The quality of habitat to wildlife is low due to limited size and human impacts from adjacent land uses.

5.03.5 Upland Forest Community

An upland forest community is located just south of Buffalo Street (Figure 19). Small thin strips of similar vegetation are located 1) to the east of Tiffany Avenue between Allen and Buffalo Street, 2) to the south of Falconer Street between Tiffany and Niagara Avenues, and 3) along the north side of Buffalo Street and east of Pratt Avenue. Altogether, the upland forest community covers 18% of the study area or approximately 90 acres (0.14 mi²).

The upland forest south of Buffalo Street is orientated on a north facing slope. It extends upgradient and outside the 0.5-mile radius to the

south. To a limited extent, it is contiguous with a large forest encompassing the Jamestown municipal district. Beyond the study region, however, sparsely populated streets encircle and interrupt the canopy.

Trees are mainly secondary growth; trunk diameters are narrow and tree heights are short in contrast to more mature growth. The region probably represents former agricultural land that has been abandoned within the last 50 years. Trunk diameters are less than 15 inches and typically are 3-6 inches. In places, the under story is dense, yet, ground cover is sparse. Tables 18, 19 and 20 summarize the canopy, shrub understory and ground cover vegetation identified at the upland forest habitat, respectively.

Tables 21 and 22 lists the fauna associated with the upland forest community. Few animals were sighted while surveying the forest habitat; however, nesting places, burrows, tracks, scat and evidence of browse were used to indicate animal presence. Deer tracks, browse, shell casings and several sets of hunter's blocks nailed into trees indicate the presence of white-tailed deer.

The upland forest is valuable habitat for white-tailed deer and other economically important game species. Adjacent pasture lands are located to the south of the study area, and usually a mix of open field and woodlot yield the most favorable wildlife conditions. Likewise, the diverse plant community, in particular the understory vegetation, provide plentiful food and adequate cover. The proximity to residential neighborhoods, however, limits the quality of the upland forest. For example, the place is heavily trafficked by people

as evidenced by a centrally located picnic table, an extinct campfire and scattered litter consisting predominantly of empty beer containers.

5.03.6 Chadakoin River Community

The only aquatic community within 0.5 miles of the former Essex facility is within the Chadakoin River (Figure 19). The surface area of the river accounts for 0.5% of the study area (2 acres or 0.004 mi²). The NYSDEC Region 9 Fisheries Manager, Stephen R. Mooradian, was contacted regarding information on the Chadakoin River aquatic community. Mr. Mooradian provided the results of an August 5, 1987 survey of fish collected from the Chadakoin River at 1) the junction of James and Second Avenues and 2) behind the County Highway Department. Lists of species identified at each location and their abundance are given in Table 23.

Based on limited water quality data (Table 14) and census data (Table 23), and a visual inspection, the Chadakoin River is eutrophic as it flows through Jamestown. This stretch of river does not support pioneering, cold water, high oxygen demanding fishes such as trout or salmon that are characteristic of oligotrophic waters. The fishery within the study area is poor. With the exception of bass fishing, angling is limited to panfish and bottom feeders.

5.04 Contaminant-Specific Impact Analysis

Criteria-specific analysis is a "first level" quantitative assessment of potential ecological impacts. It involves the comparison of observed or predicted levels of site-

related compounds in environmental media at identified receptor locations to published standards or criteria. If the site-related residues are below the criteria, then it is concluded, with a reasonable degree of certainty, that the ecological resources in the area will not be impacted. When conducting criteria analysis, it is important to keep in mind that the exceedence of criteria is not indicative of impacts, as the criteria include varying degrees of safety factors in their derivation. However, if the standards and criteria are exceeded, then further evaluation of potential impacts is considered.

Soil and ground water monitoring have shown that the site contains certain organic chemicals. A pathway analysis was performed in order to assess potential impacts of the contaminants to biota that inhabit the study region. This section of the assessment focuses on the sources of contaminants, contaminants of concern, and potential pathways of contaminant migration and exposure of receptor fish and wildlife resources.

5.04.1 Sources and Contaminants of Concern

The site was and continues to be an industrial facility used for the production of surface coatings. Ground water and soil analytical data indicate that site contamination can be traced to a few source areas. Table 24 outlines the areas of chemical release and their associated contaminants. Table 25 lists the chemicals of potential concern and their levels of detection in ground water and soil.

5.04.2 Potential Pathways of Contaminant Migration and Exposure

During the RI/FS process, the human health risk assessment determined that contact was the major route of exposure to chemicals at the site. The same is true for biota. Although many of the chemicals of concern can volatilize to air from soil, their concentrations and low total amounts suggest that volatilization is not a significant exposure route to wildlife.

The major pathway of chemical movement from the site is via ground water. Figure 6 presents the locations of the monitoring wells and their respective ground water contaminant levels. The results show that chemicals have moved from the site and that contaminated ground water has the potential to reach the Chadakoin River. Tables 26 and 27 list the maximum levels of the chemicals of concern exhibited in on-site and off-site ground water, respectively.

5.04.3 Fish and Wildlife Resources

Significant terrestrial wildlife species are not impacted by residues in soil at the site. Receptor organisms were not identified because the site does not possess suitable habitat. Likewise, very little suitable habitat occurs within a 0.5-mile radius of the site, and no pathway of chemical migration exists which can transport contaminants to the suitable habitats: the stream bank and upland forest communities.

The Chadakoin River community has been identified as a possible receptor of ground water from the site. Therefore, a criteria-specific analysis was performed to assess the level of potential impact to aquatic organisms.

5.04.4 Criteria-Specific Analysis

The previous sections established: 1) the presence of site-related compounds in ground water, 2) ground water movement as a potential pathway of migration for site-related residues, and 3) the Chadakoin River aquatic community as a potential receptor of site-related materials migrating from the site. This section utilizes numerical criteria for the contaminants of concern to evaluate the potential for those materials to reach the Chadakoin River. Table 27 compares both U.S.EPA and NYSDEC ambient water quality criteria to the maximum levels of site-related compounds detected in ground water at positions hydraulically downgradient from the site. Compounds of concern that were not detected at off-site ground water monitoring wells are assumed to not be migrating from the site, and therefore, cannot reach and expose aquatic life in the Chadakoin River. For those compounds in which maximum off-site ground water concentrations are below established regulatory criteria, no further analysis is required. Compounds whose maximum off-site ground water concentrations exceed established regulatory criteria were further evaluated to determine whether those compounds are reaching the ground water-surface water interface at the Chadakoin River and provide an estimate of their concentration at the river interface.

5.04.4.1 Immobile Compounds

The first set of compounds evaluated in the criteria specific analysis were those compounds which, due to their low water solubility

and high soil adsorption potential, are generally concluded to be "immobile" in ground water. The less mobile compounds such as bis(2-ethylhexyl)adipate, fluoranthene, phenanthrene and pyrene were not detected in ground water hydraulically downgradient from the site. Although detected in on-site soils, the analytical results indicate that these compounds have not leached into and migrated via ground water from the site. The physical-chemical properties of these compounds indicate that these compounds should not undergo subsurface transport through soil. Water solubilities at 25°C for bis(2-ethylhexyl)adipate, fluoranthene, phenanthrene and pyrene are 0.34 mg/l, 0.21 mg/l, 1.15 mg/l and 1.35E-7 mg/l, respectively (Michalenko et al. 1991). As such, water is incapable of dissolving and moving significant amounts of these compounds in solution. Furthermore, respective soil adsorption coefficients of 87, 420; 2, 830; 62, 700; and 18,800 (Michalenko et al. 1991) indicate that these chemicals favor partitioning to organic carbon contained at soil surfaces. According to the classification scheme developed by Swann et al. (1983), bis(2-ethylhexyl)adipate, fluoranthene, phenanthrene and pyrene are highly immobile compounds in soil. Because these compounds are hydrophobic and highly adsorptive, they are not likely to reach the Chadakoin River and therefore, are not considered a potential hazard to the aquatic community. Hence, the list of chemicals for further consideration only includes methylene chloride, t-1,2-dichloroethene, trichloroethene, vinyl chloride, ethylbenzene, xylene, bis(2-ethylhexyl)phthalate and naphthalene.

5.04.4.2 Compounds in Off-Site Ground Water at Levels Below Regulatory Criteria

The maximum levels of t-1,2-dichloroethene, trichloroethene, ethylbenzene, and naphthalene detected in off-site ground water during this investigation are below NYSDEC ambient water quality criteria for aquatic organisms (NYSDEC, 1991b; U.S.EPA, 1986). No U.S.EPA or NYSDEC ambient water quality criteria exist for xylene and bis(2-ethylhexyl)phthalate. However, maximum off-site ground water concentrations (12 ppb of bis(2-ethylhexyl)phthalate at MW-14S and 8 ppb of total xylenes at MW-14D) were lower than NYS ground water standards for drinking water. Toluene was not detected in off-site ground water, and is also not expected to reach the Chadakoin River. On this basis, it is assumed that these chemicals (toluene, t-1,2-dichloroethene, trichloroethene, ethylbenzene, xylene, bis(2-ethylhexyl)phthalate and naphthalene,) would not adversely effect the aquatic community within the Chadakoin River, even if the maximum observed concentrations in ground water were maintained into the river. It is likely that adsorption, dilution and degradation processes further reduce the levels of contaminants in ground and surface water, and that these compounds do not require further consideration.

5.04.4.3 Compounds in Off-Site Ground Water at Levels Above Regulatory Criteria

The maximum concentration of vinyl chloride exceeded the U.S.EPA ambient water quality criteria establishing for the consideration of human ingestion of water. U.S. EPA and NYSDEC ambient water quality criteria for aquatic life do not exist vinyl chloride. Drinking water criteria are more stringent than criteria established for aquatic life. Nevertheless, an analysis was performed to evaluate the potential consequences of these two compounds migrating to the Chadakoin River.

5.04.4.4 Method of Computing the Ground Water Transport Model

Based on the levels of vinyl chloride, (known breakdown product of trichloroethylene) exhibited at off-site monitoring wells, an evaluation of potential impacts to the Chadakoin River was performed, utilizing a simple numerical method. The average concentration of vinyl chloride (769 ppb) of the on-site ground water samples was used with the off-site maximum concentration (29 ppb of vinyl chloride at MW-14D) to linearly extrapolate the level of this compound expected to reach the river. This was accomplished by utilizing a conceptual model based on the assumption that the system has reached a steady-state. It was assumed that the reduction of contaminant concentration with distance from the source is a constant function of linear distance from the source, and that the sum effect of all adsorption and phase

partitioning, microbial-assimilation, degradation-transformation, and dilution mechanisms in ground water is represented by a single linear parameter.

The calculations involved setting two ratios equivalent to one another and solving for the unknown concentration at the Chadakoin River. The following expression was used to calculate the loss of methylene chloride and vinyl chloride in ground water:

$$\frac{\text{Ave Concn}_{\text{on-site}} - \text{Max Concn}_{\text{off-site}}}{\text{Dist}_{\text{MW}}} = \frac{\text{Max Concn}_{\text{off-site}} - x}{\text{Dist}_{\text{river}}}$$

The first proportion represents the difference between the average on-site contaminant concentration ($\text{Ave Concn}_{\text{on-site}}$) and the maximum off-site contaminant level ($\text{Max Concn}_{\text{off-site}}$) over the linear distance between on-site and off-site monitoring wells (Dist_{MW}). It approximates the observed rate of chemical loss in ground water. The second fraction represents the difference between the maximum off-site contaminant level ($\text{Max Concn}_{\text{off-site}}$) and the expected concentration at the river (x) divided by the linear distance between off-site monitoring wells and the river ($\text{Dist}_{\text{river}}$). It approximates the predicted loss of compound expected to occur based on the observed rate constant.

This simple model is conservative in its estimation of chemical breakthrough to the river because of its utilization of only positive

samples, and mean values versus maximum values. Conservative estimates of distance of ground water travel were also employed. Greater than actual values were substituted into the formula. A distance of 320 feet was used for the measure between source contaminants and off-site monitoring wells (Dist_{MW}). In fact, certain on-site and off-site monitoring wells are only 80 feet apart. In addition, a distance of 400 feet was used in the calculation as the separation between off-site monitoring wells and the river ($\text{Dist}_{\text{River}}$). The actual measure is closer to 500 ft.

5.04.4.5 Results of the Ground Water Transport Model

Despite its conservative assumptions, the model supports the conclusion that vinyl chloride present in ground water at the site are not released to the Chadakoin River at levels above criteria. Off-site concentrations an order or magnitude higher than the observed levels would be reduced below criteria at less than 250 feet from the off-site monitoring wells. Processes such as volatilization, adsorption, dilution and biodegradation will reduce contaminant levels in ground water as it migrates through sub-surface media. Even if breakthrough were to occur, the resulting concentrations in the Chadakoin River would be non-detrimental. Likewise, dilution by river water at the surface water-ground water interface would further reduce the levels in river water. Therefore, vinyl chloride is not expected to expose or otherwise impact the aquatic community.

5.05 Summary and Conclusions

An ecological assessment was performed for the site and surrounding areas according to the New York State Department of Environmental Conservation (NYSDEC) guidance document entitled Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1991a). The results of this assessment are summarized below:

1. Special resources such as significant habitats, endangered species, lakes, or wild and scenic rivers were not identified within a 2-mile radius of the site.
2. A cover type analysis determined that nearly 80% of a 0.5-mile area encompassing the site (400 of 502 acres or 0.620 of 0.785 mi²) is characterized by urban industrial, commercial-business and residential districts which are not "important" wildlife habitats as defined by NYSDEC NHP (Reschke, 1990). About one-fifth of the terrain within the study area is of value to wildlife, and of that, two terrestrial habitat types could provide the necessary life-sustaining requirements for indigenous communities. These habitat types are a thin band of stream bank vegetation along the Chadakoin River and a mixed hardwood stand to the south of the site. The only aquatic habitat within the study boundary was the Chadakoin River.
3. Based on the ground water analytical results, the chemicals of concern at the site include bis(2-ethylhexyl)adipate, bis(2-ethylhexyl)phthalate, t-1,2-dichloroethene, ethylbenzene, fluoranthene, methylene chloride,

naphthalene, phenanthrene, pyrene, toluene, trichloroethene, vinyl chloride and xylene.

4. The only pathway of chemical migration from the site is via ground water movement, and the only potentially exposed habitat is the Chadakoin River. It was concluded that none of the contaminants of concern are expected to be released to the Chadakoin River at levels above criterion that could adversely impact the aquatic community of the Chadakoin River, because these compounds are not likely to be reaching the river.

Off-site monitoring indicated that toluene and the less mobile compounds bis(2-ethylhexyl)adipate, fluoranthene, phenanthrene and pyrene were not exhibited in ground water hydraulically downgradient from the site. In addition, off-site ground water concentrations of t-1,2-dichloroethene, ethylbenzene, naphthalene and trichloroethene are below NYSDEC ambient water quality criteria for aquatic organisms. U.S.EPA and NYSDEC ambient water quality criteria do not exist for xylene and bis(2-ethylhexyl)phthalate. However, their maximum off-site ground water concentrations were lower than NYS ground water standards for drinking water, which are more stringent than criteria for aquatic life.

Only U.S.EPA ambient water quality criteria for drinking water was available for vinyl chloride. Off-site maximum ground water concentrations in select monitoring wells exceed these values. A conservative model, based on the assumption that the site is at a steady state and loss of contaminant is a constant function of linear distance from the source, predicted that vinyl chloride is not being discharged to the river, nor is discharge expected in the future. Even if vinyl chloride

was observed at current maximum off-site ground water concentrations, these levels would be below safety and health standards for humans and aquatic organisms. Moreover, adsorption, dilution and degradation processes further reduce or eliminate the levels of contaminants in ground and surface water. An additional margin of safety would be introduced by the dilution offered by the Chadakoin River to any ground water borne residues discharged to that water body.

SECTION 6 - RISK ASSESSMENT

6.01 Overview

This report presents a baseline³ assessment of the potential human health hazards which may be associated with the site. Due to the lack of NYSDEC methodology for conducting risk assessments, this assessment was conducted in accordance with United States Environmental Protection Agency (EPA) guidelines and procedures, as presented in the following guidance documents:

Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors" (U.S.EPA 1991),

Guidance on Risk Characterization for Risk Managers and Risk Assessors (U.S.EPA 1992).

Guidelines for Exposure Assessment (U.S.EPA 1992) (57 FR 104, May 29 1992).

Consistent with these guidelines, the assessment was conducted in the following five phases:

- 1) Characterization of Exposure Setting - The first step in the assessment process is to characterize the site with respect to its physical characteristics as well as those of the human populations on or near the site. The output of this

³ In a baseline exposure assessment, current and future exposures are evaluated assuming no site remediation.

step is a qualitative evaluation of the site and surrounding populations with respect to those characteristics that influence exposure.

2) Data Evaluation - The objective of the data evaluation step is to organize the data into a form appropriate for use in the assessment and to evaluate the quality of the data for risk assessment purposes.

3) Exposure Assessment - In the exposure assessment, the pathways by which receptors may be exposed to on-site chemicals are identified, and exposure point concentrations of the chemicals are estimated for each complete exposure pathway. Exposure point concentrations may be estimated directly from detected on-site concentrations, or may be estimated through the use of environmental fate and transport models.

4) Toxicity Assessment - In the toxicity assessment, available toxicological data for site-related compounds are reviewed. Dose-response relationships between the extent of exposure and the potential occurrence/severity of potential adverse health effects is estimated.

5) Risk Characterization - In the risk characterization step, the toxicity and exposure assessments are integrated into quantitative expressions of potential human health risk. Potential carcinogenic and non-carcinogenic health effects are characterized using chemical specific toxicologic reference data.

In the opinion of O'Brien & Gere Engineers, Inc., the risks calculated and presented in this assessment are not a numerical presentation of actual risks to humans represented by the site. The values presented in this Report are a reflection of the methodology developed by the U.S. EPA. Inherent in this standard methodology for conducting risk assessments is the generation of risk values which

are designed to overestimate actual site risks by utilizing standard assumptions and conventions. However, because they are generated by a "standardized" procedure, the risk values are useful as a basis for comparison between sites investigated, as well as a basis for identifying remedial objectives.

6.02 Site Characterization

A detailed discussion of the site history and results and conclusions of previous investigations at the site are provided in Section 1 of this Report. The key elements of the site are summarized below.

6.02.1 Physical Characteristics

The site is located in an area that is zoned for industrial use. The site is partially fenced, therefore access to the site is not restricted during non-working hours. The site is surrounded by industrial, residential, and agricultural land. Currently, local ground water is not used as a potable supply since there are no domestic water supply wells in the vicinity of the site, and the surrounding area is serviced by municipal water.

Detailed climatologic, meteorologic, and vegetation data for the site and surrounding area and discussions of the regional geology, hydrogeology, and surface water bodies are presented in previous sections of this report. A brief discussion of these characteristics is presented here.

The geology beneath the site is within the Chautauqua Valley of the Appalachian Plateau in Western New York. The Chadakoin River, which drains the local area, exists approximately 800 feet north of the site, flows to

the northeast and joins with Cassadaga Creek approximately three miles to the east. Based on the local topography and the subsurface hydrogeologic conditions, general ground water flow in the area is to the north towards the Chadakoin river. The unconfined ground water at the site likely discharges to the Chadakoin River. This means that there is limited potential for the future installation of ground water supply wells hydraulically downgradient of the site.

6.02.2 Potential Receptor Populations

Approximately 50 industrial workers are present on-site. In addition, there are residential properties located to the north, east, and west of the site. Since the site is partially fenced, it is possible that unauthorized individuals may occasionally trespass at the site. Current on-site populations consist of industrial workers and occasional on-site trespassers.

6.02.3 Future Conditions

It is expected that the site conditions in the foreseeable future will remain the same as the current conditions.

6.02.4 Nature and Extent of Contamination

The most common chemicals used in production and operation at the facility were toluene, xylene, and methyl ethyl ketone, which were stored in underground storage tanks. Other chemicals of potential concern include heating fuel oils which were stored in underground storage tanks located in

the southwest part of the site until 1984. Chlorinated solvents, including trichloroethylene, have reportedly been utilized at the site by a previous operator, Hopes Architectural Products, Inc. A brief discussion of the nature and extent of contamination at the site is presented here. The discussion is based on ground water and soil sampling and analysis data generated during the RI. A detailed discussion of the nature and extent of contamination at the site is presented in Section 4 of this report.

1. A stained soils area located west of the active aboveground storage tank farm was identified as containing bis(2-ethylhexyl)adipate (adipate) and related compounds. The adipate residues in the soils were confined to the visible surface stained soil area, which was completed as part of an IRM in June 1992 at the site.
2. The soils at the previously closed UST area have been identified as containing xylene, ethylbenzene, and toluene residues. The soil contamination primarily occurs in sub-surface soils (< 2 feet) in this area, and is confined to an approximate area of 4,000 m² in the vicinity of the previously closed UST area. Ground water monitoring data indicates that xylene, ethylbenzene, and toluene residues have migrated to ground water from this area.
3. The north parking lot sump area has been identified as containing trichloroethylene and other chlorinated hydrocarbon residues in soils and ground water. It is believed that the chlorinated solvents present are related to past uses of trichloroethylene at the site by Hope's. (MW-3) on-site within the north parking lot sump area. However, the

potential extent of PCB contamination in soils at the site has not been defined.

6.03 Data Evaluation

The objectives of the data evaluation step are to evaluate the quality of analytical data for use in the risk assessment. In addition, the detected on-site concentrations are compared with naturally occurring background concentrations and appropriate regulatory standards. The result of the data evaluation is a list of compounds that may be of potential regulatory concern at the site. The identified compounds are carried through the exposure assessment and risk characterization steps. Significant data gaps, if they exist, are also identified during the data evaluation.

The following factors were examined in the data evaluation process, and in the development of a data set for the risk assessment.

1. Evaluation of sampling locations/sampled media/ and analytical methods;
2. Comparison of on-site detected concentrations with background levels; and;
3. Comparison of detected concentrations of site-related residues with SCGs.

6.03.1 Evaluation of Sampling Locations/Sampled Media/Analytical Methods

A detailed discussion of the media sampled during the RI is presented in Section 3 of this report, and is briefly summarized below. Samples were collected from environmental media which potentially may be affected by the site. Sampling procedures and quality assurance/quality control (QA/QC) methods are presented in Section 3.

Soil - A detailed description of the soil sampling strategy is presented in Section 3. A statement of the soil sampling strategy and analytical methods used is presented below. Soil samples were collected from areas of potential concern at the site. The sampling areas were identified based on the results of a soil vapor study conducted on-site in July and August, 1989, visual observations, and site history.

1. In August 1989, 34 samples were collected from 17 soil borings on-site (Figure 4) and were analyzed for VOCs. Two soil borings were also analyzed for semi-volatile organic compounds.
2. In February 1990, four soil samples were collected from three locations in a test pit in the north parking lot sump area and were analyzed for VOCs.
3. In January 1990, 11 samples were collected from five test pits in the vicinity of five previously closed USTs and were analyzed for VOCs.
4. In January 1990, five samples were collected from five locations in an area of a former bis(2-ethylhexyl)adipate (adipate) spill and were analyzed for adipates.

The chemicals detected in on-site soils, and the concentrations they were detected at are summarized in Table 28.

Ground Water - A complete description of the ground water sampling strategy is presented in Section 3. The ground water monitoring well locations are indicated on Figure 5. In summary, in August 1989 and January 1990, two rounds of ground water sampling for VOCs were conducted. A third round of ground water samples for VOCs, semi-volatiles and pesticides/PCBs, and inorganics was collected during February, 1992. Resampling efforts for semi-volatiles and VOCs from select monitoring wells occurred in April 1992 and July 1992, respectively.

The chemicals and their ranges which were detected in the ground water samples are summarized in Table 29, and are indicated on Figures 6, 7, and 8.

Background ground water samples were also collected on-site from two monitoring wells (MW-1 and MW-5) installed hydraulically upgradient of areas of industrial activities.

6.03.2 Comparison of On-Site Concentrations with Background Levels

Consistent with U.S.EPA guidance (U.S.EPA 1989), the concentrations of naturally occurring compounds (inorganic compounds) detected in site ground water were compared with background levels for those compounds in the vicinity of the site⁴. For the purposes of this analysis, the upgradient

⁴ Inorganic compounds were not analyzed for in soil samples collected from the site.

monitoring wells, MW-1 and MW-5, are classified as background wells at the site. However, it should be noted that these wells may not represent "uncontaminated" ground water at the site, since VOC residues were reported in samples collected from MW-1 and MW-5 (Figure 5).

The following approach was taken to determine if the on-site and downgradient concentrations of inorganic chemicals in ground water were significantly greater than the reported concentrations in the upgradient wells.

1. The statistical distribution of the metal concentrations detected in on-site monitoring wells were evaluated using stem and leaf plots and normal probability plots. In general, the distributions were significantly non-normal left skewed distributions. Since naturally occurring elements in environmental samples are commonly distributed as log-normal distributions, the natural log of the detected concentrations was calculated to obtain a normal distribution of the on-site data (Appendix I). Consistent with U.S.EPA (1989) guidance, non-detect values were assigned a value of one half the detection limit.
2. The mean and standard deviation of the natural log transformed data was calculated. A lower tolerance limit for the on-site concentrations was then established as the mean of the log transformed data minus two standard deviations. The exponent of the log transformed lower tolerance limit was then computed to give the lower 95 percentile of the detected on-site concentrations.
3. The lower tolerance limit of the on-site data was compared with the concentrations reported for the two background wells. If the lower

tolerance limit exceeded the background concentrations, it was concluded that there was > 95 % probability that a randomly selected on-site well would exceed the reported background concentration. If the lower tolerance limit was less than or within the reported background levels, it was concluded that there was < 95 % probability that a randomly selected on-site well would exceed the background concentrations, and therefore there would be no statistically significant difference between on-site concentrations and background levels.

The results of the background comparison for inorganic compounds in on-site wells are given in Appendix I. The calculated lower tolerance limits were less than the reported background concentrations. Therefore, it was concluded that there is insufficient evidence to indicate that the on-site ground water concentrations of inorganic compounds wells are greater than the reported background levels for the area.

6.03.3 Comparison of Detected Concentrations of Site-Related Residues with SCGs

In order to refine the list of chemicals of potential concern present at the site, detected on-site concentrations were compared to applicable or relevant and appropriate State Standards, Criteria and Guidelines (SCGs). Detected ground water concentrations were compared with Federal Maximum Contaminant Levels or U.S.EPA Guidance Values for drinking water. There are no SCGs for soil concentrations currently published by U.S.EPA. The State of New York has published preliminary soil cleanup criteria in a draft

Cleanup Policy and Guidance Document. However, the published soil standards have not been finalized, and therefore are not used as SCGs for the site in this assessment.

The detected on-site concentrations are given on Table 26.

6.03.4 Selection of Compounds of Potential Concern

A list of compounds of potential concern at the site was developed consistent with U.S.EPA methodology. Based on the U.S. EPA methodology, detected on-site compounds were eliminated from potential consideration if they were exhibited infrequently and at low concentrations. Based on these considerations, the VOCs and semi-volatile organic compounds marked with a "+" on Table 29 were eliminated from further consideration in the risk assessment. The VOCs and semi VOCs not eliminated via this process were identified as compounds of potential concern.

U.S.EPA guidance also indicates that naturally occurring compounds may be eliminated from further consideration if they are essential nutrients, are present at concentrations only slightly elevated above naturally occurring levels, and are toxic only at very high doses. Based on these considerations, iron, magnesium, potassium, calcium, and sodium were eliminated as chemicals of potential concern.

Naturally occurring chemicals may also be eliminated if the on-site concentrations are not significantly greater than background levels. As discussed in section 6.03.2, the on-site concentrations of inorganic compounds were not significantly greater than the reported concentrations in up-gradient

wells. However, it should be noted that these wells may not represent "uncontaminated" ground water at the site, since VOC residues were reported in samples collected from wells MW-1 and MW-5.

Based on the considerations discussed above, a list of compounds of concern was developed (Table 25). The identified compounds were carried through the risk assessment process.

6.03.5 Identification of Data Gaps

Based on the Data Evaluation, the following data gaps were identified:

1. The basis for the relatively high concentrations of metals detected in on-site and upgradient monitoring wells have not been established. A second round of sampling, and collection of further background information relating to regional ground water quality would facilitate this evaluation.
2. PCB residues were detected in one on-site monitoring well. However, the potential source of PCB residues, and the vertical and areal extent of PCB contamination in on-site soils has not been defined. ✓

6.04 Exposure Assessment

In the exposure assessment, the mechanisms by which receptors may be exposed to the chemicals of potential concern present at or migrating from the site are identified, and the concentrations of the chemicals to which receptors may be exposed are estimated. The exposure assessment is conducted in the following sections:

1. Characterize Exposure Setting
 - a. Characterize physical environment
 - b. Identify potentially exposed populations
2. Identify/Evaluate Exposure Pathways
 - a. Exposure pathway analysis
3. Quantify Exposure
 - a. Estimate exposure point concentrations
 - b. Determine Intake Variables
 - c. Calculate estimated chemical intakes by receptors

U.S.EPA recently updated the guidance relating to exposure assessment activities (Guidelines for Exposure Assessment (U.S.EPA 1992) (57 FR 104, May 29 1992)). The updated guidance specifically directs U.S.EPA risk assessors to present a "full characterization" of the calculated risk including the "average risk" "high end risk" , and "upper bound" risk. Risk assessments would therefore allow more informed risk management decisions which are based on more plausible risk calculations. A more detailed discussion of the current U.S.EPA exposure assessment methodology is presented in Appendix L.

Average risks refers to the calculated risk estimate that would apply to most of the individuals in the exposed population. The Average Estimate can be derived by using average values (usually the median value) for all the exposure factors. High end risk refers to the top 90th percentile of the calculated risk distribution. The high end risk value is intended to be a plausible estimate of the risk level for those individuals at the upper end of the risk distribution. The high end risk estimate may be derived by conducting a mathematical simulation technique known as a Monte

Carlo simulation. The high end risk estimate may be selected as the upper 90th percentile of the final risk distribution generated by the Monte Carlo simulation. Bounding estimates represent a "worst case" scenario for the risk estimate. The bounding estimate may be used to develop a statement that the risk "does not exceed" the calculated bounding value. The bounding estimate is calculated by applying "highly conservative" assumptions in calculating the risk value. The actual probability that any individual in the population would be subject to the combination of conservative exposure assumptions is extremely small, and usually so small so as to be a practical impossibility.

6.04.1 Characterization of Exposure Setting

The first step in evaluating exposure is to characterize the site with respect to its physical characteristics, as well as those of the human populations on and near the site. The output of this step is a qualitative evaluation of the site and surrounding populations with respect to those characteristics that influence exposure. Information gathered during this step supports the identification of exposure pathways in Section 6.04.2.

The following summarizes the key aspects of the site and its surroundings:

1. The site is an active industrial facility situated in Jamestown, New York (population = approximately 35,700);
2. The site is an industrial facility used for the production of surface coatings. Many solvents are utilized in the manufacturing processes.

The more common chemicals used in the production processes include toluol, xylol, methyl ethyl ketone, and di-n-octyl phthalate;

3. Historically, heating fuel oil were stored in an underground tank. In approximately 1986, the underground tank was abandoned and filled with cement;
4. An aboveground tank farm (set on a gravel base) was installed in the vicinity of the underground heating oil tank to store the materials used during production. The aboveground tank farm was removed from operation in 1986. Currently, an aboveground tank farm (set on a concrete base) is used for storage of production materials, as illustrated on Figure 9;
5. Past practices by Hope's involving the use of trichloroethylene are evident in the area of the north parking lot sump;
6. Access to the site is not limited; therefore, trespassers may gain access to the site;
7. Approximately 50 industrial workers are present on-site;
8. The site is surrounded by industrial, residential, and agricultural land uses;
9. Local ground water is not used as a potable supply; and,
10. The nearest surface water body is the Chadakoin River, which is located approximately 800 feet to the north of the site.

Identification of Potential Receptor Populations

As discussed in Section 6.02.2, the following receptor populations were identified at the Site :

- a) On-Site workers
- b) On-Site trespassers (child)
- c) Off-site residents

6.04.2 Identification/Characterization of Exposure Pathways

An exposure pathway describes the course a chemical takes from the source to the exposed individual. An exposure pathway analysis links the sources, locations, and types of environmental releases with population locations and activity patterns to determine the significant pathways of human exposure.

An exposure pathway generally consists of four elements:

1. A source and mechanism of chemical release;
2. A retention or transport medium;
3. A point of potential human contact with the contaminated medium (referred to as the exposure point); and,
4. An exposure route (e.g., ingestion) at the contact point.

Possible release sources, release mechanisms, and receiving media were identified for past, current, and future releases. It was determined that soil, ground water, and air are potential receiving media for compounds of potential concern.

Following the identification of potential sources, release mechanisms, and receiving media, complete exposure pathways were identified (see Table 30). A pathway is considered to be complete if there is:

1. A source or chemical release from a source;
2. An exposure point where contact can occur; and,
3. An exposure route by which contact can occur.

If these conditions are not met, the pathway was classified as incomplete. Incomplete pathways are not considered further in the risk assessment. The results of the exposure pathway analysis are presented on Table 30 and summarized below:

Soil

On-Site - Under current and future land uses, the soil exposure pathway via incidental ingestion and dermal absorption was determined to be complete at on-site locations. Under current and future land uses, on-site workers may contact chemical residues in site surface soil during occasional outdoor job-related activities. In addition, on-site trespassers may contact chemical residues in site surface soil during site trespass.

Off-Site - Under current and future land uses, the soil exposure pathway via incidental ingestion and dermal absorption was concluded to be incomplete at off-site locations. Based on the degree of ground cover, significant quantities of site contaminants are not expected to be transported off-site. Therefore, site-related soil contamination is not expected off-site.

Surface Water - Under current and future land uses, it was concluded that the surface water exposure pathway via ingestion, dermal absorption, and fish

ingestion in the Chadakoin River is incomplete. This conclusion was based on the premise that the contaminants of potential concern have not migrated to the Chadakoin river. Based on the currently available data, it appears that the contaminant plume is being attenuated to undetectable concentrations by natural mechanisms (dilution, biodegradation) before it reaches the river (refer to Section 5.04).

Sediments - Under current and future land uses, it was concluded that the sediment exposure pathway via ingestion and dermal absorption in the Chadakoin River is incomplete.

Ground Water - Under current land uses, it was determined that the ground water exposure pathway via ingestion, dermal absorption, and inhalation is incomplete at on-site and off-site locations. Although chemical residues were detected in site ground water, a ground water receptor population was not identified. The Jamestown Board of Public Utilities was contacted and queried as to whether or not local ground water is used as a potable water source for the Jamestown area. Mr. Randy Peterson, P.E., Board of Public Utilities, indicated that a municipal water supply is used for all potable water needs in the area. The public water supply is obtained from well fields located in the Towns of Falconer and Kennedy, the closest field being approximately two miles from the former site. In addition, based on available information, both of these well fields appear to be upgradient of the site. Therefore, ground water originating at the site is not expected to migrate to the well fields. Because local ground water is not being used, ground water

related exposures are not possible, and are therefore concluded to be incomplete.

Under future land uses, the off-site ground water pathway was classified as complete since it was assumed that domestic ground water wells may be installed hydraulically downgradient of the site in the future. Potential receptor populations are off-site adult and child residents.

Air - Under current and future land uses, it was concluded that the air exposure pathway via inhalation is complete at on-site and off-site locations. VOCs are present in site surface soil and ground water, and may volatilize to the air. Potential receptor populations are on-site workers, on-site trespassers, and off-site residents.

Biota - Under current and future land uses, it was concluded that the foodchain pathway via ingestion of biota is incomplete. This conclusion was based on the fact that game animals are not present on-site or in its vicinity.

6.04.3 Quantification of Exposure

The next step in the exposure assessment was to quantify the magnitude, frequency, and duration of exposure for the complete exposure pathways. First, exposure concentrations were estimated, then pathway-specific intakes were quantified.

Estimation of Exposure Point Concentrations

Exposure point concentrations were estimated for the complete exposure pathways identified in this section. The exposure point concentrations for the soils, ground water, and air at the site are given on Table 31.

Consistent with current U.S.EPA guidance, "average" and "upper bound" exposure point concentrations were estimated. The methods used to calculate the exposure point concentrations for soil, ground water, and air are presented below and summarized in Appendix M.

Soil - Consistent with current U.S.EPA guidance (U.S.EPA 1992), an average exposure point concentration was calculated as the mean concentration detected in on-site samples, and an upper bound exposure point concentration was calculated as the upper 95 % confidence limit on the mean (or the maximum detected concentration if the upper 95 % confidence level exceeds the mean).

Ground Water - An average exposure point concentration was calculated as the mean concentration detected in off-site wells, and an upper bound exposure point concentration was calculated as the upper 95 % confidence limit on the mean (or the maximum detected concentration if the upper 95 % confidence level exceeds the mean).

Air - An air pathway analysis was conducted according to methods presented in U.S.EPA guidance for conducting air pathway analyses (U.S.EPA 1989, Procedures for Conducting Air Pathway Analyses for Superfund Applications, EPA-450-1-89-001 to 004). A detailed description of the procedures and assumptions regarding the air pathway analysis are presented in Appendix N. A brief summary of the approach used to estimate the air exposure point concentrations is presented below :

1. Baseline emission rates for VOCs in on-site soils were calculated using the SEAMS land treatment model for estimating the average emission

of volatile chemical residues applied to soils (U.S.EPA 1990). The SEAMS land treatment model was also applied to estimate the average emission rate from ground water. The assumptions and calculations made in estimating baseline emission rates at the site are given in Appendix N. Average emission rates were calculated using the average on-site soil and ground water concentrations, and the upper bound emission rates were based on the upper bound on-site soil and ground water concentrations.

