Supplemental Remedial Investigation Report

Hadco Corporation
Owego, New York

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SECTION 1.0 INTRODUCTION

1.1 General

This Supplemental Remedial Investigation (RI) Report presents the results of the additional investigation activities performed by Blasland & Bouck Engineers, P.C. (Blasland & Bouck) for the Hadco Corporation (Hadco) at their facility located in Owego, New York. This report also presents a summary of the activities performed in connection with the development and implementation of the Interim Remedial Measure (IRM), which was designed to initiate the containment and recovery of the ground-water contamination identified at this site.

The investigation activities presented in this document have been implemented to augment the site characterization data already generated through Blasland & Bouck's previous remedial investigation activities. The results of the previous investigation activities are presented in the Remedial Investigation Report, dated December 1992.

1.2 Background

The Hadco Corporation facility is located at 1200 Taylor Road in the Town of Owego, New York (Figure 1). The facility comprises approximately 17.3 acres, and is bordered to the south by a municipal sewage treatment plant. The land to the west of the site is undeveloped,while the land to the north and east has been developed for industrial use. The facility immediately east of the Hadco facility (the Broadway Building) is leased by IBM Corporation (IBM). In addition, IBM owns and operates a large facility further to the east of the Hadco property. A complex of buildings, referred to as the Victory Plaza, is located northeast of the Hadco site. Previous investigations performed at the Victory Plaza and at the IBM Facility have shown the presence of dissolved organic constituents in the ground water underlying these sites. In addition, testing of the former septic system at the Broadway Building has identified the presence of trichloroethylene. Given their location hydraulically upgradient of the Hadco site, these facilities are potential off-site contributors to the dissolved constituents observed underlying the Hadco site. The location of the Hadco site in relation to these surrounding facilities is illustrated on the Site Vicinity Map, presented as Figure 2.

The original property was subdivided from the Taylor family farm in 1956 and sold to Mr. George Warneke. He then sold the property to the Owego Development Company, which developed this and surrounding properties for industrial use. The property was then leased to Mutual Design, which operated the first manufacturing operation at the facility through 1970. Robintech, Incorporated (Robintech) owned and operated this facility from 1970 through 1979, and expanded the facility in 1975 and again in 1977. The Robintech facility and the original 3.6-acre parcel of land it occupied were purchased by Hadco in 1979. The site was increased to its current size of 17.3 acres through the purchase of two adjacent parcels of land in 1981 (4.5 acres) and in 1984 (9.2 acres). Since acquiring the site, Hadco has expanded the facility five

times, including two expansions in 1983, an addition in 1984, another in 1985, and most recently in 1990/1991. A separate building was also constructed south of the main facility to house an on-site biological wastewater treatment system.

Several previous investigations were implemented at the site prior to the initiation of this RI. These previous investigations included: a Preliminary Site Evaluation; a Phase I Hydrogeologic Investigation; a Phase II Hydrogeologic Investigation; a Supplementary Hydrogeologic Investigation; and the performance of an initial RI task to establish a site-specific Project Compound List (PCL). As part of these previous programs, the original network of 16 monitoring wells (MW-1 through MW-15, and MW-17) was installed at the location indicated on Figure 3. The analytical results of these previous investigations have shown dissolved volatile organic constituents (VOCs) in the ground water underlying this site.

The scope of the initial RI activities involved installation and testing of 16 additional monitoring wells, including four shallow overburden wells (MW-19, MW-25, MW-31, and MW-33); eight deep overburden wells (MW-18, MW-23, MW-24, MW-26, MW-27, MW-29, MW-30, and MW-32); and four bedrock wells (MW-20, MW-21, MW-22, and MW-28). The initial RI activities also included 18 soil borings to evaluate the nature and extent of contamination within the suspected source areas; collection of nine surface soil samples in the vicinity of selected monitoring wells; surface water and sediment sampling of Barnes Creek; the performance of a vapor extraction pilot test near the former chemical storage area; the installation and pump testing of the recovery well PW-3; and the performance of a risk assessment. The results of the initial RI activities are detailed in the "Remedial Investigation Report, Hadco Corporation, Owego, New York," dated December 1992.

The risk assessment performed during the RI was composed of a human health risk assessment and an ecological assessment reflecting NYSDEC guidelines for Fish and Wildlife Impact Assessments (FWIA) Steps I and IIA.

The human health risk assessment involved:

- The identification of constituents of concern;
- Development of potential exposure scenarios;
- Calculation of exposure concentrations;
- Establishment of reference toxicity values; and
- Characterization of both carcinogenic and non-carcinogenic risks.

The constituents identified as chemicals of concern at this site included all compounds detected in ground water or soil above detection limits, with the exception of essential nutrients. In addition, compounds for which insufficient toxicity criteria is available were also excluded from the chemicals of concern.

The exposure assessment identified only two potential exposure pathways including off-site residential use of ground water and the possibility for exposure of a future excavation worker to soil in the source area. Based on the analytical data developed during the RI, reasonable maximum exposure (RME) concentrations were calculated for each chemical of interest. The reference toxicity values established were then used in conjunction with the exposure scenarios to characterize carcinogenic and non-carcinogenic risks associated with each potential exposure pathway for each of the chemicals of concern.

For hypothetical on-site excavation workers under future use conditions, all of the pathway-specific carcinogenic risks, as well as the sum of the carcinogenic risks for all pathways, are below USEPA's target range for acceptable risk at Superfund sites. The carcinogenic risk associated with hypothetical ingestion of ground water by residents is 6×10^{-4}. This risk is due primarily to the presence of beryllium (estimated risk of 3×10^{-4}) and 1,1-dichloroethene (estimated risk of 3×10^{-4}). The RME concentration of beryllium (0.005 mg/L) also exceeds the federal proposed MCL of 0.001 mg/L and the NYSDEC TOGS guidance value of 0.003 mg/L. The RME concentration for 1,1-dichloroethene (0.04 mg/L) exceeds both the Federal MCL (0.007 mg/L) and the NYSDEC Class GA ground water value (0.005 mg/L).

The non-carcinogenic risks, expressed as hazard indices, were calculated for each exposure pathway. The Hazard Index for the ingestion/dermal contact route for hypothetical on-site excavation workers is less than 1. The Hazard Index for inhalation exposure of these receptors to dust from soils at the site yields a Hazard Index of 4.0, which is greater than one, due solely to chromium.

The Hazard Index for hypothetical ingestion of ground water by off-site residents is 7 when exposure concentrations are based on the concentrations of chemicals detected in downgradient monitoring wells at the property boundary. The elevated Hazard Index for this pathway is primarily due to the presence of arsenic and manganese with significant contributions also from trichloroethene, 1,1-dichloroethene, cadmium, copper, and nickel. The upper 95 percent confidence limit concentration for arsenic exceeds the federal MCL and NYSDEC TOGS value for Class GA waters. A Hazard Index associated with ingestion of ground water, based solely on the detected volatile organic chemicals would be less than 1.

It should be noted that the estimated risks for hypothetical ingestion of ground water was calculated in accordance with EPA's previous requirement that beryllium be considered a human carcinogen. However, in a recent re-evaluation of water quality criteria proposed under the Clean Water Act, USEPA finally agreed that derivation of a cancer-based criterion for beryllium is not specifically defensible (Federal Register, Vol. 57, No. 246, December 22, 1992). Because USEPA's classification of beryllium as an oral carcinogen lacks scientific defensibility, and because USEPA has recently agreed that there is no scientific basis for classifying beryllium as an oral carcinogen, we recommend that estimated carcinogenic risks associated with ingestion of beryllium be ignored in this risk assessment. Therefore, the total carcinogenic risks associated with the hypothetical investigation of gorund water would be reduced to approximately half of the value presented in the RA.

1.3 Supplemental Investigation Objectives

The specific objectives of the supplemental RI activities include the following:

- Sufficiently delineate the extent of the contamination identified in the unsaturated zone soil associated with the former chemical storage area to support the selection of an appropriate remedial alternative for the source area;
- Provide a basis for evaluating the effectiveness of the IRM to contain and recover dissolved groundwater contamination observed to be migrating from the source area;
- Develop the additional data needed to evaluate the potential effectiveness of vapor extraction as a source area remediation technology; and
- Evaluate the potential for the site to have impacted the wetland area located downgradient of the Hadco facility.

SECTION 2.0 SUPPLEMENTAL INVESTIGATION ACTIVITIES

2.1 General

To accomplish the supplemental investigation objectives, the following additional tasks were completed at the Hadco facility:

Task 1 - Supplemental Source Area Characterization

Task 2 - Additional Ground-Water Sampling and Analysis

Task 3 - Phase II Vapor Extraction Pilot Test

Task 4 - Wetlands Sampling and Analysis

The activities implemented at the Hadco site since the completion of the initial RI activities have also included the design, construction, and start-up of an Interim Remedial Measure (IRM). The activities performed in connection with the IRM are summarized in Section 3 of this Report.

2.2 Supplemental Source Area Characterization

To further characterize the extent of constituents of concern in the soil underlying the former chemical storage area, a total of eight additional shallow soil borings were drilled, including borings CRB-13 through CRB-19 and VE-2, as presented on Figure 4. The additional borings are located to the east of the original boring locations, since the extent of the observed soil contamination was not adequately defined in this direction.

The soil borings were drilled by Parratt-Wolff, Inc., using a customized "T" stand rig that had been equipped with an electric cat head to facilitate operation inside the building. The compact design of the "T" stand rig allowed the borings to be completed within the clean room portion of Hadco's facility which had only 8 feet of clearance.

Split-spoon soil samples were obtained continuously in each boring from immediately below the floor slab of the building to either the water table or until refusal was encountered. The split-spoon samples were decontaminated between each use by: washing with a detergent and water solution; rinsing successively with potable water, methanol, and nitric acid; then triple rinsing with distilled water; and allowing the samples to air dry. The headspace of each sample was screened for total concentration of VOCs using a MicroTip photoionization detector (PID).

Each sample was also classified according to color, grain size, density, and relative moisture content of the materials encountered. This information was recorded in the field and is summarized on the boring logs presented in Appendix A.

Based on the results of the field screening and observations, selected soil samples were submitted to RECRA Environmental, Inc. to be analyzed for Target Compound List (TCL) VOCs in accordance with the New York State Department of Environmental Conservation's (NYSDEC) ASP 91-1, and selected inorganics including beryllium, chromium, copper, lead, and zinc. A total of 11 soil samples were selected to be analyzed for these constituents.

To evaluate the potential leachability of the VOCs and inorganic constituents observed in the source area soil, a total of three soil samples were submitted for TCLP analyses for the VOCs and selected inorganics. The samples selected for the TCLP analyses included the 6 to 8 foot sample from boring CRB-14, the 4 to 6 foot sample from boring CRB-17, and the 4 to 6 foot sample from boring VE-2.

Although the Supplemental Source Area Characterization program was intended to include only seven additional soil borings, the field screening of the soil samples in the eastern-most borings suggested that the eastern horizontal extent of VOCs had not been delineated. Therefore, an additional soil boring (CRB-19) was drilled just beyond the eastern limits of the clean room areas overlying the source area.

2.3 Additional Ground-Water Sampling and Analysis

An additional round of ground-water samples was collected from 17 selected monitoring wells on June 28 and 29, 1993. This additional round of sampling was performed to provide baseline data on ground-water quality prior to initiation of the IRM. The wells sampled during this supplemental round included MW-2, MW-6, MW-11, MW-15, MW-17, MW-19, MW-23, MW-24, MW-25, MW-26, MW-27, MW-29, MW-30, MW-31, MW-32, MW-33, and PW-3.

Each well was purged of at least three well volumes prior to sample collection. The ground-water samples were collected using disposable dedicated bailers and a length of new polypropylene line. The samples were placed immediately into laboratory-provided sample containers that had been appropriately labeled. The sample containers were placed in coolers and maintained at approximately 4°C until delivery to the laboratory. A chain of custody was initiated for each sample and maintained through delivery to RECRA Environmental, Inc. The samples were submitted to be analyzed for TCL VOCs and selected inorganic constituents, including chromium, copper, and zinc.

A complete round of water level measurements was performed prior to initiation of the ground-water sampling activities. The depth to ground water recorded for each well and the calculated ground-water elevations are summarized on Table 1.

2.4 Phase II Vapor Extraction Pilot Test

The results of the initial vapor extraction pilot test performed during August 1992 were inconclusive as to the potential effectiveness of this remedial technology. Although the previous vapor extraction test indicated that the use of extraction wells located adjacent to the building would not be effective in drawing soil vapor from the source area soil located under the building, the possibility of utilizing extraction wells located within the source area soils still represented a potential remedial approach.

To evaluate the effectiveness of the vapor extraction remedial alternative, Blasland & Bouck performed a Phase II Vapor Extraction Pilot Test on September 25, 1993. The extraction point used for this test was the vapor extraction well VE-2, which was installed in the center of the source area during the Supplemental Source Area Characterization activities (Figure 4). This well was constructed by installing a five-foot length of 2-inch diameter, 0.04 slot PVC well screen from 6 feet to one foot below the base of the floor slab. An appropriate length of riser pipe was used to extend the screen to the surface. A coarse, rounded pea gravel was placed around the well screen as a filter pack, and a hydrated bentonite seal was installed above the filter pack. The well was completed flush with the floor within a 4-inch diameter valve box. The boring log and well construction detail for VE-2 is presented in Appendix A.

The three existing vapor probes, VP-1 through VP-3, installed for the previous vapor extraction pilot test, were used as monitoring points for the Phase II pilot test. The probes were equipped with a magnehelic gauge that monitored the vacuum induced in the subsurface as a result of the vacuum applied to the extraction well. The location of the vapor probe in relation to the extraction well VE-2 is illustrated on Figure 4.

A 5 horsepower regenerative blower was used as the vacuum source. The vacuum applied to the extraction well VE-2 and the induced vacuum observed at each of the three vapor probes were recorded at 5-minute intervals throughout the test. The rate at which vapor was extracted was also monitored and recorded throughout the test.

The pilot test was performed in two steps. The applied vacuum was maintained at approximately 16 inches of water during the first step, then increased to approximately 68 inches of water during the second step of the test.

To evaluate the potential VOC removal rates associated with soil vapor extraction, a total of two vapor samples were collected from the extracted vapor, including one vapor sample collected at the end of each step of the test. The vapor samples were submitted to Target Laboratories, Inc. (Target) to be analyzed by a direct air injection GC Method for chlorinated VOCs using an electron capture detector.

2.5 Wetland Sampling and Analysis

To evaluate the potential for the site to have impacted the wetland area located to the south and southwest of the site, Blasland & Bouck performed a Wetland Sampling and Analysis program.

In accordance with the NYSDEC's letter of February 3, 1993, the wetland sampling program was intended to include the collection of both surface water and sediment samples from two locations within the wetland downgradient of the site. On October 3, 1993, the wetland area was surveyed to select appropriate sampling locations.

A thorough reconnaissance was performed of the entire wetland area located between the Town of Owego Publicly-Owned Treatment Works (POTW) property and the railroad tracks (which are parallel to Route 17C) and extending approximately 1,500 feet toward the west. However, no surface water was observed to be present in the wetland area downgradient of the site. Therefore, the wetland sampling performed was limited to the collection of sediment samples.

