V00417

Site Investigation Final Report

Vineyard Research Laboratory Fredonia, New York

New York State
Agricultural Experiment Station
Cornell University
Geneva, New York

April 2003

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

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1. Introduction

1.1 General

This Site Investigation (SI) Final Report has been prepared by Blasland, Bouck, & Lee, Inc. (BBL) for Cornell University (Cornell) to present the findings of the SI conducted at the Vineyard Research Laboratory (site), located at 412 East Main Street in Fredonia, Chautauqua County, New York. The SI was conducted in accordance with the Voluntary Cleanup Agreement (Index #B9-0587-00-11) entered into on March 27, 2001, between Cornell and the New York State Department of Environmental Conservation (NYSDEC). The SI activities were implemented and completed following requirements detailed in the *Site Investigation Work Plan, Vineyard Research Laboratory*, prepared by BBL and dated October 2001 (Work Plan).

The objective of the investigation was to address the potential presence of pesticides and herbicides and related compounds (volatile organic compounds [VOCs] and metals) in soils and groundwater associated with an on-site pesticide rinse pad and pesticide storage areas. The SI also targeted an area around a former underground petroleum storage tank. Results of the investigation activities, as well as conclusions and recommendations, are presented in the following sections.

1.2 Site Location and Background

The Vineyard Research Laboratory, also known as the Taschenberg Laboratory, is located at 412 East Main Street in the Village of Fredonia, Town of Pomfret, Chautauqua County, New York. The Vineyard Research Laboratory was established in 1958 by the New York State Agricultural Experiment Station, Geneva, New York, in order to develop improved pesticide application methods; improve control of major grape insect, disease, and weed pests; and develop a mechanical harvester for grapes. The facility is currently operating to support research programs such as the mechanization of pruning and shoot positioning, long-term effects of insects and diseases on vineyard productivity, trickle irrigation, and weed control methods. Prior to 1958, the land was owned and operated by Renalski nursery. The location of the Vineyard Research Laboratory is presented on Figure 1.

The Vineyard Research Laboratory consists of a main research building with associated vehicle maintenance shop, an equipment storage building, a pesticide storage building, and a petroleum aboveground storage tank (AST) farm. Located directly north of the main research building is a pesticide fill pad and underlying sump. These are subsequently referred to as different entities. The pesticide fill pad was designed to provide a place to fill and clean pesticide sprayers and associated heavy equipment after application processes in the vineyard. Two laboratory sinks within the main research building have historically drained into the underlying sump. Cornell recently rerouted the laboratory sink drainage system from the sump to an on-site septic system. Two petroleum storage tanks (underground and aboveground) were historically located at the northeast corner of the main research building. The tanks were removed in 1995, as discussed in Section 1.3.

Historically, pesticides were stored in the former pesticide storage room located on the northwest corner of the main building. Inspection of this room indicated a sloping floor that would drain out the north side of the room to the soil adjacent to the fill pad. A pre-fabricated storage facility was installed north of the fill pad, and the former storage room was no longer used for pesticide storage.

1.3 Previous Investigations

In October 1995, one gasoline underground storage tank (UST) and one diesel fuel AST were removed and decommissioned. The UST showed indications of corrosion and pitting, but no holes were observed. The AST showed no indications of stains, corrosion, or pitting, and no obvious holes were observed.

One composite soil sample was collected from the UST excavation area. The sample was a composite of five grab samples: one grab soil sample from each of the four excavation side walls and one grab soil sample from the excavation floor. VOC contamination was found in the composite sample with constituent concentrations exceeding their respective New York State (NYS) petroleum-contaminated soil guidance values as listed in the Spill Technology and Remediation Series (STARS) Memo #1, August 1992. The VOCs included benzene, toluene, xylene, and 1,2,4-Trimethylbenzene. Additional information regarding events and findings of the UST and AST closure project can be found in the *Underground Storage Tank Closure Report*, State University of New York at Cornell, Town of Pomfret, Cattaraugus County, New York (Metcalf & Eddy, Inc., December 1995).

In August 1999, BBL sampled the sump contents (solid and liquid) in order to determine the presence of contaminants, if any. Various pesticides were determined present in the sludge. BBL then prepared and submitted to Cornell a disposal evaluation letter detailing the potential waste characterization and disposal options, in accordance with Resource Conservation and Recovery Act (RCRA) regulations codified in 40 Code of Federal Regulations (CFR), Parts 261 through 268. At Cornell's request, the sump sludge was resampled in April 2002. The resulting sludge sample was split into three samples, two of which were submitted to two separate off-site laboratories for analysis. The third sample was submitted to a Cornell representative for research analysis at Cornell. Sump sludge analytical results were summarized and submitted to Cornell in a separate letter. The sump sludge currently remains inside the pesticide sump.

Water that had accumulated inside the sump due to rainwater infiltration was removed by Cornell in December 1999. The approximately 600 gallons of sump water was pumped out of the sump and sent for off-site disposal.

1.4 Site Investigation Objectives

The objective of the SI was to evaluate the potential impact that the pesticide fill pad and underlying sump, pesticide storage areas, and former USTs/ASTs may have had on the surrounding soil and groundwater. Information was gathered to assess soil and groundwater contaminants, soil types, groundwater levels and direction of flow, potential contaminant migration pathways, and estimated rate of migration.

The scope of the investigation was intended to provide an initial indication of the area(s) impacted by the pesticide fill pad, storage areas, and former tanks, as well as the nature of contaminants, if any. BBL conducted the following on-site activities:

- collected surface and subsurface soil samples from locations around the site, primarily in the vicinity of the pesticide fill pad, to determine the presence and possible impact to potential receptors and future site use options, if any;

- installed and sampled five groundwater monitoring wells to determine site groundwater quality and the site hydraulic gradient;

- performed hydraulic conductivity testing and measured groundwater levels to determine the hydraulic gradient at the site and evaluated potential migration pathways, if any, leading from the main research building vicinity; and

- conducted a site survey.

1.5 Report Organization

This report presents a summary of the investigation field activities and analytical results, as well as conclusions and recommendations. The final report has been organized into the following remaining sections:

- Section 2 - Site Investigation Activities

- Section 3 - Physical Conditions

- Section 4 - Soil and Groundwater Quality

- Section 5 - Waste Characterization

- Section 6 - Conclusions

- Section 7 - Recommendations

2. Site Investigation Activities

2.1 General

This section of the SI Final Report presents a description of the field procedures that were performed during implementation of the SI. The SI focused on areas suspected to contain contaminants associated with the pesticide fill pad and underlying sump and past and present pesticide storage areas, and on areas associated with the former petroleum UST and AST. The specific tasks associated with the SI were:

- surface soil sample collection;
- subsurface soil sample collection;
- installation of monitoring wells;
- well development;
- groundwater sample collection;
- hydraulic conductivity testing and groundwater level measurement; and
- site survey and mapping.

Investigation activities began with the installation of soil borings and monitoring wells, followed by surface soil sampling, well development, hydraulic conductivity testing and groundwater level measurement, and, finally, groundwater sampling. Detailed information regarding sample numbering, location, procedures, analysis, and documentation is presented in Section 4 (Soil and Groundwater Quality). Generated waste was managed following procedures outlined in Section 4 of the Work Plan.

The investigation locations, including soil samples and monitoring wells, are presented on Figure 2. All locations were cleared for municipal and facility underground utilities by Cornell staff prior to the start of field activities.

Due to the potential presence of organic compounds, all soil samples were screened for VOCs using a 10.2 eV HNu™ photoionization detector (PID). Additional monitoring required for health and safety purposes was performed in accordance with the *Health and Safety Plan* (HASP) presented in Appendix B of the Work Plan.

2.2 Surface Soil Sampling

On April 26, 2002, BBL collected surface soil samples in areas suspected to have been impacted by past site operations to better define impacts to, and immediately below, the ground surface. Seven surface soil samples were collected, including one background sample (as shown on Figure 2). Surface soil samples were collected using a decontaminated stainless steel spoon. The soil was then placed on a piece of aluminum foil, composited, and placed in the appropriate labeled containers. Soil collected for VOC analyses was placed directly in the

appropriate sample containers. All surface soil samples were collected from directly below the root mass, not exceeding 3 inches below ground surface (bgs), from the following four areas:

Pesticide Fill Pad
Three surface soil samples were collected around the perimeter of the pesticide fill pad using the method described above. The samples were collected from locations directly north, west, and east of the pesticide fill pad. Samples were targeted in areas more likely to have been impacted by past operations, such as low-lying areas or areas of stressed vegetation. Soil samples were analyzed for Appendix IX Pesticides 8081 and 8270 + Tentatively Identified Compounds (TICs); Appendix IX Chlorinated Herbicides 8151; Target Analyte List (TAL) Metals 6010/7000; Target Compound List (TCL) VOCs 8260; and, in one location, for TCL Semivolatile Organic Compounds (SVOCs) 8270.

Pesticide Storage Area, North of the Main Research Building
Two surface soil samples were collected directly outside the current pesticide storage area located north of the main research building. The samples were collected to the south and northwest of the storage area using the methods described above. The sample locations were target areas more likely to have been impacted by past operations, such as low-lying areas or areas of stressed vegetation. Soil samples were analyzed for Appendix IX Pesticides 8081 and 8270 + TICs, Appendix IX Chlorinated Herbicides 8151, TAL Metals 6010/7000, and TCL VOCs 8260.

Former Pesticide Storage Area, Northwest Corner of the Main Research Building
One surface soil sample was collected outside the former pesticide storage area, directly adjacent to a floor drain leading from inside the former storage area to the outside. The former pesticide storage area is located at the northwest corner of the main research building. The soil sample was collected using methods described above. The sample location targeted the area where a drain in the former storage area floor discharges to the ground directly outside the door. The soil sample was analyzed for TCL VOCs 8260, TCL SVOCs 8270, Appendix IX Pesticides 8081 and 8270 + TICs, Appendix IX Chlorinated Herbicides 8151, and TAL Metals 6010/7000.

Background
One background surface soil sample was collected in the grassy area directly south of the main research building. The soil sample was collected using the method described above. The soil sample was analyzed for TCL VOCs 8260, TCL SVOCs 8270, Appendix IX Pesticides 8081 and 8270 + TICs, Appendix IX Chlorinated Herbicides 8151, and TAL Metals 6010/7000.

The surface soil samples were collected and submitted for off-site analysis as specified in the SI Sampling and Analysis Plan (SAP), included in the Work Plan as Appendix A. Analytical results are discussed in Section 4.

2.3 Soil Borings

On April 25, 2002, BBL installed soil borings to obtain preliminary information on soil conditions and the extent of the potential release of contaminants into the subsurface by past site activities. Eight soil borings were installed, and continuous split-spoon soil samples were collected to the maximum depths stated below. The locations of the eight soil borings are shown on Figure 2.

Each borehole was advanced with a rotary drill rig using 4¼-inch hollow-stem augers. Two-foot-long, 2-inch-outside-diameter (OD) split-spoon samples were collected continuously, in accordance with the procedures of the Standard Penetration Test (American Society for Testing and Materials [ASTM] D-1586-87). Representative samples from each split-spoon were classified in the field by a geologist as they were collected

and recorded in the field logbook. Each sample was screened using a PID during drilling. Screening results were recorded in the field logbook and are presented on the soil boring logs in Appendix A. There were no detections of VOCs from the soil screening activities in any of the soil borings or monitoring well boreholes.

A temporary stake labeled with the soil boring number was placed next to each sampling location to identify the location for follow-up survey activities.

Soil boring samples were collected from the following two areas:

Pesticide Fill Pad

Six soil borings were installed around the perimeter of the fill pad, to the north, west, and east. Continuous soil samples were collected at each location to a maximum depth of 2 feet below the bottom of the fill pad sump. The depth of each soil boring was approximately 8 feet, based on the cross-sectional drawing of the fill pad sump. No visual soil contamination or elevated PID readings were encountered. One discrete subsurface sample was collected from each soil boring and submitted to the analytical laboratory, using the methods described above. Three of the soil borings were located within 2 to 3 feet of the edge of the fill pad; the remaining three borings were offset from the fill pad by approximately 10 feet from the initial boring locations. Soil samples were analyzed for Appendix IX Pesticides 8081 and 8270 + TICs, Appendix IX Chlorinated Herbicides 8151, TAL Metals 6010/7000, and TCL VOCs 8260, and, in one location, for TCL SVOCs 8270. Analysis of the three offset soil borings was contingent on the results of the inner three soil boring samples as specified in the SAP, Appendix A of the Work Plan. Based on detections at the inner three borehole samples, samples from the offset borings were analyzed for pesticides, herbicides, and metals.

Former UST

Two soil borings were installed in the immediate area surrounding the former UST, located on the northeast corner of the main research building. One of the two soil borings was installed 1 foot north of the former UST excavation area in an attempt to avoid UST excavation backfill material. The second boring was installed directly south of the former UST excavation area. Continuous soil samples were collected to 2 feet below the former excavation area. The depth of the two soil borings was 8 feet. No visual soil contamination or elevated PID readings were encountered. One discrete subsurface sample was collected from each soil boring for submittal to the analytical laboratory, using the methods described above. The soil sample was analyzed for TCL VOCs 8260, TCL SVOCs 8270, Appendix IX Pesticides 8081 and 8270 + TICs, Appendix IX Chlorinated Herbicides 8151, and TAL Metals 6010/7000.

The subsurface soil samples were collected and submitted for off-site analysis as specified in the SI SAP. Analytical results are discussed in Section 4.

2.4 Monitoring Well Installation

On April 23 and 24, 2002, five overburden monitoring wells were installed: one upgradient (background) and four down gradient of the pesticide fill pad, as shown on Figure 2. The background monitoring well (MW-1) is located upgradient of the pesticide fill pad and in an area not historically or currently used for pesticide application and/or storage. Monitoring well MW-2 was installed adjacent to the pesticide fill pad in the same location as soil boring SB-02. The remaining three monitoring wells (MW-3, MW-4, and MW-5) were installed downgradient of the pesticide fill pad, former UST, and former septic system in areas between the pesticide fill pad and the vineyard. MW-3 and MW-4 are located north and northwest of the fill pad, respectively. MW-4 is also directly north of the current pesticide storage area. MW-5 was installed to the south of the aboveground gas tank concrete pad to act as a sentry well between the facility and the McClenathan Trailer Park.

At each location, a borehole was advanced with a rotary drill rig using 4¼-inch hollow-stem augers to approximately 5 feet into groundwater, which was estimated, based on soil saturation levels.

Two-inch-diameter monitoring wells were installed by placing a polyvinyl chloride (PVC) well screen (No. 10 screen slot size, maximum length of 10 feet) and casing to the bottom of the borehole, with the screened interval extending upward to 3 to 5 feet above the water table. As the augers were slowly removed, clean, washed sand was placed into the annular space around the well screen and riser from the base of the screen to approximately 2 feet above the screen. Following the sandpack, a 2-foot-thick bentonite seal was placed that was allowed to hydrate overnight. Cement/bentonite grout was placed from the top of the bentonite seal to a point 2 feet below existing ground surface.

The well casing was cut below grade and secured with a vented lockable cap. Sand was packed around the casing to allow drainage, and the well casing and cap were protected by a flush-mounted roadway box set in a concrete seal. Well construction details, including materials and depths, were recorded in the field logbook and are presented on the soil boring/well completion logs in Appendix A.

Upon completion of installation, the monitoring wells were developed and tested as specified in Sections 2.5 and 2.6. Groundwater samples were collected as specified in Section 3.5 of the Work Plan and detailed in the SAP. Analytical results are presented in Section 4.

2.5 Well Development

Upon completing the well installations, BBL personnel began well development activities to allow direct communication with the water-bearing zone screened by the well. Development of the wells included surging and purging the well with a decontaminated stainless-steel bailer. Field parameters (temperature, pH, conductivity, and turbidity) were collected during well development to document groundwater quality and consistency in order to confirm hydraulic connection with the formation. Development proceeded until field parameters of turbidity, pH, conductivity, and temperature stabilized, and the well yielded relatively sediment-free water. Development water was containerized and stored temporarily at the site pending off-site disposal.

2.6 Hydraulic Conductivity testing

Following the development activities, the in-situ hydraulic conductivity tests were performed on the five new monitoring wells. In-situ hydraulic conductivity tests were performed by instantaneously removing a bailer of water from a well and measuring the recovery to static conditions with a pressure transducer and data logger system. The data logger measured the water levels, with respect to time, on a logarithmic scale, allowing for the generation of more data points early in the test. The rising-head slug tests were performed as follows:

- Wells were allowed to stabilize upon completion of well development;
- The static water level was measured and recorded prior to test start-up;
- The pressure transducer and bailer were placed into the well within 1 foot of the well bottom;
- The water level was allowed to stabilize and reach static conditions;
- The pressure data logger was calibrated to the pressure transducer;
- The bailer (approximately 0.25 gallons) was removed from the well, and the data logger was initiated; and
- The test was completed when the groundwater level reached static conditions.

In-situ hydraulic conductivity test results were calculated using the Bouwer and Rice solution for an unconfined aquifer. In-situ hydraulic conductivity test results are presented in Appendix B and summarized in Table 1 of this report. These hydraulic conductivity values are consistent with the recovery observation made during well development activities. The results are discussed in Section 3.

2.7 Water-Level Measurements

The depth to groundwater was measured in all wells with an electronic water-level indicator to establish groundwater elevation and flow direction. Groundwater elevation measurements were made following well development and testing, following procedures presented in Section 3.4 of the Work Plan. The groundwater elevations were determined by referencing the site-specific datum established by the site survey.

2.8 Site Survey

On July 11, 2002, Wendel Duchscherer Survey, NYS-licensed surveyors, located and surveyed each monitoring well with respect to the existing site coordinate system. Vertical control was also established for the ground surface and the top of the riser at all monitoring wells and referenced to the site-specific datum.

The property boundary and relevant site features were surveyed by Wendel Duchscherer in 2001; this survey is the basis for the site maps used in this report.

3. Physical Conditions

3.1 Topography, Land Usage, Drainage

Topography

Chautauqua County is composed of two physiographic provinces: the Erie-Ontario Plain and the Allegheny Plateau. The site is located in the Erie-Ontario Plain province, which is a lowland belt along the southern shore of Lake Erie. This belt is 2 to 6 miles wide and has topography typical of that of an abandoned lakebed. It has little relief except for a series of very narrow ravines cut across it by a number of streams. It ranges in elevation from 572 feet at Lake Erie to about 850 feet at the base of the bordering escarpment. The alignment of the escarpment parallels Lake Erie and ranges in elevation from 1,400 feet in the eastern part of the county to 1,600 feet in the western part.

Route 20, located just south of the site, is located along a former beach ridge of an earlier, higher version of Lake Erie. As a result, the subsurface materials in this area are composed primarily of sand and gravel. Further down the driveway and out toward the vineyards, the area takes on more of the topography of the former lakebed, with an increase in finer-grained material, primarily silt.

Land Usage

The main agricultural enterprise in this region is growing grapes; however, substantial areas are used for growing vegetables, orchard crops, or small fruit. Chautauqua County is the leading grape-producing county in New York.

Drainage

The drainage of Chautauqua County is separated into two systems: the Allegheny-Ohio-Mississippi River system and the Lake Erie-St. Lawrence River system. The drainage from the plateau region flows southward into the Allegheny-Ohio-Mississippi River system, while drainage from the escarpment along the northwestern part of the county flows to the north into the Lake Erie-St. Lawrence River system. The facility lies within the Lake Erie-St. Lawrence River system.

The drainage of the northern slope of the escarpment and lake plain flows north into Lake Erie through numerous small waterways and several major creeks. Twenty Mile Creek drains the northwestern part of the county, and the drainage flows into Lake Erie. Chautauqua Creek flows north through Westfield and on to the lake. Canadaway Creek flows north through the Village of Fredonia and the City of Dunkirk, and Walnut Creek flows north and is joined by Silver Creek before entering Lake Erie.