2. Based on the calculated emission rates, the TSCREEN dispersion model on U.S.EPA's Air Quality Bulletin Board was used to estimate chemical specific centerline air concentrations at 10 M, 100 M, and 1000 M from the source. For on-site air exposures, it was assumed that the exposure point would occur at 10 M from the source, and for off-site exposures it was assumed that the exposure point would occur 100 M from the source.

It should be noted that the exposure point concentration generated using the Air Pathway analysis are highly conservative estimates of potential exposure concentrations. This point is discussed in greater detail in Appendix N.

6.04.4 Calculation of Chronic Daily Intakes

Chronic Daily Intakes (CDI) for receptors exposed via the following exposure pathways were calculated using the intake equations and parameter estimates given on Tables 38 to 42.

Exposure Pathway	Potential Receptors	Potential Exposure Route	Table No.
Direct Contact With On-Site Surface Soil	On-Site Worker On-Site Trespasser	Incidental Ingestion	38
		Dermal Uptake	39
Direct Contact with On-Site Sub-Surface Soils	On-Site Worker	Incidental Ingestion	40
		Dermal Uptake	40
Inhalation of Ambient Air	On-Site Workers, On-Site Trespasser, Off-Site Resident	Inhalation	41
Ingestion of Off-Site Ground Water	Off-Site Residents	Ingestion	42

Consistent with current U.S.EPA guidance, exposure scenarios were determined for "average" exposures, and "bounding" exposures (U.S.EPA 1992). Summary tables showing the calculated CDIs are given on Tables 43 to 46.

6.05 Toxicity Assessment

In the toxicity assessment, available toxicological data summaries for site related compounds are reviewed and the relationship between the extent of exposure to a specific contaminant and the increased likelihood and/or severity of adverse effects are estimated. The potential toxicologic effects induced by a given dose of a chemical are classified according to two criteria : carcinogenic effects, and non-carcinogenic effects.

1. Non-carcinogenic Effects - Exposures to chemicals which cause non-carcinogenic health effects are evaluated based on the notion that there is a dose level at and below which no adverse health effects would be expected to occur (threshold effect). Using animal and/or human dose response information, the U.S. EPA estimates the dose for

specific chemicals which would represent the dose at which the toxicity threshold for humans would occur. These dose levels are referred to as Reference Doses (RfD's). If the calculated dose (or intake) to the receptor is less than the published RfD, then it is believed that there will be no adverse non-carcinogenic toxicologic effects related to the exposure. Toxicity data for inhalation exposures are often presented as Reference Concentrations (RfC's) rather than RfD's. The RfC for a given chemical is derived from a No Observed Adverse Effect Concentration (NOAEC) from animal experiments in which the animals were exposed to a given air concentration over a certain exposure profile. The calculated RfC takes into consideration the delivered dose of the compound to potential target organs. However, due to the possible dependency of the delivered dose on the specific exposure pattern, the RfC should may not be applicable in situations where the receptor's exposure profile is not similar to the exposure profile in the animal experiments.

2. Carcinogenic Effects - The U.S. EPA assumes that there is no threshold dose for carcinogenicity, i.e. there is no dose of a carcinogenic substance that is associated with zero risk. This is a conservative assumption that may or may not be valid, as the concept of no threshold for carcinogenic effects has not been demonstrated via laboratory animal studies or human epidemiological information. Due to the uncertainties inherent in extending animal data to humans, the U.S. EPA calculates slope factors after incorporating safety factors

which are designed to protect the public health. This means that expected cancer rates calculated using the U.S. EPA's potency factors represent "worst case" estimates, i.e. the actual cancer rate is expected to be lower than the calculated estimate.

For inhalation exposures, the U.S.EPA publishes inhalation unit risks rather than slope factors. The potential lifetime risks for a given inhalation exposure is calculated by multiplying the unit risks by the estimated air exposure point concentration. The unit risk is calculated based on the expected delivered dose of the chemical to the target organ in question, and therefore incorporates species specific pharmacokinetics information. Due to the possible saturation of controlling pharmacokinetics factors, the dose response relationships governing the delivered dose may become non-linear above a certain critical air concentration. As such, the published inhalation unit risk should not be used if the calculated air concentration exceeds the published critical concentration. In most cases, exceedence of the critical air concentration indicates that more specific pharmacokinetics data would need to be incorporated into the risk assessment in order to evaluate the possible health effects.

6.05.1 Toxicity Profiles

Brief synopses of the human toxicological effects of chemicals of potential concern at the site, including Rfd's and cancer slope factors published by U.S.EPA, are presented below. These synopses were compiled from the U.S.EPA IRIS database, which contains toxicologic reference data, standards, and health advisories for specific chemicals. Summary tables of

toxicologic reference data for selected site compounds are given in Tables 47 and 48.

Benzene

Benzene is a recognized human carcinogen. Several epidemiologic studies have provided sufficient evidence of a causal relationship between benzene exposure and leukemia in humans. Benzene is also a known inducer of aplastic anemia in humans, with a latent period of up to ten years. The U.S. EPA has classified benzene as a class A carcinogen (known human carcinogen), and has published a cancer potency factor of $2.9\text{E-}02$ (mg/kg/day) for the quantitative estimation of the cancer risk from low level oral exposure to benzene. For inhalation exposures, U.S.EPA has published an inhalation unit risk of $8.3\text{E-}06$ (ug/m³)⁻¹, with a critical concentration of 100 (ug/m³).

Toluene

In humans, the inhalation of high concentrations of toluene is associated with central nervous system depression. Chronic low-level inhalation exposure to toluene has been associated with nervous system effects in experimental animals. Based on the potential nervous system effects, the U.S.EPA has published a chronic RfC for toluene of $4\text{E-}01$ mg/m³. However, this value is currently under review at U.S.EPA and may be subject to change. Chronic oral exposure to toluene has been associated with a reduction in weight gain in experimental animals. The current oral chronic RfD for toluene published by U.S.EPA is 0.2 mg/kg/day (IRIS 1992).

Ethylbenzene

Exposure to high doses of ethylbenzene via inhalation in experimental animals has been associated with renal, hepatic, neurological, and developmental effects. Based on a NOAEL for developmental effects in rats, the U.S.EPA has published an inhalation RfC of 1.0 (mg/m³) for ethylbenzene. However, it should be noted that this RfC refers to possible adverse effects following repeated 7 hour exposures of female rats during gestational days 1-19. The published chronic RfC may not be applicable if the exposure pattern of human receptors is different to the exposure pattern of the experimental animals. Chronic oral exposure to toluene has been associated with liver and kidney toxicity in experimental animals. U.S.EPA has published a chronic oral RfD for ethylbenzene of 0.1 mg/kg/day. U.S. EPA has classified ethylbenzene as a group D agent with respect to potential carcinogenicity (insufficient evidence for carcinogenicity).

Total Xylenes

High level acute and chronic xylene exposures in humans may be associated with respiratory effects following inhalation, and neurological effects including impaired reaction times, impaired short term memory, and alterations in equilibrium and body balance. Acute and/or chronic oral xylene exposures in animals have been related to cardiovascular, hepatic, renal, neurological, and developmental effects. U.S. EPA has published a reference dose (RfD) for oral ingestion of xylene of 2 mg/kg/day. Currently, the chronic inhalation RfC for xylenes is under review at U.S.EPA, and is not

considered verifiable by the U.S.EPA RfD/RfC work group. U.S. EPA has classified xylene as a group D agent with respect to potential carcinogenicity.

1,1-Dichloroethane (1,1-DCA)

There is limited data regarding the chronic non-carcinogenic effects of 1,1-DCA on laboratory species. U.S.EPA has published a chronic oral RfDs for 1,1,-DCA of 0.1 mg/kg/day. The U.S. EPA has classified 1,1-DCA as a possible human carcinogen (Level C). However, the slope factor and inhalation unit risk for 1,1,DCA are currently under review at U.S.EPA.

1,1,1 - Trichloroethane (1,1,1 TCA)

Animal studies suggest that dose dependant liver toxicity, CNS effects, and slight growth retardation effects may be induced by 1,1,1, TCA. Based on animal data, U.S.EPA has published a reference dose (RfD) of 0.09 mg/kg/-day for 1,1 TCA. According to U.S.EPA, there is currently insufficient evidence to indicate that 1,1 TCA may be carcinogenic in animal or human populations (group D carcinogenicity classification).

1,1 - Dichloroethylene (1,1-DCE)

According to U.S. EPA, liver toxicity is considered to be the principal toxicologic effect of 1,1, DCE in experimental animals, and rats are considered to be the most sensitive species. U.S. EPA has published a RfD for oral ingestion of 1,1, DCE of 0.009 mg/kg/day. Based on suggestive evidence of carcinogenicity in animal studies, U.S. EPA has classified 1,1, DCE as a group C carcinogen (possible human carcinogen), and published an oral slope factor for carcinogenic effects of $0.6 \text{ (mg/kg/day)}^{-1}$.

Dichloromethane

Dichloromethane induces dose dependant lesions effects in the liver which is considered to be the primary target organ for dichloromethane toxicity. Based on animal dose response data, the U.S.EPA has published a chronic oral Rfd for dichloromethane of 0.02 mg/kg/day. The potential carcinogenic classification for dichloromethane is currently being evaluated by the U.S.EPA.

Tetrachloroethylene (PCE)

Tetrachloroethylene induces dose dependant toxic effects in the liver which is considered to be the primary target organ for PCE toxicity. Based on animal dose response data, the U.S.EPA has published a chronic oral Rfd for PCE of 0.01 mg/kg/day. The potential carcinogenic classification for PCE is currently being evaluated by the U.S.EPA.

Trichloroethylene (TCE)

Trichloroethylene has been classified as a B2 carcinogenic agent by U.S.EPA based on sufficient evidence for carcinogenicity in experimental animals. Based on quantitative dose response information, U.S.EPA has published a cancer potency factor of $0.07 \text{ (mg/kg/day)}^{-1}$.

t-1,2-Dichloroethene (t-1,2-DCE)

T-1,2-Dichloroethene has been shown to induce dose-dependant liver toxicity and immunologic effects in rats. The U.S.EPA has published a chronic oral Rfd for t-1,2-DCE of 0.02 mg/kg/day based on the induction of liver toxicity. There is no data currently published by U.S.EPA regarding the potential carcinogenic effects of t-1,2-DCE.

6.05.2 Uncertainties

There are varying degrees of uncertainty associated with toxicity values used in the risk assessment. For EPA-verified RfDs obtained from IRIS, a statement of the confidence that the evaluators have in the RfD is presented.⁵ In addition, the uncertainty factor (UF) for each RfD is identified. For slope factors, the EPA weight-of-evidence classification is presented.

6.06 Risk Characterization

In this section of the risk assessment, the toxicity and exposure assessments are summarized and integrated into quantitative and qualitative expressions of risk. To characterize potential non-carcinogenic effects, comparisons are made between projected intakes of substances and toxicity values; to characterize potential carcinogenic effects, probabilities that an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response information.

6.06.1 Absorption Adjustments

To compare exposure estimates (calculated in Tables 38-41) to toxicity values (presented in Tables 47 and 48), both must be either expressed as absorbed doses or both expressed as intakes (administered doses). Except for the dermal route of exposure, the exposure estimates developed in Tables 38-41 are in the form of intakes, with no adjustments made for absorption. The

⁵ This is not reflective of the degree of confidence held by O'Brien & Gere Engineers, Inc. in these values.

exposure estimates for dermal exposure are expressed as the amount of substance absorbed per kg body weight per day. Therefore, it was necessary to adjust toxicity values expressed as administered doses to absorbed doses for comparison with the dermal exposure estimates. In the absence of chemical-specific absorption information, a relatively conservative assumption of 25% oral absorption was used (EPA 1989a).

6.06.2 Quantifying Risks

For non-carcinogenic effects, the estimated Chronic Daily Intakes (CDIs) are compared with appropriate RfDs published by U.S.EPA. The ratio of the CDI/RfD is termed the Hazard Quotient for the chemical. Chemical specific Hazard Quotients are summed for chemicals that exert adverse effects on the same target organ(s). If the Hazard Index is less than 1, then no adverse non-carcinogenic toxic effects are expected to result.

To evaluate potential carcinogenic effects, the estimated CDIs are multiplied by chemical specific slope factors published by U.S.EPA. The resultant product is a unit less value reflecting the theoretical "risk" of an individual developing cancer in exceedence of the cancer risk from other causes. In general, excess cancer risks less than 10^{-4} to 10^{-6} are considered by U.S.EPA to be acceptable risk levels, depending on the specific circumstances of the Site.

Potential health risks were quantified for the following receptor groups:

- a. On-site workers

- b. On-Site trespasser
- c. Off-Site residents (adult and children)

A discussion of the potential health risks to the receptor populations given above is summarized in Tables 49 to 56 and discussed below.

a) On-Site Workers - The total calculated average Hazard Index for on-site workers is 8.35, and the total calculated upper bound Hazard Index is 10.7 (Table 53). As shown on Table 53, the calculated Hazard Index exceeds 1 due to the estimated on-site air concentrations of xylene, ethylbenzene, and toluene. The calculated "average" cancer risk⁶ calculated for on-site workers is 3.49E-04, and the calculated "upper bound" cancer risk for on-site workers is 2.05E-03. As shown on Table 49, the main contributor to the calculated cancer risk are the calculated ambient air concentrations of VOCs.

It should be noted that the calculated air concentrations are based on conservative air quality emission and dispersion parameters. In addition, the calculated air concentrations represent the downwind centerline concentrations (assuming steady state emissions), and would be expected to be much lower at other locations at the site. Therefore, the actual Hazard Index and cancer risk for on-site workers is expected to be significantly lower than the calculated estimate.

⁶ The numerical risk is not truly representative of probability, but is a product of the U.S. EPA risk assessment process. The risk value is not a means of predicting human health impacts, but is useful for comparing to remediation goals.

b) On-Site Trespasser - The total calculated average Hazard Index for on-site trespassers is 8.35, and the total calculated upper bound Hazard Index is 10.7 (Table 54). As shown on Table 53, the calculated Hazard Index exceeds 1 due to the estimated on-site air concentrations of xylene, ethylbenzene, and toluene. The calculated "average" cancer risk calculated for on-site trespassers is $3.49\text{E-}04$, and the calculated "upper bound" cancer risk for on-site workers is $2.05\text{E-}03$ (Table 50). As shown on Table 50, the main contributor to the calculated cancer risk are the calculated ambient air concentrations of VOCs.

Consistent with U.S.EPA methodology, the Hazard Indices and cancer risks for inhalation exposures were calculated by comparing the ambient air concentration with the published RfC or unit risks respectively. The RfCs and unit risks published by U.S.EPA are based on animal studies in which animals are continuously exposed for extended time periods. On-site trespassers are expected to be exposed for brief time periods for a limited exposure duration. Therefore, the calculated HIs and cancer risks for on-site trespassers would significantly overestimate the actual health risks.

In addition, it should be noted that the calculated air concentrations are based on conservative air quality emission and dispersion parameters. In addition, the calculated air concentrations represent the downwind centerline concentrations (assuming steady state emissions), and would be expected to be much lower at other location at the site.

c) Off-Site Residents - The total calculated average Hazard Index for off-site adults is 0.62, and the total calculated upper bound Hazard Index is 1.32

(Table 55). The total calculated average Hazard Index for off-site children is 0.89, and the total calculated upper bound Hazard Index is 2.04 (Table 55). The calculated "average" cancer risk calculated for off-site adults is $1.14\text{E-}04$, and the upper bound cancer risk is $5.6\text{E-}04$. The calculated "average" cancer risk calculated for off-site children is $8.26\text{E-}05$, and the upper bound cancer risk is $3.06\text{E-}04$. Based on the calculated average Hazard Index for this site, adverse non-carcinogenic effects are not expected to occur from exposure to site-related residues.

The most significant exposure pathways contributing to the calculated off-site cancer risk is the inhalation of off-site air and the potential future ingestion of vinyl chloride and trichloroethene residues in off-site ground water. As discussed previously, the calculated off-site air concentrations represent the centerline concentrations downwind of the site under steady state conditions. Actual average exposures to airborne site related residues are expected to be significantly lower than the calculated concentrations.

6.06.3 Uncertainties

The risk measures used in this risk assessment are not precise, deterministic estimates of risk, but conditional estimates controlled by a considerable number of consecutive upper-bound assumptions regarding exposure and toxicity. They are designed to overestimate the true risk value, as opposed to present a precise, realistic estimate of it. This is done by convention, consistent with EPA protocols. There are several categories of

uncertainties associated with risk assessments: selection of substances, toxicity values for each substance, and exposure assessment.

The main sources of uncertainty in the risk assessment are the definition of the physical setting, estimation of exposure point concentrations, and calculation of chronic daily intakes. Uncertainties related to these sources are discussed below.

Physical Setting - The initial characterization of the physical setting involves many professional judgments and assumptions. These include definition of the current and future land uses, identification of potential exposure pathways, and selection of chemicals of potential concern. The following statements may be made regarding uncertainties associated with the physical setting:

1. It was assumed that future off-site land uses will remain the same as present; there is a high probability that this assumption is true.
2. It was assumed that the future on-site land use is industrial; there is a high probability that this assumption is true.
3. It is likely that the complete exposure scenarios selected for quantification are actually occurring (or may occur).

Calculation of Exposure Point Concentrations - Exposure point concentrations were calculated as "average" concentrations, and "upper bound" concentrations. This approach reduces the uncertainty relating to potential exposures. However, the approach and assumptions used in calculating air exposure point concentrations using U.S.EPA's suggested Air Pathway Analysis methodology result in a high degree of conservatism in the calculated

air concentrations. As such, the air pathway analysis (and inhalation risks) presented in this assessment represents a "site screening" procedure rather than the calculation of realistic air exposure point concentrations and risk estimates. The main sources of conservatism in the air pathway analysis are presented below :

1. The TSCREEN air dispersion model incorporates conservative input parameters for site climatologic data. For example, the TSCREEN model assumes that the average wind speed at the site is 1 m/sec. Meteorological data for the region of the site indicates that the actual average wind speed is approximately 5 m/sec. A higher wind speed would serve to increase the dispersion of the emitted vapors, and lead to lower calculated concentrations in the vicinity of the source area.
2. The TSCREEN air dispersion model calculates steady state centerline concentrations. The air concentrations at locations other than the estimated plume centerline will be lower than the centerline concentrations. Therefore, the average exposure of downwind receptors to site related airborne residues would be significantly lower than the exposures calculated based on the centerline concentrations.

Calculation of Chronic Daily Intakes - The chronic daily intakes were calculated using conservative estimates of parameter assumptions. Two estimates of Chronic Daily Intake were calculated - "average" CDIs and "upper bound" CDIs. The upper bound CDIs represent a hypothetical "not to exceed" estimate on the CDI, and are much higher than the CDIs for the

average receptor. The "average" CDIs are intended to represent the CDIs that may be expected for most of the individuals in the identified receptor populations. However, it should be noted that the calculated "average" CDIs are highly conservative estimates due to the conservative assumptions incorporated in the air pathway analysis.

6.07 Summary

A baseline risk assessment was performed using available analytical data generated by O'Brien & Gere Engineers, Inc. The risk and hazard index estimates were calculated to highlight potential sources of risk so that they may be considered for inclusion in the remedial process as remedial objectives. In summary, the following conclusions may be made:

1. The total calculated average cancer risks⁷ for off-site receptor populations at the site ($1.14\text{E-}04$) is in excess of the Superfund site remediation goal in the NCP (10^{-4} to 10^{-7}). The most significant exposure pathways for off-site residents are the hypothetical future use of off-site ground water, and the inhalation of volatilized residues from on-site source areas. The primary cause for the calculated risk level is the presence of trichloroethylene and its degradation product vinyl chloride present in ground water. However, the calculated risk

⁷ The numerical risk is not truly representative of probability, but is a product of the U.S. EPA risk assessment process. The risk value is not a means of predicting human health impacts, but is useful for comparing to remediation goals.

estimates reflect a regulatory evaluation of the potential risks associated with the site. The actual risks to off-site receptor populations are expected to be significantly lower than the calculated risk estimates.

2. The total calculated average noncancer HIs for on-site workers at the site (8.35) is in excess of the Superfund site remediation goal of 1.0. The calculated HIs for on-site workers are primarily due to the calculated air emission from VOCs at the UST area at the site. Remediation of soils at the UST area would minimize the potential for future exposures to airborne volatilized residues from the site.
3. The calculated "average" cancer risks⁸ for off-site residents (1.14E-04) exceeds the Superfund site remediation goal.

⁸ The numerical risk is not truly representative of probability, but is a product of the U.S. EPA risk assessment process. The risk value is not a means of predicting human health impacts, but is useful for comparing to remediation goals.

SECTION 7 - HAZARD RANKING SCORE

7.01 Introduction

A Hazard Ranking was prepared for the site in December 1990 prior to the current RI work efforts in accordance with USEPA Uncontrolled Hazardous Waste Site Ranking System (published in the July 16, 1982, Federal Register [pp. 31220-31243]). The Hazard Ranking, as required by the state as part of the Phase I and II RI/FS process, was used to rate the potential hazard that the site poses to the environment via the ground water, surface water, air, and direct contact routes.

Potential sources of contamination that exist at the site include:

- a former aboveground tank farm used to store materials used during production;
- an existing aboveground tank farm area;
- a former underground fuel oil storage tank;
- a previously closed underground storage tank farm used to store naphtha-type solvents; and,
- release of a chlorinated solvent at or near the north parking lot sump area.

Site ground water and soil exhibit chemical residues including the following chemicals:

<u>Volatiles</u>	<u>Semi-Volatiles (BNAs)</u>
trans-1,2-Dichloroethene	Bis(2-ethylhexyl)adipate
Ethylbenzene	Bis(2-ethylhexyl)phthalate
Methylene chloride	Fluoranthene

<u>Volatiles</u>	<u>Semi-Volatiles (BNAs)</u>
Toluene	Naphthalene
Trichloroethylene	Phenanthrene
Vinyl chloride	Pyrene
Xylenes	

7.02 Ground Water Route Score

1. Observed Release

Ground water at the site contains residues of chemical compounds, including:

trans-1,2-Dichloroethene

Ethylbenzene

Toluene

Trichloroethene

Vinyl chloride

Xylenes

Bis(2-ethylhexyl)phthalate

Naphthalene

Consistent with the protocols for Hazard Ranking, a value of 45 was assigned to "Observed Release" since a release of contaminants into the site soils and ground water was observed based on the ground water monitoring results. Therefore, Route Characteristics and Containment were not evaluated in Sections 2 and 3 of the Ground Water Route.

2. Route Characteristics

Not applicable.

3. Containment

Not applicable.

4. Waste Characteristics

- a. Toxicity/Persistence - The toxicity and persistence of chemicals detected on-site were evaluated. According to the protocols, the following toxicity/persistence values were calculated:

trans-1,2-Dichloroethene	-	12
Ethylbenzene	-	9
Methylene chloride	-	12
Toluene	-	9
Trichloroethylene	-	12
Vinyl chloride	-	15
Xylenes	-	9
Bis(2-ethylhexyl)adipate	-	6
Bis(2-ethylhexyl)phthalate	-	6
Naphthalene	-	9
Fluoranthene	-	15
Phenanthrene	-	12
Pyrene	-	18

Consistent with the protocols for Hazard Ranking, the maximum score calculated (18) was assigned to "Toxicity/Persistence".

- b. Hazardous Waste Quantity - The hazardous waste quantity was evaluated. It was estimated that a waste volume in the range of 1-10

cubic yards is present on-site. Consistent with the protocols for Hazard Ranking, a value of 1 was assigned to "Hazardous Waste Quantity".

5. Targets

- a. Ground Water Use - The nature of the use of ground water downgradient from the site was evaluated. The Jamestown Board of Public Utilities was contacted regarding the use of local ground water in the Jamestown area. Mr. Randy Peterson, P.E., Board of Public Utilities, indicated that a municipal water supply is used for all potable water needs in the area. The public water supply is obtained from well fields located in the Towns of Falconer and Kennedy; the closest well field is approximately two miles from the site. Both well fields are upgradient of the site. Due to the lack of ground water use at locations within three miles downgradient of the site, a value of 0 was assigned to "Ground Water Use".
- b. Distance to Nearest Well/Population Served - The distance to the nearest downgradient well and the population served by this well were evaluated. According to the protocols, a value of 0 was assigned to "Distance to Nearest Well" since the nearest downgradient well is greater than three miles from the site. In addition, a value of 0 was assigned to "Population Served by Ground Water" since populations within three miles of the site do not use water from the aquifer of concern.

Conclusion - Using the above values, a Ground Water Route Score of 0 was calculated (see Figure 20).

7.03 Surface Water Route Score

1. Observed Release

There is no direct evidence of a release to surface water. Consistent with the protocols, a value of 0 was assigned to "Observed Release".

2. Route Characteristics

- a. **Facility Slope and Intervening Terrain** - The facility slope is an indicator of the potential for runoff or spills to leave the facility. The facility has an average slope of less than 3%. Intervening terrain refers to the average slope of the shortest path which would be followed by runoff between the facility boundary and the nearest downhill surface water (Chadakoin River). The intervening terrain average slope is 3-5%. According to the protocols, a value of 1 was assigned to "Facility Slope and Intervening Terrain".
- b. **1-Year, 24-Hour Rainfall** - The 1-year, 24-hour rainfall indicates the potential for area storms to cause surface water contamination as a result of runoff, erosion, or flow over dikes. Figure 8 in the protocols indicates that the average rainfall in the site vicinity is 2-2.5 inches, therefore, according to the protocols, a value of 2 was assigned to "1-Year, 24-Hour Rainfall".
- c. **Distance to Nearest Surface Water** - This is the shortest distance between the nearest downhill body of surface water and the source of

a hazardous substance in which the course of runoff can be expected to follow. The Chadakoin River, the nearest downhill body of surface water, is located approximately 800 feet downhill from the site. According to the protocols, a value of 3 was assigned to "Distance to Nearest Surface Water".

- d. **Physical State** - Physical state refers to the state of the hazardous substances at the time of disposal. According to the protocols, a maximum value of 3 was assigned to "Physical State" since the contaminant released is a liquid.

3. **Containment**

Containment is a measure of the means that have been taken to minimize the likelihood of a contaminant entering surface water either at the facility or beyond the facility boundary. Since no containment or diversion systems are present to prevent contaminant transport to surface water, a value of 3 was assigned to "Containment".

4. **Waste Characteristics**

- a. **Toxicity/Persistence** - The toxicity and persistence of contaminants detected on-site with the potential to be released to surface water were evaluated. According to the protocols specified in the Hazard Ranking model, the following toxicity/persistence values were calculated:

trans-1,2-Dichloroethene	-	12
Ethylbenzene	-	9
Methylene chloride	-	12
Toluene	-	9
Trichloroethylene	-	12

Vinyl chloride	-	15
Xylenes	-	9
Bis(2-ethylhexyl)adipate	-	6
Bis(2-ethylhexyl)phthalate	-	6
Naphthalene	-	9
Fluoranthene	-	15
Phenanthrene	-	12
Pyrene	-	18

Consistent with the protocols, the maximum score calculated (18) was assigned to "Toxicity/Persistence".

- b. **Hazardous Waste Quantity** - The hazardous waste quantity was evaluated. It was estimated that a waste volume in the range of 1-10 cubic yards is present on-site. Consistent with the protocols for Hazard Ranking, a value of 1 was assigned to "Hazardous Waste Quantity".

5. Targets

- a. **Surface Water Use** - The nature of the use of surface water downstream from the facility was evaluated. The use or uses of interest are those associated with water taken from surface waters within a distance of three miles from the location of the hazardous substance. The Chadakoin River is used for recreational purposes (e.g., fishing, wading), but not for drinking water. According to the protocols, a value of 2 was assigned to "Surface Water Use".

- b. **Distance to a Sensitive Environment** - The distance from the hazardous substance to an area containing an important biological resource or a fragile natural setting that could suffer an especially severe impact from pollution was evaluated. Based on visual inspection, no wetlands (5 acres or greater) are known to exist within two miles of the site. In addition, no critical habitats (of endangered species) are known to exist within one mile of the site. Therefore, according to the protocols, a value of 0 was assigned to "Distance to a Sensitive Environment".
- c. **Population Served/Distance to Water Intake Downstream** - The population served by surface water with water intake within 3 miles downstream from the facility was evaluated. Within 2,000 feet of the point of entry into surface water, the population using surface water is approximately 3,001-10,000. According to the protocols, a value of 35 was assigned to "Population Served/Distance to Water Intake Downstream".

Conclusion - Using the above values, a Surface Water Route Score of 43.58 was calculated (see Figure 21).

7.04 Air Route Score

1. Observed Release

There is no direct evidence of a release to air. Therefore, a value of 0 was assigned to "Observed Release". Consistent with the protocols, the waste characteristics and targets were not evaluated under Sections 2 and 3 of the Air Route.

2. Waste Characteristics

Not applicable.

3. Targets

Not applicable.

Conclusion - Consistent with the protocols, based on the lack of an observed release, an Air Route Score of 0 was calculated (see Figure 22).

7.05 Migration Hazard Model Score

Following calculation of the Ground Water, Surface Water, and Air Route Scores, the Migration Hazard Mode Score was calculated. The Hazard Mode Score provides a value relating to the migration of site contaminants from the site based on potential migration routes (surface water, ground water, and air). Based on the protocols, a Migration Hazard Mode Score of 25.19 was calculated (see Figure 23).

7.06 Direct Contact Score

1. Observed Incident

It is unknown whether a confirmed instance in which contact with hazardous substances at the facility has caused injury, illness, or death to humans or domestic or wild animals. Consistent with the protocols, a value of 0 was assigned to "Observed Incident".

2. Accessibility

Accessibility to hazardous substance refers to the measures taken to limit access by humans or animals to hazardous substances at the site. Barriers do not completely surround the facility. Therefore, consistent with the protocols, a value of 3 was assigned to "Accessibility".

3. Containment

Containment indicates whether the hazardous substance itself is accessible to direct contact. Based on a review of historical information pertaining to the potential release of site contaminants, and consistent with the protocols, a value of 15 was assigned to "Containment".

4. Waste Characteristics

a. Toxicity - Toxicity of contaminants detected on-site with the potential to be contacted was evaluated. According to the protocols, the following toxicity values were calculated for those chemicals detected in on-site surface soil:

Bis(2-ethylhexyl)adipate	-	1
trans-1,2-Dichloroethene	-	2
Ethylbenzene	-	2
Toluene	-	2
Trichloroethylene	-	2
Xylenes	-	2

Consistent with the protocols, the maximum value (2) was assigned to "Toxicity" on the Direct Contact worksheet.

5. Targets

- a. **Population Within a 1-Mile Radius** - The population that potentially could be involved in direct contact incidents at the facility was evaluated. Approximately 1,001-3,000 persons reside within one mile of the site. Therefore, according to the protocols, a value of 3 was assigned to "Population Within a 1-Mile Radius".
- b. **Distance to a Critical Habitat** - The distance from the hazardous substance to a critical habitat of an endangered species was evaluated. No critical habitats (of endangered species) are known to exist within one mile of the site. Therefore, according to the protocols, a value of 0 was assigned to "Distance to a Critical Habitat".

Conclusion - Using the above values, a Direct Contact Score of 25 was calculated (see Figure 24).

7.07 Summary

The former Essex Specialty Products, Inc. Site contains areas where ground water and soil exhibit chemical residues. The EPA Hazard Ranking System was used to rate the potential hazard to the environment via the ground water, surface water, air, and direct contact routes. A Migration Hazard Mode Score was calculated from individual route scores. The following scores were calculated:

Ground Water	0	(see Figure 20)
Surface Water	43.58	(see Figure 21)
Air	0	(see Figure 22)

Migration Hazard Mode	25.19	(see Figure 23)
Direct Contact	25	(see Figure 24)

These scores do not quantify the probability of harm from the facility or the magnitude of the harm that could result, although the factors have been selected in order to approximate both of these elements of risk. The scores are not intended to be indicative of the level of risk at the site, but are intended to be used for comparative purposes in the ranking of sites.

SECTION 8 - REMEDIAL INVESTIGATION SUMMARY AND CONCLUSIONS

8.01 Summary and Conclusions

8.01.1 Nature and Extent of Contaminant

Based on the results of the RI, the site conditions and nature and extent of on-site contamination have been determined as presented below:

1. The subsurface geology at the site consists primarily of glacially-derived silt, sand and gravel. The upper most soil layer consists primarily of sand and gravel occurring at depths up to 18.5 feet. Directly beneath the sand and gravel layer is an upper silt layer that was found continuously across the site at a thickness varying from 8 to 22 feet. Underlying the upper silt layer is a fine sand layer, varying in thickness from 12 to 24 feet, which was found continuously in the North Parking Lot Sump Area and the area north of Hopkins Avenue. Below the fine sand layer lies a lower silt layer which, in the area of MW-7DD, is approximately 44 feet thick.
2. The general ground water flow direction at the site is to the north toward the Chadakoin River, which is consistent with the regional flow conditions. The site ground water flows under a hydraulic gradient of approximately 0.02 ft/ft. A localized depression in the ground water table is evident around MW-3; however, this is likely attributed to the intervals and strata in which the monitoring wells in this area are screened.

3. The depth to ground water was determined during the RI to be approximately 10 to 12 feet below grade, and the aquifer extends into the lower silt layer, which occurs at a depth of approximately 50 feet. The upper silt layer appears to be limiting the movement of ground water between the overlying sand and gravel layer and the deeper water bearing zones. However, it is likely that the shallow and deeper water bearing zones are hydraulically interconnected, based on the geologic conditions encountered at the site.
4. The hydraulic conductivities in the monitoring wells across the site range from 0.05 gpd/ft² (5.84×10^{-6} cm/s) to 40.5 gpd/ft² (1.5×10^{-3} cm/s). The wide range in hydraulic conductivities both laterally across the site and vertically with depth in the aquifer is primarily a result of variation in geologic conditions.
5. Soil vapor surveys were conducted in the north parking lot sump area, former AST area, the area north of Hopkins Avenue on the Hopes Architectural Products, Inc. property, and at the previously closed UST area to assess the estimated quantity and areal extent of VOC contamination at these locations. The following summarizes the results of the soil vapor surveys.
 - In the north parking lot sump area, TCE concentrations in the soil vapor were consistent with those concentrations exhibited in corresponding monitoring wells adjacent to the sump in this area. The soil gas results support that the sump in this area may be the source of TCE that was reportedly utilized by

Hope's during operation of the degreaser tank in former Plant 5.

- In the former AST area, a suspected source area of petroleum-type VOCs was confirmed in the vicinity of the former underground fuel tank. In addition, soil vapor sampling in the right-of-way identified the highest VOC concentrations in the vicinity of MW-2, with concentrations decreasing considerably in both the north and south directions.
 - In the parking lot north of the previously closed UST area, the soil vapor survey indicated highest concentrations of VOCs closest to the UST area, with the samples farthest from the source, near Hopkins Avenue, exhibiting near-background concentrations.
 - The soil vapor survey in the area north of Hopkins Avenue on the Hopes Architectural Products, Inc. property was not able to positively identify a second source of TCE off-site, due to the even distribution of subsurface VOCs across this area.
6. Former above ground storage tank (AST) area - A source of VOCs, consisting primarily of toluene, ethylbenzene, and other VOCs commonly associated with petroleum fuels, was identified in the vicinity of MW-2. Analysis of subsurface soils in this area revealed total VOC concentrations ranging from less than detectable (<0.01 ppm) in soil boring B-15 to 360 ppm in B-13. Immediately east of this area, two soil samples were obtained from B-10, one sample at the 0-

to 2-foot interval and one at the 6- to 8-foot interval and analyzed for xylenes. The 0- to 2-foot sample exhibited a xylene concentration of 2700 ppm and the 6- to 8-foot sample did not exhibit elevated concentrations. No TCE was exhibited in the soil samples collected from this location. Based on this data, it appears that the elevated surface concentrations may be the result of a localized surface spill.

Analysis of ground water in the vicinity (MW-2, MW-4 and HW-10) also revealed detectable levels of toluene, ethylbenzene, and xylenes. Total VOCs detected in MW-2, MW-4, and HW-10 were quantified at 241 ppm, 53 ppm, and 144 ppm, respectively. The areal extent of VOCs in ground water related to this area appears to be defined by VOC concentrations exhibited in downgradient monitoring well nests 14, 15 and 16, and additional soil vapor information obtained downgradient of the former AST area. Based on the soil and ground water data, it appears that the TCE contamination exhibited in the ground water is not attributed to a soil source within the Former AST Area.

7. North Parking Lot Sump Area - VOCs were also identified in the vicinity of MW-3 adjacent to the sump in the north parking lot. Analysis of the ground water indicate levels of TCE in MW-3 at approximately 960 ppm, in downgradient well MW-7 at approximately 1 ppm, and in well MW-8 at a concentration of 0.14 ppm. The finding of TCE is consistent with past activity conducted in the vicinity by the previous property owner, Hopes Architectural Products, Inc.