A total of two sediment samples were collected from the locations indicated on Figure 5. Each sample was collected from a depth of 0 to 6 inches using a dedicated stainless steel sampling spoon. Upon collection, the samples were placed directly into laboratory-provided containers and placed on ice in a cooler for delivery to the laboratory. The sediment samples were submitted to RECRA Environmental, Inc. to be analyzed for VOCs and selected inorganics including chromium, copper, and zinc. In addition, the sediment samples were analyzed for total organic carbon.

SECTION 3.0 SUMMARY OF INTERIM REMEDIAL MEASURES

3.1 General

An Interim Remedial Measure (IRM) was initiated at the Hadco facility to begin remediating the dissolved organic constituents observed in the ground water downgradient of the former chemical storage area. The rapid initiation of this IRM also serves to begin reducing the potential for off-site migration of these dissolved constituents. To accomplish these objectives, the IRM has involved the construction and operation of an interim ground-water recovery and treatment system. The principle components of this system included a submersible ground-water recovery pump installed in the existing recovery well PW-3 and a shallow tray-type air stripper ground-water treatment system.

The activities implemented in connection with the IRM program at this site have included:

- Development of IRM Work Plan and Conceptual Design;
- Preparation of Final Design Drawings and Specifications;
- Construction and Startup of IRM System;
- Initial IRM System Monitoring.

A summary of each of these activities is presented below.

3.2 Development of the IRM Work Plan and Conceptual Design

The first activities implemented in connection with the IRM was the development of the IRM Work Plan, dated March 1993, which proposed the conceptual design of the IRM system. This Work Plan presented a description of the specific activities to be performed in association with the design and operation of the system as well as the basis for design of the system.

The Order on Consent (Index #A701518809) between Hadco and the NYSDEC was modified in March 1993 to incorporate the IRM Work Plan.

3.3 Preparation of Design Drawings and Specifications

Upon approval of the conceptual design of the IRM, a detailed set of design drawings and technical specifications for the recommended ground-water recovery and treatment system was prepared by Blasland & Bouck. The design drawings and technical specifications included the following:

1) Site plan;

2) Process equipment layout;

3) Recovery well details;

4) Pipe trench details;

5) Process and instrumentation diagram;

6) Enclosure floor plan;

7) Enclosure section and details;

8) Structural details;

9) Electrical one-line diagram; and

10) Miscellaneous piping details.

The design drawings and technical specifications were signed and sealed by a licensed professional engineer registered in New York State and were submitted to the NYSDEC for review. The NYSDEC approved the design drawings and specifications without modification in their letter of June 21, 1993.

3.4 IRM Construction and Startup

Construction of the IRM was performed by New York Environmental Construction, Inc. between August and October 1993. The construction of the IRM consisted of the installation of the following facilities:

1) A ground-water collection/pumping system;

2) A low-profile air stripper; and

3) A water discharge pipe to the existing sanitary sewer.

An on-site construction observer was provided by Blasland & Bouck on a part-time basis throughout the construction activities. The responsibilities of the construction observer included periodic construction observation to: verify that construction work was in general accordance with the design drawings; record unusual circumstances observed; and obtain a photographic log of construction activities. Blasland & Bouck also reviewed contractor submittals (i.e., shop drawings) to determine general conformance with the contract documents.

The ground-water collection/pumping system was designed for the purpose of collecting and pumping ground water to the low-profile air stripper. In general, the ground-water collection/pumping system consisted of an existing ground-water pumping well, a new well pump, two new pre-cast concrete manholes (MH-1 and MH-2), piping, electrical equipment and conduits, and instrumentation.

The low-profile air stripper was installed to remove VOCs from the ground water to meet the Town of Owego sanitary sewer discharge limits in accordance with the IRM Work Plan. The shallow tray-type air stripper was furnished by Northeast Environmental Products, Inc. (NEEP) and consists of an influent spray nozzle and three vertically stacked trays. Influent water is sprayed into the inlet chamber through a spray nozzle. Water then flows over a flow distribution weir and through the baffled aeration trays. VOCs are then stripped from the water by an air flow provided by a blower mounted next to the low-profile air stripper. The air exhausts through an 8-inch diameter stainless steel stack located on the top of the unit, which extends vertically through the roof of the Biological Treatment Plant Building.

The water discharged from the low-profile air stripper is directed to an existing sanitary sewer system manhole located southeast of the Biological Treatment Building via a 3-inch diameter CPVC pipe installed for this system.

The startup of the IRM system was initiated in accordance with the IRM System Startup Plan submitted to the NYSDEC on September 17, 1993. The activities performed prior to startup of the system included a review of the installation by a representative of the air stripper manufacturer and operation training.

An As-Built Construction Report, Ground Water Interim Remedial Measure, will be prepared presenting a detailed set of record drawings which will document the as-built location of the low-profile air stripper, manholes, piping, and other appurtenances constructed at the Hadco facility.

3.5 Initial IRM System Monitoring

Following the startup of the IRM system, Hadco initiated the IRM monitoring program in accordance with the Operation Monitoring Plan submitted to the NYSDEC on September 17, 1993.

As per this plan, Hadco personnel have inspected the system at least three times per day since commencement of the system's operation. These inspections include a general inspection of the equipment to identify operational problems (i.e., leaks, alarms, equipment shutdown, etc.). In addition, system operation data including date and time of inspection, name of inspector, influent flow rate, influent pressure, and air pressure are recorded in an IRM Operation Monitoring Log. A copy of the initial entries in this log are presented in Appendix B.

To evaluate the effectiveness of the air stripper in achieving its performance objectives, two sets of effluent samples have been collected. The first sample was collected on October 14, 1993, approximately 48 hours after startup of the system. This effluent sample was analyzed for volatile organic compounds by Method 8240 as well as for other parameters limited under Hadco's POTW discharge permit, including: oil and grease, copper, nickel, lead, tin, and TSS. The results of this sample showed no detectable levels of any

volatile organic compounds. The observed levels of oil and grease (1.8 mg/L) and copper (0.02 mg/L) were both below their respective permit limits. No nickel, lead, tin, or TSS were detected in the sample. A second sample was collected from the treatment system effluent on October 21, 1993 and submitted for volatile organic analysis. Although no volatile compounds were observed at a concentration above the contract required detection limit, methylene chloride was detected at an estimated concentration of 0.8 ug/L, which is below the detection limit. Copies of the laboratory analytical reports for both of the IRM system effluent samples are presented in Appendix B.

The continuation of the IRM monitoring program for this site will include the collection of monthly groundwater samples from selected wells for the first six months that this system is operational. This data will be used to evaluate the effectiveness of the monitoring program.

SECTION 4.0 RESULTS OF SUPPLEMENTAL INVESTIGATION

4.1 General

This section presents the results of the Supplemental RI performed to augment the site characterization results generated through the previous RI activities. The additional data developed through the performance of these supplemental activities include both additional physical site characterization information as well as further data to delineate the nature and extent of the environmental impacts associated with the site.

4.2 Results of the Supplemental Source Area Characterization

The Supplemental Source Area Characterization activities were performed to further delineate the extent of the soil contamination associated with the former chemical storage area. These activities involved drilling eight additional soil borings at the locations identified as CRB-13 through CRB-19 and VE-2 (Figure 4). A total of 11 soil samples were selected from these borings to be submitted for laboratory analysis. Each of these samples was analyzed for TCL VOCs and selected inorganics, including beryllium, chromium, copper, lead, and zinc.

One soil sample was selected for laboratory analysis from each boring on the basis of the field screening of relative concentrations of total VOCs using a MicroTip PID. The results of the field screening of each soil sample are presented on the boring logs included in Appendix A. These field screening results indicated that the highest levels of VOCs were predominantly observed in the soil zone at a depth of approximately 6 to 8 feet below the building's floor slab. This zone correlated to the soil immediately above the water table. Relatively few VOCs were present in the shallow soil zone extending from immediately below the building to approximately 4 to 6 feet. This may be attributable to the effects of regrading activities on the near surface soil prior to construction of the new addition to the facility which was built in the former chemical storage area by Robintech in 1975. To confirm the apparent vertical distribution of the contamination within the soil of the source area, an additional soil sample was selected for laboratory analysis from a depth of 2 to 4 feet from each of three borings, including VE-2, CRB-14, and CRB-17.

The results of the VOC analyses performed on the soil samples collected during this Supplemental Investigation are summarized on Table 1. The high concentrations of VOCs were observed in the soil samples from boring VE-2, which was located at the approximate center of the source area. The boring VE-2 was also used to construct the vapor extraction well for the Phase II Vapor Extraction Pilot Test. Although the VOC observed in the highest concentration was trichloroethene (TCE), several other compounds were observed at concentrations exceeding one part per million (ppm), including tetracholorethene, toluene, 1,1,1-trichloroethane, and xylenes. An isoconcentration map illustrating the distribution of total VOCs detected in the soil underlying the former chemical storage area is presented as Figure 6. This figure incorporates the analytical results from the previous borings, CRB-1 through CRB-12,

with the analytical results from the supplemental borings, CRB-13 through CRB-19. As illustrated by this figure, the extent of the soil contamination associated with the former chemical storage area has now been adequately delineated.

The analytical results of the shallow soil samples collected from borings VE-2, CRB-14, and CRB-17 indicate the presence of only relatively low concentrations of VOCs. This confirms the results of the field screening, which suggests that the shallow soil immediately underlying the building contains relatively little contamination while the soil zone immediately above the water table represents the principle source of VOC contamination.

The results of the inorganic analyses performed on the soil samples collected during the Supplemental Source Area Characterization are summarized on Table 2. The results of these analyses show no detectable levels of beryllium in any of the samples, and concentrations of zinc are consistent with the normal background concentrations that would be anticipated in the site vicinity. However, the ranges in concentrations of both chromium (18.8 to 3,490 milligrams per kilogram [mg/kg]) and copper (18.8 to 2,460 mg/kg) were observed to extend above the background levels that would be anticipated. These two inorganic constituents were also observed at elevated concentrations in soil samples previously collected from borings CRB-1 through CRB-12 in this source area.

Three soil samples were selected during the Additional Source Area Characterization activities to be submitted for laboratory analysis by the TCLP for VOCs and selected inorganics. The samples selected for TCLP analysis included the 4 to 6 foot samples from CRB-17 and VE-2 as well as the 6 to 8 foot sample from CRB-14. The results of the VOC analyses of the TCLP extracts are summarized on Table 3. These results demonstrate the leachable concentrations of TCE in the source area soil. The observed concentrations of TCE in the TCLP extracts also indicate that these soils, if excavated, would have to be addressed as a characteristic hazardous waste. The results of the inorganic analyses of the TCLP extracts are summarized on Table 4. Although none of the inorganic concentrations exceeded the criteria for a characteristic hazardous waste, the concentrations of both chromium and copper in at least one of the samples were observed to exceed NYSDEC's ground-water quality standards.

4.3 Results of Additional Ground-Water Sampling and Analysis

To provide baseline data regarding the existing ground-water quality across the site prior to startup of the IRM ground-water recovery and treatment system, Blasland & Bouck collected an additional round of ground-water samples from selected monitoring wells. A total of 17 existing monitoring wells were selected for this additional round of testing, including: MW-2, MW-6, MW-11, MW-15, MW-17, MW-19, MW-23, MW-24, MW-25, MW-26, MW-27, MW-29, MW-30, MW-31, MW-32, MW-33, and PW-3. The locations of these wells are indicated on Figure 3.

Prior to purging and sample collection, a complete round of water level measurements was recorded from the existing wells at the site. A summary of the ground-water elevation data recorded on June 28, 1993, is presented on Table 5. This table also presents a summary of the historical ground-water elevation data for the wells at the site. The current ground-water elevation data has been used to develop contour maps for

each of the three zones monitored by the existing wells at the site. The ground-water elevation contour maps for the shallow overburden wells, deep overburden wells, and bedrock wells are presented as Figures 7, 8, and 9, respectively. The direction of ground-water flow indicated by these figures is generally toward the southwest, which is consistent with the previous ground-water elevation contour maps presented in the RI Report.

The results of the VOC analyses preformed on the ground-water samples collected for this additional round of testing are summarized on Table 6. To evaluate any apparent changes in ground-water quality, these analytical results have been compared with the ground-water quality data previously generated for this RI. The VOCs observed in the highest concentrations included trichloroethene, 1,1,1-trichloroethane, 1,1-dichloroethene, and toluene. This is consistent with the previous data. While the bedrock monitoring well MW-17 experienced a relatively large reduction in the observed concentration of the VOCs, the concentrations of these compounds were observed to increase in several of the deep overburden wells, including MW-23, MW-24, and MW-27. However, the observed concentrations of VOCs in most of the wells remained generally unchanged.

The results of the inorganic analyses performed on the ground-water samples are summarized on Table 7. A comparison of the recent data with the previously generated ground-water quality data for inorganics indicates that the concentrations of all three of these constituents of concern (chromium, copper, and zinc) were observed to decrease in wells located near the downgradient property boundary (MW-11) and the former chemical storage area (MW-19). In fact, the concentration of chromium in MW-11 declined from a high of 5.86 mg/L in October 1991 to only 1.0 mg/L in June of 1993. The concentration of copper in this well declined from 1.44 mg/L to 0.58 mg/L over the same period. The concentration of zinc in MW-11 was also observed to decline from 1.63 mg/L to 0.53 mg/L between October 1991 and June 1993. The concentrations of these inorganics in the monitoring well MW-19, located closest to the former chemical storage area also show considerable reduction between October 1991 and June 1993. Chromium was observed to decline from 17.6 mg/L to 6.7 mg/L; the copper concentration was reduced from 22.5 mg/L to 14.1 mg/L; and zinc concentrations decreased from 0.87 mg/L to 0.52 mg/L. However, the most recent concentrations of chromium, copper, and zinc detected in both of these wells still exceed NYSDEC's ground-water quality standards.

4.4 Results of the Phase II Vapor Extraction Pilot Test

The Phase II Vapor Extraction Pilot Test involved the use of a regenerative blower to apply a vacuum to the vapor extraction well VE-2, which had been installed near the center of the source area in which VOC contamination of the soil had been identified.

The information recorded during the implementation of the vapor extraction pilot test included measurements of the vacuum applied to the extraction well, the rate of flow at which soil vapor was extracted, and the induced vacuum at each of three existing vapor probes resulting from the applied vacuum. These measurements were recorded at 5-minute intervals throughout the course of the pilot test and are summarized on Table 8.