3.2 Site Geology/Hydrogeology

The overburden soils at the site are classified as the Chenango (CnA) and Pompton (Po) soil types. The CnA, which is associated with beach ridges, outwash plains, and stream terraces, is a gravely loam that is nearly level, very deep, and well drained to excessively drained. The Po, which is associated with outwash terraces and deltas, is a silt loam that is nearly level, very deep, and is moderately well drained. The bedrock underlying the site is the Gowanda Member, which is a subdivided member of the Canadaway Group. The Gowanda Member

consists of mainly gray shale that has thin bands of black shale and gray siltstone. This member is exposed near the Village of Fredonia but was not encountered at the site.

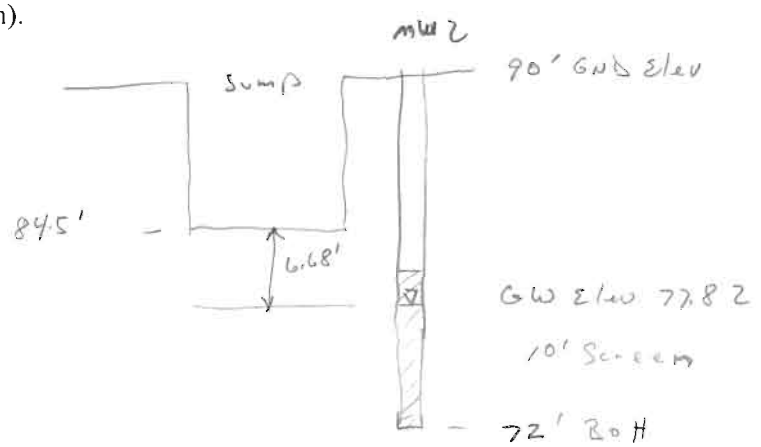
Hydraulic conductivity test results on the monitoring wells are summarized in Table 1, with the full analysis provided in Appendix B. The hydraulic conductivity values for the permeable materials at MW-1 and MW-2 range from 1.09×10^{-2} centimeters per second (cm/sec) to 2.55×10^{-2} cm/sec farther out onto the former lakebed. At MW-3, MW-4, and MW-5, the values decrease due to increased silt content, from 2.02×10^{-3} cm/sec, to 1.85×10^{-4} cm/sec, to 8.67×10^{-5} cm/sec, respectively.

The groundwater-level measurements obtained from the monitoring wells on May 2, 2002, and presented in Table 2, were converted to elevations referenced to the site-specific datum. These groundwater elevations are contoured to show groundwater flow direction as presented on Figure 3. The groundwater contour map shows a steady gradient to the north-northwest from the background well (MW-1) to the north side of the main building. This gradient demonstrates groundwater flow from the beach ridge area along Route 20 to the former lake plain. Once at the lake plain, at about the 78-foot contour, the water-table elevations flatten out, providing less of a driving force for groundwater movement.

The observed condition seems to contradict groundwater flow dynamics. Normally, as groundwater flow enters an area of lower hydraulic conductivity, the gradient becomes steeper to maintain a steady flow rate in the system. The observed condition indicates a flattening of the hydraulic gradient as conditions change to a lower hydraulic conductivity. The scope of this investigation was not extensive enough to characterize the conditions north of the building vicinity. Possible explanations for the apparent dissipation of groundwater out of the system include localized variations in hydraulic conductivity due to building fill or similar conditions; discharge to a lower system; or possible evapotranspiration of groundwater from the shallow aquifer by the extensive vineyard.

Using the hydraulic gradient between MW-1 and MW-2 (0.03), the average hydraulic conductivity of the two wells (51.6 feet per day [ft/day]), and an estimated porosity of 0.25, the groundwater flow rate for the southern portion of the site is calculated to be 6.19 ft/day. Using an estimated hydraulic gradient for the area north of the sump (0.007), an average conductivity value for MW-3 and MW-4 (3.12 ft/day), and an estimated porosity of 0.25, the groundwater flow rate for the northern portion of the site is calculated to be 0.087 ft/day.

Based on groundwater levels obtained from MW-2 on May 2, 2002, the bottom of the rinse pad sump is approximately 6.68 feet above the water table. The outside bottom of the sump is at an elevation of approximately 84.5 feet (site datum), whereas the groundwater level in MW-2 was recorded at 77.82 feet (site datum).



4. Soil and Groundwater Quality

Soil and groundwater analytical results for the project are presented below. The project Work Plan and SAP outlined the basic requirements for the sampling and analysis activities to be performed. The program included samples from the following media:

- surface soil samples;
- subsurface soil samples; and
- groundwater samples.

BBL personnel collected samples from these media during field investigation activities. A brief summary of the sample identification method, the analytical results, the constituents of concern, and data validation results is presented below. All sample locations are presented on Figure 2. All sample analytical results are discussed in Sections 4.2, 4.3, and 4.4, summarized in Tables 3, 4, and 5, presented on Figures 4 through 12, and attached as Appendix C.

Sampling activities were conducted in April and May 2002. All off-site sample analysis for this project was performed by:

Columbia Analytical Services
1 Mustard Street, Suite 250
Rochester, New York 14609
Phone: (585) 288-5380

Columbia Analytical Services (Columbia) analyzed all samples, including all quality assurance/quality control (QA/QC) samples, as specified in the SAP. All samples were analyzed according to United States Environmental Protection Agency (USEPA) Solid Waste 846 (SW846) Methodology with NYS Analytical Services Protocol (ASP) category A deliverables.

4.1 Sample Identification

Each sample was uniquely identified in such a manner that the sample number identifies the location of the sample collection point and the type of sample. This alphanumeric system included a two-letter prefix describing the sample matrix and a one- or two-digit number indicating the sample location. Soil boring sample identifications also include parenthetical numbers indicating the depth from which the soil boring sample was retrieved.

The following prefixes, indicating the sample matrix, were assigned in the field:

- soil boring - "SB";
- surface soil - "SS"; and
- groundwater from monitoring wells - "MW."

The number indicating the sample locations were as follows:

- monitoring well and number - MW-1, MW-2, and so on; and

- soil boring and surface soil sample location number - SS-01, SB-01, and so on.

4.2 Soil Analytical Results

SI samples were collected in order to determine the impact that the pesticide rinse pad and underlying sump, pesticide storage areas, and former UST/AST may have had on the surrounding soils. Soil analytical results were compared with the New York State Technical and Administrative Guidance Document #4046, "Determination of Soil Cleanup Objectives and Cleanup Levels," January 24, 1994 (TAGM 4046). Tables 3 and 4 present the analytical results for constituents detected in surface and subsurface soil samples and highlight the results exceeding TAGM 4046 levels. The following sections summarize the data evaluation for each class of constituent analyzed within surface and subsurface soils.

4.2.1 Surface Soil

Seven surface soil samples (SS-01 to SS-07) were collected during the SI project. The surface soil sample locations are identified on Figure 2 and represent the following points:

- SS-01 - Background sample in the lawn area in front of the main research building;
- SS-02 - Former storage area drain to the outside ground surface;
- SS-03 - Surface area around the pesticide rinse pad;
- SS-04 - Surface area around the pesticide rinse pad;
- SS-05 - Surface area around the pesticide rinse pad;
- SS-06 - Surface area around the current pesticide storage shed (south side); and
- SS-07 - Surface area around the current pesticide storage shed (northwest side).

The seven surface soil samples were analyzed for TCL volatiles, Appendix IX pesticides including TICs, herbicides, and TAL metals. Three of the seven samples were analyzed for TCL semivolatiles, including TICs, as specified in the SAP. The following sections summarize the analytical results for each class of constituent analyzed.

VOCs

Acetone and/or methylene chloride were detected in four of the seven surface soil samples. The acetone and methylene chloride concentrations ranged from 1.5 micrograms per kilogram (ug/kg) (estimated) to 11 ug/kg (estimated). These concentrations do not exceed applicable TAGM 4046 levels. VOC surface soil results are presented on Figure 4.

Pesticide/Herbicides

Pesticides were detected in all seven surface soil samples and ranged in concentrations from 2.8 ug/kg (estimated) to 6,500 ug/kg (estimated). Four of the seven samples contained pesticide concentrations exceeding TAGM 4046 levels, as listed below:

Constituent	TAGM 4046 (ug/kg)	Surface Soil Sample Identification (concentration) (ug/kg)
4,4' - DDE	2,100	SS-03 (2,400 D)
4,4' - DDT	2,100	SS-03 (6,500 DJ) and SS-05 (2,800 DJ)
Dieldrin	44	SS-04 (71)
Heptachlor epoxide	20	SS-02 (24)

Notes:
ug/kg – microgram per kilogram
D – Concentrations based on a diluted sample analysis.
J - Indicates an estimated concentration based on the data validation results or the constituent detected above the instrument detection limit but below the quantitation limit.

Various pesticide TICs were also identified in three of the seven surface soil samples, as presented in Table 3. Pesticide surface soil results are presented on Figure 5.

Herbicides were not detected above practical quantitation levels in any of the surface samples.

Many of the data points may be estimated data only. For example, the "DJ" posted after the 4,4'- DDT concentration in sample SS-03 indicates that the result is based in a diluted sample ("D") and that the resultant concentration is below the quantitation limit ("J") for this compound.

SVOCs

As specified in the Work Plan, only three of the seven surface soil samples were analyzed for SVOCs. SVOCs were detected in all three surface soil samples and ranged in concentrations from 43 ug/kg (estimated) to 680 ug/kg. SVOCs detected in each of the samples exceeded TAGM 4046 levels, as presented below:

Constituent	TAGM 4046 (ug/kg)	Surface Soil Sample Identification (concentration) (ug/kg)
Benzo(a)anthracene	224 or MDL	SS-02 (250 J) and SS-04 (300 J)
Benzo(a)pyrene	61 or MDL	SS-01 (190 J), SS-02 (310 J), and SS-04 (330 J)
Dibenz(a,h)anthracene	14 or MDL	SS-02 (76 J) and SS-04 (97 J)

Notes:
ug/kg – microgram per kilogram
MDL – method detection limit
J – Indicates an estimated concentration since the constituent was detected above the instrument detection limit, but below the quantitation limit.

Various SVOC TICs were also identified in three of the seven surface soil samples, as presented in Table 3. Benzo(a)pyrene was detected in the site background sample (SS-01), indicating that benzo(a)pyrene may be present at the site above TAGM 4046 criteria at levels not related to any activity at the sump.

Metals

Metals were detected in all seven surface soil samples and ranged in concentrations from 60 ug/kg to 17,800,000 ug/kg. As specified in TAGM 4046, soil background (SB) levels can be used as representation of the site and, therefore, used as the recommended soil cleanup objective. At the site, the samples collected from the south

lawn were assumed as site background values. Actual metal background concentrations in soil at the site may be substantially higher or lower for metals both at this site and typically throughout the region.

Some of the metal concentrations in each surface soil sample exceeded their associated TAGM 4046 level. Where applicable, the values observed at SS-01 are listed as the site background TAGM 4046 level. Metals detected in each of the samples exceeding TAGM 4046 levels are presented below:

Constituent	TAGM 4046 (ug/kg)	Surface Soil Sample Identification (concentration) (ug/kg)
Aluminum	SB (6,920,000 E)	SS-02 (7,600,000 E) and SS-06 (27,600,000 E)
Barium	300,000	SS-06 (380,000)
Beryllium	SB (1,000)	SS-02 (1,100), SS-03 (1,100), and SS-06 (4,400)
Cadmium	1,000	SS-02 (2,800), SS-03 (1,400), SS-04 (1,200), and SS-05 (1,500)
Calcium	SB (1,510,000)	SS-02 (2,540,000), SS-03 (8,880,000), SS-04 (33,500,000), SS-05 (8,500,000), SS-06 (157,000,000), and SS-07 (1,760,000)
Chromium	SB (10,200)	SS-02 (14,600), SS-04 (26,300), SS-05 (17,500), and SS-06 (11,900)
Copper	25,000	SS-02 (49,300), SS-03 (154,000), SS-04 (88,700), SS-05 (78,600) and SS-07 (31,800)
Iron	SB (14,000,000)	SS-02 (17,800,000), SS-03 (16,900,000), SS-04 (15,900,000), SS-05 (16,800,000), and SS-07 (15,000,000)
Lead	34,200	SS-02 (188,000) and SS-05 (78,100)
Magnesium	SB (1,460,000)	SS-02 (2,210,000), SS-03 (4,230,000), SS-04 (3,130,000), SS-05 (3,410,000), SS-06 (11,200,000), and SS-07 (2,350,000)
Manganese	SB (514,000)	SS-03 (547,000), SS-04 (579,000), and SS-06 (5,190,000)
Mercury	100	SS-02 (430)
Nickel	SB(13,500)	SS-02 (19,400), SS-03 (15,800), SS-04 (23,000), SS-05 (18,600), and SS-07 (17,400)
Potassium	SB (484,000)	SS-04 (579,000), SS-06 (2,020,000), and SS-07 (525,000)
Sodium	SB [ND (64,500)]	SS-06 (589,000)
Zinc	SB (67,100)	SS-02 (979,000), SS-03 (140,000), SS-04 (147,000), SS-05 (197,000), and SS-07 (118,000)

Notes:
ug/kg – microgram per kilogram
SB – site background
E – The reported value is estimated because of the presence of interference.
ND – Indicates no constituents detected at or above the specified practical quantitation limit.

Metal surface soil results exceeding TAGM 4046 levels are presented on Figure 6.

4.2.2 Soil Borings

A total of nine soil samples, including one duplicate sample, were collected from eight soil boring locations (SB-01 to SB-08) during the site investigation project. The soil boring locations are identified on Figure 2 and represent the following points:

- SB-01 to SB-03 – Soil borings from around the pesticide rinse pad;
- SB-03 to SB-06 – Offset soil borings from around the pesticide rinse pad;
- SB-07 – Former UST; and
- SB-08 – Former UST.

The soil boring samples were analyzed for Appendix IX pesticides, including TICs, herbicides, and TAL metals. Six of the nine soil boring samples were also analyzed for TCL volatiles. Based on VOC results of the soil boring samples adjacent to the pesticide rinse pad, the offset soil boring samples were not analyzed for volatiles. Three of the nine samples were analyzed for TCL semivolatiles, including TICs, as specified in the SAP. The following sections summarize the analytical results for each class of constituent analyzed.

VOCs

Acetone, chloroform, and/or methyl ethyl ketone were detected in four of the six subsurface samples analyzed for VOCs. The VOC concentrations ranged from 1.3 ug/kg (estimated) to 9.8 ug/kg (estimated). These concentrations do not exceed applicable TAGM 4046 levels. VOC soil boring results are presented on Figure 7.

Pesticide/Herbicides

Pesticides were detected in five of the nine subsurface samples and ranged in concentrations from 2.2 ug/kg (estimated) to 4,000 ug/kg (diluted). Only one of the five subsurface samples contained pesticide concentrations exceeding TAGM 4046 levels as listed below:

Constituent	TAGM 4046 (ug/kg)	Subsurface Soil Sample Identification (concentration) (ug/kg)
4,4' - DDT	2,100	SB-02 (4,000 DJ)
Dieldrin	44	SB-02 (63 J)

Notes:
ug/kg – microgram per kilogram
D – Concentrations based on a diluted sample analysis.
J - Indicates an estimated concentration based on the data validation results or the constituent detected above the instrument detection limit but below the quantitation limit.

TICs were identified for various pesticides, including the herbicide Simazine. Pesticide soil boring results are presented on Figure 8.

Herbicides were not detected above practical quantitation levels in any of the subsurface samples.

SVOCs

As specified in the Work Plan, only three of the nine subsurface soil samples were analyzed for SVOCs. SVOCs were not detected above practical quantitation levels in any of the three subsurface samples.

Various SVOC TICs were also identified only in SB-02 (6 to 8 feet), as presented in Table 4.

Metals

Metals were detected in all nine subsurface soil samples and ranged in concentrations from 590 ug/kg to 25,200,000 ug/kg. Some of the metal concentrations in each subsurface soil sample exceeded their associated

TAGM 4046 level. Where applicable, the site background values (identified as SB in the table below) established at surface soil sample SS-01 are used as the TAGM 4046 levels. Metals detected in each of the samples exceeding TAGM 4046 levels are presented below:

Constituent	TAGM 4046 (ug/kg)	Subsurface Soil Sample Identification (concentration) (ug/kg)
Arsenic	7500	SB-05 (8,100)
Calcium	SB (1,510,000)	SB-01 (44,800,000), SB-02 (13,100,000), SB-04 (14,200,000), SB-07 (90,300,000), SB-08 (2,090,000), and SB-01 duplicate (25,200,000)
Copper	25,000	SB-02 (30,000), SB-03 (27,400), SB-05 (29,800), SB-08 (28,000), and SB-01 duplicate (38,600)
Iron	SB (14,000,000)	SB-02 (16,400,000), SB-03 (17,800,000), SB-05 (16,000,000), SB-06 (15,000,000), and SB-08 (17,000,000)
Magnesium	SB (1,460,000)	SB-01 (21,500,000), SB-02 (6,510,000), SB-03 (2,740,000), SB-04 (8,390,000), SB-05 (2,450,000), SB-06 (2,240,000), SB-07 (7,330,000), SB-08 (2,770,000), and SB-01 duplicate (5,910,000)
Manganese	SB (514,000)	SB-02 (540,000), SB-03 (573,000), and SB-06 (517,000)
Nickel	SB(13,500)	SB-01 (14,000), SB-02 (16,200), SB-03 (17,500), SB-05 (18,300), SB-06 (16,000), SB-08 (16,500), and SB-01 duplicate (13,800)
Potassium	SB (484,000)	SB-01 (676,000), SB-02 (576,000), SB-03 (532,000), SB-05 (590,000), SB-08 (566,000), and SB-01 duplicate (509,000)
Sodium	SB [ND (64,500)]	SB-01 (97,800) and SB-07 (65,700)
Zinc	SB (67,100)	SB-01 (76,800), SB-02 (87,000), SB-03 (100,000), SB-05 (87,600), SB-06 (76,400), SB-08 (92,200), and SB-01 duplicate (90,000)

Notes:
ug/kg – microgram per kilogram
SB – site background

Metal soil boring results exceeding TAGM 4046 levels are presented on Figure 9.

4.3 Groundwater

SI samples were collected in order to determine the impact that the pesticide rinse pad and underlying sump, pesticide storage areas, and former UST/AST may have had on the surrounding groundwater. Groundwater analytical results were compared with the NYS Ambient Water Quality Standards and Guidance Values as listed in the Division of Water Technical and Operational Guidance Series (TOGS) No. 1.1.1, dated June 1998. Table 4 presents the analytical results for constituents detected in groundwater samples and highlights the results exceeding TOGS levels.

Five monitoring wells were installed and developed for sampling as specified in Section 2. Groundwater samples were collected from each of the five wells, as well as one duplicate sample, for a total of six groundwater samples. The groundwater samples were identified as MW-1 to MW-5 and MW-1 duplicate. The monitoring well locations are identified on Figure 2 and represent the following points:

- MW-1 - Background sample in the lawn area in front of the main research building;
- MW-2 - Adjacent to the pesticide rinse pad; and
- MW-3 to MW-5 - Downgradient wells.

The groundwater samples were analyzed for TCL volatiles, Appendix IX pesticides including TICs, herbicides, and TAL metals. One of the six samples was analyzed for TCL semivolatiles, including TICs, as specified in the SAP. The following sections summarize the analytical results for each class of constituent analyzed.

VOCs

Acetone, carbon disulfide, chloroform, and/or toluene were detected in three of the six groundwater samples analyzed for VOCs. The VOC concentrations range from 1.5 ug/l (estimated) to 17 ug/l (estimated). These concentrations do not exceed applicable TOGS groundwater standards and guidance values. Volatile groundwater results are presented on Figure 10.