8. **Previously Closed Underground Storage Tanks Area - Analysis of soils**
collected from the excavations adjacent to the side walls of the five underground storage tanks revealed the presence of toluene, xylene, and ethylbenzene at maximum concentrations of 410, 3600, and 1000 ppm, respectively.
9. **Stained Soils Area - Analyses of a small area of surface soils immediately east of the existing above ground tank farm** revealed the presence of bis(2-ethylhexyl) adipate and phthalate residues within both stained surface soils and underlying unstained soils. As a result, an IRM was implemented to remediate accessible stained soils in this area. Following excavation activities, contaminated soils were removed from the stained soils area with the exception of one isolated area which was inaccessible for further excavation. The results of the stained soils area IRM are documented in the summary report entitled Soil Excavation Stained Soils Area, dated July 1992.
10. The results of the ecological assessment indicate that the only pathway of chemical migration from the site is via ground water movement, and the only potentially exposed habitat is the Chadakoin River. However, it was concluded that none of the contaminants of concern are expected to reach the Chadakoin River at levels that could adversely impact the aquatic community.
11. The results of the risk assessment, which addresses potential risks associated with chemicals detected in site ground water and soil, are summarized below:

- The major potential exposure pathway considered to be possible at this site is the direct contact pathway.
- The total calculated average cancer risks⁹ for off-site receptor populations at the site (1.14E-04) is in excess of the Superfund site remediation goal in the NCP (10^{-4} to 10^{-7}). The most significant exposure pathways for off-site residents are the hypothetical future use of off-site ground water, and the inhalation of volatilized residues from on-site source areas. The primary cause for the calculated risk level is the presence of trichloroethylene and its degradation product vinyl chloride present in ground water. However, the calculated risk estimates reflect a regulatory evaluation of the potential risks associated with the site. The actual risks to off-site receptor populations are expected to be significantly lower than the calculated risk estimates.
- The total calculated average noncancer H_{is} for on-site workers at the site (8.35) is in excess of the Superfund site remediation goal of 1.0. The calculated H_{is} for on-site workers are primarily due to the calculated air emission from VOCs at the UST area at the Site. Remediation of soils at the UST area would

⁹ The numerical risk is not truly representative of probability, but is a product of the U.S. EPA risk assessment process. The risk value is not a means of predicting human health impacts, but is useful for comparing to remediation goals.

minimize the potential for future exposures to airborne volatilized residues from the site.

- The calculated "average" cancer risks for off-site residents (1.14E-04) exceeds the Superfund site remediation goal. However, the numerical risk is not truly representative of probability, but is a product of the U.S. EPA risk assessment process. The risk value is not a means of predicting human health impacts, but is useful for comparing to remediation goals.

8.02 Identification of Remedial Objectives and Actions

8.02.1 Recommended Remedial Action Objectives

The following remedial action objectives have been developed for the site based on the risk assessment:

1. Based on the measured residue of solvents, prevent ingestion of soils and ground water containing VOCs exceeding drinking water standards.
2. Prevent direct contact exposure with VOCs contaminated soils within the former AST area and previously closed UST area.

These remedial action objectives have been established for the following identified areas of on-site contamination:

1. Based on the levels of VOCs exhibited in the soils and ground water the former AST area has been fairly well defined and will require remediation. The soil contamination may be addressed during the

UST IRM by soil vapor extraction techniques, or by an alternative remedial method selected during the feasibility study (FS) component of the project. Ground water will likely need to be addressed during the FS to evaluate potential site ground water remedial alternatives.

2. Elevated concentrations of a TCE ~~plume~~^{dense} non-aqueous phase liquid (DNAPL) were exhibited in the ground water in the north parking lot sump area. Based on the levels of TCE exhibited, ground water remediation is likely required, and may be addressed through an IRM concerning the north parking lot sump area or during the evaluation of remedial alternatives during the FS.
3. Ground water treatment in the vicinity of the previously closed UST area will likely be necessary due to elevated levels of VOCs exhibited in adjacent monitoring wells in the vicinity of the tanks. Appropriate ground water remedial alternatives will be evaluated during the FS. Several remedial options are currently being evaluated as part of the IRM to address the contaminated soils in and around the previously closed USTs. The appropriate soil remedial option may be implemented during the UST IRM or following evaluation and selection during the FS.
4. Semi-volatile-contaminated soils in the current above ground tank farm area were removed as part of the stained soils area IRM performed in May 1992.

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ENGINEERS, INC.

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Tables



O'BRIEN & GERE
ENGINEERS, INC.

Table 1
Former Essex Specialty Products
Jamestown, New York

Well Specifications and Ground Water Elevations

WELL NO.	WELL DEPTH (')	TOP OF CASING ELEV. (FT)	SCREENED INTERVAL (FT)	HYDRAULIC COND. (GPD/FT ²)	GROUND WATER ELEVATIONS (FT)					
					8/24/89	2/9/90	2/12/91	2/5/92	3/31/92	7/7/92
MW-1	20.75	1280.48	20.75 - 15.75	0.124	1268.25	1269.86	—	1267.50	1268.36	1267.07
MW-2	13.25	1279.81	13.25 - 8.25	5.77	1272.67	1273.71	—	1272.27	1272.63	1271.47
MW-3	21.25	1280.58	21.25 - 16.25	0.139	1269.13	1273.49	1269.8	1268.39	1269.74	1268.38
MW-4	17.46	1281.02	17.46 - 12.46	1.83	1273.09	—	—	1272.02	1272.00	1271.65
MW-5	19.25	1280.91	19.25 - 9.25	0.188	1273.80	—	—	1272.81	1272.75	1272.69
MW-6	19.92	1277.44	19.92 - 9.92	16.16	1270.88	1271.51	1271.09	1270.03	1270.22	1269.60
MW-7	21.1	1277.37	20.1 - 10.1	19.00	1270.81	1271.53	1271.05	1269.74	1270.35	1269.42
MW-7D	45.0	1277.63	45.0 - 35.0	32.46	—	1270.58	1269.3	1268.26	1268.73	1267.55
MW-7DD	98.4	1277.47	98.4 - 88.4	0.05	—	—	—	1270.47	1274.95	1274.42
MW-8	49.6	1277.27	49.58 - 39.58	4.58	1268.80	1271.09	1269.67	1268.46	1268.84	1267.62
MW-9	15.4	1278.70	15.4 - 5.4	8.0	—	1271.62	—	—	—	—
MW-10	18.5	1278.11	18.5 - 8.5	13.0	—	1272.97	1271.69	1270.21	1270.98	1270.01
MW-11	15.0	1277.46	15.0 - 5.0	1.14	—	1270.20	1271.08	1269.53	1269.58	1269.38

NOTES: Elevations based on USGS datum
(') - Well depth in feet below grade
— - Not available.
NA - Not analyzed.

Table 1
Former Essex Specialty Products
Jamestown, New York

Well Specifications and Ground Water Elevations
(Continued)

WELL NO.	WELL DEPTH (*)	TOP OF CASING ELEV. (FT)	SCREENED INTERVAL (FT)	HYDRAULIC COND. (GPD/FT ²)	GROUND WATER ELEVATIONS (FT)					
					8/24/89	2/9/90	2/12/91	2/5/92	3/31/92	7/7/92
MW-11D	45.0	1277.52	45.0 - 35.0	1.92	—	1268.92	1268.65	1268.26	1266.30	1266.80
MW-12	14.0	1280.06	14.0 - 4.0	6.46	—	1273.55	1272.05	1270.37	1271.28	1270.11
MW-13	16.15	1278.12	16.0 - 6.0	0.463	—	—	—	1271.48	1271.32	1268.14
MW-14S	23.1	1280.25	23.0 - 13.0	0.474	—	—	—	1268.25	1268.81	1267.62
MW-14D	52.8	1280.01	52.8 - 42.8	9.8	—	—	—	1268.07	1268.73	1267.41
MW-15S	21.8	1279.55	21.8 - 11.8	40.5	—	—	—	1268.00	1268.37	1267.58
MW-15D	45.8	1279.46	45.8 - 35.8	0.5	—	—	—	1267.28	1267.88	1266.52
MW-16S	19.3	1279.32	19.0 - 9.0	11.85	—	—	—	1267.52	1268.22	—
MW-16D	46.0	1279.05	46.0 - 36.0	4.63	—	—	—	1267.11	1267.69	—
P-1	15.0	1281.63	15.0 - 10.0	NA	1271.82	—	—	—	—	—
P-2	15.0	1280.25	15.0 - 10.0	NA	1270.46	—	—	—	—	—
HW-1	—	1281.91	— - —	NA	—	—	—	1270.35	—	—
HW-2	—	1281.13	— - —	NA	—	—	—	1269.85	—	—
HW-3	—	1283.24	— - —	NA	—	—	—	1271.54	—	—

NOTES: Elevations based on USGS datum
(*) - Well depth in feet below grade
— - Not available.
NA - Not analyzed.

TABLE 2

Former Essex Specialty Products
Jamestown, New York

Soil Vapor – Analytical Results (1)
Concentrations reported in mg/kg (ppm), unless otherwise noted.
Location: *MW-2 and MW-3 Area*

Soil Vapor Sample	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6	SG-7	SG-8	SG-9	SG-10	SG-11	SG-12	SG-13
Collection Date	8/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89
Parameter (2)													
Benzene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.1	0.67
t-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	3.6	0.1	<0.01	0.1	0.1	0.3	0.5	0.2	0.1	<0.01	<0.01	<0.01	0.1
Toluene	<0.02	0.1	0.3	<0.02	0.06	0.05	0.3	<0.02	<0.02	<0.02	<0.02	2.3	121.7
Xylenes	<0.04	<0.04	0.02	0.15	<0.04	0.13	<0.04	<0.04	<0.04	<0.04	0.1	10.3	14.6
Other VOCs (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs (4)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.5	0.2	77.6	108.1

Notes:

< - Less Than NA - Not Analyzed

- (1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.
- (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.
- (3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.
- (4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

Former Essex Specialty Products
Jamestown, New York

Soil Vapor - Analytical Results (1)

Concentrations reported in mg/kg (ppm), unless otherwise noted.

Location: MW-2 and MW-3 Area

Soil Vapor Sample	SG-14	SG-15	SG-16	SG-17	SG-18	SG-19	SG-20	SG-21	SG-22	SG-23	SG-24	SG-25	SG-26
Collection Date	7/89	7/89	7/89	7/89	8/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89
Parameter (2)													
Benzene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	9.0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
t-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.4	2.9	0.1	0.7	0.5	0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	377.9	0.2	0.2	<0.02	<0.02	<0.02	<0.02
Xylenes	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	353.8	2.5	<0.04	<0.04	<0.04	<0.04	<0.04
Other VOCs (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs (4)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	1362.3	2.4	<0.04	<0.04	<0.04	<0.04	<0.04

Notes:

< - Less Than NA - Not Analyzed

(1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.

(2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

(3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.

(4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

**Former Essex Specialty Products
Jamestown, New York**

Soil Vapor – Analytical Results (1)
Concentrations reported in mg/kg (ppm), unless otherwise noted.
Location: MW-2 and MW-3 Area

Soil Vapor Sample	SG-27	SG-28	SG-29	SG-30	SG-31	SG-32	SG-33	SG-34	SG-35	SG-36	SG-37	SG-38
Collection Date	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	7/89	8/89	8/89
Parameter (2)												
Benzene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
t-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	0.6	0.6
Toluene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.1	0.1	<0.02	<0.02
Xylenes	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Other VOCs (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs (4)	<0.04	<0.04	<0.04	<0.04	<0.04	1.4	2.5	0.3	0.4	2.9	<0.04	<0.04

Notes:

< - Less Than NA - Not Analyzed

- (1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.
- (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.
- (3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.
- (4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

Former Essex Specialty Products
Jamestown, New York

Soil Vapor - Analytical Results (1)
Concentrations reported in mg/kg (ppm), unless otherwise noted.
Location: MW-2 and MW-3 Area

Soil Vapor Sample	SG-40	SG-41	SG-42	SG-43	SG-44	SG-45	SG-46	SG-47	SG-48	SG-49	SG-50	SG-51
Collection Date	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89
Parameter (2)												
Benzene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
t-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.6	2.8	0.2	4.9	<0.01	<0.01	<0.01	1.7	0.7	0.2	<0.01	<0.01
Toluene	<0.02	<0.02	<0.02	1021.3	<0.02	926.8	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Xylenes	<0.04	<0.04	<0.04	<0.04	<0.04	647	126.2	<0.04	<0.04	<0.04	<0.04	<0.04
Other VOCs (3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs (4)	<0.04	<0.04	<0.04	2163	51.1	1726.8	88	<0.04	<0.04	4.4	1.5	0.4

Notes:

< - Less Than NA - Not Analyzed

- (1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.
- (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.
- (3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.
- (4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

Former Essex Specialty Products
Jamestown, New York

Soil Vapor – Analytical Results (1)

Concentrations reported in mg/kg (ppm), unless otherwise noted.

Location: *Johnson Machine & Fibre Products Co. Property*

Soil Vapor Sample	SV-01	SV-02	SV-03	SV-04	SV-05	SV-06	SV-07	SV-08	SV-09	SV-10	SV-11
Collection Date	5/92	5/92	5/92	5/92	5/92	5/92	5/92	5/92	5/92	5/92	5/92
Parameter (2)											
Benzene	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	0.252	<0.016	<0.016	0.027	0.025
1,1,2-Dichloroethene	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Ethyl Benzene	<0.022	<0.022	0.017	<0.022	<0.022	0.150	<0.022	<0.022	0.580	<0.022	<0.022
Tetrachloroethylene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,1,1-Trichloroethane	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048
Trichloroethene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Toluene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.023	<0.015	<0.015	<0.015	<0.015
Xylenes	4.991	<0.049	<0.049	<0.049	<0.049	1.198	<0.049	<0.049	1.500	<0.049	<0.049
Other VOCs (3)	227.357	0.062	0.150	0.101	<0.004	3.277	0.278	<0.004	3.856	0.340	0.839
Total VOCs (4)	232.348	0.062	0.167	0.101	<0.004	4.626	0.553	<0.004	5.937	0.367	0.864

Notes:

< - Less Than NA - Not Analyzed

(1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.

(2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

(3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.

(4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

**Former Essex Specialty Products
Jamestown, New York**

Soil Vapor – Analytical Results (1)

Concentrations reported in mg/kg (ppm), unless otherwise noted.

Location: Right of Way

Soil Vapor Sample	SV-13	SV-14	SV-15	SV-16	SV-17	SV-18	SV-19	SV-20	SV-21	SV-22	SV-23	SV-23D	SV-24	SV-25	SV-46
Collection Date	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92
Parameter (2)															
Benzene	<0.016	2.063	0.025	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	0.022	<0.016	<0.016	<0.016	<0.016
1,1,2-Dichloroethene	<0.009	2.630	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Ethyl Benzene	26.805	3.964	0.023	<0.022	<0.022	0.191	<0.022	<0.022	<0.022	0.890	<0.022	<0.022	<0.022	<0.022	<0.022
Tetrachloroethylene	<0.004	5.184	<0.004	0.082	0.100	0.168	<0.004	0.063	0.075	1.755	0.184	0.192	<0.004	0.055	<0.004
1,1,1-Trichloroethane	11.207	35.663	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048
Trichloroethene	5.604	1.762	0.015	0.119	<0.004	<0.004	<0.004	<0.004	<0.004	0.414	<0.004	0.004	<0.004	<0.004	<0.004
Toluene	4006.85	22.987	0.495	1.184	1.443	2.831	0.393	<0.015	<0.015	0.730	<0.015	<0.015	<0.015	<0.015	0.017
Xylenes	<0.049	<0.049	0.185	0.389	0.217	2.189	0.509	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049
Other VOCs (3)	640.525	250.021	0.673	3.210	2.419	11.906	2.092	1.344	3.890	33.582	3.969	3.911	0.190	0.092	0.049
Total VOCs (4)	4690.991	324.274	1.416	4.987	4.181	17.285	2.994	1.407	3.965	37.372	4.178	4.107	0.190	0.192	0.066

Notes:

< - Less Than NA - Not Analyzed

(1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.

(2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

(3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.

(4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

Former Essex Specialty Products
Jamestown, New York

Soil Vapor - Analytical Results (1)
Concentrations reported in mg/kg (ppm), unless otherwise noted.
Location: North of Hopkins Road

Soil Vapor Sample	SV-26	SV-27	SV-28	SV-29	SV-30	SV-31	SV-32	SV-33	SV-34	SV-35	SV-36	SV-37
Collection Date	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92
Parameter (2)												
Benzene	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
1,1,2-Dichloroethene	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Ethyl Benzene	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022
Tetrachloroethylene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.057	<0.004	0.054	0.061	<0.004
1,1,1-Trichloroethane	0.200	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	0.382	<0.048	<0.048	<0.048	<0.048
Trichloroethene	0.009	<0.004	0.005	<0.004	0.030	<0.004	0.005	<0.004	0.012	<0.004	0.004	<0.004
Toluene	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.015	<0.015	<0.015	<0.015
Xylenes	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049
Other VOCs (3)	1.133	<0.004	0.014	0.076	<0.004	<0.004	<0.004	3.132	<0.004	<0.004	0.270	<0.004
Total VOCs (4)	1.346	0.004	0.018	0.076	0.030	<0.004	0.005	3.578	0.027	0.054	0.335	<0.004

Notes:

< - Less Than NA - Not Analyzed

- (1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.
- (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.
- (3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.
- (4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 2

**Former Essex Specialty Products
Jamestown, New York**

Soil Vapor - Analytical Results (1)
Concentrations reported in mg/kg (ppm), unless otherwise noted.
North of Hopkins Road (continued)

Soil Vapor Sample	SV-38	SV-38D	SV-39	SV-39D	SV-40	SV-41	SV-42	SV-43	SV-44	SV-45	SV-47
Collection Date	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92	7/92
Parameter (2)											
Benzene	0.055	0.036	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
t-1,2-Dichloroethene	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Ethyl Benzene	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	0.023	<0.022	<0.022	<0.022	<0.022
Tetrachloroethylene	0.081	0.065	<0.004	0.062	<0.004	<0.004	<0.004	0.116	0.144	<0.004	<0.004
1,1,1-Trichloroethane	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048
Trichloroethene	0.006	0.006	<0.004	0.034	<0.004	<0.004	<0.004	0.170	<0.004	0.032	0.071
Toluene	0.016	<0.015	0.023	0.021	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Xylenes	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049	<0.049
Other VOCs (3)	<0.004	0.365	0.181	<0.004	<0.004	0.025	<0.004	0.245	<0.004	<0.004	0.088
Total VOCs (4)	0.158	0.472	0.225	0.117	<0.004	0.025	0.023	0.531	0.144	0.032	0.172

Notes:

< - Less Than NA - Not Analyzed

- (1) Soil vapor data is not quantitative data, but relative to all soil samples collected on-site.
- (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.
- (3) Other VOCs represent a grouping of sample peaks which were inconsistent with calibrant retention times. These peaks were quantified to benzene.
- (4) Total VOC values represent the sum of all detected responses (peaks) consistent with the "petroleum-like" chromatogram fingerprint observed through in-field analysis. Values are calculated by comparison of sample response to average response for known calibrant standards.

TABLE 3

Former Essex Specialty Products
Jamestown, New York

Soil Boring - Analytical Results
Concentrations reported in mg/kg (ppm), unless otherwise noted

Boring	1	1	2	2	3	3	4	4	5(1)	5(1)	6	6
Depth	4' - 6'	6' - 8'	0' - 2'	4' - 6'	2' - 4'	4' - 6'	0' - 2'	2' - 4'	2' - 4'	4' - 6'	0' - 2'	2' - 4'
Collection Date	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89
Parameter (2)												
Ethyl Benzene	<0.011	<0.011	<0.013	<0.011	<0.012	<0.011	<0.013	<0.011	<0.012	<0.011	<0.012	<0.011
t-1,2-Dichloroethene	<0.011	<0.011	<0.013	<0.011	0.075	<0.011	<0.013	<0.011	<0.012	<0.011	<0.012	<0.011
Trichloroethene	0.012	<0.011	0.14	0.023	0.94	0.16	0.026	<0.011	<0.088	0.021	0.06	<0.011
Toluene	<0.011	<0.011	<0.013	<0.011	<0.012	<0.011	<0.013	<0.011	<0.012	<0.011	<0.012	<0.011
Methylene Chloride	<0.011	<0.011	<0.013	<0.011	<0.012	<0.011	<0.013	<0.011	<0.012	<0.011	<0.012	<0.011
Xylenes	<0.011	<0.011	<0.013	<0.011	<0.012	0.15	<0.013	<0.011	<0.012	<0.011	<0.012	<0.011

Notes:

(1) B5 also contained 0.460 ppm phenanthrene, 0.850 ppm pyrene, 3.6 ppm bis(2-ethylhexyl)phthalate, and 0.550 ppm fluoranthene.
(Analytical method utilized for base/neutral/acid extractables was EPA Method 8270)

(2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

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TABLE 3

**Former Essex Specialty Products
Jamestown, New York**

Soil Boring - Analytical Results
Concentrations reported in mg/kg (ppm), unless otherwise noted

Boring	7	7	7	8	8	9	9	9	10	10	11	11	12	12
Depth	2' - 4'	4' - 6'	0' - 2'	4' - 6'	2' - 4'	6' - 8'	0' - 2'	6' - 8'	4' - 6'	6' - 8'	4' - 6'	6' - 8'	2' - 4'	4' - 6'
Collection Date	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89
Parameter (1)														
Ethyl Benzene	<0.013	<0.011	<0.011	<0.011	<0.011	<0.012	78	<0.011	<0.011	<0.011	8.9	3.5	31	15
t-1,2-Dichloroethene	0.021	<0.011	<0.011	<0.011	<0.011	<0.012	<0.012	<0.012	<0.011	<0.011	<1.1	<1.1	<1.2	<1.2
Trichloroethene	0.13	<0.011	0.15	<0.011	<0.011	<0.012	<0.012	<0.012	<0.011	<0.011	<1.1	<1.1	<1.2	<1.2
Toluene	<0.013	<0.011	0.047	<0.011	<0.011	<0.012	<0.012	<0.012	<0.011	<0.011	18	20	27	66
Methylene Chloride	0.15	<0.011	<0.011	<0.011	<0.011	<0.012	<0.012	<0.012	<0.011	<0.011	<1.1	<1.1	<1.2	<1.2
Xylenes	<0.013	<0.011	0.015	<0.011	<0.011	<0.012	2700	<0.012	<0.011	<0.011	67	24	140	73

Notes:

(1) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

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TABLE 3

**Former Essex Specialty Products
Jamestown, New York**

Soil Boring - Analytical Results
Concentrations reported in mg/kg (ppm), unless otherwise noted

Boring	13	13	13	14(1)	14 DUP (2)	15	15	16	16	17	17	Field	Trip
Depth	4' - 6'	8' - 10'	8' - 10'	10' - 12'	10' - 12'	4' - 6'	8' - 10'	2' - 4'	6' - 8'	2' - 4'	4' - 6'	Blank	Blank
Collection Date	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89	8/89
Parameter (3)													
Ethyl Benzene	<0.011	20	16	1.8	3.7	<0.011	2.7	<0.012	<0.011	<0.011	<0.011	<0.011	<0.011
1,1,2-Dichloroethene	<0.011	<11	<1.1	<1.1	<1.1	<0.011	<1.1	0.045	<0.011	0.025	<0.011	<0.011	<0.011
Trichloroethene	<0.011	<11	<1.1	<1.1	<1.1	<0.011	<1.1	<0.012	<0.011	<0.011	<0.011	<0.011	<0.011
Toluene	<0.011	230	34	28	16	<0.011	23	<0.012	<0.011	<0.011	<0.011	<0.011	<0.011
Methylene Chloride	<0.011	<11	<1.1	<1.1	<1.1	<0.011	<1.1	0.067	<0.011	<0.011	<0.011	<0.011	<0.011
Xylenes	0.017	110	120	12	15	<0.011	21	<0.012	<0.011	<0.011	<0.011	0.002	<0.011

Notes:

- (1) B14 also contained 110 ppm bis (2-ethylhexyl)phthalate. (Analytical method utilized for base/neutral/acid extractables was EPA Method 8270)
- (2) B14 DUP also contained 98 ppm bis (2-ethylhexyl)phthalate. (Analytical method utilized for base/neutral/acid extractables was EPA Method 8270)
- (3) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

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TABLE 3

Former Essex Specialty Products
Jamestown, New York

Soll Boring - Analytical Results

Concentrations reported in mg/kg (ppm), unless otherwise noted

Piezometer	1	1	2	2	2 DUP	2
Depth	2' - 4'	6' - 8'	4' - 6'	6' - 8'	6' - 8'	INNERS
Collection Date	8/89	8/89	8/89	8/89	8/89	2/90
Parameter (1)						
Ethyl Benzene	<0.012	<1.1	<0.011	1.2	<0.11	<0.016
t-1,2-Dichloroethene	<0.012	<1.1	<0.011	<0.11	<0.11	<0.016
Trichloroethene	0.043	<1.1	<0.011	<0.11	<0.11	<0.016
Toluene	<0.012	<1.1	<0.011	<0.1	<0.1	<0.016
Methylene Chloride	<0.012	<1.1	<0.011	<0.11	<0.11	<0.016
Xylenes	<0.012	16	0.018	6.7	0.27	<0.016

Notes:

(1) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

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TABLE 4

Former Essex Specialty Products
Jamestown, New York

Preliminary Ground Water Analytical Results
Concentrations reported in $\mu\text{g/l}$ (ppb), unless otherwise noted.

Monitoring Well	1	1	2	2	2	3	3	3	4	5	6	6	7	7	7D	7 DUP	7 MS
Collection Date	8/89	2/90	8/89	2/90	2/90	8/89	2/90	8/89	8/89	8/89	2/90	8/89	2/90	2/90	2/90	2/90	2/90
Parameter (1)																	
Ethyl Benzene	<1	<1	2200	3100	NA	<10,000	<2500	<1000	<1	<1	<1	<10	<1	<1	<10	<1	<1
t-1,2-Dichloroethene	<1	<1	1500	<2500	NA	68000	67000	<1000	<1	<1	210	69	8	8	48	8	7
Trichloroethene	64	<1	<1000	<2500	340 (2)	960000	530000	<1000	32	37	31	1100	140	140	940	130	140
Toluene	<1	<1	160000	220000	NA	<10,000	<2500	24000	<1	<1	<1	<10	<1	<1	<10	<1	<1
Vinyl Chloride	<1	<1	<1000	<2500	NA	<10,000	<2500	<1000	<1	<1	84	<10	<1	<1	<10	<1	<1
Xylenes	3	<1	13000	18000	NA	<10,000	<2500	3100	<1	<1	<1	<10	<1	<1	<10	<1	<1
Naphthalene (3)	NA	NA	270	NA	NA	<100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) Phthalate (3)	NA	NA	170	NA	NA	<100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA Not analyzed.

(1) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 601/602.

(2) Sample was discretely analyzed at a lower detection limit for the parameter indicated.

(3) Analytical method utilized for base/neutral/acid extractables was EPA Method 625.

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TABLE 4

**Former Essex Specialty Products
Jamestown, New York**

**Preliminary Ground Water Analytical Results
Concentrations reported in $\mu\text{g/l}$ (ppb), unless otherwise noted.**

Monitoring Well	7 MSD	8	8	8D	9	10	11	11D	12	Bailer Blank	Bailer Blank	Field Blank	Trip Blank	Trip Blank (1)	Trip Blank
Collection Date	2/90	8/89	2/90	8/89	2/90	2/90	2/90	2/90	2/90	8/89	2/90	8/89	8/89	2/90	2/90
Parameter (2)															
Ethyl Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	110	<1	<1	<1
t-1,2-Dichloroethene	7	26	2	27	160	2	45	6	16	<1	<1	<10	<1	<1	<1
Trichloroethene	130	150	17	140	270	19	46	15	39	50	<1	<10	<1	<1	<1
Toluene	<1	<1	<1	<1	<1	<1	<1	4	<1	<1	<1	44	<1	<1	<1
Vinyl Chloride	<1	4	<1	4	24	<1	<1	<1	6	<1	<1	<10	<1	<1	<1
Xylenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	580	<1	<1	<1
Naphthalene (3)	NA	<1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	NA	NA	NA
bis(2-Ethylhexyl) Phthalate (3)	NA	<1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	0.018	NA	NA

Notes:

NA Not analyzed.

- (1) Trip Blank contained 19 ppb Chloroform and 8 ppb Bromodichloromethene.
 (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 601/602.
 (3) Analytical method utilized for base/neutral/acid extractables was EPA Method 625.

TABLE 5
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
SAMPLES COLLECTED FEBRUARY 1992

Monitoring Well Compound	MW-1*		MW-2 (1)**		MW-2 (2)		MW-3 (1)		MW-3 (2)		MW-4 (1)	
	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL
Acetone	44			U		U		U		U		U
Benzene	1	J	310	J		U		U		U		U
1,1,1-Trichloroethane		U		U		U		U		U		U
Vinyl Chloride		U		U		U	2,300	J		U		U
Methylene Chloride		U		U		U		U	50,000			U
1,1-Dichloroethane		U		U		U		U		U		U
1,1-Dichloroethene		U	220	J		U		U		U		U
2-Butanone	10	UR	1,000	UR	10,000	UR	10,000	UR	100,000	UR	1,000	UR
Trichloroethene	7			U		U	530,000	EB	480,000	BD		U
Ethyl Benzene		U	3,200		2,500	JD		U		U	2,400	
Toluene		U	93,000	E	100,000	D	10,000			U	41,000	ED
Chlorobenzene		U		U		U		U		U		U
Tetrachloroethene		U		U		U		U		U		U
1,2-Dichloroethene(total)		U	2,700		2,200	JD	54,000		48,000	JD		U
Total Xylenes		U	16,000		13,000	D		U		U	8,900	

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.

- U Indicates the analyte was not detected in the sample or extraction.
- J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
- B This flag is used whenever the analyte is found in the blank as well as in the sample.
- E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.

D Diluted sample result.

N Spike sample recovery not within control limits.

R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)

- Repetition of analyses for certain samples (e.g. MW-2(1), MW-2(2), etc.) represent replicate sample analyses at different dilution factors.

* MW-1 contains an unknown compound tentatively identified as Idan at an estimated 13 µg/l.

** MW-2(1) contains an unknown unidentified compound at an estimated 1400 µg/l.

- ND - Non-detectable

- NA - Not Applicable

TABLE 3
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
SAMPLES COLLECTED FEBRUARY 1992
(continued)

Monitoring Well Compound	MW-4 (2) ($\mu\text{g/l}$)	QL	MW-5 ($\mu\text{g/l}$)	QL	MW-6 ($\mu\text{g/l}$)	QL	MW-7S ($\mu\text{g/l}$)	QL	MW-7D ($\mu\text{g/l}$)	QL	MW-7DD ($\mu\text{g/l}$)	QL
Acetone		U		U		U		U		U		U
Benzene		U		U		U		U		U		U
1,1,1-Trichloroethane		U		U		U		U		U		U
Vinyl Chloride		U		U	10			U	43			U
Methylene Chloride		U		U		U		U		U		U
1,1-Dichloroethane		U		U		U		U		U		U
1,1-Dichloroethene		U		U		U		U		U		U
2-Butanone	10,000	UR	10	UR	10	UR	10	UR	10	UR	100	UR
Trichloroethene		U	16		26		30		34		340	
Ethyl Benzene	1,600	J		U		U		U		U		U
Toluene	35,000	D		U		U		U		U		U
Chlorobenzene		U		U		U		U		U		U
Tetrachloroethene		U		U		U		U		U		U
1,2-Dichloroethene(total)		U		U	58		27		3	J	30	J
Total Xylenes	6,200			U		U		U		U		U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - B This flag is used whenever the analyte is found in the blank as well as in the sample.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - D Diluted sample result.
 - N Spike sample recovery not within control limits.
 - R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)
- Repetition of analyses for certain samples (e.g. MW-2(1), MW-2(2), etc.) represent replicate sample analyses at different dilution factors.
- ND - Non-detectable
- NA - Not Applicable

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TABLE J
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
SAMPLES COLLECTED FEBRUARY 1992
(continued)

Monitoring Well	MW-8	MW-10	MW-11S	MW-11D	MW-12 (1)	MW-12 (2)*
Compound	($\mu\text{g/l}$)	($\mu\text{g/l}$)	($\mu\text{g/l}$)	($\mu\text{g/l}$)	($\mu\text{g/l}$)	($\mu\text{g/l}$)
Acetone	U	U	U	U	U	U
Benzene	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U
Vinyl Chloride	5	U	160	3	J	880
Methylene Chloride	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U
1,1,1-Dichloroethene	U	U	U	U	U	6
2-Butanone	10	10	20	10	UR	10
Trichloroethene	19	4	6	4	J	54
Ethyl Benzene	U	U	U	U	U	U
Toluene	U	U	U	U	74	U
Chlorobenzene	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U
1,2-Dichloroethene(total)	13	4	99	29	1,400	1,900
Total Xylenes	U	U	U	U	U	U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - B This flag is used whenever the analyte is found in the blank as well as in the sample.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - D Diluted sample result.
 - N Spike sample recovery not within control limits.
 - R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)
- Repetition of analyses for certain samples (e.g. MW-2(1), MW-2(2), etc.) represent replicate sample analyses at different dilution factors.
 - * MW-12 (2) contains an unknown compound tentatively identified as p-ethyl-toluene at an estimated 7 $\mu\text{g/l}$.
- ND - Non-detectable
- NA - Not Applicable

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TABLE 3
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
SAMPLES COLLECTED FEBRUARY 1992
(continued)

Monitoring Well Compound	MW-13		MW-14S		MW-14D		MW-15S		MW-15D		MW-16S*		MW-16D	
	(μ g/l)	QL	(μ g/l)	QL	(μ g/l)	QL	(μ g/l)	QL	(μ g/l)	QL	(μ g/l)	QL	(μ g/l)	QL
Acetone		U				U				U				U
Benzene		U				U				U				U
1,1,1-Trichloroethane		U				U				U				U
Vinyl Chloride		U			20					U				U
Methylene Chloride		U	11	JN						U				U
1,1-Dichloroethane		U				U				U				U
1,1-Dichloroethene		U				U				U				U
2-Butanone	100	UR	200	UR	10	UR	10		100	UR	10	UR	10	UR
Trichloroethene		U	1,200		28				600					U
Ethyl Benzene	38	J			1	J				U				U
Toluene	110					U				U				U
Chlorobenzene		U				U				U				U
Tetrachloroethene		U				U				U				U
1,2-Dichloroethene(total)		U	440		15				130					U
Total Xylenes	720				8					U	7			U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - B This flag is used whenever the analyte is found in the blank as well as in the sample.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - D Diluted sample result.
 - N Spike sample recovery not within control limits.
 - R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)
- Repetition of analyses for certain samples (e.g. MW-2(1), MW-2(2), etc.) represent replicate sample analyses at different dilution factors.
 - * MW-16S contains three unknown compounds. One compound was unidentified at an estimated 34 μ g/l, while the other two compounds were tentatively identified as Cumene at an estimated 11 μ g/l and as p-ethyl-toluene at an estimated 12 μ g/l.
- ND - Non-detectable
- NA - Not Applicable

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TAB. 1-1
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER RESAMPLING ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS

Monitoring Well	MW-4			MW-7D			MW-7DD			MW-13		
	2/92	7/92	QL	2/92	7/92	QL	2/92	7/92	QL	2/92	7/92	QL
Compound	(µg/l)	(µg/l)		(µg/l)	(µg/l)		(µg/l)	(µg/l)				
Acetone			U		17			8	J			U
Benzene			U			U			U			U
1,1,1-Trichloroethane			U			U			U			U
Vinyl Chloride			U	43	38				U		4	J
Methylene Chloride		530	BJ		0.8	BJ		0.8	BJ		0.7	BJ
1,1-Dichloroethane			U			U			U			U
1,1-Dichloroethene			U			U			U			U
2-Butanone			U	10		UR	100		U	100		U
Trichloroethene			U	34	12		340	100				U
Ethyl Benzene	2,400	1,200	J			U			U	38	8	
Toluene	35,000	29,000	D			U			U	110		U
Chlorobenzene			U			U		4	J			U
Tetrachloroethene			U			U			U			U
1,2-Dichloroethene(total)			U	3	2	J	30	7				U
Total Xylenes	8,900	4,500				U		23		720	4	J

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - B This flag is used whenever the analyte is found in the blank as well as in the sample.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - D Diluted sample result.
 - N Spike sample recovery not within control limits.
 - R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)

- ND - Non-detectable

- NA - Not Applicable

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TABLE 6
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
GROUND WATER RESAMPLING ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS

(continued)

Monitoring Well	MW-14S			MW-14D			MW-15S			MW-15D		
	2/92	7/92	QL	2/92	7/92	QL	2/92	7/92	QL	2/92	7/92	QL
Sampling Date												
Compound	(μ g/l)	(μ g/l)	QL	(μ g/l)	(μ g/l)	QL	(μ g/l)	(μ g/l)	QL			QL
Acetone			U			U			U			U
Benzene			U			U			U			U
1,1,1-Trichloroethane		1	U			U			U			U
Vinyl Chloride			U			U			U			U
Methylene Chloride		290	E	20	29				U		4	J
1,1-Dichloroethane	11	2	BJ		0.7	BJ			U		0.7	BJ
1,1-Dichloroethene		19	U			U			U		1	J
2-Butanone			U			U	10		U	100	2	J
Trichloroethene	1,200	450	E	28	5				U	600		U
Ethyl Benzene			U	1	1	J			U			U
Toluene			U			U			U			U
Chlorobenzene			U			U			U			U
Tetrachloroethene			U			U			U			U
1,2-Dichloroethene(total)	440	840	E	15	3	J			U	130		U
Total Xylenes			U	8		U			U			U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers. The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - B This flag is used whenever the analyte is found in the blank as well as in the sample.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - D Diluted sample result.
 - N Spike sample recovery not within control limits.
 - R Rejected based on data validation report prepared by H2M Labs, Inc. (June 19, 1992)

- ND - Non-detectable

- NA - Not Applicable

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TABLE 7

Former Essex Specialty Products
Jamestown, New York
Ground Water Analytical Results
Semivolatiles / Pesticides / PCBs

Monitoring Well Sampling Date Compound	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7S	
	2/92 (ug/l)	QL	2/92 (ug/l)	QL	4/92 (ug/l)	QL	2/92 (ug/l)	QL	4/92 (ug/l)	QL	2/92 (ug/l)	QL	2/92 (ug/l)	QL
<u>Semivolatiles</u>														
Benzene, 1-ethyl-methyl(isomer)		U		U		U		U		U		U		U
Benzoic acid		U		U		U	8	J		U		U		U
Benzyl alcohol		U		U		U	9	J	4	J		U		U
Bis(2-Ethylhexyl)phthalate		U	17	N	60	N	46	N	94	N		U	1	J
Butylbenzylphthalate		U		U		U		U		U		U		U
Diethylphthalate		U		U		U		U		U		U		U
2-4-Dimethylphenol		U		U		U		U		U		U		U
Di-n-butylphthalate		U		U		U		U		U		U		U
1 H-Idene,2,3-dihydro	9	J		U		U		U		U		U		U
1-Hexanol,2-ethyl		U		U		U		U		U		U		U
2-Methylnaphthalene		U		U	13	J	30			U		U		U
2-Methylphenol		U	11	UR		U	2	JN	5	J		U		U
Naphthalene		U	410	EJ	320	D	31	N	17	J		U		U
Pentadecane,2,6,10,14-tetran	1	J		J		U		U		U		U		U
Phenanthrene		U		U		U	5	U		U		U		U
3-Penten-2-one,4-methyl		U		U		U		U		U		U		U
Tridencane,5-propyl		U		U		U		U		U		U		U
<u>Pesticides/PCBs</u>														
PCB		U		U		U	290	U		U		U		U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - E This flag indicates that the quantity of this compound detected in this sample is above the linear range of the instrument. Results are probably lower than actual.
 - N Spike sample recovery not within control limits.
- A number of unknown benzene compounds and/or unknown hydrocarbons were exhibited in samples from MW-2 and MW-4.