During the first step of the pilot test, the vacuum applied to the extraction well was maintained between 15.5 and 16 inches of water. This resulted in a soil vapor extraction rate of approximately 19 standard cubic feet per minute (SCFM). The initial response to this applied vacuum was observed almost immediately at the vapor probe P-1, located approximately 10 feet from the extraction well VE-2. The time from the start of the test required to observe an initial response at vapor probes VP-2 and VP-3 was approximately 2 minutes and 10 minutes, respectively. The observed vacuum in all three of the vapor probes had stabilized within 10 to 15 minutes of the test startup. At the end of the first step of the Phase II Vapor Extraction Pilot Test, the observed vacuum in the three vapor probes ranged from 0.01 to 0.03 inches of water (Table 8). The first soil vapor sample (VE-2-1) was collected from the sampling port of the vapor extraction pilot unit at the end of the first step of the test. The analytical results of this sample are summarized on Table 9. As anticipated, trichloroethene (23,108 micrograms per liter [ug/L]) and 1,1,1-trichloroethane (2,064 ug/L) were the compounds detected in the highest concentrations in this sample. Two other compounds, 1,1-dichloroethene and tetrachloroethene, were also observed at concentrations in excess of 100 ug/L. Trace concentrations of four more compounds, including chloroform, methylene chloride, cis 1,2-dichloroethene, and trans 1,2-dichloroethene, were also detected in this sample.

At the start of the second step of the pilot test, the vacuum applied to the extraction well was increased to approximately 68 inches of water. This resulted in an increase in the vapor extraction rate to approximately 38 SCFM. The vacuum applied to the extraction well by the pilot test unit gradually decreased from 68 inches of water to 62 inches of water over the duration of the second step of the test. However, the vapor flow rate remained generally constant at approximately 38 SCFM. The response to the increase in applied vacuum was noted immediately in vapor probes VP-1 and VP-2. Vapor probe VP-3 did not respond to the increase in applied vacuum until 10 minutes into the second step of the test. At the conclusion of the second step of the vapor extraction pilot test, the observed vacuum in the vapor probe ranged from 0.015 to 0.09 inches of water. The second soil vapor sample was collected immediately prior to the conclusion of the second step of the test. The analytical results for this sample are also summarized on Table 9. Trichloroethene and 1,1,1-trichloroethane were detected in this sample at concentrations of 30,881 ug/L and 1,757 ug/L, respectively. These concentrations, as well as the concentrations of the other VOCs detected were generally consistent with the first vapor sample.

Based on the average concentration of total VOCs detected in the soil vapor samples collected during this pilot test (29,327 ug/L) and the rate of vapor withdrawal during the second portion (38 SCFM), the average rate at which volatile compounds were removed during the Phase II Vapor Extraction Pilot Test was approximately 1.6 grams per day (g/day).

The results of the Phase II pilot test indicate that properly located and constructed extraction wells can achieve significant contaminant removal rates. However, the relatively low response observed in the vapor probes in terms of the induced vacuum indicates that the effective zone of influence around the vapor extraction point is very limited.

4.5 Results of Wetland Sampling and Analysis

The area hydraulically downgradient of the site includes a wetland area identified in a topographical depression, located south of the site and extending approximately 5,000 feet toward the northwest. To evaluate whether the downgradient wetland area exhibits any indication of impacts, Blasland & Bouck collected two sediment samples from the locations indicated on Figure 5. These samples were submitted to RECRA Environmental, Inc. to analyze for VOCs and selected inorganics, including, chromium, copper, and zinc. In addition, these samples were analyzed for total organic carbon (TOC). Although Blasland & Bouck had also intended to collect surface water samples from the same location, no standing water was present throughout the wetland area downgradient of the site.

The results of the VOC analyses performed on the sediment samples are summarized on Table 10. These results show no indication of any VOCs being present in the sediment. The results of the inorganic analyses and TOC analyses are presented on Table 11. These results show concentrations of chromium ranging from 683 to 790 mg/kg, copper ranging from 8.3 to 162 mg/kg and zinc ranging from 48 to 102 mg/kg. TOC concentrations were observed at 786 micrograms per gram (ug/g) to 1,430 ug/g.

The observed concentrations of both chromium and copper were elevated in comparison to the range of concentrations found in background soil. The source of these inorganics has yet to be identified. Potential sources located in the vicinity of these wetlands include the Town of Owego POTW property, the Broadway Building located to the northeast, as well as the Hadco facility located north of the POTW property.

SECTION 5 CONCLUSIONS

5.1 General

This section presents Blasland & Bouck's conclusions based on the Supplemental RI results presented herein as well as the previous RI results presented in the RI Report for Hadco Corporation dated December 1992. The following conclusions are presented according to the investigation objectives that they address.

5.2 Conclusions Regarding Potential Source Areas

The following conclusions have been developed based on the available data regarding the potential on-site and off-site sources of the constituents observed in the subsurface at this site:

1. The principle source of the VOCs observed in the subsurface appears to be the former chemical storage area. The horizontal extent of the residual soil contamination in this area has been delineated toward to the north, west, and south by the original RI results. The extent of residual contamination toward the east has also been demonstrated through the Supplemental Source Area Investigation results.

2. The former Robintech septic leach field, which was also identified as a potential source area, does not appear to be acting as a source of chemical constituents to the subsurface.

3. Dissolved TCE continues to be observed in the overburden ground-water monitoring wells located upgradient of the Hadco facility. This demonstrates that an off-site source of dissolved TCE exists upgradient of the Hadco site. The apparent contribution of this off-site source is relatively small in comparison to the concentrations of TCE and other organics observed emanating from the vicinity of the former chemical storage area.

4. Although VOCs were previously demonstrated to be present in the septic system of the Broadway Building located immediately east of the site, the investigations performed to date do not provide an adequate basis for evaluating the relative contributions of dissolved constituents from this source area to the ground water underlying the Hadco site.

5. The presence of chromium and copper concentrations above background levels in the soil samples from the former chemical storage area suggests that this area may act as a contributing source of the dissolved chromium and copper observed in ground water downgradient of the area.

6. The analytical results of the soil samples collected to evaluate potential sources of the dissolved inorganics observed in wells MW-3, MW-7, and MW-11 did not indicate the presence of a source area in the vicinity of these wells.

7. The Phase II Vapor Extraction Pilot Test demonstrated that reasonable VOC removal rates could be achieved with vapor extraction remedial methods. However, the limited zone of influence indicated by the pilot test results also suggest that the extraction points of a full-scale system would have to be spaced at intervals of approximately 10 feet or less.

5.3 Conclusions Regarding Ground-Water Quality

The following conclusions are related to the investigation objectives regarding ground-water quality issues:

1. The dissolved constituents in the ground water underlying the Hadco site appears to include a number of halogenated VOCs (principally TCE, TCA, and DCE) and several aromatic hydrocarbons (including toluene, ethylbenzene, and xylenes).

2. Several inorganic constituents (including chromium, copper, lead, and zinc) were identified in ground-water samples at concentrations that exceed their respective NYSDEC Guidance Values by an order of magnitude or more, and that are not indicative of background conditions. The presence of chromium and copper in the soil of the former chemical storage area suggests this area is a contributing source of these inorganic constituents in ground water. The source(s) of the other inorganics not attributable to background conditions has not been identified.

3. The horizontal distribution of the dissolved VOCs observed in the shallow overburden aquifer extends the length of the site. The concentrations observed in the upgradient wells were consistently low. The highest concentrations of VOCs were observed immediately downgradient of the former chemical storage area. These high concentrations were observed to attenuate downgradient of the source area.

4. The groundwater analytical results show that dissolved VOCs have migrated vertically into the deeper zones of the overburden aquifer. The concentrations observed in the deep overburden wells near the former chemical storage area may suggest the movement of dense, non-aqueous phase liquids (DNAPLs) through the subsurface in this vicinity.

5. The analytical results of the ground-water samples from the new off-site well clusters located downgradient of the site show the attenuation of the dissolved constituents of concern to relatively low concentrations.

6. The results of the initial RI data suggest that the impact to ground water in the bedrock downgradient of the site is limited to only low concentrations of VOCs; however, increased concentration of VOCs were observed in the bedrock well at the downgradient property boundary during both of the subsequent rounds of ground-water sampling from this well.

5.4 Conclusions Regarding Surface Water Quality

The results of the surface water and wetland investigation activities implemented as part of the Supplemental RI support the following conclusions:

1. The analytical results of the surface water samples show no indication of any adverse impacts to the Barnes Creek from the Hadco site. However, the upstream water samples did indicate the presence of trace concentrations of TCE from some upstream source.

2. The results of both the VOC and inorganic analyses performed on the sediment samples collected from Barnes Creek also showed no indication of adverse impacts associated with the site.

3. The results of the wetland sediment sample showed no indication that the VOCs observed at the site have had any adverse impact on the wetland area. However, elevated levels of both chromium and copper were detected in the sediment samples. Potential sources of these inorganics in the vicinity of the wetlands include the Town of Owego POTW property, the Broadway Building, and the IBM facilities located to the northeast as well as the Hadco facility located north of the POTW property.

Respectfully Submitted:

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Officer

Prepared by:
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Tables

TABLES

TABLE 1

SUMMARY OF ANALYTICAL RESULTS
PHASE II SOURCE AREA CHARACTERIZATION – DECEMBER 1992
VOLATILE ORGANIC COMPOUNDS IN SOIL

HADCO CORPORATION
OWEGO, NEW YORK

SAMPLE ID (SAMPLE DEPTH)	CRB-13 (6 to 8 ft.)	CRB-14 (2 to 4 ft.)	CRB-14 (6 to 8 ft.)	CRB-15 (4 to 6 ft.)	CRB-16 (6 to 8 ft.)	CRB-17 (2 to 4 ft.)	CRB-17 (4 to 6 ft.)	CRB-18 (4 to 6 ft.)	CRB-19 (4 to 6 ft.)	CRB-20* (4 to 6 ft.)	VE-2 (2 to 4ft.)	VE-2 (4 to 6 ft.)
Compound												
Acetone	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethene (total)	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	850 J	--	--	--	--	--	--	--	--	--
2-Hexanone	--	--	470 J	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	1 J	--	--	--	1 J	--	--	--	--	--	--
4-Methyl-2-Pentanone	--	--	610	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	110 J	--	--	--	--	--	--	--	--	--
Tetrachloroethene	170 J	1 J	23,000	280 J	27	--	7 J	3 J	0.9 J	610 J	--	110,000 J
Toluene	100 J	2 J	7,600	100 J	--	--	3 J	1 J	--	79 J	--	46,000 J
1,1,1-Trichloroethane	--	1 J	2,800	--	25	--	5 J	2 J	--	--	--	170,000
1,1,2-Trichloroethane	--	--	360 J	--	2 J	--	--	--	--	--	--	--
Trichloroethene	2,500	170	360,000 D	5,400	3,300 D	9 J	200 D	210	6 J	9,900	13	5,300,000 D
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (total)	110 J	--	5,000	--	--	--	--	--	--	--	--	13,000 J
Total VOCs	2,880	175	400,800	5,780	3,354	10	215	216	7	10,589	13	5,639,000

Notes:
All concentrations reported in ug/kg, dry weight (ppb).
B = Compound determined to be present in the blanks as well as in the sample.
J = Estimated value; concentration less than the quantitation limit but greater than zero.
D = Coumpounds identified at a secondary dilution factor.
-- = Not detected.
Total VOCs is the sum of the concentrations for the volatile organic compounds listed.
*CRB-20 is a duplicate of CRB-15 (4 to 6 feet).

TABLE 2

SUMMARY OF ANALYTICAL RESULTS
PHASE II SOURCE AREA CHARACTERIZATION – DECEMBER 1992
INORGANICS IN SOIL

HADCO CORPORATION
OWEGO, NEW YORK

ANALYTE	SAMPLE I.D.											
	CRB–13 (6 to 8 ft)	CRB–14 (2 to 4 ft)	CRB–14 (6 to 8 ft)	CRB–15 (4 to 6 ft)	CRB–16 (6 to 8 ft)	CRB–17 (2 to 4 ft)	CRB–17 (4 to 6 ft)	CRB–18 (4 to 6 ft)	CRB–19 (4 to 6 ft)	CRB–20* (4 to 6 ft)	VE–2 (2 to 4 ft)	VE–2 (4 to 6 ft)
Beryllium	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.2 U
Chromium	419	595	1810	1220	2700	18.8	1590	1800	866	1270	2670	3490
Copper	238	220	438	385	268	18.8	143	830	117	543	2460	524
Lead	230	489	477	688	498	3.7	155	1570	108	667	268	625
Zinc (total)	81.8	35.1	32.3	27.5	37.5	73.3	37.0	12.7	18.0	15.6	56.6	16.2

Notes:

All concentrations reported in mg/kg (ppm).

B – Compound determined to be present in the blanks as well as in the sample.

U – Compound was analyzed for but not detected.

* Duplicate sample of CRB–15 (4 to 6 feet).

TABLE 3

SUMMARY OF TCLP ANALYTICAL RESULTS
PHASE II SOURCE AREA CHARACTERIZATION
VOLATILE ORGANIC COMPOUNDS

HADCO CORPORATION
OWEGO, NEW YORK

SAMPLE ID (SAMPLE DEPTH)	CRB-14 (6 to 8 ft.)	CRB-17 (4 to 6 ft.)	VE-2 (4 to 6 ft.)
Compound			
Benzene	--	--	8 J
2-Butanone	--	--	--
Carbon Tetrachloride	--	--	--
Chlorobenzene	--	--	4 J
Chloroform	--	--	--
1,2-Dichloroethane	--	--	--
1,1-Dichloroethene	--	--	--
Tetrachloroethene	120	4 J	880
Trichloroethene	2,500 D	270	43,000 D
Vinyl Chloride	--	--	--

Notes:
All concentrations reported in ug/L.
J = Estimated value;concentration less than the quantitation limit but greater than zero.
D = Coumpounds identified at a secondary dilution factor.
-- = Not detected.

TABLE 4

SUMMARY OF TCLP ANALYTICAL RESULTS
PHASE II SOURCE AREA CHARACTERIZATION
INORGANICS

HADCO CORPORATION
OWEGO, NEW YORK

SAMPLE ID (SAMPLE DEPTH)	CRD-14 6'-8'	CRD-17 4'-6'	VE-2 4'-6'
Compound			
Arsenic	4.0 U	4.0 U	4.0 U
Barium	230	440	550
Beryllium	5.0 U	5.0 U	5.0 U
Cadmium	0.40 B	0.30 B	0.40 B
Chromium	1030	100	3110
Copper	1780	198	3880
Lead	660	15.0 U	900
Mercury	0.23	0.20 U	0.20
Selenium	4.0 U	4.0 U	4.0 U
Silver	1.0 U	1.0 U	1.0 U
Zinc	71.0	72.0	53.0

Notes:
Concentrations reported in ug/L.
U = Not detected.
D = Indicates a value greater than the instrument detection limit but less than the contract required detection limit.