Pesticide/Herbicides

Pesticides were detected in two of the six groundwater samples and ranged in concentrations from 0.062 micrograms per liter (ug/l) to 7.8 ug/l (diluted). Both samples contained one or more pesticides in concentrations exceeding TOGS standards and guidance values, as listed below:

Constituent	TOGS Standards and Guidance Values (ug/l)	Groundwater Sample Identification (concentration) (ug/l)
4,4' - DDE	0.2	MW-2 (0.69)
4,4' - DDT	0.2	MW-2 (3.3 D)
4,4' – DDD	0.3	MW-2 (7.8 D
Dieldrin	0.004	MW-2 (0.58) and MW-5 (0.087 J)

Notes:
ug/l – microgram per liter
D – Concentration in based on a diluted sample analysis.
J – Indicates an estimated concentration since the constituent was detected above the instrument detection limit, but below the quantitation limit.

Various pesticide TICs were also identified in each of the six groundwater samples as presented in Table 5. Pesticide groundwater results are presented on Figure 11.

Herbicides were not detected above practical quantitation levels in any of the groundwater samples.

SVOCs

As specified in the Work Plan, only one of the six groundwater samples was analyzed for SVOCs. SVOCs were detected in MW-2 at concentrations ranging from 2.6 ug/l (estimated) to 7.5 ug/l (estimated). Bis(2-ethylhexyl)phthalate was the only SVOC with a concentration exceeding its associated TOGS standard and guidance value.

Various SVOC TICs were also identified in the MW-2 sample, as presented in Table 5.

Metals

Metals were detected in all six groundwater samples and ranged in concentrations from 1 ug/l to 585,000 ug/l. Some of the metal concentrations in each groundwater sample exceeded their associated TOGS standards and guidance values. Metals detected in each of the samples exceeding TOGS standards and guidance values are presented below:

Constituent	TOGS Standards and Guidance Values (ug/l)	Groundwater Sample Identification (concentration) (ug/l)
Arsenic	25	MW-1 (58.7), MW-2 (326), MW-3 (125), MW-4 (58.9), MW-5 (50.1), and MW-1 duplicate (57.1)
Barium	1,000	MW-2 (4,050) and MW-3 (1,250)
Beryllium	3	MW-2 (11.3)
Cadmium	5	MW-2 (23.8) and MW-3 (7)
Chromium	50	MW-1 (58.6), MW-2 (412), MW-3 (155), MW-4 (95.8), and MW-1 duplicate (52)
Copper	200	MW-2 (1,100) and MW-3 (304)
Iron	300	MW-1 (97,000), MW-2 (585,000), MW-3 (206,000), MW-4 (108,000), MW-5 (74,200), and MW-1 duplicate (87,700)
Lead	25	MW-1 (55.5), MW-2 (484), MW-3 (161), MW-4 (70.7), MW-5 (53.2), and MW-1 duplicate (49.7)
Magnesium	35,000	MW-2 (123,000) and MW-3 (45,900)
Manganese	300	MW-1 (3,590), MW-2 (18,000), MW-3 (8,050), MW-4 (2,950), MW-5 (2,290), and MW-1 duplicate (3,160)
Nickel	100	MW-1 (121), MW-2 (673), MW-3 (227), MW-4 (125), and MW-1 duplicate (110)
Selenium	10	MW-1 (12), MW-2 (31), and MW-3 (11)
Sodium	20,000	MW-2 (42,300), MW-3 (38,200), MW-4 (41,700), and MW-5 (45,700)
Zinc	2,000	MW-2 (2,900)

Notes:
ug/l – microgram per liter

Metal groundwater results exceeding TOGS standards and guidance values are presented on Figure 12. For almost all inorganic constituents, the highest concentration in groundwater was detected in MW-2 adjacent to the rinse pad. Note that many of the inorganic constituents that exceeded TOGS standards and/or guidance values were also detected at elevated levels in the upgradient well (MW-1), suggesting that local background levels of some metals are higher than water quality standards and are not the result of historical sump activities. However, it should be noted that turbidity measurements obtained from the site wells during the well development and groundwater sampling efforts were elevated, ranging from 54 to 900 NTUs. Therefore, the elevated metal concentrations may be the result of local background metal concentrations and not the result of historical sump activities, or may, in part be due to elevated turbidity levels in the groundwater samples.

4.4 Constituents of Concern Summary

The following table summarizes the compounds that were identified as constituents of concern (COCs) based on evaluating the types of constituents detected, including naturally occurring constituents, comparing the constituent concentrations to the NYS TAGM 4046 levels and TOGS standards and guidance values, and comparing soil metal concentrations to NYS TAGM or site background levels. Following the table is a discussion of the COC evaluation.

Constituents of Concern

Unit and/or Media	COCs	Range of Concentrations Exceeding TAGM or TOGS levels	NYS TAGM 4046 levels or NYS TOGS standard or Guidance Value
Pesticide rinse pad and sump – surface soil (SS-03, SS-04, SS-05)	4,4' – DDE 4,4' – DDT Dieldrin Cadmium Chromium Lead Benzo(a)anthracene Benzo(a)pyrene Dibenz(a,h)anthracene	2,400 D ug/kg 2,800 DJ to 6,500 DJ ug/kg 71 ug/kg 1,200 to 1,500 ug/kg 17,500 to 26,300 ug/kg 78,100 ug/kg 300 J ug/kg 330 J ug/kg 97 J ug/kg	2,100 ug/kg 2,100 ug/kg 44 ug/kg 1,000 ug/kg SB (10,200) ug/kg 34,200 ug/kg 224 ug/kg 61 ug/kg 14 ug/kg
Pesticide rinse pad and sump – subsurface soil (SB-02)	4,4' – DDT Dieldrin	4,000 DJ ug/kg 63 J ug/kg	2,100 ug/kg 44 ug/kg
Pesticide rinse pad and sump – groundwater (MW-2)	4,4' – DDE 4,4' – DDT 4,4' – DDD Dieldrin Arsenic Barium Cadmium Chromium Lead Selenium	0.69 ug/l 3.3 D ug/l 7.8 D ug/l 0.58 ug/l 326 ug/l 4,050 ug/l 23.8 ug/l 412 ug/l 484 ug/l 31 ug/l	0.2 ug/l 0.2 ug/l 0.3 ug/l 0.004 ug/l 25 ug/l 1,000 ug/l 5 ug/l 50 ug/l 25 ug/l 10 ug/l
Former pesticide storage area - surface soil (SS-02)	Heptachlor epoxide Mercury Cadmium Chromium Lead Benzo(a)anthracene Benzo(a)pyrene Dibenz(a,h)anthracene	24 ug/kg 430 ug/kg 2,800 ug/kg 14,600 ug/kg 188,000 ug/kg 250 J ug/kg 310 J ug/kg 76 J ug/kg	20 ug/kg 100 ug/kg 1,000 ug/kg SB (10,200) ug/kg 34,200 ug/kg 224 ug/kg 61 ug/kg 14 ug/kg
Current pesticide storage area - surface soil (SS-06)	Aluminum Beryllium Manganese	27,600,000 E ug/kg 4,400 ug/kg 5,190,000 ug/kg	SB (6,920,000) ug/kg SB (1,000) ug/kg SB (514,000) ug/kg

Notes:
ug/kg – microgram per kilogram
ug/l – microgram per liter
D – Concentrations based on a diluted sample analysis.
E – The reported value is estimated because of the presence of interference.
J - Indicates an estimated concentration based on the data validation results or the constituent detected above the instrument detection limit but below the quantitation limit.
SB – site background

There were no COCs identified in soils near the former UST.

4.4.1 Area Surrounding the Pesticide Rinse Pad and Sump

Pesticides were detected in the surface (0 to 2 inches) and subsurface (6 to 8 feet) soil immediately surrounding the pesticide rinse pad and sump. These pesticide concentrations exceed the TAGM 4046 soil cleanup levels. Several pesticides exceeding TOGS standards and guidance values were also detected in groundwater immediately adjacent to the pesticide rinse pad. The groundwater was collected from a depth of approximately 14 feet bgs.

Metals exceeding TAGM 4046 soil cleanup levels were detected in the surface and subsurface soil and groundwater immediately surrounding the pesticide rinse pad and sump. However, some of the metals detected above TAGM 4046 levels and TOGS standards and guidance values are considered essential nutrients. These metals (including iron, magnesium, calcium, potassium, and sodium) are toxic only at very high doses and are, therefore, not considered COCs. The significant metals of concern are arsenic, barium, selenium, cadmium, chromium, and lead. Several SVOCs also exceed TAGM levels in surface soils next to the rinse pad that may not be related to the materials historically used.

4.4.2 Former Pesticide Storage Area

Pesticides were detected in the surface (0 to 2 inches) soil located directly at the outlet of a drain pipe running from the floor drain inside the former pesticide storage to the outside wall and discharging directly to the ground surface. These pesticide concentrations exceed the TAGM 4046 soil cleanup levels.

Metals exceeding TAGM 4046 soil cleanup levels were detected in the same surface soil area. However, some of the metals detected above TAGM 4046 levels are considered essential nutrients. These metals (including iron, magnesium, calcium, potassium, and sodium) are toxic only at very high doses and are, therefore, not considered COCs. The significant metals of concern are mercury, cadmium, chromium, and lead.

Three SVOCs also exceeded TAGM levels in surface soil. These pesticides, metals, and SVOCs were all identified in samples taken from areas directly adjacent to the building.

4.4.3 Current Pesticide Storage Area

Metals were detected in the surface soil area on the south side of the current pesticide storage area at concentrations exceeding TAGM 4046 soil cleanup levels. However, some of the metals detected above TAGM 4046 levels are considered essential nutrients. These metals (including iron, magnesium, calcium, potassium, and sodium) are toxic only at very high doses, and are, therefore, not considered COCs. The most significant metals of concern are aluminum, beryllium, and manganese, all located in surface soil by the door to the pesticide storage building. While these metals exceed TAGM levels, they are not considered a significant environmental issue.

4.5 Data Validation

In accordance with the Project SAP, pesticide and herbicide analytical data packages were evaluated by BBL for the following:

- completeness;
- holding time compliance;

- Quality Control (QC) data (blank, surrogates, recoveries, laboratory controls, etc.);
- system performance; and
- data qualifier assessment.

The data validation summary reports are included as Appendix D.

During the review process, laboratory qualified and unqualified data were verified against the supporting documentation. Based on the evaluation, additional qualifier codes were added to the data summary tables (Tables 3, 4, and 5) that may not be present on the final data packages received from the analytical laboratory.

5. Waste Characterization

Investigation-derived wastes (IDW) generated as a result of SI activities, including soil cuttings, decontamination water, development/purge water, personal protective equipment (PPE), and poly sheeting, were containerized in appropriately labeled, 55-gallon 17E4 and 17H drums. Full containers were appropriately marked and staged on wooden pallets. The drums are currently staged on site pending final characterization and off-site disposal.

A total of 11 drums were staged at the site. The drum contents and approximate aggregate volumes are as follows:

- four 55-gallon drums of soil cuttings;
- one 55-gallon drum of PPE; and
- six 55-gallon drums of purge, decon, and development water.

The resulting IDWs were evaluated for disposal according to RCRA solid and hazardous waste criteria specified in Title 40 CFR, Parts 261 through 268. SI soil and groundwater analytical results were used to characterize the IDW. The analytical data indicated the detection of various constituents as discussed in Section 4 of this report; however, the concentrations did not exceed their respective RCRA toxicity characteristic levels as listed in 40 CFR, Part 261. Therefore, the solid and liquid IDW could not be characterized as a RCRA toxicity characteristic waste. BBL summarized the IDW characterization and disposal options based on potentially applicable RCRA-listed hazardous waste codes, in a disposal evaluation letter prepared and presented to Cornell in July 2002.

6. Conclusions

Conclusions and recommendations regarding the results of the SI activities are presented below. The results are discussed with regard to potential implications for the current and future use of the area. A preliminary screening of soil and groundwater results with NYS soil cleanup levels and groundwater quality standards and guidance values, respectively, is presented as a basis for evaluating potential threats to human health and the environment. Potential migration and exposure pathways for identified compounds in soil or groundwater are discussed.

6.1 Site Investigation Summary

The results of the SI activities indicate:

- limited impact on surface and subsurface soil immediately surrounding the pesticide rinse pad and sump and the former pesticide storage area;
- no significant impact on groundwater downgradient of the pesticide rinse pad and sump;
- groundwater, which is located approximately 8 to 10 feet below ground, is moving to the north-northeast toward Lake Erie at a rate of approximately 30 ft/year;
- limited impact on groundwater in the immediate vicinity of the pesticide rinse pad and sump;
- no impact on sample media in the immediate vicinity of the former AST and UST based on the lack of detection of petroleum related compounds (benzene, toluene, ethylbenzene, and xylene [BTEX]) in soil and groundwater; and
- no significant impact on surface soils immediately surrounding the current pesticide storage area.
- elevated metal concentrations detected during groundwater analysis may be representative of local conditions, or may, in part be due to elevated turbidity in the groundwater samples. It is expected that this question will be resolved by future sampling, in which low-flow sampling techniques can be utilized to reduce turbidity levels.

Specific conclusions concerning the site investigation include:

- Surface soils around the pesticide rinse pad and sump indicate the presence of pesticides and metals, possibly due to past over-spray from rinse operations, runoff, or overflowing of the sump.
- Groundwater results from the monitoring wells located downgradient from the pesticide rinse pad and sump (MW-3, MW-4, and MW-5) indicate virtually no impact of waste stream constituents from the pesticide sump or former UST.
- The groundwater sample collected from MW-2, located directly adjacent to the pesticide sump, indicated only minor detections of potential pesticide sump constituents, suggesting that the pesticide sump has not extensively impacted local groundwater. While MW-2 indicates the highest hydraulic

conductivity on the site, the relatively low detections at MW-2 and lack of detections at distant wells indicate limited migration. Lack of movement may be attributed to the plugging of soil pores near the sump or an active zone of degradation adjacent to the sump.

- Some of the metals detected in soil and groundwater samples exceeding the TAGM 4046 levels may be related to elevated metal background levels in the area since the elevated metal concentration also occurred at the site background location, upgradient of the pesticide sump.

- Groundwater migration rates estimated for the site overburden soil minimizes the potential for rapid off-site migration of the limited constituents detected in groundwater at the site.

6.2 Potential Migration Pathways

The significant potential pathway for further migration of contaminants at the site is groundwater migration. Surface-water runoff with associated erosion potential from the immediate area around the sump constitutes a minor potential pathway of contaminant migration. An increase in potential releases may occur from the eventual deterioration of the existing sump.

Wind-blown dust from the surface soils at the pesticide rinse pad and former pesticide storage area may result in migration of limited concentrations of pesticides and metals. Surface-water runoff from these areas may also assist in moving these constituents northward. A well-maintained grass cover and/or removal of surface soils should restrict the movement of surface soil from the pesticide rinse pad and former storage area. The groundwater flow system does not appear to represent a current migration pathway. However, a significant volume and concentration of constituents are currently restricted to the sump. Removal of the sump contents will minimize potential migration to groundwater as a result of future system deterioration.

The pesticide rinse sump structure, with the upper 3 feet of concrete blocks turned on their sides, represents a primary pathway for contaminant migration. Although current data suggest that the constituents found in the sump have not migrated away from the immediate area of the sump, the potential exists for future flushing of the system by rainwater infiltration and possible redistribution of contaminants in the event that the sump cover is inadvertently left open, or is not sealed properly.

6.3 Potential Exposure Pathways

The potential exposure pathways for this site are limited to contact with surface soil and dust inhalation in the vicinity of the pesticide sump and former pesticide storage areas, and contact with sludge from inside the sump during potential cleaning and removal. Exposure to subsurface conditions during potential future construction and decommissioning activities represents additional exposure potential. The potential future use of the area, including the rinse pad, should consider site preparation and excavation activities in terms of increased exposure potential.

Current subsurface conditions in the pesticide sump area present a insignificant exposure potential unless the site is disturbed or future development is initiated. Groundwater use is insignificant at the site. The pesticide sump area does appear to present a significant impact to the existing groundwater exposure pathway under current site conditions.

7. Recommendations

Although the site can generally be characterized as not being a significant threat to human health or the environment, there are several recommendations for supplemental decommissioning and investigative activities that may further define the site and minimize future site concerns. Several of the recommendations are dependent on Cornell's intended future use for the site, which may necessitate a more complete cleaning or removal of portions of the pesticide rinse pad and sump.

Based on the information developed during this study, BBL recommends the following for Cornell's consideration:

- Remove the surface pad, sludge, and sump. Potential soil contamination outside the sump should be addressed at that time. Recent subsurface soil and groundwater data indicate limited impact from the system.

- At this time, the limits of the sump contaminant migration are restricted to the immediate area around the sump in surface soil, subsurface soil, and groundwater. BBL recommends that the sump and a limited amount of surrounding soil and gravel be removed, properly disposed of, and backfilled with clean material. Since details concerning the extent of material placed around the sump during construction are not available, exact volumes of material requiring removal are not defined. However, BBL recommends, at a minimum, removing 2 feet of soil along all four sides of the sump, to a depth of 2 feet below the sump bottom (including 2 feet below the entire sump floor). The minimum total volume of soil and gravel that would require removal is estimated at 33 cubic yards. Backfill quantities are estimated at 53 cubic yards. The exact volume of soil and gravel to be removed would be determined by the observations made during sump removal activities.

- Confirmation samples should be collected from the excavation area floor bottom at the end of sump and surrounding soil removal activities. Analysis of these soils will help confirm the vertical extent of contamination and completion of sump removal activities.

- Remove surface soils around the former pesticide storage area drain pipe outlet to remove potential exposure and migration pathway associated with these areas. Soil removal activities should focus on the surface soil beneath the drain pipe outlet and any obvious drainage way. BBL recommends removing an area of soil approximately 3 foot by 3foot by 1 foot deep, or approximately 1/3 of a cubic yard.

Tables

Table 1
Hydraulic Conductivity Summary
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, New York

Well	Hydraulic Conductivity		Aquifer Model
	ft/day	cm/sec	
MW-1	31.07	1.09×10^{-2}	unconfined
MW-2	72.14	2.55×10^{-2}	unconfined
MW-3	5.72	2.02×10^{-3}	unconfined
MW-4	0.522	1.85×10^{-4}	unconfined
MW-5	0.245	8.67×10^{-5}	unconfined

Notes: Tests were single well rising head slug tests performed May 2, 2002.

Table 2
Groundwater Elevations - May 2, 2002
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, NY

Well No.	Coordinates		Ground Elevation	Well Casing Elevation	Well Riser Elevation	Depth to Water	Groundwater Elevation
	Northing	Easting					
MW-1	5070.2	5117.1	96.5	96.48	95.99	12.33	83.66
MW-2	5250.7	5084.6	90	90.01	89.57	11.75	77.82
MW-3	5271.2	5010.6	89.1	89.11	88.78	10.92	77.86
MW-4	5309.07	5079.2	86.6	86.69	86.33	8.79	77.54
MW-5	5256.8	5273.6	89.6	89.68	89.21	12.09	77.12

Notes:
Horizontal coordinates and vertical elevations are based on site-specific datum.
All units are in feet.
Survey completed on July 11, 2002.
Water level measurements obtained on May 2, 2002.