TABLE 7

Former Essex Specialty Products
Jamestown, New York
Ground Water Analytical Results
Semivolatiles / Pesticides / PCBs

Monitoring Well	MW-7D		MW-7DD		MW-3		MW-10		MW-11S		MW-11D		MW-12
Sampling Date	2/92		2/92		2/92		2/92		2/92		2/92		2/92
Compound	(ug/l)	QL	(ug/l)	QL	(ug/l)	QL	(ug/l)	QL	(ug/l)	QL	(ug/l)	QL	QL
<u>Semivolatiles</u>													
Benzene, 1-ethyl-methyl(isomer)		U		U		U		U		U		U	U
Benzoic acid		U		U		U		U		U		U	U
Benzyl alcohol		U	10	J		U		U		U		U	U
Bis(2-Ethylhexyl)phthalate		U	95			U		U		U		U	U
Butylbenzylphthalate		U		U		U		U		U		U	U
Diethylphthalate		U		U	2	JN		U		U		U	U
2-4-Dimethylphenol		U		U		U		U		U		U	U
Di-n-butylphthalate		U		U	1	J		U		U	1	J	U
1 H-Idene, 2,3-dihydro		U		U		U		U		U		U	U
1-Hexanol, 2-ethyl		U	10	J		U		U		U		U	U
2-Methylnaphthalene		U		U		U		U		U		U	U
2-Methylphenol		U		U		U		U		U		U	U
Naphthalene		U		U		U		U		U		U	U
Pentadecane, 2,6,10,14-tetran		U		U		U		U		U		U	U
Phenanthrene		U		U		U		U		U		U	U
3-Penten-2-one, 4-methyl		U		U		U		U		U		U	U
Tridencane, 5-propyl		U		U		U		U		U		U	U
<u>Pesticides/PCBs</u>													
PCB		U		U		U		U		U		U	U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - U Indicates the analyte was not detected in the sample or extraction.
 - J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.
 - N Spike sample recovery not within control limits.

Former Essex Specialty Products
 Jamestown, New York
 Ground Water Analytical Results
 Semivolatiles / Pesticides / PCBs

Monitoring Well	MW-13			MW-14S		MW14D		MW-15S		MW-15D		MW-16S		MW-16D	
	2/92	4/92	QL	2/92	QL	2/92	QL	2/92	QL	2/92	QL	2/92	QL	2/92	QL
Compound	(ug/l)	(ug/l)		(ug/l)		(ug/l)		(ug/l)		(ug/l)		(ug/l)		(ug/l)	
<u>Semivolatiles</u>															
Benzene, 1-ethyl-methyl(isomer)			U		U		U		U		U	20	J		U
Benzolc acid			U		U		U		U		U		U		U
Benzyl alcohol			U		U		U		U		U		U		U
Bis(2-Ethylhexyl)phthalate			U	12	U	6	J	3	JN		U	4	J	11	
Butylbenzylphthalate			U		U	3	J		U		U		U		U
Diethylphthalate			U		U		U		U		U		U		U
2-4-Dimethylphenol			U		U		U		U		U		U		U
Di-n-butylphthalate			U		U		U		U		U		U		U
1 H-Idene, 2,3-dihydro			U		U		U		U		U		U		U
1-Hexanol, 2-ethyl			U		U		U		U		U		U		U
2-Methylnaphthalene			U		U		U		U		U	15			U
2-Methylphenol			U		U		U		U		U		U		U
Naphthalene			U		U		U		U		U	15			U
Pentadecane, 2,6,10,14-tetran			U		U		U	40	J		U		U		U
Phenanthrene			U		U		U		U		U		U		U
3-Penten-2-one, 4-methyl			U		U		U		U	9	J		U		U
Tridencane, 5-propyl			U		U		U	20	J		U		U		U
<u>Pesticides/PCBs</u>															
PCB			U		U		U		U		U		U		U

Notes:

- Immediately following the analytical data for the samples the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.

U Indicates the analyte was not detected in the sample or extraction.

J Indicates an estimated value. This flag is used when mass spectral data indicates the presence of the compound, but the result is less than the specified detection limit.

N Spike sample recovery not within control limits.

- A number of unknown benzene compounds and/or unknown hydrocarbons were exhibited in the sample from MW-16S.

TABLE 6
Former Essex Specialty Products
Jamestown, New York
Ground Water Analytical Results
Inorganics
Samples Collected February 1992

Monitoring Well Compound	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7S	
	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL	(µg/l)	QL
Aluminum	11,000		48,000		22,300		174,000		31,400		20,900		88,400	
Antimony	28.7	B	27.6	B	24.1	B	75.0		29.3	B	40.5	B	14.0	U
Arsenic	15.2		28.2		32.2		60.6		12.7		8.5	B	52.1	
Barium	530		1,950		417		3,250		380		896		641	
Beryllium	3.4	B	3.4		3.2	B	9.0		3.2	B	3.2	B	3.9	B
Cadmium	2.0	U	2.0	U	2.0	U	3.8	B	2.0	U	2.0	U	10.1	
Calcium	116,000		108,000		145,000		153,000		88,200		59,300		69,800	
Chromium	117		97.8		48.9		247		136		45.4		134	
Cobalt	14.4	B	35.4	B	31.2	B	132		34.0	B	20.9	B	82.2	
Copper	74.0		256		119		579		98.7		69.8		118	
Iron	25,900		148,000		50,600		273,000		73,900		38,600		191,000	
Lead	29.4		144		84.4		292		31.4		38.7		119	
Magnesium	19,800		25,800		38,500		68,700		26,700		13,600		47,400	
Manganese	5,270		21,800		3,060		28,400		1,780		24,700		2,280	
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	67.4		104		63.4		374		127		46.7		174	
Potassium	8,050		8,470		3,730	B	21,000		5,440		4,810	B	8,970	
Selenium	3.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U	30.0	U
Silver	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Sodium	15,600		60,600		53,000		110,000		33,000		25,700		12,300	
Thallium	1.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Vanadium	23.5	B	84.5		42.3	B	259		58.6		43.3	B	140	
Zinc	166		473		269		2,360		212		343		588	
Cyanide	10.0	U	10.0	U	10.0	U	10.0	U	100	U	10.0	U	10.0	U

Notes:

- Immediately following the analytical data for the samples, the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - B Indicates the reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
 - U Indicates the analyte was not detected in the sample or extraction.

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Former Essex Specialty Products
Jamestown, New York
Ground Water Analytical Results
Inorganics
Samples Collected February 1992
(continued)

Monitoring Well Compound	MW-7D		MW-7DD		MW-8		MW-10		MW-11S		MW-11D		MW-12	
	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL
Aluminum	32,600		35,500		37,300		71,600		9,780		9,840		25,400	
Antimony	23.1	B	14.0	U	17.9	B	56.2	B	48.4	B	14.0	U	39.7	B
Arsenic	18.4		25.8		19.7		21.2		30.3		5.7	B	80.8	
Barium	232		341		524		859		1,140		163	B	839	
Beryllium	1.0	U	1.0	U	3.1	B	4.0	B	2.1	B	1.0	B	3.2	B
Cadmium	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Calcium	55,300		93,700		33,500		56,200		71,200		33,600		64,400	
Chromium	48.1		83.0		64.1		101		27.4		22.9		60.4	
Cobalt	29.2	B	35.0	B	35.8	B	65.5		11.6	B	7.8	B	21.5	B
Copper	37.1		114		105		132		31.5		17.9	B	73.8	
Iron	65,300		71,000		74,700		131,000		25,500		17,900		76,000	
Lead	34.6		98.2		206		105		27.2		13.6		135	
Magnesium	22,400		20,500		17,100		30,500		11,700		8,880		15,900	
Manganese	798		1,260		1,900		16,300		49,100		229		22,200	
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	62.2		67.2		74.4		132		20.4	B	23.3	B	40.1	
Potassium	6,830		71,500		64,100		9,980		3,920		7,990		4,620	B
Selenium	30.0	U	30.0	U	30.0	U	30.0	U	3.0	U	3.0	U	30.0	U
Silver	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Sodium	105,000		125,000		107,000		5,410		18,700		62,000		11,500	
Thallium	10.0	U	1.0	U	10.0	U	10.0	U	10.0	U	1.0	U	10.0	U
Vanadium	54.6		86.6		61.6		118		34.3	B	18.8	B	52.9	
Zinc	201		303		647		469		130		81.0		310	
Cyanide	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U

Notes:

- Immediately following the analytical data for the samples, the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - B Indicates the reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
 - U Indicates the analyte was not detected in the sample or extraction.

TABLE 8

Former Essex Specialty Products
Jamestown, New York
Ground Water Analytical Results
Inorganics
Samples Collected February 1992
(continued)

Monitoring Well Compound	MW-13		MW-14S		MW-14D		MW-15S		MW-15D		MW-16S		MW-16D	
	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL	($\mu\text{g/l}$)	QL
Aluminum	43,700		25,400		6,230		137,000		11,500		55,900		46,100	
Antimony	51.3	B	14.0	U	14.0	U	43.6	B	14.0	U	31.6	B	38.7	B
Arsenic	48.7		23.8		3.9	B	29.9		9.8	B	24.1		50.1	
Barium	387		199	B	87.3	B	3,900		218		1,160		268	
Beryllium	3.4	B	1.0	U	1.0	U	4.7	B	1.0	U	1.0	U	1.0	U
Cadmium	3.2	B	2.0	U	2.0	U	2.8	B	2.0	U	2.0	U	2.0	U
Calcium	129,000		105,000		51,300		74,900		75,300		101,000		152,000	
Chromium	79.0		43.8		15.4		195		23.6		78.6		65.9	
Cobalt	50.5		26.2	B	3.8	B	103		9.1	B	54.2		48.3	B
Copper	205		38.6		12.2	B	376		22.9	B	127		76.6	
Iron	102,000		58,100		10,500		255,000		23,700		108,000		104,000	
Lead	56.5		35.2		9.6		206		12.7		84.8		51.7	
Magnesium	41,900		33,000		12,400		58,100		21,200		37,300		53,300	
Manganese	7,600		1,580		245		16,100		608		6,340		1,840	
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	162		58.8		14.3	B	250		28.4	B	104		99.2	
Potassium	6,890		5,270		2,780	B	14,100		3,000	B	9,680		5,950	
Selenium	30.0	U	3.0	U	3.0	U	30.0	U	3.0	U	30.0	U	30.0	U
Silver	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Sodium	13,500		78,300		119,000		20,800		96,400		37,000		111,000	
Thallium	10.0	U	10.0	U	1.0	U	10.0	U	1.0	U	10.0	U	10.0	U
Vanadium	79.5		43.9	B	9.9	B	207		20.1	B	89.2		78.6	
Zinc	478		196		67.9		920		133		415		267	
Cyanide	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U

Notes:

- Immediately following the analytical data for the samples, the QA/QC information that pertains to these samples can be found in the form of Data Report Qualifiers (QL). The following are descriptions of the data report qualifiers which may have been used in this analytical report.
 - B Indicates the reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
 - U Indicates the analyte was not detected in the sample or extraction.

TABLE 9

Former Essex Specialty Products
Jamestown, New York

Sump Area Soil – Analytical Results
Concentrations reported in mg/kg (ppm), unless otherwise noted.

Sample	S1	S2	S3	S3 DUP	S4	Trip Blank (1)
Depth	0' - 2'	6 "	5.5'	5.5' DUP	7.5'	NA
Collection Date	2/90	11/89	2/90	2/90	2/90	2/90
Parameter (1)						
Ethyl Benzene	<0.013	<0.012	<0.012	<0.012	<0.012	<0.001
t-1,2-Dichloroethene	0.05	<0.012	<0.012	<0.012	<0.012	<0.001
Trichloroethene	0.066	<0.012	<0.012	<0.012	0.026	<0.001
Toluene	<0.013	<0.012	<0.012	<0.012	<0.012	<0.001
Methylene Chloride	<0.013	<0.012	<0.012	<0.012	<0.012	<0.001
Xylenes	<0.013	<0.012	<0.012	<0.012	<0.012	<0.001

Notes:

(1) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 601/602.

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TABLE 10

Former Essex Specialty Products
Jamestown, New York

Underground Storage Tank Area - Analytical Results
Concentrations reported in mg/kg (ppm), unless otherwise noted.

Tank (1)	1A	1B	1BD	2A	2B	3E	3W	4E	4W	5E	5WD	Field Blank
Depth	6'	9.5'	9.5'	6'	9'	8'	8'	5' - 6'	6'	5'	9'	
Collection Date	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90
Parameter (2)												
Ethyl Benzene	67	1000	240	89	1.6	<13	0.48	<11	17	22	21	<0.001
t-1,2-Dichloroethene	<12	<12	<12	<12	<0.11	<13	<0.12	<11	<12	<1.3	<12	<0.001
Trichloroethene	<12	<12	<12	<12	<0.11	<13	<0.12	<11	<12	<1.3	<12	<0.001
Toluene	<12	<12	<12	410	0.87	<13	<0.12	<11	130	22	250	<0.001
Methylene Chloride	<12	<12	<12	<12	<0.11	<13	<0.12	<11	<12	<1.3	<12	<0.001
Xylenes	370	3600	1200	450	14	<130	2.9	43	110	250	180	<0.001

Notes:

- (1) Refer to Figure 10 for sampling locations.
 (2) Analytical method utilized for volatile organics (halogenated and aromatic) was EPA Method 8010/8020.

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TABLE 11

**Former Essex Specialty Products
Jamestown, New York**

**Stained Soils Area - Analytical Results
Residual Semi-Volatiles**

Concentrations reported in mg/kg (ppm), unless otherwise noted.

Sample Location	1	2	3	4	5	6	7	8	9	10	11	12
Depth	6'	2.5'	3'	3'	4'	4'	3'	3'	2'	2'	3'	3'
Collection Date	6/92	6/92	6/92	6/92	6/92	6/92	5/92	5/92	5/92	5/92	5/92	5/92
Parameter (2)												
Bis(2-ethylhexyl)- phthalate	0.78	ND	0.94	ND	0.42	2.4	ND	ND	ND	ND	1.5	4.2
Bis(2-ethylhexyl)- adipate	580	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	1.2
Isophorone	ND	ND	ND	ND	5.1	ND	ND	ND	ND	ND	ND	ND
Total SVOCs	580.78	ND	0.94	ND	5.52	2.4	ND	ND	ND	ND	4.5	5.4

Notes:

- (1) ND indicates parameter not detected.
 (2) Analytical method utilized for semi-volatile organic compounds (SVOCs) was EPA Method 8270.

Table 12

**FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES
IN NEW YORK**

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Distribution</u>
<u>FISHES</u>			
Sturgeon, shortnose*	<i>Acipenser brevirostrum</i>	E	Hudson River & other Atlantic coastal rivers
<u>REPTILES</u>			
Turtle, green*	<i>Chelonia mydas</i>	T	Oceanic summer visitor coastal waters
Turtle, hawksbill*	<i>Eretmochelys imbricata</i>	E	Oceanic summer visitor coastal waters
Turtle, leatherback*	<i>Dermochelys coriacea</i>	E	Oceanic summer resident coastal waters
Turtle, loggerhead*	<i>Caretta caretta</i>	T	Oceanic summer resident coastal waters
Turtle, Atlantic ridley*	<i>Lepidochelys kempii</i>	E	Oceanic summer resident coastal waters
<u>BIRDS</u>			
Eagle, bald	<i>Haliaeetus leucocephalus</i>	E	Entire state
Falcon, peregrine	<i>Falco peregrinus</i>	E	Entire state - re- establishment to former breeding range in progress
Plover, piping	<i>Charadrius melodus</i>	E T	Great Lakes Watershed Remainder of coastal New York
Tern, roseate	<i>Sterna dougallii dougallii</i>	E	Southeastern coastal portions of state
<u>MAMMALS</u>			
Bat, Indiana	<i>Myotis sodalis</i>	E	Entire state
Cougar, eastern	<i>Felis concolor cougar</i>	E	Entire state - probably extinct
Whale, blue*	<i>Balaenoptera musculus</i>	E	Oceanic
Whale, finback*	<i>Balaenoptera physalus</i>	E	Oceanic
Whale, humpback*	<i>Megaptera novaeangliae</i>	E	Oceanic
Whale, right*	<i>Eubalaena glacialis</i>	E	Oceanic
Whale, sei*	<i>Balaenoptera borealis</i>	E	Oceanic
Whale, sperm*	<i>Physeter catodon</i>	E	Oceanic
<u>MOLLUSKS</u>			
Snail, Chittenango ovate amber	<i>Succinea chittenangoensis</i>	T	Madison County
Mussel, dwarf wedge	<i>Alasmidonta heterodon</i>	E	Orange County - lower Neversink River
<u>BUTTERFLIES</u>			
Butterfly, Karner blue	<i>Lycaeides melissa samuelis</i>	PE	Albany, Saratoga, Warren, and Schenectady Counties
<u>PLANTS</u>			
Monkshood, northern wild	<i>Aconitum noveboracense</i>	T	Ulster County
Pogonia, small whorled	<i>Isotria medeoloides</i>	E	Entire state
Swamp pink	<i>Helonias bullata</i>	T	Staten Island - presumed extirpated
Gerardia, sandplain	<i>Agalinis acuta</i>	E	Nassau and Suffolk Counties
Fern, American hart's-tongue	<i>Phyllitis scolopendrium</i> var. <i>americana</i>	T	Onondaga and Madison Counties
Orchid, eastern prairie fringed	<i>Platanthera leucophea</i>	T	Not relocated in New York
Bulrush, northeastern	<i>Scirpus ancistrochaetus</i>	E	Not relocated in New York
Roseroot, Leedy's	<i>Sedum integrifolium</i> ssp. <i>Leedyi</i>	PT	West shore of Seneca Lake

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

E=endangered T=threatened P=proposed

Table 13
CLASSIFICATIONS AND STANDARDS OF QUALITY AND PURITY ASSIGNED TO
SURFACE WATERS WITHIN THE CHADAKOLN RIVER DRAINAGE BASIN, CHAUTAQUA COUNTY, NEW YORK

<i>Item No.</i>	<i>Waters Index Number</i>	<i>Name</i>	<i>Description</i>	<i>Map Ref. No.</i>	<i>Class</i>	<i>Standards</i>
1	Pa 63-13-4	Chadakoln River		4,3	C	C
2	Pa 63-13-4-a	Tributary of Chadakoln River	Enters Chadakoln River approximately 1.0 mile above mouth.	4	C	C
3	Pa 63-13-4-1	Moon Creek	Enters Chadakoln River approximately 1.5 miles above its mouth.	4,3	B	B
4	Pa 63-13-4-1-1	Tributary of Moon Creek	Enters approximately 1.8 miles southwest of Ross Mills.	4	C	C
5	Pa 63-13-4-1a	Tributary of Chadakoln River	Enters approximately 0.1 mile above Moon Creek.	4	C	C
6	Pa 63-13-4-2 portion as described	Tributary of Chadakoln River	Enters approximately near center of Jamestown. From mouth to Allen Park.	4	C	C
7	Pa 63-13-4-2 portion as described	Tributary of Chadakoln River	From Allen Park to source.	4	B	B
8	Pa 63-13-4-3,4 and tribs.	Tributaries of Chadakoln River	Enter from north approximately 0.3 mile east and 0.1 mile west, respectively, of Jamestown city line.	4	C	C
9	Pa 63-13-4-4a	Tributary of Chadakoln River	Enters approximately 0.2 mile west of Jamestown city line.	4	C	C(T)

TABLE 14

**Former Essex Specialty Products
Jamestown, New York**

PHYSICAL-CHEMICAL PARAMETERS OF THE CHADAKOIN RIVER

	<u>Sampling Location</u>	
	<u>James and Second Avenue</u>	<u>County Highway Department</u>
Specific conductance (moh)	225	320
pH	9.0	9.5
Dissolved oxygen (mg/L)	6.0	6.0
Water temperature (°F)	82	81
Flow rate (cfs)	115.8	115.8

TABLE 15

**Former Essex Specialty Products
Jamestown, New York**

STREAM BANK VEGETATIVE COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
White ash	<i>Fraxinus americana</i> L.
Red maple	<i>Acer rubrum</i> L.
Silver maple	<i>Acer saccharinum</i> L.
Black maple	<i>Acer nigrum</i> Michx. f.
Boxelder	<i>Acer negundo</i> L.
Black oak	<i>Quercus velutina</i> Lam.
Northern red oak	<i>Quercus rubra</i> L.
Quaking aspen	<i>Populus tremuloides</i> Michx.
Eastern cottonwood	<i>Populus deltoides</i> Bartr. ex Marsh
Bigtooth aspen	<i>Populus grandidentata</i> Michx.
Black willow	<i>Salix nigra</i> Marsh.
Paper birch	<i>Betula papyrifera</i> Marsh.
Catapala	<i>Catapala speciosa</i> Warder ex Engelm.
Staghorn sumac	<i>Rhus typhina</i> L.
Poison ivy	<i>Rhus radicans</i> L.
Speckled alder	<i>Alnus rugosa</i> (Du Roi) K. Spreng.
Red-osier or Red-stemmed dogwood	<i>Cornus stolonifera</i> Michx. [<i>C. sericea</i> L.]
Alternate-leaf or Pagoda dogwood	<i>Cornus alternifolia</i> L.
Gray or Panicle dogwood	<i>Cornus racemosa</i> Lam.
Cattails	<i>Typha latifolia</i> L.
Wild grape	<i>Vitis</i> spp.
Black nightshade	<i>Solanum nigrum</i> L.
Common mullein	<i>Verbascum thapsus</i> L.
Teasel	<i>Dipsacus sylvestris</i> Huds.
Bull thistle	<i>Cirsium vulgare</i> (Savi) Tenore
Wild carrot	<i>Daucus carota</i> L.
Aster	<i>Aster</i> spp. L.
Common burdock	<i>Arctium minus</i> Schk.
Plantain	<i>Plantago rugelii</i> Decne.
Black raspberry	<i>Rubus occidentalis</i> L.
Skunk cabbage	<i>Symplocarpus foetidus</i>
Wild strawberry	<i>Fragaria virginiana</i> Duchesne
Christmas fern	<i>Polystichum acrostichoides</i>
Cinamon fern	<i>Osmunda cinnamomea</i>

TABLE 16

**Former Essex Specialty Products
Jamestown, New York**

MAMMALS OF THE STREAM BANK COMMUNITY

Common Name

Scientific Name

Cottontail rabbit

Sylvilagus floridanus

Gray squirrel

Sciurus carolinensis

Woodchuck

Marmota monax

Raccoon

Procyon lotor

TABLE 17

Former Essex Specialty Products
Jamestown, New York

BIRDS OF THE STREAM BANK COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
Mallard duck	<i>Anas platyrhynchos platyrhynchos</i>
Great blue heron	<i>Ardea herodias</i>
Robin	<i>Turdus migratorius</i>
Blue jay	<i>Cyanocitta cristata</i> Subsp.
Cardinal	<i>Richmondia cardinalis</i>
Meadowlark	<i>Sturnella magna</i>
Crow	<i>Corvus brachyrhynchos</i> Subsp.
Woodpecker	Species not identified

TABLE 18

Former Essex Specialty Products
Jamestown, New York

TREES OF THE UPLAND FOREST COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
Eastern hemlock	<i>Tsuga canadensis</i> (L.) Carr
Eastern white pine	<i>Pinus strobus</i> L.
Scots pine	<i>Pinus sylvestris</i> L.
White ash	<i>Fraxinus americana</i> L.
Black ash	<i>Fraxinus nigra</i> Marsh.
Green ash	<i>Fraxinus pennsylvanica</i> Marsh.
Red maple	<i>Acer rubrum</i> L.
Sugar maple	<i>Acer saccharum</i> Marsh.
Silver maple	<i>Acer saccharinum</i> L.
Black maple	<i>Acer nigrum</i> Michx. f.
Boxelder	<i>Acer negundo</i> L.
Black oak	<i>Quercus velutina</i> Lam.
Northern red oak	<i>Quercus rubra</i> L.
Black cherry	<i>Prunus serotina</i> Ehrh.
Choke cherry	<i>Prunus Virginiana</i> L.
Apple	<i>Malus</i> spp. Mill.
Quaking aspen	<i>Populus tremuloides</i> Michx.
Eastern cottonwood	<i>Populus deltoides</i> Bartr. ex Marsh
Bigtooth aspen	<i>Populus grandidentata</i> Michx.
Black willow	<i>Salix nigra</i> Marsh.
Paper birch	<i>Betula papyrifera</i> Marsh.
Yellow birch	<i>Betula alleghaniensis</i> Britton
Sweet birch	<i>Betula lenta</i> L.
American beech	<i>Fagus grandifolia</i> Ehrh.
American hornbeam	<i>Carpinus caroliniana</i> Walt. K. Koch

TABLE 19

Former Essex Specialty Products
Jamestown, New York

SHRUB SPECIES OF THE UPLAND FOREST COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
Buckthorn	<i>Rhamnus cathartica</i> L.
Staghorn sumac	<i>Rhus typhina</i> L.
Speckled alder	<i>Alnus rugosa</i> (Du Roi) K. Spreng.
Red-osier or Red-stemmed dogwood	<i>Cornus stolonifera</i> Michx. [<i>C. sericea</i> L.]
Alternate-leaf or Pagoda dogwood	<i>Cornus alternifolia</i> L.
Gray or Panicked dogwood	<i>Cornus racemosa</i> Lam.
Wild Grape	<i>Vitis</i> spp.

TABLE 20

Former Essex Specialty Products
Jamestown, New York

GROUND COVER SPECIES OF THE UPLAND FOREST COMMUNITY

Common Name

Scientific Name

Christmas Fern
Cinamon Fern
Black nightshade
Black raspberry
Skunk cabbage
Wild Strawberry

Polystichum acrostichoides
Osmunda cinnamomea
Solanum nigrum L.
Rubus occidentalis L.
Symplocarpus foetidus
Fragaria virginiana Duchesne

TABLE 21

Former Essex Specialty Products
Jamestown, New York

MAMMALS OF THE UPLAND FOREST COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
White-tailed deer	<i>Odocoileus virginianus</i>
Cottontail rabbit	<i>Sylvilagus floridanus</i>
Gray squirrel	<i>Sciurus carolinensis</i>
Woodchuck	<i>Marmota monax</i>
Raccoon	<i>Procyon lotor</i>

TABLE 22

Former Essex Specialty Products
Jamestown, New York

BIRDS OF THE UPLAND FOREST COMMUNITY

<u>Common Name</u>	<u>Scientific Name</u>
Robin	<i>Turdus migratorius</i>
Field sparrow	<i>Spizella pusilla</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Crow	<i>Corvus brachyrhynchos</i> Subsp.
Blue jay	<i>Cyanocitta cristata</i> Subsp.
Cardinal	<i>Richmondia cardinalis</i>
Woodpecker	Species not identified

TABLE 23

**Former Essex Specialty Products
Jamestown, New York**

FISH SPECIES OF THE CHADAKOIN RIVER

James and Second Avenue Sampling Location:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Abundance</u>
Emerald shiner	<i>Notropis atherinoides</i> Rafinesque	1
Common shiner	<i>Notropis cornutus</i>	3
Northern cheek chub	<i>Semotilus atromaculatus atromaculatus</i> Mitchell).	4
Bluntnose minnow	<i>Pimephales notatus</i> (Rafinesque).	4
Northern hog sucker	<i>Hypentelium nigricans</i> (LeSueur).	12
Pumpkinseed	<i>Lepomis gibbosus</i> L.	2
Yellow perch	<i>Perca flavescens</i> (Mitchell)	2

County Highway Department Sampling Location:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Abundance</u>
Stoneroller	<i>Campostoma anomalum</i> (Rafinesque)	17
Blacknose dace	<i>Rhinichthys atratulus</i> (Hermann).	2
Common shiner	<i>Notropis cornutus</i>	23
Bluntnose minnow	<i>Pimephales notatus</i> (Rafinesque).	19
White sucker	<i>Catostomas commersonnii</i> (Lacepede).	8
Reghorse	<i>Moxostoma</i> sp.	
Northern Yellow Bullhead	<i>Ictalurus natalis natalis</i> (LeSueur).	2
Pumpkinseed	<i>Lepomis gibbosus</i> L.	4
Northern largemouth bass	<i>Micropterus salmoides salmoides</i> (Lacepede).	1
Logperch	<i>Percina caprodes caprodes</i> (Rafinesque).	4
Northern greenside darter	<i>Etheostoma blenniodes blenniodes</i> Rafinesque	2
Fantail	<i>Etheostoma flabellare flabellare</i> Rafinesque	2

Note: Abundance indicates number of species collected per sample.

TABLE 24

**Former Essex Specialty Products
Jamestown, New York**

AREAS OF CHEMICAL RELEASE AND ASSOCIATED CONTAMINANTS

<u>Contaminated Area</u>	<u>Contaminants</u>
Former AST/UST Area	VOCs (benzene, toluene, xylene, ethylbenzene, t-1,2-dichlorethene)
North Parking Lot Sump Area	trichloroethene (TCE)
Previously Closed UST Area	toluene, xylene, ethylbenzene
Stained Soils Area	bis(2-ethylhexyl)phthalate

TABLE 25

**FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK**

MAXIMUM CONCENTRATIONS OF CHEMICALS DETECTED IN GROUNDWATER

Chemical	Maximum Detected On-Site Concentration (ug/l)
<u>VOLATILE ORGANIC COMPOUNDS</u>	
Acetone	34827
Benzene	308
2-Butanone	32
Chlorobenzene	48
1,1-Dichloroethane	224
1,1-Dichloroethene	174
1,2-Dichloroethene (total)	68000
Ethylbenzene	3159
Methylene Chloride	18057
Tetrachloroethene	320
Toluene	220000
1,1,1-Trichloroethane	41
Trichloroethene	960000
Vinyl chloride	3072
Xylenes (total)	18000
<u>SEMI-VOLATILE ORGANIC COMPOUNDS</u>	
Benzene, 1-ethyl-methyl (isomer)	20
Benzoic acid	9
Benzyl alcohol	10
BEHP	170
Butylbenzylphthalate	3
Diethylphthalate	2
2,4-Dimethylphenol	4
Di-n-butylphthalate	2
1 H-Indene,2,3-dihydro	9
1-Hexanol,2-ethyl	10
2-Methylnaphthalene	30
2-Methylphenol	2
Naphthalene	780
Pentadecane,2,6,10,14-tetran	40
Phenanthrene	5
3-Penten-2-one,4-methyl	9
Tridecane, 5-propyl	20

Units = ug/l (ppb)

* = Maximum Contaminant Level Goal

G = Guidance value

NA = not available

BEHP = bis(2-ethylhexyl)phthalate

TABLE 26
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

CHEMICAL	GROUND WATER Range (ug/l)	SOIL Range (mg/kg)
<u>Volatile Organic Compounds</u>		
Acetone	3 - 34827	
Benzene	<1 - 306	
2-Butanone	3 - 32	
1,1-Dichloroethane	30 - 224	
1,1-Dichloroethene	6 - 174	
1,2-Dichloroethene (total)	<1 - 68000	<0.011 - 0.075
Ethylbenzene	<1 - 3159	<0.011 - 1000
Methylene Chloride	<1 - 18057	<0.011 - 0.067
Tetrachloroethene	320	
1,1,1-Trichloroethane	<1 - 41	
Trichloroethene	<1 - 960000	<0.011 - 0.94
Toluene	<1 - 220000	<0.011 - 410
Vinyl Chloride	<1 - 3072	
Xylenes (total)	<1 - 18000	<0.011 - 3600
<u>Semi-Volatile Organic Compounds</u>		
BEHP	<100 - 170	3.6 - 110*
Di-n-butylphthalate	1J - 2J	
PCBs	290	
<u>Inorganic Compounds/PCBs</u>		
Arsenic	3.9B - 81	
Barium	87.3B - 3900	
Beryllium	<1 - 4.7	
Cadmium		
Chromium	15 - 247	
Iron	10500 - 273000	
Lead	9.6 - 292	

* = detected in surface soil only (0-2')

TABLE 27

**Former Essex Specialty Products
Jamestown, New York**

**A COMPARISON OF MAXIMUM CHEMICAL LEVELS IN OFF-SITE
GROUND WATER AND AMBIENT WATER QUALITY CRITERIA FOR SURFACE WATER**

<u>Potential Contaminant</u>	<u>Ambient Water Quality Criteria¹</u>		<u>Maximum Concentration¹ in Off-Site Ground Water³</u>
	<u>U.S.EPA</u>	<u>NYSDEC²</u>	
Methylene chloride	0.19 ⁴	NA	11.3
t-1,2-Dichloroethene	NA	11,600	436.1
Trichloroethene	2.7	21,900	1175.8
Vinyl chloride	2.0	NA	19.8
Ethylbenzene	NA	32,000	1.3
Toluene	14,300	17,500	ND
Xylene	NA	NA	8.1
Bis(2-ethylhexyl)adipate	NA	NA	ND
Bis(2-ethylhexyl)phthalate	NA	NA	12
Naphthalene	NA	620	15
Fluoranthene	42	3980	ND
Phenanthrene	NA	NA	ND
Pyrene	NA	NA	ND

NA = Not Available

ND = Not Detected

¹ug/L unless otherwise indicated

²insufficient data to develop criteria; value represents the lowest observed effect level

³from deep and shallow monitoring wells 14-16 (off site)

⁴for halomethanes

TABLE 28

**FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK**

CHEMICALS DETECTED IN SOIL SAMPLES

Compound	On-Site		Background/Off Site*
	Frequency of Detection	Detected Concentration Range (mg/kg)	
SURFACE SOIL			
<u>Volatile Organics</u>			
t-1,2-Dichloroethene	1/6	<0.011 - 0.05	
Trichloroethene	5/6	0.026 - .15	
Toluene	1/6	<0.011 - 0.047	
Ethylbenzene	1/6	<0.011 - 78	
Xylenes	2/6	<0.011 - 2700	
<u>Semi-Volatile Organics</u>			
Not Detected			
<u>Metals</u>			
Not Analyzed			
SUB-SURFACE SOILS			
<u>Volatile Organics</u>			
Methylene Chloride	2/49	<0.011 - 0.067	
t-1,2-Dichloroethene	4/49	<0.011 - 0.075	
Trichloroethene	9/49	<0.011 - 0.94	
Toluene	14/49	<0.011 - 410	
Ethylbenzene	19/49	<0.011 - 1000	
Xylenes	25/49	<0.011 - 3600	
<u>Semi-Volatile Organics</u>			
Bis(2-ethylhexyl)phthalate	2/2	3.6 - 110	
Phenanthrene	1/2	0.460	
Fluoranthene	1/2	0.550	
Pyrene	1/2	0.850	
<u>Metals</u>			
Not Analyzed			