TABLE 5

SUMMARY OF GROUND–WATER ELEVATION DATA

HADCO CORPORATION
OWEGO, NEW YORK

Well I.D.	Water Bearing Zone Monitored	Reference Elevation*	10/30/91		8/31/92		10/21/92		6/28/93	
			Depth to Water	Ground Water Elevation	Depth to Water	Ground Water Elevation	Depth to Water	Ground Water Elevation	Depth to Water	Ground Water Elevation
MW–1	Shallow Overburden	842.22	7.69	834.53	---	---	9.66	832.56	8.32	833.90
MW–2	Shallow Overburden	841.13	11.53	829.60	---	---	10.25	830.88	10.99	830.14
MW–3	Shallow Overburden	853.80	16.29	837.51	15.44	838.36	14.63	839.17	13.71	840.09
MW–4	Shallow Overburden	855.11	14.26	840.85	13.55	841.56	12.93	842.18	15.19	839.92
MW–5	Shallow Overburden	848.75	7.74	841.01	---	---	6.90	841.85	8.68	840.07
MW–6	Shallow Overburden	841.25	9.66	831.59	---	---	8.33	832.92	8.89	832.36
MW–7	Shallow Overburden	843.43	14.75	828.68	14.82	828.61	13.53	829.90	13.83	829.60
MW–8	Shallow Overburden	830.07	16.24	813.83	12.46	817.61	12.30	817.77	12.20	817.87
MW–9	Shallow Overburden	857.75	20.40	837.35	19.02	838.73	18.25	839.50	19.98	837.77
MW–10	Shallow Overburden	845.68	8.36	837.32	---	---	7.67	838.01	8.78	836.90
MW–11	Shallow Overburden	821.33	19.08	802.25	12.35	808.98	10.25	811.08	13.00	808.33
MW–12	Shallow Overburden	844.59	7.90	836.69	---	---	8.06	836.53	8.92	835.67
MW–13	Shallow Overburden	840.81	21.88	818.93	18.69	822.12	18.79	822.02	18.15	822.66
MW–14	Deep Overburden	827.65	16.21	811.44	11.70	815.95	11.50	816.15	12.17	815.48
MW–15	Deep Overburden	822.03	23.73	798.30	18.83	803.20	18.00	804.03	18.02	804.01
MW–17	Bedrock	840.38	9.88	830.50	8.88	831.50	8.49	831.89	8.90	831.48
MW–18	Deep Overburden	829.35	13.94	815.41	10.59	818.76	10.53	818.82	10.25	819.10
MW–19	Shallow Overburden	841.26	9.12	832.14	6.89	834.37	6.67	834.59	7.27	833.99
MW–20	Bedrock	829.41	14.35	815.06	10.80	818.61	10.55	818.86	10.18	819.23
MW–21	Bedrock	854.85	16.65	838.20	14.30	840.55	13.96	840.89	15.90	838.95
MW–22	Bedrock	819.39	22.55	796.84	19.46	799.93	17.70	801.69	17.19	802.20
MW–23	Deep Overburden	841.32	8.31	833.01	7.29	834.03	7.06	834.26	7.90	833.42
MW–24	Deep Overburden	840.65	9.84	830.81	9.00	831.65	8.75	831.90	9.39	831.26
MW–25	Shallow Overburden	837.67	12.33	825.34	11.67	826.00	11.57	826.10	12.22	825.45
MW–26	Deep Overburden	837.73	13.67	824.06	12.53	825.20	12.45	825.28	12.90	824.83
MW–27	Deep Overburden	840.96	9.40	831.56	8.42	832.54	8.25	832.71	8.70	832.26
MW–28	Bedrock	837.91	88.38	749.53	---	---	37.05	800.86	25.78	812.13
MW–29	Deep Overburden	820.63	NI	NI	19.20	NI	18.70	801.93	18.74	801.89
MW–30	Deep Overburden	815.13	NI	NI	23.42	NI	22.14	792.99	22.04	793.09
MW–31	Shallow Overburden	815.25	NI	NI	7.84	NI	6.95	808.30	8.24	807.01
MW–32	Deep Overburden	816.17	NI	NI	17.20	NI	16.68	799.49	16.06	800.11
MW–33	Shallow Overburden	815.77	NI	NI	7.31	NI	6.40	809.37	7.42	808.35
PW–1	Overburden	842.09	11.52	830.57	---	---	10.73	831.36	11.00	831.09
PW–2	Overburden	839.71	---	---	---	---	---	---	8.80	830.91
PW–3	Deep Overburden	836.96	---	---	11.69	NI	11.60	825.36	12.00	824.96

Notes:

* = Elevations are referenced to plant datum.

--- = Depth to water not recorded; ground–water evaluation not calculated.

NI = Well not installed at time of measurement.

TABLE 6

SUMMARY OF GROUND–WATER ANALYTICAL RESULTS – VOLATILE ORGANICS
JUNE 1993

HADCO CORPORATION
OWEGO, NEW YORK

	WELL NUMBER																
	MW–2	MW–6	MW–11	MW–15	MW–17	MW–19	MW–23	MW–24	MW–25	MW–26	MW–27	MW–29	MW–30	MW–31	MW–32	MW–33	PW–3
Compound																	
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19	--
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2–Butanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1–Dichloroethane	7	25 D	14 D	11	5700 D	--	--	26 DJ	8 DJ	210 DJ	--	14	--	--	--	4 J	480 D
1,2–Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1–Dichloroethene	3 J	15 DJ	13 D	2 J	--	14000 DJ	3600 D	--	7 DJ	220 DJ	--	25	--	--	2 J	--	210 DJ
1,2–Dichloroethene (total)	22	260 D	51 D	12	1600 DJ	--	1800 DJ	46 DJ	63 D	410 D	94 DJ	69	--	--	4 J	7	360 D
1,2–Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis–1,3–Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans–1,3–Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	1200 DJ	--	--	--	--	--	--	--	--	--	--	1 J	--
2–Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	3900 DJ	--	--	--	--	--	--	--	--	--	--	--
4–Methyl–2–Pentanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2–Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	0.5 J	--	2200 DJ	--	--	--	--	--	--	--	--	--	0.8 J	--
Toluene	--	--	--	--	6400 D	20000 D	2600 D	--	--	--	--	--	--	--	--	0.6 J	--
1,1,1–Trichloroethane	12	18 DJ	84 D	6	31000 D	140000 D	38000 D	1200 D	43 D	2500 D	39 DJ	100	--	--	22	5	5800 D
1,1,2–Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	120	620 D	350 D	120	37000 D	500000 D	72000 D	1100 D	320 D	4600 D	3200 D	370	--	--	--	52	6400 D
Vinyl Chloride	8 J	94 D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene (total)	--	--	--	--	910 DJ	--	--	--	--	--	--	--	--	--	0.9 J	20	--
Total VOCs	172	1032	512	151.5	83810	680100	118000	2372	441	7940	3333	578	0	0	28.9	109.4	13250

Notes:
All concentrations reported in ug/L (ppb).
B = Compound determined to be present in the blanks as well as in the sample.
J = Estimated value; concentration less than the quantitation limit but greater than zero.
D = Coumpounds identified at a secondary dilution factor.
-- = Not detected.
Total VOCs is the sum of the concentrations for the volatile organic compounds listed.

TABLE 7

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS
INORGANICS
JUNE 1993

HADCO CORPORATION
OWEGO, NEW YORK

WELL NUMBER:	MW-2	MW-6	MW-11	MW-15	MW-17	MW-19	MW-23	MW-24	MW-25
ANALYTE									
Chromium	0.013	2.7	1	0.53	0.010 U	6.7	0.087	0.030	0.20
Copper	0.011	6.8	0.58	0.12	0.011	14.1	0.097	0.016	0.077
Zinc	0.075	0.65	0.53	0.50	0.14	0.52	0.10	0.056	0.034

WELL NUMBER:	MW-26	MW-27	MW-29	MW-30	MW-31	MW-32	MW-33	PW-3
ANALYTE								
Chromium	0.019	0.38	0.022	0.010 U	0.041	0.010 U	0.20	0.049
Copper	0.023	0.12	0.011	0.018	0.067	0.018	0.11	0.10
Zinc	0.073	0.20	0.020 U	0.079	0.59	0.093	0.15	0.36

Notes:
All concentrations reported in mg/L.
U – Compound was analyzed for but not detected at the detection limit indicated.

TABLE 8

SUMMARY OF FIELD MEASUREMENTS
VAPOR EXTRACTION PILOT TEST

HADCO CORPORATION
OWEGO, NEW YORK

SEPTEMBER 25. 1992					
	Applied Vacuum		Observed Vacuum		
Time	VE-2	Flow	VP-1	VP-2	VP-3
11:00:00	0	0	0	0	0
11:00:30	15.5	19	0.02	--	--
11:02:00	15.5	19	0.02	0.01	0
11:03:00	15.5	19	0.02	0.01	0
11:05:00	16	19	0.02	0.02	0
11:10:00	16	19	0.02	0.02	0.01
11:15:00	16	19	0.03	0.02	0.01
11:20:00	16	19	0.03	0.02	0.01
11:25:00	16	19	0.03	0.02	0.01
End of Step One					
11:30:00	68	38	0.07	0.04	--
11:30:30	66	38	0.09	0.04	0.01
11:35:00	64	38	0.09	0.04	0.01
11:40:00	64	38	0.09	0.045	0.015
11:45:00	63	38	0.09	0.045	0.015
11:50:00	62	38	0.09	0.045	0.015
11:55:00	62	38	0.09	0.04	0.015
12:00:00	62	38	0.09	--	--
End of Step Two					
END OF PILOT TEST					

Notes:

Vacuum measured in inches of water.
Flow measured in standard cubic feet per minute (SCFM).
-- = Measurement not taken.

TABLE 9

SUMMARY OF SOIL VAPOR ANALYTICAL RESULTS
PHASE II VAPOR EXTRACTION PILOT TEST

HADCO CORPORATION
OWEGO, NEW YORK

Compound	Soil Vapor Sample Identification	
	VE-2-1	VE-2-2
Chloroform	4.4	3.8
1,1-Dichloroethene	222	136
1,1-Dichloroethane	<1.0	<1.0
1,1,1-Trichloroethane	2,064	1,757
1,1,2-Trichloroethane	<1.0	6.4
Methylene chloride	45	36
cis 1,2-Dichloroethene	1.2	<1.0
trans 1,2-Dichloroethene	8.1	4.9
Carbon tetrachloride	<1.0	<1.0
Tetrachloroethene	196	180
Trichloroethene	23,108	30,881

Notes:

Concentrations reported in ug/l.

The concentration of 1,1-dichloroethene represent a sum of this compound and 1,1,2-trichlorotrifloroethane, as these compounds coelute.

TABLE 10

SUMMARY OF ANALYTICAL RESULTS
WETLANDS SEDIMENT SAMPLES
VOLATILE ORGANIC COMPOUNDS

HADCO CORPORATION
OWEGO, NEW YORK

SAMPLE ID (SAMPLE DEPTH)	SS-1-93 0-6"	SS-2-93 0-6"
Compound		
Acetone	--	--
Benzene	--	--
Bromomethane	--	--
Bromodichloromethane	--	--
Bromoform	--	--
2-Butanone	--	--
Carbon Disulfide	--	--
Carbon Tetrachloride	--	--
Chlorobenzene	--	--
Chloroethane	--	--
Chloroform	--	--
Chloromethane	--	--
Dibromochloromethane	--	--
1,1-Dichloroethane	--	--
1,2-Dichloroethane	--	--
1,1-Dichloroethene	--	--
1,2-Dichloroethene (total)	--	--
1,2-Dichloropropane	--	--
cis-1,3-Dichloropropene	--	--
trans-1,3-Dichloropropene	--	--
Ethylbenzene	--	--
2-Hexanone	--	--
Methylene Chloride	--	--
4-Methyl-2-Pentanone	--	--
Styrene	--	--
1,1,2,2-Tetrachloroethane	--	--
Tetrachloroethene	--	--
Toluene	--	--
1,1,1-Trichloroethane	--	--
1,1,2-Trichloroethane	--	--
Trichloroethene	--	--
Vinyl Chloride	--	--
Xylene (total)	--	--
Total VOCs	--	--

Notes:
All concentrations reported in ug/kg, dry weight (ppb).

TABLE 11

SUMMARY OF ANALYTICAL RESULTS
WETLANDS SEDIMENT SAMPLES
INORGANICS

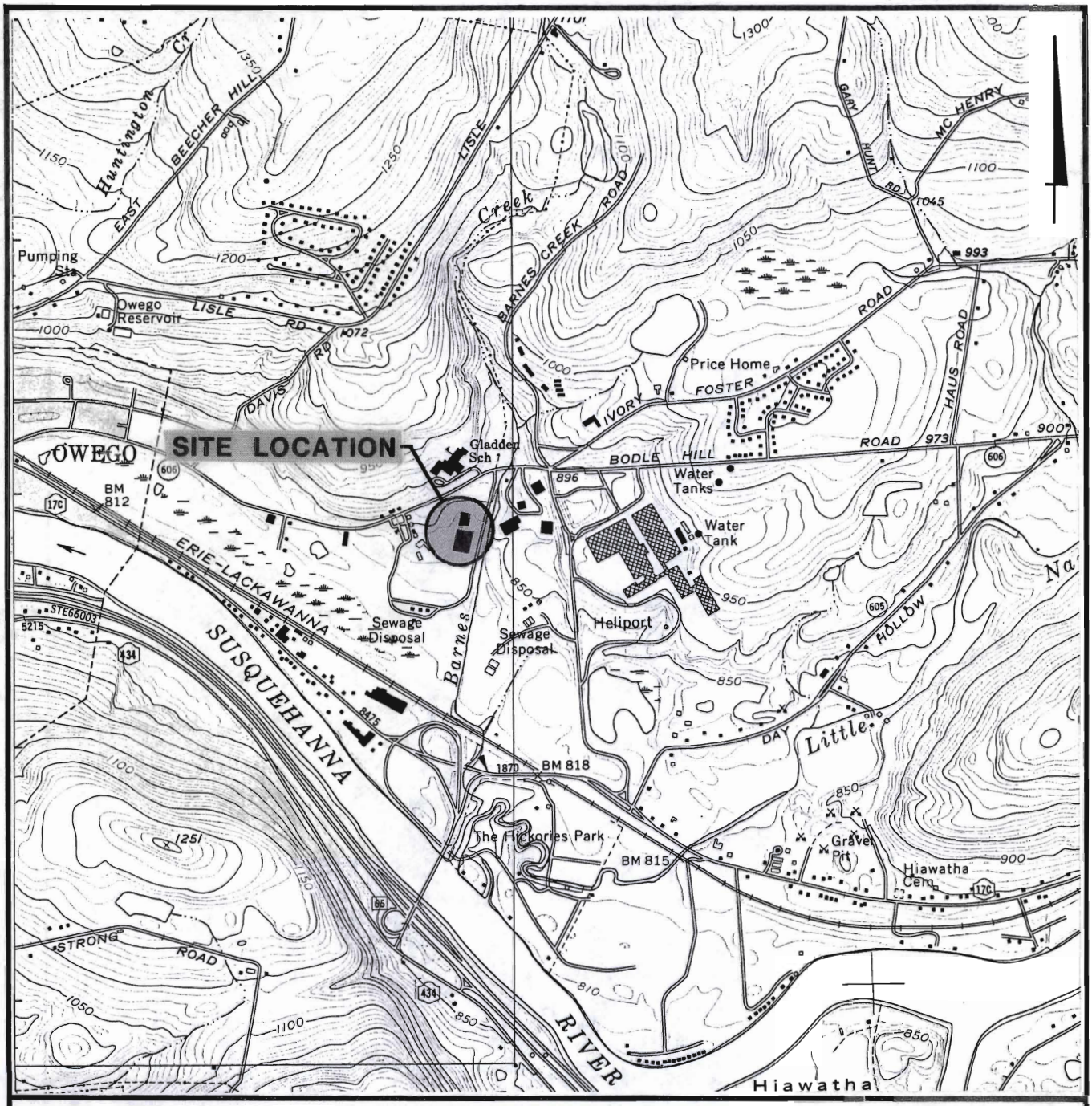
HADCO CORPORATION
OWEGO, NEW YORK

SAMPLE ID (SAMPLE DEPTH)	SS-1-93 0"-6"	SS-2-93 0"-6"
Analyte		
Chromium	683	790
Copper	162	8.3
Zinc	102	48.3
TOC	1,430	786