Table 3
Surface Soil Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory, Fredonia, NY

	Surface Soil (µg/kg)							NYSDEC TAGM 4046 Soil Cleanup Levels [a] (µg/kg)
Sample ID	SS-01 (0 to 2 inches)	SS-02 (0 to 2 inches)	SS-03 (0 to 2 inches)	SS-04 (0 to 2 inches)	SS-05 (0 to 2 inches)	SS-06 (0 to 2 inches)	SS-07 (0 to 2 inches)	
Sample Location	Background	former storage area drain	Sump	Sump	Sump	Storage Shed	Storage Shed	
Results								
TCL Volatiles (8260 B)								
Acetone	10 JB	ND (25)	7.2 JB	ND (27)	ND (23)	11 JB	ND (24)	200
Methylene Chloride	ND (6.6)	ND (6.4)	ND (5.6)	ND (6.7)	ND (5.8)	ND (5.7)	1.5 J	100
Appendix IX Pesticides (8081)								
Aldrin	ND (2.2)	ND (22)	ND (19)	ND (23)	ND (20)	ND (3.9)	ND (2)	41
Gamma-BHC	ND (2.2)	ND (22)	ND (19)	ND (23)	ND (20)	ND (3.9)	ND (2)	60
Gamma-Chlordane	ND (2.2)	ND (22)	ND (19)	ND (23)	ND (20)	ND (3.9)	ND (2)	540
4,4' - DDE	3.6 J	740	**2,400 D**	870 D	960 D	42	850 D	2,100
4,4' - DDT	5 J	1,800 DJ	**6,500 DJ**	1,900 D	**2,800 DJ**	75 J	1,100 DJ	2,100
4,4' - DDD (TDE)	ND (4.3)	33 J	57	34 J	76	5 J	18	2,900
Dieldrin	ND (4.3)	24 J	ND (37)	71	21 J	ND (7.5)	2.8 J	44
Alpha - Endosulfan	ND (2.2)	ND (22)	ND (19)	ND (23)	28	ND (3.9)	ND (2)	900
Beta - Endosulfan	ND (4.3)	ND (42)	ND (37)	ND (44)	51	ND (7.5)	ND (3.9)	900
Heptachlor	ND (2.2)	ND (22)	ND (19)	ND (23)	ND (20)	ND (3.9)	ND (2)	100
Heptachlor epoxide	ND (2.2)	**24**	ND (19)	ND (23)	ND (20)	ND (3.9)	ND (2)	20
Methoxychlor	ND (22)	93 J	ND (190)	ND (230)	ND (200)	32 J	28	none
TICS (8270 C)								
1 unknown	NI	NI	210 J	NI	650 J	NI	NI	none
2 unknown hydrocarbons	NI	NI	220 -270 J	NI	350 - 1,000 J	NI	NI	none
p,p'-DDE	NI	NI	1,700 JN	NI	580 JN	NI	NI	none
o,p'-DDT	NI	NI	490 JN	NI	410 JN	NI	NI	none
1 unknown PAH	NI	NI	240 J	NI	NI	220 J	NI	none
Benzene, 1,2-dichloro-4-isocyana	NI	NI	180 JN	NI	NI	NI	NI	none
1,1-Dichloro-2,2-bis(p-chlorophen	NI	NI	700 JN	NI	580 JN	NI	NI	none
Chlorophenothane	NI	NI	2,200 JN	NI	NI	NI	NI	none
2 unknown PAHs	NI	NI	NI	NI	440 - 1,000 J	NI	NI	none
Herbicides (8151)								
None Detected	ND (130)	ND (130)	ND (110)	ND (130)	ND (120)	ND (110)	ND (120)	NA

Table 3
Surface Soil Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory, Fredonia, NY

	Surface Soil (µg/kg)							NYSDEC TAGM 4046 Soil Cleanup Levels [a] (µg/kg)
Sample ID	SS-01 (0 to 2 inches)	SS-02 (0 to 2 inches)	SS-03 (0 to 2 inches)	SS-04 (0 to 2 inches)	SS-05 (0 to 2 inches)	SS-06 (0 to 2 inches)	SS-07 (0 to 2 inches)	
Sample Location	Background	former storage area drain	Sump	Sump	Sump	Storage Shed	Storage Shed	
Results								
Appendix IX Semivolatiles (8270 C)								
Anthracene	ND (430)	49 J	NA	67 J	NA	NA	NA	50,000
Benzo(a)anthracene	150 J	**250 J**	NA	**300 J**	NA	NA	NA	224 or MDL
Benzo(a)pyrene	**190 J**	**310 J**	NA	**330 J**	NA	NA	NA	61 or MDL
Benzo(b)fluoranthene	180 J	350 J	NA	330 J	NA	NA	NA	1,100
Benzo(g,h,i)perylene	130 J	280 J	NA	280 J	NA	NA	NA	50,000
Benzo(k)fluoranthene	160 J	240 J	NA	240 J	NA	NA	NA	1,100
Indeno(1,2,3-cd)pyrene	110 J	230 J	NA	240 J	NA	NA	NA	3,200
Chrysene	190 J	340 J	NA	340 J	NA	NA	NA	400
Dibenz(a,h)anthracene	ND (430)	**76 J**	NA	**97 J**	NA	NA	NA	14 or MDL
Bis(2-ethylhexyl)phthalate	370 J	390 J	NA	400 J	NA	NA	NA	50,000
Fluoranthene	360 J	680	NA	680	NA	NA	NA	50,000
Phenanthrene	140 J	350 J	NA	300 J	NA	NA	NA	none
Pyrene	310 J	490	NA	500	NA	NA	NA	50,000
Di-N-Butyl Phthalate	ND (430)	43 J	NA	ND (440)	NA	NA	NA	none
TICS (8270 C)								
1 unknown	980 J	190 J	NA	NI	NA	NA	NA	none
Oxirane, hexadecyl-	190 JN	240 JN	NA	NI	NA	NA	NA	none
2 unknown hydrocarbons	270 - 920 J	NI	NA	NI	NA	NA	NA	none
3 unknown hydrocarbons	NI	280 - 830 J	NA	390 - 1,600 J	NA	NA	NA	none
Benzenesulfonamide, 2-methyl-	NI	170 JN	NA	NI	NA	NA	NA	none
Benzenesulfonamide, 4-methyl-	NI	270 JN	NA	NI	NA	NA	NA	none
p,p'-DDE	NI	310 JN	NA	300 JN	NA	NA	NA	none
o,p'-DDT	NI	490 JN	NA	NI	NA	NA	NA	none
1 unknown PAH	NI	350 J	NA	310 J	NA	NA	NA	none
1,1-Dichloro-2,2-bis(p-chlorophen	NI	NI	NA	250 JN	NA	NA	NA	none
3 unknowns	NI	NI	NA	180 - 480 J	NA	NA	NA	none

Table 3
Surface Soil Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory, Fredonia, NY

	Surface Soil (µg/kg)							NYSDEC TAGM 4046 Soil Cleanup Levels [a] (µg/kg)
Sample ID	SS-01 (0 to 2 inches)	SS-02 (0 to 2 inches)	SS-03 (0 to 2 inches)	SS-04 (0 to 2 inches)	SS-05 (0 to 2 inches)	SS-06 (0 to 2 inches)	SS-07 (0 to 2 inches)	
Sample Location	Background	former storage area drain	Sump	Sump	Sump	Storage Shed	Storage Shed	
Results								
TAL Metals (6010/7000)								
Aluminum	6,920,000 E	**7,600,000 E**	5,350,000 E	6,140,000 E	4,850,000 E	**27,600,000 E**	6,090,000 E	SB (6,920,000 E) [b]
Arsenic	7,400	7,300	7,400	5,500	7,400	1,700	7,100	7,500
Barium	86,700	39,300	73,100	84,900	78,800	**380,000**	49,500	300,000
Beryllium	1,000	**1,100**	**1,100**	980	1,000	**4,400**	1,000	SB (1,000)[b]
Cadmium	720	**2,800**	**1,400**	**1,200**	**1,500**	840	850	1,000
Calcium	1,510,000	**2,540,000**	**8,880,000**	**33,500,000**	**8,500,000**	**157,000,000**	**1,760,000**	SB (1,510,000)[b]
Chromium	10,200	**14,600**	7,800	**26,300**	**17,500**	**11,900**	7,300	SB (10,200)[b]
Cobalt	ND (6,400)	6,600	ND (5,500)	ND (6,300)	ND (5,500)	ND (5,600)	6,300	30,000
Copper	22,400	**49,300**	**154,000**	**88,700**	**78,600**	9,100	**31,800**	25,000
Iron	14,000,000	**17,800,000**	**16,900,000**	**15,900,000**	**16,800,000**	12,200,000	**15,000,000**	SB (14,000,000)[b]
Lead	34,200	**188,000**	28,500	25,300	**78,100**	10,100	18,300	34,200
Magnesium	1,460,000	**2,210,000**	**4,230,000**	**3,130,000**	**3,410,000**	**11,200,000**	**2,350,000**	SB (1,460,000)[b]
Manganese	514,000	409,000	**547,000**	**579,000**	502,000	**5,190,000**	445,000	SB (514,000)[b]
Mercury	60	**430**	50	ND (40)	70	ND (40)	ND (40)	100
Nickel	13,500	**19,400**	**15,800**	**23,000**	**18,600**	ND (4,500)	**17,400**	SB (13,500)[b]
Potassium	484,000	360,000	474,000	**579,000**	428,000	**2,020,000**	**525,000**	SB (484,000)[b]
Selenium	ND (650)	690	ND (530)	ND (670)	ND (1,100)	ND (5,500)	ND (570)	2,000
Sodium	ND (64,500)	ND (61,700)	ND (54,600)	ND (63,500)	ND (54,500)	**589,000**	ND (58,500)	SB [ND (64,500)][b]
Vanadium	11,400	11,000	7,800	9,900	7,500	10,000	8,400	150,000
Zinc	67,100	**979,000**	**140,000**	**147,000**	**197,000**	31,100	**118,000**	SB (67,100)[b]

Notes:

Additional constituents under each analytical method were analyzed for but not detected at the method detection limit unless listed in the above table.

(a) - New York State Department of Environmental Conservation, Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 (TAGM 4046), April 1995 .

(b) - Value in ( ) is the site-specific soil background level based on the concentrations detected in surface soil sample SS-01.

µg/kg - micrograms per kilogram, parts per billion

BOLD - Indicates constituent concentrations exceeded their associated TAGM level or background level (SS-01), where appropriate as listed in the TAGM 4046, whichever is higher.

B - Indicates the analyte was detected in the associated blank sample.

D - Concentration is based on a diluted sample analysis.

E - The reported value is estimated because of the presence of interference.

J - Indicates an estimated concentration based on the data validation results or the constituent detected above the instrument detection limit but below the quantitation limit.

JN - The analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. The concentration is estimated.

N - For organic TICs only, indicates presumptive evidence of a compound based on a mass spectral library search.

NA - Not analyzed

ND - Indicates no constituents detected at or above the specified practical quantitation limit.

NI - No TICs identified

SB - Site Background

SS - Surface Soil

TAL - Target Analyte List

TCL - Target Compound List

TICs - Tentatively Identified Compounds

Table 4
Soil Borings Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, NY

	Soil Borings (SB) (µg/kg)									NYSDEC TAGM 4046 Soil Cleanup Levels [a] (µg/kg)
Sample ID	SB-01 (6 to 8 feet)	SB-02 (6 to 8 feet)	SB-03 (6 to 8 feet)	SB-04 (6 to 8 feet)	SB-05 (6 to 8 feet)	SB-06 (6 to 8 feet)	SB-07 (6 to 8 feet)	SB-08 (6 to 8 feet)	FD042502 (SB-01 Duplicate) (6 to 8 feet)	
Sample Location	Sump	Sump	Sump	Sump	Sump	Sump	Former UST	Former UST	Sump	
Results										
TCL Volatiles (8260B)										
Acetone	ND (23)	ND (22)	ND (23)	NA	NA	NA	8.4 JB	7.5 JB	9.8 JB	200
Chloroform	ND (5.8)	1.3 J	ND (5.7)	NA	NA	NA	ND (5.3)	ND (5.5)	ND (5.4)	300
Methyl Ethyl Ketone	ND (12)	ND (11)	ND (11)	NA	NA	NA	1.8 J	ND (11)	ND (11)	300
Appendix IX Pesticides (8081)										
Aldrin	ND (2.0)	7.9	ND (1.9)	ND (1.9)	ND (2.1)	ND (1.9)	ND (1.8)	ND (1.9)	ND (1.8)	41
Gamma-BHC	25	29 J	12	ND (1.9)	11	ND (1.9)	ND (1.8)	ND (1.9)	21	60
Gamma-Chlordane	ND (2.0)	24 J	ND (1.9)	ND (1.9)	ND (2.1)	ND (1.9)	ND (1.8)	ND (1.9)	ND (1.8)	540
4,4' - DDE	3.7 J	470 D	44	ND (3.7)	3.8 J	ND (3.7)	ND (3.5)	ND (3.7)	13	2100
4,4' - DDT	15 J	**4,000 DJ**	160 DJ	ND (3.7) UJ	5.2 J	ND (3.7) UJ	ND (3.5) UJ	ND (3.7) UJ	45 J	2100
4,4' - TDE (DDD)	4	230 J	5.9	ND (3.7)	ND (4.1)	ND (3.7)	ND (3.5)	ND (3.7)	5.2	2900
Dieldrin	19	**63 J**	31	ND (3.7)	2.7 J	ND (3.7)	ND (3.5)	ND (3.7)	20	44
Alpha - Endosulfan	2.2 J	ND (1.9)	ND (1.9)	ND (1.9)	ND (2.1)	ND (1.9)	ND (1.8)	ND (1.9)	ND (1.8)	900
Heptachlor	ND (2.0)	2.7	ND (1.9)	ND (1.9)	ND (2.1)	ND (1.9)	ND (1.8)	ND (1.9)	ND (1.8)	100
TICs (8270 C)										
1,3,5-Triazine-2,4-diamine, 6-chl	NI	NI	3,400 JN	NI	NI	NI	NI	NI	NI	none
4 unknowns	NI	NI	NI	170 - 330 JB	220 - 350 JB	190 - 350 JB	NI	NI	NI	none
1 unknown siloxane	NI	NI	NI	160 J	NI	170 J	NI	NI	NI	none
2-Butanone, 1-(4-chlorophenoxy)	NI	NI	NI	NI	220 JN	NI	NI	NI	NI	none
Herbicides (8151A)										
None Detected	ND (120)	ND (110)	ND (110)	ND (110)	ND (120)	ND (110)	ND (110)	ND (110)	ND (110)	none
Appendix IX Semivolatiles (8270 C)										
None Detected	NA	ND (370 to 3,700)	NA	NA	NA	NA	ND (350 to 3,500)	ND (370 to 3,700)	NA	none
TICs (8270 C)										
p,p'-DDE	NA	230 JN	NA	NA	NA	NA	NI	NI	NI	none
Mitotane	NA	660 JN	NA	NA	NA	NA	NI	NI	NI	none
1,1-Dichloro-2,2-bis(p-chlorophen	NA	690 JN	NA	NA	NA	NA	NI	NI	NI	none
o,p'-DDT	NA	690 JN	NA	NA	NA	NA	NI	NI	NI	none
Chlorophenothane	NA	380 JN	NA	NA	NA	NA	NI	NI	NI	none

Table 4
Soil Borings Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, NY

	Soil Borings (SB) (µg/kg)									
Sample ID	SB-01 (6 to 8 feet)	SB-02 (6 to 8 feet)	SB-03 (6 to 8 feet)	SB-04 (6 to 8 feet)	SB-05 (6 to 8 feet)	SB-06 (6 to 8 feet)	SB-07 (6 to 8 feet)	SB-08 (6 to 8 feet)	FD042502 (SB-01 Duplicate) (6 to 8 feet)	NYSDEC TAGM 4046 Soil Cleanup Levels [a] (µg/kg)
Sample Location	Sump	Sump	Sump	Sump	Sump	Sump	Former UST	Former UST	Sump	
Results										
TAL Metals (6010/7000)										
Aluminum	4,890,000 E	5,530,000 E	6,770,000 E	5,290,000 E	5,980,000 E	5,870,000 E	4,690,000 E	6,760,000 E	5,010,000 E	SB (6,920,000)[b]
Arsenic	5,700	7,500	6,900	5,300	**8,100**	6,500	5,700	7,200	6,600	7,500
Barium	34,500	34,700	34,900	24,500	31,500	32,600	28,500	33,800	40,700	300,000
Beryllium	ND (580)	710	810	800	990	910	700	1,000	660	SB (1,000)[b]
Cadmium	590	740	760	590	750	610	560	810	720	1,000
Calcium	**44,800,000**	**13,100,000**	1,450,000	**14,200,000**	1,310,000	1,090,000	**90,300,000**	**2,090,000**	**25,200,000**	SB (1,510,000)[b]
Chromium	5,800	7,100	7,800	5,200	7,700	6,800	5,700	7,200	6,300	SB (10,200)[b]
Cobalt	ND (5,800)	6,400	6,600	5,900	6,200	6,100	5,600	6,800	ND (5,400)	30,000
Copper	19,600	**30,000**	**27,400**	24,500	**29,800**	23,000	23,100	**28,000**	**38,600**	25,000
Iron	12,300,000	**16,400,000**	**17,800,000**	13,800,000	**16,000,000**	**15,000,000**	11,800,000	**17,000,000**	12,800,000	SB (14,000,000)[b]
Lead	6,600	9,000	10,100	8,200	10,200	9,000	8,800	11,300	11,100	34,200
Magnesium	**21,500,000**	**6,510,000**	**2,740,000**	**8,390,000**	**2,450,000**	**2,240,000**	**7,330,000**	**2,770,000**	**5,910,000**	SB (1,460,000)[b]
Manganese	418,000	**540,000**	**573,000**	386,000	431,000	**517,000**	430,000	448,000	**759,000**	SB (514,000)[b]
Nickel	**14,000**	**16,200**	**17,500**	10,600	**18,300**	**16,000**	13,300	**16,500**	**13,800**	SB (13,500)[b]
Potassium	**676,000**	**576,000**	**532,000**	475,000	**590,000**	481,000	433,000	**566,000**	**509,000**	SB (484,000)[b]
Sodium	**97,800**	61,500	ND (56,000)	ND (52,800)	ND (59,700)	ND (55,200)	**65,700**	ND (52,700)	ND (54,300)	ND (64,500)
Vanadium	7,400	8,000	9,300	16,800	8,400	8,200	6,700	17,000	7,100	150,000
Zinc	**76,800**	**87,000**	**100,000**	66,800	**87,600**	**76,400**	62,100	**92,200**	**90,000**	SB (67,100)[b]

Notes:

Additional constituents under each analytical method were analyzed for but not detected at the method detection limit unless listed in the above table.

(a) - New York State Department of Environmental Conservation, Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 (TAGM 4046), April 1995 .

(b) - Value in ( ) is the site specific soil background level based on the concentrations detected in surface soil sample SS-01.

µg/kg - micrograms per kilogram, parts per billion

BOLD - Indicates constituent concentrations exceeded their associated TAGM level or background level (SS-01), where appropriate as listed in the TAGM 4046, whichever is higher.

B - Indicates the analyte was detected in the associated blank sample.

D - Concentration is based on a diluted sample analysis.

E - The reported value is estimated because of the presence of interference.

J - Indicates an estimated concentration based on the data validation results or the constituent detected above the instrument detection limit but below the quantitation limit.

JN - The analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. The concentration is estimated.

N - For organic TICs only, indicates presumptive evidence of a compound based on a mass spectral library search.

NA - Not analyzed

ND - Indicates no constituents detected at or above the specified practical quantitation limit, corrected for dry weight.

NI - No TICs identified

SB - Site Background or Soil Boring, as appropriate.