* - Background soil samples were not collected

TABLE 29
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

CHEMICALS DETECTED IN MONITORING WELLS

Compound	On-Site		Background/Off Site	
	Frequency of Detection	Detected Range (ug/l)	Frequency of Detection	Detected Range (ug/l)
<u>Volatile Organic Compounds</u>				
Acetone	22/28	3J - 34827J	2/2	25-44
Benzene	5/28	<1 - 306J	1/2	1J
2-Butanone	3/28	3J - 32J	0/2	ND
Chlorobenzene +	1/28	48	0/2	ND
1,1-Dichloroethane	2/28	30J - 224J	0/2	ND
1,1-Dichloroethene	3/28	6 - 174J	0/2	ND
1,2-Dichloroethene (total)	34/50	2 - 68000	0/5	<1
Ethylbenzene	9/50	1 - 3159	0/5	<1
Methylene Chloride	12/28	<1 - 18057J	1/2	1JB
Tetrachloroethene	1/28	320J	0/2	ND
Toluene	16/50	<1 - 220000	0/5	<1
1,1,1-Trichloroethane	2/28	<1 - 41J	0/2	ND
Trichloroethene	39/50	<1 - 960000	4/5	<1 - 64
Vinyl chloride	16/50	2 - 3072	0/5	<1
Xylenes (total)	15/50	<1 - 18000	1/5	<1 - 3
<u>Semi-Volatile Organics</u>				
Benzene, 1-ethyl-methyl (isomer) +	1/21	20J	0/2	ND
Benzoic acid +	1/21	9J	0/2	ND
Benzyl alcohol +	2/21	8J - 10J	0/2	ND
BEHP	8/24	<100 - 170	0/4	ND
Butylbenzylphthalate +	1/21	3J	0/2	ND
Diethylphthalate +	1/21	2J	0/2	ND
2,4-Dimethylphenol +	1/21	4J	0/2	ND
Di-n-butylphthalate +	3/21	1J - 2J	0/2	ND
1 H-indene,2,3-dihydro +	1/21	9J	1/2	9J
1-Hexanol,2-ethyl +	1/21	10J	0/2	ND
2-Methylnaphthalene +	2/21	15-30	0/2	ND
2-Methylphenol +	1/21	2J	0/2	ND
Naphthalene	7/24	<100 - 780	1/4	ND
Pentadecane,2,6,10,14-tetran +	1/21	40J	0/2	ND
Phenanthrene +	1/21	5J	0/2	ND
3-Penten-2-one,4-methyl +	1/21	9J	0/2	ND
Tridecane, 5-propyl +	1/21	20J	0/2	ND
PCBs	1/21	290	0/2	ND
<u>Inorganics</u>				
Aluminum +	21/21	6230 - 174000	2/2	1000 - 31400
Antimony +	11/21	<14 - 75	2/2	28.7B - 29.3B
Arsenic +	21/21	3.9B - 81	2/2	12.7 - 15.2
Barium +	21/21	87.3B - 3900	2/2	380 - 530
Beryllium +	14/21	<1 - 4.7	2/2	3.2B - 3.4B
Cadmium +	6/21	2 - 10	0/2	<2
Calcium +	21/21	33500 - 153000	2/2	200 - 116000
Chromium +	21/21	15 - 247	2/2	117 - 136
Cobalt +	21/21	4B - 132	2/2	14B - 34
Copper +	21/21	4B - 579	2/2	74 - 99
Iron +	21/21	10500 - 273000	2/2	5900 - 73900
Lead +	21/21	9.6 - 292	2/2	29 - 31
Magnesium +	21/21	8880 - 68700	2/2	9800 - 26700
Manganese +	21/21	229 - 49100	2/2	5270 - 1780
Mercury +	0/21	<0.2	0/2	<0.2
Nickel +	21/21	20 - 374	2/2	127 - 67.4
Potassium +	21/21	2780 - 71500	2/2	5440 - 8050
Selenium +	0/21	<3 - <30	0/2	<3 - <30
Silver +	0/21	<3	0/2	<3
Sodium +	21/21	5410 - 125000	2/2	3000 - 15600
Thallium +	0/21	<1 - <10	0/2	<1 - <10
Vanadium +	21/21	9.9B - 259	2/2	24 - 59
Zinc +	21/21	81 - 2360	2/2	166 - 212
Cyanide +	0/21	<10	0/2	<10

Units = ug/l (ppb)

Data from 03/92 sampling event

Note: (1) Background concentrations based on MW1 and MW5

+ - Not selected as compound of potential concern, see Section 6.03

TABLE 30
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

**POTENTIAL EXPOSURE ROUTES
AND EXPOSURE PATHWAYS**

Exposure Medium/ Exposure Route	Exposure Point	Current Exposures Current Land Use	Future Exposures Current Land Use	Future Exposures Future Land Use
<u>SOIL</u> Ing, derm Ing, derm	on-site off-site	complete incomplete	incomplete incomplete	incomplete incomplete
<u>SURFACE WATER</u> Ing, derm, fish	Chadakoin River	incomplete	incomplete	incomplete
<u>SEDIMENTS</u> Ing, derm	Chadakoin River	incomplete	incomplete	incomplete
<u>GROUND WATER</u> Ing, inh, derm Ing, inh, derm	on-site wells off-site wells	incomplete incomplete	incomplete incomplete	incomplete complete
<u>AIR</u> Inh Inh	on-site off-site	complete complete	complete complete	complete complete
<u>FOODCHAIN</u> Ing	biota	incomplete	incomplete	incomplete

Ing = ingestion, Inh = inhalation, Derm = dermal contact, fish = fish ingestion

TABLE 31
FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

SUMMARY OF EXPOSURE POINT CONCENTRATIONS

Receptor/Exposure Pathway	Exposure Point Concentration		Comment
	Average	Upper Bound	
<u>On-Site Worker</u>			
<u>Direct Contact with Surface Soil</u> (mg/kg)			
Ethylbenzene	13	36.7	Average concs. are mean on-site concs. Upper bound concs. are upper 95 % confidence limit on the mean (See Appendices K and M)
Trichloroethene	0.088	0.13	
Toluene	0.015	0.03	
Xylenes	450	1271	
<u>Direct Contact with Sub-surface Soil</u> (mg/kg)			
Ethylbenzene	29	68	Average concs. are mean on-site concs. Upper bound concs. are upper 95 % confidence limit on the mean (See Appendices K and M)
t-1,2-dichloroethene	0.14	0.2	
Trichloroethene	0.17	0.24	
Toluene	26	36	
Xylenes	217	381	
<u>Inhalation of On-Site Air</u> (ug/m3)			
1,1,1,-Trichloroethane	4.6E+00	6.0E+00	Air concs. calculated based on SEAMS emission model and TSCREEN dispersion model. Average concs are calculated air concs. based on average soil and groundwater concs. Upper bound concs. are based on upper 95 % confidence limit on the mean (See Appendices K and M)
1,1-Dichloroethane	7.1E-02	1.2E-01	
1,1-Dichloroethene	8.2E-01	9.6E-01	
1,2-Dichloroethene	2.0E+01	2.2E+01	
2,Butanone	1.3E-03	1.3E-03	
Acetone	1.7E+01	3.3E+01	
Benzene	1.7E-01	3.1E-01	
Chlorobenzene	2.6E-02	2.6E-02	
Ethylbenzene	1.6E+03	3.9E+03	
Methylene chloride	4.1E+00	8.3E+00	
Tetrachloroethene	9.6E-01	9.7E-01	
Toluene	2.7E+03	2.7E+03	
Trichloroethene	2.4E+02	7.8E+02	
t,1,2-Dichloroethene	4.6E+00	6.0E+00	
Vinyl Chloride	1.9E+00	6.1E+00	
Xylene	5.8E+03	1.3E+05	

TABLE 31 (Cont.)
FORMER ESSEX SPECIALTY PRODUCTE FACILITY
JAMESTOWN, NEW YORK

SUMMARY OF EXPOSURE POINT CONCENTRATIONS

Receptor/Exposure Pathway	Exposure Point Concentration		Comment
	Average	Upper Bound	
<u>On-Site Trespasser</u>			
<u>Direct Contact with Surface Soil</u>			
(mg/kg)			
Ethylbenzene	13	36.7	Average concs. are mean on-site concs. Upper bound concs. are upper 95 % confidence limit on the mean (See Appendices K and M)
Trichloroethene	0.088	0.13	
Toluene	0.015	0.03	
Xylenes	450	1271	
<u>Inhalation of On-Site Air</u>			
(ug/m3)			
1,1,1,-Trichloroethane	4.6E+00	6.0E+00	Air concs. calculated based on SEAMS emission model and TSCREEN dispersion model. Average concs are calculated air concs. based on average soil and groundwater concs. Upper bound concs. are based on upper 95 % confidence limit on the mean (See Appendices K and M)
1,1-Dichloroethane	7.1E-02	1.2E-01	
1,1-Dichloroethene	8.2E-01	9.6E-01	
1,2-Dichloroethene	2.0E+01	2.2E+01	
2,Butanone	1.3E-03	1.3E-03	
Acetone	1.7E+01	3.3E+01	
Benzene	1.7E-01	3.1E-01	
Chlorobenzene	2.6E-02	2.6E-02	
Ethylbenzene	1.6E+03	3.9E+03	
Methylene chloride	4.1E+00	8.3E+00	
Tetrachloroethene	9.6E-01	9.7E-01	
Toluene	2.7E+03	2.7E+03	
Trichloroethene	2.4E+02	7.8E+02	
1,1,2-Dichloroethene	4.6E+00	6.0E+00	
Vinyl Chloride	1.9E+00	6.1E+00	
Xylene	5.8E+03	1.3E+05	

TABLE 31 (Cont.)
FORMER ESSEX SPECIALTY PRODUCTE FACILITY
JAMESTOWN, NEW YORK

SUMMARY OF EXPOSURE POINT CONCENTRATIONS

Receptor/Exposure Pathway	Exposure Point Concentration		Comment
	Average	Upper Bound	
<u>Off-Site Resident</u>			
<u>Ingestion of Off-Site</u>			
<u>Groundwater</u>			
(ug/l)			Average concs. are mean on-site concs. Upper bound concs. are upper 95 % confidence limit on the mean (See Appendix K and M)
Acetone	8	11	
1,2-dichloroethylene	284	436	
Ethylbenzene	1	1	
Methylene chloride	6	11	
Trichloroethene	591	1071	
Vinyl chloride	20	20	
Xylenes	8	8	
BEHP	7	10	
Naphthalene	15	15	
<u>Inhalation of Off-Site Air</u>			
(ug/m3)			Air concs. calculated based on SEAMS emission model and TSCREE dispersion model. Average concs are calculated air concs. based on average soil and groundwater concs. Upper bound concs. are based on upper 95 % confidence limit on the mean (See Appendices K and M)
1,1,1,-Trichloroethane	1.8E-03	1.8E-03	
1,1-Dichloroethane	4.0E-03	7.1E-03	
1,1-Dichloroethene	4.9E-02	5.8E-02	
1,2-Dichloroethene	1.1E+00	1.3E+00	
2,Butanone	7.4E-05	7.8E-05	
Acetone	9.8E-01	1.9E+00	
Benzene	9.4E-03	1.8E-02	
Chlorobenzene	1.7E-03	1.7E-03	
Ethylbenzene	1.1E+02	2.6E+02	
Methylene chloride	2.4E-01	4.8E-01	
Tetrachloroethene	5.5E-02	5.6E-02	
Toluene	9.2E+01	1.8E+02	
Trichloroethene	1.4E+01	4.5E+01	
1,1,2-Dichloroethene	3.1E-01	4.0E-01	
Vinyl Chloride	1.1E-01	3.6E-01	
Xylene	3.9E+02	8.8E+02	

TABLE 32
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

EXPOSURE PARAMETERS - INCIDENTAL INGESTION OF SURFACE SOILS

$CDI = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$					
<u>On-Site Worker</u>					
Parameter	Description	Units	Average	Maximum	Reference
Cs	Contaminant conc. in soil	mg/kg soil	Mean on-site surface soil conc.	upper 95 % CI or maximum on-site conc.	U.S. EPA 1989
IR	Incidental Ingestion Rate	mg/day	61	100	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	days/year	250	250	U.S. EPA 1989
ED	Exposure Duration	Years/Lifetime	9	25	U.S. EPA 1989
BW	Body Weight	Kg	70	70	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	9	25	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989
<u>On-Site Trespasser</u>					
Cs	Contaminant conc. in soil	mg/kg soil	Mean on-site surface soil conc.	upper 95 % CI or maximum on-site conc.	U.S. EPA 1989
IR	Incidental Ingestion Rate	mg/day	200	800	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	days/year	16	52	Professional Judgment
ED	Exposure Duration	Years/Lifetime	3	6	U.S. EPA 1989
BW	Body Weight	Kg	16	16	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	3	6	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	

TABLE 33
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

EXPOSURE PARAMETERS - INCIDENTAL INGESTION OF SUB-SURFACE SOILS

$CDI = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$					
On-site worker					
Parameter	Description	Units	Average	Maximum	Reference
Cs	Contaminant conc. in soil	mg/kg soil	Mean on-site surface soil conc.	upper 95 % CI or maximum on-site conc.	U.S. EPA 1989
IR	Incidental Ingestion Rate	mg/day	480	480	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	days/year	30	30	Professional Judgement
ED	Exposure Duration	Years/Lifetime	2	2	Professional Judgement
BW	Body Weight	Kg	70	70	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	2	2	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989

TABLE 34
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

EXPOSURE PARAMETERS - DERMAL UPTAKE OF CHEMICAL RESIDUES IN SOIL

Absorbed Dose = $\frac{Cs \times CF \times AF \times SA \times ABS \times EF \times ED}{BW \times AT}$					
On-site worker					
Parameter	Description	Units	Average	Maximum	Reference
Cs	Contaminant conc. in soil	mg/kg soil	Mean on-site surface soil conc.	upper 95 % CI or maximum on-site conc.	U.S. EPA 1989
AF	Soil to skin adherence factor	mg/cm ² - event	0.2	1.0	U.S. EPA 1989
SA	Exposed skin surface area	cm ²	5230	7060	Surface Area of exposed arms, hands, feet, legs, and head in adults
ABS	Absorption Factor	unitless	compound specific	compound specific	
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	events/year	250	250	U.S. EPA 1989
ED	Exposure Duration	Years/Life	9	25	U.S. EPA 1989
BW	Body Weight	Kg	70	70	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	9	25	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989
On-Site Child Trespasser					
Cs	Contaminant conc. in soil	mg/kg soil	Mean on-site surface soil conc.	upper 95 % CI or maximum on-site conc.	U.S. EPA 1989
AF	Soil to skin adherence factor	mg/cm ² - event	0.2	1.0	U.S. EPA 1989
SA	Exposed skin surface area	cm ²	3900	4400	Surface Area of exposed arms, hands, feet, legs, and head in children
ABS	Absorption Factor	unitless	compound specific	compound specific	
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	events/year	15	52	U.S. EPA 1989
ED	Exposure Duration	Years/Life	9	30	U.S. EPA 1989
BW	Body Weight	Kg	70	70	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	9	30	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989

TABLE 35
FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

EXPOSURE PARAMETERS - INGESTION OF GROUNDWATER

$CDI = \frac{Ca \times IR \times CF \times EF \times ED}{BW \times AT}$					
Off-Site Resident - Adult					
Parameter	Description	Units	Average	Maximum	Reference
Cw	Contaminant conc. in air	mg/L water	Mean conc in off-site wells.	upper 95 % CI of off-site well conc.	U.S. EPA 1989
IR	Ingestion Rate	L/day	1.4	2	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	days/year	350	350	U.S. EPA 1989
ED	Exposure Duration	Years/Lifetime	9	30	U.S. EPA 1989
BW	Body Weight	Kg	70	70	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	9	30	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989
Off-Site Resident - Child					
Cs	Contaminant conc. in water	mg/l water	Mean conc. in off-site wells	Upper 95 % CI of off-site well mean.	U.S. EPA 1989
IR	Ingestion Rate	L/day	0.64	1.0	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S. EPA 1989
EF	Exposure Frequency	days/year	350	350	U.S. EPA 1989
ED	Exposure Duration	Years/Lifetime	3	6	U.S. EPA 1989
BW	Body Weight	Kg	16	16	U.S. EPA 1989
AT	Averaging time (non-cancer)	Years	3	6	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S. EPA 1989

TABLE 36
FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

EXPOSURE PARAMETERS - INHALATION OF AMBIENT AIR

CDI = $\frac{Ca \times IR \times CF \times ET \times EF \times ED}{BW \times AT}$					
On-Site Worker					
Parameter	Description	Units	Average	Maximum	Reference
Ca	Contaminant conc. in air	mg/m ³	"Average" air concentration 10 M from the source according to TSCREEN model	"Max" air concentration 10 M from the source according to TSCREEN model	U.S. EPA 1989
IR	Inhalation Rate	m ³ /hour	1.4	3	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S.EPA 1989
ET	Exposure Time	Hours/Day	4	8	Professional Judgement
EF	Exposure Frequency	days/year	250	250	U.S. EPA 1989
ED	Exposure Duration	Years/Lifetime	9	30	U.S. EPA 1989
BW	Body Weight	Kg	70	70	U.S.EPA 1989
AT	Averaging time (non-cancer)	Years	9	30	U.S. EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S.EPA 1989
On-site Trespasser					
Ca	Contaminant conc. in air	mg/m ³ air	"Average" air concentration 10 M from the source according to TSCREEN model	"Max" air concentration 10 M from the source according to TSCREEN model	U.S. EPA 1989
IR	Inhalation Rate	m ³ /hour	0.64	1.0	U.S. EPA 1989
CF	Conversion factor	kg/mg	1E-06	1E-06	U.S.EPA 1989
ET	Exposure Time	Hours/Day	2	4	Professional Judgement
EF	Exposure Frequency	days/year	16	52	U.S. EPA 1989
ED	Exposure Duration	Years/Lifetime	3	6	U.S. EPA 1989
BW	Body Weight	Kg	16	16	U.S.EPA 1989
AT	Averaging time (non-cancer)	Years	3	6	U.S.EPA 1989
	Averaging Time (cancer)	Years	70	70	U.S.EPA 1989

TABLE 37

**FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK**

**SUMMARY OF PHYSICAL AND ENVIRONMENTAL FATE DATA
FOR CHEMICALS OF POTENTIAL CONCERN**

Chemical	Koc (ml/g)	log Kow	Water Solubil- ity (mg/l)	Henry's Law Constant (atm * m3/mol)	Vapor Pressure (mm Hg)	Fish BCF (l/kg)	Surface Water Half- life (days)
<u>Volatile Organic Compounds</u>							
Acetone	2.2	-0.24	1.00E+06	2.06E-05	2.70E+02		
Benzene	83	2.12	1.75E+03	5.59E-03	9.52E+01	5.2	
2-Butanone							
Chlorobenzene	330	2.84	4.66E+02	3.72E-03	1.17E+01	10	
1,1-Dichloroethane	30	1.79	5.50E+03	4.31E-03	1.82E+02		
1,1-Dichloroethene	65	1.84	2.25E+03	3.40E-02	6.00E+02	5.6	
1,2-Dichloroethene (total)	59	0.48	6.30E+03	6.56E-03	3.24E+02	1.6	1.00 - 6.00
Ethylbenzene	1100	3.15	1.52E+02	6.43E-03	7.00E+00	37.5	1.50 - 7.50
Methylene Chloride							
Toluene	300	2.73	5.35E+02	6.37E-03	2.81E+01	10.7	0.17
1,1,1-Trichloroethane	152	2.5	1.50E+03	1.44E-02	1.23E+02	5.6	
Trichloroethene	126	2.38	1.10E+03	9.10E-03	5.79E+01	10.6	1.00 - 90.00
Vinyl Chloride	57	1.38	2.67E+03	8.19E-02	2.66E+03	1.17	1.00 - 5.00
Xylenes	240	3.26	1.98E+02	7.04E-03	1.00E+01		1.50 - 9.00
<u>Semi-Volatile Organic Compounds/PCBs</u>							
BEHP							
Di-n-butylphthalate							
Naphthalene							
PCBs	530000	6.04	3.10E-02	1.07E-03	7.70E-05	100000	

TABLE 38
FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

INTAKES FROM INCIDENTAL INGESTION OF CHEMICALS IN ON-SITE SURFACE SOIL

AVERAGE INTAKE*											
Chemical	Average CS (mg/kg)	IR (mg/day)	CF (kg/mg)	FI	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
<u>On-Site Worker</u>											
Ethylbenzene	13	61	1.00E-06	1	250	9	70	9	7.76E-06	-	-
Trichloroethylene	0.088	61	1.00E-06	1	250	9	70	9	5.25E-08	70	6.75E-09
Toluene	0.015	61	1.00E-06	1	250	9	70	9	8.95E-09	-	-
Xylenes	450	61	1.00E-06	1	250	9	70	9	2.69E-04	-	-
<u>Child Trespasser (ages 6-13)</u>											
Ethylbenzene	13	200	1.00E-06	1	16	3	16	3	7.12E-06	-	-
Trichloroethylene	0.088	200	1.00E-06	1	16	3	16	3	4.82E-08	70	2.07E-09
Toluene	0.015	200	1.00E-06	1	16	3	16	3	8.22E-09	-	-
Xylenes	450	200	1.00E-06	1	16	3	16	3	2.47E-04	-	-
UPPER BOUND INTAKE*											
Chemical	Upper Bound CS (mg/kg)	IR (mg/day)	CF (kg/mg)	FI	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
<u>Industrial Worker</u>											
Ethylbenzene	36.7	100	1.00E-06	1	250	25	70	25	3.59E-05	-	-
Trichloroethylene	0.13	100	1.00E-06	1	250	25	70	25	1.27E-07	70	4.54E-08
Toluene	0.03	100	1.00E-06	1	250	25	70	25	2.94E-08	-	-
Xylenes	1271	100	1.00E-06	1	250	25	70	25	1.24E-03	-	-
<u>Child Trespasser (ages 6-13)</u>											
Ethylbenzene	36.7	800	1.00E-06	1	52	7	16	7	2.61E-04	-	-
Trichloroethylene	0.13	800	1.00E-06	1	52	7	16	7	9.26E-07	70	9.26E-08
Toluene	0.03	800	1.00E-06	1	52	7	16	7	2.14E-07	-	-
Xylenes	1271	800	1.00E-06	1	52	7	16	7	9.05E-03	-	-

* - Please refer to Table 32 for explanation of symbols and parameter value sources

TABLE 39

FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

INTAKES FROM DERMAL CONTACT WITH CHEMICALS IN SURFACE SOIL

AVERAGE EXPOSURES

Chemical	Average* CS (mg/kg)	CF (kg/mg)	SA (cm2)	AF (mg/cm2)	ABS	EF (event/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
<u>On-Site Worker</u>												
Ethylbenzene	13	1.00E-06	5230	0.2	0.08	250	25	70	25	1.06E-05	-	-
Trichloroethylene	0.088	1.00E-06	5230	0.2	0.08	250	25	70	25	7.21E-08	70	2.57E-08
Toluene	0.015	1.00E-06	5230	0.2	0.08	250	25	70	25	1.23E-08	-	-
Xylenes	450	1.00E-06	5230	0.2	0.08	250	25	70	25	3.68E-04	-	-
<u>On-Site Trespasser</u>												
Ethylbenzene	13	1.00E-06	3900	0.2	0.08	16	7	16	7	2.22E-06	-	-
Trichloroethylene	0.088	1.00E-06	3900	0.2	0.08	16	7	16	7	1.50E-08	70	1.50E-09
Toluene	0.015	1.00E-06	3900	0.2	0.08	16	7	16	7	2.56E-09	-	-
Xylenes	450	1.00E-06	3900	0.2	0.08	16	7	16	7	7.69E-05	-	-

Chemical	Maximum*	CF (kg/mg)	SA (cm2)	AF (mg/cm2)	ABS	EF (event/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
<u>On-Site Worker</u>												
Ethylbenzene	36.7	1.00E-06	7060	1	0.15	250	25	70	25	3.80E-04	-	-
Trichloroethylene	0.13 **	1.00E-06	7060	1	0.15	250	25	70	25	1.35E-06	70	4.81E-07
Toluene	0.03	1.00E-06	7060	1	0.15	250	25	70	25	3.11E-07	-	-
Xylenes	1271	1.00E-06	7060	1	0.15	250	25	70	25	1.32E-02	-	-
<u>On-Site Trespasser</u>												
Ethylbenzene	36.7	1.00E-06	4400	1	0.15	52	6	16	6	2.16E-04	-	-
Trichloroethylene	0.13 **	1.00E-06	4400	1	0.15	52	6	16	6	7.64E-07	70	6.55E-08
Toluene	0.03	1.00E-06	4400	1	0.15	52	6	16	6	1.76E-07	-	-
Xylenes	1271	1.00E-06	4400	1	0.15	52	6	16	6	7.47E-03	-	-

* - Please refer to Table 34 for an explanation of symbols and parameter value references.

TABLE 40

**FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK**

INTAKES FROM INCIDENTAL INGESTION OF CHEMICALS IN ON-SITE SUB-SURFACE SOIL

AVERAGE INTAKE											
Chemical	Average*			FI	EF	ED	BW	AT	Intake for		Intake for
	CS	IR	CF						Non-carc.	AT	Carc.
	(mg/kg)	(mg/day)	(kg/mg)		(dy/yr)	(yrs)	(kg)	(yrs)	Effects	(yrs)	Effects
On-Site Worker											
Ethylbenzene	29	480	1.00E-06	1	30	2	70	2	1.63E-05	-	-
t-1,2-dichloroethene	0.14	480	1.00E-06	1	30	2	70	2	7.89E-08	-	-
Trichloroethylene	0.17	480	1.00E-06	1	30	2	70	2	9.58E-08	70	2.74E-09
Toluene	26	480	1.00E-06	1	30	2	70	2	1.47E-05	-	-
Xylenes	217	480	1.00E-06	1	30	2	70	2	1.22E-04	-	-

UPPER BOUND INTAKE											
Chemical	Max*			FI	EF	ED	BW	AT	Intake for		Intake for
	CS	IR	CF						Non-carc.	AT	Carc.
	(mg/kg)	(mg/day)	(kg/mg)		(dy/yr)	(yrs)	(kg)	(yrs)	Effects	(yrs)	Effects
On-Site worker											
Ethylbenzene	68	480	1.00E-06	1	30	2	70	2	3.83E-05	-	-
t-1,2-dichloroethene	0.2	480	1.00E-06	1	30	2	70	2	1.13E-07	-	-
Trichloroethylene	0.24	480	1.00E-06	1	30	2	70	2	1.35E-07	70	3.86E-09
Toluene	36	480	1.00E-06	1	30	2	70	2	2.03E-05	-	-
Xylenes	381	480	1.00E-06	1	30	2	70	2	2.15E-04	-	-

* - Please refer to Table 33 for explanation of symbols and parameter value references.

TABLE 41
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

INTAKES FROM INHALATION OF AIRBOURNE (VAPOR PHASE) CHEMICALS

AVERAGE INTAKES										
Chemical	Average Ca (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
On-Site Worker										
1,1,1,-Trichloroethane	4.60E-03	1.4	4	125	9	70	9	1.26E-04	-	-
1,1,-Dichloroethane	7.10E-05	1.4	4	125	9	70	9	1.95E-06	-	-
1,1-Dichloroethene	8.20E-04	1.4	4	125	9	70	9	2.25E-05	70	2.89E-06
1,2-Dichloroethene	1.99E-02	1.4	4	125	9	70	9	5.46E-04		
2,Butanone	1.27E-06	1.4	4	125	9	70	9	3.48E-08		
Acetone	1.71E-02	1.4	4	125	9	70	9	4.69E-04		
Benzene	1.70E-04	1.4	4	125	9	70	9	4.65E-06	70	5.97E-07
Chlorobenzene	2.62E-05	1.4	4	125	9	70	9	7.18E-07	70	9.23E-08
Ethylbenzene	1.62E+00	1.4	4	125	9	70	9	4.43E-02	-	-
Methylchloride	4.11E-03	1.4	4	125	9	70	9	1.13E-04	70	1.45E-05
Tetrachloroethene	9.61E-04	1.4	4	125	9	70	9	2.63E-05	-	-
Toluene	2.69E+00	1.4	4	125	9	70	9	7.37E-02	-	-
Trichloroethene	2.37E-01	1.4	4	125	9	70	9	6.49E-03	70	8.35E-04
t,1,2-Dichloroethene	4.64E-03	1.4	4	125	9	70	9	1.27E-04	-	-
Vinyl Chloride	1.94E-03	1.4	4	125	9	70	9	5.32E-05	70	6.84E-06
Xylene	5.83E+00	1.4	4	125	9	70	9	1.60E-01	-	-
UPPER BOUND INTAKE										
	Maximum CA (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
On-Site Worker										
1,1,1,-Trichloroethane	6.00E-03	3.0	8	250	25	70	25	1.41E-03	-	-
1,1,-Dichloroethane	1.24E-04	3.0	8	250	25	70	25	2.92E-05	-	-
1,1-Dichloroethene	9.59E-04	3.0	8	250	25	70	25	2.25E-04	70	8.04E-05
1,2-Dichloroethene	2.19E-02	3.0	8	250	25	70	25	5.14E-03		
2,Butanone	1.32E-06	3.0	8	250	25	70	25	3.11E-07		
Acetone	3.33E-02	3.0	8	250	25	70	25	7.82E-03		
Benzene	3.06E-04	3.0	8	250	25	70	25	7.19E-05	70	2.57E-05
Chlorobenzene	2.60E-05	3.0	8	250	25	70	25	6.11E-06	70	2.18E-06
Ethylbenzene	3.91E+00	3.0	8	250	25	70	25	9.17E-01	-	-
Methylchloride	8.30E-03	3.0	8	250	25	70	25	1.95E-03	70	6.96E-04
Tetrachloroethene	9.69E-04	3.0	8	250	25	70	25	2.27E-04	-	-
Toluene	2.72E+00	3.0	8	250	25	70	25	6.39E-01	-	-
Trichloroethene	7.79E-01	3.0	8	250	25	70	25	1.83E-01	70	6.53E-02
t,1,2-Dichloroethene	6.00E-03	3.0	8	250	25	70	25	1.41E-03	-	-
Vinyl Chloride	6.09E-03	3.0	8	250	25	70	25	1.43E-03	70	5.11E-04
Xylene	1.30E+02	3.0	8	250	25	70	25	3.05E+01	-	-

* - Please refer to Table 36 for explanation of symbols and parameter value references

TABLE 41 (con't)
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

INTAKES FROM INHALATION OF AIRBOURNE (VAPOR PHASE) CHEMICALS

AVERAGE INTAKES										
Chemical	Average Ca (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
On-Site Child Trespasser										
1,1,1,-Trichloroethane	4.60E-03	1.0	2	16	3	16	3	2.52E-05	-	-
1,1,-Dichloroethane	7.10E-05	1.0	2	16	3	16	3	3.89E-07	-	-
1,1-Dichloroethene	8.20E-04	1.0	2	16	3	16	3	4.49E-06	70	1.93E-07
1,2-Dichloroethene	1.99E-02	1.0	2	16	3	16	3	1.09E-04	-	-
2,Butanone	1.27E-06	1.0	2	16	3	16	3	6.95E-09	-	-
Acetone	1.71E-02	1.0	2	16	3	16	3	9.39E-05	-	-
Benzene	1.70E-04	1.0	2	16	3	16	3	9.29E-07	70	3.98E-08
Chlorobenzene	2.62E-05	1.0	2	16	3	16	3	1.44E-07	70	6.15E-09
Ethylbenzene	1.62E+00	1.0	2	16	3	16	3	8.86E-03	-	-
Methylchloride	4.11E-03	1.0	2	16	3	16	3	2.25E-05	70	9.65E-07
Tetrachloroethene	9.61E-04	1.0	2	16	3	16	3	5.27E-06	-	-
Toluene	2.69E+00	1.0	2	16	3	16	3	1.47E-02	-	-
Trichloroethene	2.37E-01	1.0	2	16	3	16	3	1.30E-03	70	5.56E-05
t,1,2-Dichloroethene	4.64E-03	1.0	2	16	3	16	3	2.54E-05	-	-
Vinyl Chloride	1.94E-03	1.0	2	16	3	16	3	1.06E-05	70	4.56E-07
Xylene	5.83E+00	1.0	2	16	3	16	3	3.20E-02	-	-
UPPER BOUND INTAKE										
Chemical	Maximum CA (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
On-Site Child Trespasser										
1,1,1,-Trichloroethane	6.00E-03	2	4	52	6	16	6	4.27E-04	-	-
1,1,-Dichloroethane	1.24E-04	2	4	52	6	16	6	8.86E-06	-	-
1,1-Dichloroethene	9.59E-04	2	4	52	6	16	6	6.83E-05	70	5.85E-06
1,2-Dichloroethene	2.19E-02	2	4	52	6	16	6	1.56E-03	-	-
2,Butanone	1.32E-06	2	4	52	6	16	6	9.44E-08	-	-
Acetone	3.33E-02	2	4	52	6	16	6	2.37E-03	-	-
Benzene	3.06E-04	2	4	52	6	16	6	2.18E-05	70	1.87E-06
Chlorobenzene	2.60E-05	2	4	52	6	16	6	1.85E-06	70	1.59E-07
Ethylbenzene	3.91E+00	2	4	52	6	16	6	2.78E-01	-	-
Methylchloride	8.30E-03	2	4	52	6	16	6	5.91E-04	70	5.07E-05
Tetrachloroethene	9.69E-04	2	4	52	6	16	6	6.90E-05	-	-
Toluene	2.72E+00	2	4	52	6	16	6	1.94E-01	-	-
Trichloroethene	7.79E-01	2	4	52	6	16	6	5.55E-02	70	4.75E-03
t,1,2-Dichloroethene	6.00E-03	2	4	52	6	16	6	4.27E-04	-	-
Vinyl Chloride	6.09E-03	2	4	52	6	16	6	4.34E-04	70	3.72E-05
Xylene	1.30E+02	2	4	52	6	16	6	9.26E+00	-	-

* - Please refer to Table 36 for explanation of symbols and parameter value references

TABLE 41 (con't)
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

INTAKES FROM INHALATION OF AIRBOURNE (VAPOR PHASE) CHEMICALS

AVERAGE INTAKES										
Chemical	Average Ca (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
Off-Site Adult										
1,1,1,-Trichloroethane	1.78E-06	1.4	3	350	9	70	9	1.02E-07	-	-
1,1,-Dichloroethane	4.00E-06	1.4	3	350	9	70	9	2.30E-07	-	-
1,1-Dichloroethene	4.90E-05	1.4	3	350	9	70	9	2.82E-06	70	3.62E-07
1,2-Dichloroethene	1.10E-03	1.4	3	350	9	70	9	6.33E-05		
2,Butanone	7.40E-08	1.4	3	350	9	70	9	4.26E-09		
Acetone	9.80E-04	1.4	3	350	9	70	9	5.64E-05		
Benzene	9.40E-06	1.4	3	350	9	70	9	5.41E-07	70	6.95E-08
Chlorobenzene	1.70E-06	1.4	3	350	9	70	9	9.78E-08	70	1.26E-08
Ethylbenzene	1.10E-01	1.4	3	350	9	70	9	6.33E-03	-	-
Methylchloride	2.40E-04	1.4	3	350	9	70	9	1.38E-05	70	1.78E-06
Tetrachloroethene	5.50E-05	1.4	3	350	9	70	9	3.16E-06	-	-
Toluene	9.20E-02	1.4	3	350	9	70	9	5.29E-03	-	-
Trichloroethene	1.50E-01	1.4	3	350	9	70	9	8.63E-03	70	1.11E-03
t,1,2-Dichloroethene	3.10E-04	1.4	3	350	9	70	9	1.78E-05	-	-
Vinyl Chloride	1.10E-04	1.4	3	350	9	70	9	6.33E-06	70	8.14E-07
Xylene	3.90E-01	1.4	3	350	9	70	9	2.24E-02	-	-
UPPER BOUND INTAKE										
	Maximum CA (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
Off-Site Adult										
1,1,1,-Trichloroethane	1.79E-06	3.0	8	350	30	70	30	5.88E-07	-	-
1,1,-Dichloroethane	7.14E-06	3.0	8	350	30	70	30	2.35E-06	-	-
1,1-Dichloroethene	5.76E-05	3.0	8	350	30	70	30	1.89E-05	70	8.11E-06
1,2-Dichloroethene	1.27E-03	3.0	8	350	30	70	30	4.18E-04		
2,Butanone	7.77E-08	3.0	8	350	30	70	30	2.56E-08		
Acetone	1.91E-03	3.0	8	350	30	70	30	6.28E-04		
Benzene	1.81E-05	3.0	8	350	30	70	30	5.95E-06	70	2.55E-06
Chlorobenzene	1.70E-06	3.0	8	350	30	70	30	5.59E-07	70	2.40E-07
Ethylbenzene	2.63E-01	3.0	8	350	30	70	30	8.64E-02	-	-
Methylchloride	4.76E-04	3.0	8	350	30	70	30	1.56E-04	70	6.71E-05
Tetrachloroethene	5.55E-05	3.0	8	350	30	70	30	1.83E-05	-	-
Toluene	1.80E-01	3.0	8	350	30	70	30	5.92E-02	-	-
Trichloroethene	4.47E-02	3.0	8	350	30	70	30	1.47E-02	70	6.30E-03
t,1,2-Dichloroethene	4.00E-04	3.0	8	350	30	70	30	1.32E-04	-	-
Vinyl Chloride	3.60E-04	3.0	8	350	30	70	30	1.18E-04	70	5.07E-05
Xylene	8.76E-01	3.0	8	350	30	70	30	2.88E-01	-	-