Notes:
Concentrations reported in mg/kg dry weight.
TOC = Total Organic Carbon (ug/g)

Figures

FIGURE 1



HADCO CORPORATION
OWEGO, NEW YORK

CONTOUR INTERVAL = 10 FEET

SITE LOCATION MAP

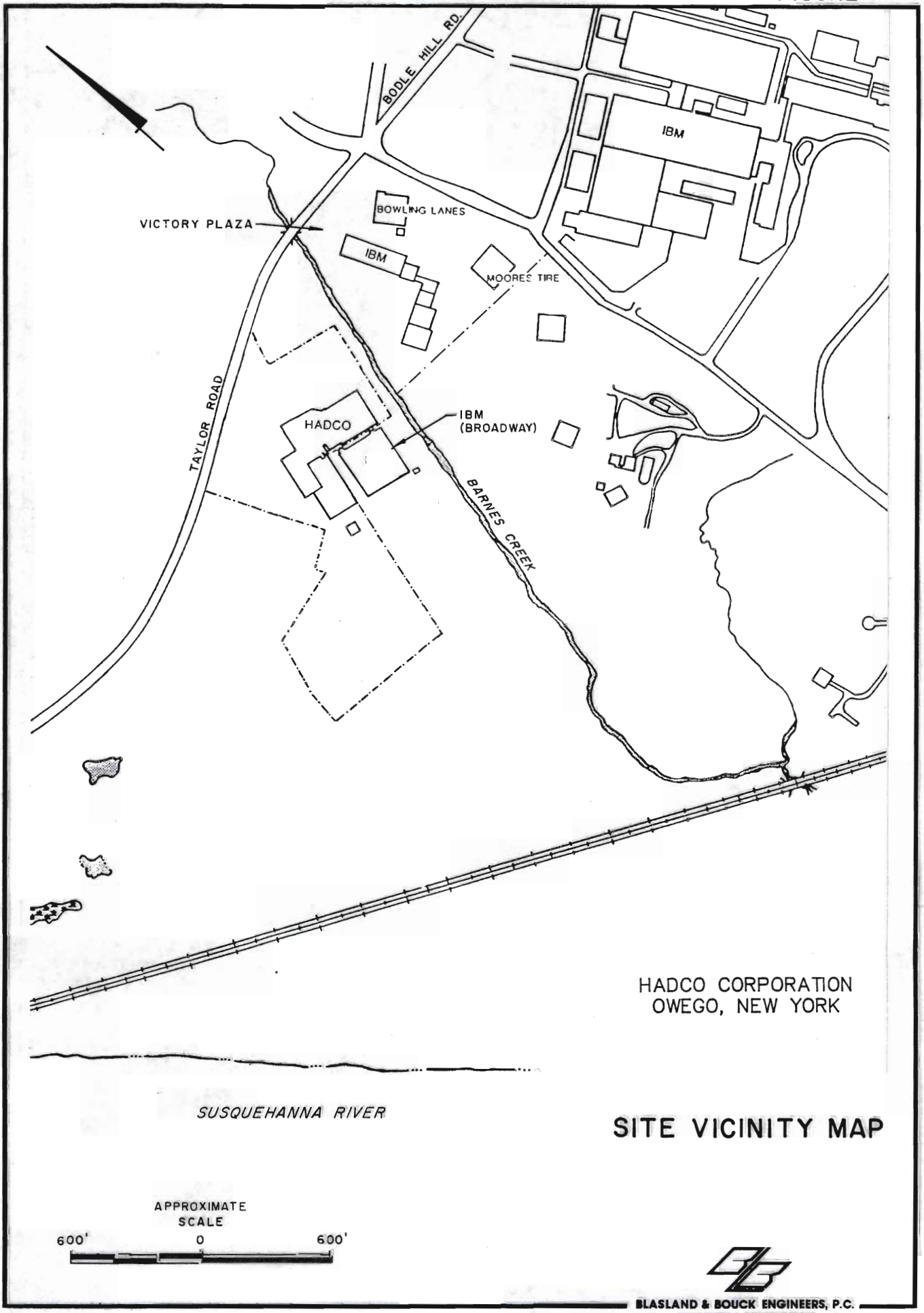
SCALE:

2000' 0 2000'

SOURCE: USGS 7 1/2 MINUTE TOPOGRAPHIC QUADRANGLE:
APALACHIN, NEW YORK, 1973

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

FIGURE 2

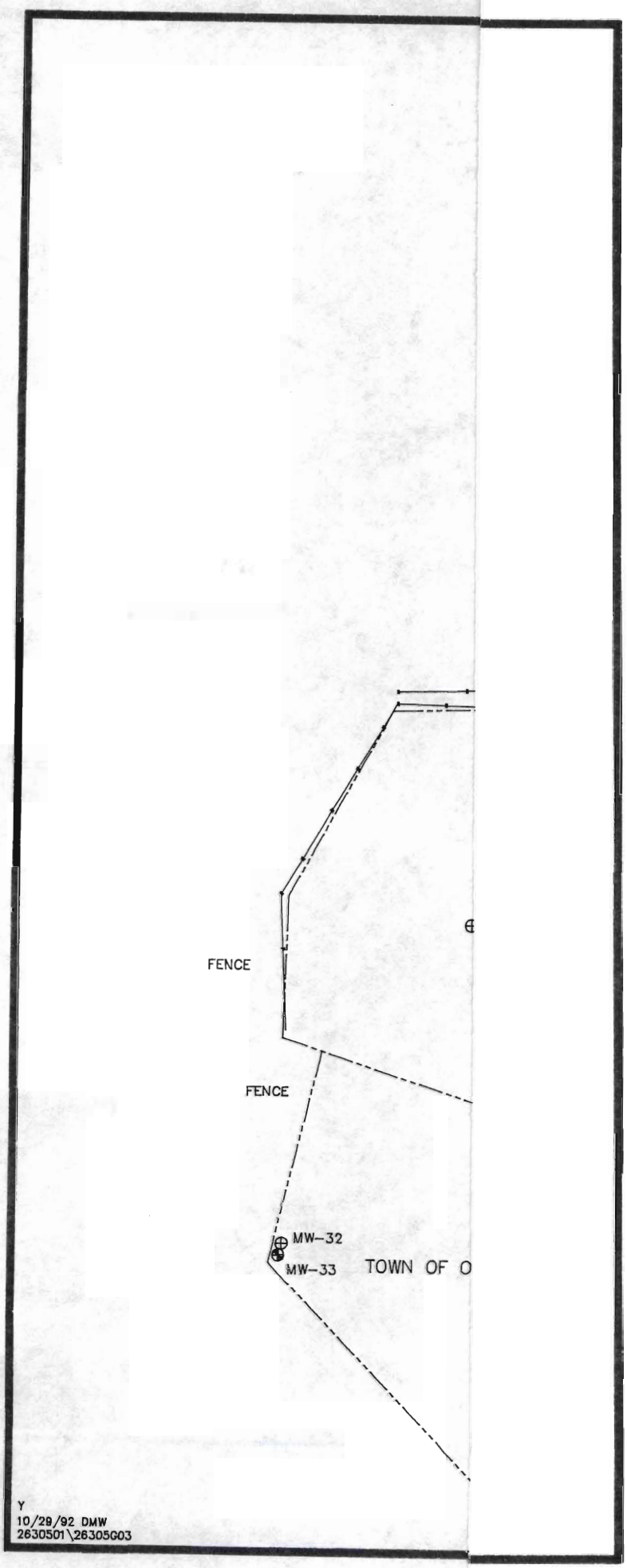


HADCO CORPORATION
OWEGO, NEW YORK

SITE VICINITY MAP

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

FIGURE 3



LEGEND

- INTERMITTENT STREAM WITH TOP OF STREAM BANKS SHOWN
- SHALLOW OVERBURDEN MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- SURFACE WATER SAMPLE
- VAPOR EXTRACTION WELL

HADCO CORPORATION
OWEGO, NEW YORK

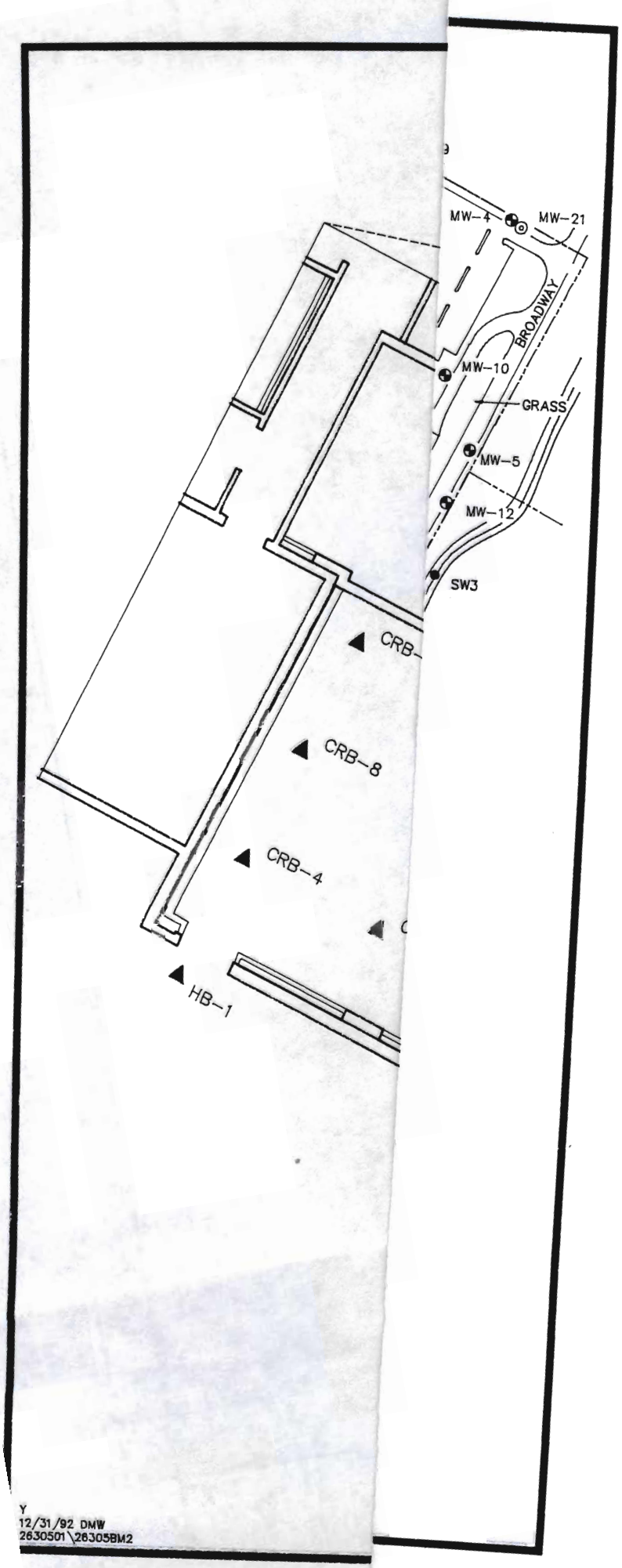
MONITORING WELL LOCATION MAP

SCALE

200' 0 200'

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

FIGURE 4



LEGEND

- SHALLOW OVERBURDEN MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- SURFACE WATER SAMPLE
- VAPOR PROBE LOCATION
- SOIL BORING
- VAPOR EXTRACTION WELL

HADCO CORPORATION
OWEGO, NEW YORK

FORMER CHEMICAL STORAGE AREA LOCATION MAP

SCALE

10' 0 10'

BLASLAND & BOUCK ENGINEERS, P.C.
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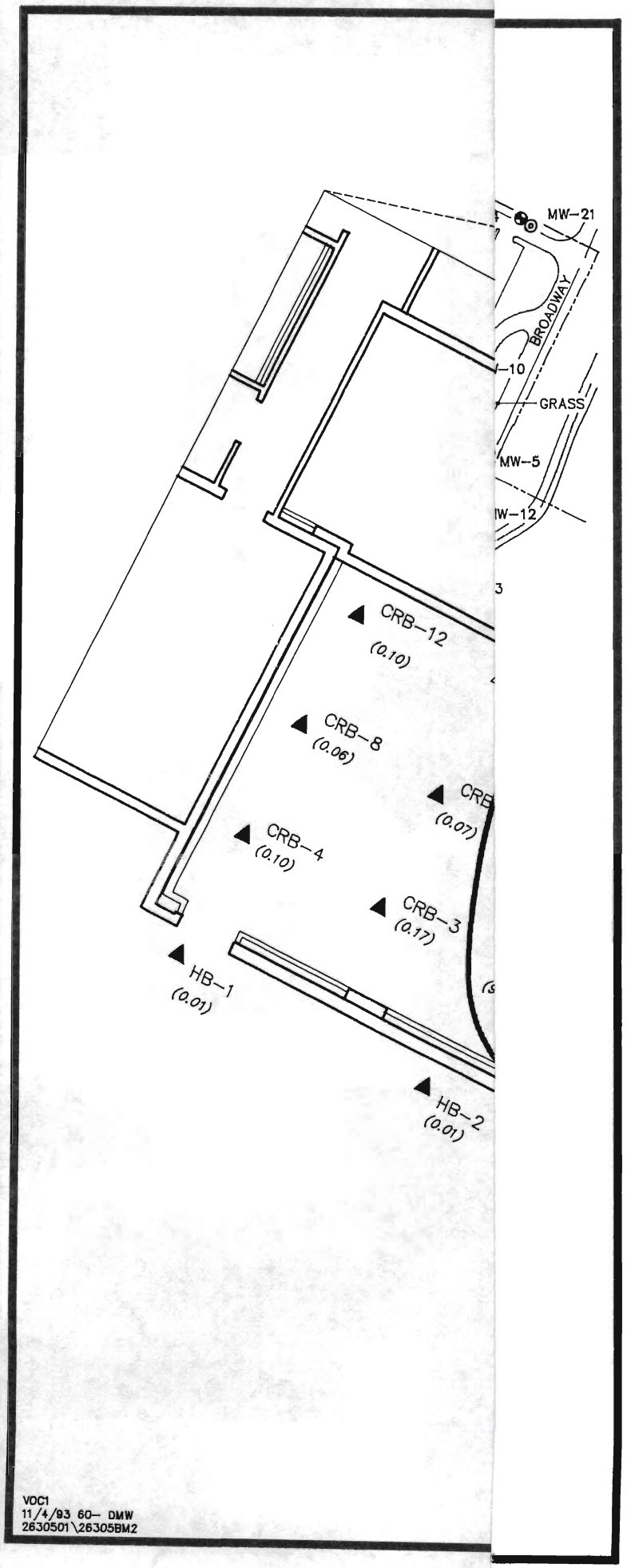
Y
12/31/92 DMW
2630501\26305BM2

FIGURE 6



LEGEND

- SHALLOW OVERBURDEN MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- SURFACE WATER SAMPLE
- VAPOR PROBE LOCATION
- SOIL BORING
- VAPOR EXTRACTION WELL
- (9.35) TOTAL VOCs CONCENTRATION (ppm)
- 10 TOTAL VOCs CONCENTRATION CONTOUR LINE (ppm)

HADCO CORPORATION
OWEGO, NEW YORK

TOTAL VOCs ISOCONCENTRATION MAP IN FORMER CHEMICAL STORAGE AREA

SCALE

10' 0 10'

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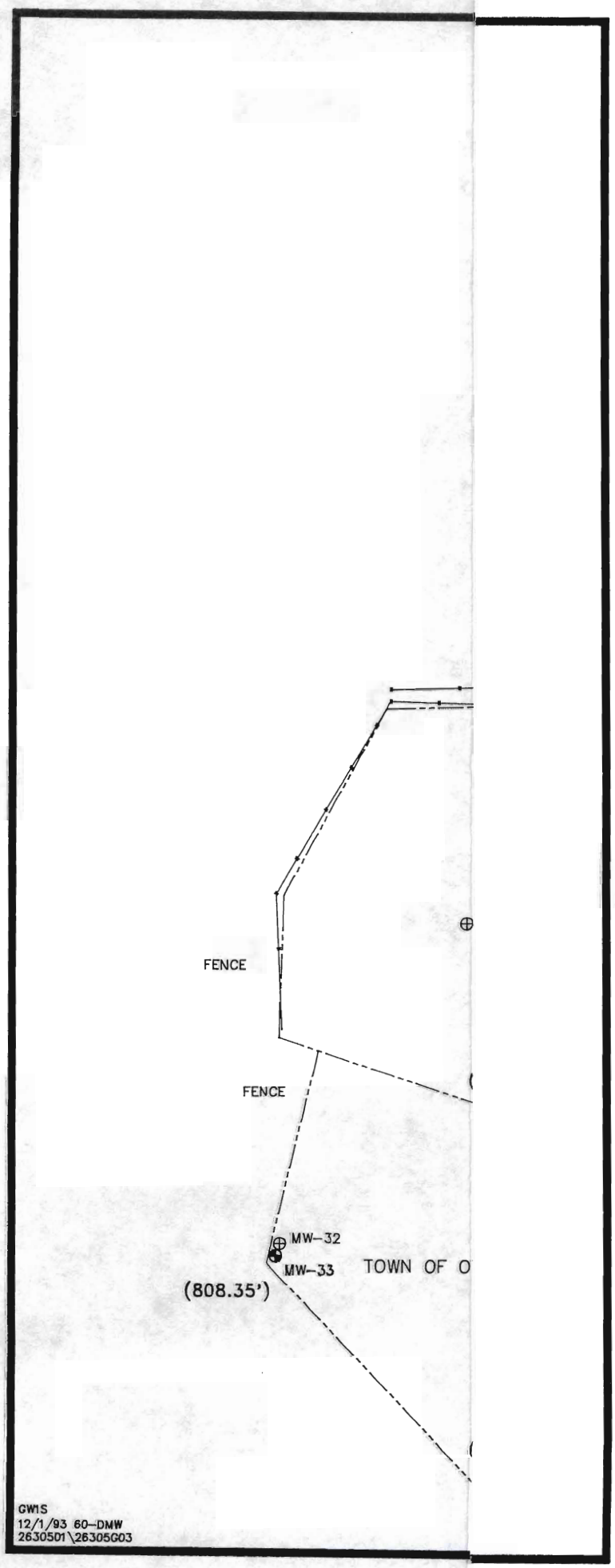
ENGINEERS & GEOSCIENTISTS

FIGURE 7



LEGEND

- INTERMITTENT STREAM WITH TOP OF STREAM BANKS SHOWN
- SHALLOW OVERBURDEN MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- SURFACE WATER SAMPLE
- VAPOR EXTRACTION WELL
- (829.60') GROUND-WATER ELEVATION
- 830' GROUND-WATER CONTOUR LINE, DASHED WHERE INFERRED

HADCO CORPORATION
OWEGO, NEW YORK

SHALLOW OVERBURDEN GROUND-WATER CONTOUR MAP JUNE 28, 1993

SCALE

200' 0 200'

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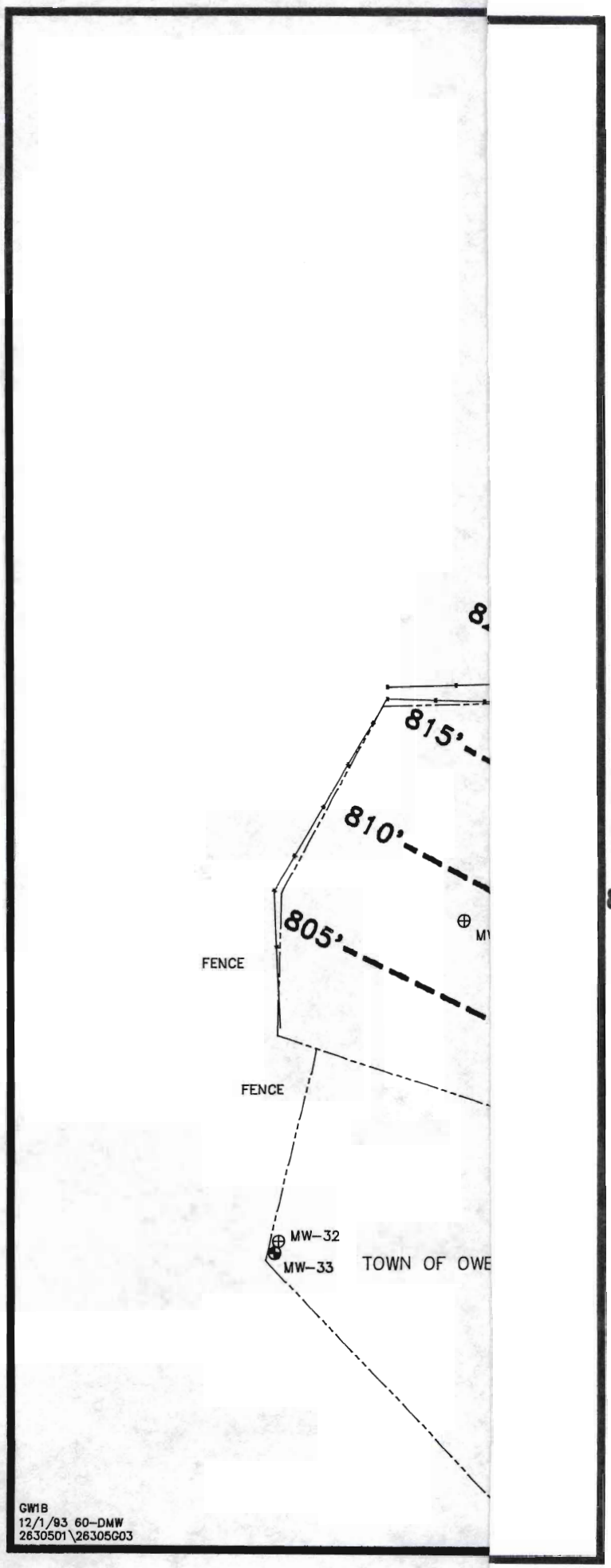
ENGINEERS & GEOSCIENTISTS

FIGURE 9



LEGEND

- INTERMITTENT STREAM WITH TOP OF STREAM BANKS SHOWN
- SHALLOW OVERBURDEN MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- BEDROCK MONITORING WELL
- SURFACE WATER SAMPLE
- VAPOR EXTRACTION WELL
- (819.23') GROUND-WATER ELEVATION
- 820' GROUND-WATER CONTOUR LINE, DASHED WHERE INFERRED

HADCO CORPORATION
OWEGO, NEW YORK

BEDROCK GROUND-WATER CONTOUR MAP JUNE 28, 1993

SCALE
200' 0 200'

GW1B
12/1/93 60-DMW
2630501\26305G03

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ENGINEERS & GEOSCIENTISTS

APPENDIX A

Boring Logs and Well Construction Details

BLASLAND & BOUCK ENGINEERS, P.C.

DATE COMPLETED	12/28/92	**BORING CRB-13**	
CLASSIFIED BY:	DWL/TRO		
SURFACE ELEVATION:		PROJECT NO.:	263.05
PROJECT:	HADCO CORPORATION	PAGE:	1 of 1
DATE STARTED:	12/28/92	LOCATION:	Owego, NY

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	ROCK DATA: AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SUBSURFACE LOG / SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
0												CONCRETE.	
	1	1	1.8	48 47 50 43	11.7							Brown fine to coarse GRAVEL and fine to coarse SAND, trace Silt, trace Clay, compact, moist.	
	2	2	1.6	50 57 57 52	13.6								
-5		3	0.5	117 97 54 49	13.6							Grades to some Clay	
	▽	4	0.9	31 48 50 110	1680							-Wet at 7.5'	
												Bottom of boring at 8.0 feet.	
-10												NOTES: Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill. Boring advanced with a tripod rig and Standard 2 in X 2 ft split spoon samplers. Boring grouted to surface upon completion Sample no. 4 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.

BORING CRB-14

SURFACE ELEVATION:		DATE COMPLETED: 12/28/92	PROJECT NO.: 263.05
DATE STARTED: 12/28/92		CLASSIFIED BY: DWL/TRO	PAGE: 1 of 1
		PROJECT: HADCO CORPORATION	
		LOCATION: Owego, NY	

SUBSURFACE LOG

SOIL/ROCK CLASSIFICATION

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
												CONCRETE.	
												Gray medium GRAVEL, loose, dry.	
0		1	0.8	40	53.8							Brown fine to medium GRAVEL, some Clay, compact, moist.	
				28									
		2	0.7	31								Brown medium GRAVEL, trace fine Sand and Silt, loose, moist.	
				26									
		3	1.3	79	21.6							Brown fine to coarse SAND and fine to coarse GRAVEL, trace Clay, loose, moist.	
				40									
				20									
				27									
		4	1.8	29	>2500								
-5				36									
				68									
				42									
		5	1.1	58	>2500								
				39									
	▽			107								-Wet at 7.5'	
				42									
												Bottom of boring at 8.0 feet.	
-10													
												NOTES:	
												Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill. Boring advanced with a tripod rig and Standard 2 in X 2 ft split spoon samplers. Boring grouted to surface upon completion Sample no. 4 and 5 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.

SURFACE ELEVATION:		DATE COMPLETED	12/29/92
DATE STARTED:	12/29/92	CLASSIFIED BY:	DWL/TRO
		PROJECT:	HADCO CORPORATION
		LOCATION:	Owego, NY

BORING CRB-15

PROJECT NO.: 263.05

PAGE: 1 of 1

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	ROCK DATA: AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SUBSURFACE LOG / SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
0		1	NR	57	—							CONCRETE.	
				27								Brown fine to coarse SAND and fine to medium GRAVEL, little Silt, compact, moist.	
				17									
				12									
		2	0.8	10	111.6								
				5									
				5									
				10									
-5 ▽		3	2.0	27	>2500								
				60									
				37									
				70								-Wet at 5.8'	
												Bottom of boring at 6.0 feet.	
-10													
-15													
-20													
-25													

NOTES:

Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill.
Boring advanced with a tripod rig and Standard 3 in X 2 ft split spoon samplers.
Boring grouted to surface upon completion
Sample no. 3 submitted to laboratory for analysis.

BLASLAND & BOUCK ENGINEERS, P.C.

DATE COMPLETED	12/28/92	**BORING CRB-16**	
CLASSIFIED BY:	DWL/TRO		
SURFACE ELEVATION:		PROJECT:	HADCO CORPORATION
PROJECT NO.:	263.05		
DATE STARTED:	12/28/92	LOCATION:	Owego, NY
PAGE:	1 of 1		

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % RQD	ROCK DATA: AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SUBSURFACE LOG: SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
												CONCRETE.	
0		1	0.7	13	5.7							Brown fine to coarse SAND, some fine to medium Gravel, trace Silt, trace Clay, compact, moist.	
				18									
				18									
				18									
		2	1.6	22	23.9								
				26									
				41									
				13									
-5		3	1.2	18	20.5								
				25									
				21									
				24									
		4	0.9	18	>2500								
				24									
				30									
				32									
												Bottom of boring at 8.0 feet.	
-10												NOTES:	
												Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill. Boring advanced with a tripod rig and Standard 2 in X 2 ft split spoon samplers. Boring grouted to surface upon completion Sample no. 4 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.

DATE COMPLETED	12/28/92	**BORING CRB-17**	
CLASSIFIED BY:	DWL/TRO		
SURFACE ELEVATION:		PROJECT:	HADCO CORPORATION
PROJECT NO.:	263.05		
DATE STARTED:	12/28/92	LOCATION:	Owego, NY
PAGE:	1 of 1		

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	ROCK DATA: AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SUBSURFACE LOG: SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
												CONCRETE.	
0		1	1.6	32	0.0							Brown fine to coarse GRAVEL and fine to coarse SAND, some Clay, trace Silt, compact, moist.	
				48									
				68									
				43									
		2	1.7	54	11.7								
				81									
				64									
				52									
		3	0.9	113	238								
-5				88									
				43								-Wet at 5.5'	
				45									
												Bottom of boring at 6.0 feet.	
-10													
												NOTES:	
												Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill.	
												Boring advanced with a tripod rig and Standard 3 in X 2 ft split spoon samplers.	
												Boring grouted to surface upon completion	
												Sample no. 2 and 3 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.

BORING CRB-18

SURFACE ELEVATION:		DATE COMPLETED: 12/29/92	PROJECT NO.: 263.05
DATE STARTED: 12/28/92		CLASSIFIED BY: DWL/TRO	PAGE: 1 of 1
		PROJECT: HADCO CORPORATION	
		LOCATION: Owego, NY	

SUBSURFACE LOG

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
												CONCRETE.	
0		1	0.8	13	0.0							Brown fine to coarse SAND, some Gravel, trace Silt, compact, moist.	
				18									
				10									
				12									
		2	1.2	9	36.9								
				10									
				9									
				8									
		3	1.6	8	—								
-5				4									
				4									
				8									
		4	0.2	8	—								
	▽			6								-Wet at 7.5'	
				8									
				8									
												Bottom of boring at 8.0 feet.	
-10													
												NOTES:	
												Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill. Boring advanced with a tripod rig and Standard 2 in X 2 ft split spoon samplers. Boring grouted to surface upon completion Sample no. 3 and 4 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.

DATE COMPLETED	12/29/92	**BORING CRB-19**	
CLASSIFIED BY:	DWL/TRO		
SURFACE ELEVATION:		PROJECT: HADCO CORPORATION	PROJECT NO.: 263.05
DATE STARTED: 12/29/92		LOCATION: Owego, NY	PAGE: 1 of 1

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	ROCK DATA: AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SUBSURFACE LOG: SOIL/ROCK CLASSIFICATION	ROCK FEATURES
5													
												CONCRETE.	
0		1	1.1	7 11 22 14	1.7							Brown fine to coarse SAND, some Gravel, trace Silt, compact, moist.	
		2	1.7	10 38 22 41	3.3								
		3	1.6	77 37 27 29	3.5								
-5													
▽		4	0.8	14 13 9 15	0.0							-Wet at 6.5'	
												Bottom of boring at 8.0 feet.	
-10												NOTES: Concrete floor cored through with a diamond coring bit driven by a mounted industrial drill. Boring advanced with a tripod rig and Standard 2 in X 2 ft split spoon samplers. Boring grouted to surface upon completion Sample no. 3 submitted to laboratory for analysis.	
-15													
-20													
-25													

BLASLAND & BOUCK ENGINEERS, P.C.	DATE COMPLETED 12/29/92	EXTRACTION POINT VE-2
	CLASSIFIED BY: DWL/TRO	
SURFACE ELEVATION:	PROJECT: HADCO CORPORATION	PROJECT NO.: 263.05
DATE STARTED: 12/29/92	LOCATION: Owego, NY	PAGE: 1 of 1

SUBSURFACE LOG

DEPTH (FT)	SAMPLES	SAMPLE/RUN NO.	SOIL DATA: RECOVERY (FT)	SOIL DATA: BLOWS/6 IN.	SOIL DATA: PID HEADSPACE (ppm)	ROCK DATA: FROM/TO	ROCK DATA: % RECOVERY	ROCK DATA: % ROD	AVERAGE RATE (MIN./FT)	WELL COLUMN	GEOLOGIC COLUMN	SOIL/ROCK CLASSIFICATION	ROCK FEATURES
0												CONCRETE.	
		1	1.8	80 61 40 27	1.9							Brown fine to coarse SAND, some Gravel, trace Silt, compact, moist.	
		2	1.4	19 10 10 19	8.8								
-5		3	1.3	12 26 14 32	>2500							Wet at 5.8'	
												Bottom of boring 6.0 feet.	

NOTES:

Boring advanced with tripod rig and 3 in x 2 ft split spoon samplers. Sample numbers 2 and 3 submitted to laboratory for analysis.

WELL CONSTRUCTION DETAILS

2-inch diameter schedule 40 PVC riser 1.0' - 0.0'
2-inch diameter, SCH 40 PVC 0.040 inch slot screen 6.0' - 1.0'
Rounded, washed pea gravel filter pack 6.0' - 0.5'
Hydrated/bentonite seal 0.5' - 0.0'
Well completed with a 4-inch diameter flush mount cover and a press-on cap on top of riser (All measurments for vapor extraction well, taken from bottom of concrete)

APPENDIX B

Initial IRM Monitoring Data

HADCO CORPORATION - OWEGO DIVISION

IRM OPERATION MONITORING LOG

DATE	TIME	TECH.	FLOW (GPM)	FLOW (GPD)	INF PRESS. (PSI)	AIR PRESS. (IN. H2O)	COMMENTS
10/7/93	3:00PM	R. Wolter	11.20	5175	11	10	*
				Reading @ 4:30PM			
* Adjusted		down on blower to a reading of 10" of water.					
This resulted		in an air flow rate of 1235 CFM.					
10/8/93	7:15AM.	R. Wolter	0	5773	0	6	Well pump
switch in		Auto position, appears off			due to low level. →		
Found back		tripped in contactor			located adjacent		
to	Stripper	Control panel.		Reset, & put pump back in Auto			
position							
10/8/93	7:45AM	R. Wolter	11.44	5884	11	~9.5	
10/8	4:45PM	"	11.64	8681	11	~9.5	Shutdown
	unit for	weekend.					
10/12	Started unit	@ 9:15 AM.					
10/12	9:30AM	R. Wolter	11.570	8834	11	~9.5	
10/12	1:05PM	R. Wolter	11.570	11,281	11	~9.5	
10/12	9.25 pm	J Sowka	11.706	16,960	12	10	
10-13	7:46AM	M. Hoover	11.570	24,045	12	8.25	Approx. 5 min. after start up from Training Viewing
10/13	5:06 pm	J Sowka	11.830	30,617	12	10	
10/14	12:55Am	Schriver	11.763	36068	12	10	
10/14	4:AM	Schriver	11.765	35217	12	11	
10/14	8:00AM	C. Hill	11.899	41080	12.5	10	Effl. Sample pulled for Comp.
10/14/93	12:10 PM	R. Millard	11.830	44045	12.5	10	" " " "
10/14/93	4:23 PM	E.C.	11.895	47139	12.5	10	" " " "
~~10/16/93~~	~~4:10~~	KOWALSKI					

HADCO CORPORATION - OWEGO DIVISION

IRM OPERATION MONITORING LOG

Rate Total Magnehelic

DATE	TIME	TECH.	FLOW (GPM)	FLOW (GPD)	INF PRESS. (PSI)	AIR PRESS. (IN. H2O)	COMMENTS
10/15/93	12:15 AM	[illegible]	11.895	52614	12.5	10	
10/15	4:05 AM	[illegible]	11.960	55305	12.5	10	
10/15	9:00 AM	C. Hill	11.960	58814	12.5	10	
10-15	12:11 PM	M. H	12.025	61127	12.5	10	
10/15	6:10 pm	JS	11.895	65348	12.5	10	
10/16	12:30 Am	SS	11.895	69533	12.5	10	
10/16	4:46 Am	SS	11.960	72941	12.5	10	
10/16	8:20 Am	R.M.	11.505	75474	12.75	10	
10-16	11:11 AM	MH	11.960	77468	12.5	10	
10-16	4:10 PM	K Bidwell	11.960	81053	12.5	10	
10-17	2:55 AM	Darlin g	12.025	88712	12.5	10	
10-17	1:10 PM	MH	12.090	96088	12.5	10	
10-17	5:45 PM	R. Williams	12.025	99298	12.5	10	
10/18	12:10 AM	[illegible]	12.025	104021	12.5	10	
10/18	4:25 Am	[illegible]	12.090	107032	12.5	10	
10-18	8:36 AM	MH	11.960	110051	12.5	10	
10/18	1:12 PM	R.M.	11.960	113366	12.75	10	
10/18	5:01 pm	JS	12.025	116132	12.5	10	
10/19	12:23 Am	SS	12.025	121350	12.5	10	
10/19	4:27 Am	SS	12.025	124265	12.5	10	
10/19	11:55 Am	R.M.	12.900	129600	12.75	10	
10/	~~5:07 AM~~	E C	11.960	133368	12.5	10	
10/20	1:10 PM 30sec	J.P	11,961	139115	1.3	10	
10/20	8:25 AM	C. Hill	12,025	144297	13	10	
10/20	1:00 PM	JK	11.5	147604	12.5	10	
10/20	6:30 pm	JS	11.960	151554	12.5	10	

HADCO CORPORATION - OWEGO DIVISION

IRM OPERATION MONITORING LOG

Guage Magnehelic

DATE	TIME	TECH.	FLOW (GPM)	FLOW (GPD)	INF PRESS. (PSI)	AIR PRESS. (IN. H2O)	COMMENTS
10/21/93	12:10 am	JF	12.09	155663	13	10	
10/21	4:15 AM	JF	12.09	158618	13	10	
10/21	9:31 AM	MH	12.025	162338	12.5	10	
10/21	12:18 PM	C. Hill	12.090	164348	12.5	10	
10/21	4:00 PM	Ed.	12.090	170773	12.5	10	
10/22	12:55 AM	SS	12.480	173408	12.5	10	
10/22	4:40 AM	SS	12.025	176131	12.5	10	
10-22	8:50 AM	MH	12.025	179118	12.5	10	
10/22/93	1:00 PM	R.M.	12.090	1821740	12.75	10	
10/22	5:30 PM	Ed.	12.025	185408	12.5	10	
10/23	12:45 AM	SE	12.025	190569	12.5	10	
10/23	4:15 AM	SS	12.025	193102	12.5	10	
10-23	9:25 AM	MH	12.025	196822	12.5	10	
10-23	12:10 PM	MH	12.090	198787	12.5	10	
10/23	9:49 PM	Ed.	12.026	205707	12.5	10	
10/25	12:38 AM	SS	12.025	224896	12.5	10	
10/25	5:04 AM	SS	12.090	228086	12.5	10	
10-25	9:15 AM	MH	12.025	231096	12.5	10	
10/25	1:10 PM	R.M.	12.090	233935	12.75	10	
10/25	6:15 pm	JS	12.090	237625	12.75	10.2	
10/25	7:48 pm	JS	12.025	238799	12.75	10.2	
10/25	11:50 PM	SS	12.025	241618	12.5	10.2	
10/26	4:10 AM	SS	12.025	244727	12.5	10.2	
10/26	9:00 AM	R.M.	12.090	2482270	12.75	10.2	
10/26	7:00 pm	JS	12.025	255417	12.75	10.2	
10/26	4:15 PM	EC	12.090	256493	12.75	10	

HADCO CORPORATION - OWEGO DIVISION

IRM OPERATION MONITORING LOG

DATE	TIME	TECH.	FLOW (GPM)	FLOW (GPD)	INF PRESS. (PSI)	AIR PRESS. (IN. H2O)	COMMENTS
10/27/93	12:20 Am	S.S	12.090	259203	12.5	10.2	
10/27	4:15 Am	SS	12.025	261984	12.5	10.2	
10-27	8:39 AM	MH	12.025	265142	12.5	10.25	
10-27	11:21 AM	MH	12.090	267076	12.5	10.10	
10/27	6:50 Pm	E.O.	12.090	272484	12.5	10	Added 500 m Vol= 13.5
10/27	9:10 Pm	E.O.	12.025	274161	12.5	10	
10/28	12:10 AM	J.P.	12.025	276294	13	10	
10/28	3:35 AM	SW	12.025	278427	13	10	
10/28	9:30 Am	R.M.	12.090	282982	12.75	10.2	
10/28	11:30 Am	R.M.	12.090	284466	12.75	10.2	
10/28	4:17 PM	C. Hill	12.025	287873	12.75	10.10	
10/28	9:40 Pm	SS	12.025	291775	12.75	10.1	
10/29	12:15 Am	SS	12.025	293625	12.75	10.1	
10/29	3:35 Am	SS	12.960	295995	12.75	10.1	
10-29	7:19 AM	MH	12.025	300070	12.75	10.1	
10-29	11:28 AM	MH	12.025	301633	12.80	10.1	
10-29	9:40 Pm	SS	12.025	305983	12.75	10.1	
10/30	5:25 AM	SS	12.025	314777	12.75	10.1	
10/30	9:18 Am	R.M.	12.025	317305	12.75	10.1	
10/30	1:00 Pm	R.M.	12.090	320105	12.75	10.1	
10/30	5:30 pm	JS	12.025	323270	12.75	10.1	
10/31	1:25 am	TM	12.025	328832	12.75	10.0	
10/31	3:43 Am	KW	12.025	339851	13.	10.0	
10/31	5:46 pm	DLD	12.09	341190	13.	10.0	
11/1	11:20 pm	JS	12.285	345318	13.2	10.1	
11/1	9:06 AM	C.Hill	12.350	348575	12.5	8.0	Pump down reset breaker

HADCO CORPORATION - OWEGO DIVISION

IRM OPERATION MONITORING.LOG

DATE	TIME	TECH.	FLOW (GPM)	FLOW (GPD)	INF PRESS. (PSI)	AIR PRESS. (IN. H2O)	COMMENTS
11-1-93	9:25AM	HH	12.285	348778	12.5	9.9	
11/1/93	1:00 PM	R.M.	12.220	351463	13.0	10.0	
11/1	5:31PM	Ed.	12.285	354726	13.25	10.0	
11/1	9:09PM	Ed.	12.285	357391	13.25	10	
11/2	12:55AM	SS	12.285	360101	13.25	10	
11/2	4:15AM	SS	12.285	362578	13.25	10	
11-2	8:50AM	HH	12.285	365921	13.25	10.1	
	1:05PM	R.M.	12.285	369034	13.25	10.0	
	5:20 pm	JS	12.285	372272	13.00	10.2	
11/3	1:20AM	SS	12.220	378039	13.	10.2	
	4:35AM	SS	12.220	380360	13	10.2	
	8:50AM	HH	12.220	383443	13.0	10.1	
	11:08AM	HH	12.285	385730	13.0	10.2	
11/3	2:00PM	C. Hill	12.285	387268	13.0	10.2	Pulled Inf/Effl. VOC samples
	4:20 pm	JS	12.220	388985	13.0	10.2	
11/3	8:34PM	Ed.	12.285	392035	13.0	10	
11/4	12:20AM	SS	12.220	394777	13	10	
	4:20AM	SS	12.285	397709	13	10	
	8:29AM	HH	12.155	400722	13	10.2	
	2:30PM	Throttled (closed) influent ball valve to					
	maintain flow rate @ ~ 12 GPM (11.96)						

ORGANIC DATA COMMENT PAGE

Laboratory Name RECRA ENVIRONMENTAL, INC.

USEPA Defined Organic Data Qualifiers:

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - The TCLP Matrix Spike recovery was greater than the upper limit of the analytical method.

L - The TCLP Matrix Spike recovery was lower than the lower limit of the analytical method.

T - This flag is used when the analyte is found in the associated TCLP extraction as well as in the sample.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. It is applied to all TIC results.

P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the Form I and flagged with a "P".

A - This flag indicates that a TIC is a suspected aldol-condensation product.

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3486	Dilution Factor:	1
Lab Sample ID:	AS047421	Sample Date:	10/15/93
Client Sample ID:	AIR STRIPPER INFL	Analysis Date:	10/18/93

Parameter	Units = UG/L	Result	Q
Acetone		10	U
Benzene		4	J
Bromodichloromethane		5	U
Bromoform		5	U
Bromomethane		10	U
2-Butanone		10	U
Carbon Disulfide		5	U
Carbon Tetrachloride		5	U
Chlorobenzene		5	U
Chloroethane		10	U
Chloroform		2	J
Chloromethane		10	U
Dibromochloromethane		5	U
1,1-Dichloroethane		300	E
1,2-Dichloroethane		8	
1,1-Dichloroethene		340	E
,2-Dichloroethene (Total)		650	E
1,2-Dichloropropane		5	U
cis-1,3-Dichloropropene		5	U
trans-1,3-Dichloropropene		5	U
Ethyl benzene		5	U
2-Hexanone		10	U
Methylene chloride		5	U
4-Methyl-2-pentanone		10	U
Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		10	
Toluene		5	U
1,1,1-Trichloroethane		2000	E
1,1,2-Trichloroethane		5	U
Trichloroethene		2300	E
Vinyl acetate		10	U
Vinyl chloride		54	
Total Xylenes		5	U

PRELIMINARY

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3486	Dilution Factor:	40
Lab Sample ID:	AS047421DL	Sample Date:	10/15/93
Client Sample ID:	AIR STRIPPER INFL DL	Analysis Date:	10/18/93

Parameter Units = UG/L	Result	Q
Acetone	400	U
Benzene	200	U
Bromodichloromethane	200	U
Bromoform	200	U
Bromomethane	400	U
2-Butanone	400	U
Carbon Disulfide	200	U
Carbon Tetrachloride	200	U
Chlorobenzene	200	U
Chloroethane	400	U
Chloroform	200	U
Chloromethane	400	U
Dibromochloromethane	200	U
1,1-Dichloroethane	300	D
1,2-Dichloroethane	200	U
1,1-Dichloroethene	320	D
1,2-Dichloroethene (Total)	660	D
1,2-Dichloropropane	200	U
cis-1,3-Dichloropropene	200	U
trans-1,3-Dichloropropene	200	U
Ethyl benzene	200	U
2-Hexanone	400	U
Methylene chloride	200	U
4-Methyl-2-pentanone	400	U
Styrene	200	U
1,1,2,2-Tetrachloroethane	200	U
Tetrachloroethene	200	U
Toluene	200	U
1,1,1-Trichloroethane	2900	D
1,1,2-Trichloroethane	200	U
Trichloroethene	5000	D
Vinyl acetate	400	U
Vinyl chloride	400	U
Total Xylenes	200	U

PRELIMINARY

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3486	Dilution Factor:	1
Lab Sample ID:	AS047422	Sample Date:	10/15/93
Client Sample ID:	AIR STRIPPER EFFL	Analysis Date:	10/18/93

Parameter	Units - UG/L	Result	Q
Acetone		10	U
Benzene		5	U
Bromodichloromethane		5	U
Bromoform		5	U
Bromomethane		10	U
2-Butanone		10	U
Carbon Disulfide		5	U
Carbon Tetrachloride		5	U
Chlorobenzene		5	U
Chloroethane		10	U
Chloroform		5	U
Chloromethane		10	U
Dibromochloromethane		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethane		5	U
1,1-Dichloroethene		5	U
1,2-Dichloroethene (Total)		5	U
1,2-Dichloropropane		5	U
cis-1,3-Dichloropropene		5	U
trans-1,3-Dichloropropene		5	U
Ethyl benzene		5	U
2-Hexanone		10	U
Methylene chloride		5	U
4-Methyl-2-pentanone		10	U
Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		5	U
Toluene		5	U
1,1,1-Trichloroethane		5	U
1,1,2-Trichloroethane		5	U
Trichloroethene		5	U
Vinyl acetate		10	U
Vinyl chloride		10	U
Total Xylenes		5	U

PRELIMINARY

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3486	Dilution Factor:	1
Lab Sample ID:	AS047423	Sample Date:	10/15/93
Client Sample ID:	TRIP BLANK	Analysis Date:	10/18/93

Parameter Units = UG/L	Result	Q
Acetone	10	U
Benzene	5	U
Bromodichloromethane	5	U
Bromoform	5	U
Bromomethane	10	U
2-Butanone	10	U
Carbon Disulfide	5	U
Carbon Tetrachloride	5	U
Chlorobenzene	5	U
Chloroethane	10	U
Chloroform	5	U
Chloromethane	10	U
Dibromochloromethane	5	U
1,1-Dichloroethane	5	U
1,2-Dichloroethane	5	U
',1-Dichloroethene	5	U
,2-Dichloroethene (Total)	5	U
1,2-Dichloropropane	5	U
cis-1,3-Dichloropropene	5	U
trans-1,3-Dichloropropene	5	U
Ethyl benzene	5	U
2-Hexanone	10	U
Methylene chloride	5	U
4-Methyl-2-pentanone	10	U
Styrene	5	U
1,1,2,2-Tetrachloroethane	5	U
Tetrachloroethene	5	U
Toluene	5	U
1,1,1-Trichloroethane	5	U
1,1,2-Trichloroethane	5	U
Trichloroethene	5	U
Vinyl acetate	10	U
Vinyl chloride	10	U
Total Xylenes	5	U

PRELIMINARY

INORGANIC DATA COMMENT PAGE

Laboratory Name RECRA ENVIRONMENTAL, INC.

USEPA Defined Inorganic Data Qualifiers:

B - Indicates a value greater than or equal to the instrument detection limit but less than the contract required detection limit.

U - Indicates element was analyzed for but not detected. Report with the detection limit value (e.g., 100).

E - Indicates a value estimated or not reported due to the presence of interference.

S - Indicates value determined by Method of Standard Addition.

N - Indicates spike sample recovery is not within control limits.

* - Indicates duplicate analysis is not within control limits.

+ - Indicates the correlation coefficient for method of standard addition is less the 0.995.

M - Indicates duplicate injection results exceeded control limits.

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

HADCO

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECOH
Lab Job No: C93-0582
Lab Sample ID: CS006310
Client Sample ID: AIR STRIPPER EFF.

Matrix: Aqueous
Sample Date: 10/15/93

Dilution Factor: 1

Parameter	Units = MG/L	Method	Digestion Date	Analysis Date	Result	Q
Copper - Total		7210	10/18/93	10/19/93	0.020	
Lead - Total		7421	10/18/93	10/19/93	0.0030	U
Nickel - Total		6010	10/18/93	10/19/93	0.040	U
Tin - Total		6010	10/18/93	10/20/93	0.20	U

PRELIMINARY

HADCO

Wet Chemistry Analysis

Laboratory: Recra Environmental, Inc.- RECOH
Lab Job No: C93-0582
Lab Sample ID: CS006310
Client Sample ID: AIR STRIPPER EFF.

Matrix: Aqueous
Sample Date: 10/15/93

Dilution Factor: 1

Parameter	Units of Measure	Method	Analysis Date	Result	Q
Non-Filterable Residue (103°C)	MG/L	160.2	10/16/93	1.0	U
Total Recoverable Oil & Grease	MG/L	9070	10/19/93	1.8	

PRELIMINARY

RECRA
ENVIRONMENTAL
INC.

Chemical and Environmental Analysis Services

World University Games Buffalo '93
GRAND PATRON
HELPING TO BRING THE WORLD TO BUFFALO

October 29, 1993

Mr. Perry Walter
Hadco Corporation
1160 Taylor Road
Owego, NY 13827

Read 11/1/93 P.W.

Dear Mr. Walter:

Please find enclosed results concerning the analyses of the samples recently submitted by your firm. The Pertinent Information regarding these analyses is listed below:

Quote #:	NY93-493
Project Name:	Air Stripper
Matrix:	Aqueous
Samples Received:	10/22/93
Sample Date:	10/21/93

If you have any questions concerning these data, please contact Ms. Michele Streif, Associate Program Manager at (716) 691-2600 and refer to the I.D. number listed below. It has been our pleasure to provide Hadco Corporation with Environmental Testing Services. We look forward to serving you in the future.

Sincerely,

RECRA ENVIRONMENTAL, INC.

Michele M. Streif
Michele M. Streif
Associate Program Manager

Candace L. Steady for RKW
Robert K. Wyeth
Laboratory Director

MMS/RKW/mms

I.D.#A93-3567
NY4A4775

ANALYTICAL RESULTS

Prepared For

Hadco Corporation
1160 Taylor Road
Owego, NY 13827

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14228-2298

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to one of the following U.S. Environmental Protection Agency references

* U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste-Physical/Chemical Methods." Office of Solid Waste and Emergency Response. November 1986, SW-846, Third Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

Quality control analysis was performed on a batch basis. All results were within acceptable limits.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic Data Comment Page.

METHOD 8240

Sample Air Stripper Influent was initially analyzed at a dilution factor of 40 (forty).

ORGANIC DATA COMMENT PAGE

Laboratory Name RECRA ENVIRONMENTAL, INC.

USEPA Defined Organic Data Qualifiers:

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - The TCLP Matrix Spike recovery was greater than the upper limit of the analytical method.

L - The TCLP Matrix Spike recovery was lower than the lower limit of the analytical method.

T - This flag is used when the analyte is found in the associated TCLP extraction as well as in the sample.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. It is applied to all TIC results.

P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the Form I and flagged with a "P".

A - This flag indicates that a TIC is a suspected aldol-condensation product.

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3567	Dilution Factor:	40
Lab Sample ID:	AS047822	Sample Date:	10/21/93
Client Sample ID:	AIR STRIP. INFL.	Analysis Date:	10/25/93

Parameter	Units = UG/L	Result	Q
Acetone		400	U
Benzene		200	U
Bromodichloromethane		200	U
Bromoform		200	U
Bromomethane		400	U
2-Butanone		400	U
Carbon Disulfide		200	U
Carbon Tetrachloride		200	U
Chlorobenzene		200	U
Chloroethane		400	U
Chloroform		200	U
Chloromethane		400	U
Dibromochloromethane		200	U
1,1-Dichloroethane		230	
1,2-Dichloroethane		200	U
1,1-Dichloroethene		310	
1,2-Dichloroethene (Total)		610	
1,2-Dichloropropane		200	U
cis-1,3-Dichloropropene		200	U
trans-1,3-Dichloropropene		200	U
Ethyl benzene		200	U
2-Hexanone		400	U
Methylene chloride		200	U
4-Methyl-2-pentanone		400	U
Styrene		200	U
1,1,2,2-Tetrachloroethane		200	U
Tetrachloroethene		200	U
Toluene		200	U
1,1,1-Trichloroethane		2100	
1,1,2-Trichloroethane		200	U
Trichloroethene		4300	
Vinyl acetate		400	U
Vinyl chloride		400	U
Total Xylenes		200	U

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3567	Dilution Factor:	1
Lab Sample ID:	AS047823	Sample Date:	10/21/93
Client Sample ID:	AIR STRIP. EFFL.	Analysis Date:	10/25/93

Parameter Units = UG/L	Result	Q
Acetone	10	U
Benzene	5	U
Bromodichloromethane	5	U
Bromoform	5	U
Bromomethane	10	U
2-Butanone	10	U
Carbon Disulfide	5	U
Carbon Tetrachloride	5	U
Chlorobenzene	5	U
Chloroethane	10	U
Chloroform	5	U
Chloromethane	10	U
Dibromochloromethane	5	U
1,1-Dichloroethane	5	U
1,2-Dichloroethane	5	U
1,1-Dichloroethene	5	U
1,2-Dichloroethene (Total)	5	U
1,2-Dichloropropane	5	U
cis-1,3-Dichloropropene	5	U
trans-1,3-Dichloropropene	5	U
Ethyl benzene	5	U
2-Hexanone	10	U
Methylene chloride	0.8	J
4-Methyl-2-pentanone	10	U
Styrene	5	U
1,1,2,2-Tetrachloroethane	5	U
Tetrachloroethene	5	U
Toluene	5	U
1,1,1-Trichloroethane	5	U
1,1,2-Trichloroethane	5	U
Trichloroethene	5	U
Vinyl acetate	10	U
Vinyl chloride	10	U
Total Xylenes	5	U

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METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3567	Dilution Factor:	1
Lab Sample ID:	AS047824	Sample Date:	10/21/93
Client Sample ID:	TRIP BLANK	Analysis Date:	10/25/93

Parameter	Units = UG/L	Result	Q
Acetone		10	U
Benzene		5	U
Bromodichloromethane		5	U
Bromoform		5	U
Bromomethane		10	U
2-Butanone		10	U
Carbon Disulfide		5	U
Carbon Tetrachloride		5	U
Chlorobenzene		5	U
Chloroethane		10	U
Chloroform		5	U
Chloromethane		10	U
Dibromochloromethane		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethane		5	U
1,1-Dichloroethene		5	U
1,2-Dichloroethene (Total)		5	U
1,2-Dichloropropane		5	U
cis-1,3-Dichloropropene		5	U
trans-1,3-Dichloropropene		5	U
Ethyl benzene		5	U
2-Hexanone		10	U
Methylene chloride		5	U
4-Methyl-2-pentanone		10	U
Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		5	U
Toluene		5	U
1,1,1-Trichloroethane		5	U
1,1,2-Trichloroethane		5	U
Trichloroethene		5	U
Vinyl acetate		10	U
Vinyl chloride		10	U
Total Xylenes		5	U

HADCO

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A93-3567	Dilution Factor:	1
Lab Sample ID:	AM003394	Sample Date:	-
Client Sample ID:	VBLK66	Analysis Date:	10/25/93

Parameter	Units = UG/L	Result	Q
Acetone		10	U
Benzene		5	U
Bromodichloromethane		5	U
Bromoform		5	U
Bromomethane		10	U
2-Butanone		10	U
Carbon Disulfide		5	U
Carbon Tetrachloride		5	U
Chlorobenzene		5	U
Chloroethane		10	U
Chloroform		5	U
Chloromethane		10	U
Dibromochloromethane		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethane		5	U
1,1-Dichloroethene		5	U
1,2-Dichloroethene (Total)		5	U
1,2-Dichloropropane		5	U
cis-1,3-Dichloropropene		5	U
trans-1,3-Dichloropropene		5	U
Ethyl benzene		5	U
2-Hexanone		10	U
Methylene chloride		5	U
4-Methyl-2-pentanone		10	U
Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		5	U
Toluene		5	U
1,1,1-Trichloroethane		5	U
1,1,2-Trichloroethane		5	U
Trichloroethene		5	U
Vinyl acetate		10	U
Vinyl chloride		10	U
Total Xylenes		5	U

HADCO
METHOD 8240 - TCL VOLATILE ORGANICS
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A93-3567

Client Sample ID	Lab Sample ID	S1 TOL #	S2 BFB #	S3 DCE #
AIR STRIP. EFFL.	AS047823	96	98	96
AIR STRIP. INFL.	AS047822	95	98	95
TRIP BLANK	AS047824	98	98	99
VBLK66	AM003394	97	99	98

QC Limits

S1 TOL = Toluene-D8 (88 - 110)
S2 BFB = p-Bromofluorobenzene (86 - 115)
S3 DCE = 1,2-Dichloroethane-D4 (76 - 114)

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

HADCO
METHOD 8240 - TCL VOLATILE ORGANICS
WATER INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A93-3567

Client Sample ID	Lab Sample ID	IS1 BCM #	IS2 DFB #	IS3 CBZ #
AIR STRIP. EFFL.	AS047823	105	104	108
AIR STRIP. INFL.	AS047822	103	103	107
TRIP BLANK	AS047824	104	105	108
VBLK66	AM003394	101	102	104

QC Limits

IS1 BCM = Bromochloromethane (50 - 200)
IS2 DFB = 1,4-Difluorobenzene (50 - 200)
IS3 CBZ = Chlorobenzene-D5 (50 - 200)

Column to be used to flag recovery values
* Values outside of contract required QC limits

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO

SITE NAME 1200 TAYLOR RD. HADCO CORP. OWEGO, N.Y. 13827

SAMPLERS (SIGNATURE) Allen M. Hill Jr.

STATION NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS	40ml. VOA Vials 8240						REMARKS
1	10/21/93	12:10pm		X	AIR STRIPPER INFLUENT	2	X						
2	10/21/93	12:15pm		X	AIR STRIPPER EFFLUENT	2	X						
3	10/21/93				TRIP BLANKS	2	X						

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
Allen M. Hill Jr.	10/21/93 3:55pm	Stacy L. Ryan			
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE/TIME	REMARKS	
			10/22/93 11:15		

Distribution: Original accompanies shipment / copy to coordinator field files

APPENDIX C

Laboratory Analytical Reports (Submitted Under Separate Cover)