TAL - Target Analyte List

TCL - Target Compound List

TICs - Tentatively Identified Compounds

UJ - The compound was not detected above the quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

Table 5
Groundwater Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, NY

	Monitoring Wells (MW) (µg/l)						NYS Ambient Water Quality Standard - Class GA[a] (µg/l)
Sample ID	MW-1	MW-2	MW-3	MW-4	MW-5	FD050202 (MW-1 Duplicate)	
Well Location	Background	Adjacent to Sump	NW of Sump	N of Sump	E of Sump	Background	
Results							
TCL Volatiles (8260B)							
Acetone	ND (20)	17 J	12 J	12 J	ND (20)	ND (20)	50
Carbon Disulfide	ND (10)	1.9 J	4.4 J	2.9 J	ND (10)	ND (10)	60
Chloroform	ND (5)	2.6 J	ND (5)	1.5 J	ND (5)	ND (5)	7
Toluene	ND (5)	2.6 J	ND (5)	ND (5)	ND (5)	ND (5)	5
Appendix IX Semivolatiles (8270C)							
Di-n-butyl phthalate	NA	2.6 JB	NA	NA	NA	NA	50
Bis (2-ethylhexyl)phthalate	NA	**7.5 JB**	NA	NA	NA	NA	5
TICs (8270 C)							
1 unknown	NA	4 JB	NA	NA	NA	NA	none
unknown siloxane	NA	5 JB	NA	NA	NA	NA	none
Carbaril	NA	8 JN	NA	NA	NA	NA	none
Norflurazon	NA	6 JN	NA	NA	NA	NA	none
Appendix IX Pesticides+TICs (8081)							
Gamma-BHC	ND (0.051)	0.078	ND (0.051)	ND (0.052)	ND (0.054)	ND (0.048)	none
4,4' - DDE	ND (0.10)	**0.69**	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.096)	0.2
4,4' - DDT	ND (0.10)	**3.3 D**	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.096)	0.2
4,4' - TDE (DDD)	ND (0.10)	**7.8 D**	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.096)	0.3
Dieldrin	ND (0.10)	**0.58**	ND (0.10)	ND (0.10)	**0.087 J**	ND (0.096)	0.004
Alpha-Endosulfan	ND (0.051)	0.062	ND (0.051)	ND (0.052)	ND (0.054)	ND (0.048)	none
TICs (8270 C)							
2 unknowns	4 - 10 J	(See Semivolatiles above for TIC results)	NI	NI	NI	NI	none
1 unknown	9 JB		NI	NI	NI	NI	none
unknown siloxane	4 JB		6 JB	6 JB	NI	NI	none
2 unknown amides	4 - 13 J		NI	NI	NI	NI	none
Carbaril	NI		NI	NI	NI	NI	none
Norflurazon	NI		NI	NI	NI	NI	none
1 unknown alcohol	NI		7 JB	13 JB	NI	4 JB	none
2 unknown alcohols	NI		NI	NI	4 - 11 JB	NI	none
E-10-Pentadecenol	NI		NI	NI	24 JN	NI	none
Appendix IX Herbicides (8151)							
2,4 - D	ND (0.51)	ND (0.47)	ND (0.51)	ND (0.52)	ND (0.54)	ND (0.48)	50
2,4,5 - T	ND (0.51)	ND (0.47)	ND (0.51)	ND (0.52)	ND (0.54)	ND (0.48)	35
2,4,5 - TP (Silvex)	ND (0.51)	ND (0.47)	ND (0.51)	ND (0.52)	ND (0.54)	ND (0.48)	0.26

Table 5
Groundwater Analytical Data Summary
Site Investigation
Cornell University, Vineyard Research Laboratory
Fredonia, NY

	Monitoring Wells (MW) (µg/l)						NYS Ambient Water Quality Standard - Class GA[a] (µg/l)
Sample ID	MW-1	MW-2	MW-3	MW-4	MW-5	FD050202 (MW-1 Duplicate)	
Well Location	Background	Sump	NE of Sump	N of Sump	E of Sump	Background	
Results							
TAL Metals (6010/7000)							
Aluminum	49,100	300,000	108,000	63,200	30,300	43,700	none
Arsenic	**58.7**	**326**	**125**	**58.9**	**50.1**	**57.1**	25
Barium	665	**4,050**	**1,250**	545	965	602	1,000
Beryllium	ND (5)	**11.3**	ND (5)	ND (5)	ND (5)	ND (5)	3
Cadmium	ND (5)	**23.8**	**7**	ND (5)	ND (5)	ND (5)	5
Calcium	84,400	266,000	114,000	116,000	120,000	78,300	none
Chromium	**58.6**	**412**	**155**	**95.8**	44.3	**52**	50
Cobalt	ND (50)	257	89.5	50.9	ND (50)	ND (50)	none
Copper	133	**1,100**	**304**	131	97.7	124	200
Iron	**97,000**	**585,000**	**206,000**	**108,000**	**74,200**	**87,700**	300
Lead	**55.5**	**484**	**161**	**70.7**	**53.2**	**49.7**	25
Magnesium	27,500	**123,000**	**45,900**	32,400	28,900	24,900	35,000*
Manganese	**3,590**	**18,000**	**8,050**	**2,950**	**2,290**	**3,160**	300
Mercury	ND (0.20)	1	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	1
Nickel	**121**	**673**	**227**	**125**	65.9	**110**	100
Potassium	12,900	63,000	35,400	20,600	9,640	11,300	none
Selenium	**12**	**31**	**11**	7.9	7.3	ND (5)	10
Sodium	5,910	**42,300**	**38,200**	**41,700**	**45,700**	5,690	20,000
Vanadium	74.2	457	176	99.5	67.9	90.3	none
Zinc	565	**2,900**	987	477	364	522	2,000

Notes:

Additional constituents under each analytical method were analyzed for but not detected at the method detection limit unless listed in the above table.

(a) - New York State Division of Water Technical and Operation Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998.

* - TOGS Guidance Value

µg/l - micrograms per liter, parts per billion

B - Indicates the analyte was detected in the associated blank sample.

BOLD - Indicates the analytical compound concentration exceeds its applicable groundwater standard or guidance value.

D - Concentration is based on a diluted sample analysis.

J - Indicates an estimated concentration since the constituent was detected above the instrument detection limit but below quantitation limit.

N - For organic TICs only, indicates presumptive evidence of a compound based on a mass spectral library search.

NA - Not applicable

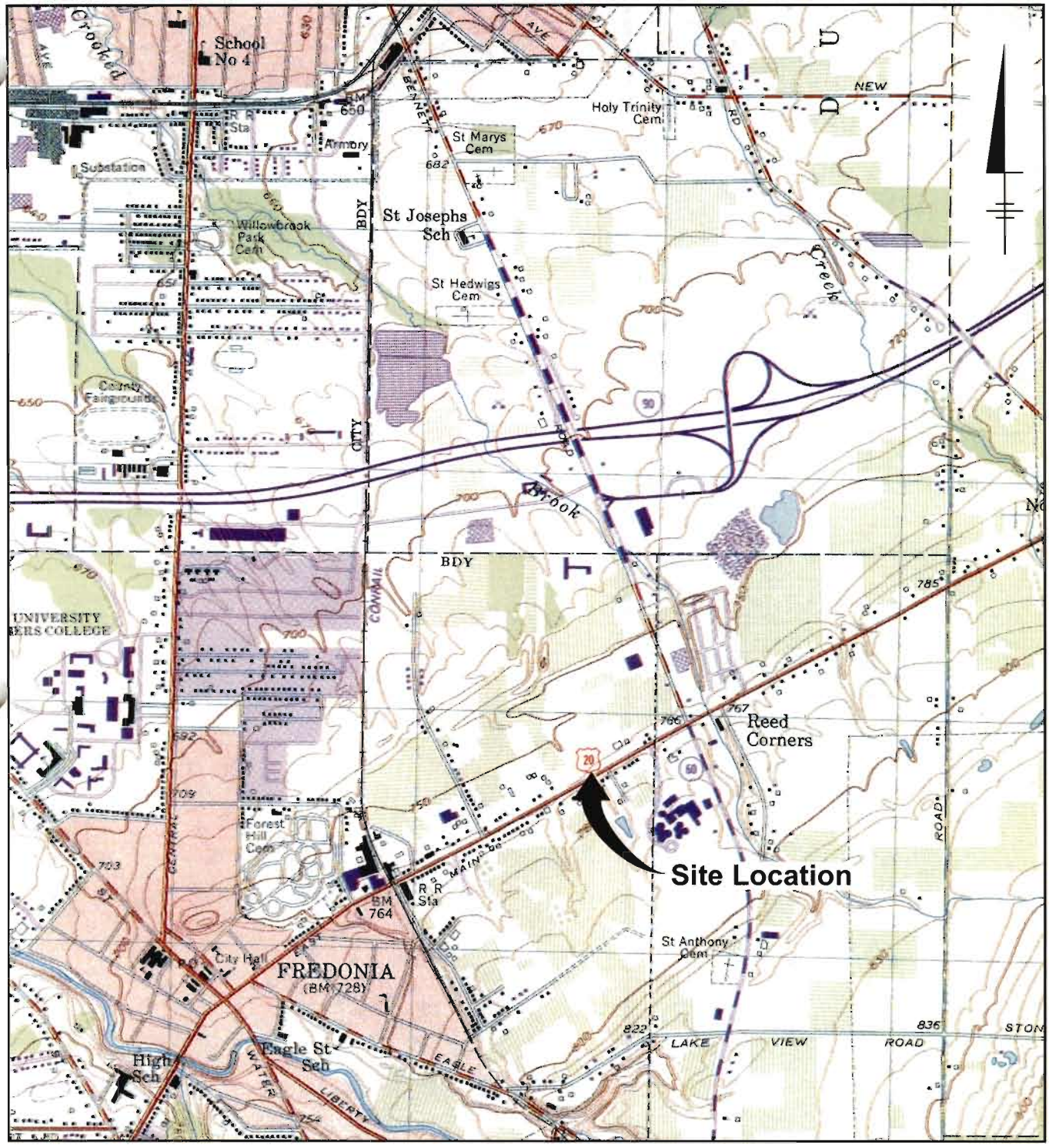
ND - Indicates no constituents detected at or above the specified practical quantitation limit.

NI - No TICs identified

TAL - Target Analyte List

TCL - Target Compound List

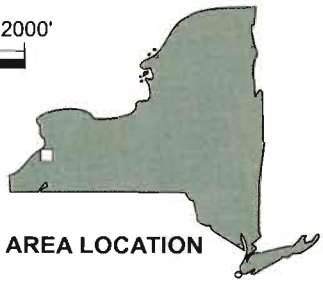
Figures



REFERENCE: BASE MAP SOURCE USGS 7.5 MINUTE QUADS. SERIES DUNKIRK, NEW YORK, 1954, PHOTOREVISED 1979.

2000' 0 2000'

Approximate Scale: 1" = 2000'



AREA LOCATION

CORNELL
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FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

SITE LOCATION MAP

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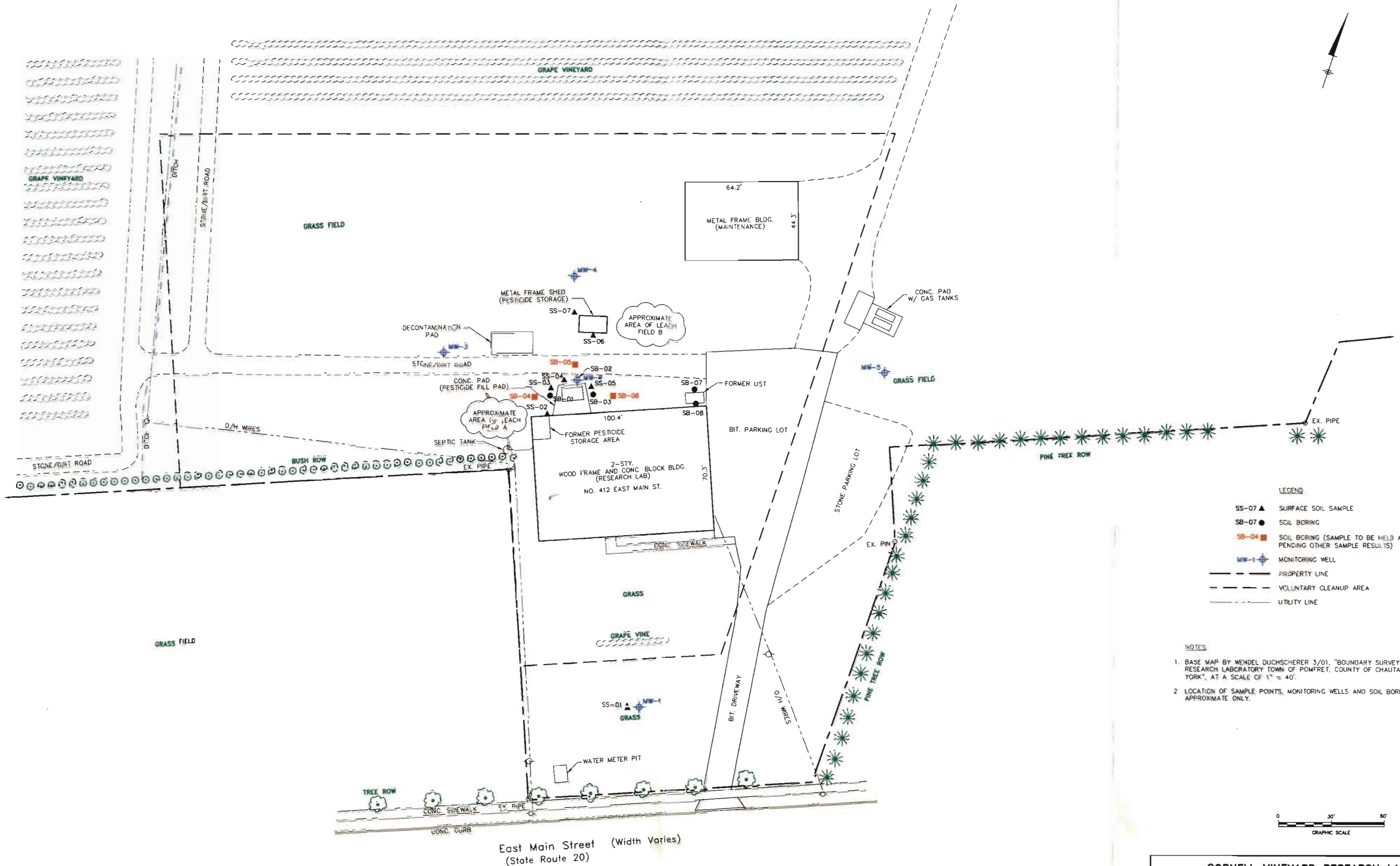
engineers & scientists

FIGURE 1

9/16/02 SYR D54-LBR LAS ROC-54-SLM
73631002/73631n01.cdr



LEGEND

- SS-07 ▲ SURFACE SOIL SAMPLE
- SB-07 ● SOIL BORING
- SB-04 ■ SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
- MW-1 ⊕ MONITORING WELL
- PROPERTY LINE
- VOLUNTARY CLEANUP AREA
- UTILITY LINE

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.

0 30' 60'
GRAPHIC SCALE

CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

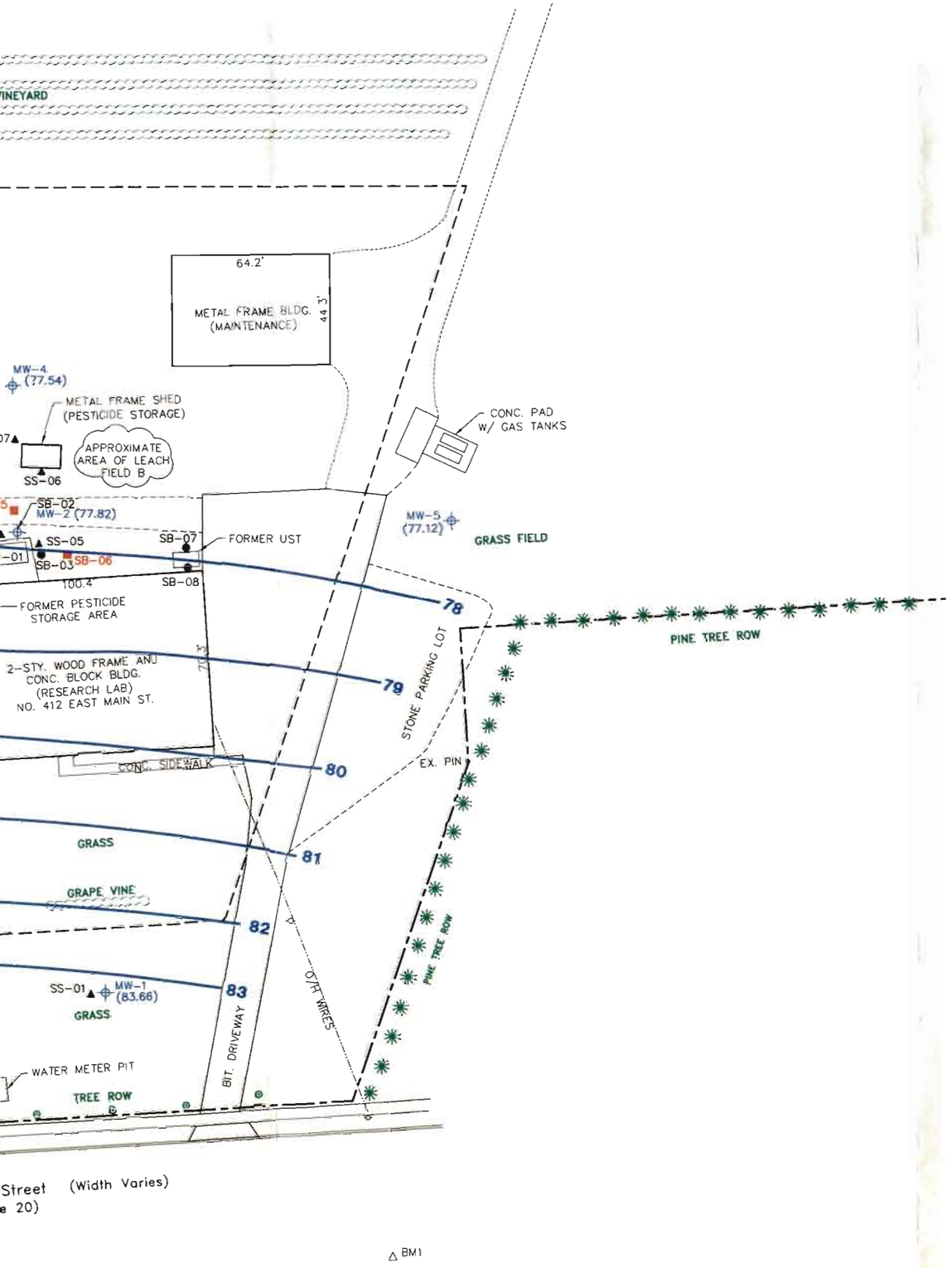
SITE INVESTIGATION FINAL REPORT

MONITORING WELL AND SAMPLE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

X (XREF)
L: (LAYER)
P: STD-PCP/DL
9/13/02 ROC-54-SLM
73630001/73630B01.DWG



LEGEND

SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
BM1 △	SITE BENCHMARK – SOUTH SIDE OF MAIN STREET AND SIDEWALK: CHISELED "X" ON NORTH RIM OF SANITARY MANHOLE (LOWEST POINT) ELEVATION 100.00 ASSUMED DATUM
— — —	PROPERTY LINE
— — —	VOLUNTARY CLEANUP AREA
———	UTILITY LINE
(77.12)	GROUNDWATER ELEVATION IN FEET
80	GROUNDWATER ELEVATION CONTOUR LINE IN FEET

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED AT THE METHOD DETECTION LIMIT UNLESS LISTED.
4. GROUNDWATER ELEVATIONS ARE BASED ON A SITE SPECIFIC DATUM.