* - Please refer to Table 36 for explanation of symbols and parameter value references

TABLE 41 (con't)
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

INTAKES FROM INHALATION OF AIRBOURNE (VAPOR PHASE) CHEMICALS

AVERAGE INTAKES										
Chemical	Average Ca (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
Off-Site Child										
1,1,1,-Trichloroethane	1.78E-06	1.0	4	350	3	16	3	4.26E-07	-	-
1,1,-Dichloroethane	4.00E-06	1.0	4	350	3	16	3	9.59E-07	-	-
1,1-Dichloroethene	4.90E-05	1.0	4	350	3	16	3	1.17E-05	70	5.03E-07
1,2-Dichloroethene	1.10E-03	1.0	4	350	3	16	3	2.64E-04	-	-
2,Butanone	7.40E-08	1.0	4	350	3	16	3	1.77E-08	-	-
Acetone	9.80E-04	1.0	4	350	3	16	3	2.35E-04	-	-
Benzene	9.40E-06	1.0	4	350	3	16	3	2.25E-06	70	9.66E-08
Chlorobenzene	1.70E-06	1.0	4	350	3	16	3	4.08E-07	70	1.75E-08
Ethylbenzene	1.10E-01	1.0	4	350	3	16	3	2.64E-02	-	-
Methylchloride	2.40E-04	1.0	4	350	3	16	3	5.75E-05	70	2.47E-06
Tetrachloroethene	5.50E-05	1.0	4	350	3	16	3	1.32E-05	-	-
Toluene	9.20E-02	1.0	4	350	3	16	3	2.21E-02	-	-
Trichloroethene	1.50E-01	1.0	4	350	3	16	3	3.60E-02	70	1.54E-03
t,1,2-Dichloroethene	3.10E-04	1.0	4	350	3	16	3	7.43E-05	-	-
Vinyl Chloride	1.10E-04	1.0	4	350	3	16	3	2.64E-05	70	1.13E-06
Xylene	3.90E-01	1.0	4	350	3	16	3	9.35E-02	-	-
UPPER BOUND INTAKE										
Chemical	Maximum CA (mg/m ³)	IR (m ³ /hr)	ET (hr/dy)	EF (dy/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake for Non-carc. Effects	AT (yrs)	Intake for Carc. Effects
Off-Site Child										
1,1,1,-Trichloroethane	1.79E-06	2.0	8	350	6	16	6	1.71E-06	-	-
1,1,-Dichloroethane	7.14E-06	2.0	8	350	6	16	6	6.85E-06	-	-
1,1-Dichloroethene	5.76E-05	2.0	8	350	6	16	6	5.52E-05	70	4.73E-06
1,2-Dichloroethene	1.27E-03	2.0	8	350	6	16	6	1.22E-03	-	-
2,Butanone	7.77E-08	2.0	8	350	6	16	6	7.45E-08	-	-
Acetone	1.91E-03	2.0	8	350	6	16	6	1.83E-03	-	-
Benzene	1.81E-05	2.0	8	350	6	16	6	1.73E-05	70	1.49E-06
Chlorobenzene	1.70E-06	2.0	8	350	6	16	6	1.63E-06	70	1.40E-07
Ethylbenzene	2.63E-01	2.0	8	350	6	16	6	2.52E-01	-	-
Methylchloride	4.76E-04	2.0	8	350	6	16	6	4.56E-04	70	3.91E-05
Tetrachloroethene	5.55E-05	2.0	8	350	6	16	6	5.33E-05	-	-
Toluene	1.80E-01	2.0	8	350	6	16	6	1.73E-01	-	-
Trichloroethene	4.47E-02	2.0	8	350	6	16	6	4.29E-02	70	3.68E-03
t,1,2-Dichloroethene	4.00E-04	2.0	8	350	6	16	6	3.84E-04	-	-
Vinyl Chloride	3.60E-04	2.0	8	350	6	16	6	3.45E-04	70	2.96E-05
Xylene	8.76E-01	2.0	8	350	6	16	6	8.40E-01	-	-

* - Please refer to Table 36 for explanation of symbols and parameter value references

TABLE 42
FORMER ESSEX SPECIALTY PRODUCTS FACILITY
JAMESTOWN, NEW YORK

INGESTION OF VOLATILE ORGANIC COMPOUNDS IN DRINKING WATER

AVERAGE INTAKES							Intake for		Intake for
COMPOUND	Average* CW (mg/l)	IR (l/day)	EF (dys/yr)	ED (years)	BW (kg)	AT (yrs)	Non-carc. Effects	AT (yrs)	Carc. Effects
<u>Adult Off-site resident</u>									
Acetone	0.008	1.4	350	9	70	9	1.53E-04		
1,2-Dichloroethene (total)	0.284	1.4	350	9	70	9	5.45E-03		
Ethylbenzene	0.001	1.4	350	9	70	9	1.92E-05		
Methylene chloride	0.006	1.4	350	9	70	9	1.15E-04	70	1.48E-05
Trichloroethene	0.591	1.4	350	9	70	9	1.13E-02	70	1.46E-03
Vinyl chloride	0.020	1.4	350	9	70	9	3.84E-04	70	4.93E-05
Xylenes (total)	0.008	1.4	350	9	70	9	1.53E-04		
BEHP	0.007	1.4	350	9	70	9	1.34E-04		
Naphthalene	0.015	1.4	350	9	70	9	2.88E-04		
<u>Child Off-site resident</u>									
Acetone	0.008	0.64	350	3	16	3	3.07E-04		
1,2-Dichloroethene (total)	0.284	0.64	350	3	16	3	1.09E-02		
Ethylbenzene	0.001	0.64	350	3	16	3	3.84E-05		
Methylene chloride	0.006	0.64	350	3	16	3	2.30E-04	70	9.86E-06
Trichloroethene	0.591	0.64	350	3	16	3	2.27E-02	70	9.72E-04
Vinyl chloride	0.020	0.64	350	3	16	3	7.67E-04	70	3.29E-05
Xylenes (total)	0.008	0.64	350	3	16	3	3.07E-04		
BEHP	0.007	0.64	350	3	16	3	2.68E-04		
Naphthalene	0.015	0.64	350	3	16	3	5.75E-04		

MAXIMUM INTAKES									
	Maximum* CW (mg/l)	IR (l/day)	EF (dys/yr)	ED (years)	BW (kg)	AT (yrs)	for Non-carc. Effects	AT (yrs)	for Carc. Effects
<u>Adult Off-Site resident</u>									
Acetone	0.011	2	350	30	70	30	3.01E-04		
1,2-Dichloroethene (total)	0.436	2	350	30	70	30	1.19E-02		
Ethylbenzene	0.001	2	350	30	70	30	2.74E-05		
Methylene chloride	0.011	2	350	30	70	30	3.01E-04	70	1.29E-04
Trichloroethene	1.071	2	350	30	70	30	2.93E-02	70	1.26E-02
Vinyl chloride	0.02	2	350	30	70	30	5.48E-04	70	2.35E-04
Xylenes (total)	0.008	2	350	30	70	30	2.19E-04		
BEHP	0.01	2	350	30	70	30	2.74E-04		
Naphthalene	0.015	2	350	30	70	30	4.11E-04		
<u>Child Off-Site Resident</u>									
Acetone	0.011	1	350	6	16	6	6.59E-04		
1,2-Dichloroethene (total)	0.436	1	350	6	16	6	2.61E-02		
Ethylbenzene	0.001	1	350	6	16	6	5.99E-05		
Methylene chloride	0.011	1	350	6	16	6	6.59E-04	70	5.65E-05
Trichloroethene	1.071	1	350	6	16	6	6.42E-02	70	5.50E-03
Vinyl chloride	0.02	1	350	6	16	6	1.20E-03	70	1.03E-04
Xylenes (total)	0.008	1	350	6	16	6	4.79E-04		
BEHP	0.01	1	350	6	16	6	5.99E-04		
Naphthalene	0.015	1	350	6	16	6	8.99E-04		

* - Please see Table 35 for explanation of symbols and parameter value references.

TABLE 43

CURRENT AND FUTURE INTAKES* BY

[illegible]

* Intakes based upon maximum detected concentrations of compounds of potential concern
ING = ingestion, DERM = dermal contact, INH = inhalation, GW = ground water

CURRENT AND FUTURE INTAKES* BY ON-SITE TRESPASSERS

* Intakes based upon maximum detected concentrations of compounds of potential concern
ING = ingestion, DERM = dermal contact, INH = inhalation, GW = ground water

**CURRENT AND FUTURE INTAKES* BY
OFF-SITE ADULTS**

[illegible]

* Intakes based upon maximum detected concentrations of compounds of potential concern
ING = ingestion, DEEM = dermal contact, INH = inhalation, GW = ground water

TABLE 48

**CURRENT AND FUTURE INTAKES* BY
OFF-SITE CHILDREN**

[illegible]

* Intakes based upon maximum detected concentrations of compounds of potential cancer
ING = ingestion, DERM = dermal contact, INH = inhalation, GW = ground water

TABLE 47
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

TOXICITY VALUES OF POTENTIAL NON-CARCINOGENIC EFFECTS

Chemical	Chronic RfD (Oral-mg/kg-day) (Inhalation-mg/cu.m)	Confidence Level*	Critical Effect	RfD Basis/ RfD Source	Uncertainty and Modifying Factors
Oral Route					
Tetrachloroethylene (PCE)	1E-2	Medium	Liver effects	Water**/IRIS	UF=1,000*** for H,A,S: MF=1
Acetone	.1	Low	Liver and Kidney effects Leukemia	Water**/IRIS	UF=1,000*** for H,A,S: MF=1
Benzene	Under Review				
Methyl ethyl ketone	Withdrawn (08/01/91)				
Ethylbenzene	.1	Low	Liver and Kidney Toxicity	Water**/IRIS	UF=1,000*** for H,A,S: MF=1
1,1-Dichloroethane	Under Review			/HEAST	
1,1-Dichloroethylene	9E-3	Medium	Liver effects and fetotoxicity	Water**/IRIS	UF=1,000*** for H,A,L: MF=1
cis-1,2-Dichloroethylene	Under Review			/HEAST	
trans-1,2-Dichloroethylene	2E-2	Low	Liver effects	Water**/IRIS	UF=1,000*** for H,A,S: MF=1
Dichloromethane	6E-2	Medium	Liver toxicity	Water**/IRIS	UF=100 for H,A: MF=1
1,1,1-Trichloroethane	9E-2			/HEAST	
1,1,2-Trichloroethane	4E-3	Medium	Liver and Immune effects	Water**/IRIS	UF=1,000 for H,A,S: MF=1
Trichloroethylene	Under Review				
Toluene	.2	Medium	Liver and Kidney effects	Water**/IRIS	UF=1,000 for H,A,S: MF=1
Napthalene	4E-2			/HEAST	
BEHP	2E-2	Medium	Liver Effects	Diet**/IRIS	UF=1,000 for H,A,S: MF=1
Vinyl Chloride	Under Review				
Inhalation Route					
Benzene	Under Review				
Methyl ethyl ketone	1.	Low	Fetal and Teratogenic effects	Inhalation**/IRIS	UF=1,000 for H,A,S: MF=3
Ethylbenzene	1.	Low	Developmental Toxicity	Inhalation**/IRIS	UF=300 for H,A,M
1,1-Dichloroethane	Under Review				
1,1-Dichloroethylene	Under Review				
Dichloromethane	3.			/HEAST	
1,1,1-Trichloroethane	Under Review				
1,1,2-Trichloroethane	Under Review				
Trichloroethylene	Under Review				
Toluene	.4			/HEAST	

* - Confidence levels from IRIS.
 ** - Assumed absorption fraction of 1.0.
 *** - H = Derived from variation in human sensitivity.
 - A = Derived from animal to human extrapolation.
 - S = Derived from extrapolation from subchronic to chronic NOAEL.
 - M = Derived from lack of multi-generational studies.

TABLE 48
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK
TOXICITY VALUES FOR POTENTIAL CARCINOGENIC EFFECTS

Oral Route						
Chemical	Slope Factor ₁ (SF) (mg/kg-day) ⁻¹	Inhalation Unit Risk [Max Conc.] (ug/cu.m)	Weight of Evidence Classification	Type of Cancer	SF Basis/SF Source	
Benzene	2.9E-2	--	A	Leukemia	Water*/IRIS	
1,1-Dichloroethylene	.6	--	C	--	Water*/IRIS	
Dichloromethane	7.5E-3	--	B2	--	Water*/IRIS	
1,1,2-Trichloroethane	5.7E-2	--	C	--	Water*/IRIS	
BEHP	1.4E-2	—	B2	—	Diet**/IRIS	
Vinyl Chloride	1.9	--	A	Hemangio Sarcoma	Water*/IRIS	
Inhalation Route						
Chemical	Slope Factor (SF) (ug/cu.m)	Inhalation Unit Risk [Max Conc.] (ug/cu.m)	Weight of Evidence Classification	Type of Cancer	SF Basis/SF Source	
Benzene	--	8.3E-6 [1E+2]	A	Leukemia	Inhalation*/IRIS	
1,1-Dichloroethylene	--	5E-5 [2E+2]	C		Inhalation*/HEAST	
Dichloromethane	--	4.7E-7 [2E+4]	B2		Inhalation*/IRIS	
1,1,2-Trichloroethane	--	1.6E-5 [6E+2]	C		Inhalation*/IRIS	
Vinyl Chloride	.3	8.4E-5	A	Hemangio Sarcoma	Inhalation*/HEAST	

TABLE 60
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

CANCER RISK ESTIMATES FOR ON-SITE TRESPASSERS

Chemical	Ave CDI (mg/kg/day)	Upper CDI (mg/kg/day)	SF 1/(mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation Unit Risk 1/(ug/m3)	Ave. Chem. Specific Risk	Upper Chem. Specific Risk	Ave. Total Pathway Risk	Upper Total Pathway Risk	Ave Total Exposure Risk	Upper Total Exposure Risk
Surface Soil Ingestion Pathway:												
Trichloroethylene	2.07E-06	9.26E-05	Under Review				NQ	NQ	NQ	NQ		
Surface Soil Dermal Exposure Pathway:												
Trichloroethylene	1.50E-06	6.55E-05	Under Review				NQ	NQ	NQ	NQ		
Air Inhalation Pathway:												
Trichloroethylene				8.30E+01	8.74E+02	1.70E-06	1.41E-04	1.49E-03				
Benzene				1.70E-01	3.06E-01	8.30E-06	1.41E-06	2.54E-06				
1,1-Dichloroethylene				8.23E-01	9.59E-01	5.00E-05	4.12E-05	4.80E-05				
Tetrachloroethylene				9.60E-01	9.70E-01	5.80E-07	5.57E-07	5.63E-07				
Dichloromethane				4.11E+00	8.30E+00	4.47E-07	1.84E-06	3.71E-06				
Vinyl Chloride				1.94E+00	6.09E+00	8.40E-05	1.63E-04	5.12E-04	3.49E-04	2.05E-03	3.49E-04	2.05E-03

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S.EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization.

TABLE 51
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

CANCER RISK ESTIMATES FOR OFF-SITE ADULTS

Chemical	Ave CDI (mg/kg/day)	Upper CDI (mg/kg/day)	SF 1/(mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation Unit Risk 1/(ug/m3)	Ave. Chem. Specific Risk	Upper Chem. Specific Risk	Ave. Total Pathway Risk	Upper Total Pathway Risk	Ave Total Exposure Risk	Upper Total Exposure Risk
Groundwater Ingestion Pathway:												
Trichloroethylene	1.48E-03	1.28E-02	Under Review				NQ	NQ				
Vinyl Chloride	4.93E-05	2.35E-04	1.90E+00				9.37E-05	4.47E-04				
Methylene Chloride	1.48E-05	1.29E-04	7.50E-03				1.11E-07	9.67E-07				
Air Inhalation Pathway:												
Trichloroethylene				4.79E+00	4.50E+01	1.70E-08	8.14E-08	7.65E-05	9.38E-05	4.47E-04		
Benzene				9.40E-03	1.80E-02	8.30E-08	7.80E-08	1.49E-07				
1,1-Dichloroethylene				4.90E-02	5.80E-02	5.00E-05	2.45E-08	2.90E-08				
Tetrachloroethylene				5.50E-02	5.60E-02	5.80E-07	3.19E-08	3.25E-08				
Dichloromethane				2.40E-01	4.80E-01	4.47E-07	1.07E-07	2.15E-07				
Vinyl Chloride				1.10E-01	3.80E-01	8.40E-05	9.24E-08	3.02E-05	2.01E-05	1.10E-04	1.14E-04	5.58E-04

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S.EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization.

TABLE 52
FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

CANCER RISK ESTIMATES FOR OFF-SITE CHILDREN

Chemical	Ave CDI (mg/kg/day)	Upper CDI (mg/kg/day)	SF 1/(mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation Unit Risk 1/(ug/m3)	Ave. Chem. Specific Risk	Upper Chem. Specific Risk	Ave. Total Pathway Risk	Upper Total Pathway Risk	Ave Total Exposure Risk	Upper Total Exposure Risk
Groundwater Ingestion Pathway:												
Trichloroethylene	9.72E-04	5.50E-03	Under Review				NQ	NQ				
Vinyl Chloride	3.29E-05	1.03E-04	1.90E+00				6.25E-05	1.96E-04				
Methylene Chloride	9.86E-06	5.85E-05	7.50E-03				7.40E-08	4.24E-07				
Air Inhalation Pathway:												
Trichloroethylene				4.78E+00	4.50E+01	1.70E-06	8.14E-06	7.65E-05	8.28E-05	1.96E-04		
Benzene				9.40E-03	1.80E-02	8.30E-06	7.80E-08	1.49E-07				
1,1-Dichloroethylene				4.90E-02	5.80E-02	5.00E-05	2.45E-06	2.90E-06				
Tetrachloroethylene				5.50E-02	5.80E-02	5.80E-07	3.19E-08	3.25E-08				
Dichloromethane				2.40E-01	4.80E-01	4.47E-07	1.07E-07	2.15E-07				
Vinyl Chloride				1.10E-01	3.80E-01	8.40E-05	9.24E-06	3.02E-05	2.01E-05	1.10E-04	8.28E-05	3.08E-04

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S.EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization.

TABLE 53
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK
HAZARD INDEX ESTIMATES FOR ON-SITE INDUSTRIAL WORKERS

Chemical	Ave. CDI (mg/kg/day)	Upper CDI (mg/kg/day)	RfD (mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation RIC (ug/m3)	Ave. Hazard Quotient	Upper Hazard Quotient	Ave. Pathway HI	Upper Pathway HI	Ave. Total Exposure HI	Upper Total Exposure HI
Surface Soil Ingestion Pathway:												
Ethylbenzene	7.12E-06	2.61E-04	1.00E-01				7.12E-05	2.61E-03				
Trichloroethylene	4.82E-08	9.26E-07	1.10E-02				4.38E-08	8.42E-05				
Toluene	8.22E-09	2.14E-07	2.00E-01				4.11E-08	1.07E-06				
Xylenes	2.47E-04	9.05E-03	2.00E+00				1.24E-04	4.53E-03	1.99E-04	7.22E-03		
Surface Soil Dermal Exposure Pathway:												
Ethylbenzene	2.22E-06	2.16E-04	2.50E-02				8.88E-05	8.64E-03				
Trichloroethylene	1.50E-08	7.94E-07	2.75E-03				5.45E-08	2.78E-04				
Toluene	2.56E-09	1.76E-07	5.00E-02				5.12E-08	3.52E-06				
Xylenes	7.69E-05	7.47E-03	5.00E-01				1.54E-04	1.49E-02	2.48E-04	2.39E-02		
Sub-Surface Soil Ingestion Pathway:												
trans-1,2-Dichloroethene	7.89E-08	1.13E-07	2.00E-02				3.95E-08	5.65E-06				
Ethylbenzene	1.63E-05	3.83E-05	1.00E-01				1.63E-04	3.83E-04				
Trichloroethylene	9.58E-08	1.35E-07	1.10E-02				8.71E-08	1.23E-05				
Toluene	1.47E-05	2.03E-05	2.00E-01				7.35E-05	1.02E-04				
Xylenes	1.22E-04	2.15E-04	2.00E+00				6.10E-05	1.08E-04	3.10E-04	6.10E-04		
Air Inhalation Pathway:												
trans-1,2-Dichloroethene				4.60E+00	5.95E+00	NA	NQ	NQ				
Ethylbenzene				1.60E+03	3.90E+03	1.00E+03	1.60E+00	3.90E+00				
Trichloroethylene				2.40E+02	7.80E+02	Under Review	NQ	NQ				
Toluene				2.70E+03	2.70E+03	4.00E+02	6.75E+00	6.75E+00				
Xylenes				5.80E+03	1.30E+05	Under Review	NQ	NQ				
Acetone				1.70E+01	3.30E+01	NA	NQ	NQ				
Benzene				1.30E-03	1.30E-03	Under Review	NQ	NQ				
2-Butanone				1.30E-03	1.30E-03	1.00E+03	1.30E-06	1.30E-06				
Chlorobenzene				2.60E-02	2.60E-02	NA	NQ	NQ				
1,1-Dichloroethane				7.10E-02	1.20E-01	NA	NQ	NQ				
1,1-Dichloroethene				8.20E-01	9.60E-01	NA	NQ	NQ				
1,2-Dichloroethene (total)				2.00E+01	2.20E+01	NA	NQ	NQ				
Methylene Chloride				4.10E+00	8.30E+00	3.00E+03	1.37E-03	2.77E-03				
Tetrachloroethene				9.60E-01	9.70E-01	NA	NQ	NQ				
1,1,1-Trichloroethane				3.10E-02	3.10E-02	Under Review	NQ	NQ				
Vinyl Chloride				1.90E+00	6.10E+00	NA	NQ	NQ	8.35E+00	1.07E+01	8.35E+00	1.07E+01

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S. EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization

TABLE 54
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

HAZARD INDEX ESTIMATES FOR ON-SITE TRESPASSERS

Chemical	Ave. CDI (mg/kg/day)	Upper CDI (mg/kg/day)	RfD (mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation RfC (ug/m3)	Ave. Hazard Quotient	Upper Hazard Quotient	Ave. Pathway HI	Upper Pathway HI	Ave. Total Exposure HI	Upper Total Exposure HI
Surface Soil Ingestion Pathway:												
Ethylbenzene	7.12E-06	2.61E-04	1.00E-01				7.12E-05	2.61E-03				
Trichloroethylene	4.82E-08	9.26E-07	1.10E-02				4.38E-08	8.42E-05				
Toluene	8.22E-09	2.14E-07	2.00E-01				4.11E-08	1.07E-06				
Xylenes	2.47E-04	9.05E-03	2.00E+00				1.24E-04	4.53E-03	1.99E-04	7.22E-03		
Surface Soil Dermal Exposure Pathway:												
Ethylbenzene	2.22E-06	2.16E-04	2.50E-02				8.88E-05	8.64E-03				
Trichloroethylene	1.50E-08	7.64E-07	2.75E-03				5.45E-06	2.78E-04				
Toluene	2.56E-09	1.78E-07	5.00E-02				5.12E-08	3.52E-06				
Xylenes	7.69E-05	7.47E-03	5.00E-01				1.54E-04	1.49E-02	2.48E-04	2.39E-02		
Air Inhalation Pathway:												
trans-1,2-Dichloroethene				4.60E+00	5.95E+00	NA		NQ				
Ethylbenzene				1.60E+03	3.90E+03	1.00E+03	1.60E+00	3.90E+00				
Trichloroethylene				2.40E+02	7.80E+02	Under Review	NQ	NQ				
Toluene				2.70E+03	2.70E+03	4.00E+02	6.75E+00	6.75E+00				
Xylenes				5.80E+03	1.30E+05	Under Review	NQ	NQ				
Acetone				1.70E+01	3.30E+01	NA	NQ	NQ				
Benzene				1.70E-01	3.10E-01	Under Review	NQ	NQ				
2-Butanone				1.30E-03	1.30E-03	1.00E+03	1.30E-06	1.30E-06				
Chlorobenzene				2.60E-02	2.60E-02	NA	NQ	NQ				
1,1-Dichloroethane				7.10E-02	1.20E-01	NA	NQ	NQ				
1,1-Dichloroethene				8.20E-01	9.60E-01	NA	NQ	NQ				
1,2-Dichloroethene (total)				2.00E+01	2.20E+01	NA	NQ	NQ				
Methylene Chloride				4.10E+00	8.30E+00	3.00E+03	1.37E-03	2.77E-03				
Tetrachloroethene				9.60E-01	9.70E-01	NA	NQ	NQ				
1,1,1-Trichloroethane				3.10E-02	3.10E-02	Under Review	NQ	NQ				
Vinyl Chloride				1.90E+00	6.10E+00	NA	NQ	NQ	8.35E+00	1.07E+01	8.35E+00	1.07E+01

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S.EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization.

TABLE 55
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

HAZARD INDEX ESTIMATES FOR OFF-SITE ADULTS

Chemical	Ave. CDI (mg/kg/day)	Upper CDI (mg/kg/day)	RfD (mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation RfC (ug/m3)	Ave. Hazard Quotient	Upper Hazard Quotient	Ave. Pathway HI	Upper Pathway HI	Ave. Total Exposure HI	Upper Total Exposure HI
Groundwater Ingestion Pathway:												
Acetone	1.53E-04	3.01E-04	1.00E-01				1.53E-03	3.01E-03				
1,2-Dichloroethene	5.45E-03	1.19E-02	2.00E-02				2.73E-01	5.95E-01				
Ethylbenzene	1.92E-05	2.74E-05	1.00E-01				1.92E-04	2.74E-04				
Dichloromethane	1.15E-04	3.01E-04	6.00E-02				1.92E-03	5.02E-03				
Trichloroethylene	1.13E-02	2.93E-02	1.10E-02				1.03E+00	2.86E+00				
Xylenes	1.53E-04	2.19E-04	2.00E+00				7.85E-05	1.10E-04				
BEHP	1.34E-04	2.74E-04	2.00E-02				6.70E-03	1.37E-02				
Napthalene	2.88E-04	4.11E-04	4.00E-02				7.20E-03	1.03E-02				
Vinyl Chloride	3.84E-04	5.48E-04	NA				NQ	NQ	2.76E-01	6.03E-01		
Air Inhalation Pathway:												
trans-1,2-Dichloroethene				3.10E-01	4.00E-01	NA	NQ	NQ				
Ethylbenzene				1.09E+02	2.82E+02	1.00E+03	1.09E-01	2.82E-01				
Trichloroethylene				1.55E+02	4.47E+01	Under Review	NQ	NQ				
Toluene				9.18E+01	1.81E+02	4.00E+02	2.30E-01	4.53E-01				
Xylenes				3.93E+02	8.78E+02	Under Review	NQ	NQ				
Acetone				9.82E-01	1.91E+00	NA	NQ	NQ				
Benzene				9.44E-03	1.81E-02	Under Review	NQ	NQ				
2-Butanone				7.41E-05	7.77E-05	1.00E+03	7.41E-08	7.77E-08				
Chlorobenzene				1.73E-03	1.73E-03	NA	NQ	NQ				
1,1-Dichloroethane				4.05E-03	7.14E-03	NA	NQ	NQ				
1,1-Dichloroethene				4.86E-03	5.76E-02	NA	NQ	NQ				
1,2-Dichloroethene (total)				1.14E+00	1.27E+00	NA	NQ	NQ				
Methylene Chloride				2.36E-01	4.76E-01	3.00E+03	7.87E-05	1.59E-04				
Tetrachloroethene				5.51E-02	5.55E-02	NA	NQ	NQ				
1,1,1-Trichloroethane				1.78E-03	1.79E-03	Under Review	NQ	NQ				
Vinyl Chloride				1.12E-01	3.60E-01	NA	NQ	NQ	3.39E-01	7.15E-01	6.15E-01	1.32E+00

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S. EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.08.2 for discussion of the Risk Characterization.

TABLE 56
FORMER ESSEX SPECIALTY PRODUCTS SITE
JAMESTOWN, NEW YORK

HAZARD INDEX ESTIMATES FOR OFF-SITE CHILDREN

Chemical	Ave. CDI (mg/kg/day)	Upper CDI (mg/kg/day)	RfD (mg/kg/day)	Ave. Air Conc. (ug/m3)	Upper Air Conc. (ug/m3)	Inhalation RfC (ug/m3)	Ave. Hazard Quotient	Upper Hazard Quotient	Ave. Pathway HI	Upper Pathway HI	Ave. Total Exposure HI	Upper Total Exposure HI
Groundwater Ingestion Pathway:												
Acetone	3.07E-04	6.59E-04	1.00E-01				3.07E-03	6.59E-03				
1,2-Dichloroethene	1.09E-02	2.61E-02	2.00E-02				5.45E-01	1.31E+00				
Ethylbenzene	3.84E-05	5.99E-05	1.00E-01				3.84E-04	5.99E-04				
Dichloromethane	2.30E-04	6.59E-04	6.00E-02				3.83E-03	1.10E-02				
Trichloroethylene	2.27E-02	6.42E-02	1.10E-02				2.06E+00	5.84E+00				
Xylenes	3.07E-04	4.79E-04	2.00E+00				1.54E-04	2.40E-04				
BEHP	2.68E-04	5.99E-04	2.00E-02				1.34E-02	3.00E-02				
Napthalene	5.75E-04	8.99E-04	4.00E-02				1.44E-02	2.25E-02				
Vinyl Chloride	7.67E-04	1.20E-03	NA				NQ	NQ	5.52E-01	1.32E+00		
Air Inhalation Pathway:												
trans-1,2-Dichloroethene												
Ethylbenzene				3.10E-01	4.00E-01	NA	NQ	NQ				
Trichloroethylene				1.09E+02	2.62E+02	1.00E+03	1.09E-01	2.62E-01				
Toluene				1.55E+02	4.47E+01	Under Review	NQ	NQ				
Xylenes				9.18E+01	1.81E+02	4.00E+02	2.30E-01	4.53E-01				
Acetone				3.83E+02	8.76E+02	Under Review	NQ	NQ				
Benzene				9.82E-01	1.91E+00	NA	NQ	NQ				
2-Butanone				9.44E-03	1.81E-02	Under Review	NQ	NQ				
Chlorobenzene				7.41E-05	7.77E-05	1.00E+03	7.41E-08	7.77E-08				
1,1-Dichloroethane				1.73E-03	1.73E-03	NA	NQ	NQ				
1,1-Dichloroethene				4.05E-03	7.14E-03	NA	NQ	NQ				
1,2-Dichloroethene (total)				4.86E-02	5.76E-02	NA	NQ	NQ				
Methylene Chloride				1.14E+00	1.27E+00	NA	NQ	NQ				
Tetrachloroethene				2.36E-01	4.76E-01	3.00E+03	7.87E-05	1.59E-04				
1,1,1-Trichloroethane				5.51E-02	5.55E-02	NA	NQ	NQ				
Vinyl Chloride				1.78E-03	1.79E-03	Under Review	NQ	NQ				
				1.12E-01	3.60E-01	NA	NQ	NQ	3.39E-01	7.15E-01	8.91E-01	2.04E+00

* - The evaluated risk estimates are based on ambient air concentrations and published unit risks for air exposures, since, according to the U.S.EPA use of slope factors and chronic daily intakes is inappropriate. Please see Section 6.06.2 for discussion of the Risk Characterization.

Figures



O'BRIEN & GERE
ENGINEERS, INC.

FIGURE 1



FORMER ESSEX SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

SITE LOCATION MAP



QUADRANGLE LOCATION

0 2000 4000



SCALE 1"=2000'



ADAPTED FROM 7.5 MIN. U.S.G.S. QUAD MAP, JAMESTOWN, NEW YORK

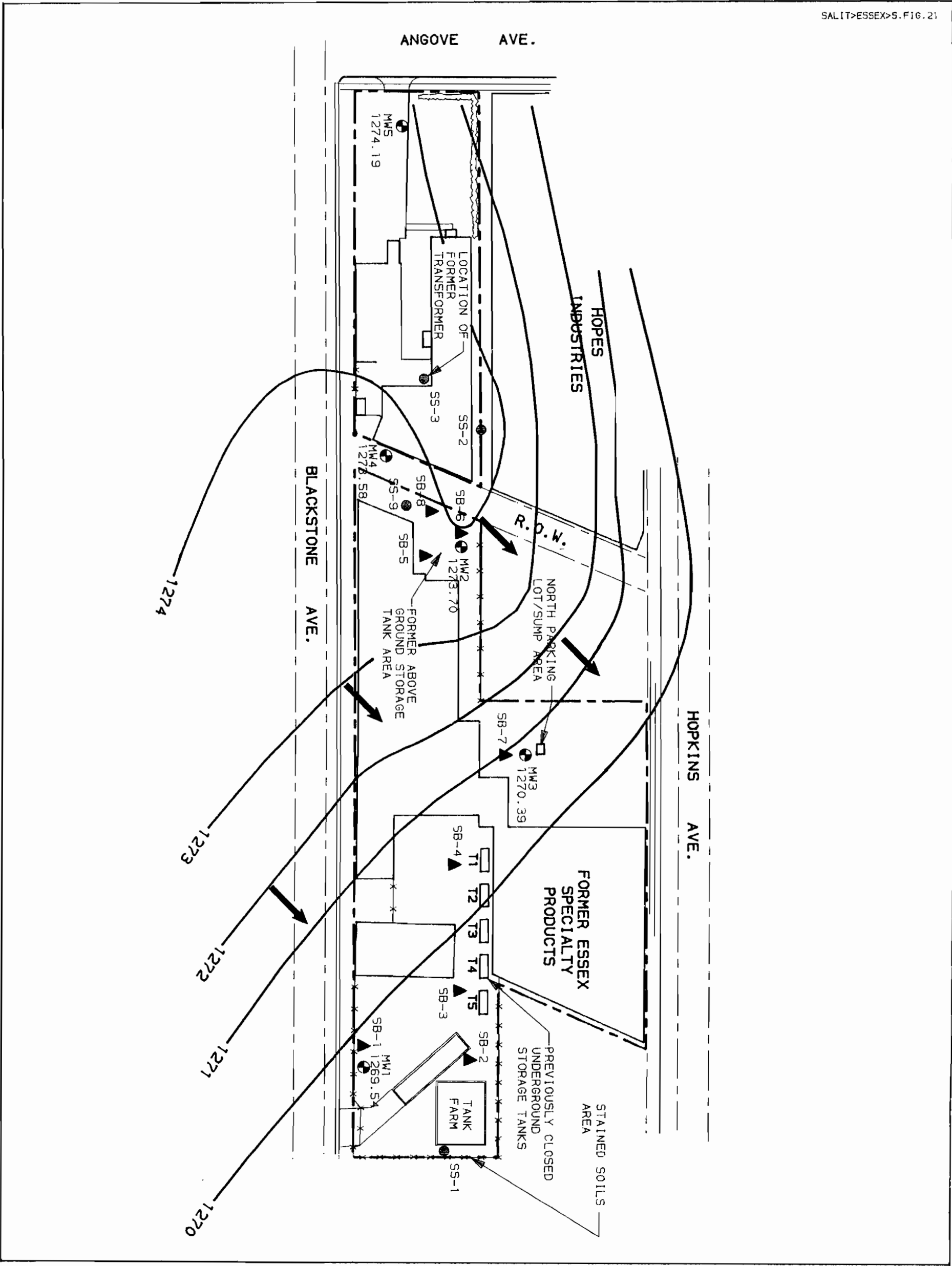
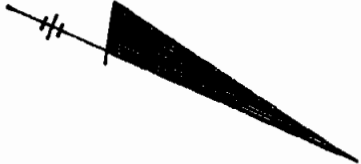


FIGURE 2



LEGEND

- MONITORING WELL 1985
- ~ GROUND WATER CONTOUR 5/24/89
- SURFACE SOIL SAMPLING LOCATION
- ▲ SOIL BORING
- ➔ GROUND WATER FLOW DIRECTION
- - - PROPERTY BOUNDARY

REMEDIAL INVESTIGATION
FORMER ESSEX SPECIALTY
PRODUCTS
JAMESTOWN, NEW YORK

SITE MAP AND
ERM INVESTIGATIONS



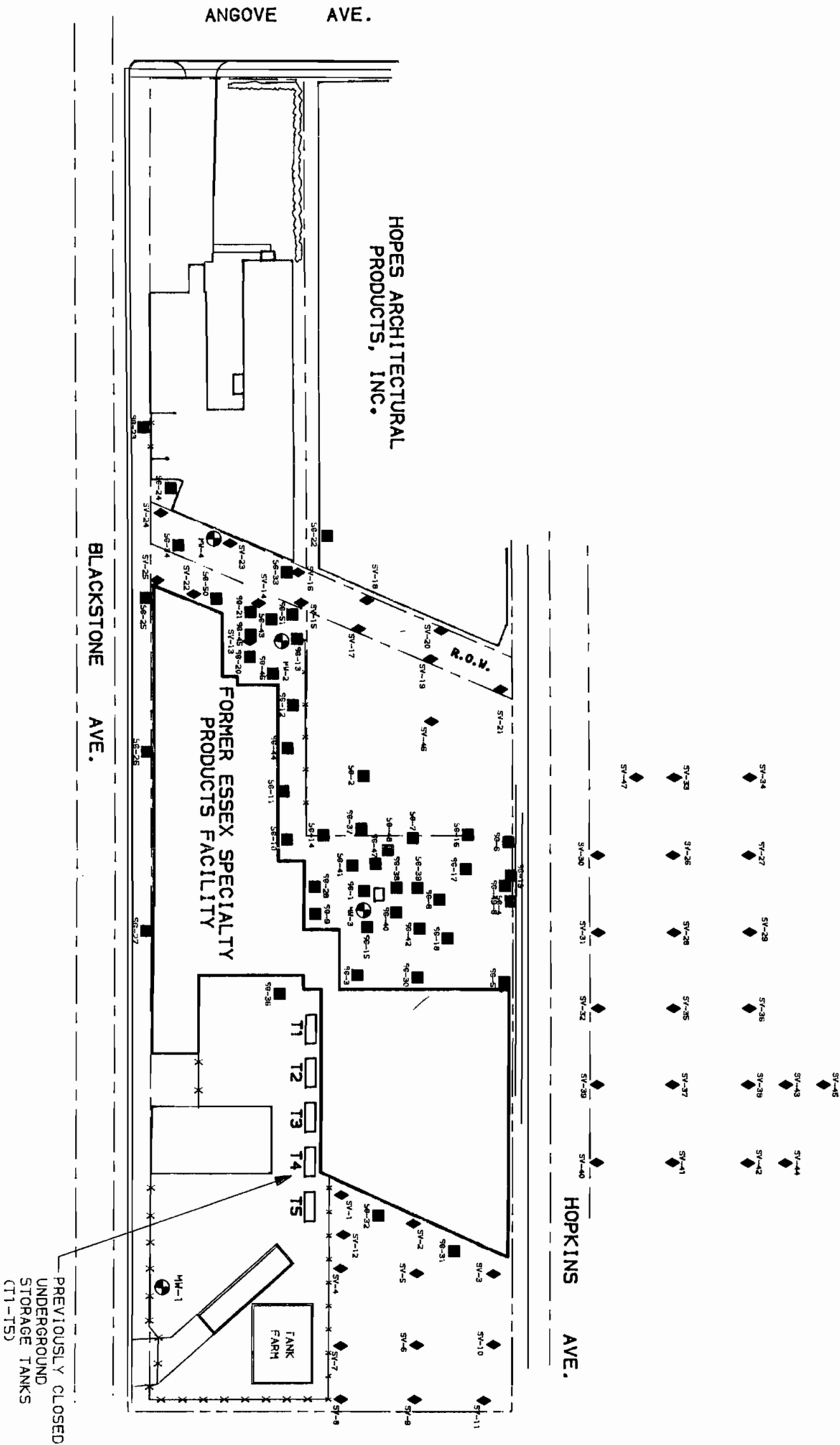


FIGURE 3



LEGEND

- MONITORING WELL
- PROPERTY LINE
- SOIL VAPOR SAMPLING LOCATIONS (MAY, JULY 1992)
- SOIL VAPOR SAMPLING LOCATIONS (JULY, AUGUST 1989)

FORMER ESSEX SPECIALTY PRODUCTS, INC.
JAMESTOWN, NEW YORK

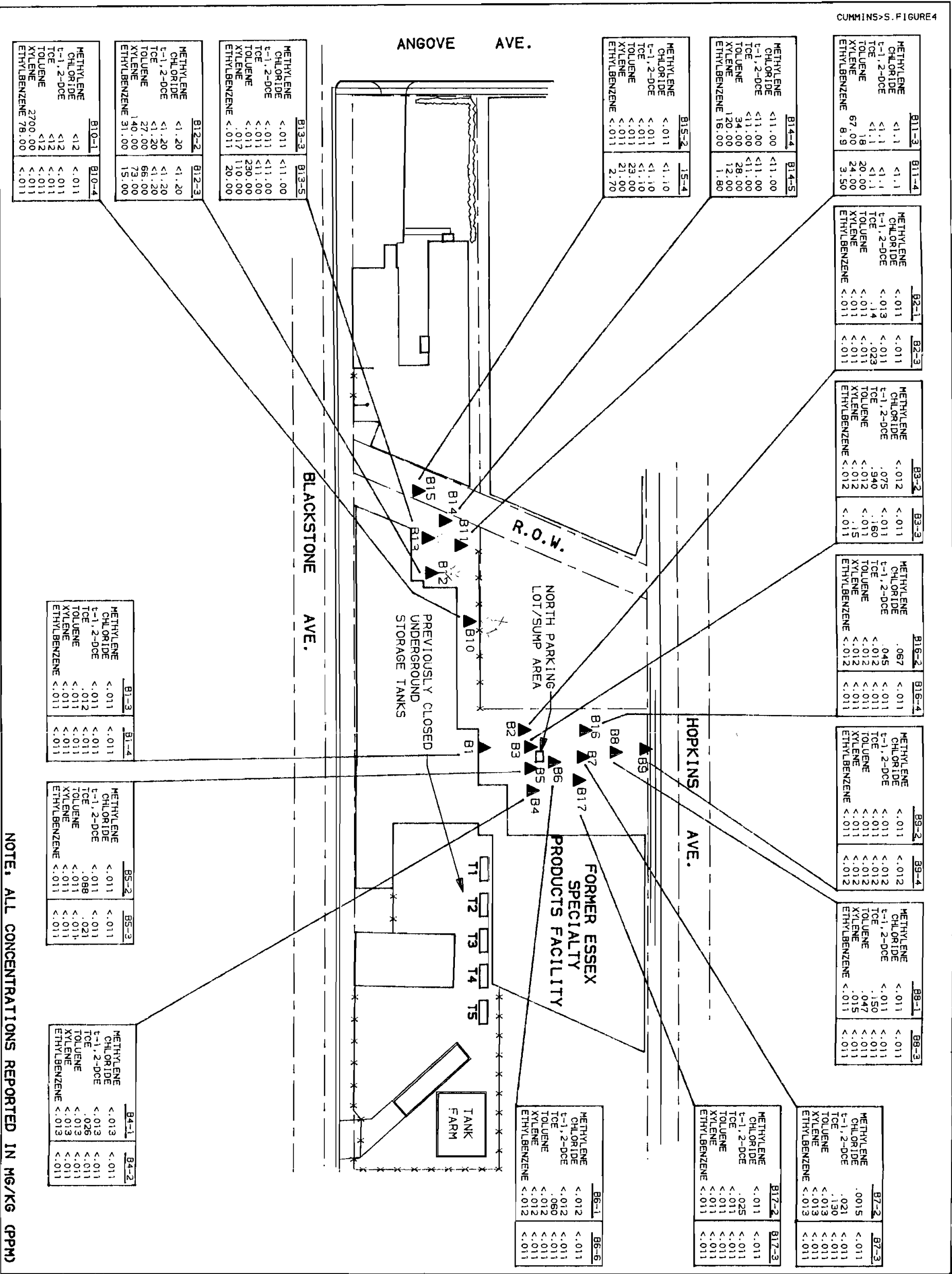
SOIL VAPOR SURVEY

SAMPLING LOCATIONS



O'BRIEN & GERE
ENGINEERS, INC.
Syracuse, New York

FIGURE 4



▲ SOIL BORING

LEGEND

FORMER ESSEX SPECIALTY PRODUCTS, INC.
JAMESTOWN, NEW YORK

SOIL BORING LOCATIONS
AND ANALYTICAL
RESULTS
VOLATILE ORGANIC
COMPOUNDS

AUGUST 1989



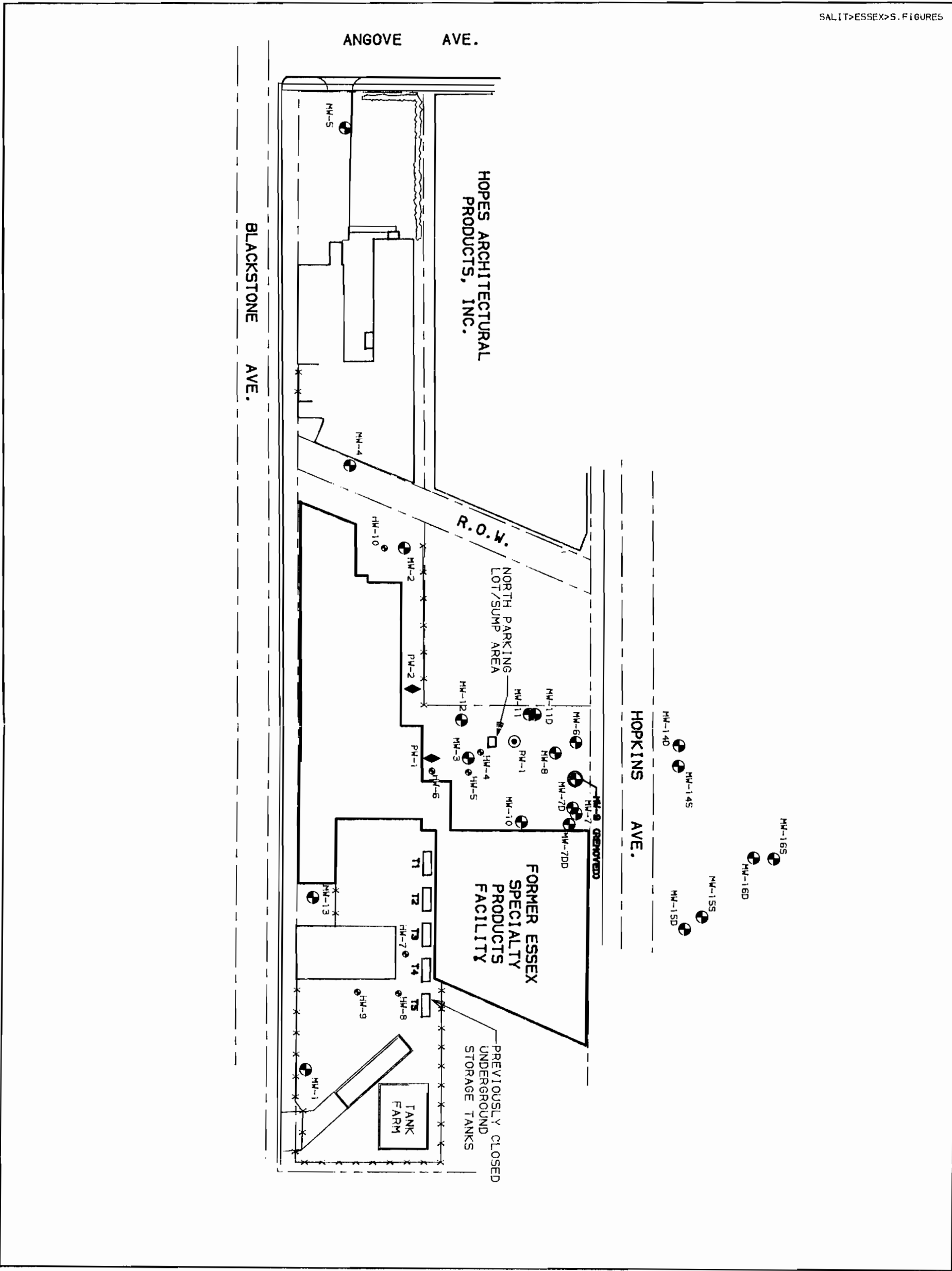
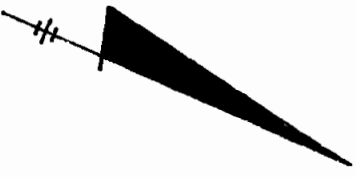


FIGURE 5

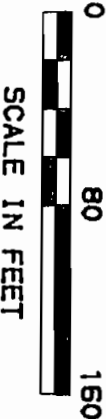


LEGEND

- MW-1 MONITORING WELL
- MW-4 MONITORING WELL INSTALLED BY HOPES
- PROPERTY LINE
- RECOVERY WELL
- ◆ PIEZOMETER

FORMER ESSEX SPECIALTY PRODUCTS, INC. JAMESTOWN, NEW YORK

GROUND WATER MONITORING WELL, PIEZOMETER AND RECOVERY WELL LOCATIONS



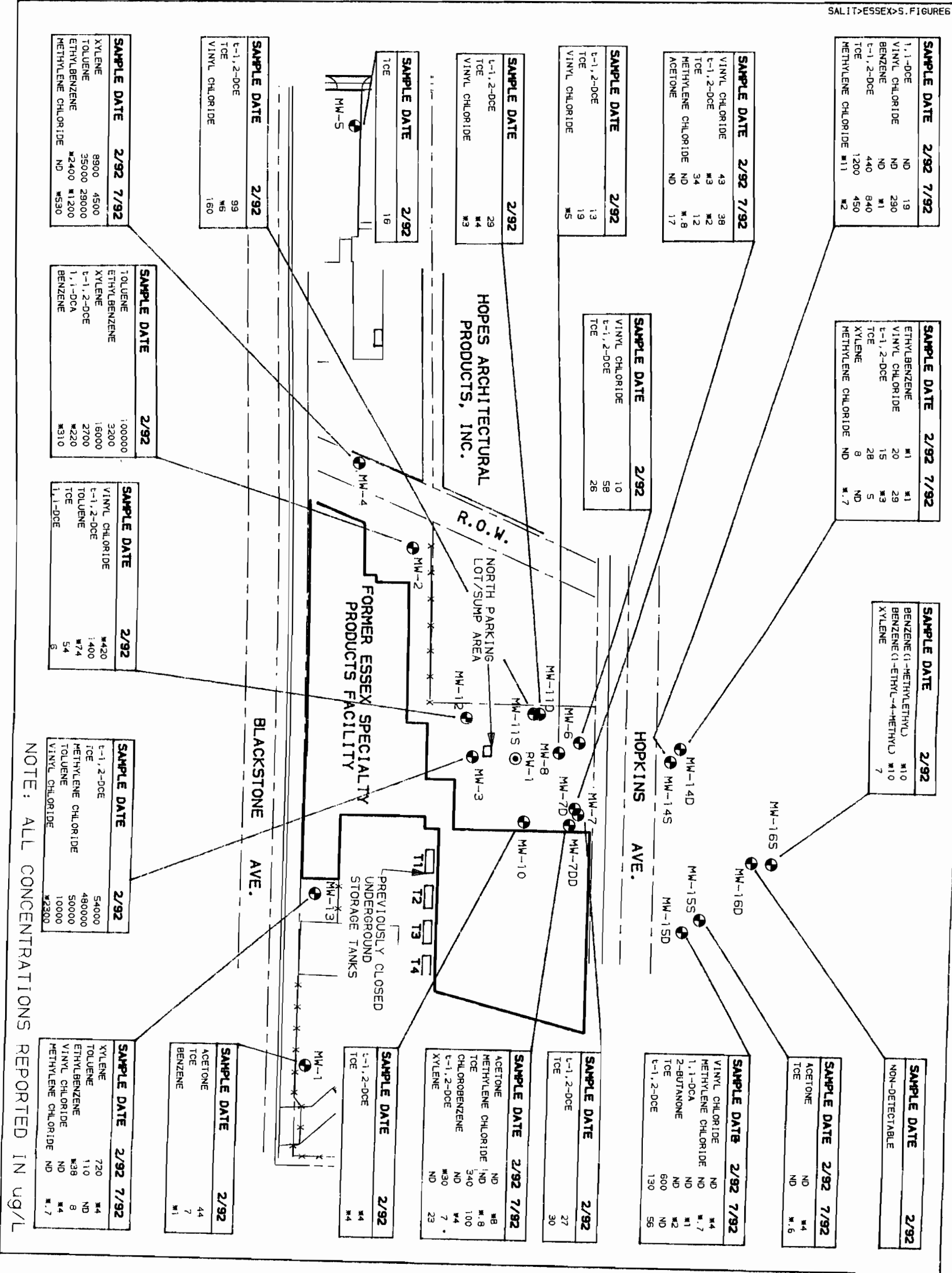


FIGURE 6

LEGEND

-
- A horizontal scale bar with alternating black and white segments. It is labeled with '0' at the left end, '80' in the middle, and '160' at the right end. Below the bar, the text 'SCALE IN FEET' is written in all caps.



Syracuse, New York

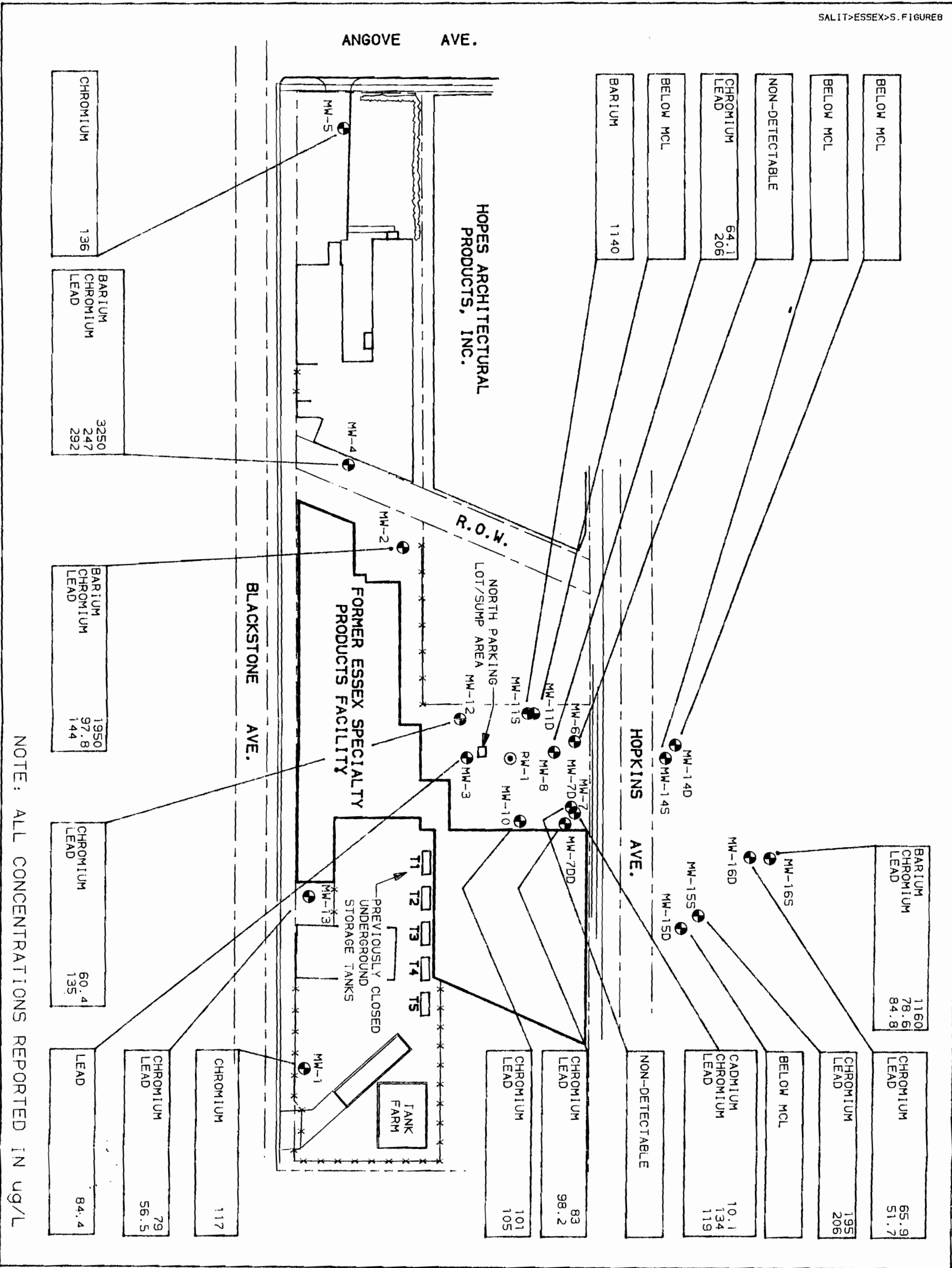


FIGURE 8



LEGEND

- MONITORING WELL
- ⊕ PROPERTY LINE
- ⊙ RECOVERY WELL
- ⊖ MCL MAXIMUM CONTAMINANT LEVEL

FORMER ESSEX SPECIALTY
PRODUCTS, INC.
JAMESTOWN, NEW YORK
GROUND WATER
ANALYTICAL
RESULTS-
PRINCIPLE METALS
ABOVE MCL

FEBRUARY 1992



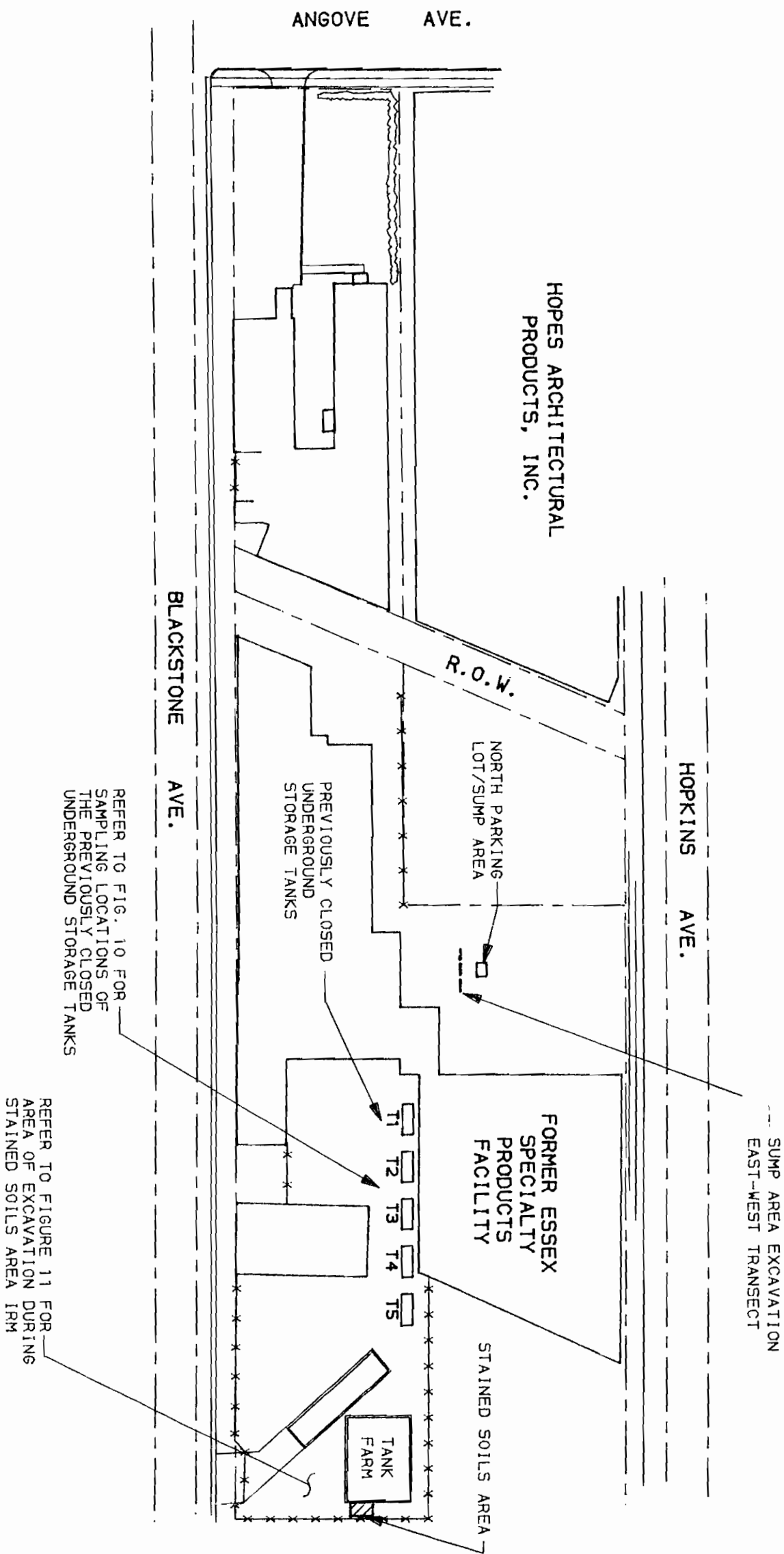
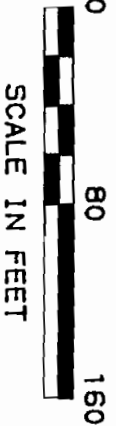


FIGURE 9



FORMER ESSEX SPECIALT
PRODUCTS, INC.
JAMESTOWN, NEW YORK

PARKING LOT SUMP,
PREVIOUSLY CLOSED
UST AREA, AND
STAINED SOILS
AREA



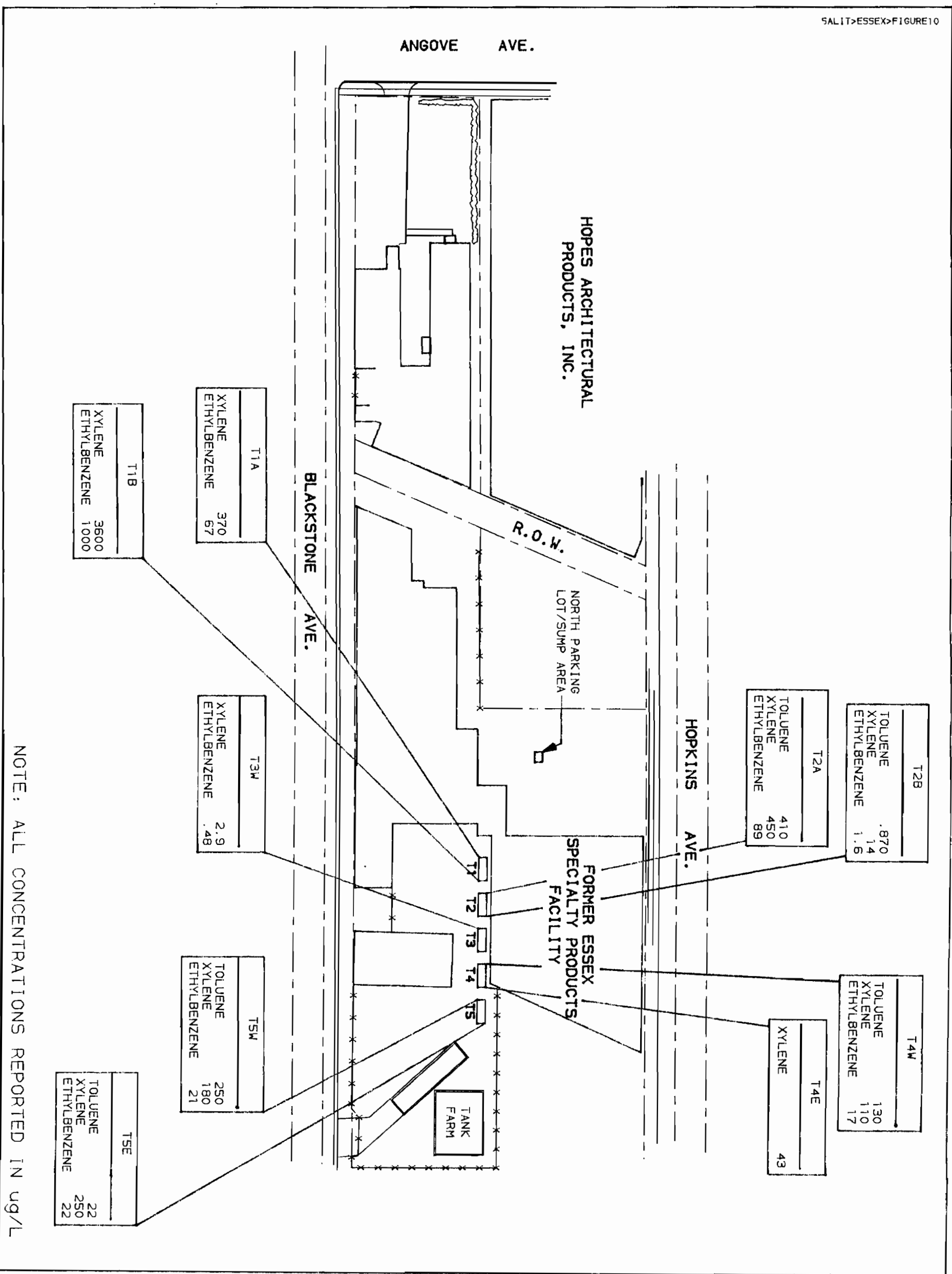


FIGURE 10

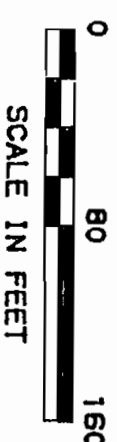


LEGEND

FORMER ESSEX SPECIALTY PRODUCTS, INC.
JAMESTOWN, NEW YORK

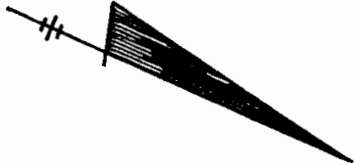
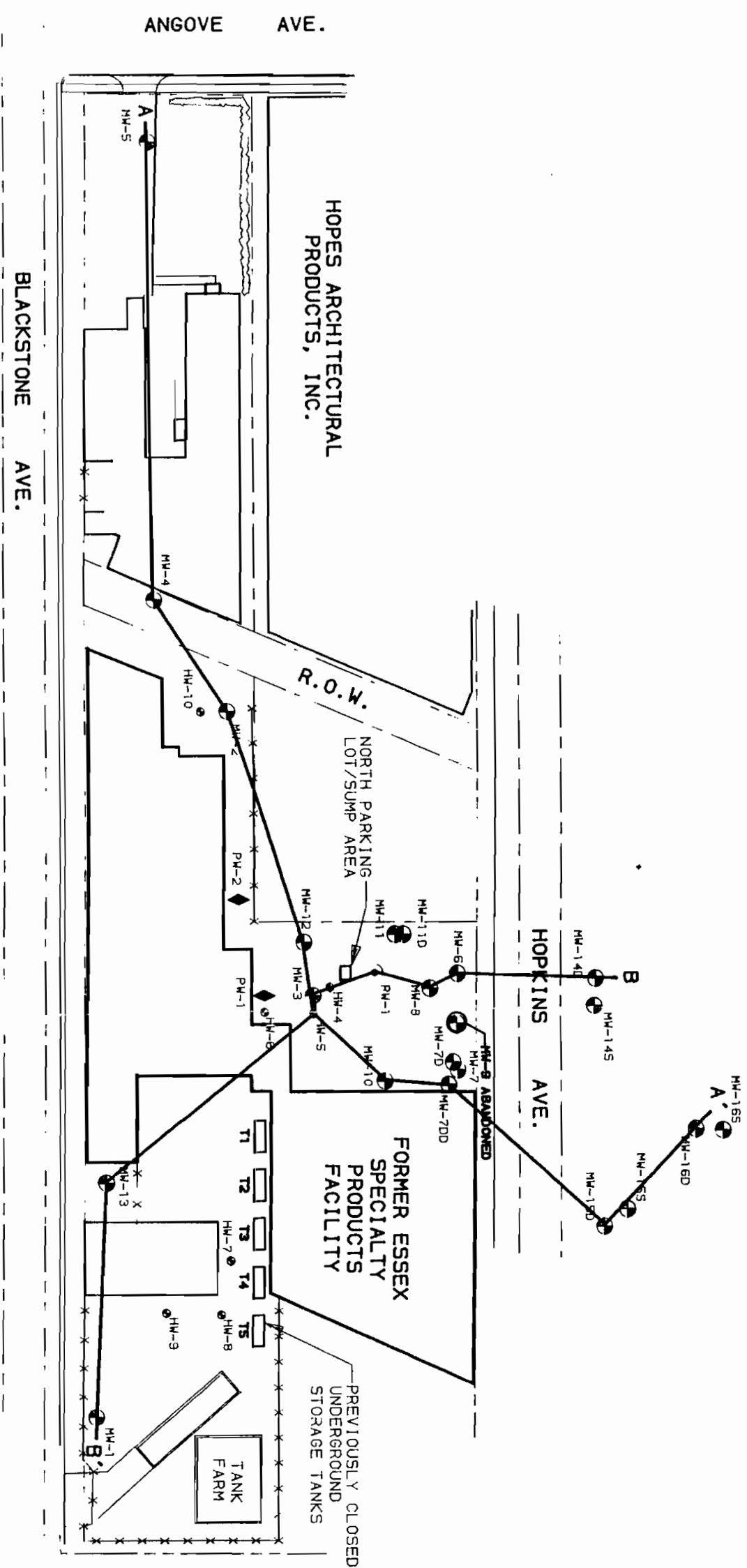
UNDERGROUND STORAGE TANK AREA
ANALYTICAL RESULTS

JANUARY 25, 1990



O'BRIEN & GERE
ENGINEERS, INC.
Syracuse, New York

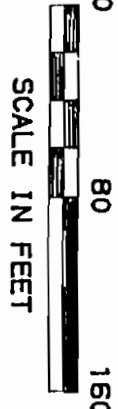
FIGURE 13



LEGEND

- MW-1 MONITORING WELL
- MW-4 MONITORING WELL INSTALLED BY HOPES
- PROPERTY LINE
- RECOVERY WELL
- PIEZOMETER
- A-A' CROSS SECTION LOCATION

CROSS SECTION LOCATION MAP



#4	
DATE COLLECTED	6/3/92
SAMPLE DEPTH (1)	3'
PARAMETER (2)	
BIS (2 ETHYLHEXYL)	ND
BIS (2 ETHYLHEXYL ADIPATE	ND
ISOPHORONE	ND
TOTAL SVOCs	ND

#3	
DATE COLLECTED	6/3/92
SAMPLE DEPTH (1)	3'
PARAMETER (2)	
BIS (2 ETHYLENYL)	0.9
BIS (2 ETHYLENYL) ADIPATE	ND
ISOPHORONE	ND
TOTAL SVOCs	0.9

DATE COLLECTED		5/21/92
SAMPLE DEPTH (1)		
PARAMETER (2)		2
BIS (2 ETHYLEXYL	PHTHALATE	ND
BIS (2 ETHYLEXYL	ADIPATE	ND
ISOPHORONE		ND
TOTAL SVOCs		ND

DATE COLLECTED	6/3/92
SAMPLE DEPTH (1)	2.5
PARAMETER (2)	
BIS (2 ETHYHEXYL)	NP
BIS (2 ETHYHEXYL)	NP
ADIPATE	NP
ISOPHORONE	NP
TOTAL SVOCs	NP

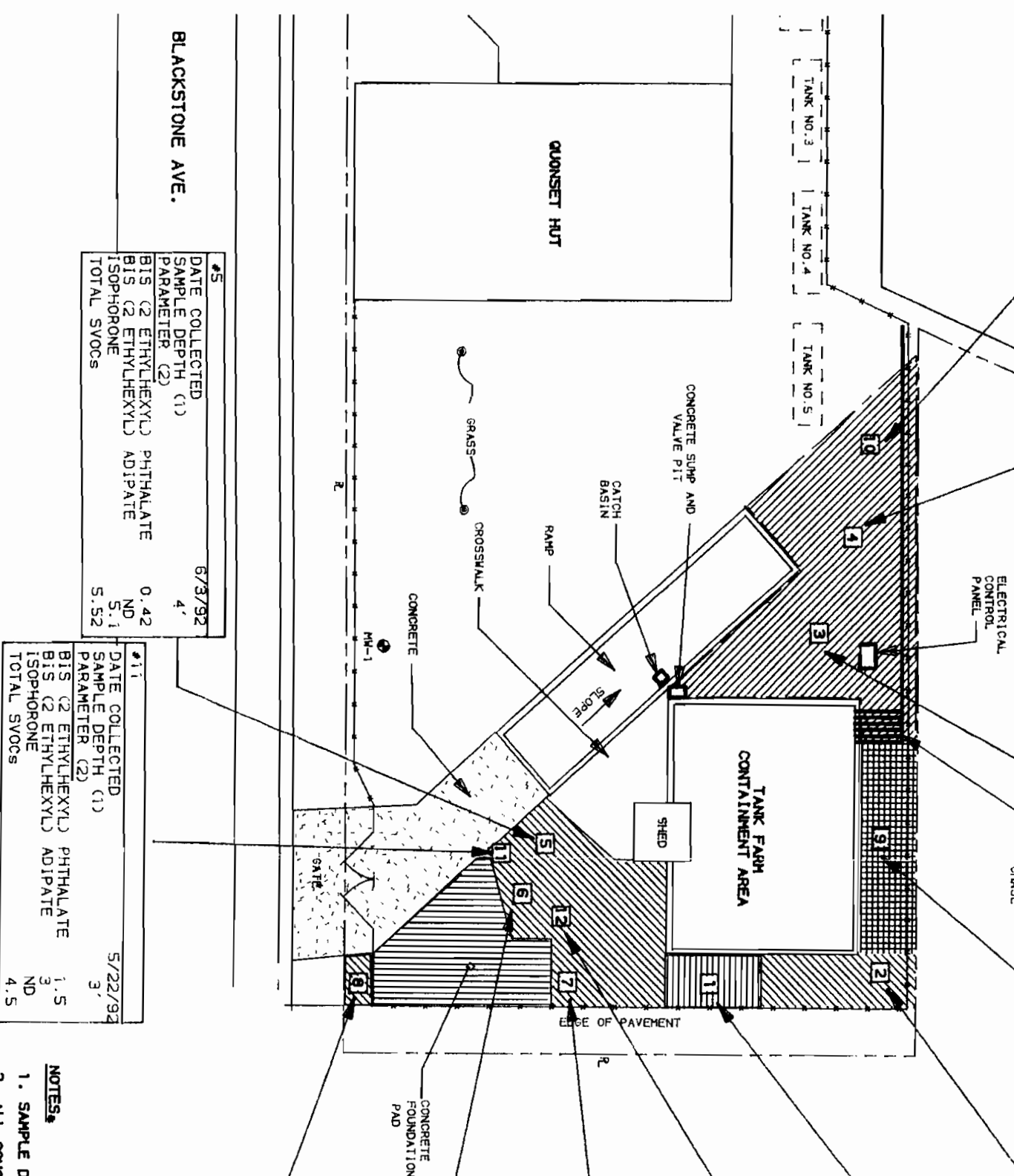
DATE COLLECTED	6/3/92
SAMPLE DEPTH (1)	6
PARAMETER (2)	
BIS (2 ETHYLEXYL	0.77
BIS (2 ETHYLEXYL	580
ISOPHORONE	ND
TOTAL SVCS	580.7

#12	DATE COLLECTED	5/22/92
SAMPLE DEPTH (1)	1'	
PARAMETER (2)		
BIS (2 ETHYLHEXYL)	PHthalate	4.2
BIS (2 ETHYLHEXYL)	ADIPate	1.2
ISOPHRONE		ND
TOTAL SVCS		5.4

DATE COLLECTED	5/22/92
SAMPLE DEPTH (1)	3'
PARAMETER (2)	
BIS (2 ETHYLHEXYL)	ND
BIS (2 ETHYLHEXYL)	ND
ISOPHORONE	ND
TOTAL SVOCs	ND

#6	DATE COLLECTED	6/3/92
	SAMPLE DEPTH (1)	4
	PARAMETER (2)	
	BIS (2 ETHYLHEXYL) PHTHALATE	2.
	BIS (2 ETHYLHEXYL) ADIPATE	ND
	ISOPHORONE	ND
	TOTAL SVCS	2.

#8	DATE COLLECTED	5/22/93
SAMPLE DEPTH (1)		3
PARAMETER (2)		
BIS (2 ETHYLHEXYL)	PHthalate	ND
BIS (2 ETHYLHEXYL)	ADIPATE	ND
ISOPHORONE		ND
TOTAL SVOCs		ND



1. SAMPLE DEPTHS ARE INDICATED IN FEET BELOW GROUND.
2. ALL CONCENTRATIONS REPORTED IN mg/kg (based DRY WEIGHT).

 P
PROPERTY LINE

 FENCE

7	VERIFICATION SAMPLE LOCATION

SOILS EXCAVATED TO 1'-0"

SOILS EXCAVATED TO 2'-0"

 SOILS EXCAVATED TO 3'-0" SOILS EXCAVATED TO 4'-0"

Introduction

ND NOT DETECTED

INTERIM REMEDIAL MEASURES
STAINED SOILS AREA
EXCAVATION

FORMER ESSEX SPECIALTY
PRODUCTS, INC.
JAMESTOWN, NEW YORK

STAINED SOILS AREA ANALYTICAL RESULTS

SEMI-VOLATILES



O'BRIEN & GERE
ENGINEERS, INC.

Syracuse, New York

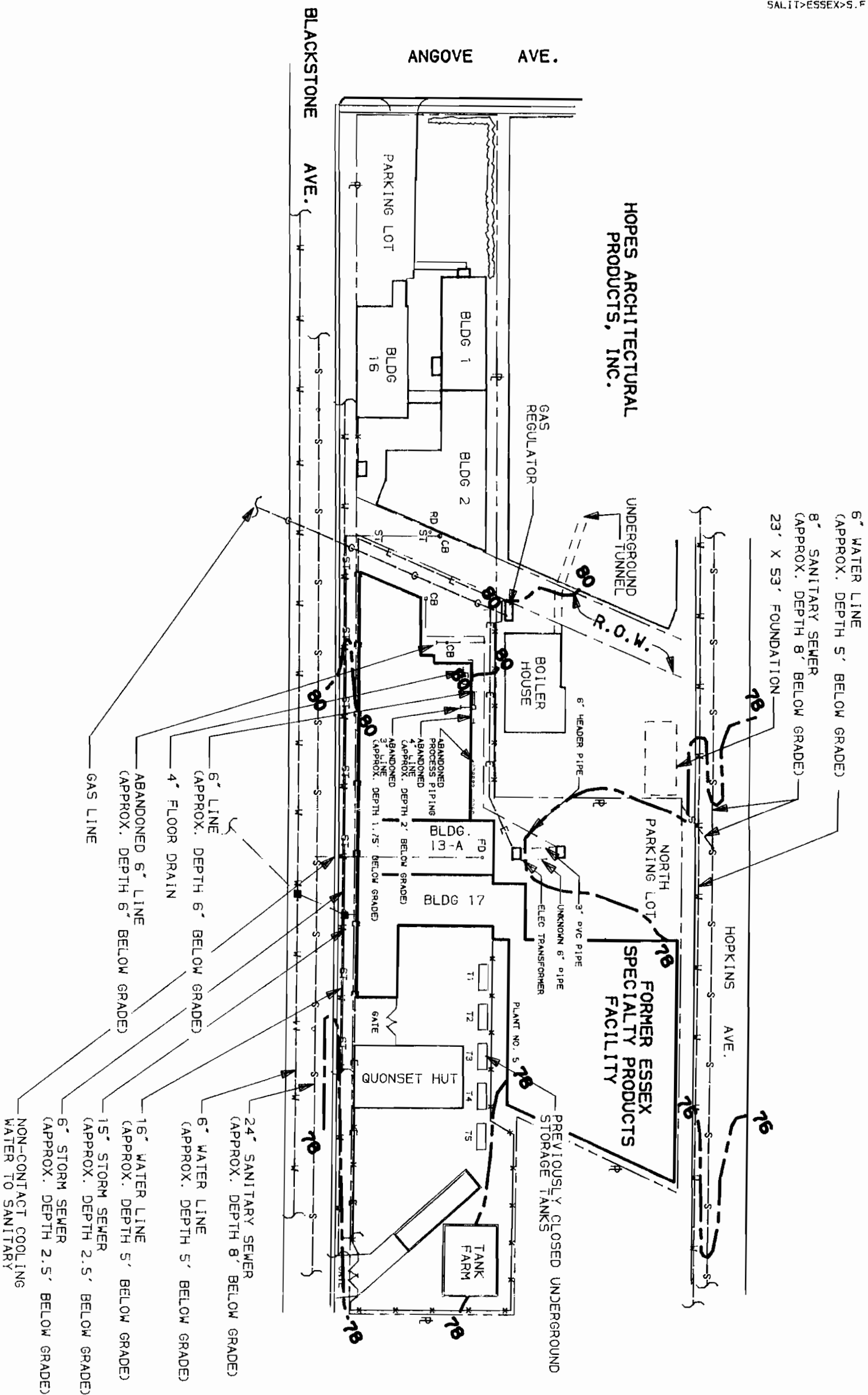
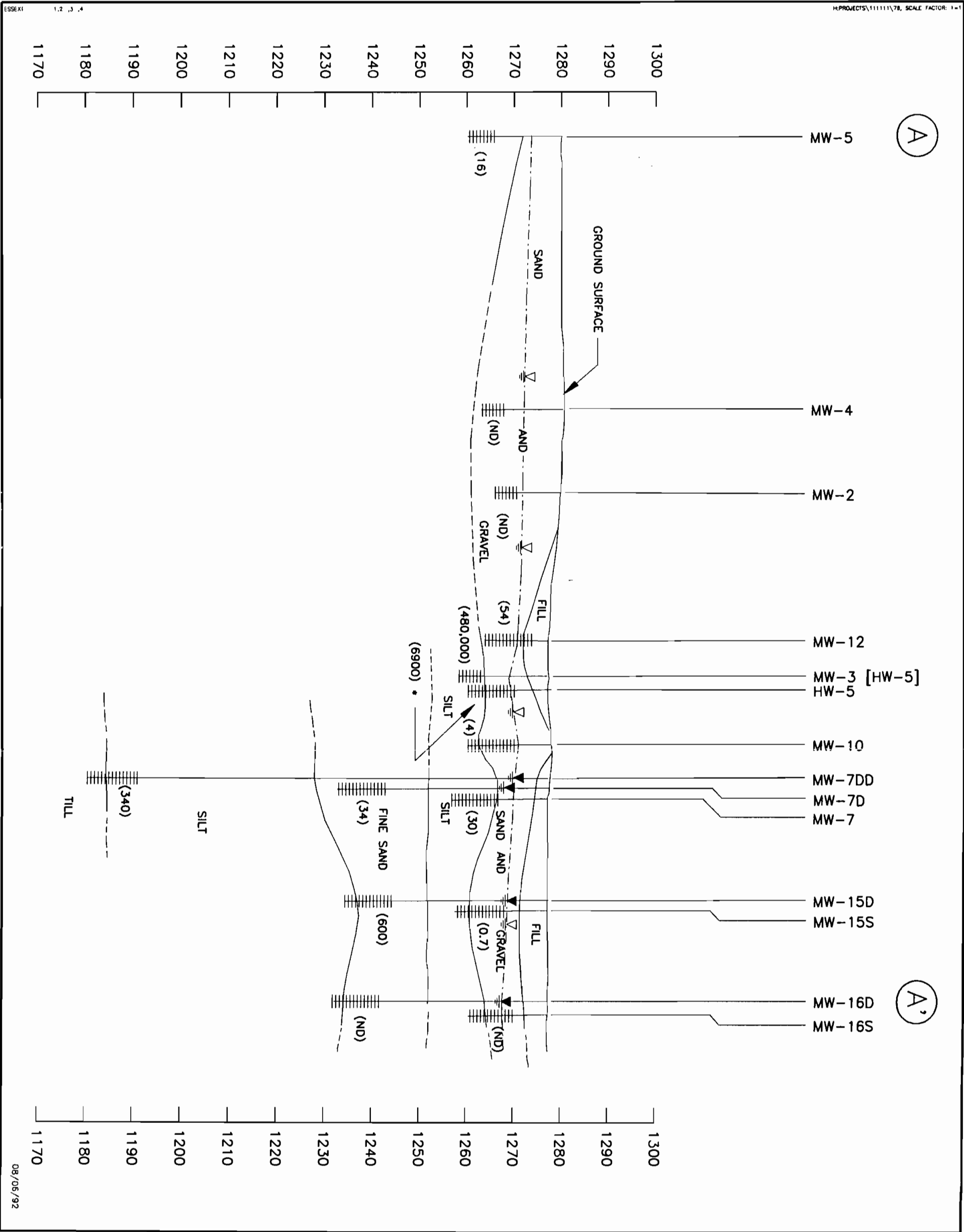


FIGURE 12

FIGURE 14
REMEDIAL INVESTIGATION
FORMER ESSEX SPECIALTY
PRODUCTS, INC.
JAMESTOWN, NEW YORK



MW-2
MONITORING WELL LOCATION

LEGEND

(600)
TCE CONCENTRATION
(FEB 1992)

(ND)
NOT DETECTED

(6900) •
TCE CONCENTRATION
(APRIL 1992) FROM GROUND
WATER SAMPLE SPLIT WITH
GZA PERSONNEL

[HW-5]
INTERPRETATION OF SUBSURFACE
CONDITIONS BASED ON BORING
LOG FROM THIS WELL

▼
INTERMEDIATE GROUND WATER
ELEVATION

▽
SHALLOW GROUND WATER
TABLE

NOTE:
VERTICAL EXAGGERATION = 10X

CROSS SECTION
A - A'



HORIZ. SCALE IN FEET

2576.010.802

FIGURE 15
 REMEDIAL INVESTIGATION
 FORMER ESSEX SPECIALTY
 PRODUCTS, INC.
 JAMESTOWN, NEW YORK

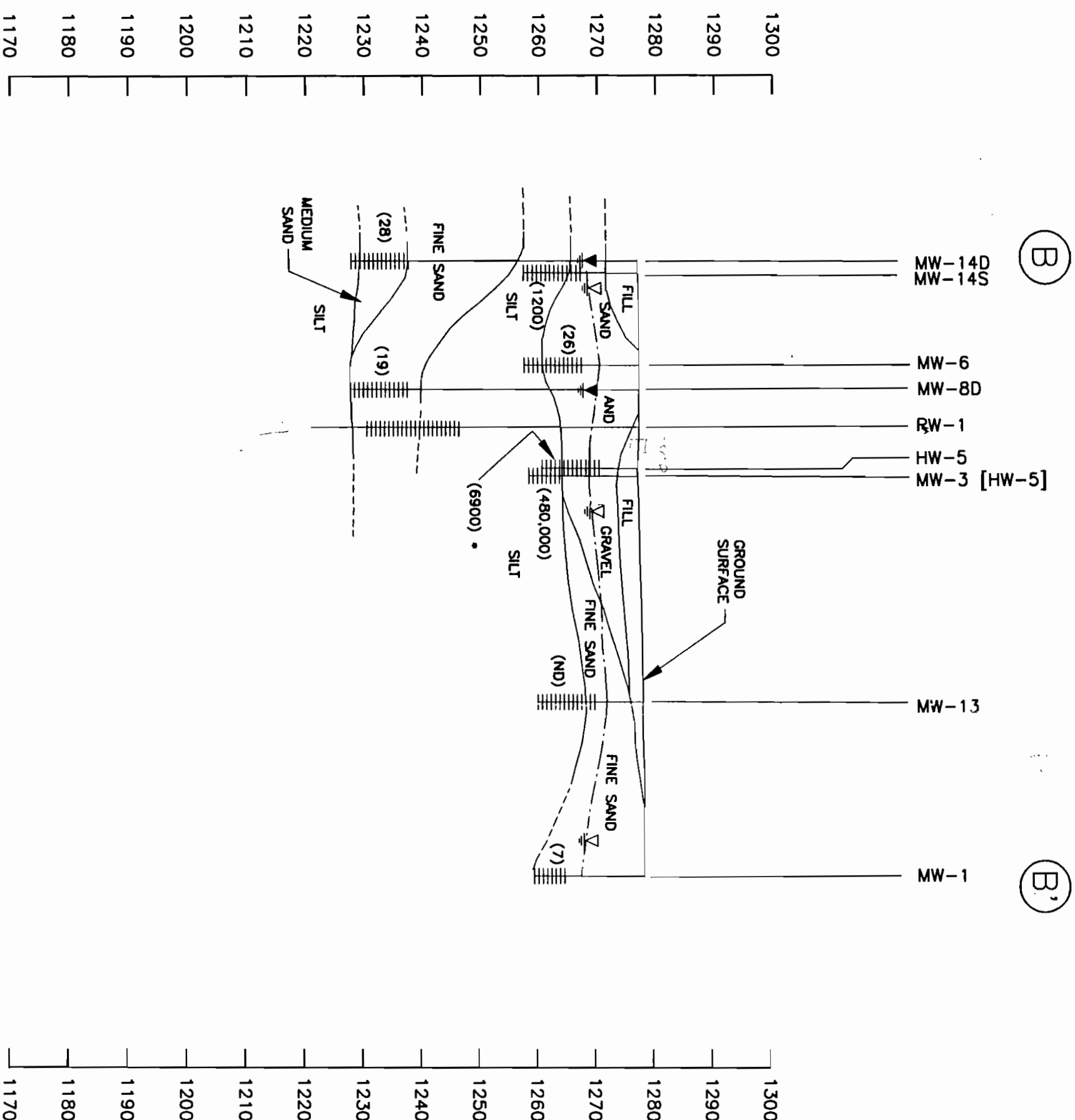
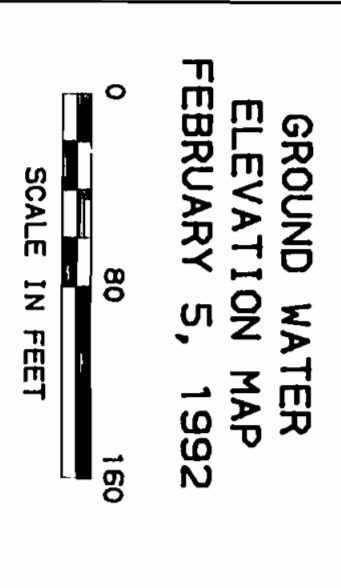
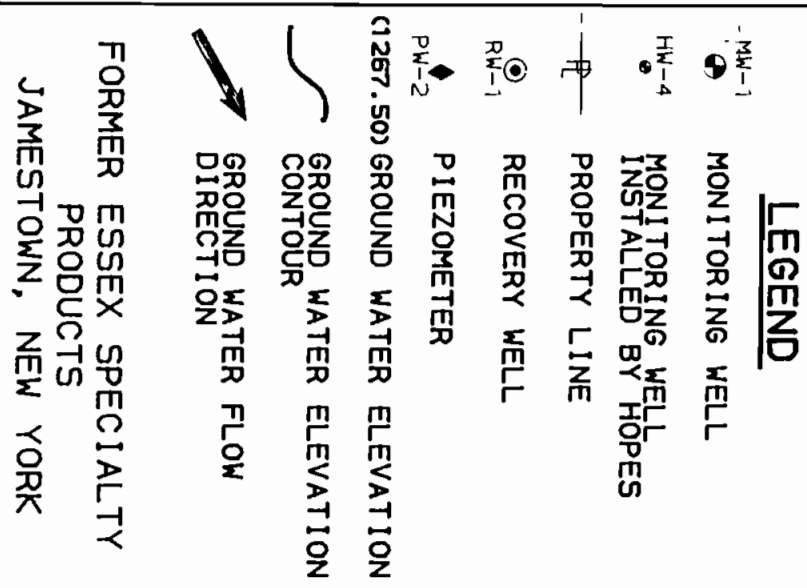
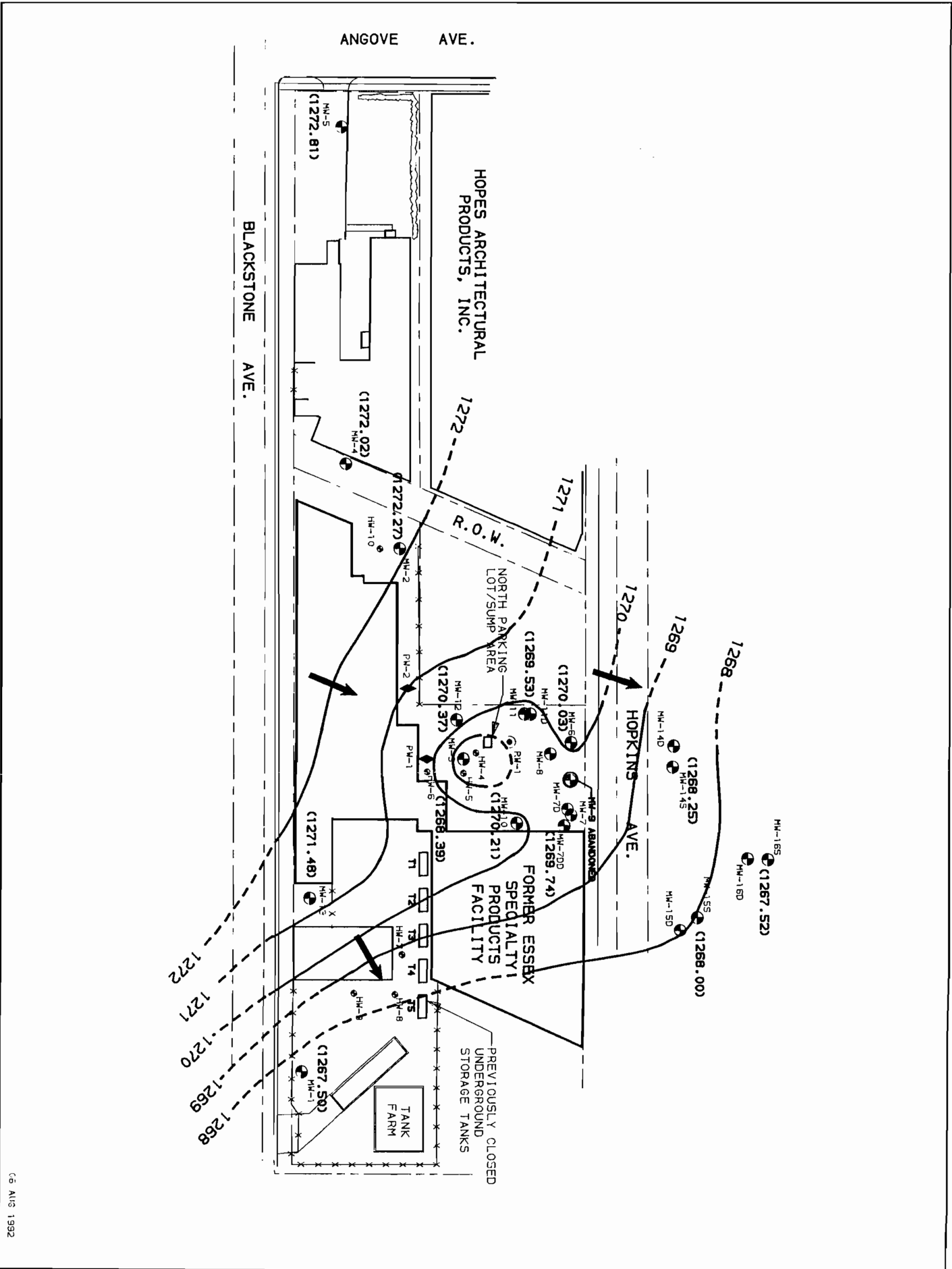


FIGURE 16



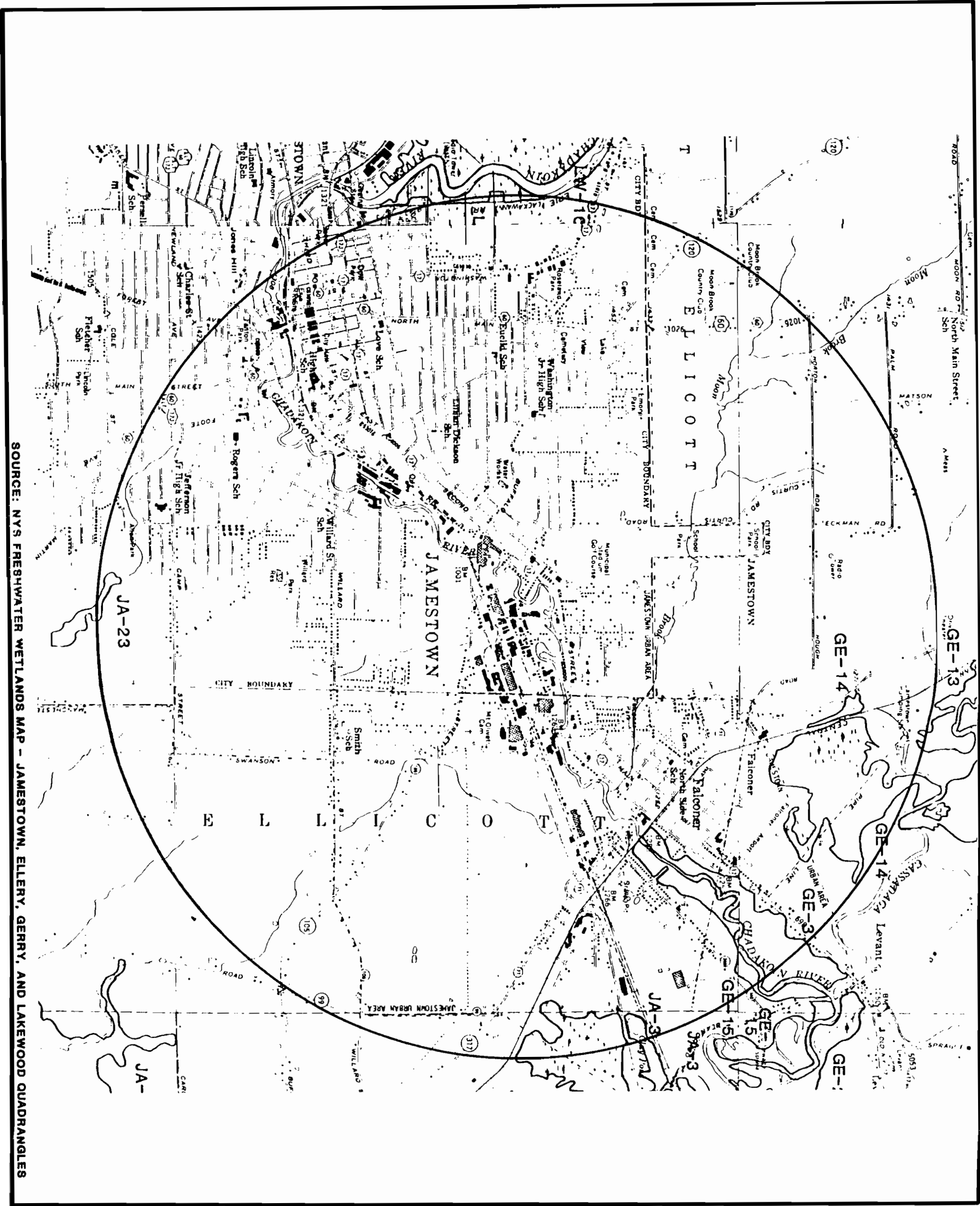


Figure 17

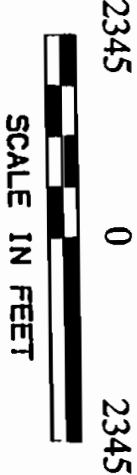


LEGEND

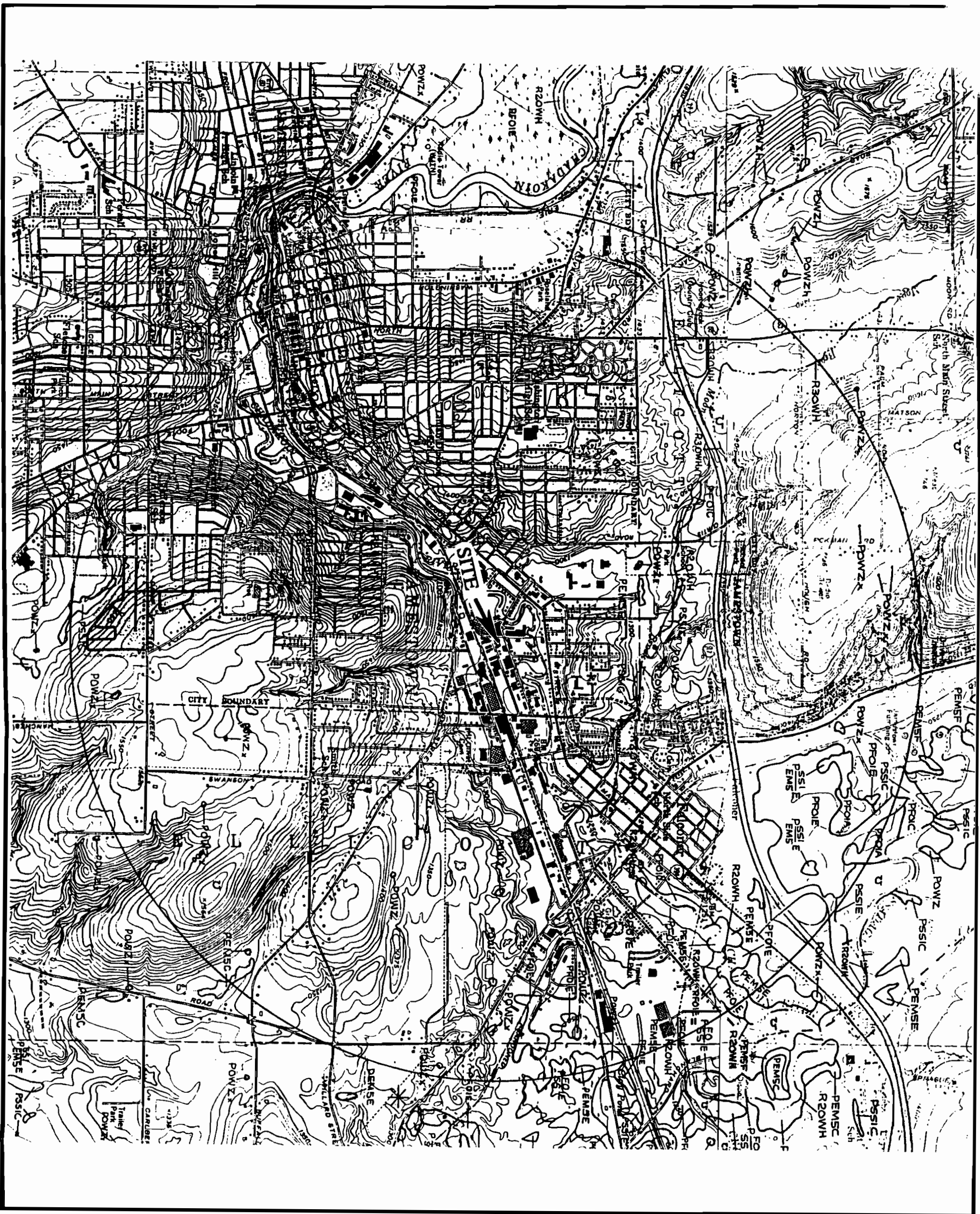
- APPROXIMATE WETLAND BOUNDARY
- JA-23 WETLAND IDENTIFICATION CODE

REMEDIAL INVESTIGATION
FORMER ESSEX
SPECIALTY PRODUCTS
JAMESTOWN, NEW YORK

NEW YORK STATE
FRESHWATER WETLANDS

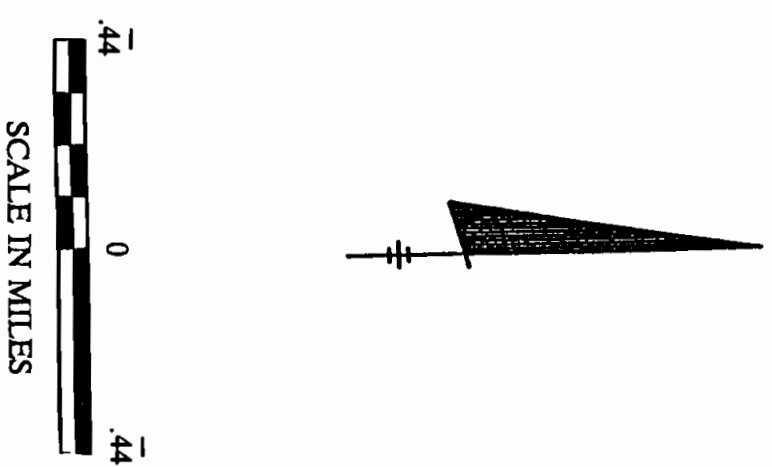


1" = 2345'

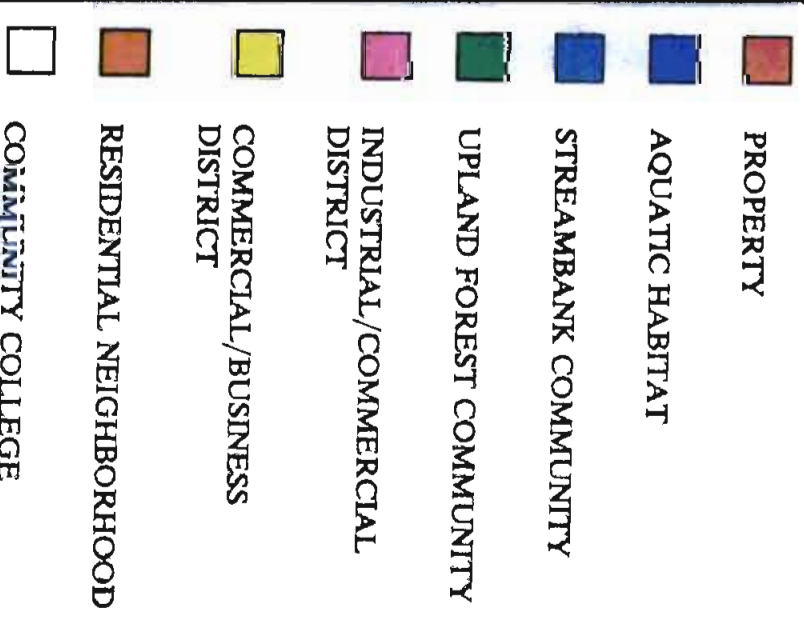


**FORMER ESSEX SPECIALTY PRODUCT
JAMESTOWN, NEW YORK**

NATIONAL WETLANDS INVENTORY



**FORMER ESSEX SPECIALTY
PRODUCTS
JAMESTOWN, NEW YORK**



COVER TYPE MAP

528	0	528
-----	---	-----

SCALE IN FEET

1ⁿ = 528 feet

	S	S²
Groundwater Route Score (S_{gw})	0	0
Surface Water Route Score (S_{sw})	43.58	1899.2
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		1899.2
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		43.58
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		25.19

WORKSHEET FOR COMPUTING S_M

FIGURE 23

Direct Contact Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
1 Observed Incident	0 45	1	0	45	8.1	
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2						
2 Accessibility	0 1 2 3	1	3	3	8.2	
3 Containment	0 15	1	15	15	8.3	
4 Waste Characteristics Toxicity	0 1 2 3	5	10	15	8.4	
5 Targets					8.5	
Population Within a 1-Mile Radius	0 1 2 3 4 5	4		20		
Distance to a Critical Habitat	9 1 2 3	4		12		
Total Targets Score			12	32		
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			5400	21,600		
7 Divide line 6 by 21,600 and multiply by 100			SOC = 25			

DIRECT CONTACT WORK SHEET

FIGURE 24

Ground Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
[1] Observed Release	0 (45)	1	45	45	3.1	
If observed release is given a score of 45, proceed to line [4] . If observed release is given a score of 0, proceed to line [2] .						
[2] Route Characteristics					3.2	
Depth to Aquifer of Concern	0 1 2 3	2		6		
Net Precipitation	0 1 2 3	1		3		
Permeability of the Unsaturated Zone	0 1 2 3	1		3		
Physical State	0 1 2 3	1		3		
Total Route Characteristics Score			N/A	15		
[3] Containment	0 1 2 3	1	N/A	3	3.3	
[4] Waste Characteristics					3.4	
Toxicity/Persistence	0 3 6 9 12 15 (18)	1		18		
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score			19	26		
[5] Targets					3.5	
Ground Water Use	(0) 1 2 3	3		9		
Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	1		40		
Total Targets Score			0	49		
[6] If line [1] is 45, multiply [1] x [4] x [5] If line [1] is 0, multiply [2] x [3] x [4] x [5]			0	57,330		
[7] Divide line [6] by 57,330 and multiply by 100			S_{gw} = 0			

GROUND WATER ROUTE WORK SHEET

FIGURE 20

Surface Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)	
[1] Observed Release	0 45	1	0	45	4.1	
If observed release is given a value of 45, proceed to line [4] If observed release is given a value of 0, proceed to line [2]						
[2] Route Characteristics					4.2	
Facility Slope and Intervening Terrain	0 <u>1</u> 2 3	1		3		
1-yr. 24-hr. Rainfall	0 1 <u>2</u> 3	1		3		
Distance to Nearest Surface Water	0 1 2 <u>3</u>	2		6		
Physical State	0 1 2 <u>3</u>	1		3		
Total Route Characteristics Score			12	15		
[3] Containment	0 1 2 <u>3</u>	1	3	3	4.3	
[4] Waste Characteristics					4.4	
Toxicity/Persistence	0 3 6 9 12 15 <u>18</u>	1		18		
Hazardous Waste Quantity	0 <u>1</u> 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score			19	28		
[5] Targets					4.5	
Surface Water Use	0 1 <u>2</u> 3	3		9		
Distance to a Sensitive Environment	<u>0</u> 1 2 3	2		6		
Population Served/Distance to Water Intake Downstream	0 4 8 8 10 12 16 18 <u>20</u> 24 30 32 <u>35</u> 40	1		40		
Total Targets Score			41	55		
[6] If line [1] is 45, multiply [1] x [4] x [5] If line [1] is 0, multiply [2] x [3] x [4] x [5]			28044	64,350		
[7] Divide line [6] by 64,350 and multiply by 100			S_{sw} =		43.58	

SURFACE WATER ROUTE WORK SHEET

FIGURE 21

Air Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multi- plier	Score	Max. Score	Ref. (Section)	
1 Observed Release	0 45	1	0	45	5.1	
Date and Location:						
Sampling Protocol:						
If line 1 is 0, the $S_g = 0$. Enter on line 5 . If line 1 is 45, then proceed to line 2 .						
2 Waste Characteristics					5.2	
Reactivity and Incompatibility	0 1 2 3	1		3		
Toxicity	0 1 2 3	3		9		
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8		
Total Waste Characteristics Score			N/A	20		
3 Targets					5.3	
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30		
Distance to Sensitive Environment	0 1 2 3	2		6		
Land Use	0 1 2 3	1		3		
Total Targets Score			N/A	39		
4 Multiply 1 x 2 x 3			0	35.100		
5 Divide line 4 by 35.100 and multiply by 100			$S_g = 0$			

AIR ROUTE WORK SHEET

FIGURE 22