0 30' 60'
GRAPHIC SCALE

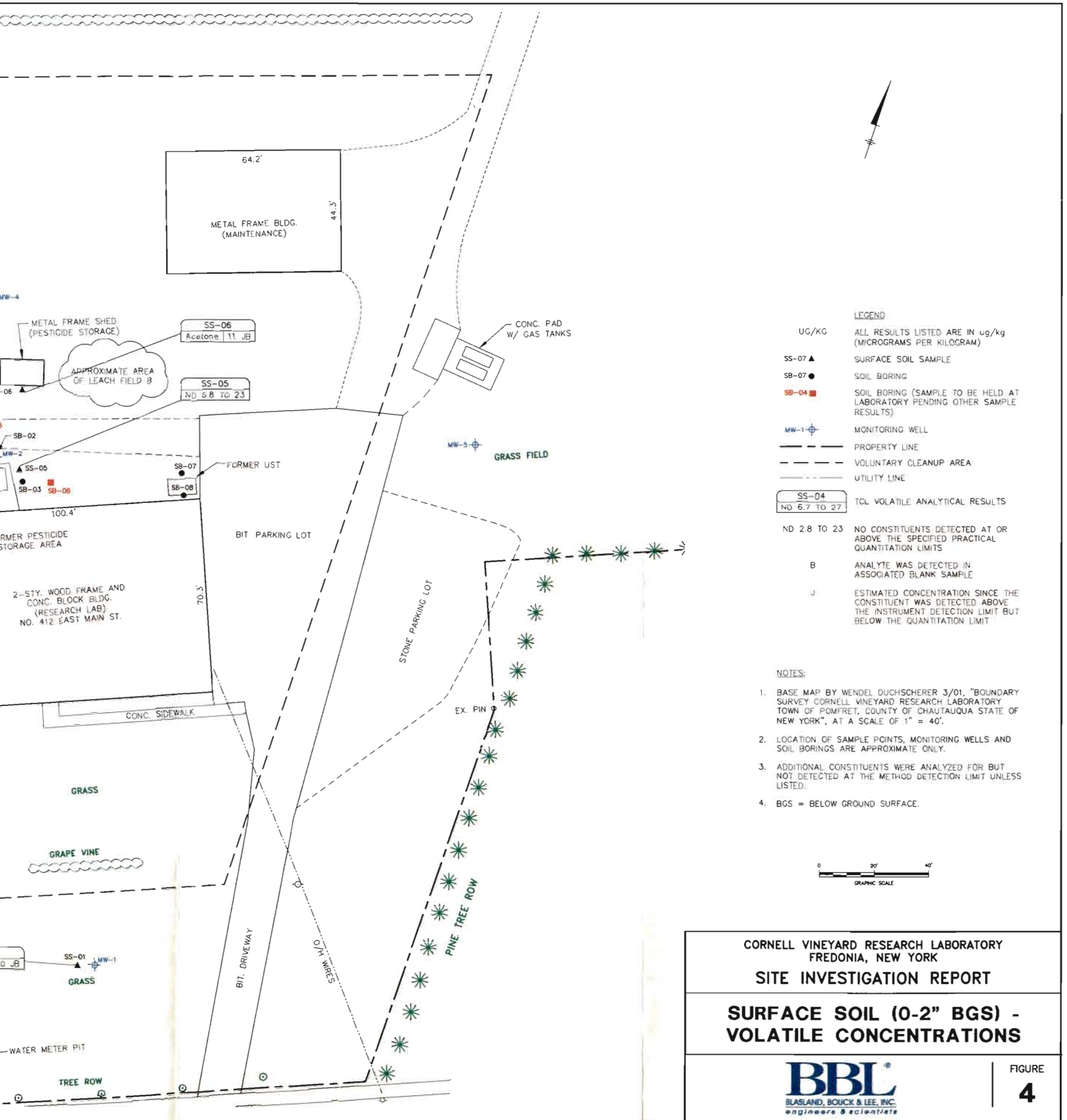
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

GROUNDWATER ELEVATION CONTOUR MAP MAY 2, 2002

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 3



LEGEND

UG/KG	ALL RESULTS LISTED ARE IN ug/kg (MICROGRAMS PER KILOGRAM)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — — —	VOLUNTARY CLEANUP AREA
— — —	UTILITY LINE
SS-04 / ND 6.7 TO 27	TCL VOLATILE ANALYTICAL RESULTS
ND 2.8 TO 23	NO CONSTITUENTS DETECTED AT OR ABOVE THE SPECIFIED PRACTICAL QUANTITATION LIMITS
B	ANALYTE WAS DETECTED IN ASSOCIATED BLANK SAMPLE
J	ESTIMATED CONCENTRATION SINCE THE CONSTITUENT WAS DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT BUT BELOW THE QUANTITATION LIMIT

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED AT THE METHOD DETECTION LIMIT UNLESS LISTED.
4. BGS = BELOW GROUND SURFACE.

0 20' 40'
GRAPHIC SCALE

CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

SURFACE SOIL (0-2" BGS) - VOLATILE CONCENTRATIONS

BBL
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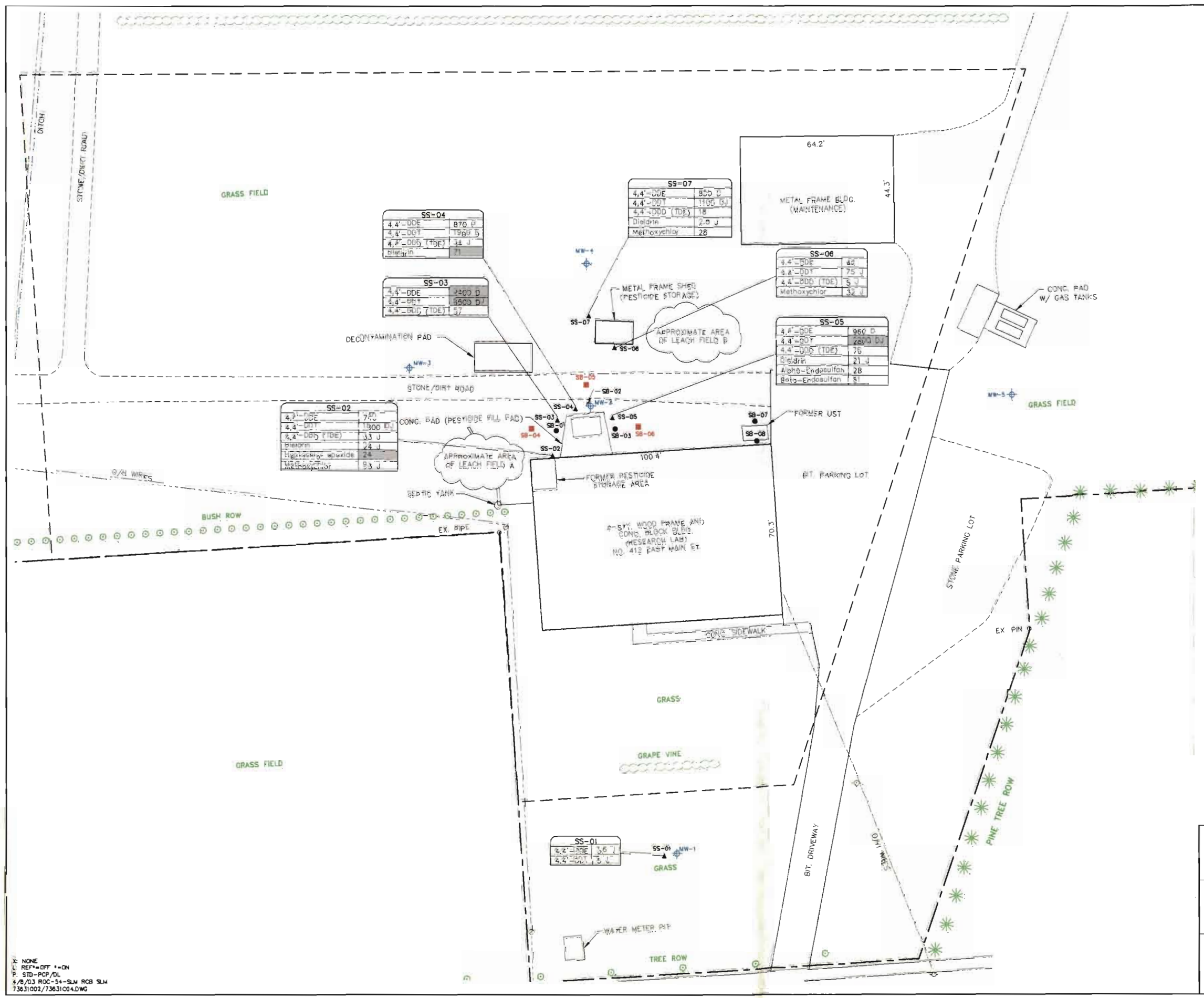
engineers & scientists

FIGURE
4



LEGEND

UG/KG	ALL RESULTS LISTED ARE IN ug/kg (MICROGRAMS PER KILOGRAM)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — —	VOLUNTARY CLEANUP AREA
— · — · —	UTILITY LINE
SS-01 / 4,4'-DDE 3.6 J / 4,4'-DDT 1.5 J	PESTICIDE ANALYTICAL RESULTS
	CONSTITUENT CONCENTRATION EXCEEDS NYSDEC TAGM 4046 SOIL CLEANUP LEVELS
J	ESTIMATED CONCENTRATION SINCE THE CONSTITUENT WAS DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT BUT BELOW THE QUANTITATION LIMIT
D	INDICATES THE SAMPLE ALIQUOT WAS DILUTED PRIOR TO ANALYSIS.

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF PONFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED AT THE METHOD DETECTION LIMIT UNLESS LISTED.
4. BGS = BELOW GROUND SURFACE

0 20' 40'
GRAPHIC SCALE

CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

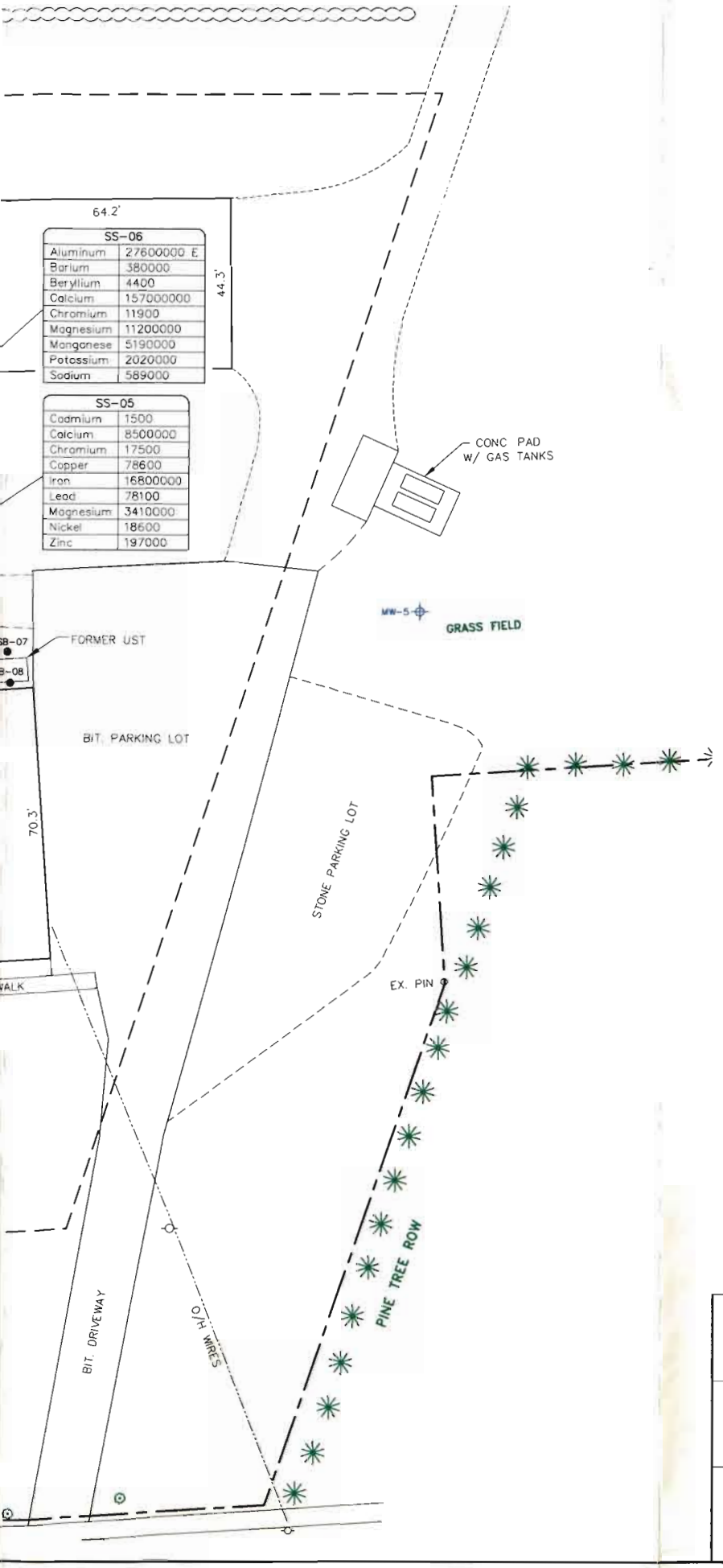
SITE INVESTIGATION REPORT

SURFACE SOIL (0-2" BGS) - PESTICIDE CONCENTRATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5

X: NONE
L: REF*=OFF *=ON
P: STD-PCP/DL
6/8/03 ROC-54-SLW RCB SLM
73631002/73631004.DWG



LEGEND

UG/KG	ALL RESULTS LISTED ARE IN ug/kg (MICROGRAMS PER KILOGRAM)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLES HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — — —	VOLUNTARY CLEANUP AREA
———	UTILITY LINE

SS-07	
Calcium	1760000
Copper	31800
Iron	15000000
Magnesium	2350000
Nickel	17400
Potassium	525000
Zinc	118000

TAL METALS ANALYTICAL RESULTS EXCEEDING NYSDEC TAGM 4046 SOIL CLEANUP LEVELS ONLY. ADDITIONAL METALS DETECTED AS LISTED IN THE ANALYTICAL DATA SUMMARY TABLES.

* NO METAL CONSTITUENTS DETECTED EXCEEDING TAGM 4046 LEVELS – SEE ANALYTICAL DATA SUMMARY TABLES

E CONCENTRATION IS ESTIMATED BECAUSE OF THE PRESENCE OF INTERFERENCE

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. BGS = BELOW GROUND SURFACE

0 20' 40'
GRAPHIC SCALE

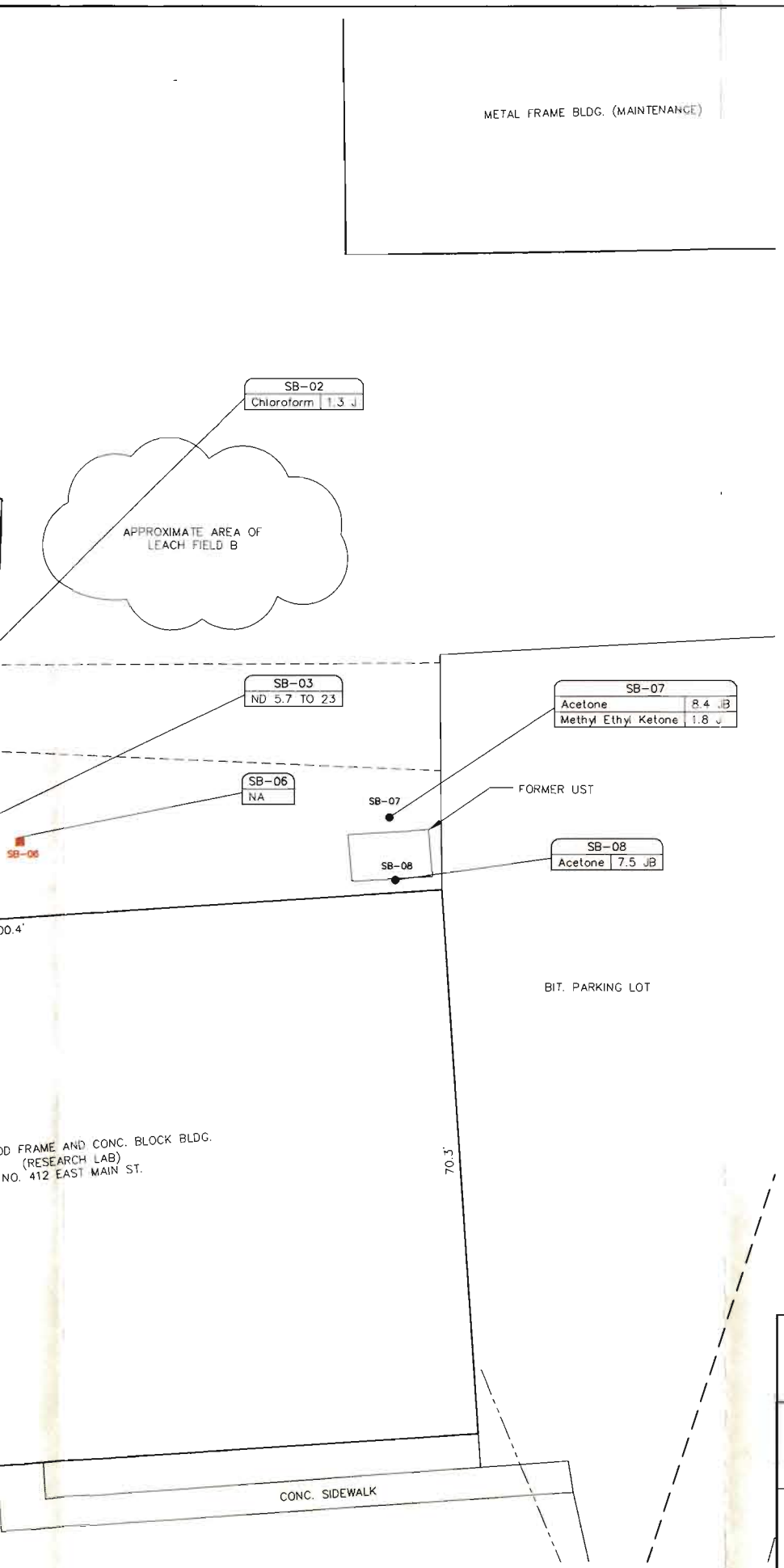
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

SURFACE SOIL (0-2" BGS) - METAL CONCENTRATIONS EXCEEDING TAGM 4046 LEVELS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 6



LEGEND

UG/KG	ALL RESULTS LISTED ARE IN ug/kg (MICROGRAMS PER KILOGRAM)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — — —	VOLUNTARY CLEANUP AREA
———	UTILITY LINE
SB-08 / Acetone 7.5 JB	TCL VOLATILE ANALYTICAL RESULTS
ND 2.8 TO 23	NO CONSTITUENTS DETECTED AT OR ABOVE THE SPECIFIED PRACTICAL QUANTITATION LIMITS
NA	NO CONSTITUENTS WERE ANALYZED
B	ANALYTE WAS DETECTED IN ASSOCIATED BLANK SAMPLE
J	ESTIMATED CONCENTRATION SINCE THE CONSTITUENT WAS DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT BUT BELOW THE QUANTITATION LIMIT

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED AT THE METHOD DETECTION LIMIT UNLESS LISTED.
4. BGS = BELOW GROUND SURFACE

0 10' 20'
GRAPHIC SCALE

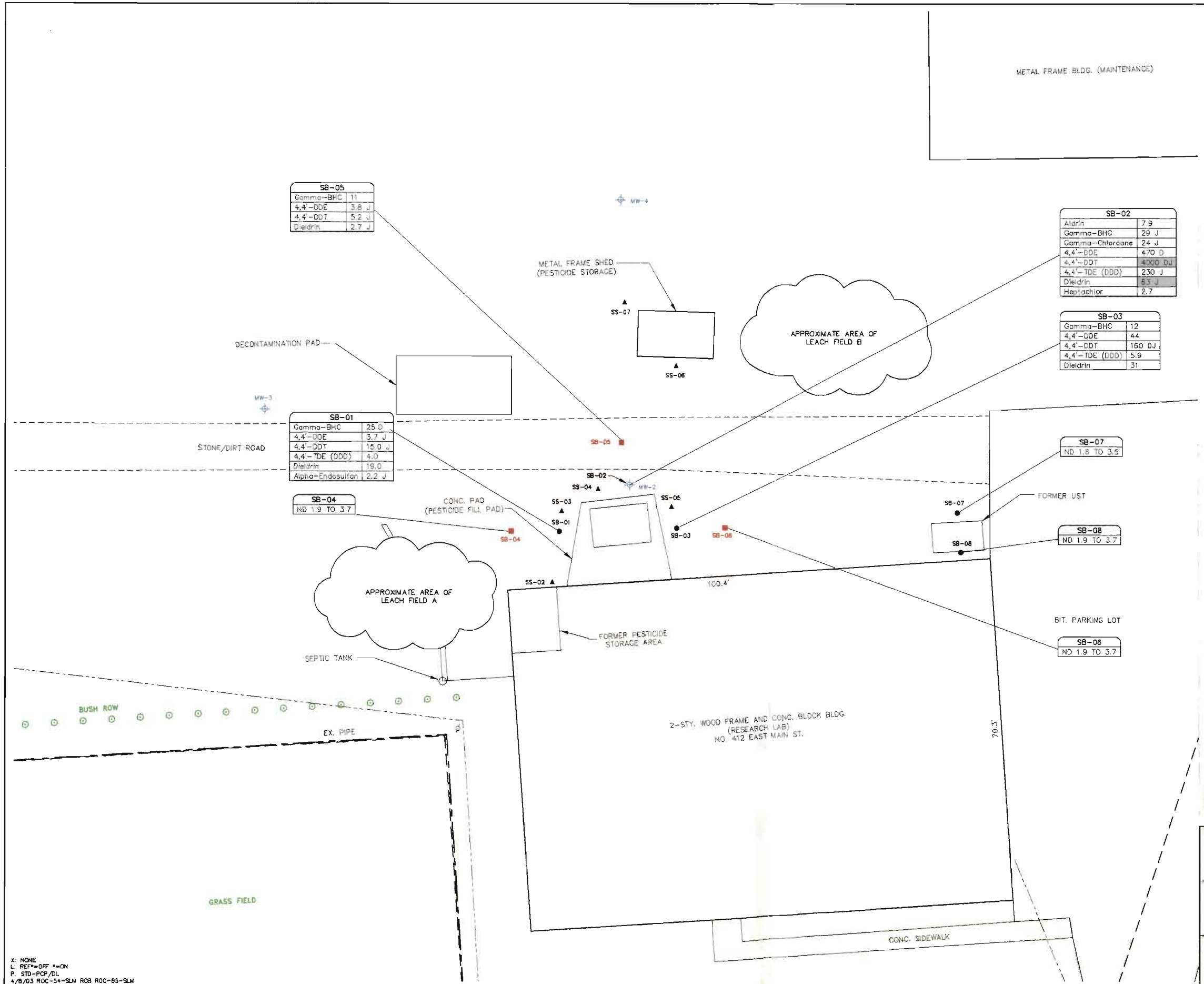
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION FINAL REPORT

SOIL BORINGS (6'-8' BGS) - VOLATILE CONCENTRATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 7



X: NONE
L: REF*=OFF *=ON
P: STD-PCP/DL
4/8/03 ROC-S4-SLM ROB ROC-B5-SLM
73631002/73631C02.DWG

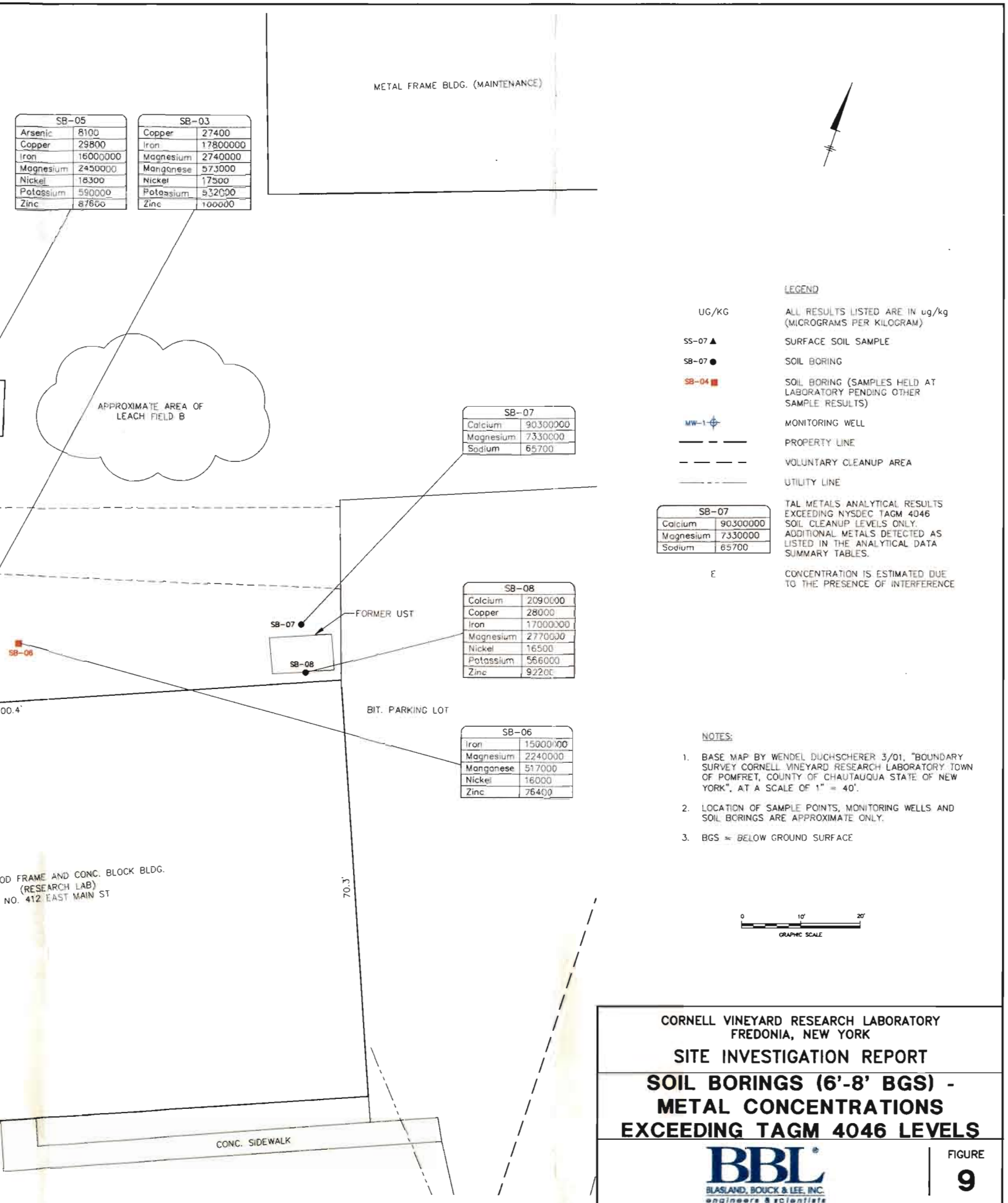
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

SOIL BORINGS (6'-8' BGS) - PESTICIDE CONCENTRATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 8



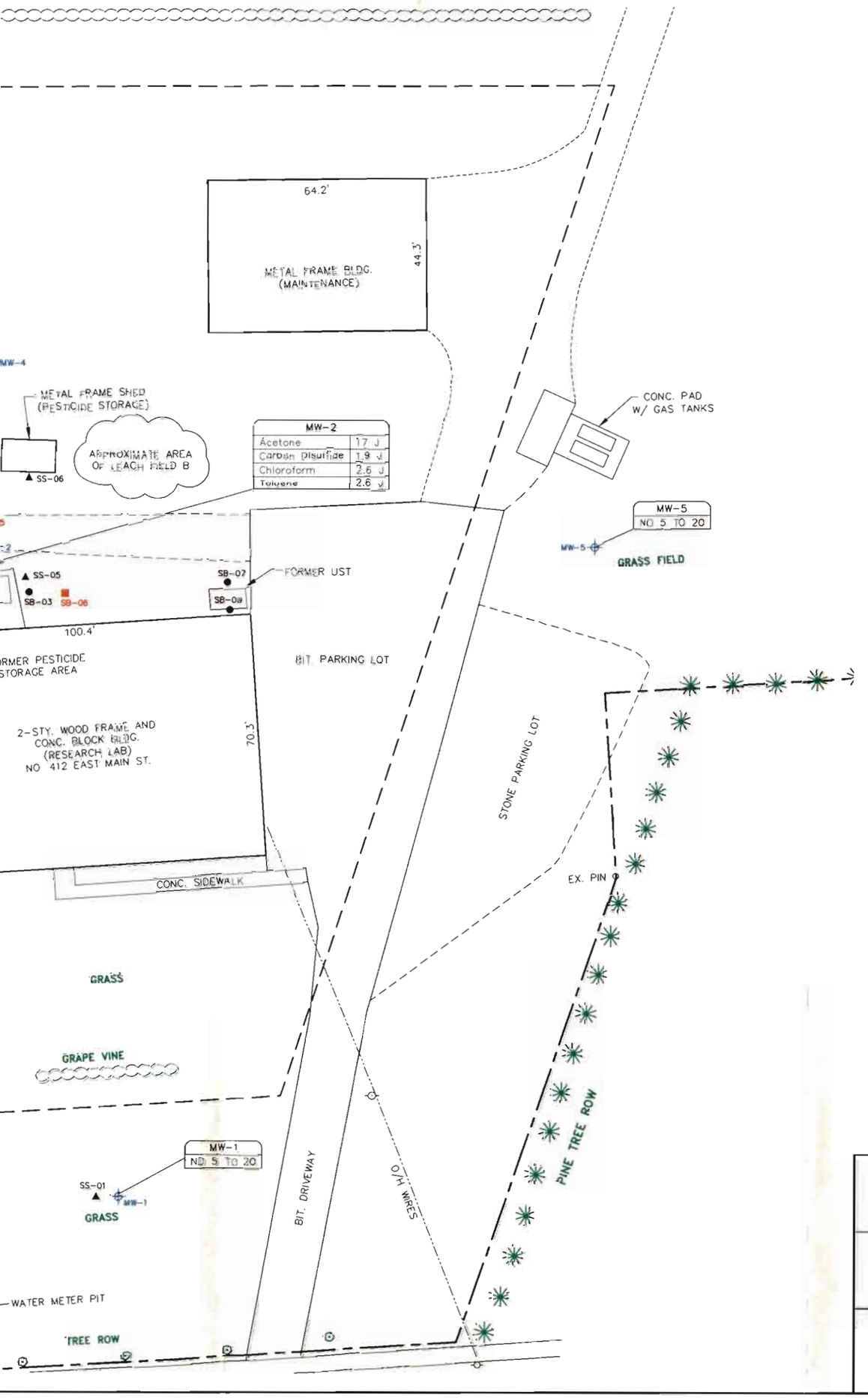
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

SOIL BORINGS (6'-8' BGS) - METAL CONCENTRATIONS EXCEEDING TAGM 4046 LEVELS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 9



LEGEND

UG/L	ALL RESULTS LISTED ARE IN ug/l (MICROGRAMS PER LITER)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — — —	VOLUNTARY CLEANUP AREA
—— - ——	UTILITY LINE
MW-5 / ND 5 TO 20	TCL VOLATILES ANALYTICAL RESULTS
ND 5 TO 20	NO CONSTITUENTS DETECTED AT OR ABOVE THE SPECIFIED PRACTICAL QUANTITATION LIMITS
J	ESTIMATED CONCENTRATION SINCE THE CONSTITUENT WAS DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT BUT BELOW THE QUANTITATION LIMIT

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED AT THE METHOD DETECTION LIMIT UNLESS LISTED.

0 20' 40'
GRAPHIC SCALE

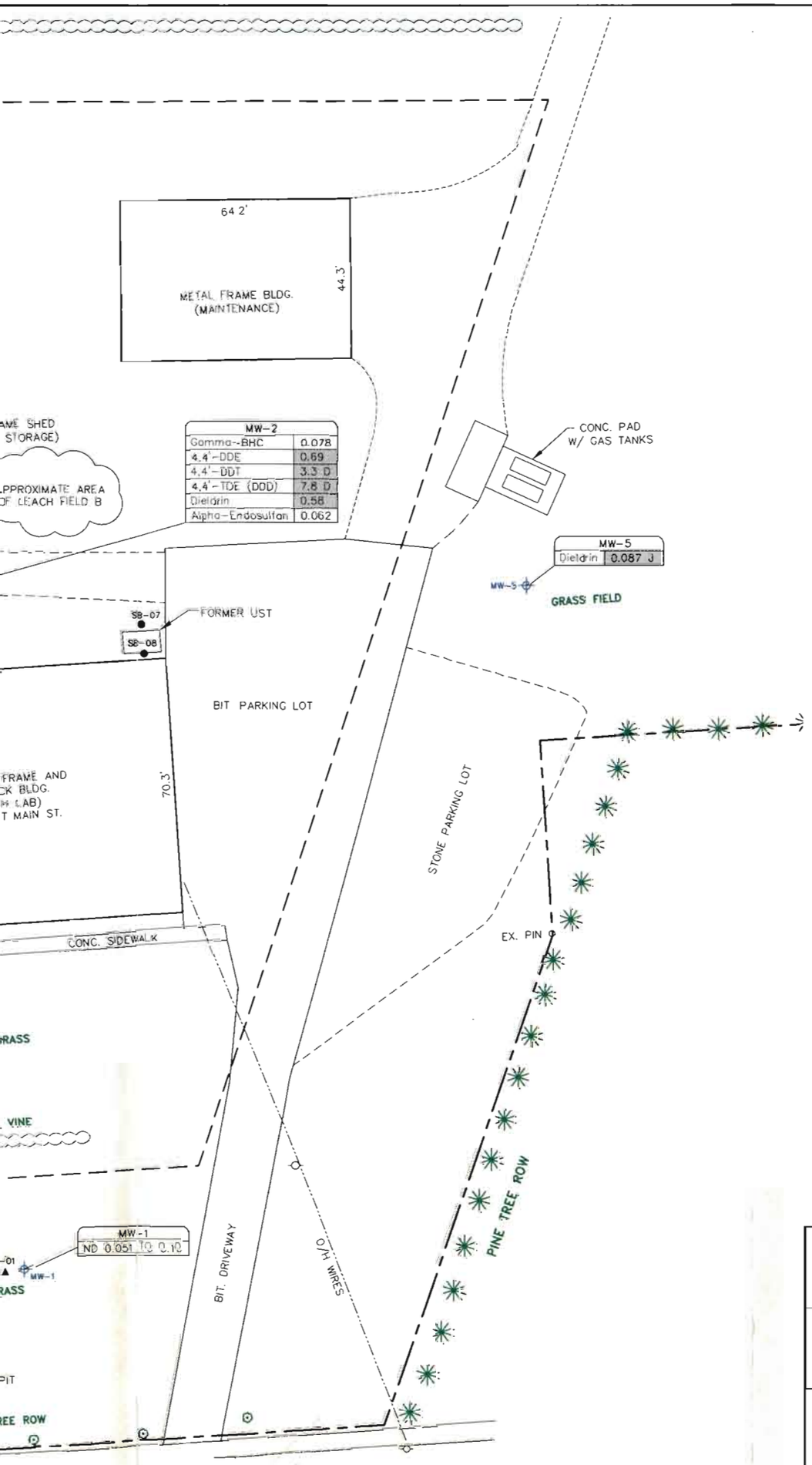
CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

GROUNDWATER - VOLATILE CONCENTRATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 10



LEGEND

UG/L	ALL RESULTS LISTED ARE IN ug/l (MICROGRAMS PER LITER)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1	MONITORING WELL
	PROPERTY LINE
	VOLUNTARY CLEANUP AREA
	UTILITY LINE
MW-5 Dieldrin 0.087	PESTICIDES ANALYTICAL RESULTS
J	ESTIMATED CONCENTRATION SINCE THE CONSTITUENT WAS DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT BUT BELOW THE QUANTITATION LIMIT
D	INDICATES THE SAMPLE ALIQUOT WAS DILUTED PRIOR TO ANALYSIS.
	CONSTITUENT CONCENTRATION EXCEEDS NYS AMBIENT WATER QUALITY STANDARD - CLASS GA. SEE ANALYTICAL DATA SUMMARY TABLES.
ND 0.051 TO 0.10	NO CONSTITUENTS DETECTED AT OR ABOVE THE SPECIFIED PRACTICAL QUANTITATION LIMITS

NOTES:

1. IBASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.
3. ADDITIONAL CONSTITUENTS WERE ANALYZED FOR BUT NOT DETECTED) AT THE METHOD DETECTION LIMIT UNLESS LISTED.

0 20' 40'
GRAPHIC SCALE

CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

GROUNDWATER - PESTICIDE CONCENTRATIONS

BBL
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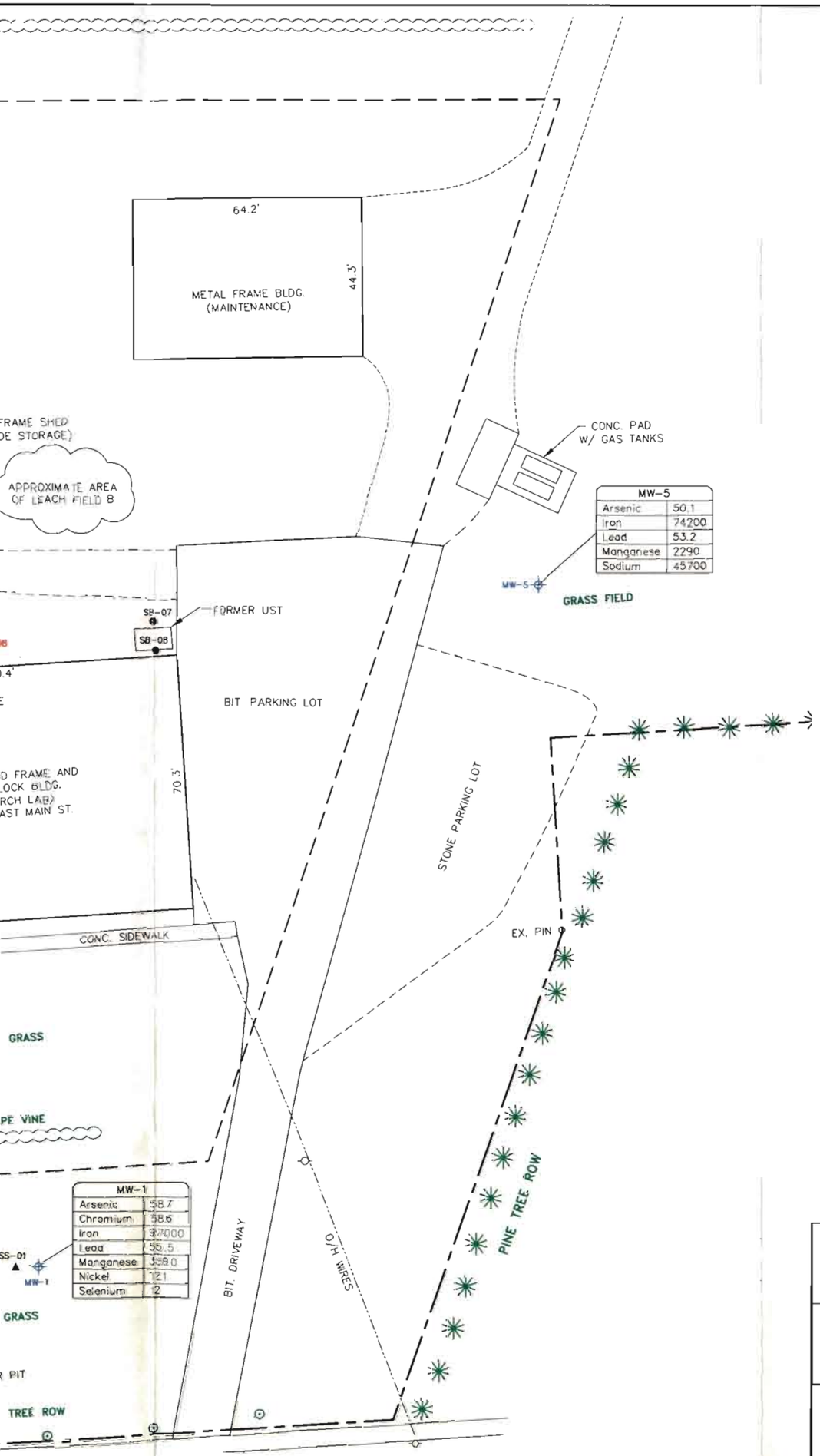
engineers & scientists

FIGURE
11



LEGEND

UG/L	ALL RESULTS LISTED ARE IN ug/l (MICROGRAMS PER LITER)
SS-07 ▲	SURFACE SOIL SAMPLE
SB-07 ●	SOIL BORING
SB-04 ■	SOIL BORING (SAMPLE TO BE HELD AT LABORATORY PENDING OTHER SAMPLE RESULTS)
MW-1 ⊕	MONITORING WELL
— — —	PROPERTY LINE
— — — —	VOLUNTARY CLEANUP AREA
———	UTILITY LINE

MW-5	
Arsenic	50.1
Iron	74200
Lead	53.2
Manganese	2290
Sodium	45700

TAL METALS ANALYTICAL RESULTS EXCEEDING NYS AMBIENT WATER QUALITY STANDARD – CLASS GA ONLY. ADDITIONAL METALS DETECTED AS LISTED IN THE ANALYTICAL DATA SUMMARY TABLES.

NOTES:

1. BASE MAP BY WENDEL DUCHSCHERER 3/01, "BOUNDARY SURVEY CORNELL VINEYARD RESEARCH LABORATORY TOWN OF POMFRET, COUNTY OF CHAUTAUQUA STATE OF NEW YORK", AT A SCALE OF 1" = 40'.
2. LOCATION OF SAMPLE POINTS, MONITORING WELLS AND SOIL BORINGS ARE APPROXIMATE ONLY.

0 20' 40'
GRAPHIC SCALE

CORNELL VINEYARD RESEARCH LABORATORY
FREDONIA, NEW YORK

SITE INVESTIGATION REPORT

GROUNDWATER - METAL CONCENTRATIONS EXCEEDING NYS WATER QUALITY STANDARDS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 12

Appendices

Appendix A

Subsurface Boring Logs and Well Concentration Details

BBL®
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engineers & scientists

Date Start/Finish: 04/23/02-04/23/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing: 5070.2
Easting: 5117.1
Riser Elevation: 95.99

Borehole Depth: 20.0 ft.
Surface Elevation: 96.5

Geologist: Michael R. Arlauckas

Well/Boring ID: MW-1
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0											8-inch diameter Flush mount road box.
		S-1	0'-2'	1.5	1 1 1 2	2	0.0			Dark brown, SILTY SAND.		
										Tan, very fine SAND and SILT, trace subrounded Gravel and Rootlets/Organics, moist.		24-inch square Concrete surface pad (0.0' - 1.5' bgs).
		S-2	2'-4'	2.0	1 1 2 3	3	0.0			Dark brown to gray, fine SAND, trace subangular/subrounded fine Gravel, moist.		ØØN Sand drain (0.10' - 2.5' bgs).
5	5	S-3	4'-6'	1.6	4 6 6 5	12	0.0					Cement/bentonite grout (2.5' - 5.12' bgs).
		S-4	6'-8'	1.0	4 3 3 2	6	0.0			Gray, medium to coarse SAND and fine to medium subrounded GRAVEL, moist.		Hydrated bentonite seal (5.12'- 7.95' bgs).
		S-5	8'-10'	1.5	4 4 2 2	6	0.0					2-inch diameter SCH 40 PVC riser (0.1' - 10.0' bgs.).
10	10	S-6	10'-12'	1.5	4 4 4 4	8	0.0					
		S-7	12'-14'	1.0	2 1 2 3	3	0.0			Dark gray, fine to medium GRAVEL, little coarse Sand, trace Silt, wet.		ØØN Sand (7.95' - 20.0' bgs).
15	15	S-8	14'-16'	0.9	3 3 3 3	6	0.0			Brown to gray, fine to medium SAND, trace fine Sand and subrounded Gravel, wet.		
		S-9	16'-18'	1.9	5 5 6 6	11	0.0			Dark gray very fine SAND grading to a dark gray Sandy Silt, trace subangular fine Gravel, wet.		2-inch diameter SCH 40 PVC 0.010-inch slotted well screen (10.0' - 20.0' bgs).
20	20	S-10	18'-20'	2.0	2 5 6 8	11	0.0			Dark gray, SANDY SILT, trace subangular/subrounded fine Gravel, wet.		

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Remarks:
Elevations based on site specific datum.

Date Start/Finish: 04/24/02-04/24/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
ıger Size: 4.25-inch
g Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing: 5250.7
Easting: 5084.6
Riser Elevation: 89.57

Borehole Depth: 18.0 ft.
Surface Elevation: 90.0

Geologist: Michael R. Arlauckas

Well/Boring ID: MW-2
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet) / Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0 0	S-1	0'-2'	1 6	1 4 4 4	8	0.0			Brown, SILTY SAND, little subangular/subrounded fine Gravel, moist.		8-inch diameter Flush mount road box.
	S-2	2'-4'	1.9	5 4 3 2	7	0 0			Brown, very fine to coarse SAND, little subangular/subrounded fine Gravel, trace Silt, moist.		24-inch square Concrete surface pad (0.0' - 1.5' bgs).
5 5	S-3	4'-6'	1.6	4 5 4 4	9	0.0					ØØN Sand drain (0.10' - 2.0' bgs)
	S-4	6'-8'	1.7	4 5 4 6	9	0.0					Cement/bentonite grout (2.0' - 3.9' bgs).
	S-5	8'-10'	1.0	4 3 2 2	5	0.0			Dark brown, medium to coarse SAND, some subangular/subrounded fine to medium Gravel, moist.		Hydrated bentonite seal (3.9'- 6.0' bgs).
10 10	S-6	10'-12'	1.2	1 1 1 2	2	0.0					2-inch diameter SCH 40 PVC riser (0.1' - 8.0' bgs.).
	S-7	12'-14'	0.0	2 1 2 3	3	0.0			No Recovery		ØØN Sand (6.00' - 18.0' bgs).
15 15	S-8	14'-16'	1.5	3 5 27 30	32	0.0			Brown to gray, medium to coarse SAND, little subangular/subrounded fine Gravel, trace black Shale Fragments, wet.		
	S-9	16'-18'	0.9	14 15 14 20	39	0.0					2-inch diameter SCH 40 PVC 0.010-inch slotted well screen (8.0' - 18.0' bgs).

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Remarks:
Elevations based on site specific datum.

Date Start/Finish: 04/24/02-04/24/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing: 5271.3
Easting: 5010.6
Riser Elevation: 88.78

Borehole Depth: 18.0 ft.
Surface Elevation: 89.1

Geologist: Michael R. Arlauckas

Well/Boring ID: MW-3
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet) / Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0 0	S-1	0'-2'	0.9	1 2 2 1	4	0.0			Dark brown SILTY SAND as sandy loam, trace Organics/Rootlets, trace subrounded fine Gravel, moist.		8-inch diameter Flush mount road box.
	S-2	2'-4'	1.8	3 3 4 3	7	0.0			Dark brown, fine to coarse SAND, little subrounded/subangular fine Gravel, moist.		24-inch square Concrete surface pad (0.0' - 1.5' bgs).
5 5	S-3	4'-6'	1.1	3 4 4 4	8	0.0			Dark brown, fine to medium SAND, little subangular/subrounded fine Gravel, trace Rock fragments, moist.		ØØN Sand drain (0.10' - 2.0' bgs).
	S-4	6'-8'	1.6	3 3 3 3	6	0.0					Cement/bentonite grout (2.0' - 3.90' bgs).
	S-5	8'-10'	1.5	2 2 1 2	3	0.0					Hydrated bentonite seal (3.80'- 5.90' bgs).
10 10	S-6	10'-12'	0.9	2 3 2 3	5	0.0			Dark brown, coarse SAND and ROCK FRAGMENTS, wet.		2-inch diameter SCH 40 PVC riser (0.1' - 8.0' bgs.).
	S-7	12'-14'	1.1	2 2 3 4	5	0.0			Dark brown, medium SAND, little Rock Fragments, wet.		ØØN Sand (5.90' - 18.0' bgs).
15 15	S-8	14'-16'	1.6	3 14 14 10	28	0.0					
	S-9	16'-18'	1.9	9 10 12 11	22	0.0			@ 14.8' Dark gray SILT, trace subangular/subrounded fine Gravel, moist.		2-inch diameter SCH 40 PVC 0.010-inch slotted well screen (8.0' - 18.0' bgs).

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Remarks:
Elevations based on site specific datum.

Date Start/Finish: 04/23/02-04/23/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing: 5309.7
Easting: 5079.2
Riser Elevation: 86.33
Borehole Depth: 18.0 ft.
Surface Elevation: 86.6
Geologist: Michael R. Arlauckas

Well/Boring ID: MW-4
Client: Cornell University
Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet) / Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0 0	S-1	0'-2'	2.0	1 1 2 2	3	0.0			Dark brown SILTY SAND as sandy loam, trace Organics/Rootlets, subangular/subrounded fine Gravel, moist.		8-inch diameter Flush mount road box.
	S-2	2'-4'	1.6	2 2 1 3	3	0.0			Dark brown, fine to coarse SAND, little well rounded fine Gravel, moist.		24-inch square Concrete surface pad (0.0' - 1.5' bgs).
5 5	S-3	4'-6'	1.6	3 3 2 2	5	0.0			Dark brown, medium to coarse SAND, little subangular/subrounded fine Gravel, moist.		ØØN Sand drain (0.10' - 2.0' bgs).
	S-4	6'-8'	1.0	3 3 3 3	6	0.0			Gray, medium to coarse SAND and fine to medium subrounded GRAVEL, moist.		Cement/bentonite grout (2.0' - 3.90' bgs).
	S-5	8'-10'	1.6	4 3 4 2	7	0.0					Hydrated bentonite seal (3.90'- 6.10' bgs).
10 10	S-6	10'-12'	1.0	5 4 3 3	7	0.0			Dark brown, medium to coarse SAND, little Rock Fragments, trace subrounded fine Gravel. moist to wet.		2-inch diameter SCH 40 PVC riser (0.1' - 8.0' bgs.).
	S-7	12'-14'	1.7	3 4 6 9	10	0.0			Dark brown, fine to coarse SAND, trace subrounded/subangular fine Gravel, wet.		ØØN Sand (6.1' - 18.0' bgs).
15 15	S-8	14'-16'	1.6	7 8 9 13	17	0.0			Dark gray, SILTY SAND, moist.		
	S-9	16'-18'	1.8	10 10 11 12	21	0.0					2-inch diameter SCH 40 PVC 0.010-inch slotted well screen (8.0' - 18.0' bgs).

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Remarks:
Elevations based on site specific datum.

Date Start/Finish: 04/23/02-04/23/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing: 5256.8
Easting: 5273.6
Riser Elevation: 89.21

Borehole Depth: 20.0 ft.
Surface Elevation: 89.6

Geologist: Michael R. Arlauckas

Well/Boring ID: MW-5
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet) / Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0 0	S-1	0'-2'	1.6	1 2 1 2	3	0.0			Dark brown, SILT and very fine SAND, little subangular/subrounded Gravel, trace Clay, Rootlets/Organics, moist.		8-inch diameter Flush mount road box.
	S-2	2'-4'	1.5	5 5 5 4	10	0.0			Brown to gray, very fine SAND, little Rock Fragments, Glass, Wood, dry.		24-inch square Concrete surface pad (0.0' - 1.5' bgs).
5 5	S-3	4'-6'	1.0	2 2 4 5	6	0.0			Dark gray very fine to medium SAND, little subrounded fine Gravel, moist.		ØØN Sand drain (0.10' - 2.5' bgs).
	S-4	6'-8'	1.0	10 9 4 3	13	0.0			Brown to gray, Rock Fragments, little fine to medium Sand, trace subrounded medium Gravel, moist to dry.		Cement/bentonite grout (2.5' - 5.6' bgs).
	S-5	8'-10'	0.9	3 5 8 7	13	0.0					Hydrated bentonite seal (5.6'- 7.8' bgs).
10 10	S-6	10'-12'	0.0	6 6 4 4	10	0.0			No Recovery.		2-inch diameter SCH 40 PVC riser (0.1' - 10.0' bgs.).
	S-7	12'-14'	0.6	5 5 6 4	11	0.0			Dark gray, fine to coarse Gravel, moist to wet.		ØØN Sand (7.8' - 20.0' bgs).
15 15	S-8	14'-16'	1.6	2 8 13 13	21	0.0			Dark gray medium to coarse SAND, trace subrounded fine Gravel, wet. Dark gray SILTY SAND in tip of spoon.		
	S-9	16'-18'	0.0	8 10 10 10	20	0.0			No Recovery.		2-inch diameter SCH 40 PVC 0.010-inch slotted well screen (10.0' - 20.0' bgs).
20 20	S-10	18'-20'	1.9	9 6 9 11	15	0.0			Dark gray, very fine SAND and SILT, wet. @18.0' - 18.4' Dark gray SILT.		

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Remarks:
Elevations based on site specific datum.

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:
Borehole Depth: 8.0 ft.
Surface Elevation:
Geologist: Michael R. Arlauckas

Well/Boring ID: SB-01
Client: Cornell University
Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0		0'-2'	1.1	3 5 6 4	11	0.0			Dark brown, SILT and fine SAND, little Asphalt, trace subangular/subrounded fine Gravel, moist.		
			2'-4'	1.0	4 4 6 4	10	0.0			Dark brown, fine to coarse SAND, little subangular/subrounded fine Gravel, trace Silt, moist.		Cement/bentonite grout (0.0' - 8.0' bgs).
5	5		4'-6'	1.1	4 3 2 4	5	0.0					
		S-4	6'-8'	1.5	4 8 7 6	15	0.0					

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Remarks:

Date Start/Finish: 04/24/02-04/24/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 18.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-02
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.6	1 4 4 4	8	0.0			Brown, SILTY SAND, little subangular/subrounded fine Gravel, moist.		
		S-2	2'-4'	1.9	5 4 3 2	7	0.0			Brown, very fine to coarse SAND, little subangular/subrounded fine Gravel, trace Silt, moist.		
5	5	S-3	4'-6'	1.6	4 5 4 4	9	0.0					
		S-4	6'-8'	1.7	4 5 4 6	9	0.0					
		S-5	8'-10'	1.0	4 3 2 2	5	0.0			Dark brown, medium to coarse SAND, some subangular/subrounded fine to medium Gravel, moist.		Cement/bentonite grout (0.0' - 18.0' bgs).
10	10	S-6	10'-12'	1.2	1 1 1 2	2	0.0					
		S-7	12'-14'	0.0	2 1 2 3	3	0.0			No Recovery		
15	15	S-8	14'-16'	1.5	3 5 27 30	32	0.0			Brown to gray, medium to coarse SAND, little subangular/subrounded fine Gravel, trace black Shale Fragments, wet.		
		S-9	16'-18'	0.9	14 15 14 20	39	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Hammer Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 8.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-03
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.1	2 2 2 3	4	0.0			Dark brown, very fine SAND and SILT, trace subangular to subrounded fine Gravel, moist.		
		S-2	2'-4'	0.9	6 6 5 4	11	0.0					
5	5	S-3	4'-6'	1.3	3 4 5 4	9	0.0			Dark brown fine to coarse SAND, little subangular to subrounded fine Gravel, moist.		Cement/bentonite grout (0.0' - 8.0' bgs).
		S-4	6'-8'	1.4	3 3 4 5	7	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 8.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-04
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.1	3 5 6 4	11	0.0			Dark brown, SILT and fine SAND, little Asphalt, trace subangular/subrounded fine Gravel, moist		
		S-2	2'-4'	1.0	4 4 6 4	10	0.0			Dark brown, fine to coarse SAND, little subangular/subrounded fine Gravel, moist, trace Silt, moist.		Cement/bentonite grout (0.0' - 8.0' bgs).
5	5	S-3	4'-6'	1.1	4 3 2 4	5	0.0					
		S-4	6'-8'	1.5	4 8 7 6	15	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
ıger Size: 4.25-inch
g Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 8.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-05
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.1	9 8 4 4	12	0.0			Dark brown, SILT and SAND, little Rock fragments, trace subangular/subrounded fine Gravel, moist.		
		S-2	2'-4'	1.1	4 5 6 6	11	0.0			Dark brown medium to coarse SAND and subrounded/subrounded fine Gravel, trace Silt, moist		Cement/bentonite grout (0.0' - 8.0' bgs).
5	5	S-3	4'-6'	0.9	4 6 6 4	12	0.0					
		S-4	6'-8'	1.1	5 4 4 5	8	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
'ger Size: 4.25-inch
g Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 8.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-06

Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.5	6 2 3 1	5	0.0			Dark brown SILTY SAND, little subangular to subrounded fine Gravel, trace Clay, Rootlets, moist.		
		S-2	2'-4'	1.2	5 4 5 5	9	0.0					
5	5	S-3	4'-6'	1.6	6 6 5 4	11	0.0			Dark brown, fine to coarse SAND, little subangular to subrounded fine Gravel, moist.		Cement/bentonite grout (0.0' - 8.0' bgs).
		S-4	6'-8'	1.5	2 3 5 4	8	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:

Borehole Depth: 8.0 ft.
Surface Elevation:

Geologist: Michael R. Arlauckas

Well/Boring ID: SB-07
Client: Cornell University

Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.1	8 7 5 4	12	0.0			Dark brown, SILTY SAND, little Rock fragments, trace fine to medium Sand, moist.		Cement/bentonite grout (0.0' - 8.0' bgs).
		S-2	2'-4'	1.2	5 4 5 4	9	0.0					
5	5	S-3	4'-6'	1.5	6 6 7 9	13	0.0			Dark brown to tan, fine to coarse SAND, little subangular to subrounded fine Gravel, trace Silt, moist.		
		S-4	6'-8'	1.6	7 12 7 6	19	0.0					

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Remarks:

Date Start/Finish: 04/25/02-04/25/02
Drilling Company: Nothnagle Drilling
Driller's Name: Neil Short
Drilling Method: HSA
Bit Size:
Auger Size: 4.25-inch
Rig Type: Track Mounted CME-75
Sampling Method: 2-inch diameter split spoon

Northing:
Easting:
Riser Elevation:
Borehole Depth: 8.0 ft.
Surface Elevation:
Geologist: Michael R. Arlauckas

Well/Boring ID: SB-08
Client: Cornell University
Location: Vineyard Research Laboratory
Fredonia, New York

Depth (feet)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Well Construction
0	0	S-1	0'-2'	1.8	2 3 2 1	5	0.0			Dark brown, SILTY SAND, little subangular to subrounded fine Gravel, trace coarse Sand, Rootlets/Organics, moist.		
		S-2	2'-4'	1.0	4 3 4 7	7	0.0			Dark brown, fine to medium SAND, little subangular to subrounded fine Gravel, moist.		
5	5	S-3	4'-6'	0.9	4 5 5 6	10	0.0					Cement/bentonite grout (0.0' - 8.0' bgs).
		S-4	6'-8'	1.1	4 6 4 5	10	0.0			Dark brown, fine to medium SAND, some little subangular to subrounded fine Gravel, trace Silt, moist.		

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Remarks: