REMEDIAL PRE-DESIGN REPORT

Leica Inc.
Cheektowaga, NY

Site Code: 915156

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CONESTOGA-ROVERS & ASSOCIATES

TABLE OF CONTENTS

LIST OF FIGURES
(Following Report)

LIST OF TABLES
(Following Report)

LIST OF APPENDICES

1.0 INTRODUCTION

This Remedial Pre-Design Report was prepared by Conestoga-Rovers & Associates (CRA) for Leica Inc. This report presents the results of the pre-design activities that were conducted to provide supplemental data to support the detailed design requirements for the selected remedial alternative for the former Leica Site (Site). The Site is located at Eggert and Sugar Roads in Cheektowaga, New York as presented on Figure 1.1.

The preferred remedial alternative is identified in the Feasibility Study (FS) Report dated March 5, 1996, prepared by CRA. Based upon the evaluation presented in the FS Report, Alternative 4 was recommended as the preferred alternative to address the environmental and human health concerns at the Site. Alternative 4 includes the following remedial components:

i) soil source removal with on-Site mechanical volatilization, soil vapor extraction (SVE) and biological treatment;

ii) bedrock groundwater containment/source removal with on-Site treatment;

iii) institutional controls; and

iv) groundwater monitoring.

The following pre-design data collection activities, identified in the approved Remedial Pre-Design Work Plan (Work Plan) dated August 18, 1995, were conducted to provide the necessary information to support the detailed design requirements for Alternative 4:

i) Soil Treatability Study; and
ii) Bedrock Aquifer Pumping Study.

In addition to the pre-design activities outlined in the Work Plan, the New York State Department of Environmental Conservation (NYSDEC) requested the following supplemental activities to be included in the pre-design work:

i) Non-Aqueous Phase Liquid (NAPL) Investigation; and
ii) Deep Bedrock Groundwater Investigation.

These supplemental activities were conducted in accordance with the Responses to the August 30, 1995 NYSDEC Comments on the Work Plan dated September 26, 1995 (Responses to Comments).

All design data collection activities were conducted in accordance with the Health and Safety Plan (HASP), Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) presented in the approved Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan).

The results of the pre-design activities presented in this report will be incorporated into the final remedial design for the Site.

2.0 SITE BACKGROUND

2.1 CHEMICAL DISTRIBUTION

Subsurface Soils

Three areas of the Site have been identified that contain subsurface soils with organic chemical concentrations exceeding applicable NYSDEC soil cleanup objectives. The primary chemicals detected in the subsurface soil samples were chlorinated ethenes, chlorinated ethanes and BTEX compounds (benzene, toluene, ethylbenzene, and xylene).

The three areas, designated A, B, and C are associated with the former drum storage area, the northeastern source area and the southeastern fill area, respectively. The following areas and volumes have been estimated for these areas:

	Areal Extent (ft^2)	*Average Depth (ft)*	*Volume (yd^3)*
Area A	990	3	110
Area B	12,450	13	6,000
Area C	22,050	12.5	10,210

Inorganic concentrations detected above soil cleanup objectives in the overburden soils are most likely naturally occurring and do not represent a Site-related impact.

Overburden Groundwater

The primary chemicals detected in the overburden groundwater at concentrations exceeding Class GA groundwater standards are chlorinated ethenes, chlorinated ethanes and BTEX compounds in the northeast area of the Site and chlorinated ethenes and BTEX compounds in the southeast portion of the Site. The volatile organic compounds (VOCs) detected most frequently at high concentrations include 1,1-dichloroethene

(1,1-DCE), 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE) and vinyl chloride.

Bedrock Groundwater

The primary chemicals detected in the bedrock groundwater at concentrations exceeding Class GA groundwater standards are chlorinated ethenes, chlorinated ethanes and BTEX compounds in the northeast area of the Site and chlorinated ethenes and BTEX compounds in the southeast area of the Site. The VOCs detected most frequently at concentrations exceeding Class GA groundwater standards include 1,2-DCE and vinyl chloride in the northeast and southeast areas and 1,1-DCE, TCE and tetrachloroethene in the northeast area only.

Inorganic parameters detected in both the overburden and bedrock groundwater at concentrations exceeding Class GA groundwater standards are considered to be naturally occurring and do not indicate a Site-related impact.

NAPL

NAPL was detected in the overburden groundwater at wells MW-8 and MW-11. The NAPL was found to consist primarily of trichloroethene, 1,2-dichloroethene, xylene, vinyl chloride, ethylbenzene and tetrachloroethene at concentrations ranging from 160,000 J micrograms per liter (μg/L) to 330,000,000 μg/L.

2.2 REMEDIAL ACTION OBJECTIVES

Subsurface Soil

Remedial action objectives for subsurface soil at the Site are to prevent or mitigate, to the maximum extent practicable, the migration of chemicals from Areas A, B, and C that would result in groundwater contamination in excess of Class GA groundwater standards. NYSDEC soil cleanup objectives are, therefore, remedial goals for the subsurface soils.

Overburden Groundwater

The remedial objective for the overburden groundwater at the Site is to restore groundwater quality, to the maximum extent practicable, to levels that are protective of human health and the environment. The Class GA groundwater standards and guidance values are, therefore, remedial goals for the overburden groundwater. In addition, remedial goals for the overburden groundwater are to prevent the migration of contaminants, to the maximum extent practicable, to the bedrock aquifer for the protection of human health and the environment.

Bedrock Groundwater

Remedial objectives for the bedrock groundwater at the Site are to prevent, to the maximum extent practicable, the future ingestion and exposure to groundwater with chemicals that pose carcinogenic and non-carcinogenic health risks in excess of the established acceptable levels. In addition, remedial goals for the Site bedrock groundwater are to reduce chemical concentrations, to the maximum extent practicable, to the applicable Class GA standards and guidance values for the protection of human health and the environment.

NAPL

The remedial objective for NAPL at the Site is to prevent or mitigate, to the maximum extent practicable, the migration of chemicals from this source area to the groundwater and soil for the protection of human health and the environment.

3.0 PRE-DESIGN ACTIVITIES

The following pre-design activities were completed in accordance with the Work Plan and the Responses to Comments.

3.1 NAPL INVESTIGATION

As requested by the NYSDEC in Comment 7 of the August 30, 1995 Comments on the Work Plan, the vertical and horizontal extent of NAPL was investigated to estimate the volume of NAPL containing soil to ensure that the selected technologies (mechanical volatilization, soil vapor extraction and biological treatment) will be effective in addressing this media in a timely manner. The extent of NAPL containing soil was investigated by the excavation of trenches in the areas of previously identified NAPL presence.

3.2 SOIL TREATABILITY STUDY

Contaminated soils from Area B, Area C, and NAPL containing soil from Area C were collected and evaluated, in accordance with the Work Plan, for biodegradability and volatilization potential in support of the selected remedial technologies for the treatment of soil at the Site.

3.3 DEEP BEDROCK GROUNDWATER INVESTIGATION

As requested by the NYSDEC in Comment 6 of the August 30, 1995 Comments on the Work Plan, the vertical extent of bedrock groundwater contamination was investigated by the installation and sampling of two deep bedrock wells (MW-9B and MW-15B).

3.4 BEDROCK AQUIFER PUMPING STUDY

Bedrock aquifer tests including step-drawdown and constant rate tests were conducted in accordance with the Work Plan, to provide sufficient data for the detailed design of the groundwater extraction system and sizing of the groundwater treatment system.

The methodologies and results of these pre-design data collection activities are discussed in the following sections.

4.0 NAPL INVESTIGATION

Based on the results of the boreholes installed during the Remedial Investigation (RI), NAPL was identified in the sandy zone soils at a depth of approximately 10 to 12 feet below ground surface (BGS) in the area encompassing BH-S, MW-11 and MW-8 within Area C. For the purposes of the FS, it was assumed that by combining the NAPL containing soils with soils exhibiting less chemistry (as would automatically occur during excavation and handling activities), the resulting chemical concentrations in the mix would be amenable to treatment by mechanical volatilization, soil vapor extraction and biodegradation.

As requested by the NYSDEC in Comment 7 of the August 30, 1995 Comments on the Work Plan, test trenches were excavated in the area of known NAPL presence to further refine the volume of NAPL containing soils in support of the preferred alternative for the treatment of soils at the Site.

On December 4, 5, and 6, 1995, seven test trenches were excavated in the southeast part of the Site in the vicinity of the MW-8 and MW-11 wells, where NAPL is known to be present in the overburden. These trenches were excavated at the locations shown on Figure 4.1 to determine the approximate horizontal and vertical extent of the NAPL in this area. Each test pit is described in the following titled paragraphs. Stratigraphic logs for each test pit are presented in Appendix A.

4.1 TEST TRENCH EXCAVATION

Trench #1

Oriented in the north-south direction about 20 feet west of well MW-8, Trench #1 was excavated to determine the northern extent of NAPL presence. A small amount of NAPL was observed in the soil and as an oily layer on the water in the bottom of the excavation to approximately eight feet north of well MW-8. Some "sour odor" was noted while excavating the silty sand zone, and photoionization detector (PID) readings of over 200 parts per million (ppm) were recorded 20 feet downwind of the trench. NAPL was present in the lower part of the silty-sand zone above a sandy till layer encountered about 11.0 feet BGS. The NAPL extended to about eight feet northward of MW-8.

The fill at this location was mostly black ash, with some brick, cinders, wood, glass, and concrete. Several empty, closed top 5-gallon metal cans and the corroded remains of a 55-gallon drum were also present in the fill layer.

The trench was backfilled with the excavated soil material and topped off with the excavated asphalt and subbase gravel.

Photographs of this trench are presented on Figure 4.2.

Trench #2

Oriented in a north-south direction directly south of Trench #1 and approximately 13 feet east of well MW-11, this trench was excavated to determine the extent of NAPL southward of MW-11, where NAPL was observed below 12 feet BGS during installation of this well. No NAPL was seen in the soil excavated from this trench south of MW-11, however, a sour odor was noted. A trace amount of NAPL was noted in the silty sand soils northward of an alignment between the MW-4 and MW-11 wells. Overall the silty-sand zone was much drier in this trench than in Trench #1 and the PID readings were much lower (60 ppm compared to over 200 ppm in Trench #1). This trench was backfilled using the excavated soil material.

Photographs of this trench are presented on Figure 4.3.

Trench #3

Installed in an east-west orientation about 15 feet west and 25 feet north of well MW-12, this trench was excavated to the top of bedrock at a depth of 14.0 feet. Evidence of contamination was not observed throughout Trench #3 which was substantiated by a maximum PID reading of 14 ppm. The excavated soils were dry to moist with no water accumulation in the trench prior to backfilling with the excavated soil. A photograph of this trench is presented on Figure 4.4.

<u>Trench #4</u>

Located about seven feet southwest of borehole BH-S and oriented in a southwest-northeast direction, this trench was excavated to a depth of 12.0 feet to the sandy till zone. Evidence of contamination was not observed in the fill zone or lake sediment layer, however, a thin (6-inch to 1-foot thick) gravel layer at 11.0 to 11.5 feet BGS in the silty sand zone was saturated with an odorous, dark brown NAPL which extended approximately 35 feet southwest of BH-S. PID readings of up to 450 ppm were recorded from this gravelly layer. This trench was dry to moist with no water accumulation in the bottom of the excavation. The trench was backfilled with the excavated soil material.

Photographs of this trench are presented on Figure 4.5.

<u>Trench #5</u>

Trench #5 was located about ten feet southwest of well MW-4 and was oriented in a northwest-southeast direction. This trench was excavated to determine the extent of NAPL in a southeasterly direction. The fill at this location contained some larger debris and was wet, with a chemical odor. The silty sand zone was moist to wet, with trace NAPL, a sour odor, and maximum PID readings greater than 300 ppm. NAPL extended to about six feet south of well MW-4. This trench was backfilled with excavated soil. No photographs were taken of this trench.

<u>Trench #6</u>

This trench was excavated in a west-east direction about ten feet south of well MW-8 to determine the extent of NAPL in an easterly direction (toward the eastern property line). The fill was found to contain several lengths of 2-inch by 6-inch lumber, 1-inch diameter galvanized pipe, bricks, and other large debris. A gasoline odor and a sheen was apparent from this layer, with a 4 percent lower explosive limit (LEL) reading and a 100 ppm PID reading. The silty sand zone at this location was only moist to wet. No NAPL was observed in the soil directly beneath, however, a sour odor and maximum PID readings greater than 140 ppm were noted and a small amount of oily NAPL was observed on the water which accumulated in the excavation. The NAPL was present to about eight feet east of well MW-8. This excavation was completed into the sandy till to 11.5 feet BGS and was backfilled with the excavated soil.

Photographs of this trench are presented on Figure 4.6.

Trench #7

Trench #7 was located about 30 feet north of BH-S to determine the northwest extent of NAPL presence. While excavating in the fill zone at a depth of about 4 to 5 feet BGS, a large amount of water began to enter the excavation from the northwest corner. Because of the volume of water entering the hole, it was decided not to continue digging and the excavation was backfilled.

The fill at this location included some large sheet metal. A sheen was noted on the water entering the excavation, after the water came in contact with the fill material, and a PID reading of 140 ppm was recorded.

A photograph of this excavation is presented on Figure 4.4.

4.2 SUMMARY

The area of identified NAPL presence, as determined by the results of the RI and the test trench investigation program, is delineated on Figure 4.1. The volume of NAPL containing soil is estimated to be less than 500 cubic yards occurring primarily within a depth of 8 to 11 feet BGS within the silty sand zone. The estimated volume of NAPL containing soil is estimated to be approximately 2 percent of the total volume of soil potentially requiring remediation.

The effectiveness of the preferred alternative (mechanical volatilization, soil vapor extraction and biological treatment) for the treatment of NAPL containing soils is evaluated in the soil treatability study presented in Section 5.0.

5.0 SOIL TREATABILITY STUDY

A bench scale soil treatability study was conducted to determine the potential effectiveness of mechanical volatilization, soil vapor extraction and biodegradation to treat the contaminated soils at the Site. Bench scale treatability testing was conducted on contaminated soils from the northeastern source area (Area B) and the southern eastern fill area (Area C). Tests were also conducted on NAPL containing soil from Area C by mixing it with Area C soil at a ratio consistent with the inplace soil at the Site. Soil from Area A (the former drum storage area) was not included in the treatability study due to its relatively small estimated volume and its similar chemistry to Areas B and C.

5.1 SCOPE OF WORK

The scope of work for the bench-scale soil treatability study consisted of the following tests:

i) Soil and microbial characterization. The tests consisted of determining the soil nutrient levels, particle size, microbial populations, and target chemicals of concern (COC). Tests were conducted on Area B, Area C, and NAPL containing soils;

ii) Soil amendment test. The test consisted of evaluating soil permeabilities to determine if ex situ SVE can be effectively implemented to treat the chemicals of concern (COCs). The addition of a bulking agent (vermiculite) to increase soil permeabilities was also evaluated. Tests were conducted on Area B and Area C soils;

iii) Soil respirometry test. The test consisted of determining whether the soil chemical constituents had any detrimental effect on the microbial activity. Tests were conducted on Area B and C soils, and Area C soil mixed with 5 percent NAPL containing soil by weight; and

iv) Soil microcosm test. The test consisted of performing soil microcosm assays to determine the volatilization and biological potential of the COCs. Tests were conducted on Area B and C soils, and Area C soil mixed with 5 percent NAPL containing soil.

5.2 SOIL SAMPLE COLLECTION

Soil samples were collected from two boreholes in Area B and two boreholes in Area C at the locations shown on Figure 5.1. The borehole locations were chosen to obtain soil from areas of high chemistry in Area B and Area C. The soils from the two boreholes in Area B were composited into one bulk sample and the soils from Area C were composited into another bulk sample. However, the lower portion of the two Area C boreholes contained NAPL in the soil above the till layer. These NAPL containing soils were collected and contained separately from the remainder of the Area C soil. All boreholes were completed using rotary drilling to drive a split spoon sampler in advance of hollow stem augers.

Samples were collected from the bottom of asphalt to refusal at bedrock in order to obtain a complete cross section of the soil horizon, including fill, lake sediments, and silty sands. After logging the samples, the soil was placed into a large plastic bag inside a five gallon bucket. No in-field homogenization was performed. Upon completion of the boreholes in an area, the bag was sealed with a twist tie and the bucket securely closed for transport under Chain of Custody to the TreaTek-CRA laboratory in Niagara Falls, New York. Approximately 20 to 25 pounds of soil were obtained from each of the two areas and approximately four pounds of NAPL containing soil was obtained from Area C.

5.3 SOIL AND MICROBIAL CHARACTERIZATION

Soil samples from Areas B and C and the NAPL containing soil sample from Area C were received by the TreaTek-CRA Laboratory on September 5, 1995. Representative samples of Area B, Area C, and NAPL containing soils were individually homogenized and analyzed in duplicate for nutrients, particle size (not performed in duplicate), microorganisms, and target chemicals in accordance with the standard operating procedures (SOPs) presented in Appendix B.

5.3.1 Soil Nutrients

The soil nutrient characterization test was initiated on September 8, 1995 and performed on Area B, Area C, and NAPL containing soils. The tests included analysis of pH, nitrogen, phosphorus, total organic matter, and moisture content. The results of these analyses are tabulated in Table 5.1. The pH of the soil samples were approximately 8.0 with a moisture content ranging from 13 to 20 percent. The average nutrient levels ranged from 4.6 to 24 milligrams per kilogram (mg/kg) for ammonia nitrogen and 4.9 to 8.4 mg/kg for orthophosphate phosphorus. Total average organic matter ranged from 9,000 to 15,000 mg/kg soil.

A soil pH of 8 is in the acceptable range of 5 to 9 for supporting biological activity. Soil nutrient levels and availability were assessed relative to the total carbonaceous material present in the soil. Typically, a carbon/nitrogen (C/N) range of 20:1 to 80:1 is desirable for enhancing biodegradation. Due to the high total carbon content in the soil (average concentrations of 4,500 to 7,250 mg/kg) all three soils exhibit C/N ratios higher than the desirable ratio range of 20:1 to 80:1. To reduce the high C/N values to acceptable levels, nitrogen addition to the soil would be required. Phosphorus addition may also be necessary to maintain a desirable nitrogen and phosphorus (N/P) balance of 5:1 to 10:1.

5.3.2 Soil Particle Size

Representative soil samples from Areas B and C were shipped to an outside laboratory (Buffalo Drilling Company, Inc., Clarence, New York)) on September 13, 1995 for particle size characterization. Analyses for particle size distribution were not performed in duplicate. The results of these analyses are presented in Table 5.2. The clay, silt, and sand contents for the soils were in the range of 19 to 31 percent, 44 to 45 percent, and 22 to 32 percent, respectively. The soils were primarily silt in nature with Area C soil (31 percent clay) being finer grained than Area B soil (19 percent clay). While the silt fraction was about the same in both soils (44 to 45 percent), the gravel and sand fractions were higher in Area B soil (37 percent) than in Area C soil (23 percent).

5.3.3 Soil Microbial Evaluation

Area B, Area C, and NAPL containing soils were characterized for indigenous microorganisms on September 8, 1995. The results of duplicate soil sample analyses are presented in Table 5.3. The total heterotrophic bacteria were counted by plating on a nutrient-rich Tryptic Soy Agar (TSA) medium; petroleum hydrocarbon specific bacteria were counted by plating on a mineral salts medium with hexadecane (C-16) as a sole carbon source; and chlorinated solvent specific bacteria were counted by plating on a mineral salts medium containing TCE or 1,2-DCE as a sole carbon source.

The results of the microbial characterization were similar for Area B and Area C soils. The results for Area B and Area C soils indicated total heterotrophic bacteria of about 10^5 colony forming units (CFUs)/g while the C-16 and chlorinated solvent specific bacteria were about 10^4 CFUs/g and 10^3 CFUs/g, respectively. These results suggest that Area B and Area C soils support a relatively healthy native bacterial population including bacteria capable of utilizing chlorinated solvents and petroleum hydrocarbons as organic substrates. The NAPL containing soil contained lower bacterial concentrations, one or two orders of magnitude less than Area B and Area C soils. These low bacterial numbers may be attributable to toxic levels of chemicals in the NAPL containing soil or may be representative of naturally lower bacterial concentrations in the deeper silty sand zone in which the NAPL resides.

5.3.4 Target Chemicals

Samples from Area B, Area C and NAPL containing soils were analyzed for VOCs, total petroleum hydrocarbons (TPH) and metals in accordance with the SOPs presented in Appendix B. The analytical results are presented in Appendix C and summarized in Table 5.4.

Acetone, ethylbenzene, 1,1,1-trichloroethane, TCE and xylenes were detected in the duplicate samples collected from Area B at concentrations ranging from 29 micrograms per kilogram (µg/kg) to 210 µg/kg. TPH was reported at a concentration of 120 mg/kg in both duplicate samples. The results for Area B soil are generally consistent with the results of the RI.

TCE was the only VOC detected in the duplicate samples of Area C soil at concentrations of 4,400 µg/kg and 5,600 µg/kg. The presence of other VOCs detected in Area C soils during the RI, was mostly likely masked by the elevated detection limits required by the high TCE concentration reported for the Area C soil sample. TPH was reported at an average concentration of 315 mg/kg.

The analytical results for the NAPL containing soil indicate the presence of TCE at concentrations of 91,000 µg/kg and 360,000 µg/kg in the duplicate samples. Methylene chloride was detected at a concentration of 5,000 µg/kg in one of the duplicate samples. The presence of the predominant VOC, TCE, at relatively high concentrations resulted in elevated detection limits, thereby masking the presence of any other VOC that may be present in the NAPL containing soil. TPH was approximately one order of magnitude greater in the NAPL containing soil sample in comparison to Area B and Area C TPH levels.

The analytical results for metals indicate similar concentrations of beryllium, chromium, copper, lead, nickel and zinc for both the Area B and Area C soil samples. The metal results are generally consistent with the results of the RI for these areas.

5.4 SOIL AMENDMENT TEST

Generally, a high clay content in soil does not permit sufficient oxygen transfer and makes the soil relatively impermeable to air. This is a concern for implementing SVE and biological treatment for the Leica Site. Due to the high clay content in Area B and C soils, amendment experiments were conducted to test the effect of adding bulking agents to the soil on improving air permeability. Vermiculite, a common bulking agent, was added at levels of 5 percent and 10 percent by weight to the soils and its impact on air permeability was compared to unamended soils.

The soil permeability test was conducted in glass columns 30 centimeters (cm) in length with a radius of 2.5 cm. Soil was placed inside the column and both ends of the column were sealed tightly with rubber stoppers. Nitrogen was used as the carrier gas and pressurized into the column through an opening in the rubber stoppers. The pressure at which nitrogen entered into and exited from the soil column was recorded. The flow rate of nitrogen after exiting the soil column was monitored. The soil volume, moisture content, and the temperature at which the experiment was conducted were noted. Soil permeability tests were conducted for Area C soil, Area C soil with 5 percent vermiculite (by weight), and Area C soil containing 10 percent vermiculite (by weight). Similar variations were tested for Area B soil.

Soil permeability was calculated from Darcy's law based on the following equation:

$$k = Q\mu L/Ap$$

where,

K = air permeability in darcies
Q = nitrogen flow rate in cm^3/sec
μ = dynamic viscosity in centipoise (0.01)
L = length of the soil column in cm
p = pressure differential in atmospheres

A = cross sectional area of the soil column in cm^2

The air permeability obtained in k (Darcy) is converted to k (cm^2) based on the following conversion:

1 Darcy = 9.87×10^{-9} cm^2

5.4.1 Soil Bulking Test Results

The results of air permeability for Area B and Area C soils are presented in Table 5.5. Without any vermiculite addition, the average air permeabilities for Area B and Area C soils were 2.9×10^{-7} cm^2 and 0.79×10^{-7} cm^2, respectively. While these air permeability results are considered acceptable for SVE implementation (generally up to 10^{-8} cm^2), it should be noted that the laboratory soil core columns may not truly represent the longitudinal section of soil cores in the field due to disturbance of the soil core integrity during sampling, transport, homogenization and repacking into columns. Therefore, a lower air permeability may be expected under actual field situations for these soils with high clay content (19 to 31 percent).

Vermiculite addition to Area C soil at 5 percent (by weight) increased the air permeability by about 3 times (increased from 0.79×10^{-7} to 2.3×10^{-7} cm^2). However, addition of vermiculite at 10 percent (by weight) did not significantly further improve the permeability. Similarly, vermiculite addition to Area B soil at a 5 percent (by weight) almost doubled the air permeability but vermiculite addition at 10 percent (by weight) did not further increase the air permeability.

5.6 SOIL RESPIROMETRY TEST

Respirometry tests were conducted to determine the amount of biodegradation that can be expected for the Site soils to determine whether the soil chemistry is toxic to microorganisms and to determine the effect of nutrient addition on biological activity. The soil respirometry test measures the amount of carbon dioxide (CO_2) that would be produced from the biodegradation of carbonaceous compounds. This test is a good indicator to quickly determine whether the soil chemistry is toxic to microorganisms. The soil respirometry test was performed separately on Area B soil, Area C soil, and Area C soil containing 5 percent (by weight) NAPL soil. The test was initiated on September 14, 1995 and was carried out for three weeks. The soils (50 g) were placed in respirometric flasks and incubated under four treatment conditions in duplicate as follows:

Treatment 1: Sterile control (sodium azide in water was added to the soil to poison microbes and inhibit biological activity);
Treatment 2: Water;
Treatment 3: Water plus nutrients; and
Treatment 4: Water plus nutrients plus glucose.

For Area C soil, Treatment 1 consisted of a sterile control wherein sodium azide (a biological inhibitor) in water was added to 50 g of soil to provide a final sodium azide concentration of approximately 1,000 mg/kg. For Treatment 2, only water was added to the soil. For Treatment 3, an inorganic nutrient solution containing nitrogen and phosphorus was added. Nitrogen was added in the form of urea (6 mg/50 g soil) and ammonium chloride (10.7 mg/50 g soil) and phosphorus was added in the form of dibasic potassium phosphate (3.4 mg/50 g soil) and monobasic potassium phosphate (2.7 mg/50 g soil). After the addition of nutrients, the C/N and N/P ratios in the soils were about 50:1 and 5:1, respectively. For Treatment 4, inorganic nutrients were provided as described for Treatment 3 plus organic carbon in the form of glucose at 0.1 percent. Glucose represented less than 5 percent of the soil native carbon. Glucose was added to these soils to get a quick indication of microbial toxicity since glucose is more readily degraded than the native organic carbon associated with the Site-related contaminants. The test with Area C soil containing 5 percent NAPL soil was performed the same way as for Area C soil.

The respirometry test for Area B soil was designed similarly to the test for Area C soil. Sodium azide was added in Treatment 1 to provide a 1,000 mg/kg concentration. Inorganic nutrients were added in

Treatment 3 to provide C/N and N/P ratios of approximately 60:1 and 5:1, respectively (urea, 3.13 mg; ammonium chloride, 5.58 mg; dibasic potassium phosphate, 2.15 mg; and monobasic potassium phosphate, 1.68 mg in 50 g soil). Inorganic nutrients and glucose (0.1 percent) were added in Treatment 4.

5.5.1 Soil Respirometry Results

The soil respirometry test results for a 21-day period are presented in Table 5.6. The results for the treatment variations for Area B soil, Area C soil, and Area C plus NAPL soil are presented on Figures 5.2, 5.3 and 5.4, respectively. The CO_2 production (or microbial activity) generally increased with nutrient addition in all three soils. Area C soil (with or without NAPL soil) exhibited significant intrinsic CO_2 production even in the absence of nutrient addition. All soils produced greatest CO_2 upon glucose addition since glucose is readily biodegradable compared to the degradation of native organic carbon and the contaminants such as chlorinated solvents and TPH. It is important to note that the CO_2 production in Area C soil and in Area C soil containing NAPL were quite similar. This implies that NAPL soil addition to Area C soil (at 5 percent) did not inhibit microbial activity. In comparison, the CO_2 production in sterile control soils was relatively low. It is not unusual to detect low amounts of CO_2 in sterile soils since the headspace of the flask at the start of the experiment contains air and some intrusion of air occurs during sampling and analysis.

The results of the soil respiratory tests indicate that the chlorinated solvents and a low percentage (5 percent) of NAPL soil were not toxic to microorganisms in Area B and C soils.

5.6 SOIL MICROCOSM TEST

Chlorinated solvents such as chlorinated ethenes are known to aerobically biodegrade through a co-metabolic process. For the co-metabolic process to occur, the appropriate carbon co-substrate must be present. Soil microcosm tests were conducted to determine the degree of chlorinated solvent and TPH degradation with and without the addition of a carbon co-substrate (glucose). In addition, the effect of nutrient additives (as determined by the results of the soil characterization and respirometry tests) on the degradation of chlorinated solvents and TPH was also examined. The need for microbial addition was determined by introducing commercially available microorganisms to the test soils. The soil microcosm study was, therefore, designed to investigate the following:

i) the chemical (volatilization) versus microbial degradation;
ii) the requirement for nutrients and carbon co-substrate;
iii) the need for microbial addition; and
iv) the rate of chlorinated solvents and TPH degradation.

Field treatment of soil by SVE and biodegradation was duplicated in the laboratory with soil microcosms. The microcosm tests were conducted separately on Area B soil, Area C soil, and Area C soil containing 5 percent NAPL soil to evaluate the volatilization and biodegradation impact on VOCs and TPH reduction.

The microcosm tests were conducted in glass jars containing 180 g soil samples. Vermiculite (5 percent by weight) was added to Area C soil alone and Area C soil containing 5 percent NAPL soil. For comparative purposes, Area B soil did not receive any vermiculite. Each microcosm was incubated under five different treatment conditions in duplicate as follows:

Treatment 1: Sterile control (sodium azide was added to the soil to poison and inhibit biological activity);

Treatment 2: Soil alone (no nutrients were added to the soil);

Treatment 3: Soil plus nutrients (nitrogen and phosphorus were added to the soil);

Treatment 4: Soil plus nutrients and carbon (nitrogen, phosphorus and glucose were added to the soil); and

Treatment 5: Soil plus nutrients, carbon and bacteria (nitrogen, phosphorus, glucose, and commercial bacteria were added to the soil).

For Area C soil, Treatment 1 consisted of the addition of sodium azide in water to 180 g of soil for a final sodium azide concentration of 1,000 mg/kg. For Treatment 2, only water was added to the soil. For Treatment 3, an inorganic nutrient solution containing nitrogen and phosphorus was added. Nitrogen, in the forms of urea (21.6 mg/180 g soil) and ammonium chloride (38.5 mg/180 g soil) and phosphorus in the forms of dibasic potassium phosphate (12.2 mg/180 g soil) and monobasic potassium phosphate (9.7 mg/180 g soil) were added to the soil. After the addition of nutrients, the C/N and N/P ratios in the soils were approximately 50:1 and 5:1, respectively. For Treatment 4, inorganic nutrients were provided as described for Treatment 3 plus organic carbon in the form of glucose at 0.1 percent. Glucose represented less than 5 percent of the soil native carbon. Treatment 5 was similar to Treatment 4 with the addition of bacteria. The bacteria consisted of TCE degrading Pseudomonas sp. procured from Osprey Biotechnics, Sarasota, Florida, and TPH degrading bacterial strain ETB 015 maintained in the TreaTek-CRA laboratory. The log phase bacterial cells were inoculated to soil at 1 percent by volume. The test for Area C soil containing 5 percent NAPL soil was treated exactly the same way as Area C soil.

The soil microcosm test for Area B soil was designed the same as the tests for Area C soil. The amount of inorganic nutrients added to 180 g soil were slightly different for Treatment 3 and consisted of 11.3 mg urea, 20 mg ammonium chloride, 7.7 mg dibasic potassium phosphate, and 6.1 mg monobasic potassium phosphate.

5.6.1 Soil Microcosm Results For Volatile Organic Compounds

The results of the soil microcosm tests on VOCs for Area B soil, Area C soil, and Area C soil containing 5 percent NAPL are presented in Tables 5.7, 5.8 and 5.9, respectively. The soils were sampled for VOCs at zero, two, and four weeks. Since four week sampling results indicated that most of the compounds were at or below the analytical detection limits, further sampling was not performed.

The time zero analysis of Area B soil microcosms indicated a low initial chemistry of methylene chloride, 1,1,1-trichloroethane (TCA) and TCE. These chemicals, except for methylene chloride, declined from average concentrations of 10 µg/kg to 14 µg/kg at time zero to concentrations below the detection limits in four weeks. Methylene chloride was detected in all the soil samples for the Area B soil microcosm test (including the method blank). The results for methylene chloride are, therefore, considered suspect due to analytical method interference and are not included in the interpretation of the results.

For Area C soil, the time zero analysis indicated the presence of 1,2-DCE, methylene chloride, TCE, and xylenes. The TCE levels declined from an average concentration of 373 µg/kg at time zero to 19 to 31 µg/kg in two weeks and to below the detection limits after four weeks. Similarly, 1,2-DCE declined from an average concentration of 85 µg/kg on day 0 to 17 to 39 µg/kg in two weeks and to below the detection limits in four weeks. In four weeks, total xylenes declined from an average concentration of 490 µg/kg to below the detection limit of 12 µg/kg. The effects of different treatment enhancements (i.e., nutrient, carbon, and bacteria additions to soil) on VOC reduction were similar to the sterile control. This suggests high volatilization losses over biological degradation for VOC reduction.

For Area C soil containing 5 percent NAPL soil, the time zero analysis of soil microcosms for VOCs indicated the presence of acetone, 1,2-DCE, TCE, and xylenes. The TCE, 1,2-DCE, and xylene levels in these soil microcosms declined from average concentrations of 210, 61, and 167 µg/kg, respectively, at time zero, to concentrations below the detection limits in four weeks. Similar to Area C soil, the effects of five different treatments on chemical loss were similar, which again indicates rapid volatilization as the primary removal mechanism for VOCs.

5.6.2 Soil Microcosm Results For Petroleum Hydrocarbons

The soil microcosm test results for TPH are presented in Table 5.10. The average TPH levels at time zero for Area C soil, Area C soil containing 5 percent NAPL soil, and Area B soil were 2,000; 2150; and 195 mg/kg, respectively. After eight weeks of incubation, the average TPH level for Area C soil was lower in treatments that received nutrient, carbon, and bacteria (890 to 1,400 mg/kg) compared to the sterile control (2,100 mg/kg). This suggests that, unlike the VOCs, most of the TPH in the soil was lost by biological degradation. For Area C soil containing 5 percent NAPL, the TPH levels declined by 50 percent in sterile soil after eight weeks. During the corresponding period, the TPH loss was 74 percent in soils that were amended with nitrogen and phosphorus. TPH loss in soils amended with carbon and bacteria (Treatments 4 and 5) were higher than the sterile controls and varied between 69.5 to 71.4 percent. These results suggest that the TPH loss in this soil was through both volatilization and biodegradation processes. The TPH results for Area B soil were inconclusive. The TPH levels were initially low (180 mg/kg) and never exceeded 380 mg/kg during the eight week study. TPH concentrations of 180 to 360 mg/kg is close to typical soil background levels and further decline due to treatment variations was not observed during the eight week study.

5.7 SUMMARY

The following conclusions can be drawn from the bench-scale soil treatability tests:

- Based on soil characterization and respirometric results, Area B and Area C soils are both amenable to mechanical volatilization, ex situ SVE and biodegradation. The addition of 5 percent (by weight) of NAPL to the Area C soil showed no inhibitory impact to microbial activity.

- Soil microcosm tests simulating full-scale SVE/biodegradation treatment showed significant VOC removal (>90 percent) by volatilization alone in a four-week period. TPH reduction of over 50 percent was observed over an eight-week period, with the removal primarily attributed to biodegradation.

- Full-scale treatment of Area B and Area C soils (including 5 percent NAPL by weight) can be implemented using a combination of mechanical volatilization, SVE, and biotreatment technologies. VOCs are expected to be removed primarily by volatilization while TPH removal will be primarily from biodegradation. The addition of inorganic and organic nutrients will enhance the rate of TPH biodegradation. The need for bulking agents to improve soil air permeability and reduce the cleanup time will have to be reassessed based on actual soil conditions during full-scale treatment.

6.0 DEEP BEDROCK GROUNDWATER INVESTIGATION

The vertical extent of bedrock contamination was investigated as an adjunct to the Work Plan as requested by the NYSDEC in Comment 6 of the August 30, 1995 Comments on the Work Plan. Two bedrock monitoring wells were installed at the Site to monitor the bedrock interval below the existing shallow bedrock wells. The two deeper bedrock wells, designated MW-9B and MW-15B, were installed downgradient of the two known contaminant source areas (Area B and Area C) as shown on Figure 6.1. The wells were screened in competent bedrock and sampled to determine the concentrations of Site-related contaminants, if any, in the deeper bedrock.

The two bedrock wells were installed prior to the Bedrock Aquifer Pumping Study so that they could be included in the study to determine the degree of hydraulic connection between the shallow fractured bedrock and the deeper competent bedrock.

6.1 WELL INSTALLATION

The two deep bedrock wells were designed and cased to prevent the potential drawdown of contaminants from the overburden and upper bedrock to the deep bedrock.

Wells MW-9B and MW-15B were installed using hollow stem augering and wet rotary drilling methods. The overburden was penetrated using 8 1/4-inch internal diameter (ID) hollow stem augers with no split spoon sampling, except for the lower two feet of soil at each borehole, where a split spoon sample was collected to evaluate NAPL presence. After augering to bedrock, a 7 7/8-inch diameter roller bit was used to penetrate the uppermost six inches of bedrock. A 6-inch diameter steel casing was then installed to the bottom of the bedrock notch and cemented into place using a plugged end on the casing and a tremie tube for cement placement around the casing.

Well MW-9B was cored from the bottom of the overburden casing to a depth of 45 feet BGS to assess shallow bedrock quality as there is no shallow bedrock well at the MW-9 location. A depth of 45 feet was used as this is the maximum depth of the four nearby shallow bedrock wells (MW-5A, MW-6A, MW-13A, and MW-14A). Coring was performed using an NX size wireline diamond bit core barrel. It was determined through core examination that the rock quality description (RQD) increased below 36.7 feet and there was no chert present in the 40.8 to 45.0 foot run, with more coral in this run.

The corehole for well MW-9B was enlarged to a diameter of 5 7/8-inch (nominal) using a roller bit to a depth of 44.3 feet BGS, and a 4-inch steel casing was installed to this depth using a grout plug on the lower end and a tremie pipe to place the grout around the casing. After allowing the cement to cure for 24 hours, the well was then completed as an open hole bedrock well by coring below the 4-inch casing to a depth of 60 feet using an HQ size core barrel (4-inch [nominal] outside diameter [OD]). A flush-mounted protective casing was then installed over well MW-9B to complete the installation.

Deep bedrock well MW-15B was installed adjacent to the existing shallow bedrock well MW-15A, which monitors the interval from 14.4 to 36.0 feet BGS. Well MW-15B was drilled to a depth of 35.0 feet BGS using a 5 7/8-inch roller bit. The bedrock was HQ cored from 36.0 to 39.5 feet BGS to recover the bedrock core from the interval below well MW-15A. The corehole was enlarged to approximately 6-inches in diameter and drilled to a depth of 41 feet (five feet below the interval monitored by MW-15A) to install the 4-inch steel overburden casing. After a four day set time for the cement, well MW-15B was completed as an open hole bedrock well by coring with HQ size equipment to a depth of 56.1 feet BGS. A flush mount protective casing was installed over the 6-inch surface casing to complete the installation.

Bedrock logs and well instrumentation diagrams are included in Appendix E of this report.

6.2 HYDRAULIC MONITORING

During installation of the deeper bedrock wells, water levels in one or more adjacent shallow bedrock wells were monitored manually and with a Telog® pressure transducer as a preliminary evaluation of any interconnection between the shallow and deeper bedrock zones. At the MW-15 location, the existing MW-15A well was monitored while drilling occurred at MW-15B. Review of the Telog® data shows slight increases in water levels at well MW-15A during drilling, including a rapid rise of about 1.1 feet corresponding to the loss of water return observed at well MW-15B while drilling at approximately 22 feet BGS. A smaller increase (about 0.2 feet) in water level at well MW-15A was also noted while coring below the 4-inch casing, indicating some hydraulic interconnection between the "A" (shallow) bedrock zone and the "B" (deep) bedrock zone.

During drilling of well MW-9B, Telog® transducers were installed in well MW-5A (approximately 135 feet southwest) and well MW-13A (approximately 120 feet east).

Review of the Telog® data collected during drilling of the shallow bedrock (A-Zone) at well MW-9B shows a rise in water levels at both wells MW-13A and MW-5A, especially during reaming (enlargement) of the corehole prior to casing installation. The water level increase was slight (0.4 feet) but more pronounced at well MW-5A than at well MW-13A.

During coring of the deep bedrock (B-Zone) at well MW-9B, water levels in wells MW-5A and MW-13A, which were falling prior to coring, leveled out, then began to rise during coring, again indicating some hydraulic interconnection between the shallow and deep bedrock zones.

Graphs of the Telog® data are presented on Figures 6.2 through 6.5.

6.3 MONITORING WELL DEVELOPMENT

Newly installed monitoring wells MW-9B and MW-15B were developed using surge and pump techniques to remove a minimum of ten calculated well volumes of water from each well in accordance with the RI/FS Work Plan. A stainless steel bailer was used to agitate the water column, placing sediments into suspension, and a Grundfos Redi-Flow 2 Pump was used to evacuate the water. Measurements of groundwater pH, conductivity, temperature, and turbidity, were taken for each well volume removed. Groundwater was pumped into 55-gallon drums, then transferred from the drums into a wastewater tanker for storage pending disposal approvals.

6.4 GROUNDWATER SAMPLING

Groundwater samples were collected from the two wells for analysis of Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), and TPH. A matrix spike and matrix spike duplicate (MS and MSD) sample were collected from well MW-15B and a blind duplicate sample (labeled MW-24B) was collected from well MW-9B for analysis of the above compounds.

In accordance with the RI/FS Work Plan, samples were to be collected after purging a minimum of three calculated well volumes; when pH, specific conductance, and temperature stabilized and a low turbidity sample was obtained; or after a maximum of five well volumes were removed. Stability and low turbidity were attained after pumping three well volumes at well MW-15B and after four well volumes at well MW-9B as shown in Table 6.1. The wells were purged using the Grundfos pumps with the intake positioned just below the top of the water column. The groundwater samples were collected using a teflon disposable bailer.

A separate pump and bailer were used at each well. Groundwater pH, specific conductance, temperature, and turbidity were measured and recorded for each well volume pumped from each well. These field parameters are summarized in Table 6.1.

6.5 ANALYTICAL RESULTS

The results of analyses of groundwater samples from the MW-9B and MW-15B wells are presented in Table 2 of the Analytical Data Assessment and Validation report which is contained in Appendix F.

6.5.1 MW-9B

Analytical results for both the investigative and blind duplicate samples collected from well MW-9B indicate that VOCs, SVOCs, and TPH were not detected at or above the method detection limits at this location. Although there is no shallow A-Zone bedrock well at the MW-9 location, several surrounding wells (MW-6A, MW-13A, and MW-14A) all exhibited varying levels of chemistry during the RI, indicating the A-Zone bedrock has been impacted in the vicinity of the known area of contamination in the southeast part of the Site. The current results for well MW-9B indicate that the deeper B-Zone bedrock groundwater in the southeast area has not been impacted by the contamination present in the shallow A-Zone bedrock groundwater.

6.5.2 MW-15B

Analysis of the groundwater samples collected from the MW-15B well indicate the presence of VOCs and a trace amount of phenol. Phenol was detected at an estimated concentration of 5 µg/L. This compound was not analyzed for the MW-15A samples collected during the RI. The detected VOCs and the concentration at which they were detected are similar to those detected in groundwater samples from the MW-15A well, as shown in parenthesis for January and March 1994, respectively. These volatile compounds are:

i) 1,1-dichloroethene at an estimated concentration of 7 µg/L (5 µg/L and 4 µg/L);

ii) vinyl chloride at 41 µg/L (300 and 200 µg/L);

iii) 1,1-dichloroethane at 52 µg/L (19 and 25 µg/L);

iv) 1,1,1-trichloroethane at 64 µg/L (8 and 5 µg/L);

v) trichloroethene at 210 µg/L (8 and 14 µg/L); and

vi) 1,2-dichloroethene (total) at 760 µg/L (650 and 490 µg/L).

It is recommended that a second round of sampling be conducted to confirm the results of the initial sampling.

7.0 BEDROCK AQUIFER PUMPING STUDY

7.1 STEP DRAWDOWN TEST

In February 1996, step drawdown testing was conducted at the MW-6A and MW-16A wells. These tests were conducted separately from the constant rate pumping tests in order to obtain better estimates of anticipated pumping rates and to quantify pre- and post-treatment groundwater chemistry, both of which are needed to estimate carbon requirements in the event that treatment of air emissions from the air stripper is required and to obtain approvals for direct discharge to the sanitary sewer system during the pumping tests.

The step-drawdown tests were conducted using a 1.6-inch diameter Grundfos Redi-Flow 2 pump to pump water into a Shallow Tray Model 1341 4 Stage Air Stripper. A blower unit was used to supply 150 cubic feet of air per minute through the air stripper. The treated water was pumped to a wastewater storage tanker after flowing through the air stripper and the air exhaust was vented through a 175 pound vapor phase carbon canister to the atmosphere. The stored water was sampled on February 23, 1996 to determine appropriate disposal of this material.

Groundwater samples of the influent to the air stripper and the discharge from the air stripper were collected at the beginning and at the end of the test for analysis of VOCs. These samples were collected as a check on the effectiveness of removal of contaminants by the air stripper.

7.1.1 MW-6A

Well MW-6A was pumped on February 13, 1996. The flow rates for each step were 1-gallon per minute (GPM), 2 GPM, 4 GPM, and 6.5 to 7.0 GPM. A Telog transducer was used to monitor the water levels in the pumping well and at the adjacent overburden well. The transducer and pump were set at 34 feet BGS (MW-6). Manual water levels were measured in the pumping well (MW-6A), the adjacent overburden well (MW-6), overburden wells MW-5, MW-7, MW-12, MW-15, and MW-20, and bedrock wells MW-5A, MW-9B, MW-15A, and MW-15B. The flush-mounted roadboxes on several other nearby wells were frozen and could not be accessed, including MW-2, MW-2A, MW-9, MW-13, MW-13A, and MW-21. The location of the pumping well and the surrounding monitoring wells where water levels were measured are presented on Figure 7.1.

The first three steps resulted in a noticeable drop and subsequent stabilization of the water table in the pumping well. The water level was still dropping when the pump defaulted in the fourth step, however, it is believed that this well may be capable of yielding a larger flow rate than 6.5 GPM, as there was still approximately 16.2 feet of water over the pump and water levels had stabilized fairly rapidly during the previous tests. A graph of the response in the water table at well MW-6A during the step test is presented on Figure 7.2.

Measurement of water levels in the surrounding wells were taken prior to startup of the test and after two hours of pumping. A final round of water levels was not taken due to the unexpected failure of the pump in well MW-6A about ten minutes into the fourth step of this test. The water levels indicate a local response of about 1.9 feet of drop in the MW-6 well (about 30 feet north of the pumping well) and a drop of about 0.2 feet in the MW-12 well (about 115 feet southeast of MW-6A). The remaining wells showed no change or very little increase in the water table (0 to 0.64 feet). The response in well MW-6 to the MW-6A step test is presented on Figure 7.3. A summary of the water level measurements taken during the test is presented in Table 7.1.

7.1.2 MW-16A

The step test at well MW-16A was begun on February 14, 1996, however, the 3-inch submersible being used failed about 45 minutes into the first step (1 GPM) and could not be restarted. The test was restarted on February 15 using a Grundfos Redi-Flow 2 pump at rates of 3.0 GPM, 5.0 GPM, and 6.5 to 7.0 GPM. A Telog transducer was installed in the pumping well and the adjacent overburden well to monitor the water table response during the step test. Additionally, water levels were measured in wells MW-16 and MW-16A, overburden wells MW-1, MW-15, and MW-18, and bedrock wells MW-1A, MW-15A, MW-15B, and MW-17A. These levels were measured before the start of the step test; at two hours into the test, and just prior to shutdown after four hours of pumping. The location of these hydraulic monitoring wells in relation to the pumping well is presented on Figure 7.4.

Each pumping step resulted in a fairly rapid drop in the water table and a subsequent stabilization. Final water levels in the pumping well indicate a drawdown of about 9.0 feet occurred during the test, leaving about 12 feet of water above the pump. Based on this information it is anticipated that this well could sustain a higher pumping rate than the 6.5 GPM final rate of the step test. The pumping well water table response during the step test is presented on Figure 7.5.

The water level measurements in the nearby overburden wells as presented in Table 7.2 show a drop in the water table of 0.03 to 0.08 feet over the test period. This slight drop may be a response to the pumping test or may be the result of a change in atmospheric pressure. The water levels measured in the nearby bedrock wells show a drop of 0.19 to 0.26 feet during the test. This is expected to be a response to the pumping test but could be due to an atmospheric pressure change. These step tests will be followed with a 48-hour to 72-hour constant rate pumping test when approvals for direct discharge to the sanitary sewer are obtained. Based on the step test, it is estimated to attempt pumping rates of 10 GPM in both MW-6A and MW-16A.

7.1.3 Step Test Analytical Results

The results of the analyses of influent and effluent samples collected at a low flow rate at the start of each step test and at the maximum flow rate at the end of each step test indicate that the air stripper is effective in the removal of VOCs from the groundwater, with chemistry reduction of greater than 99 percent of the influent concentrations observed for well MW-16A in both samples and removal of 98 percent or more in the low-flow samples for well MW-6A. The higher flow rate samples at well MW-6A did not, however, show the same removal efficiencies (ranging from 58.3 percent for ethylbenzene and toluene to 95.81 percent for xylene) despite lower influent concentrations for this set of samples. As a result, the Buffalo Sewer Authority (BSA) sanitary sewer discharge limits for 1,2-dichloroethene and vinyl chloride were not met for the higher flow rate at this location. Theoretical calculations, using higher flows and higher influent concentrations indicated treated effluent concentrations will be below the BSA limits of 202 µg/L and 1 µg/L for 1,2-dichloroethene and vinyl chloride, respectively. The only variable that differed between the MW-6A and MW-16A tests was the air temperature during the MW-6A test, which reached a high of 6°Fahrenheit (°F) during the MW-6A test, with wind chills of well below 0°F. The lower temperature during the MW-6A test which was below the temperature of 50°F used to determine the modeled concentrations, most likely reduced the removal efficiency of the air stripping unit. It is, therefore, expected that the BSA limits can be achieved for all compounds if the system is operated during higher ambient temperatures.

The concentrations of the detected compounds and the overall removal efficiencies for both step tests are presented in Table 7.3.

8.0 SUMMARY AND CONCLUSIONS

8.1 NAPL INVESTIGATION

The seven trenches installed in the southeastern area were successful in determining that only a thin section of the sandy zone (immediately above the sandy till layer) contains NAPL. Based on the areal extent of NAPL found during the trenching program, it is estimated that the volume of NAPL containing soil is less than 500 cubic yards occurring within the silty sand layer at a depth between 8 to 11 feet BGS. The volume of NAPL containing soil is estimated to be approximately 2 percent of the total volume of soil requiring remediation. Therefore, separate handling and treatment of the NAPL containing soil will not be required.

8.2 SOIL TREATABILITY STUDY

The results of the soil treatability study indicate that soils from Area A, Area B and NAPL containing soils are amenable to treatment by mechanical volatilization, ex situ SVE and biodegradation. VOCs are expected to be removed primarily by volatilization while TPH removal will be primarily from biodegradation. Inorganic and organic nutrients may be added to the soils to enhance biodegradation.

Although the air permeability of the soils may be sufficient for vapor extraction and biodegradation, the addition of 5 percent vermiculite was found to further increase air permeability. The requirement to add a bulking agent such as vermiculite to enhance treatment and reduce the cleanup time must be reassessed during remedial design and full-scale treatment.

8.3 DEEPER BEDROCK MONITORING WELLS

8.3.1 Northern Area

Groundwater chemistry at the MW-15 cluster is similar (both in concentration and in chemicals present) in the A- and B- bedrock zones, with the primary chemicals detected being chlorinated ethenes and ethanes. A total VOC concentration of 994 and 752 µg/L in the A-Zone (MW-15A analyses from January 1994 and March 1994, respectively) and a total VOC concentration of 1,144 µg/L in the MW-15B well were detected in the groundwater. This indicates chemicals are present in the bedrock groundwater in the northern area to at least a depth of 60 feet BGS.

Due to the response recorded by the pressure transducers in the MW-15A well while drilling in the B-Zone at the MW-15B well, and the similarity in the groundwater chemistry in the MW-15A and MW-15B wells, the conclusion can be reached that interconnection exists between these two zones and no confining layer is present in the bedrock in the vicinity of the MW-15 wells to at least 60 feet.

It is recommended that a second groundwater sample be collected from well MW-15B to confirm the presence of the VOCs detected in the initial sampling round. If VOC presence is confirmed in the B-Zone at MW-15B, groundwater extraction from the B-Zone and/or the deeper bedrock in the northern part of the Site may be necessary to reduce chemical concentrations in the bedrock groundwater. The deeper bedrock (below 60 feet BGS) could be investigated as part of the installation of any deeper extraction wells at the Site.

8.3.2 Southern Area

At the MW-9B well, analysis of groundwater samples show no detectable chemistry to be present in the B-Zone. Analysis of samples from nearby A-Zone wells collected during the RI indicates that the chemistry in the A-Zone is limited to the upper bedrock beneath the known contaminated areas and does not extend to the deeper bedrock.

8.4 STEP DRAWDOWN TESTS

8.4.1 Hydraulic Data

The step drawdown tests were partly successful in establishing a maximum pumping rate for the constant rate tests. The limited corehole diameter at well MW-6A and a failure of the one-half horsepower electric submersible at well MW-16A necessitated the use of Grundfos Redi-Flow 2 pumps at both wells. Because these pumps have a maximum pumping rate of about 7.0 GPM, the pumping rate was limited to this flow rate. Both wells yielded a flow rate of at least 6.5 GPM, with a drawdown of 6.6 feet at MW-6A and 9.0 feet at MW-16A. Because of these relatively low drawdowns and the rapid stabilization of the water table during each step, both wells should be capable of yielding greater than 7 GPM during the constant rate pumping test. It is proposed that the constant rate test start at 10 GPM for the first hour and, depending upon the response of the water table, increase to 12 GPM or 15 GPM after one hour.

8.4.2 Radius of Influence

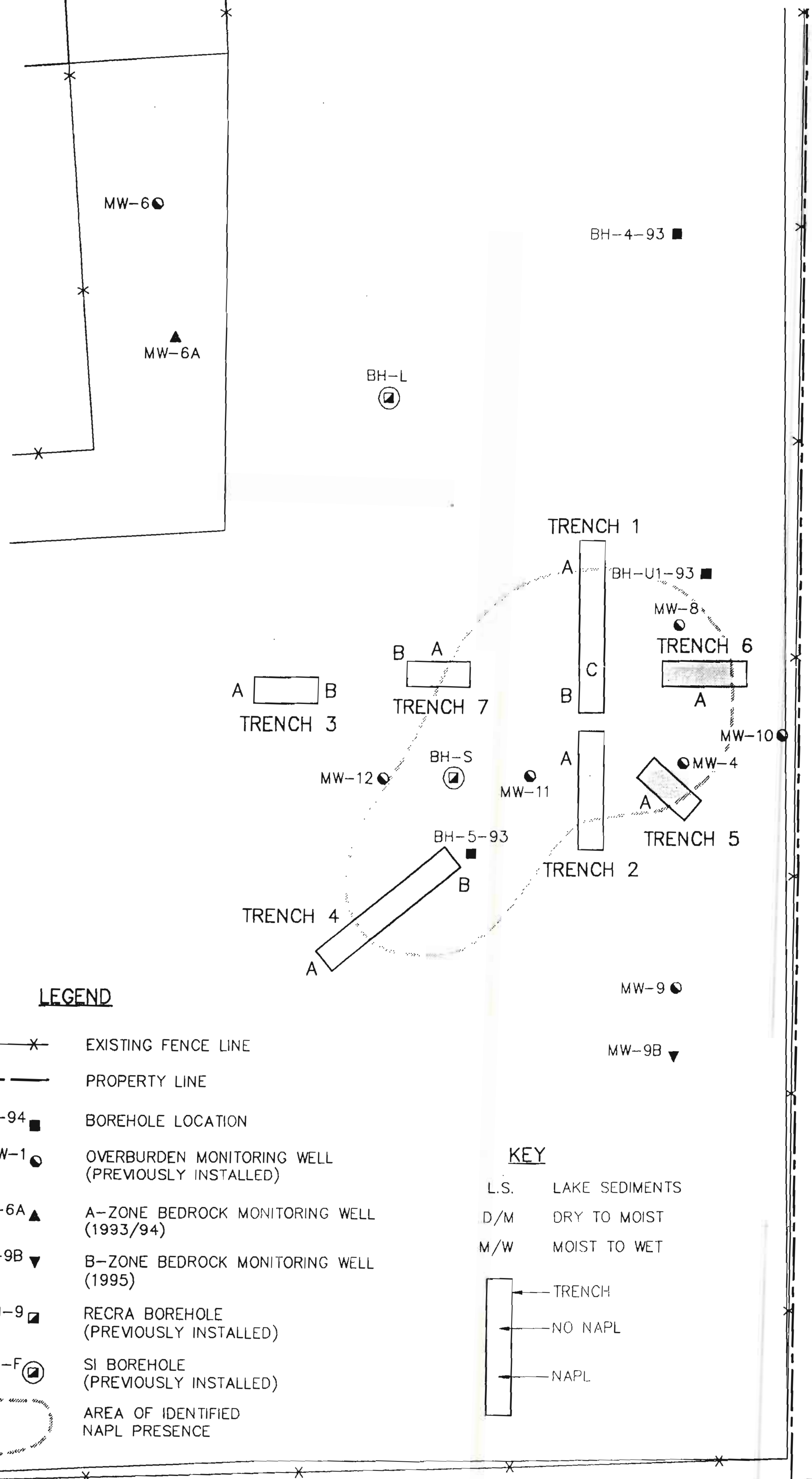
During both step tests, nearby overburden and bedrock monitoring wells were monitored for changes in the water table resulting from the pumping of the shallow bedrock groundwater. The results of the MW-6A test showed definite response in the MW-6 well and a possible response in the MW-12 well. The MW-16A test showed a consistent drop in water level in every well monitored, however, this drop was so slight in some wells, it may be a result of atmospheric pressure changes rather than pumping at MW-16A. Because of the short duration of these tests and the small volumes of water extracted, the lack of response in the adjacent wells is not unexpected. A more complete monitoring network will be established for the constant rate tests.

8.4.3 VOC Removal

Removal of VOCs using the air stripper was effective, as demonstrated by the removal rates attained during the step tests at the MW-16A well, allowing the effluent to meet the BSA discharge limits for direct discharge to the sanitary sewer.

The samples collected at MW-6A during the higher flow rate portion of the step test show less effective removal of the VOCs, even though lower influent concentrations were observed in the samples. It is believed that the low removal is due to the cold temperatures (6°F with sub-zero wind chill) at the time the test was run. If the constant rate tests are run when the air temperatures are higher it is expected that the effluent concentrations should meet the BSA limits for direct discharge to the sanitary sewer system.

FIGURES



A. FILL 0-5 (WET)
L.S. 5-8.5'
SAND 8.5'+ (WET)
BOTTOM AT 11.0' IN T

B. FILL 0-4' (WET)
L.S. 4-8.0'
SAND 8.0'+ (WET)
BOTTOM AT 11.0' IN T

C. ENCOUNTERED REMAIN
GALLON DRUM AND SE
5 GALLON CLOSED TO
CONTAINERS (EMPTY).

TRENCH 2 60± ppm

A. FILL 0-4' (WET)
L.S. 4-7.5'
SAND 7.5'+ (M/W)
BOTTOM AT 11.0' IN T

TRENCH 3 14 ppm

A. FILL 0-1.5'
L.S. 1.5-9.0'
SAND 9-14.0' (D/
BEDROCK AT 14.0'

B. FILL 0-3.0' (MOIS
L.S. 3-9.0'
SAND 9-14.0' (D/
BEDROCK AT 14.0'

TRENCH 4 450 ppm

A. FILL 0-2.0' (DRY
L.S. 2-8.0'
SAND 8.0'+ (MOIST
BOTTOM AT 12.0' IN T

B. FILL 0-3.5' (DRY
L.S. 3.5-8.5'
SAND 8.5'+ (MOIST
BOTTOM AT 12.0' IN T
NAPL IN DISCRETE LAY
FROM 11.0-11.5' BGS.

TRENCH 5 300± ppm

A. FILL 0-4.0' (WET)
L.S. 4-8.0'
SAND 8.0'+ (MOIST
BOTTOM AT 11.0' IN TI

TRENCH 6 100± ppm

A. FILL 0-4.0' (VER
L.S. 4-9.0'
SAND 9.0'+ (MOIST
BOTTOM AT 11.5' IN T
FILL CONTAINS LARGE
(BOARDS, CONCRETE).

TRENCH 7 140± ppm

A. FILL 0-4.0' (WET
L.S. 4.0'+
BOTTOM AT 5.0'

B. METAL AT 3.5' WITH L
VOLUME (4-5 GPM) O
INFLOW. WATER CLEA
ODOR OR SHEEN.

figur

NAPL TEST TRENCH LOCATIONS AND DE
LEIC
Cheektowaga, New

MAR 13/96(NF) REV.0 (P-64)

<u>TRENCH #1</u>

NOTE OILY LAYER ON BOTTOM

VIEW NORTHWARD

figure 4.2

TEST TRENCH #1 PHOTO LOG

LEICA INC.

Cheektowaga, New York

CRA

3967 (10) MAR 13/96(NF) REV.0 (L-01)

TRENCH #2

SOUTH END

VIEW NORTHWARD

figure 4.3

TEST TRENCH #2 PHOTO LOG

LEICA INC.

Cheektowaga, New York

CRA

TRENCH #3

SHINY AREA AT BOTTOM IS BEDROCK

TRENCH #7

NOTE VERY WET AREA IN CENTER OF PHOTO

figure 4.4

TEST TRENCH #3 AND TEST TRENCH #7 PHOTO LOG
LEICA INC.
Cheektowaga, New York

CRA

3967 (10) MAR 13/96(NF) REV.0 (L-03)

TRENCH #4

CLOSEUP OF CONTAMINATED (DARKLY COLORED) SOIL

DIGGING – VIEW SOUTHWEST

figure 4.5

TEST TRENCH #4 PHOTO LOG
LEICA INC.
Cheektowaga, New York

CRA

3967 (10) MAR 13/96(NF) REV.0 (L-04)

TRENCH #6

NOTE WOOD BELOW ASPHALT SURFACE

NOTE TRENCH IS DRIER THAN OTHERS

CRA

figure 4.6

TEST TRENCH #6 PHOTO LOG

LEICA INC.

Cheektowaga, New York

3967 (10) MAR 13/96(NF) REV.0 (L-05)

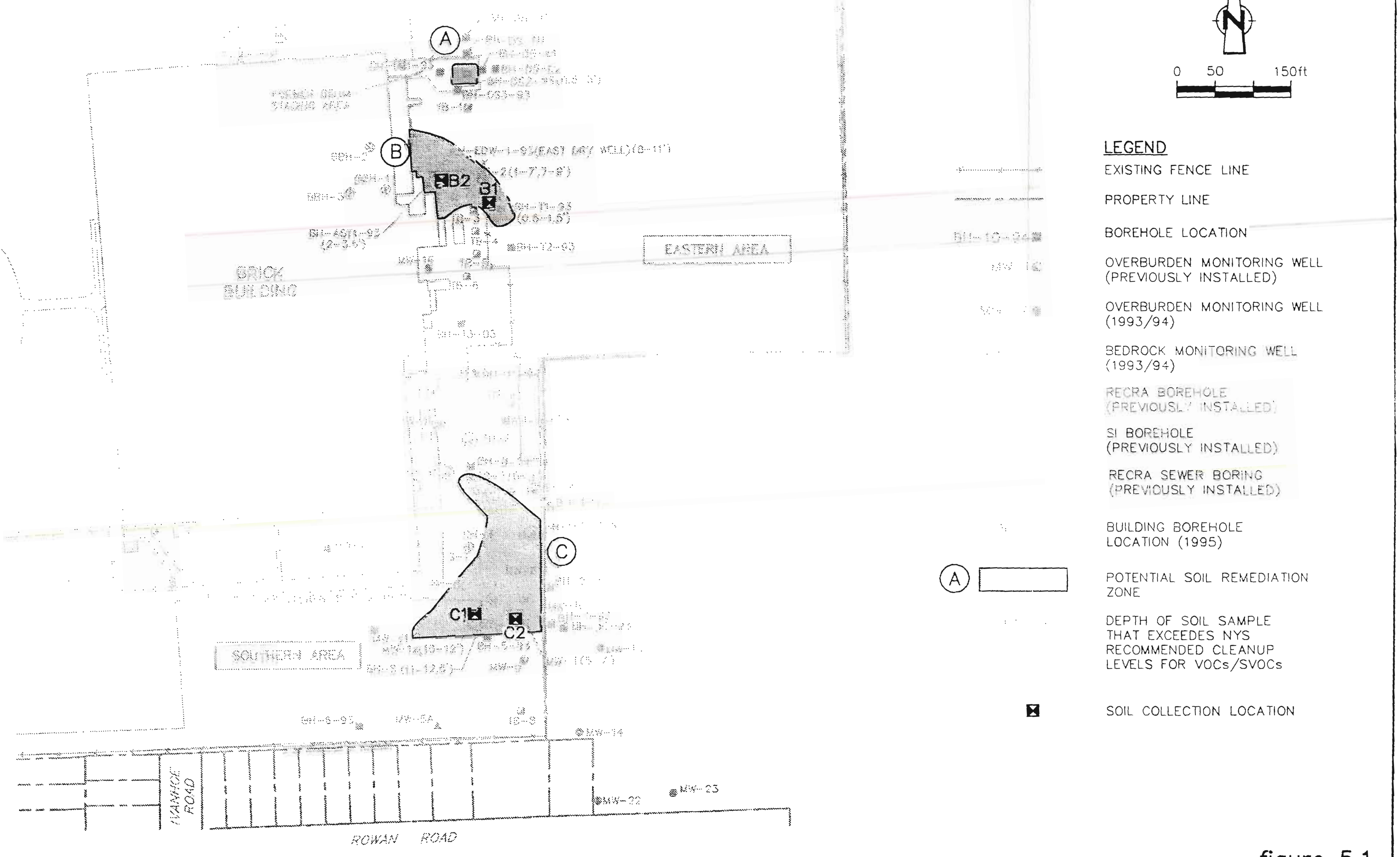


figure 5.1

SOIL TREATABILITY STUDY COLLECTION LOCATI

AND SURVEYOR
RIVE
K 14102

Figure 5.2
Soil Respirometry Results - Area B
Leica inc.
Cheektowaga, New York

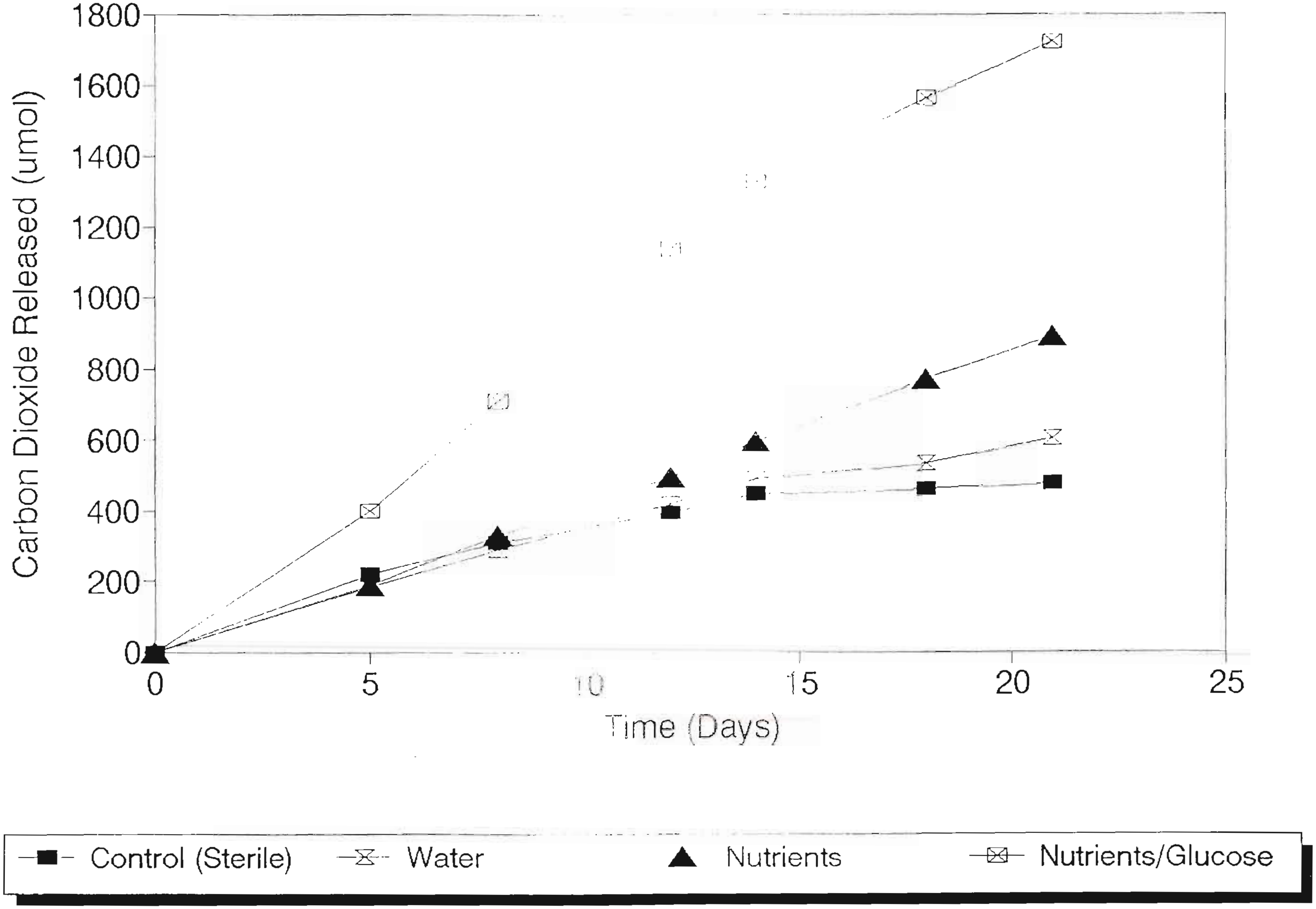


Figure 5.3
Soil Respirometry Results - Area C
Leica Inc.
Cheektowaga, New York

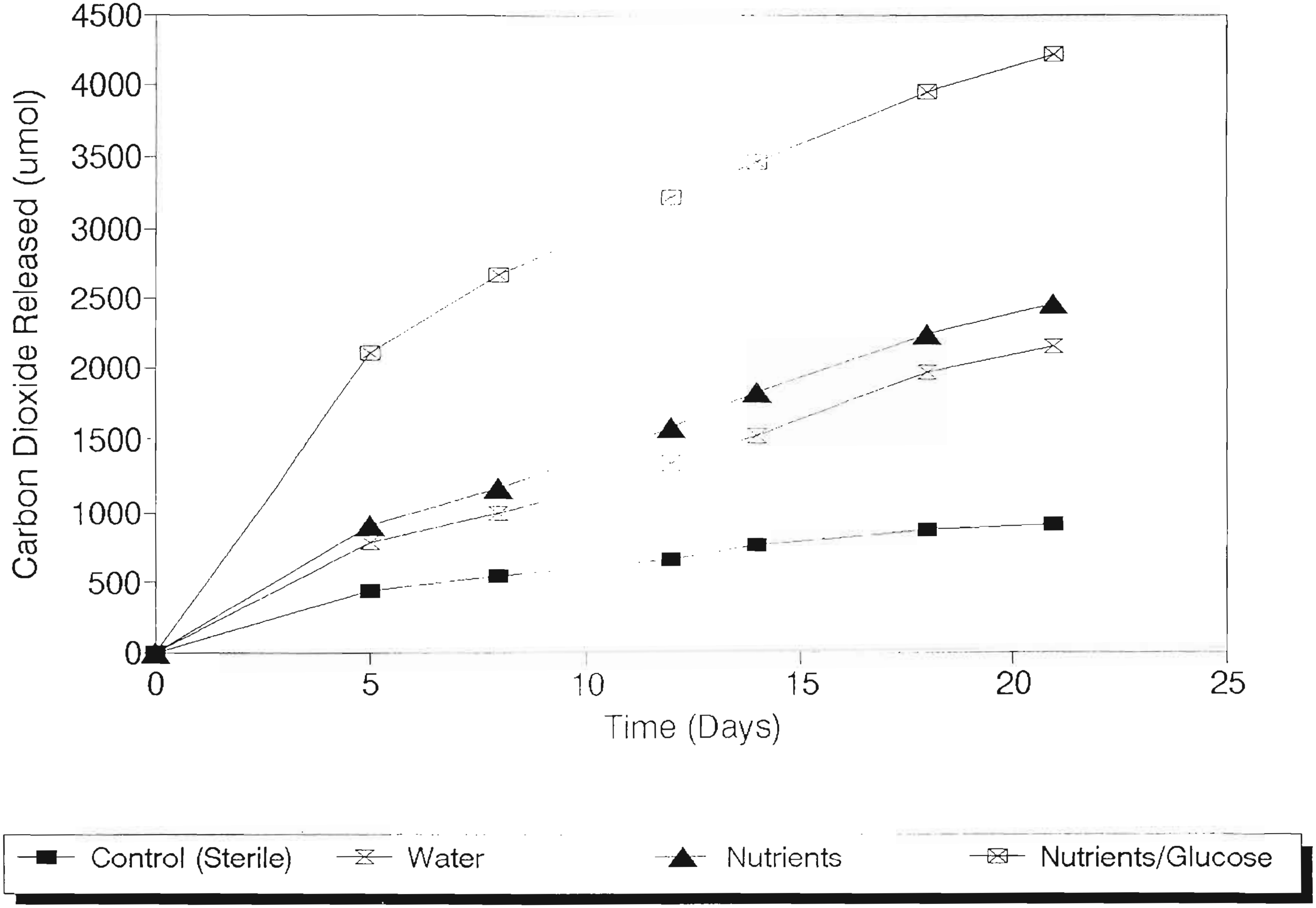
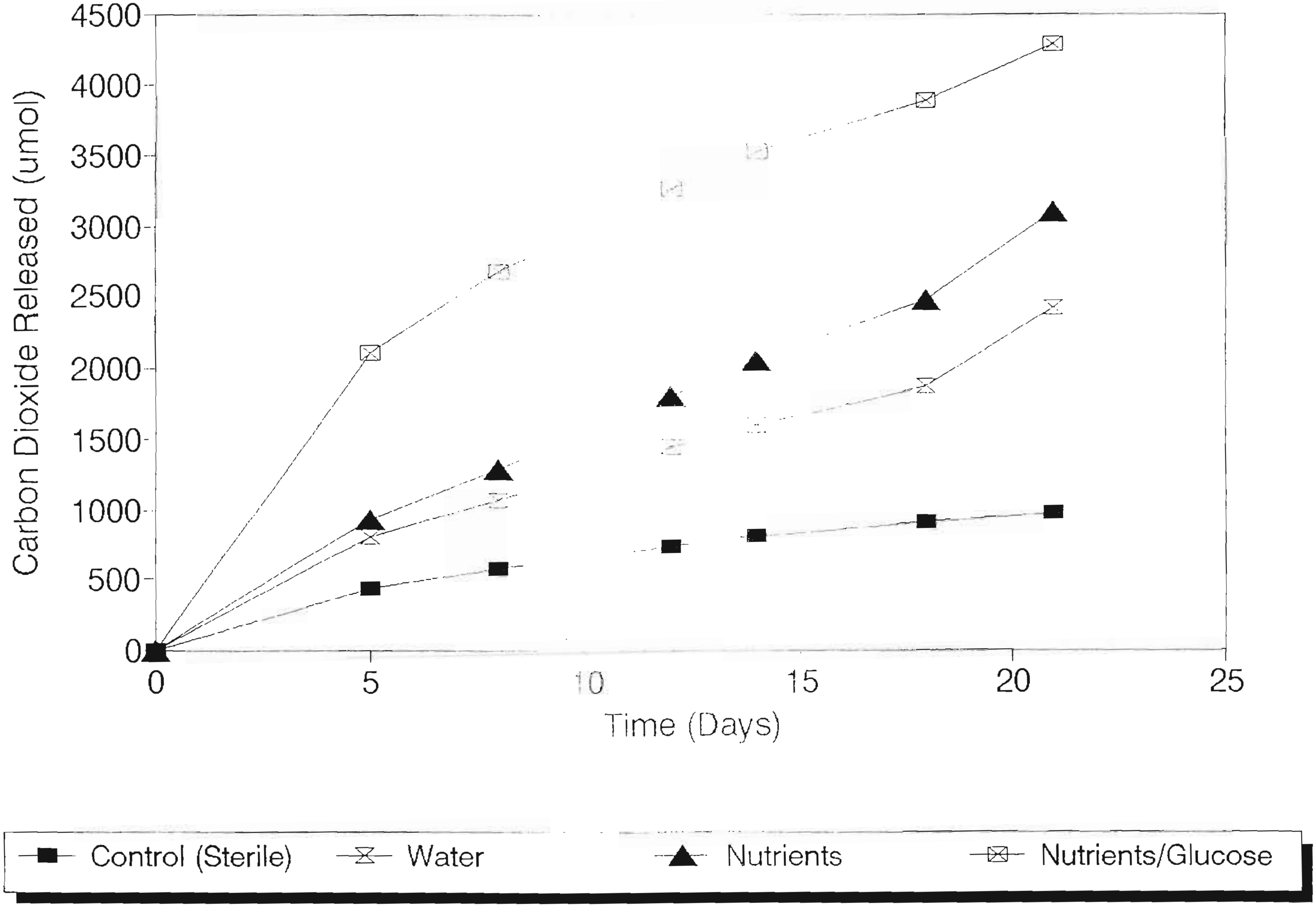


Figure 5.4
Soil Respirometry Results - Area C + NAPL
Leica Inc.
Cheektowaga, New York



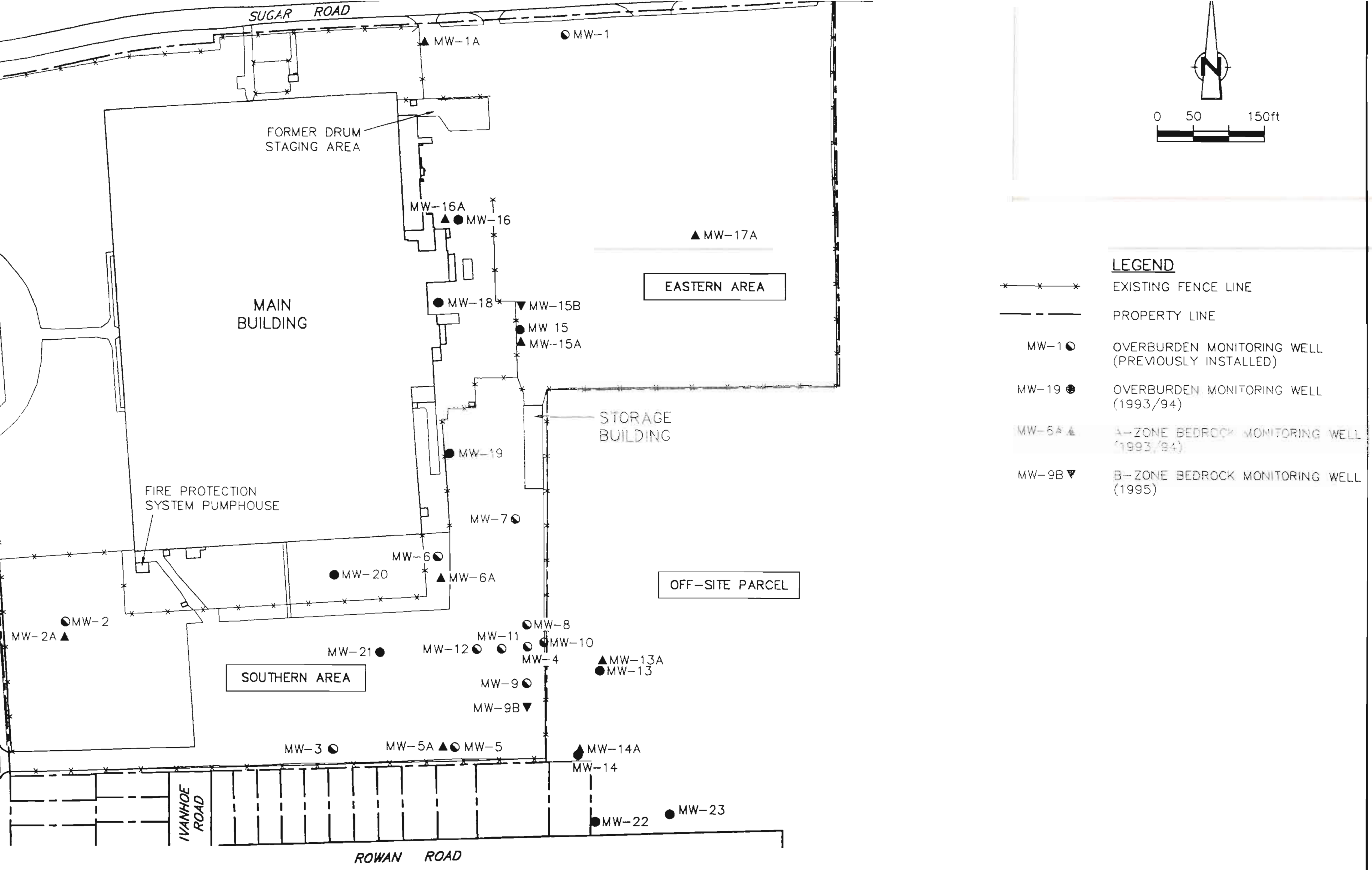
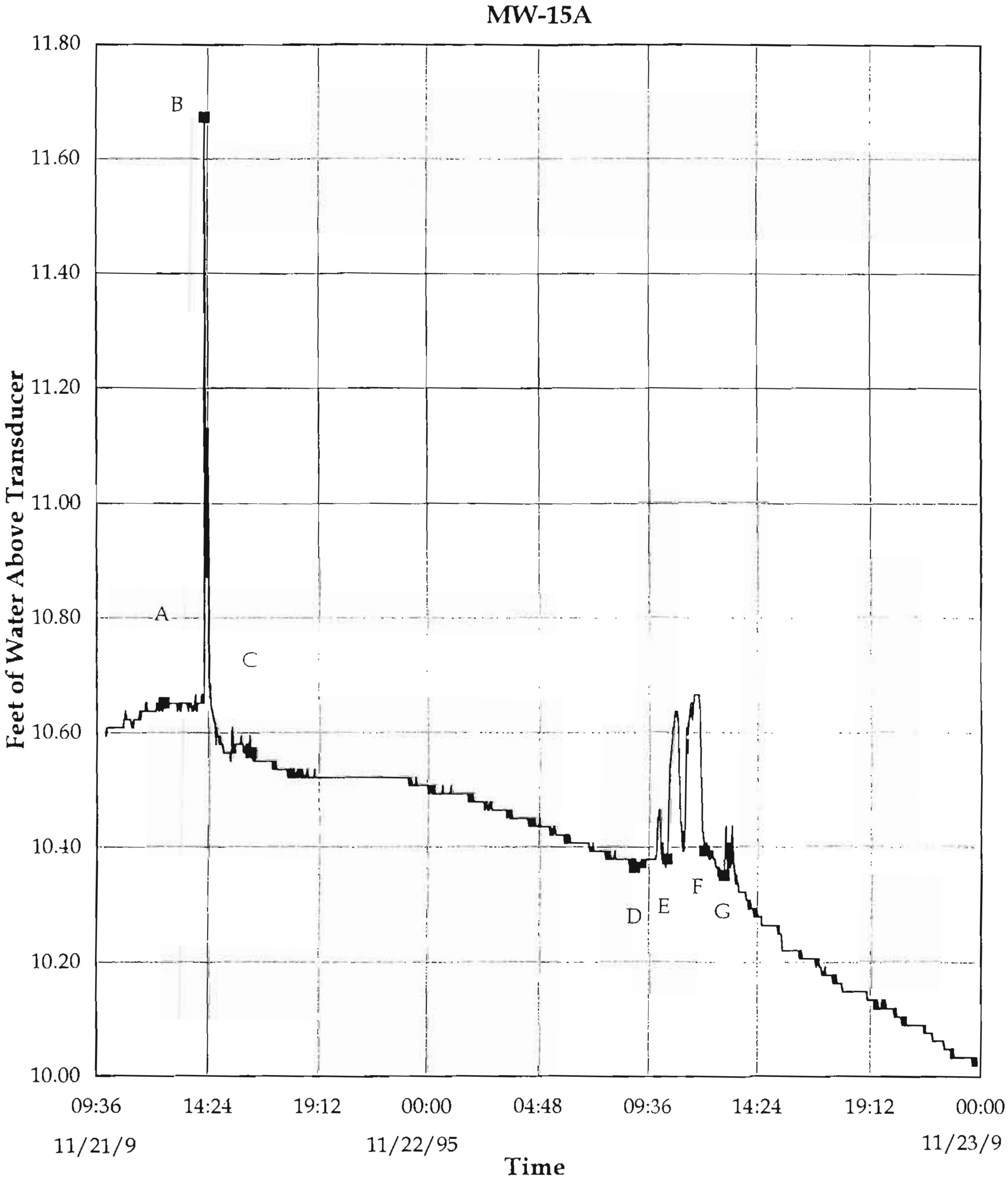

SUGAR ROAD
MW-1A
MW-1
FORMER DRUM STAGING AREA
MAIN BUILDING
MW-16A
MW-16
MW-17A
EASTERN AREA
MW-18
MW-15B
MW 15
MW-15A
STORAGE BUILDING
MW-19
FIRE PROTECTION SYSTEM PUMPHOUSE
MW-7
MW-6
MW-20
MW-6A
OFF-SITE PARCEL
MW-2
MW-2A
MW-8
MW-11
MW-10
MW-12
MW-4
MW-21
MW-13A
MW-13
SOUTHERN AREA
MW-9
MW-9B
MW-3
MW-5A
MW-5
MW-14A
MW-14
IVANHOE ROAD
MW-22
MW-23
ROWAN ROAD
N
0
50
150ft
LEGEND
EXISTING FENCE LINE
PROPERTY LINE
MW-1 OVERBURDEN MONITORING WELL (PREVIOUSLY INSTALLED)
MW-19 OVERBURDEN MONITORING WELL (1993/94)
MW-6A A-ZONE BEDROCK MONITORING WELL (1993/94)
MW-9B B-ZONE BEDROCK MONITORING WELL (1995)

figure 6.1



Notes:

A - Begin Drilling at MW-15B

B - Lost All Return Water (22')

C - Stop Drilling

D - Start Coring (35')

E - Start Drilling (6" Rollerbit) (35')

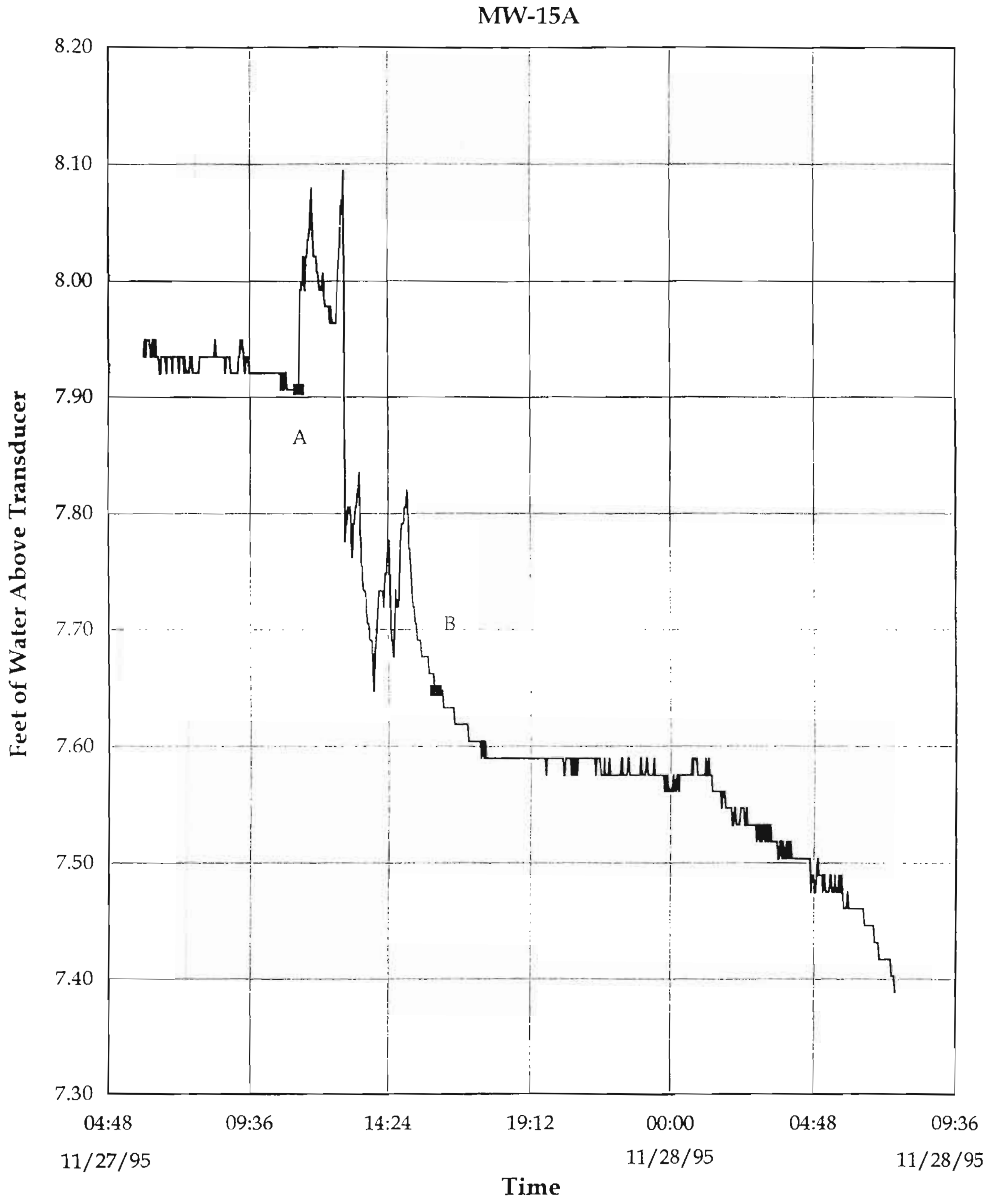
F - Drilling Complete

G - Install 4" Steel Casing

figure 6.2

HYDROGRAPH FOR WELL MW-15A DURING
A-ZONE DRILLING AT WELL MW-15B
LEICA INC.
CHEEKTOWAGA, NEW YORK

CRA



NOTES:

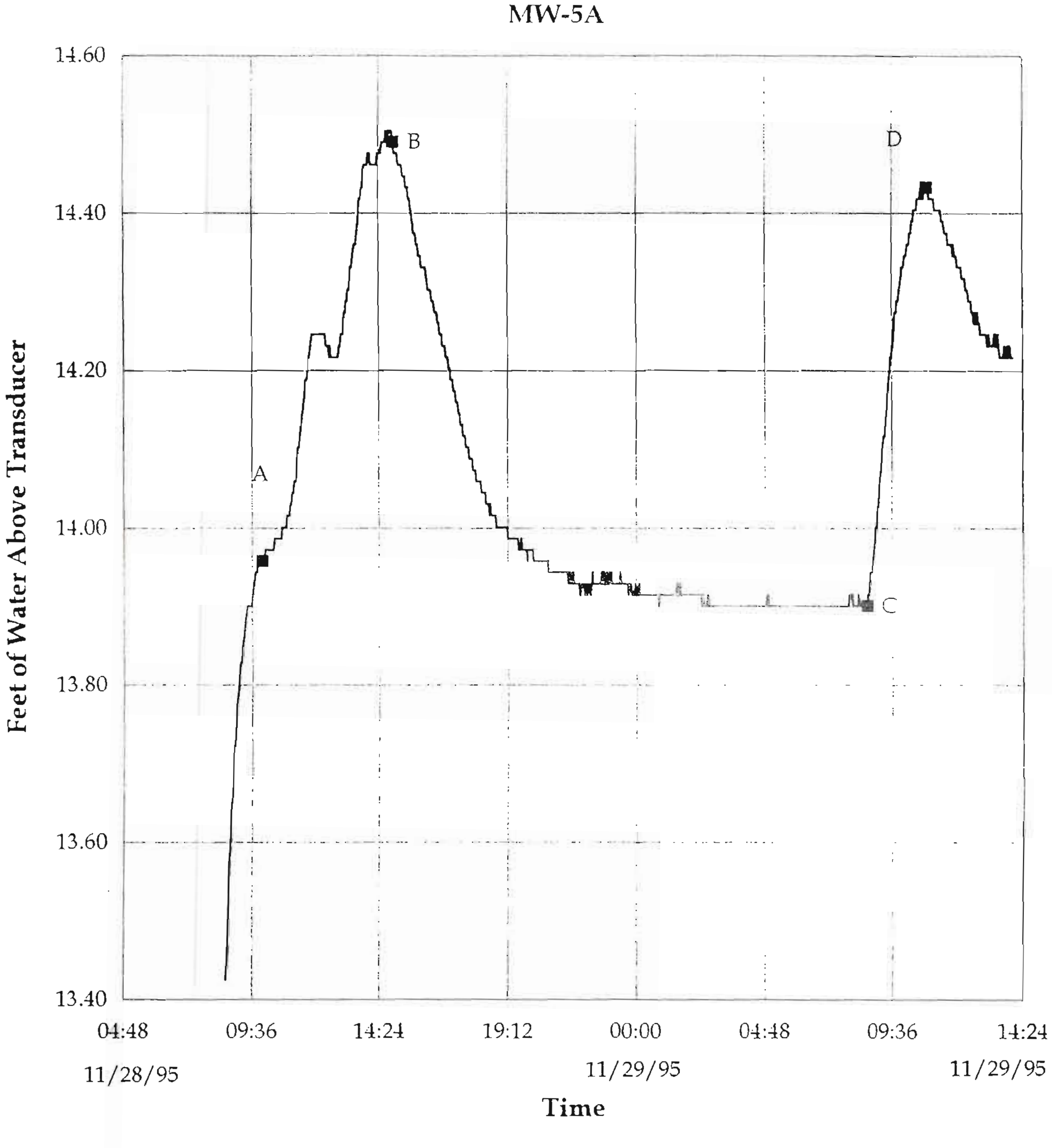
A - Start Coring (41')

B - Stop Coring (56.1')

CRA

figure 6.3

HYDROGRAPH FOR WELL MW-15A DURING B-ZONE DRILLING AT WELL MW-15B LEICA INC. CHEEKTOWAGA, NEW YORK



NOTES:

A - Begin Coring MW-9B

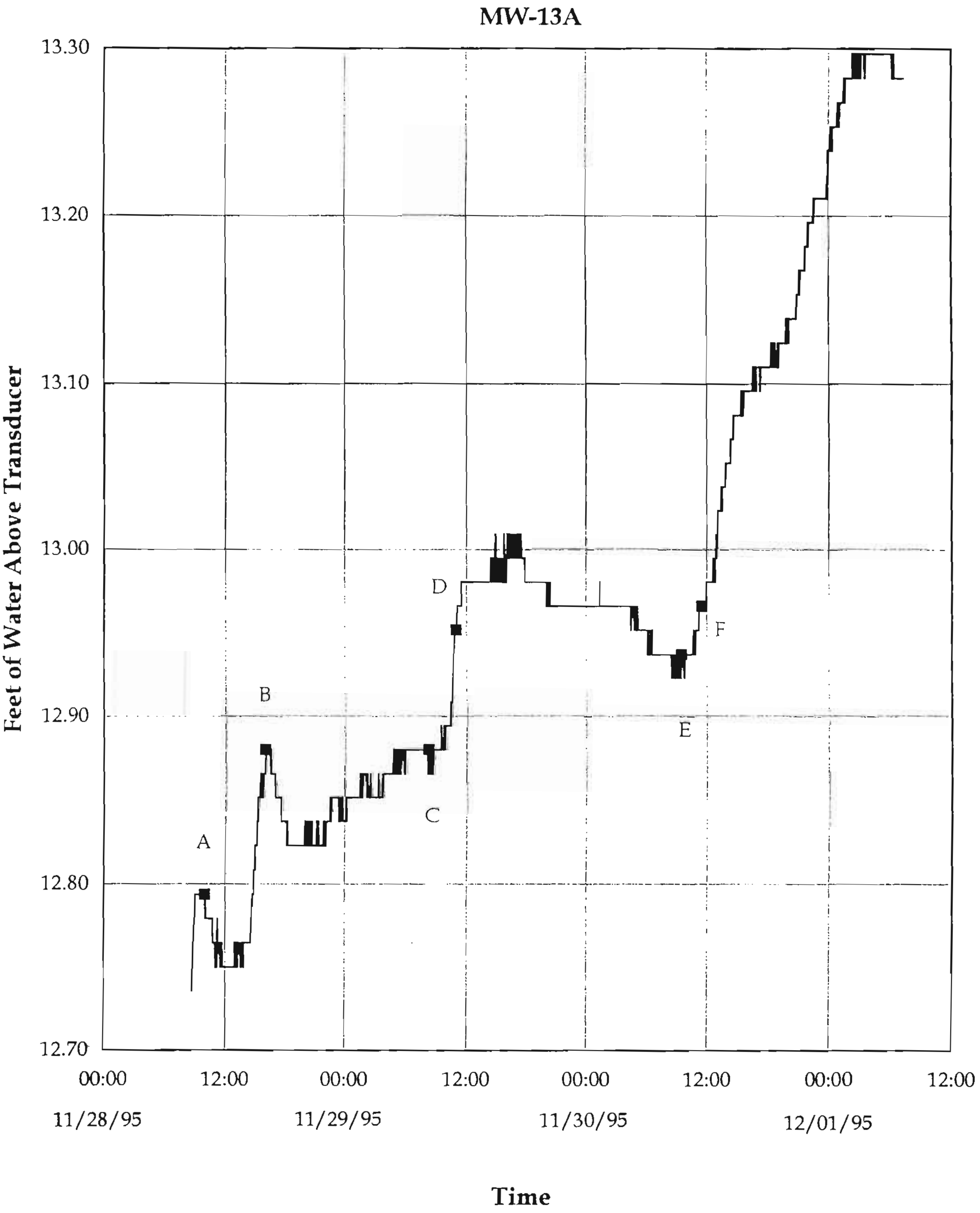
B - Stop Coring at 45.0'

C - Begin Reaming (6")

D - Reaming Complete

CRA

figure 6.4
HYDROGRAPH FOR WELL MW-5A DURING
DRILLING AT WELL MW-9B
LEICA INC.
CHEEKTOWAGA, NEW YORK



NOTES:

A - Begin Coring MW-9B

B - Stop Coring (45')

C - Begin Reaming (6")

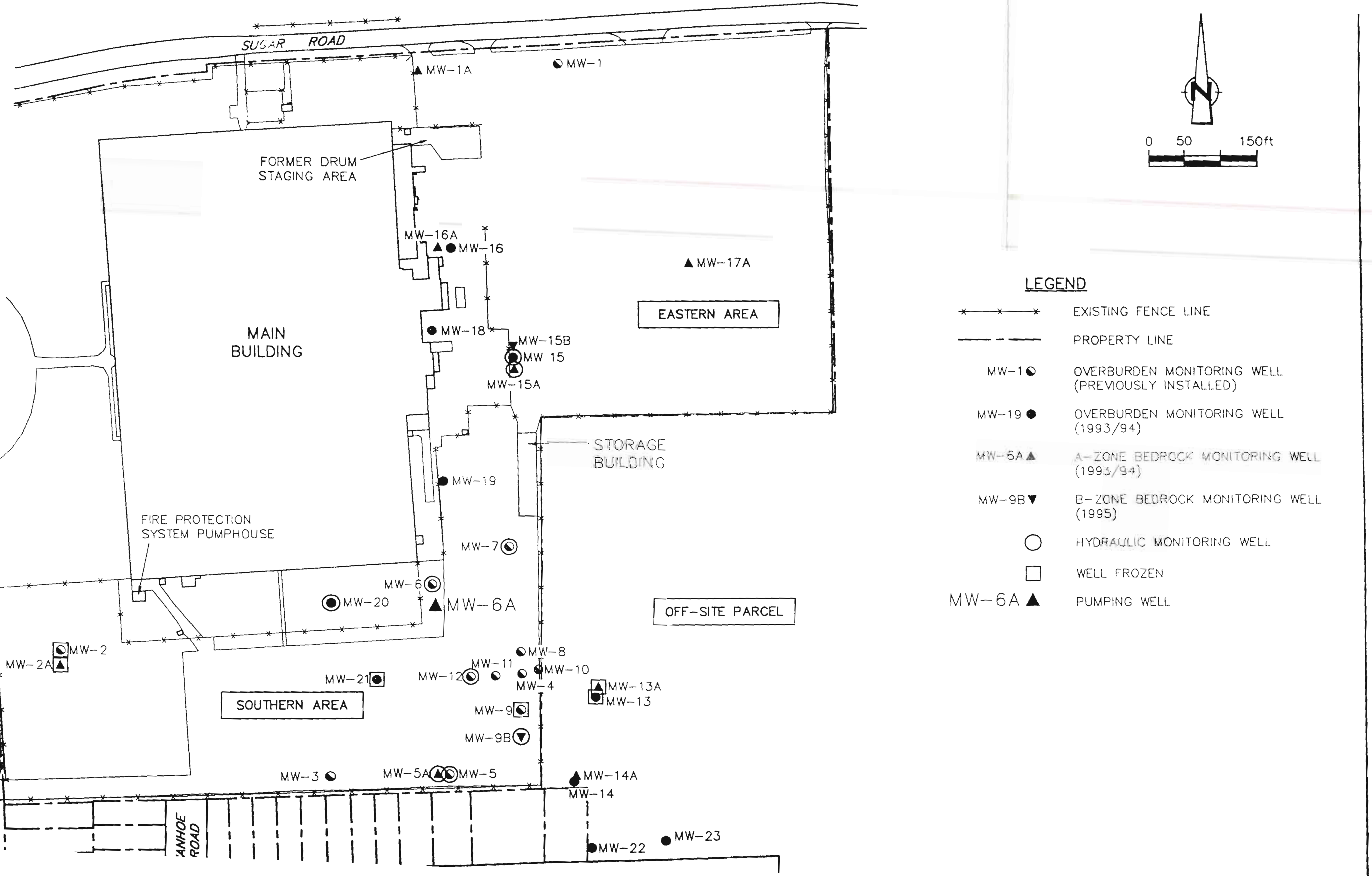
figure 6.5

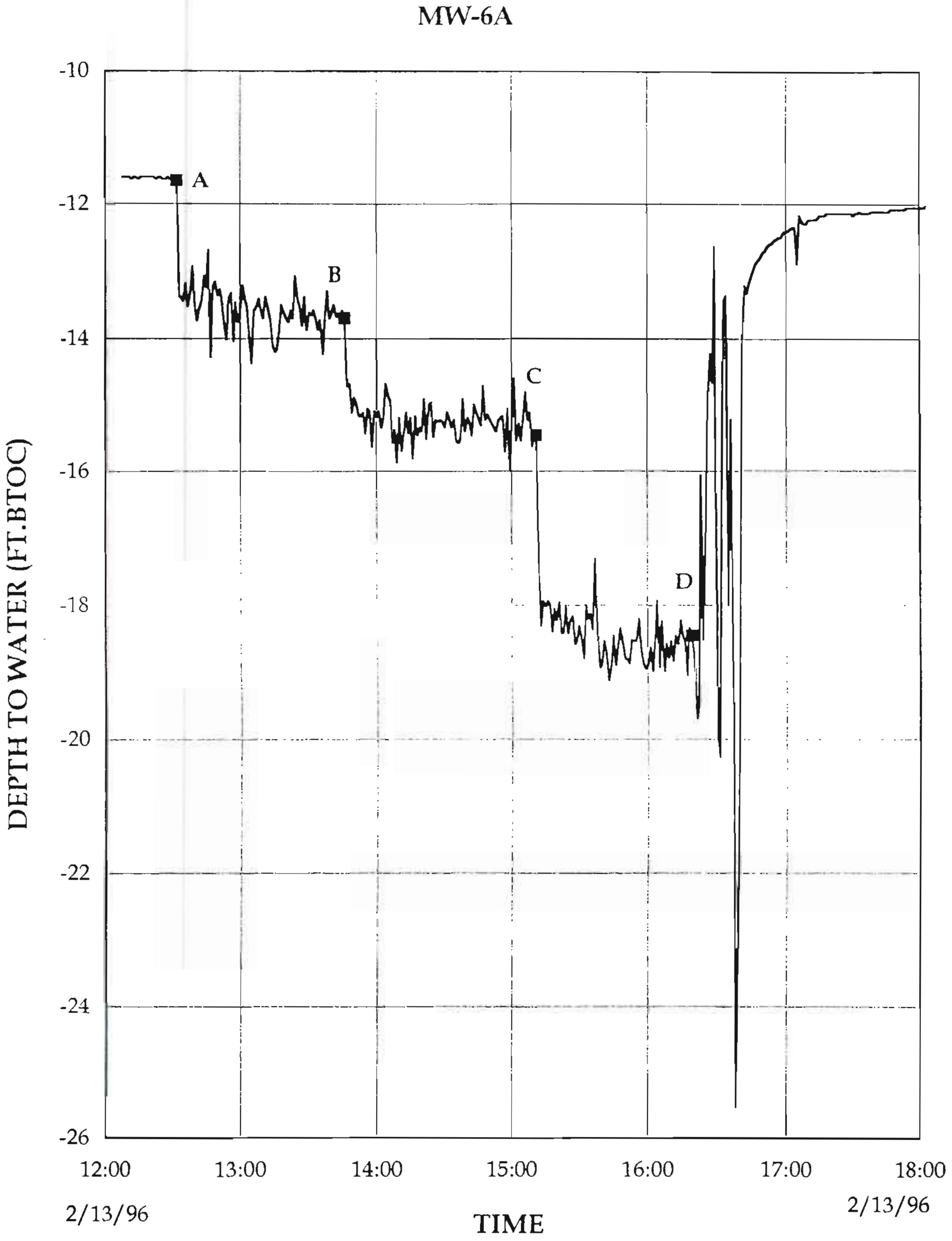
HYDROGRAPH FOR WELL MW-13A DURING DRILLING AT WELL MW-9B

LEICA INC.

CHEEKTOWAGA, NEW YORK

CRA


SUGAR ROAD
MW-1A
MW-1
FORMER DRUM STAGING AREA
MAIN BUILDING
MW-16A
MW-16
MW-17A
EASTERN AREA
MW-18
MW-15B
MW 15
MW-15A
STORAGE BUILDING
MW-19
FIRE PROTECTION SYSTEM PUMPHOUSE
MW-7
MW-6
MW-20
MW-6A
OFF-SITE PARCEL
MW-2
MW-2A
MW-8
MW-11
MW-10
MW-4
MW-21
MW-12
MW-13A
MW-13
SOUTHERN AREA
MW-9
MW-9B
MW-3
MW-5A
MW-5
MW-14A
MW-14
ANHOE ROAD
MW-22
MW-23
N
0
50
150ft
LEGEND
EXISTING FENCE LINE
PROPERTY LINE
MW-1 OVERBURDEN MONITORING WELL (PREVIOUSLY INSTALLED)
MW-19 OVERBURDEN MONITORING WELL (1993/94)
MW-6A A-ZONE BEDROCK MONITORING WELL (1993/94)
MW-9B B-ZONE BEDROCK MONITORING WELL (1995)
HYDRAULIC MONITORING WELL
WELL FROZEN
MW-6A PUMPING WELL



NOTES:

A - 1.0 GPM

B - 2.0 GPM

C - 4.0 GPM

D - ATTEMPTED 6.5 GPM (PUMP FAILURE).

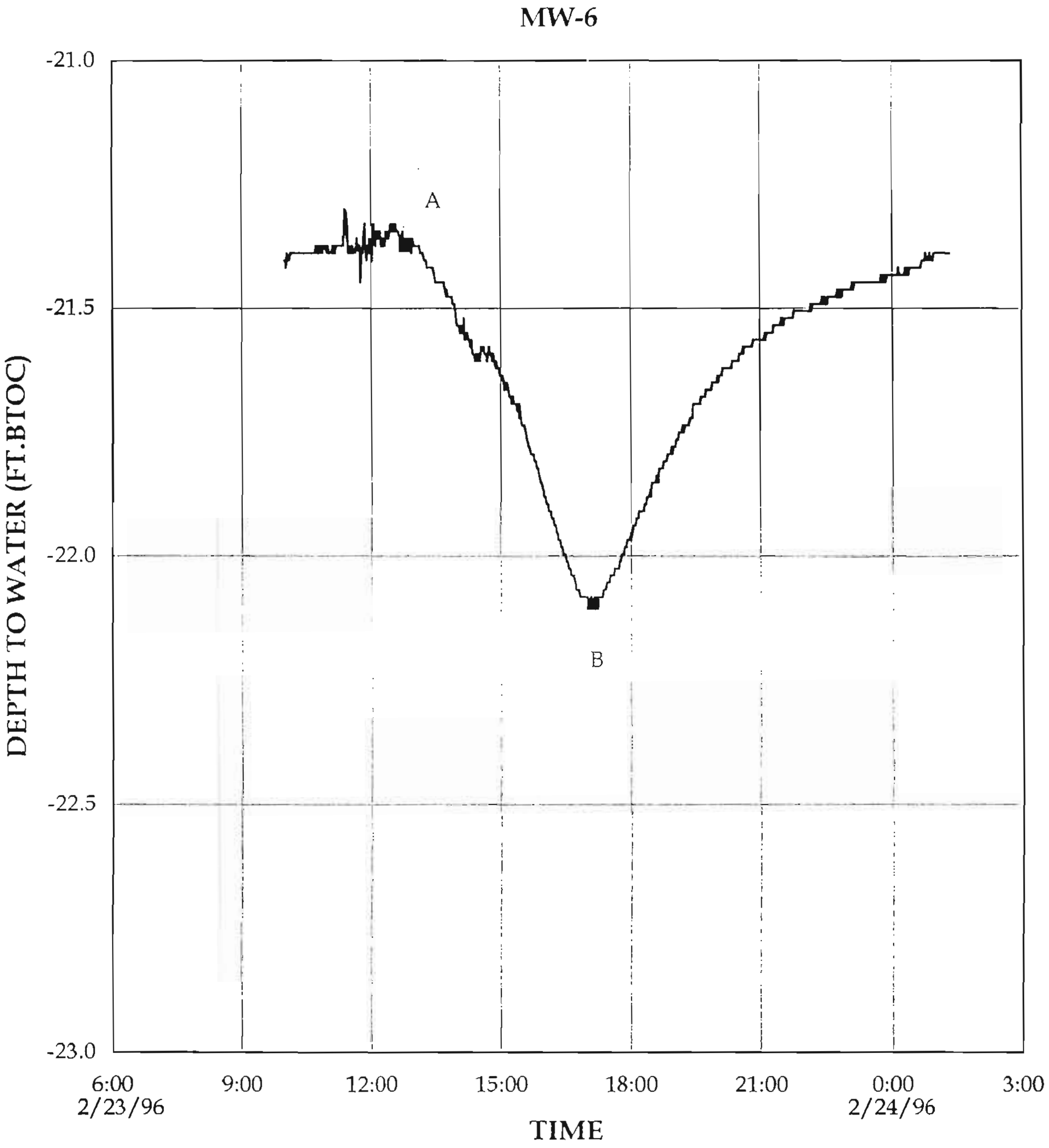
figure 7.2

WELL MW-6A STEP TEST

LEICA INC.

CHEEKTOWAGA, NEW YORK

CRA



NOTES:

A - MW6A TEST STARTS

B - MW6A TEST ENDS

CRA

figure 7.3

RESPONSE AT WELL MW-6 TO WELL MW-6A STEP TEST.

LEICA INC.

CHEEKTOWAGA, NEW YORK

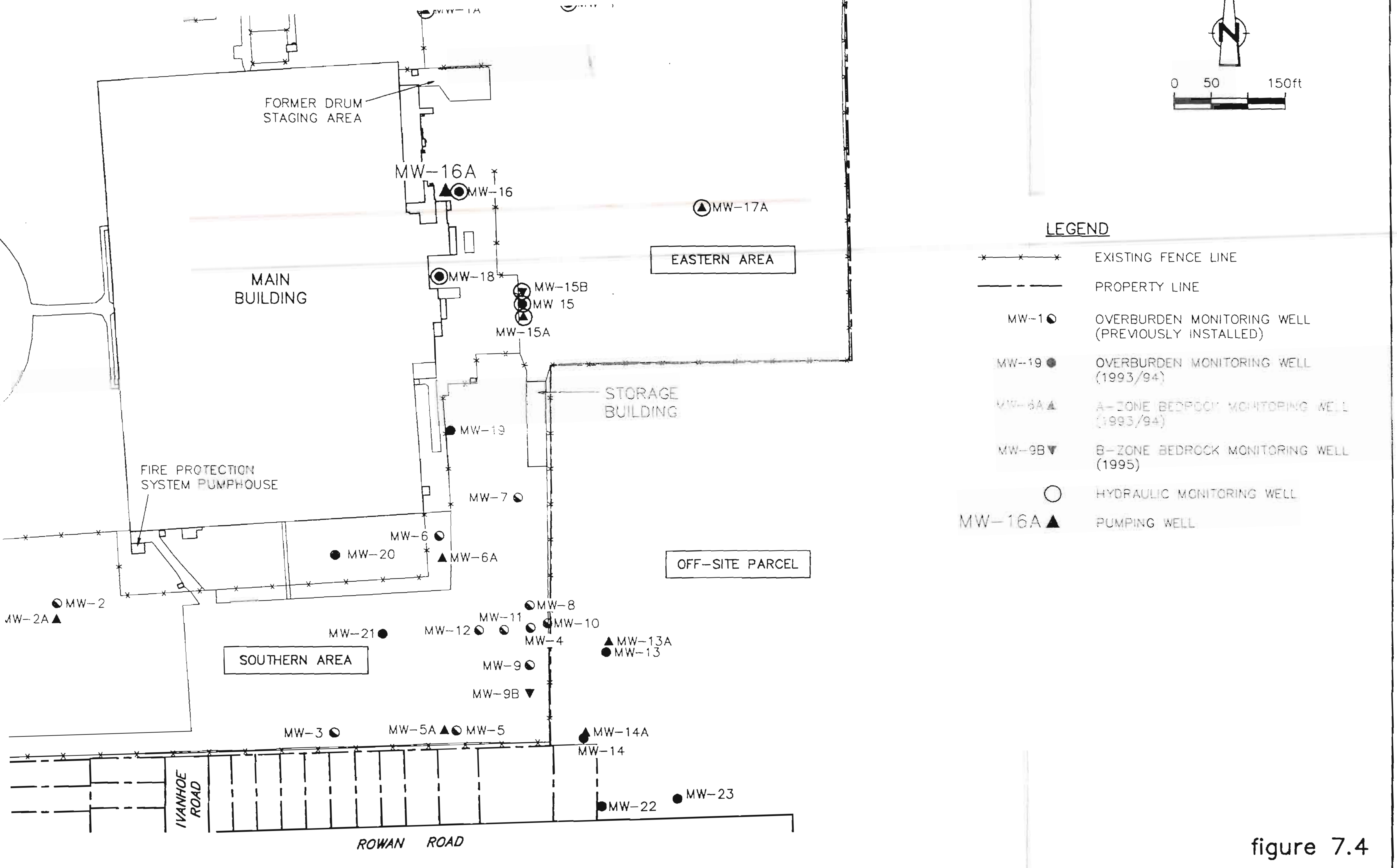
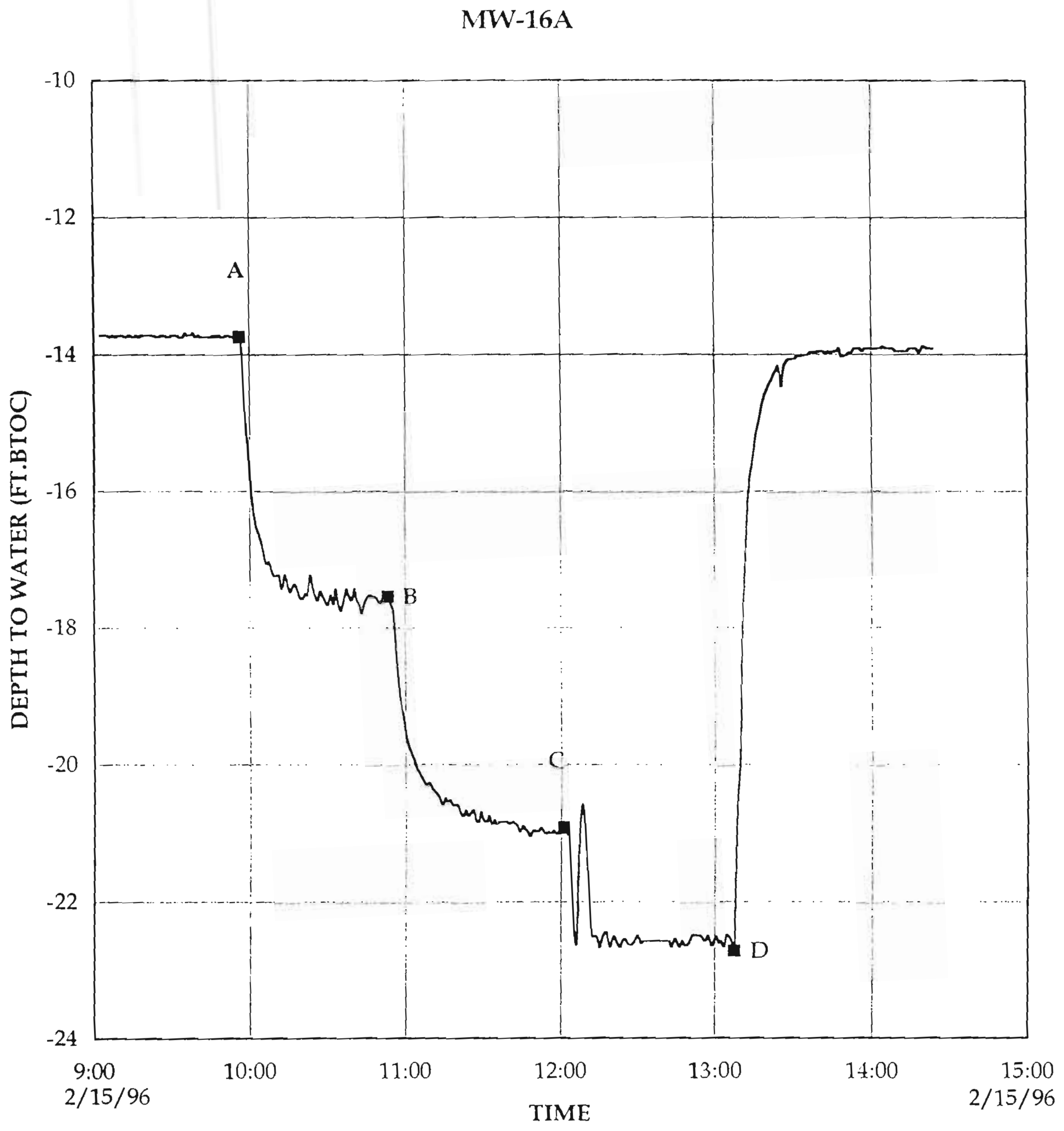


figure 7.4

WELL MW-16A STEP TEST

PUMPING WELL AND HYDRAULIC MONITORING WELL



NOTES:

A - START TEST - 3 GPM

B - 5 GPM

C - 6.5 GPM

D - STOP TEST

CRA

figure 7.5

WELL MW-16A HYDROGRAPH RESPONSE
DURING STEP TEST
LEICA INC.
CHEEKTOWAGA, NEW YORK

TABLES

TABLE 5.1

SOIL NUTRIENT CHARACTERIZATION RESULTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Parameter	Area B Soil			Area C Soil			NAPL Soil (2)		
	Dup 1	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Moisture Content (%)	18	13	16	20	13	17	16	15	16
pH (units)	7.9	7.9	7.9	8.0	7.9	8.0	8.0	8.0	8.0
Total Organic Matter (%)	0.8	1.0	0.9	1.5	1.4	1.5	1.8	1.1	1.5
Calculated Carbon Content (mg/kg)	4,000	5,000	4,500	7,500	7,000	7,250	9,000	5,500	7,250
Ammonia Nitrogen (mg/kg)	27	20	24	13	9.2	11.1	6.5	2.6	4.6
Orthophosphate Phosphorus (mg/kg)	4.9	4.9	4.9	8.4	8.4	8.4	7.7	7.6	7.7
Calculated Carbon/Nitrogen (C/N) Ratio (1)	180:1	303:1	242:1	701:1	924:1	813:1	1679:1	2,570:1	2,125:1
Calculated Nitrogen/Phosphorus (N/P) Ratio (1)	14:1	10:1	12:1	4:1	2.8:1	3.4:1	2.2:1	0.8:1	1.5:1

Notes:

(1) C/N and N/P ratios were calculated as follows:
For Area B soil (Dup 1), the carbon content was 4,000 mg/kg; nitrogen content was 22.25 mg/kg (27 mg/kg ammonia nitrogen); and phosphorus content was 1.6 mg/kg (4.9 mg/kg orthophosphate phosphorus). From these values C/N ratio is calculated to be 180:1 and N/P ratio to be 14:1.

(2) Soil containing non-aqueous phase liquid (NAPL)

TABLE 5.2

SOIL PARTICLE SIZE ANALYSIS
LEICA INC.
CHEEKTOWAGA, NEW YORK

	Gravel (%)	*Sand* (%)	*Silt* (%)	*Clay* (%)
Area B Soil	5	32	44	19
Area C Soil	1	22	45	31

Notes:

Analyses were not performed in duplicate for soil particle size determination.

TABLE 5.3

SOIL MICROBIAL CHARACTERIZATION RESULTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Parameters		*Total Heterotrophic Bacteria (CFUs/g)*	*C-16-Specific Bacteria (CFUs/g)*	*TCE-Specific Bacteria (CFUs/g)*	*DCE-Specific Bacteria (CFUs/g)*
Area B Soil					
	Dup 1	2.2×10^5	4.0×10^4	6.0×10^3	4.5×10^3
	Dup 2	2.6×10^5	3.0×10^4	7.2×10^3	3.6×10^3
	Average	2.4×10^5	3.5×10^4	6.6×10^3	4.1×10^3
Area C Soil					
	Dup 1	1.4×10^5	4.0×10^4	4.4×10^3	2.2×10^3
	Dup 2	2.2×10^5	5.0×10^4	2.8×10^3	2.9×10^3
	Average	1.8×10^5	4.5×10^4	3.6×10^3	2.6×10^3
NAPL Soil (1)					
	Dup 1	1.0×10^2	$<10^1$	2.0×10^2	$<10^1$
	Dup 2	2.0×10^2	$<10^1$	3.0×10^2	$<10^1$
	Average	1.5×10^2	$<10^1$	2.5×10^2	$<10^1$

Notes:

(1)	Soil containing non-aqueous phase liquid (NAPL)
CFUs	Colony Forming Units
C-16	Hexadecane
TCE	Trichloroethene
DCE	Dichloroethene

TABLE 5.4

INITIAL CHEMICAL CHARACTERIZATION OF SOILS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Volatiles (µg/kg)	*Area B Soil*		*Area C Soil*		*NAPL Soil (1)*	
	Dup 1	*Dup 2*	*Dup 1*	*Dup 2*	*Dup 1*	*Dup 2*
Acetone	62	49	ND (1500)	ND (1400)	ND (27000)	ND (5,500)
Benzene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2,700)
Bromodichloromethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2,700)
Bromoform	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Bromomethane	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
2-Butanone	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Carbon disulfide	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Carbon tetrachloride	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Chlorobenzene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Chloroethane	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Chloroform	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Chloromethane	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Dibromochloromethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,1-Dichloroethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,2-Dichloroethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,1-Dichloroethene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,2-Dichloroethene, total	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,2-Dichloropropane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
cis-1,3-Dichloropropene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
trans-1,3-Dichloropropene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Ethylbenzene	14	40	ND (730)	ND (720)	ND (14000)	ND (2700)
2-Hexanone	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Methlylene chloride	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	5000

TABLE 5.4

INITIAL CHEMICAL CHARACTERIZATION OF SOILS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Volatiles (µg/kg)	*Area B Soil*		*Area C Soil*		*NAPL Soil (1)*	
	Dup 1	*Dup 2*	*Dup 1*	*Dup 2*	*Dup 1*	*Dup 2*
4-Methyl-2-pentanone	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Styrene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,1,2,2-Tetrachloroethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Tetrachloroethene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Toluene	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
1,1,1-Trichloroethane	29	140	ND (125)	ND (500)	ND (14000)	ND (2700)
1,1,2-Trichloroethane	ND (11)	ND (11)	ND (730)	ND (720)	ND (14000)	ND (2700)
Trichloroethene	33	69	4,400	5,600	360,000	91,000
Vinyl chloride	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Vinyl acetate	ND (23)	ND (23)	ND (1500)	ND (1400)	ND (27000)	ND (5500)
Xylenes, total	91	210	ND (730)	ND (720)	ND (14000)	ND (2700)
Metals (mg/kg)						
Antimony	ND (12)	ND (12)	ND (12)	ND (12)	NA	NA
Arsenic	ND (24)	ND (24)	ND (24)	ND (23)	NA	NA
Beryllium	0.65	0.51	0.44	0.5	NA	NA
Cadmium	ND (0.58)	ND (0.58)	ND (0.59)	ND (0.58)	NA	NA
Chromium	8.3	7	14.2	16.8	NA	NA
Copper	21.7	19.8	27.5	49	NA	NA
Lead	29.3	17.8	41.6	137	NA	NA
Mercury	ND (0.094)	ND (0.097)	ND (0.10)	ND (0.09)	NA	NA
Nickel	9.7	8.3	17.2	18.8	NA	NA
Selenium	ND (12)	ND (12)	ND (12)	ND (12)	NA	NA

TABLE 5.4

INITIAL CHEMICAL CHARACTERIZATION OF SOILS
LEICA INC.
CHEEKTOWAGA, NEW YORK

	Area B Soil		*Area C Soil*		*NAPL Soil (1)*	
Metals (mg/kg)	***Dup 1***	***Dup 2***	***Dup 1***	***Dup 2***	***Dup 1***	***Dup 2***
Silver	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	NA	NA
Thallium	ND (46)	ND(47)	ND (47)	ND (46)	NA	NA
Zinc	62.5	73	84.5	91.5	NA	NA
Petroleum Hydrocarbons (mg/kg)						
Total petroleum hydrocarbons	120	120	300	330	1360	1950

Notes:

(1) Soil containing non-aqeuous phase liquid (NAPL)
ND (11) Not detected at or above a detection limit of 11 µg/kg
NA Not analyzed

TABLE 5.5
AIR PERMEABILITY RESULTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

AIR PERMEABILITY (cm2)

Vermiculite Added (% by weight)	*Area B Soil*			*Area C Soil*		
	Dup 1	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*
0	2.9×10^{-7}	2.9×10^{-7}	2.9×10^{-7}	0.76×10^{-7}	0.82×10^{-7}	0.79×10^{-7}
5	5.1×10^{-7}	5.1×10^{-7}	5.1×10^{-7}	2.2×10^{-7}	2.3×10^{-7}	2.3×10^{-7}
10	5.3×10^{-7}	5.4×10^{-7}	5.4×10^{-7}	2.0×10^{-7}	2.0×10^{-7}	2.0×10^{-7}

TABLE 5.6

SOIL RESPIROMETRY RESULTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

		Carbon Dioxide Evolved (µmol)																	
	Day	*Day 5*			*Day 8*			*Day 12*			*Day 14*			*Day 18*			*Day 21*		
Treatments	***0***	*Dup 1*	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*	*Dup 1*	*Dup 2*	*Average*
Area B Soil																			
Sterile Control	0	150	290	220	240	380	310	310	480	395	370	520	445	400	530	465	420	540	480
Soil Only	0	260	110	185	360	220	290	470	370	420	530	450	490	590	480	535	650	560	605
Soil Plus Nutrients	0	150	230	190	260	400	330	420	570	495	520	670	595	710	830	770	830	950	890
Soil Plus Nutrients Plus Glucose	0	370	430	400	700	720	710	1120	1160	1140	1320	1340	1330	1540	1590	1565	1700	1740	1720
Area C Soil																			
Sterile Control	0	410	460	435	540	560	550	640	690	665	740	790	765	840	910	875	870	970	920
Soil Only	0	810	760	785	1010	980	995	1380	1290	1335	1570	1470	1520	2030	1900	1965	2200	2090	2145
Soil Plus Nutrients	0	890	930	910	1150	1210	1180	1530	1630	1580	1760	1890	1825	2170	2300	2235	2400	2530	2465
Soil Plus Nutrients Plus Glucose	0	2160	2050	2105	2700	2640	2670	3240	3200	3220	3490	3440	3465	3990	3900	3945	4250	4170	4210
Area C Soil plus 5% NAPL Soil (1)																			
Sterile Control	0	460	400	430	590	560	575	740	720	730	830	800	815	940	890	915	1010	940	975
Soil Only	0	860	740	800	1160	1000	1080	1510	1390	1450	1660	1540	1600	1960	1800	1880	2500	2330	2415
Soil Plus Nutrients	0	960	920	940	1350	1230	1290	1860	1750	1805	2100	2010	2055	2530	2410	2470	3190	3020	3105
Soil Plus Nutrients Plus Glucose	0	2110	2100	2105	2710	2640	2675	3300	3240	3270	3570	3500	3535	3930	3850	3890	4340	4220	4280

Notes:
(1) Soil containing non-aqueous-phase liquid (NAPL)

TABLE 5.7

SOIL MICROCOSM RESULTS FOR VOLATILE ORGANIC COMPOUNDS - AREA B SOIL (1)
LEICA INC.
CHEEKTOWAGA, NEW YORK

Time (Weeks)	*0*				*2*														
Treatment					*T1*			*T2*			*T3*			*T4*			*T5*		
	Trp 1	*Trp 2*	*Trp 3*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Volatiles (µg/kg)																			
Acetone	ND(11)	ND(11)	ND(11)	ND(11)	42	16	29	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	40B	26 B	28B	100B	64 B
Ethylbenzene	ND(5.5)	ND(5.4)	ND(5.7)	ND(6)	ND(6)	2.3J	2.3 J	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	4.9J	4.9J
Methylene chloride	15	11	6.4	11	5.4JB	1.7J	4 JB	1.9JB	6.5B	4 JB	8.4B	6.0JB	7 JB	6.9B	3.9J	5 JB	3.0J	2.9J	3 J
1,1,1-Trichloroethane	9.6	14	ND(5.7)	10	1.9J	8.4	5 J	9.9	9.5	10	12	9.9	11	6.0J	15	11 J	13	14	14
Trichloroethene	15	22	ND(5.7)	14	2.7J	6.3	5 J	10	10	10	10	11	11	8.7	19	14	12	11	12
Xylenes, total	ND(5.5)	ND(5.4)	ND(5.7)	ND(6)	3.4J	15	9 J	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	ND(6)	4.5J	31	18

Time (Weeks)	*4*														
Treatment	*T1*			*T2*			*T3*			*T4*			*T5*		
	Dup 1	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Volatiles (µg/kg)															
Acetone	ND(12)	10J	10 J	10J	ND(12)	10 J	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)
Ethylbenzene	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)
Methylene chloride	19B	15B	17 B	18B	20B	19 B	17B	10JB	14 JB	11JB	6JB	9 JB	10JB	14B	12 JB
1,1,1-Trichloroethane	ND(12)	1J	1 J	ND(12)	ND(12)	ND (12)	ND(12)	4J	4 J	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)
Trichloroethene	ND(12)	2J	2 J	2J	ND(12)	2 J	2J	3J	3 J	ND(12)	ND(12)	ND(12)	2J	1J	2 J
Xylenes, total	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND (12)	2J	ND(12)	2 J

Notes:

(1)	-	Averages of duplicate or triplicate results include non-detect values at the detection limit except when the compound was only detected at an estimated concentration below the detection limit. In this case, non-detect values were not included in the calculation of the average concentration.
T1	-	Sterile control
T2	-	Soil alone
T3	-	Soil plus nutrients
T4	-	Soil plus nutrients plus carbon
T5	-	Soil plus nutrients plus carbon plus bacteria
ND(58)	-	Not detected at or above a detection limit of 58 µg/kg
J	-	The associated result is an estimated quantity
B	-	The parameter was detected in the associated method blank

TABLE 5.8

SOIL MICROCOSM RESULTS FOR VOLATILE ORGANIC COMPOUNDS - AREA C SOIL (1)
LEICA INC.
CHEEKTOWAGA, NEW YORK

Time (Weeks)	*0*				*2*														
Treatment					*T1*			*T2*			*T3*			*T4*			*T5*		
	Trp 1	*Trp 2*	*Trp 3*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Volatiles (µg/kg)																			
Acetone	ND(58)	ND (57)	ND (110	ND (57)	170	84 B	127 B	ND (12)	ND (12)	ND (12)	ND(12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	20	16
2-Butanone	ND(58)	ND (57)	ND (110	ND (57)	29	ND (12)	21	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)
1,2-Dichloroethene, total	44	90	120	85	47	13	30	33	44	39	11	23	17	17	30	24	26	20	23
Methylene chloride	51	ND(28)	ND (56)	40	10	7.0 B	9 B	7.8	8.1	8	4.9J	10B	8 JB	9.4	8.5	9	10	5.2J	8 J
Trichloroethene	200	380	540	373	25	12	19	31	30	31	11	17	14	20	32	26	28	20	24
Vinyl chloride	ND(58)	ND(57)	ND (110	ND (57)	8.7 J	ND (12)	8.7 J	7.2 J	5.7J	6 J	ND (12)	ND (12)	ND (12)	9.8J	22	16 J	6.4J	ND (12)	6.4 J
Vinyl acetate	ND(58)	ND(57)	ND (110	ND (57)	72	ND (12)	42	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)
Xylenes, total	310	480	680	490	43B	34	39 B	ND (6)	ND (6)	ND (6)	ND (6)	ND (6)	ND (6)	1.6J	2.2J	2 J	19	22	21

Time (Weeks)	*4*														
Treatment	*T1*			*T2*			*T3*			*T4*			*T5*		
	Dup 1	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Volatiles (µg/kg)															
Acetone	ND (12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	25	17	21	ND(12)	ND(12)	ND (12)
2-Butanone	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)
1,2-Dichloroethene, total	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	2J	2 J	2J	2J	2 J	ND(12)	2J	2 J
Methylene chloride	19B	6JB	13 JB	6JB	10JB	8 JB	13B	21B	17 B	15B	18B	17 B	17B	17B	17 B
Trichloroethene	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	2J	2 J	ND(12)	1J	1 J	ND(12)	1J	1 J
Vinyl chloride	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)
Vinyl acetate	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)	ND(120)	ND(120)	ND (120)
Xylenes, total	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)

Notes:

(1)	-	Averages of duplicate or triplicate results include non-detect values at the detection limit except when the compound was only detected at an estimated concentration below the detection limit. In this case, non-detect values were not included in the calculation of the average concentration.
T1	-	Sterile control
T2	-	Soil alone
T3	-	Soil plus nutrients
T4	-	Soil plus nutrients plus carbon
T5	-	Soil plus nutrients plus carbon plus bacteria
ND(58)	-	Not detected at or above a detection limit of 58 µg/kg
J	-	The associated result is an estimated quantity
B	-	The parameter was detected in the associated method blank

TABLE 5.9

SOIL MICROCOSM RESULTS FOR VOLATILE ORGANIC COMPOUNDS - AREA C SOIL PLUS 5% NAPL SOIL (1)
LEICA INC.
CHEEKTOWAGA, NEW YORK

Time (Weeks)	*0*				*2*															
Treatment					*T1*			*T2*			*T3*			*T4*			*T5*			
Volatiles (µg/kg)	*Trp 1*	*Trp 2*	*Trp 3*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	
Acetone	86	ND(58)	ND(58)	67	100	60	80	17	16	17	16	26	21	10J	16	13 J	16	ND(12)	14	
1,2-Dichloroethene, Total	86	47	49	61	8.3	13	11	12	12	12	19	14	17	24	15	20	9.7	8.5	9	
Methylene chloride	ND(28)	ND(29)	ND(29)	ND(29)	4.9JB	5.8JB	5 JB	5.9JB	10B	8 JB	7.4B	8.4B	8 B	5.8JB	4.6JB	5 JB	5.6JB	7.1B	6 JB	
Trichloroethene	230	220	180	210	7.0	9.2	8	10	12	11	19	17	18	22	10	16	10	5.6J	8 J	
Xylenes, total	150	180	170	167	13	13	13	6.4	5.6J	6 J	11	7.2	9	6.9J	6.8	7 J	12	8.8	10	

Time (Weeks)	*4*														
Treatment	*T1*			*T2*			*T3*			*T4*			*T5*		
Volatiles (µg/kg)	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
Acetone	ND(12)	11J	11 J	ND(12)	18	15	ND(12)	ND(12)	ND (12)	17	19	18	16	16	16
1,2-Dichloroethene, Total	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)
Methylene chloride	16B	11JB	14 JB	13B	10JB	12 JB	15B	27B	21 B	32B	20B	26 B	21B	19B	20 B
Trichloroethene	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)
Xylenes, total	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)	ND(12)	ND(12)	ND (12)

Notes:

(1)	-	Averages of duplicate or triplicate results include non-detect values at the detection limit except when the compound was only detected at an estimated concentration below the detection limit. In this case, non-detect values were not included in the calculation of the average concentration.
T1	-	Sterile control
T2	-	Soil alone
T3	-	Soil plus nutrients
T4	-	Soil plus nutrients plus carbon
T5	-	Soil plus nutrients plus carbon plus bacteria
ND(58)	-	Not detected at or above a detection limit of 58 µg/kg
J	-	The associated result is an estimated quantity
B	-	The parameter was detected in the associated method blank

TABLE 5.10

SOIL MICROCOSM RESULTS FOR TOTAL PETROLEUM HYDROCARBONS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Time (Weeks)	*0*			*8*														
Treatment				*T1*			*T2*			*T3*			*T4*			*T5*		
	Dup 1	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*	*Dup 1*	*Dup 2*	*Avg.*
TPH (mg/kg)																		
Area B Soil	190	200	195	375	385	380	295	310	305	250	250	250	250	260	255	255	250	255
Area C Soil	2,000	2,000	2,000	2,190	2,050	2,120	1,700	1,700	1,700	1,400	1,400	1,400	870	910	890	925	870	900
Area C Plus NAPL Soil *	2,150	2,150	2,150	1,120	1,080	1,100	805	810	810	570	570	570	660	680	670	650	620	635

Notes:

T1 - Sterile control
T2 - Soil alone
T3 - Soil plus nutrients
T4 - Soil plus nutrients plus carbon
T5 - Soil plus nutrients plus carbon plus bacteria
* - Soil containing non-aqueous phase liquid was addded to Area C soil at a 5% level

TABLE 6.1

WELL PURGING AND SAMPLE COLLECTION SUMMARY LOG
DEEP (B-ZONE) BEDROCK WELLS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Monitoring Well Location:	*MW-9B*	*MW-15B*
Well Measurements		
Well Depth (Sounded) (below top of casing)	60.0 Ft.	56.1 Ft.
Depth to Water Table (below top of casing)	9.8 Ft.	14.0 Ft.
Height of Water Column	50.2 Ft.	42.1 Ft.
Volume of Water in Well	33.5 Gallons	28.2 Gallons
Water Removed per Volume	35 Gallons	30 Gallons

Purge/Sample Record

	MW-9B				*MW-15B*		
Purge Volume Number:	1	2	3	4	1	2	3
Volume Purged (Gal.):	35	35	35	35	30	30	30
pH (standard units):	6.89	6.83	6.77	6.79	7.00	6.80	6.85
Conductivity (mmho/cm):	490	460	460	470	960	880	830
Temperature (°C):	55.0	53.9	54.6	54.7	55.4	54.6	54.8
Turbidity (NTU):	26	14	10	5	36	4.0	1.6

	MW-9B	*MW-15B*
Total Purge Volume:	140 Gallons	90 Gallons
Sample Location:	MW-9B	MW-15B
Sample Description:		
pH (standard units)	6.82	6.80
Conductivity (mmho/cm)	460	840
Temperature (°C)	54.6	54.8
Turbidity (NTU)	3.6	1.6
Characteristics	Clear, colorless, trace sheen, H2S odor	Clear, colorless, slight H2S odor, no sheen
Analytical Parameters:	TCL VOCs, TCL SVOCs, TPH Blind duplicate as MW-24B	TCL VOCs, TCL SVOCs, TPH MS/MSD samples taken

Notes:

MS/MSD	Matrix Spike/Matrix Spike Duplicate.
SVOC	Semi-Volatile Organic Compound.
TAL	Target Analyte List.
TPH	Total Petroleum Hydrocarbon.
VOC	Volatile Organic Compound.

TABLE 7.1

WATER LEVEL RESPONSE IN NEARBY WELLS
MW-6A STEP DRAWDOWN TESTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Well Location	Water Level (Ft. BTOC) *Start*	 *2 Hours*	Water Level *Change* *(Ft.)*
Pumping Well			
MW-6A	13.81	15.9	-2.09
Overburden Wells			
MW-5	6.36	6.20	+0.16
MW-6	9.84	11.75	-1.91
MW-7	7.64	7.64	0
MW-12	8.52	8.73	-0.21
MW-15	7.48	6.84	+0.64
MW-20	7.02	6.92	+0.10
Bedrock Wells			
MW-5A	8.72	8.70	+0.02
MW-6A	13.81	15.90	-2.09
MW-15A	11.88	11.92	-0.04
MW-9B	8.08	7.92	+0.16
MW-15B	12.76	12.75	+0.01

Notes:

No four hour (final) water levels were taken due to unexpected pump failure early in the fourth step.
BTOC Below Top of Casing.

TABLE 7.2

WATER LEVEL RESPONSE IN NEARBY WELLS
MW-16A STEP DRAWDOWN TESTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

	Water level (Ft. BTOC)			*Water Level Change (Ft.)*
Well Location	*Start*	*2 Hours*	*4 Hours*	
Pumping Well				
MW-16A	13.74	21.10	22.76	-9.02
Overburden Wells				
MW-1	6.85	6.86	6.88	-0.03
MW-15	7.21	7.24	7.26	-0.05
MW-16	8.10	8.11	8.18	-0.08
MW-18	11.45	11.46	11.48	-0.03
Bedrock Wells				
MW-1A	17.21	17.40	17.46	-0.26
MW-15A	12.61	12.80	12.85	-0.24
MW-16A	13.74	21.10	22.76	-9.02
MW-17A	3.78	3.78	3.78	0
MW-15B	12.75	12.88	12.94	-0.19

Notes:
BTOC Below Top of Casing.

TABLE 7.3

AIR STRIPPER REMOVAL EFFICIENCIES DURING STEP TESTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Compound	*BSA Limits (1) (µg/L)*	*MW-6A Concentration Influent (µg/L)*	*Effluent (µg/L)*	*% Removal*
1 Hour Test - 1 GPM				
cis-1,2-Dichloroethene	285	20,000	46	99.77
trans-1,2-Dichloroethene	285	270J	<5.0	>98.15
Ethylbenzene	1,580	260J	<5.0	>98.08
Toluene	680	240J	2.5J	98.96
Vinyl chloride	3	12,000	4.4J	99.96
m + p Xylene	2,080	410J	2.0J	99.51
4 Hour Test - 6.5 GPM				
cis-1,2-Dichloroethene	285	34,000	1,800	94.71
trans-1,2-Dichloroethene	285	180J	<50	>72.2
Ethylbenzene	1,580	120J	<50	>58.3
Toluene	680	120J	<50	>58.3
Vinyl chloride	3	12,000	510	95.75
m + p Xylene	2,080	310J	13J	95.81

$$\% \text{ Removal} = \frac{\text{Influent Concentration - Effluent Concentration}}{\text{Influent Concentration}}$$

Notes:
(1) Buffalo Sewer Authority (BSA) discharge limits.
GPM Gallons Per Minute.

TABLE 7.3

AIR STRIPPER REMOVAL EFFICIENCIES DURING STEP TESTS
LEICA INC.
CHEEKTOWAGA, NEW YORK

Compound	*BSA Limits (1) (µg/L)*	*MW-16A Concentration Influent (µg/L)*	*MW-16A Concentration Effluent (µg/L)*	*% Removal*
1 Hour Test - 1 GPM				
1,1-Dichloroethane	500	5,900	<5.0	>99.92
1,1-Dichloroethene	3	580	<5.0	>99.14
cis-1,2-Dichloroethene	285	45,000	<5.0	>99.99
Ethylbenzene	1,580	1,500	<5.0	>99.67
Toluene	680	1,600	<5.0	>99.69
1,1,1-Trichloroethane	1,550	44,000	4.1J	99.991
Trichloroethene	710	50,000	2.1J	99.996
Vinyl chloride	3	3,600	<5.0	>99.86
o + m + p Xylene	2,080	7,700	7.3J	99.91
4 Hour Test (6.5 GPM)				
1,1-Dichloroethene	3	2,900	<5.0	>99.83
cis-1,2-Dichloroethene	285	45,000	<5.0	>99.990
Ethylbenzene	1,580	790J	<5.0	>99.37
Toluene	680	840J	<5.0	>99.40
1,1,1-Trichloroethane	1,550	14,000	<5.0	>99.96
Trichloroethene	710	38,000	1.2J	99.997
Vinyl chloride	3	3,600	<5.0	>99.86
o + m + p Xylene	2,080	4,200J	6.6J	99.84

$$\% \text{ Removal} = \frac{\text{Influent Concentration - Effluent Concentration}}{\text{Influent Concentration}}$$

Notes:

(1) Buffalo Sewer Authority (BSA) discharge limits.
GPM Gallons Per Minute.

APPENDIX A

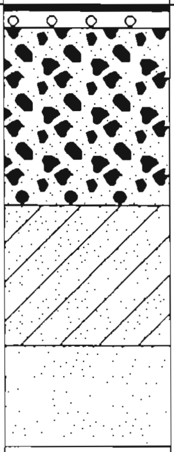
TEST TRENCH STRATIGRAPHIC LOGS

TEST PIT STRATIGRAPHIC LOG

(WL-98)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

TEST PIT DESIGNATION: TRENCH 1
DATE COMPLETED: DECEMBER 4, 1995
TEST PIT METHOD: TRACKHOE
CRA SUPERVISOR: K. LYNCH



DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE INTERVAL	PID (ppm)	ANALYSIS GRAIN SIZE	ANALYSIS CHEMICAL
	GROUND SURFACE	.00						
-2.5	FILL, ash, brick, cinders, metal, wood, glass, concrete, loose, dark gray to black, wet, some odor - corroded 55 gallon drum (empty), several 5 gallon metal closed top cans (empty)							
-5.0	ML-SILT, some clay, little sand, trace gravel, very stiff, fine grained, low plasticity, laminated, red-brown, dry to moist, lake sediments	-5.00						
-7.5 -10.0	SM-SAND, some to little silt, trace fine subangular gravel, increasing amounts with depth, medium dense, thinly layered, gray and dark gray, wet, some sour odor - NAPL	-8.50						
-12.5 -15.0 -17.5 -20.0 -22.5 -25.0 -27.5 -30.0 -32.5	BOTTOM OF TESTPIT @ 11.0ft BGS NOTES: 1. 275 ppm maximum PID; 4% LEL downwind. 8-16 ppm at East Property Line. 2. Trench backfilled with excavated material.	-11.00						

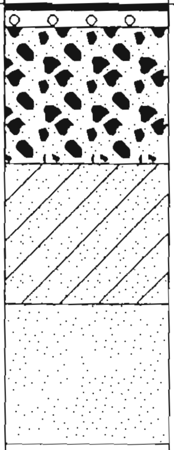
<u>NOTES:</u> MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

TEST PIT STRATIGRAPHIC LOG

(WL-99)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS	TEST PIT DESIGNATION: TRENCH 2
PROJECT NUMBER: 3967	DATE COMPLETED: DECEMBER 4, 1995
CLIENT: LEICA INC.	TEST PIT METHOD: TRACKHOE
LOCATION: CHEEKTOWAGA, NY	CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE			ANALYSIS	
				NUMBER	SAMPLE INTERVAL	PID (ppm)	GRAIN SIZE	CHEMICAL
	GROUND SURFACE	.00						
-2.5	FILL, ash, concrete, brick, gravel, wood, wire rope, metal, black, wet, some odor							
-5.0	ML-SILT, some clay, little sand, trace gravel, stiff to very stiff, low plasticity, laminated, red-brown, dry to moist, lake sediments	-4.00						
-7.5 -10.0	SM-SAND, some to little silt, trace subangular gravel, medium dense to dense, thinly layered, gray and dark gray, moist to wet, trace NAPL in thin layer	-7.50						
-12.5 -15.0 -17.5 -20.0 -22.5 -25.0 -27.5 -30.0 -32.5	BOTTOM OF TESTPIT @ 11.0ft BGS NOTES: 1. 60 ppm +/- maximum PID reading. 2. Trench backfilled with excavated material.	-11.00						



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊽

TEST PIT STRATIGRAPHIC LOG

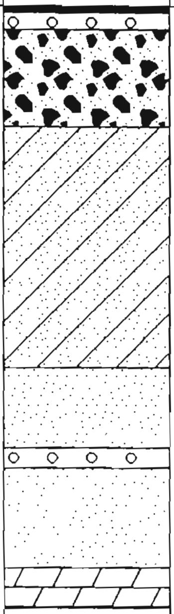
(WL100)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

TEST PIT DESIGNATION: TRENCH 3
DATE COMPLETED: DECEMBER 6, 1995
TEST PIT METHOD: TRACKHOE
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	SAMPLE NUMBER	SAMPLE INTERVAL	PID (ppm)	ANALYSIS GRAIN SIZE	ANALYSIS CHEMICAL
	GROUND SURFACE	.00					
-2.5	FILL, ash, brick, soil (1.5 to 3.0ft thick), black and red-brown, dry, no odor	-3.00					
-5.0 -7.5	ML-SILT, little clay and sand, very stiff, laminated, red-brown, dry, no odor, lake sediments	-9.00					
-10.0	SM-SAND, little silt, little gravel, medium dense to dense, thinly layered, gray, dry to moist, no apparent odor	-11.00					
	GM-GRAVEL, little sand and silt, gray, moist to wet	-11.50					
-12.5	SM-SAND, little silt, little gravel, medium dense to dense, thinly layered, gray, dry to moist, no apparent odor	-14.00					
-15.0	BEDROCK	-14.00					
-17.5	BOTTOM OF TESTPIT @ 14.0ft BGS NOTES: 1. No NAPL observed; no odors or sheens noted. 2. 14 ppm maximum PID. 3. Trench backfilled with excavated material.						
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

GRAPHIC LOG



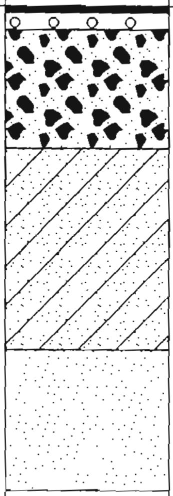
<u>NOTES:</u> MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ∇

TEST PIT STRATIGRAPHIC LOG

(WL101)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

TEST PIT DESIGNATION: TRENCH 4
DATE COMPLETED: DECEMBER 5, 1995
TEST PIT METHOD: TRACKHOE
CRA SUPERVISOR: K. LYNCH

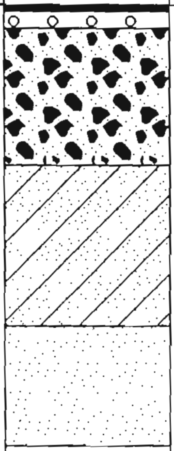
DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE PID (ppm)	ANALYSIS GRAIN SIZE	ANALYSIS CHEMICAL
	GROUND SURFACE	.00						
	FILL, ash, brick, soil, dry, no odor							
-2.5								
		-3.50						
	ML-SILT, some clay, little sand, trace fine subangular gravel, very stiff, laminated, red-bown, dry, no odors, lake sediments							
-5.0								
-7.5								
		-8.50						
	SM-SAND, little silt, trace gravel, thinly layered, gray and dark gray							
-10.0								
		-11.00						
	GM-GRAVEL, little sand, little silt, gray-brown, moist, abundant NAPL, strong chemical odor, dark discoloration	-11.50						
-12.5		-12.00						
	SM-SAND, little silt, trace gravel, thinly layered, gray and dark gray							
-15.0	BOTTOM OF TESTPIT @ 12.0ft BGS NOTES: 1. 450+ ppm maximum PID reading on NAPL layer. 2. Trench dry at completion. 3. Trench backfilled with excavated material.							
-17.5								
-20.0								
-22.5								
-25.0								
-27.5								
-30.0								
-32.5								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

TEST PIT STRATIGRAPHIC LOG

(WL102)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS	TEST PIT DESIGNATION: TRENCH 5
PROJECT NUMBER: 3967	DATE COMPLETED: DECEMBER 5, 1995
CLIENT: LEICA INC.	TEST PIT METHOD: TRACKHOE
LOCATION: CHEEKTOWAGA, NY	CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE			ANALYSIS	
				NUMBER	SAMPLE INTERVAL	PID (ppm)	GRAIN SIZE	CHEMICAL
	GROUND SURFACE	.00						
-2.5	FILL, ash, concrete, brick, metal, wet, strong chemical odor	-4.00						
-5.0 -7.5	ML-SILT, some clay, little sand, trace subangular gravel, very stiff, laminated, red-brown, dry to moist, lake sediments	-8.00						
-10.0	SM-SAND, little to some silt, little fine gravel, firm, thinly layered, gray to dark gray, moist to wet, trace NAPL above till, sour chemical odor	-11.00						
-12.5 -15.0 -17.5 -20.0 -22.5 -25.0 -27.5 -30.0 -32.5	BOTTOM OF TESTPIT @ 11.0ft BGS NOTES: 1. 300+ ppm maximum PID reading over excavated soil; 2-3 ppm 75.0ft downwind. 2. Trench backfilled with excavated material.							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

TEST PIT STRATIGRAPHIC LOG

(WL103)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

TEST PIT DESIGNATION: TRENCH 6
DATE COMPLETED: DECEMBER 5, 1995
TEST PIT METHOD: TRACKHOE
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE			ANALYSIS	
				NUMBER	SAMPLE INTERVAL	PID (ppm)	GRAIN SIZE	CHEMICAL
	GROUND SURFACE	.00						
2.5	FILL. ash, pipe, boards, brick, metal, loose, black, very wet, gasoline odor, rainbow sheen, 4% LEL	-4.00	●					
5.0 7.5	ML-SILT, some clay, little sand, trace subround gravel, laminated, red-brown, dry to moist, lake sediments	-9.00	▨					
10.0	SC-SAND, little clay and silt, trace gravel, medium dense, medium plasticity, thinly layered, gray and dark gray, moist to wet, chemical odor	-11.50	░					
12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0 32.5	BOTTOM OF TESTPIT @ 11.5ft BGS NOTES: 1. No NAPL observed in soil. Dark brown oily layer noted on water. 2. 140 ppm maximum PID reading. 3. Trench backfilled with excavated material.							

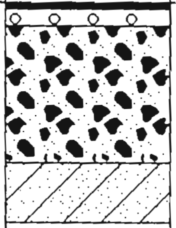
<u>NOTES:</u> MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

TEST PIT STRATIGRAPHIC LOG

(WL104)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

TEST PIT DESIGNATION: TRENCH 7
DATE COMPLETED: DECEMBER 6, 1995
TEST PIT METHOD: TRACKHOE
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	SAMPLE DESCRIPTION	ELEV. ft. BGS	GRAPHIC LOG	SAMPLE			ANALYSIS	
				NUMBER	SAMPLE INTERVAL	PID (ppm)	GRAIN SIZE	CHEMICAL
	GROUND SURFACE	.00						
-2.5	FILL, ash, brick, metal, loose, black, moist - wet, large amount of water (~4-5 gpm) was entering excavation from northwest corner	-4.00						
-5.0	ML-SILT, some clay, little sand, stiff, laminated, red-brown, dry to moist	-5.50						
-7.5 -10.0 -12.5 -15.0 -17.5 -20.0 -22.5 -25.0 -27.5 -30.0 -32.5	BOTTOM OF TESTPIT @ 5.5ft BGS NOTES: 1. Trench terminated at 5.5ft due to uncontrolled entry of groundwater into excavation. Water was clear with no odor. A sheen developed on contact with fill soils. Some odor noted over trench with 140 ppm maximum PID reading. 2. Trench backfilled with excavated material.							

<u>NOTES:</u> MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

APPENDIX B

SOIL TREATABILITY STUDY
STANDARD OPERATING PROCEDURES

SOIL WATER CONTENT
Adapted from Methods of Soil Analysis - Part II
Chemical and Microbiological Properties 2nd Ed.

1. Preparation of evaporating dish:

   - Wash evaporating dish with laboratory soap (Alconox). Rinse with distilled water.
   - Heat dish at 105°C for one hour in oven (Isotemp® Oven - Fisher Scientific).
   - Cool in desiccator, weigh, and store in desiccator until ready to use.

2. Place 5 g of representative soil in a prepared evaporating dish and weigh.

3. Evaporate to dryness at 105°C for one hour. Cool in desiccator and weigh.

4. Repeat step 3 until a constant weight is obtained.

5. Calculate % Moisture Content:

$$\frac{\text{Wet Dish/Soil Weight (g)} - \text{Dry Dish/Soil Weight @105°C (g)}}{\text{"Wet" Soil Weight (g)}} \times 100$$

Revision 8/94

pH (electrometric)
Adapted from EPA Method 9045

pH of water samples is determined electrometrically using a glass electrode with a reference potential or a combustion electrode

Interferences: Coatings of oily or particulate matter, temperature.

Instrumentation: pH meter, magnetic stirrer, and teflon stirring bar.

For soil pH measurement, the above method is modified as follows:

1. Weigh out 5 g of soil into a 25 ml glass vial.
2. Add 5 ml distilled water (pH 7.0) to vial
3. Shake sample on an orbital shaker for one hour at 200 rpm (Lab-Line Instruments, Inc.)
4. Let stand for 10 minutes
5. Insert pH electrode into the vial (Beckmann instruments)
6. Read the pH immediately on a calibrated pH meter (Beckmann Instruments) Record as soil pH in water

Revision 8/94

RESIDUE, VOLATILE SOLIDS
(Total Organic Matter)
Adapted from EPA Method 160.4

1 Preparation of evaporating dish

- Wash evaporating dish with laboratory soap (Alconox). Rinse with distilled water.
- Heat dish at 105°C for one hour in oven (Isotemp® Oven - Fisher Scientific)
- Cool in desiccator, weigh, and store in desiccator until ready to use.

2. Place 25 g of representative soil in a prepared evaporating dish and weigh.

3. Evaporate to dryness at 105°C for one hour. Cool in desiccator and weigh.

4. Transfer to a muffle furnace and ignite sample at 550°C ± 1°C for one hour (Isotemp® Muffle Oven - Fisher Scientific). Cool in desiccator and weigh.

5 Repeat [illegible]

6 Calculate Total Organic Matter

$$\frac{\text{"Dry" Dish/Soil Weight @ } 105^{\circ}\text{C (g)} - \text{"Dry" Dish/Soil Weight @ } 550^{\circ}\text{C (g)}}{\text{"Dry" Soil Weight @ } 105^{\circ}\text{C (g)}} \times 100$$

Interferences:

- Large source of error is in failure to obtain a representative sample. The test is subject to error due to loss of volatile organic matter prior to combustion, incomplete oxidation of certain complex organics and decomposition of mineral salts.

NITROGEN, ALL FORMS
Adapted from EPA Method 350.2 (NH_4-N) and 351.2 (TKN)
Operation Instructions for the Tecator Digestion System 20 & Autoanalyzer 1030

Reagents:

- **Alkali Solution:** standard technical grade sodium hydroxide solution (35-40%).

- **Ammonium Sulfate Solution (0.02N):** 1.32 g ammonium sulfate in 1000 ml deionized H_2O.

- **Ammonium Sulfate Solution (0.002N):** 0.132 g ammonium sulfate in 1000 ml deionized H_2O.

- **KCl Solution (2M):** 150 g KCl in 1000 ml deionized H_2O.

- **Kjeltabs:** (K/Cu/Ti) 3.5 g potassium sulfate, 105 mg copper sulfate, 105 mg titanium dioxide

- **MgO:** heat powdered MgO in a muffle oven at 800 °C for 2 hours to remove any CO_2. Store in desiccator containing KOH pellets to prevent CO_2 contamination

- **Receiver Solution:** Kjel-Sorb (4% boric acid with bromocresol green/methyl-red indicator)

- **Sulfamic acid:** 2 g sulfamic acid in 100 ml deionized H_2O. Store solution in refrigerator to prevent acid reacting with nitrite.

- **Sulfuric acid (H_2SO_4):** concentrated technical grade

- **Titration Acid:** 0.02N HCl (400 ml 0.1N HCl in 1600 ml deionized H_2O).

Procedure:

TOTAL KJELDAHL NITROGEN (TKN):

DIGESTION

- Turn on the digestion apparatus and allow system to heat up to 420°C by adjusting the heat dial.

- Weigh out 2 g of homogenized sample into clean 250 ml digestion tubes.

- Place digestion tubes into the tube stand and place on heat shields.

DIGESTION (cont'd)

- Add two Kjeltabs K-Cu [illegible] each digestion tube
- Add 15 ml of concentrated H_2SO_4 to each digestion tube
- Place the exhaust manifold over the digestion tube stand with the prepared samples. Turn on the vacuum source to maximum air flow.
- Place stand, tubes, and exhaust manifold in the pre-heated digestion block.
- Digest samples for 3-5 minutes with maximum air flow through the exhaust manifold. Then adjust the flow until fumes are just contained.
- Continue to digest the samples for another 55 minutes at 420°C.
- Remove the tube stand and the exhaust manifold and place the entire assembly into the cooling stand. Increase the air flow through the exhaust manifold if necessary. **Note:** Insulated gloves should be worn at all times due to apparatus being extremely hot.
- As soon as the samples have cooled sufficiently, they should be diluted with 100 ml of distilled water. Cooling can be speeded up by blowing air between the tubes with a small fan. If the digest is too hot when water is added, the reaction will be too violent and sample material might be lost. On the other hand, if digest is too cold when water is added, salts may precipitate, which are difficult to redissolve (solidification should be avoided, but in case precipitation does occur, dissolve it by placing the tubes in the digester for a short period of time).

DISTILLATION/TITRATION

- Start up the Autoanalyzer 1030 by turning on the power switch. The machine readout will display "HELP".
- Place a digestion tube into the tube holder (always keep a tube in the tube holder even when analyzer is not in use).
- Close the safety door (steam valve will not function if the door is open and the analyzer will not begin its cycle).
- Place the steam switch in the "up" position and allow the steam system to warm up for 2-3 minutes.

DISTILLATION/TITRATION (cont'd)

- Open the safety door, remove digestion tube, turn steam switch off, and switch analyzer to the "auto" mode. The analyzer is now ready to run samples. <u>Note</u>: Insulated gloves should be worn at all times due to samples being extremely hot.

- When running kjeldahl or ammonia tests, the thumb wheels should be set as follows:

  B = 1.000
  Blank = 0.00

  The "A" value should be left at 20.00 as it will only run in the "micro" mode.

- The "A" value should only be used for nitrate determinations because of its delay factor of two minutes used to allow the deverada alloy and base solution reaction to subside before steam distillation begins.

- To use the "A" value, open the top panel and position the third toggle switch to the "micro" position and close the panel. Depress the reset switch, wait a few seconds and return the switch to the "auto" position. The safety switch must be open when doing this. The machine will now run samples with a 2 minute delay between base addition and steam distillation.

AMMONIA NITROGEN (NH_4-N):

SOIL ANALYSIS:

- Weigh out 2 g of homogenized sample into 250 ml digestion tubes

- Add 10 ml of 2N KCl solution to each digestion tube

- Place the digestion tubes into the tube rack and secure the rack onto an orbital shaker.

- Shake digestion tubes for 1 hour at 250 rpm.

- Add 1 ml of sulfamic acid solution to all samples to destroy any nitrite present.

- Add 0.1 g of prepared MgO to the sample and place on the analyzer for steam distillation.

- Record ammonia (NH_4) level of the sample.

LIQUID ANALYSIS:

- Measure 5 ml of sample into 250 ml digestion tubes
- Add 1 ml of sulfamic acid solution to all samples to destroy any nitrite present.
- Add 0.1 g of prepared MgO to the sample and place on the analyzer for steam distillation.
- Record ammonia (NH_4) level of the sample.

Calculations:

- Once the analyzer has distilled and titrated a sample it will give a digital reading of the volume of acid used in the titration. Use this value in the following equation to calculate either ammonia nitrogen (NH_4-N) or total kjeldahl nitrogen (TKN). Report results as N (ppm) for liquid samples.

$$\underset{\text{wet basis}}{\text{ppm N}} = \frac{(A-B)N \times F \times 1000}{S}$$

where

A = sample reading
B = blank reading
N = normality of HCl titrating acid (0.02N)
F = milliequivalent weight of nitrogen (14 mg)
S = weight of sample analyzed

- For soil analysis, results will be on a wet basis. To obtain results on a dry basis, use the following equation:

$$\underset{\text{(wet basis)}}{\text{Nitrogen Concentration}} \times \frac{100}{100 - \text{Moisture Content}}$$

QA/QC:

- Run 10 ml of 0.02N ammonium sulfate solution on the analyzer. Results should be between 9.8 - 10.1 ppm.
- Varying amounts of ammonium sulfate solution can be spiked into clean (nitrogen-free) sand for further quality assurance.

PHOSPHORUS, ALL FORMS

Adapted from EPA Method 365.3 (Colorimetric, Ascorbic Acid, Two Reagent)

Detection Limit: 0.01 - 1.2 mg P/L

Interferences:

- Arsenate is determined similarly to phosphorus and should be considered when present. This interference may be eliminated by reducing the arsenic acid to arsenious acid with sodium bisulfite.

- When high concentrations of iron are present low recovery of phosphorus will be obtained because it will use some of the reducing agent. The bisulfite treatment will also eliminate this interference.

Reagents:

- **Ammonium molybdate - antimony potassium tartrate solution:** Dissolve 4 g of ammonium molybdate and 0.1 g antimony potassium tartrate in 400 ml of distilled water and dilute to 500 ml.

- **Ascorbic acid solution:** Dissolve 30 g of ascorbic acid in 400 ml of distilled water and dilute to 500 ml. Add 1 ml of acetone. This solution is stable for two weeks.

- **Sulfuric acid, 11N:** Slowly add 155 ml of concentrated H_2SO_4 to approximately 300 ml distilled water. Cool and dilute to 500 ml.

- **Sodium bisulfite ($NaHSO_3$) solution:** Dissolve 5.2 g of $NaHSO_3$ in 100 ml of 1.0 N H_2SO_4.

- **Ammonium persulfate**

- **Stock phosphorus solution:** Dissolve 0.4393 g of predried (105°C for 1 hour) KH_2PO_4 in distilled water and dilute to 1000 ml. 1.0 ml = 0.1 mg P (100 ppm P).

- **Standard phosphorus solution:** Dilute 100 ml of stock phosphorus solution to 1000 ml with distilled water. 1.0 ml = 0.01 mg P (10 ppm P). Prepare an appropriate series of standards by diluting suitable volumes of standard solutions to 100 ml with distilled water. Deionized water is used as the 0.0 mg/L standard. The standard solutions are sensitive to light and should be kept in the dark when not in use.

ml of Standard Phosphorus Solution	Concentration (mg/L)
0	0.00
0.1	0.01
1.5	0.15
3.0	0.30
4.5	0.45
6.0	0.60
7.5	0.75
9.0	0.90
10.5	1.05
12.0	1.20

Procedure:

TOTAL PHOSPHORUS

- Transfer 10 ml of sample or an aliquot diluted to 10 ml (for soil: 0.2 g (wet weight)/10 ml deionized water: use 5 ml of extract for analysis) into a sample flask and add 0.2 ml of 11 N sulfuric acid

- Add 0.08 g ammonium persulfate, mix, and autoclave for 15 minutes at 15 psi. Cool and dilute to approximately 10 ml and filter if necessary

- For samples containing arsenic or high levels of iron, add 1 ml of sodium bisulfite, mix and place in a 95°C water bath for 30 minutes (20 minutes after the temperature of the sample reaches 95°C). Cool and dilute to 10 ml

- Add 0.4 ml of ascorbic acid solution and mix.

- After 5 minutes, measure the absorbance at 880 nm with a spectrophotometer (Method #6 Perkin Elmer Lambda 2 Model) and determine the phosphorus concentration from the standard curve. The color is stable for at least one hour.

Calculations:

- Prepare a standard curve by plotting the absorbance values of standards versus the corresponding phosphorous concentrations using the spectrophotometer (Method #6 Perkin Elmer Lambda 2 Model).

- Obtain concentration value of sample directly from prepared standard curve based on absorbance reading. Report results as P, mg/L for liquid samples. For soil analysis, readings should be multiplied by 50 to give phosphorus concentration (P) in mg/kg (ppm) on a wet basis. To obtain the result on a dry basis, use the following equation:

$$\underset{\text{(wet basis)}}{\text{Phosphorus Concentration}} \times \frac{100}{100 - \text{Moisture Content}}$$

ORTHOPHOSPHATE

- To 5 ml of sample/standard (for soil: 0.2 g (wet weight)/10 ml deionized water; use 5 ml of extract for analysis), add 0.1 ml of 11 N sulfuric acid.
- For samples containing arsenic or high levels of iron, add 0.5 ml of sodium bisulfite solution, mix and place in a 95°C water bath for 30 minutes. Cool and dilute to 5 ml if necessary.
- Add 0.4 ml of ammonium molybdate-antimony potassium tartrate and 0.2 ml ascorbic acid solution and mix.
- After 5 minutes, measure the absorbance at 880 nm with a spectrophotometer (Method #6 Perkin Elmer Lambda 2 Model) and determine the phosphorus concentration from the standard curve. The color is stable for at least one hour.

Calculations:

- Prepare a standard curve by plotting the absorbance values of standards versus the corresponding phosphorous concentrations using the spectrophotometer (Method #6 Perkin Elmer Lambda 2 Model).
- Obtain concentration value of sample directly from prepared standard curve based on absorbance reading. Report results as PO_4-P, mg/L for liquid samples. For soil analysis, readings should be multiplied by 50 to give phosphorus concentration (PO_4-P) in mg/kg (ppm) on a wet basis. To obtain the result on a dry basis, use the following equation:

$$\underset{\text{(wet basis)}}{\text{Phosphorus Concentration}} \times \frac{100}{100 - \text{Moisture Content}}$$

PROCEDURE FOR SOIL BACTERIAL POPULATION DETERMINATION

Adapted from Standard Methods for the Examination of Water and Wastewater 17th Edition

1 Weigh out one gram of fresh soil sample aseptically into 9 ml of sterile deionized water.

2. Make serial 1 to 10 dilutions aseptically into 10^{-2}, 10^{-3}, and 10^{-4}, etc, with a 30 second intermittent mixing before the 1 ml withdrawal.

3. Transfer 100 μL of the 10^{-4} suspension onto tryptic soy agar (Difco Laboratories, Detroit, MI), spread uniformly with a sterile bent glass rod and incubate at room temperature. When high toxicity is suspected, lower dilutions (10^{-2} and 10^{-3}) should be used.

4. The petri plates are counted 24 to 48 hours later with a Manostat colony counter (Manostat Corp).

5 The bacterial population is reported as the product of number of colonies on the plate and the dilution factor. When [illegible] sample [illegible] when more than one plate is enumerated, the mea[illegible]

Revision 8/94

PROCEDURE FOR DETERMINING THE POPULATION OF ALIPHATIC HYDROCARBON DEGRADING BACTERIA

Adapted from Standard Methods for the Examination of Water and Wastewater - 17th Edition

1. Weigh out one gram of fresh soil sample aseptically into 9 ml of sterile deionized water.

2. Make serial 1 to 10 dilutions aseptically into 10^{-2}, 10^{-3}, and 10^{-4}, etc, with a 30 second intermittent mixing before the 1 ml withdrawal.

3. Transfer 100 μL of the 10^{-4} suspension onto 500 ppm hexadecane noble agar (hexadecane added aseptically into autoclaved nobel agar, Difco Laboratories, Detroit, MI), spread uniformly with a sterile bent glass rod and incubate at room temperature. When high toxicity is suspected, lower dilutions (10^{-2} and 10^{-3}) should be used.

4. The petri plates are counted 48 to 72 hours later with a Manostat colony counter (Manostat Corp).

5. The bacterial population is reported as the product of number of colonies on the plate and the dilution factor. When more than one dilution is sampled or when more than one plate is replicated, a mean of the populations is reported.

Revision 8/94

TOTAL PETROLEUM HYDROCARBON ANALYSIS (TPH) - INFRARED METHOD

Adapted from EPA Method 418.1

1. Scope and Application

1.1 This method is for the measurement of fluorocarbon-113 extractable petroleum hydrocarbons from surface and saline waters, industrial and domestic waste.

1.2 This method is applicable to measurement of light fuels, although loss of about half of any gasoline present during the extraction manipulations can be expected.

1.3 The detection limit of this method is 50 mg/kg soil.

2. Summary of Method

2.1 The soil sample is acidified to a low pH (<2) and serially extracted with fluorocarbon-113. Interferences are removed with silica gel adsorbent. Infrared analysis of the extract is performed by direct comparison with standards.

3. Definitions

3.1 As in the case of Oil and Grease the parameter of Petroleum Hydrocarbons is defined by the method. The measurement may be subject to interferences and the results should be evaluated accordingly.

4. Apparatus

4.1 150 ml Corex centrifuge tubes
4.2 Orbital shaker (Lab-line)
4.3 Centrifuge (Beckmann GP)
4.4 Infrared spectrophotometer (Foxboro Miran 1A)
4.5 IR cuvettes (10 and 50 mm)
4.6 Filter paper, Whatman # 2V
4.7 Millipore Millex HV_{13} 0.45 micron filters
4.8 Glass funnels
4.9 Glass syringe (5 or 10 ml)

5. Reagents

5.1 Hydrochloric acid (concentrated)
5.2 Fluorocarbon-113 (1 1.2-trichloro-1 2.2-trifluoroethane)(Fisher)
5.3 Sodium sulfate, anhydrous crystal (Fisher)
5.4 Silica gel, 100-200 mesh (Fisher)
5.5 Calibration mixtures:

5.5.1 **Reference oil:** Pipet 15.0 ml n-hexadecane, 15.0 ml isooctane, and 10.0 ml chlorobenzene into a 50 ml glass stoppered volumetric flask. Maintain the integrity of the mixture by keeping stoppered except when withdrawing aliquots.

5.5.2 **Stock standard:** Pipet 1.0 ml reference oil (5.5.1) into a tared 100 ml volumetric flask and immediately stopper. Weigh and dilute to volume with fluorocarbon-113.

5.5.3 **Working standards:** Pipet appropriate volumes of stock standard (5.5.2) into 100 ml volumetric flasks according to the cell pathlength to be used. Dilute to volume with fluorocarbon-113. Calculate concentration of standards from the stock standard.

6. Procedure

6.1 Determine moisture content of the soil using the standard method for water analysis (Methods of Soil Analysis Part I - Physical and Mineralogical Methods - 2nd Ed).

6.2 Weigh 10 gm of sifted soil into a 150 ml centrifuge tube. Acidify to pH <2 with HCl. Add 10 gm of anhydrous sodium sulfate to the soil and mix well.

6.3 Pipet 30 ml of fluorocarbon-113 into centrifuge tube.

6.4 Shake the soil mixture on an orbital shaker for 10 minutes at 350 rpm.

6.5 Filter the freon extract (Whatman #2V) into a 50 ml volumetric flask.

6.6 Use 20 ml of fresh freon to further extract the residual material in the centrifuge tube. Use additional freon if needed to adjust the final volume to 50 ml.

6.7 Use silica gel to remove the interfering material from the extract (4 g/10 ml) and then leave the sample to settle.

6.8 Filter the extract through a Millipore Millex HV_{13} filter.

6.9 Calibrate the instrument for the appropriate cells using a series of working standards (5.5.3). it is not necessary to add silica gel to the standards. Determine absorbance directly for each solution at the absorbance maximum at 2930 cm^{-1}. Prepare a calibration plot of absorbance vs. mg petroleum hydrocarbons.

6.10 Fill a clean cell with solution and determine the absorbance of the extract. If the absorbance exceeds 0.8 prepare an appropriate dilution. **NOTE:** The possibility that the absorptive capacity of the silica gel has been exceeded can be tested at this point by adding another 3.0 gm silica gel to the extract and repeating the treatment and determination.

6.11 Determine the concentration of petroleum hydrocarbons in the extract by comparing the response against the calibration plot.

7. Instrument Parameters

7.1 The Foxboro Miran 1A analyzer should be set-up as follows

Wavelength:	3.48 microns
Slit:	1 mm
Response Meter:	1 second
Range:	1A
Coarse Zero:	1X (10 mm); 10X (50 mm)
Fine Zero:	Should be adjusted to give a zero reading when fluorocarbon-113 is used.
Absorbance Scale:	Upper absorbance scale is used.
Source Positioning:	Appropriate adjustment of the light source should be made to allow proper alignment.

CO_2 RELEASE OF SOIL
Adapted from Soil Science - Volume 100. Number 1

1 50 g of soil (I) is added to the 250 ml erlenmeyer flask

2. Soil is moistened to 70% of capacity with mineral salts media and the flask is closed with a rubber stopper on which is mounted an ascarite filter (F) (20-30 mesh ascarite - Fisher Scientific).

3. Stopcock (G) is slightly greased to allow easy turning (Dow Corning vacuum grease).

4. The side tube (C) is sealed with a rubber stopper pierced by a 15-gauge needle (B) 15 cm long.

5. The needle (B) is capped with a rubber policeman (A) and its tip covered with a short length of polyethylene tubing (E) that contacts the very bottom of the round base of the side tube (C).

6. The unit is charged with alkali by injection. The policeman (A) is replaced by a calibrated syringe containing [illegible] N KOH; the filter stopper is removed and the stopcock (G) is removed or opened; [illegible] ml of alkali is introduced through the needle (B) to the side tube (C); the stopcock is closed; the syringe is removed; and the policeman (A) and filter stopper are then returned to their initial positions.

7 Carbon dioxide produced by the soil is absorbed by the alkali and determined volumetrically

8 To recover the alkali for analysis, the procedure for charging the unit is performed in reverse

9. The side tube (C) is rinsed with carbon dioxide-free water and then recharged with fresh alkali using the syringe.

10. The wash water and KOH are combined in a 50 ml erlenmeyer flask containing 1 ml of 2N $BaCl_2$ and titrated with 0.1 N HCl using 2-3 drops phenolphthalein as indicator (250 mg phenolphthalein in 200 ml absolute EtOH).

11. Flasks are kept in an environmental chamber at 25°C. CO_2 readings should be taken every 48 hours by titrating with 0.1N HCl. Note the volume used to titrate from a bright pink to a clear solution.

12. CO$_2$ (μmol) calculated:

$$\left[\frac{\text{[illegible] KOH}}{1000} \quad \text{[illegible]} \quad \frac{\text{[illegible] Cl}}{1000} \right] \text{[illegible]}$$

Standard Check:

1. Take 10 ml of 0.1N KOH and place in a 50 ml erlenmeyer flask.

2. Add 2-3 drops of phenolphthalein indicator solution.

3. Titrate with 0.1N HCl. Note starting and ending volume of HCl used to titrate from a bright pink to a clear solution.

4. Calculate moles of alkali used

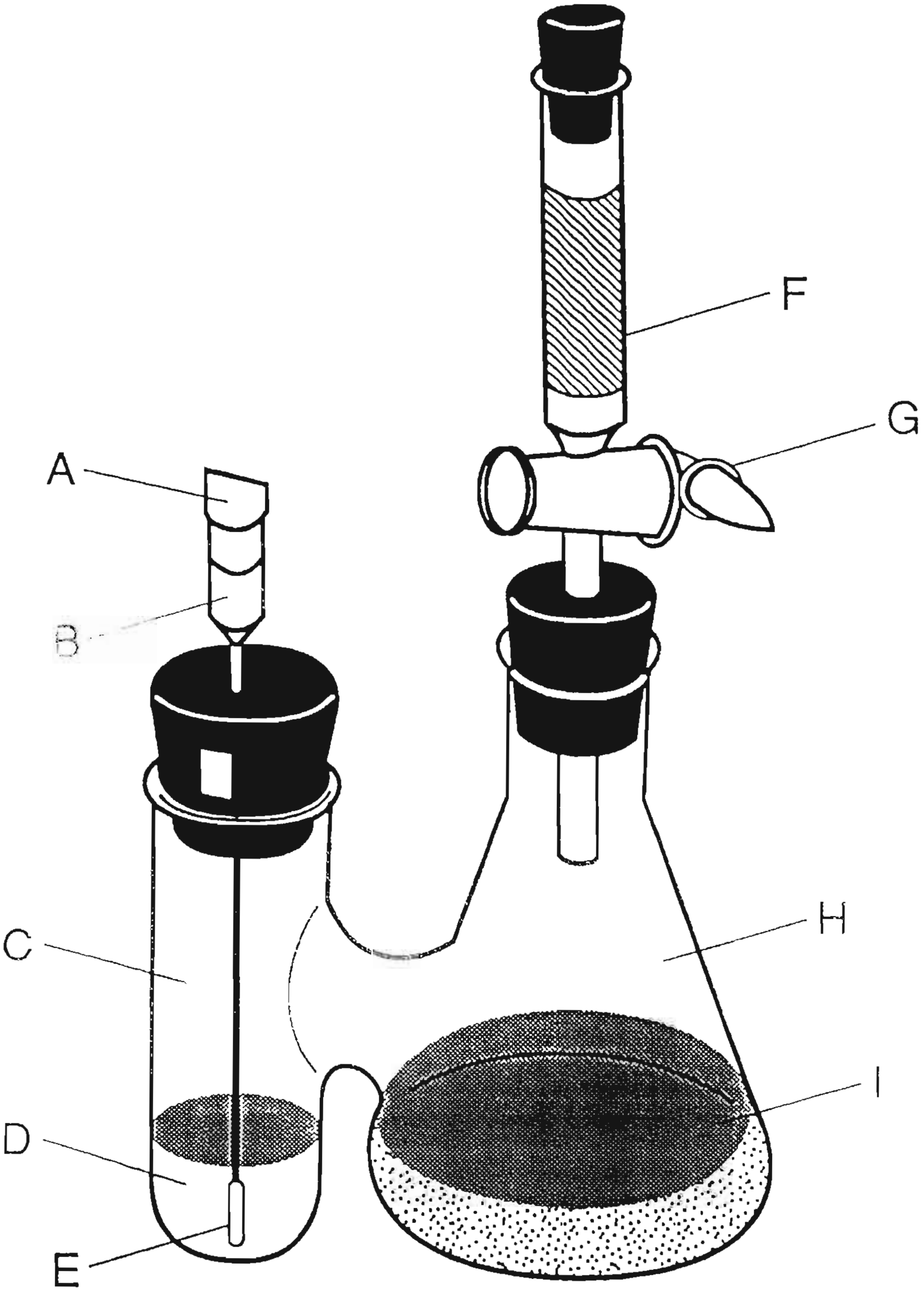


Fig. 1 Flask for monitoring the production by soil of carbon dioxide

Designation: D 422 - 63 (Reapproved 1990)$^{\epsilon 1}$

Standard Test Method for Particle-Size Analysis of Soils[1]

This standard is issued under the fixed designation D 422; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

$^{\epsilon 1}$ NOTE—Section 19 was added editorially in September 1990.

1. Scope

1.1 This test method covers the quantitative determination of the distribution of particle sizes in soils. The distribution of particle sizes larger than 75 µm (retained on the No. 200 sieve) is determined by sieving, while the distribution of particle sizes smaller than 75 µm is determined by a sedimentation process, using a hydrometer to secure the necessary data (Notes 1 and 2).

NOTE 1—Separation may be made on the No. 4 (4.75-mm), No. 40 (425-µm), or No. 200 (75-µm) sieve instead of the No. 10. For whatever sieve used, the size shall be indicated in the report.

NOTE 2—Two types of dispersion devices are provided: *(1)* a high-speed mechanical stirrer, and *(2)* air dispersion. Extensive investigations indicate that air-dispersion devices produce a more positive dispersion of plastic soils below the 20-µm size and appreciably less degradation on all sizes when used with sandy soils. Because of the definite advantages favoring air dispersion, its use is recommended. The results from the two types of devices differ in magnitude, depending upon soil type, leading to marked differences in particle size distribution, especially for sizes finer than 20 µm.

2. Referenced Documents

2.1 *ASTM Standards*:

D421 Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants[2]

E 11 Specification for Wire-Cloth Sieves for Testing Purposes[3]

E 100 Specification for ASTM Hydrometers[4]

3. Apparatus

3.1 *Balances*—A balance sensitive to 0.01 g for weighing the material passing a No. 10 (2.00-mm) sieve, and a balance sensitive to 0.1 % of the mass of the sample to be weighed for weighing the material retained on a No. 10 sieve.

3.2 *Stirring Apparatus*—Either apparatus A or B may be used.

3.2.1 Apparatus A shall consist of a mechanically operated stirring device in which a suitably mounted electric motor turns a vertical shaft at a speed of not less than 10 000 rpm without load. The shaft shall be equipped with a replaceable stirring paddle made of metal, plastic, or hard rubber, as shown in Fig. 1. The shaft shall be of such length that the stirring paddle will operate not less than ¾ in. (19.0 mm) nor more than 1½ in. (38.1 mm) above the bottom of the dispersion cup. A special dispersion cup conforming to either of the designs shown in Fig. 2 shall be provided to hold the sample while it is being dispersed.

3.2.2 Apparatus B shall consist of an air-jet dispersion cup[5] (Note 3) conforming to the general details shown in Fig. 3 (Notes 4 and 5).

NOTE 3—The amount of air required by an air-jet dispersion cup is of the order of 2 ft³/min; some small air compressors are not capable of supplying sufficient air to operate a cup.

NOTE 4—Another air-type dispersion device, known as a dispersion tube, developed by Chu and Davidson at Iowa State College, has been shown to give results equivalent to those secured by the air-jet dispersion cups. When it is used, soaking of the sample can be done in the sedimentation cylinder, thus eliminating the need for transferring the slurry. When the air-dispersion tube is used, it shall be so indicated in the report.

NOTE 5—Water may condense in air lines when not in use. This water must be removed, either by using a water trap on the air line, or by blowing the water out of the line before using any of the air for dispersion purposes.

3.3 *Hydrometer*—An ASTM hydrometer, graduated to read in either specific gravity of the suspension or grams per litre of suspension, and conforming to the requirements for hydrometers 151H or 152H in Specifications E 100. Dimensions of both hydrometers are the same, the scale being the only item of difference.

3.4 *Sedimentation Cylinder*—A glass cylinder essentially 18 in. (457 mm) in height and 2½ in. (63.5 mm) in diameter, and marked for a volume of 1000 mL. The inside diameter shall be such that the 1000-mL mark is 36 ± 2 cm from the bottom on the inside.

3.5 *Thermometer*—A thermometer accurate to 1°F (0.5°C).

3.6 *Sieves*—A series of sieves, of square-mesh woven-wire cloth, conforming to the requirements of Specification E 11. A full set of sieves includes the following (Note 6):

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[1] This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.03 on Texture, Plasticity, and Density Characteristics of Soils.

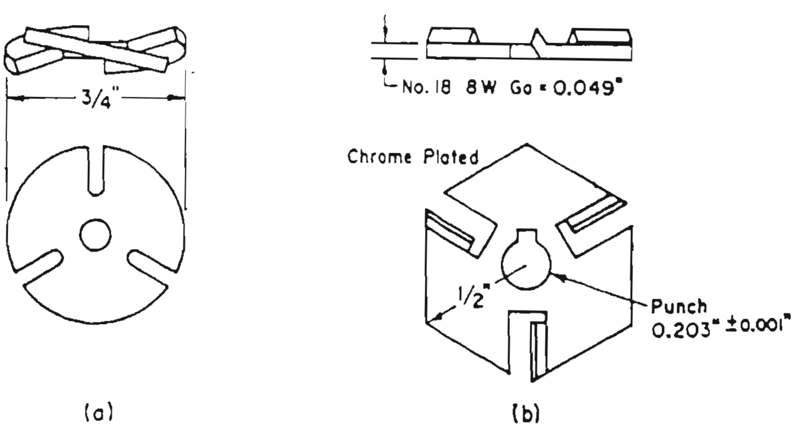
Current edition approved Nov. 21, 1963. Originally published 1935. Replaces D 422 - 62.

[2] *Annual Book of ASTM Standards*, Vol 04.08

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 14.03.

[5] Detailed working drawings for this cup are available at a nominal cost from the American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103. Order Adjunct No. 12-404220-00.



Metric Equivalents

in.	0.001	0.049	0.203	½	¾
mm	0.03	1.24	5.16	12.7	19.0

FIG. 1 Detail of Stirring Paddles

3-in. (75-mm)
2-in. (50-mm)
1½-in. (37.5-mm)
1-in. (25.0-mm)
¾-in. (19.0-mm)
⅜-in. (9.5-mm)
No. 4 (4.75-mm)
No. 10 (2.00-mm)
No. 20 (850-μm)
No. 40 (425-μm)
No. 60 (250-μm)
No. 140 (106-μm)
No. 200 (75-μm)

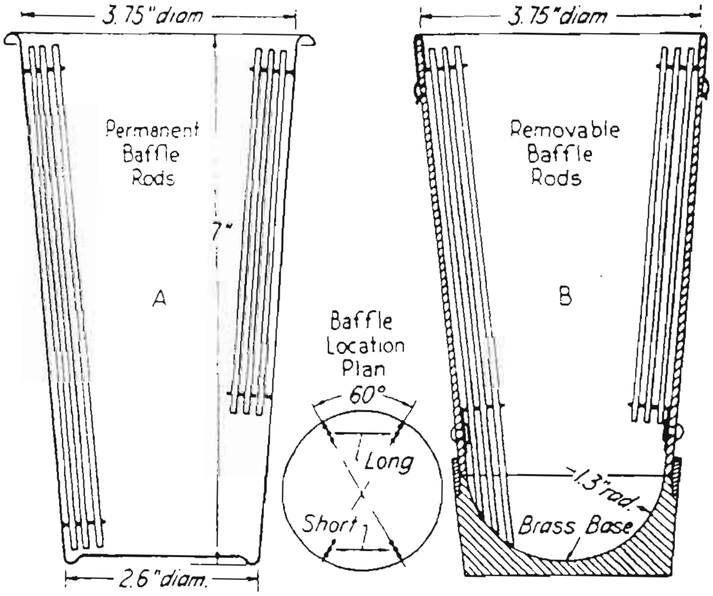
NOTE 6—A set of sieves giving uniform spacing of points for the graph, as required in Section 17, may be used if desired. This set consists of the following sieves:

3-in. (75-mm)
1½-in. (37.5-mm)
¾-in. (19.0-mm)
⅜-in. (9.5-mm)
No. 4 (4.75-mm)
No. 8 (2.36-mm)
No. 16 (1.18-mm)
No. 30 (600-μm)
No. 50 (300-μm)
No. 100 (150-μm)
No. 200 (75-μm)

3.7 *Water Bath or Constant-Temperature Room*—A water bath or constant-temperature room for maintaining the soil suspension at a constant temperature during the hydrometer analysis. A satisfactory water tank is an insulated tank that maintains the temperature of the suspension at a convenient constant temperature at or near 68°F (20°C). Such a device is illustrated in Fig. 4. In cases where the work is performed in a room at an automatically controlled constant temperature, the water bath is not necessary.

3.8 *Beaker*—A beaker of 250-mL capacity.

3.9 *Timing Device*—A watch or clock with a second hand.



Metric Equivalents

in.	1.3	2.6	3.75
mm	33	66	95.2

FIG. 2 Dispersion Cups of Apparatus

4. Dispersing Agent

4.1 A solution of sodium hexametaphosphate (sometimes called sodium metaphosphate) shall be used in distilled or demineralized water, at the rate of 40 g of sodium hexametaphosphate/litre of solution (Note 7).

NOTE 7—Solutions of this salt, if acidic, slowly revert or hydrolyze back to the orthophosphate form with a resultant decrease in dispersive action. Solutions should be prepared frequently (at least once a month) or adjusted to pH of 8 or 9 by means of sodium carbonate. Bottles containing solutions should have the date of preparation marked on them.

4.2 All water used shall be either distilled or demineralized water. The water for a hydrometer test shall be brought to the temperature that is expected to prevail during the hydrometer test. For example, if the sedimentation cylinder is to be placed in the water bath, the distilled or demineralized water to be used shall be brought to the temperature of the controlled water bath; or, if the sedimentation cylinder is used in a room with controlled temperature, the water for the test shall be at the temperature of the room. The basic temperature for the hydrometer test is 68°F (20°C). Small variations of temperature do not introduce differences that are of practical significance and do not prevent the use of corrections derived as prescribed.

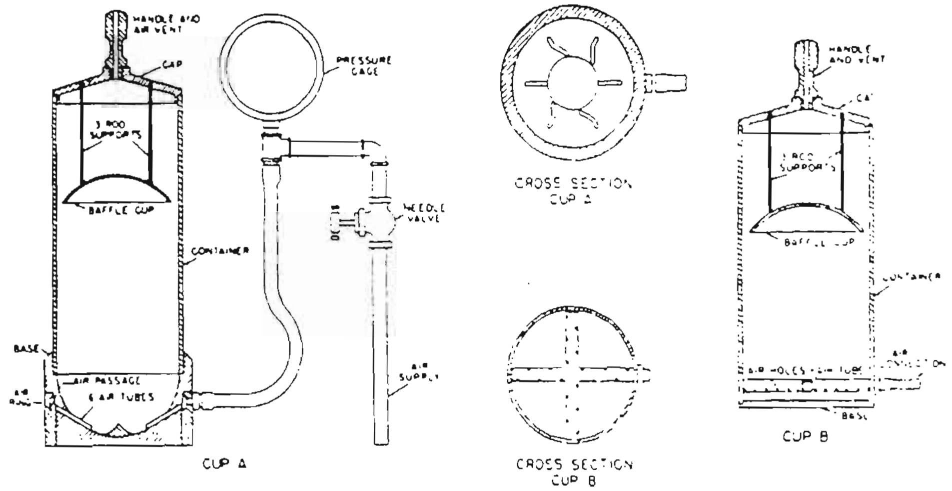


FIG. 3 Air-Jet Dispersion Cups of Apparatus B

5. Test Sample

5.1 Prepare the test sample for mechanical analysis as outlined in Practice D 421. During the preparation procedure the sample is divided into two portions. One portion contains only particles retained on the No. 10 (2.00-mm) sieve while the other portion contains only particles passing the No. 10 sieve. The mass of air-dried soil selected for purpose of tests, as prescribed in Practice D 421, shall be sufficient to yield quantities for mechanical analysis as follows:

5.1.1 The size of the portion retained on the No. 10 sieve shall depend on the maximum size of particle, according to the following schedule:

Nominal Diameter of Largest Particles, in. (mm)	Approximate Minimum Mass of Portion, g
⅜ (9.5)	500
¾ (19.0)	1000
1 (25.4)	2000
1½ (38.1)	3000
2 (50.8)	4000
3 (76.2)	5000

5.1.2 The size of the portion passing the No. 10 sieve shall be approximately 115 g for sandy soils and approximately 65 g for silt and clay soils.

5.2 Provision is made in Section 5 of Practice D 421 for weighing of the air-dry soil selected for purpose of tests, the separation of the soil on the No. 10 sieve by dry-sieving and washing, and the weighing of the washed and dried fraction retained on the No. 10 sieve. From these two masses the percentages retained and passing the No. 10 sieve can be calculated in accordance with 12.1.

NOTE 8—A check on the mass values and the thoroughness of pulverization of the clods may be secured by weighing the portion passing the No. 10 sieve and adding this value to the mass of the washed and oven-dried portion retained on the No. 10 sieve.

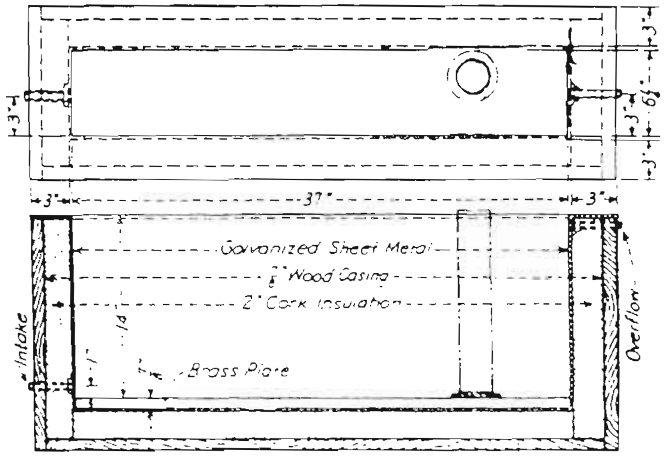
SIEVE ANALYSIS OF PORTION RETAINED ON NO. 10 (2.00-mm) SIEVE

6. Procedure

6.1 Separate the portion retained on the No. 10 (2.00-mm) sieve into a series of fractions using the 3-in. (75-mm), 2-in. (50-mm), 1½-in. (37.5-mm), 1-in. (25.0-mm), ¾-in. (19.0-mm), ⅜-in. (9.5-mm), No. 4 (4.75-mm), and No. 10 sieves, or as many as may be needed depending on the sample, or upon the specifications for the material under test.

6.2 Conduct the sieving operation by means of a lateral and vertical motion of the sieve, accompanied by a jarring action in order to keep the sample moving continuously over the surface of the sieve. In no case turn or manipulate fragments in the sample through the sieve by hand. Continue sieving until not more than 1 mass % of the residue on a sieve passes that sieve during 1 min of sieving. When mechanical sieving is used, test the thoroughness of sieving by using the hand method of sieving as described above.

6.3 Determine the mass of each fraction on a balance conforming to the requirements of 3.1. At the end of weighing, the sum of the masses retained on all the sieves used should equal closely the original mass of the quantity sieved.



Metric Equivalents

in	⅞	1	3	6¼	14	37
mm	22 2	25 4	76.2	158 2	356	940

FIG. 4 Insulated Water Bath

HYDROMETER AND SIEVE ANALYSIS OF PORTION PASSING THE NO. 10 (2.00-mm) SIEVE

7. Determination of Composite Correction for Hydrometer Reading

7.1 Equations for percentages of soil remaining in suspension, as given in 14.3, are based on the use of distilled or demineralized water. A dispersing agent is used in the water, however, and the specific gravity of the resulting liquid is appreciably greater than that of distilled or demineralized water.

7.1.1 Both soil hydrometers are calibrated at 68°F (20°C), and variations in temperature from this standard temperature produce inaccuracies in the actual hydrometer readings. The amount of the inaccuracy increases as the variation from the standard temperature increases.

7.1.2 Hydrometers are graduated by the manufacturer to be read at the bottom of the meniscus formed by the liquid on the stem. Since it is not possible to secure readings of soil suspensions at the bottom of the meniscus, readings must be taken at the top and a correction applied.

7.1.3 The net amount of the corrections for the three items enumerated is designated as the composite correction, and may be determined experimentally.

7.2 For convenience, a graph or table of composite corrections for a series of 1° temperature differences for the range of expected test temperatures may be prepared and used as needed. Measurement of the composite corrections may be made at two temperatures spanning the range of expected test temperatures, and corrections for the intermediate temperatures calculated assuming a straight-line relationship between the two observed values.

7.3 Prepare 1000 mL of liquid composed of distilled or demineralized water and dispersing agent in the same proportion as will prevail in the sedimentation (hydrometer) test. Place the liquid in a sedimentation cylinder and the cylinder in the constant-temperature water bath, set for one of the two temperatures to be used. When the temperature of the liquid becomes constant, insert the hydrometer, and, after a short interval to permit the hydrometer to come to the temperature of the liquid, read the hydrometer at the top of the meniscus formed on the stem. For hydrometer 151H the composite correction is the difference between this reading and one; for hydrometer 152H it is the difference between the reading and zero. Bring the liquid and the hydrometer to the other temperature to be used, and secure the composite correction as before.

8. Hygroscopic Moisture

8.1 When the sample is weighed for the hydrometer test, weigh out an auxiliary portion of from 10 to 15 g in a small metal or glass container, dry the sample to a constant mass in an oven at 230 ± 9°F (110 ± 5°C), and weigh again. Record the masses.

9. Dispersion of Soil Sample

9.1 When the soil is mostly of the clay and silt sizes, weigh out a sample of air-dry soil of approximately 50 g. When the soil is mostly sand the sample should be approximately 100 g.

9.2 Place the sample in the 250-mL beaker and cover with 125 mL of sodium hexametaphosphate solution (40 g/L). Stir until the soil is thoroughly wetted. Allow to soak for at least 16 h.

9.3 At the end of the soaking period, disperse the sample further, using either stirring apparatus A or B. If stirring apparatus A is used, transfer the soil - water slurry from the beaker into the special dispersion cup shown in Fig. 2, washing any residue from the beaker into the cup with distilled or demineralized water (Note 9). Add distilled or demineralized water, if necessary, so that the cup is more than half full. Stir for a period of 1 min.

NOTE 9—A large size syringe is a convenient device for handling the water in the washing operation. Other devices include the wash-water bottle and a hose with nozzle connected to a pressurized distilled water tank.

9.4 If stirring apparatus B (Fig. 3) is used, remove the cover cap and connect the cup to a compressed air supply by means of a rubber hose. A air gage must be on the line between the cup and the control valve. Open the control valve so that the gage indicates 1 psi (7 kPa) pressure (Note 10). Transfer the soil - water slurry from the beaker to the air-jet dispersion cup by washing with distilled or demineralized water. Add distilled or demineralized water, if necessary, so that the total volume in the cup is 250 mL, but no more.

NOTE 10—The initial air pressure of 1 psi is required to prevent the soil - water mixture from entering the air-jet chamber when the mixture is transferred to the dispersion cup.

9.5 Place the cover cap on the cup and open the air control valve until the gage pressure is 20 psi (140 kPa). Disperse the soil according to the following schedule:

Plasticity Index	Dispersion Period, min
Under 5	5
6 to 20	10
Over 20	15

Soils containing large percentages of mica need be dispersed for only 1 min. After the dispersion period, reduce the gage pressure to 1 psi preparatory to transfer of soil - water slurry to the sedimentation cylinder.

10. Hydrometer Test

10.1 Immediately after dispersion, transfer the soil - water slurry to the glass sedimentation cylinder, and add distilled or demineralized water until the total volume is 1000 mL.

10.2 Using the palm of the hand over the open end of the cylinder (or a rubber stopper in the open end), turn the cylinder upside down and back for a period of 1 min to complete the agitation of the slurry (Note 11). At the end of 1 min set the cylinder in a convenient location and take hydrometer readings at the following intervals of time (measured from the beginning of sedimentation), or as many as may be needed, depending on the sample or the specification for the material under test: 2, 5, 15, 30, 60, 250, and 1440 min. If the controlled water bath is used, the sedimentation cylinder should be placed in the bath between the 2- and 5-min readings.

NOTE 11—The number of turns during this minute should be approximately 60, counting the turn upside down and back as two turns.

Any soil remaining in the bottom of the cylinder during the first few turns should be loosened by vigorous shaking of the cylinder while it is in the inverted position.

10.3 When it is desired to take a hydrometer reading, carefully insert the hydrometer about 20 to 25 s before the reading is due to approximately the depth it will have when the reading is taken. As soon as the reading is taken, carefully remove the hydrometer and place it with a spinning motion in a graduate of clean distilled or demineralized water.

NOTE 12—It is important to remove the hydrometer immediately after each reading. Readings shall be taken at the top of the meniscus formed by the suspension around the stem, since it is not possible to secure readings at the bottom of the meniscus.

10.4 After each reading, take the temperature of the suspension by inserting the thermometer into the suspension.

11. Sieve Analysis

11.1 After taking the final hydrometer reading, transfer the suspension to a No. 200 (75-µm) sieve and wash with tap water until the wash water is clear. Transfer the material on the No. 200 sieve to a suitable container, dry in an oven at 230 ± 9°F (110 ± 5°C) and make a sieve analysis of the portion retained, using as many sieves as desired, or required for the material, or upon the specification of the material under test.

CALCULATIONS AND REPORT

12. Sieve Analysis Values for the Portion Coarser than the No. 10 (2.00-mm) Sieve

12.1 Calculate the percentage passing the No. 10 sieve by dividing the mass passing the No. 10 sieve by the mass of soil originally split on the No. 10 sieve, and multiplying the result by 100. To obtain the mass passing the No. 10 sieve, subtract the mass retained on the No. 10 sieve from the original mass

12.2 To secure the total mass of soil passing the No. 4 (4.75-mm) sieve, add to the mass of the material passing the No. 10 sieve the mass of the fraction passing the No. 4 sieve and retained on the No. 10 sieve. To secure the total mass of soil passing the ⅜-in. (9.5-mm) sieve, add to the total mass of soil passing the No. 4 sieve, the mass of the fraction passing the ⅜-in. sieve and retained on the No. 4 sieve. For the remaining sieves, continue the calculations in the same manner.

12.3 To determine the total percentage passing for each sieve, divide the total mass passing (see 12.2) by the total mass of sample and multiply the result by 100.

13. Hygroscopic Moisture Correction Factor

13.1 The hydroscopic moisture correction factor is the ratio between the mass of the oven-dried sample and the air-dry mass before drying. It is a number less than one, except when there is no hygroscopic moisture.

14. Percentages of Soil in Suspension

14.1 Calculate the oven-dry mass of soil used in the hydrometer analysis by multiplying the air-dry mass by the hygroscopic moisture correction factor.

14.2 Calculate the mass of a total sample represented by the mass of soil used in the hydrometer test, by dividing the oven-dry mass used by the percentage passing the No. 10 (2.00-mm) sieve, and multiplying the result by 100. This value is the weight W in the equation for percentage remaining in suspension.

TABLE 1 Values of Correction Factor, α, for Different Specific Gravities of Soil Particles[A]

Specific Gravity	Correction Factor[A]
2.95	0.94
2.90	0.95
2.85	0.96
2.80	0.97
2.75	0.98
2.70	0.99
2.65	1.00
2.60	1.01
2.55	1.02
2.50	1.03
2.45	1.05

[A] For use in equation for percentage of soil remaining in suspension when using Hydrometer 152H.

14.3 The percentage of soil remaining in suspension at the level at which the hydrometer is measuring the density of the suspension may be calculated as follows (Note 13): For hydrometer 151H:

$$P = [(100\,000/W) \times G/(G - G_1)](R - G_1)$$

NOTE 13—The bracketed portion of the equation for hydrometer 151H is constant for a series of readings and may be calculated first and then multiplied by the portion in the parentheses

For hydrometer 152H:

$$P = (Ra/W) \times 100$$

where:

a = correction faction to be applied to the reading of hydrometer 152H. (Values shown on the scale are computed using a specific gravity of 2.65. Correction factors are given in Table 1),

P = percentage of soil remaining in suspension at the level at which the hydrometer measures the density of the suspension,

R = hydrometer reading with composite correction applied (Section 7),

W = oven-dry mass of soil in a total test sample represented by mass of soil dispersed (see 14.2), g,

G = specific gravity of the soil particles, and

G_1 = specific gravity of the liquid in which soil particles are suspended. Use numerical value of one in both instances in the equation. In the first instance any possible variation produces no significant effect, and in the second instance, the composite correction for R is based on a value of one for G_1.

15. Diameter of Soil Particles

15.1 The diameter of a particle corresponding to the percentage indicated by a given hydrometer reading shall be calculated according to Stokes' law (Note 14), on the basis that a particle of this diameter was at the surface of the suspension at the beginning of sedimentation and had settled to the level at which the hydrometer is measuring the density of the suspension. According to Stokes' law:

$$D = \sqrt{[30n/980(G - G_1)] \times L/T}$$

where:

D = diameter of particle, mm,

n = coefficient of viscosity of the suspending medium (in this case water) in poises (varies with changes in temperature of the suspending medium),

L = distance from the surface of the suspension to the level at which the density of the suspension is being measured, cm. (For a given hydrometer and sedimentation cylinder, values vary according to the hydrometer readings. This distance is known as effective depth (Table 2)),

T = interval of time from beginning of sedimentation to the taking of the reading, min,

G = specific gravity of soil particles, and

G_1 = specific gravity (relative density) of suspending medium (value may be used as 1.000 for all practical purposes).

NOTE 14—Since Stokes' law considers the terminal velocity of a single sphere falling in an infinity of liquid, the sizes calculated represent the diameter of spheres that would fall at the same rate as the soil particles.

15.2 For convenience in calculations the above equation may be written as follows:

$$D = K\sqrt{L/T}$$

where:

K = constant depending on the temperature of the suspension and the specific gravity of the soil particles. Values of K for a range of temperatures and specific gravities are given in Table 3. The value of K does not change for a series of readings constituting a test, while values of L and T do vary.

15.3 Values of D may be computed with sufficient accuracy, using an ordinary 10-in. slide rule

NOTE 15—The value of L is divided by T using the A- and B-scales the square root being indicated on the D-scale. Without ascertaining the value of the square root it may be multiplied by K, using either the C- or CI-scale.

16. Sieve Analysis Values for Portion Finer than No. 10 (2.00-mm) Sieve

16.1 Calculation of percentages passing the various sieves used in sieving the portion of the sample from the hydrometer test involves several steps. The first step is to calculate the mass of the fraction that would have been retained on the No. 10 sieve had it not been removed. This mass is equal to the total percentage retained on the No. 10 sieve (100 minus total percentage passing) times the mass of the total sample represented by the mass of soil used (as calculated in 14.2), and the result divided by 100.

16.2 Calculate next the total mass passing the No. 200 sieve. Add together the fractional masses retained on all the sieves, including the No. 10 sieve, and subtract this sum from the mass of the total sample (as calculated in 14.2).

16.3 Calculate next the total masses passing each of the other sieves, in a manner similar to that given in 12.2.

16.4 Calculate last the total percentages passing by dividing the total mass passing (as calculated in 16.3) by the total mass of sample (as calculated in 14.2), and multiply the result by 100.

TABLE 2 **Values of Effective Depth Based on Hydrometer and Sedimentation Cylinder of Specified Sizes**[A]

Hydrometer 151H		Hydrometer 152H			
Actual Hydrometer Reading	Effective Depth, L, cm	Actual Hydrometer Reading	Effective Depth, L, cm	Actual Hydrometer Reading	Effective Depth, L, cm
1.000	16.3	0	16.3	31	11.2
1.001	16.0	1	16.1	32	11.1
1.002	15.8	2	16.0	33	10.9
1.003	15.5	3	15.8	34	10.7
1.004	15.2	4	15.6	35	10.6
1.005	15.0	5	15.5		
1.006	14.7	6	15.3	36	10.4
1.007	14.4	7	15.2	37	10.2
1.008	14.2	8	15.0	38	10.1
1.009	13.9	9	14.8	39	9.9
1.010	13.7	10	14.7	40	9.7
1.011	13.4	11	14.5	41	9.6
1.012	13.1	12	14.3	42	9.4
1.013	12.9	13	14.2	43	9.2
1.014	12.6	14	14.0	44	9.1
1.015	12.3	15	13.8	45	8.9
1.016	12.1	16	13.7	46	8.8
1.017	11.8	17	13.5	47	8.6
1.018	11.5	18	13.3	48	8.4
1.019	11.3	19	13.2	49	8.3
1.020	11.0	20	13.0	50	8.1
1.021	10.7	21	12.9	51	7.9
1.022	10.5	22	12.7	52	7.8
1.023	10.2	23	12.5	53	7.6
1.024	10.0	24	12.4	54	7.4
1.025	9.7	25	12.2	55	7.3
1.026	9.4	26	12.0	56	7.1
1.027	9.2	27	11.9	57	7.0
1.028	8.9	28	11.7	58	6.8
1.029	8.6	29	11.5	59	6.6
1.030	8.4	30	11.4	60	6.5
1.031	8.1				
1.032	7.8				
1.033	7.6				
1.034	7.3				
1.035	7.0				
1.036	6.8				
1.037	6.5				
1.038	6.2				

[A] Values of effective depth are calculated from the equation:

$$L = L_1 + \tfrac{1}{2}\left[L_2 - (V_B/A)\right]$$

where:

L = effective depth, cm,

L_1 = distance along the stem of the hydrometer from the top of the bulb to the mark for a hydrometer reading, cm,

L_2 = overall length of the hydrometer bulb, cm,

V_B = volume of hydrometer bulb, cm^3, and

A = cross-sectional area of sedimentation cylinder, cm^2

Values used in calculating the values in Table 2 are as follows:

For both hydrometers, 151H and 152H:

L_2 = 14.0 cm

V_B = 67.0 cm^3

A = 27.8 cm^2

For hydrometer 151H

L_1 = 10.5 cm for a reading of 1.000

= 2.3 cm for a reading of 1.031

For hydrometer 152H:

L_1 = 10.5 cm for a reading of 0 g/litre

= 2.3 cm for a reading of 50 g/litre

17. Graph

17.1 When the hydrometer analysis is performed, a graph of the test results shall be made, plotting the diameters of the particles on a logarithmic scale as the abscissa and the percentages smaller than the corresponding diameters to ar

TABLE 3 Values of K for Use in Equation for Computing Diameter of Particle in Hydrometer Analysis

Temperature, °C	Specific Gravity of Soil Particles								
	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85
16	0.01510	0.01505	0.01481	0.01457	0.01435	0.01414	0.01394	0.01374	0.01356
17	0.01511	0.01486	0.01462	0.01439	0.01417	0.01396	0.01376	0.01356	0.01338
18	0.01492	0.01467	0.01443	0.01421	0.01399	0.01378	0.01359	0.01339	0.01321
19	0.01474	0.01449	0.01425	0.01403	0.01382	0.01361	0.01342	0.1323	0.01305
20	0.01456	0.01431	0.01408	0.01386	0.01365	0.01344	0.01325	0.01307	0.01289
21	0.01438	0.01414	0.01391	0.01369	0.01348	0.01328	0.01309	0.01291	0.01273
22	0.01421	0.01397	0.01374	0.01353	0.01332	0.01312	0.01294	0.01276	0.01258
23	0.01404	0.01381	0.01358	0.01337	0.01317	0.01297	0.01279	0.01261	0.01243
24	0.01388	0.01365	0.01342	0.01321	0.01301	0.01282	0.01264	0.01246	0.01229
25	0.01372	0.01349	0.01327	0.01306	0.01286	0.01267	0.01249	0.01232	0.01215
26	0.01357	0.01334	0.01312	0.01291	0.01272	0.01253	0.01235	0.01218	0.01201
27	0.01342	0.01319	0.01297	0.01277	0.01258	0.01239	0.01221	0.01204	0.01188
28	0.01327	0.01304	0.01283	0.01264	0.01244	0.01255	0.01208	0.01191	0.01175
29	0.01312	0.01290	0.01269	0.01249	0.01230	0.01212	0.01195	0.01178	0.01162
30	0.01298	0.01276	0.01256	0.01236	0.01217	0.01199	0.01182	0.01165	0.01149

arithmetic scale as the ordinate. When the hydrometer analysis is not made on a portion of the soil, the preparation of the graph is optional, since values may be secured directly from tabulated data.

18. Report

18.1 The report shall include the following:

18.1.1 Maximum size of particles,

18.1.2 Percentage passing (or retained on) each sieve, which may be tabulated or presented by plotting on a graph (Note 16),

18.1.3 Description of sand and gravel particles:

18.1.3.1 Shape—rounded or angular,

18.1.3.2 Hardness—hard and durable, soft, or weathered and friable,

18.1.4 Specific gravity, if unusually high or low,

18.1.5 Any difficulty in dispersing the fraction passing the No. 10 (2.00-mm) sieve, indicating any change in type and amount of dispersing agent, and

18.1.6 The dispersion device used and the length of the dispersion period.

NOTE 16—This tabulation of graph represents the gradation of the sample tested. If particles larger than those contained in the sample were removed before testing, the report shall so state giving the amount and maximum size.

18.2 For materials tested for compliance with definite specifications, the fractions called for in such specifications shall be reported. The fractions smaller than the No. 10 sieve shall be read from the graph.

18.3 For materials for which compliance with definite specifications is not indicated and when the soil is composed almost entirely of particles passing the No. 4 (4.75-mm) sieve, the results read from the graph may be reported as follows:

(*1*) Gravel, passing 3-in. and retained on No. 4 sieve %
(*2*) Sand, passing No. 4 sieve and retained on No. 200 sieve %
  (*a*) Coarse sand, passing No. 4 sieve and retained on No. 10 sieve %
  (*b*) Medium sand, passing No. 10 sieve and retained on No. 40 sieve %
  (*c*) Fine sand, passing No. 40 sieve and retained on No. 200 sieve %
(*3*) Silt size, 0.074 to 0.005 mm %
(*4*) Clay size, smaller than 0.005 mm %
  Colloids, smaller than 0.001 mm %

18.4 For materials for which compliance with definite specifications is not indicated and when the soil contains material retained on the No. 4 sieve sufficient to require a sieve analysis on that portion, the results may be reported as follows (Note 17):

SIEVE ANALYSIS

Sieve Size	Percentage Passing
3-in	
2-in	
1½-in	
1-in	
¾-in.	
⅜-in.	
No. 4 (4.75-mm)	
No. 10 (2.00-mm)	
No. 40 (425-μm)	
No. 200 (75-μm)	

HYDROMETER ANALYSIS

0.074 mm	
0.005 mm	
0.001 mm	

NOTE 17—No. 8 (2.36-mm) and No. 50 (300-μm) sieves may be substituted for No. 10 and No. 40 sieves.

19. Keywords

19.1 grain-size; hydrometer analysis; hygroscopic moisture; particle-size; sieve analysis

METHOD 6010A

INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Inductively coupled plasma-atomic emission spectroscopy (ICP) determines trace elements, including metals, in solution. The method is applicable to all of the elements listed in Table 1. All matrices, including ground water, aqueous samples, TCLP and EP extracts, industrial and organic wastes, soils, sludges, sediments, and other solid wastes, require digestion prior to analysis.

1.2 Elements for which Method 6010 is applicable are listed in Table 1. Detection limits, sensitivity, and optimum ranges of the metals will vary with the matrices and model of spectrometer. The data shown in Table 1 provide estimated detection limits for clean aqueous samples using pneumatic nebulization. Use of this method is restricted to spectroscopists who are knowledgeable in the correction of spectral, chemical, and physical interferences.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, samples must be solubilized or digested using appropriate Sample Preparation Methods (e.g. Methods 3005-3050). When analyzing for dissolved constituents, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

2.2 Method 6010 describes the simultaneous, or sequential, multielemental determination of elements by ICP. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the lines are monitored by photomultiplier tubes. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 3.0 should also be recognized and appropriate corrections made; tests for their presence are described in Step 8.5.

TABLE 1.
RECOMMENDED WAVELENGTHS AND ESTIMATED INSTRUMENTAL DETECTION LIMITS

Element	Wavelength[a] (nm)	Estimated Detection Limit[b] (ug/L)
Aluminum	308.215	45
Antimony	206.833	32
Arsenic	193.696	53
Barium	455.403	2
Beryllium	313.042	0.3
Cadmium	226.502	4
Calcium	317.933	10
Chromium	267.716	7
Cobalt	228.616	7
Copper	324.754	6
Iron	259.940	7
Lead	220.353	42
Lithium	670.784	5
Magnesium	279.079	30
Manganese	257.610	2
Molybdenum	202.030	8
Nickel	231.604	15
Phosphorus	213.618	51
Potassium	766.491	See note c
Selenium	196.026	75
Silver	328.068	7
Sodium	588.995	29
Strontium	407.771	0.3
Thallium	190.864	40
Vanadium	292.402	8
Zinc	213.856	2

[a] The wavelengths listed are recommended because of their sensitivity and overall acceptance. Other wavelengths may be substituted if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference (see Step 3.1). In time, other elements may be added as more information becomes available and as required.

[b] The estimated instrumental detection limits shown are taken from Reference 1 in Section 10.0 below. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

[c] Highly dependent on operating conditions and plasma position.

3.0 INTERFERENCES

3.1 Spectral interferences are caused by: (1) overlap of a spectral line from another element at the analytical or background measurement wavelengths; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuum or recombination phenomena; and (4) stray light from the line emission of high-concentration elements. Spectral overlap can be compensated for by computer-correcting the raw data after monitoring and measuring the interfering element. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line.

Users of all ICP instruments must verify the absence of spectral interference from an element in a sample for which there is no instrument detection channel. Recommended wavelengths are listed in Table 1 and potential spectral interferences for the recommended wavelengths are given in Table 2. The data in Table 2 are intended as rudimentary guides for indicating potential interferences; for this purpose, linear relations between concentration and intensity for the analytes and the interferents can be assumed.

3.1.1 Element-specific interference is expressed as analyte concentration equivalents (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that As is to be determined (at 193.696 nm) in a sample containing approximately 10 mg/L of Al. According to Table 2, 100 mg/L of Al would yield a false signal for As equivalent to approximately 1.3 mg/L. Therefore, the presence of 10 mg/L of Al would result in a false signal for As equivalent to approximately 0.13 mg/L. The user is cautioned that other instruments may exhibit somewhat different levels of interference than those shown in Table 2. The interference effects must be evaluated for each individual instrument since the intensities will vary with operating conditions, power, viewing height, argon flow rate, etc. The user should be aware of the possibility of interferences other than those specified in Table 2 and that analysts should be aware of these interferences when conducting analyses.

3.1.2 The dashes in Table 2 indicate that no measurable interferences were observed even at higher interferent concentrations. Generally, interferences were discernible if they produced peaks, or background shifts, corresponding to 2 to 5% of the peaks generated by the analyte concentrations.

3.1.3 At present, information on the listed silver and potassium wavelengths is not available, but it has been reported that second-order energy from the magnesium 383.231-nm wavelength interferes with the listed potassium line at 766.491 nm.

TABLE 2.

ANALYTE CONCENTRATION EQUIVALENTS ARISING FROM INTERFERENCE AT THE 100-mg/L LEVEL

	Wavelength	Interferent[a,b]									
Analyte	(nm)	Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	V
Aluminum	308.215	--	--	--	--	--	--	0.21	--	--	1.4
Antimony	206.833	0.47	--	2.9	--	0.08	--	--	--	0.25	0.45
Arsenic	193.696	1.3	--	0.44	--	--	--	--	--	--	1.1
Barium	455.403	--	--	--	--	--	--	--	--	--	--
Beryllium	313.042	--	--	--	--	--	--	--	--	0.04	0.05
Cadmium	226.502	--	--	--	--	0.03	--	--	0.02	--	--
Calcium	317.933	--	--	0.08	--	0.01	0.01	0.04	--	0.03	0.03
Chromium	267.716	--	--	--	--	0.003	--	0.04	--	--	0.04
Cobalt	228.616	--	--	0.03	--	0.005	--	--	0.03	0.15	--
Copper	324.754	--				0.003		--		0.05	0.02
Iron	259.940	--	--	--	--	--	--	0.12	--	--	--
Lead	220.353	0.17	--	--	--	--	--	--	--	--	--
Magnesium	279.079	--	0.02	0.11	--	0.13	--	0.25	--	0.07	0.12
Manganese	257.610	0.005	--	0.01	--	0.002	0.002	--	--	--	--
Molybdenum	202.030	0.05	--	--	--	0.03	--	--	--	--	--
Nickel	231.604	--	--	--	--	--	--	--	--	--	--
Selenium	196.026	0.23	--	--	--	0.09	--	--	--	--	--
Sodium	588.995	--	--	--	--	--	--	--	--	0.08	--
Thallium	190.864	0.30	--	--	--	--	--	--	--	--	--
Vanadium	292.402	--	--	0.05	--	0.005	--	--	--	0.02	--
Zinc	213.856	--	--	--	0.14	--	--	--	0.29	--	--

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[a] Dashes indicate that no interference was observed even when interferents were introduced at the following levels:

Al - 1000 mg/L	Mg - 1000 mg/L
Ca - 1000 mg/L	Mn - 200 mg/L
Cr - 200 mg/L	Tl - 200 mg/L
Cu - 200 mg/L	V - 200 mg/L
Fe - 1000 mg/L	

[b] The figures recorded as analyte concentrations are not the actual observed concentrations; to obtain those figures, add the listed concentration to the interferent figure.

3.2 Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. Differences in solution volatility can also cause inaccuracies when organic solvents are involved. If physical interferences are present, they must be reduced by diluting the sample or by using a peristaltic pump. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer, or diluting the sample. Changing the nebulizer and removing salt buildup at the tip of the torch sample injector can be used as an additional measure to control salt buildup. Also, it has been reported that better control of the argon flow rate improves instrument performance; this is accomplished with the use of mass flow controllers.

3.3 Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique. If observed, they can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering of the sample, by matrix matching, and by standard addition procedures. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.0 APPARATUS AND MATERIALS

4.1 Inductively coupled argon plasma emission spectrometer:

4.1.1 Computer-controlled emission spectrometer with background correction.

4.1.2 Radio frequency generator compliant with FCC regulations.

4.1.3 Argon gas supply - Welding grade or better.

4.2 Operating conditions - The analyst should follow the instructions provided by the instrument manufacturer. For operation with organic solvents, use of the auxiliary argon inlet is recommended, as are solvent-resistant tubing, increased plasma (coolant) argon flow, decreased nebulizer flow, and increased RF power to obtain stable operation and precise measurements. Sensitivity, instrumental detection limit, precision, linear dynamic range, and interference effects must be established for each individual analyte line on that particular instrument. All measurements must be within the instrument linear range where spectral interference correction factors are valid. The analyst must (1) verify that the instrument configuration and operating conditions satisfy the analytical requirements and (2) maintain quality control data confirming instrument performance and analytical results.

4.3 Class A volumetric flasks

4.4 Class A volumetric pipets

4.5 Analytical balance - capable of accurate measurement to 4 significant figures.

5.0 REAGENTS

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. If the purity of a reagent is in question analyze for contamination. If the concentration is less than the MDL then the reagent is acceptable.

5.1.1 Hydrochloric acid (conc), HCl.

5.1.2 Hydrochloric acid (1:1), HCl. Add 500 mL concentrated HCl to 400 mL water and dilute to 1 liter in an appropriate beaker.

5.1.3 Nitric acid (conc), HNO_3.

5.1.4 Nitric acid (1:1), HNO_3. Add 500 mL concentrated HNO_3 to 400 mL water and dilute to 1 liter in an appropriate beaker.

5.2 Reagent Water. All references to water in the method refer to reagent water unless otherwise specified. Reagent water will be interference free. Refer to Chapter One for a definition of reagent water.

5.3 Standard stock solutions may be purchased or prepared from ultra-high purity grade chemicals or metals (99.99 to 99.999% pure). All salts must be dried for 1 hour at 105°C, unless otherwise specified.

CAUTION: Many metal salts are extremely toxic if inhaled or swallowed. Wash hands thoroughly after handling.

Typical stock solution preparation procedures follow. Concentrations are calculated based upon the weight of pure metal added, or with the use of the mole fraction and the weight of the metal salt added.

Metal

$$\text{Concentration (ppm)} = \frac{\text{weight (mg)}}{\text{volume (L)}}$$

Metal salts

$$\text{Concentration (ppm)} = \frac{\text{weight (mg)} \times \text{mole fraction}}{\text{volume (L)}}$$

5.3.1 Aluminum solution, stock, 1 mL = 1000 ug Al: Dissolve 1.0 g of aluminum metal, weighed accurately to at least four significant figures, in an acid mixture of 4 mL of (1:1) HCl and 1 mL of concentrated HNO_3 in a beaker. Warm gently to effect solution. When solution is complete, transfer quantitatively to a liter flask, add an additional

10 mL of (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.2 Antimony solution, stock, 1 mL = 1000 ug Sb: Dissolve 2.70 g $K(SbO)C_4H_4O_6$ (mole fraction Sb = 0.3749), weighed accurately to at least four significant figures, in water, add 10 mL (1:1) HCl, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.3 Arsenic solution, stock, 1 mL = 1000 ug As: Dissolve 1.30 g of As_2O_3 (mole fraction As = 0.7574), weighed accurately to at least four significant figures, in 100 mL of water containing 0.4 g NaOH. Acidify the solution with 2 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water

5.3.4 Barium solution, stock, 1 mL = 1000 ug Ba: Dissolve 1.50 g $BaCl_2$ (mole fraction Ba = 0.6595), dried at 250°C for 2 hours, weighed accurately to at least four significant figures, in 10 mL water with 1 mL (1:1) HCl. Add 10.0 mL (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.5 Beryllium solution, stock, 1 mL = 1000 ug Be: Do not dry. Dissolve 19.7 g $BeSO_4 \cdot 4H_2O$ (mole fraction Be = 0.0509), weighed accurately to at least four significant figures, in water, add 10.0 mL concentrated HNO_3, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.6 Cadmium solution, stock, 1 mL = 1000 ug Cd: Dissolve 1.10 g CdO (mole fraction Cd = 0.8754), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3. Heat to increase rate of dissolution. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.7 Calcium solution, stock, 1 mL = 1000 ug Ca: Suspend 2.50 g $CaCO_3$ (mole Ca fraction = 0.4005), dried at 180°C for 1 hour before weighing, weighed accurately to at least four significant figures, in water and dissolve cautiously with a minimum amount of (1:1) HNO_3. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.8 Chromium solution, stock, 1 mL = 1000 ug Cr: Dissolve 1.90 g CrO_3 (mole fraction Cr = 0.5200), weighed accurately to at least four significant figures, in water. When solution is complete, acidify with 10 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.9 Cobalt solution, stock, 1 mL = 1000 ug Co: Dissolve 1.00 g of cobalt metal, weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3. Add 10.0 mL (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.10 Copper solution, stock, 1 mL = 1000 ug Cu: Dissolve 1.30 g CuO (mole fraction Cu = 0.7989), weighed accurately to at least four significant figures), in a minimum amount of (1:1) HNO_3. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.11 Iron solution, stock, 1 mL = 1000 ug Fe: Dissolve 1.40 g Fe_2O_3 (mole fraction Fe = 0.6994), weighed accurately to at least four significant figures, in a warm mixture of 20 mL (1:1) HCl and 2 mL of concentrated HNO_3. Cool, add an additional 5.0 mL of concentrated HNO_3, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.12 Lead solution, stock, 1 mL = 1000 ug Pb: Dissolve 1.60 g $Pb(NO_3)_2$ (mole fraction Pb = 0.6256), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3. Add 10 mL (1:1) HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.13 Lithium solution, stock, 1 mL = 1000 ug Li: Dissolve 5.324 g lithium carbonate (mole fraction Li = 0.1878), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HCl and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.14 Magnesium solution, stock, 1 mL = 1000 ug Mg: Dissolve 1.70 g MgO (mole fraction Mg = 0.6030), weighed accurately to at least four significant figures, in a minimum amount of (1:1) HNO_3. Add 10.0 mL (1:1) concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.15 Manganese solution, stock, 1 mL = 1000 ug Mn: Dissolve 1.00 g of manganese metal, weighed accurately to at least four significant figures, in acid mixture (10 mL concentrated HCl and 1 mL concentrated HNO_3) and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.16 Molybdenum solution, stock, 1 mL = 1000 ug Mo: Dissolve 2.00 g $(NH_4)_6Mo_7O_{24}.4H_2O$ (mole fraction Mo = 0.5772), weighed accurately to at least four significant figures, in water and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.17 Nickel solution, stock, 1 mL = 1000 ug Ni: Dissolve 1.00 g of nickel metal, weighed accurately to at least four significant figures, in 10.0 mL hot concentrated HNO_3, cool, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.18 Phosphate solution, stock, 1 mL = 1000 ug P: Dissolve 4.393 g anhydrous KH_2PO_4 (mole fraction P = 0.2276), weighed accurately to at least four significant figures, in water. Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.19 Potassium solution, stock, 1 mL = 1000 ug K: Dissolve 1.90 g KCl (mole fraction K = 0.5244) dried at 110°C, weighed accurately to at least four significant figures, in water, and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.20 Selenium solution, stock, 1 mL = 1000 ug Se: Do not dry. Dissolve 1.70 g H_2SeO_3 (mole fraction Se = 0.6123), weighed accurately to at least four significant figures, in water and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.21 Silver solution, stock, 1 mL = 1000 ug Ag: Dissolve 1.60 g $AgNO_3$ (mole fraction Ag = 0.6350), weighed accurately to at least four significant figures, in water and 10 mL concentrated HNO_3. Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.22 Sodium solution, stock, 1 mL = 1000 ug Na: Dissolve 2.50 g NaCl (mole fraction Na = 0.3934), weighed accurately to at least four significant figures, in water. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.23 Strontium solution, stock, 1 mL = 1000 ug Sr: Dissolve 2.415 g of strontium nitrate ($Sr(NO_3)_2$) (mole fraction 0.4140), weighed accurately to at least four significant figures, in a 1-liter flask containing 10 mL of concentrated HCl and 700 mL of water. Dilute to volume in a 1,000 mL volumetric flask with water.

5.3.24 Thallium solution, stock, 1 mL = 1000 ug Tl: Dissolve 1.30 g $TlNO_3$ (mole fraction Tl = 0.7672), weighed accurately to at least four significant figures, in water. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.25 Vanadium solution, stock, 1 mL = 1000 ug V: Dissolve 2.30 g NH_4O_3 (mole fraction V = 0.4356), weighed accurately to at least four significant figures, in a minimum amount of concentrated HNO_3. Heat to increase rate of dissolution. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.3.26 Zinc solution, stock, 1 mL = 1000 ug Zn: Dissolve 1.20 g ZnO (mole fraction Zn = 0.8034), weighed accurately to at least four significant figures, in a minimum amount of dilute HNO_3. Add 10.0 mL concentrated HNO_3 and dilute to volume in a 1,000 mL volumetric flask with water.

5.4 Mixed calibration standard solutions - Prepare mixed calibration standard solutions by combining appropriate volumes of the stock solutions in volumetric flasks (see Table 3). Matrix match with the appropriate acids and dilute to 100 mL with water. Prior to preparing the mixed standards, each stock solution should be analyzed separately to determine possible spectral interference or the presence of impurities. Care should be taken when preparing the mixed standards to ensure that the elements are compatible and stable together. Transfer the mixed standard solutions to FEP fluorocarbon or previously unused polyethylene or polypropylene bottles for storage. Fresh mixed standards should be prepared, as needed, with the realization that concentration can change on aging. Calibration standards must be initially verified using a quality control sample (see Step 5.8) and monitored weekly for stability. Some typical calibration standard combinations are listed in Table 3. All mixtures should then be scanned using a sequential spectrometer to verify the absence of interelement spectral interference in the recommended mixed standard solutions.

NOTE: If the addition of silver to the recommended acid combination results in an initial precipitation, add 15 mL of water and warm the flask until the solution clears. Cool and dilute to 100 mL with water. For this acid combination, the silver concentration should be limited to 2 mg/L. Silver under these conditions is stable in a tap-water matrix for 30 days. Higher concentrations of silver require additional HCl.

TABLE 3.
MIXED STANDARD SOLUTIONS

Solution	Elements
I	Be, Cd, Mn, Pb, Se and Zn
II	Ba, Co, Cu, Fe, and V
III	As, Mo
IV	Al, Ca, Cr, K, Na, Ni,Li,& Sr
V	Ag (see Note to Step 5.4), Mg, Sb, and Tl
VI	P

5.5 Two types of blanks are required for the analysis. The calibration blank is used in establishing the analytical curve, and the reagent blank is used to correct for possible contamination resulting from varying amounts of the acids used in the sample processing.

5.5.1 The calibration blank is prepared by acidifying reagent water to the same concentrations of the acids found in the standards and samples. Prepare a sufficient quantity to flush the system between standards and samples.

5.5.2 The method blank must contain all the reagents and in the same volumes as used in the processing of the samples. The method blank must be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis.

5.6 The instrument check standard is prepared by the analyst by combining compatible elements at concentrations equivalent to the midpoint of their respective calibration curves (see Step 8.6.1.1 for use). The instrument check standard should be prepared from a source independent from that used in the calibration standards.

5.7 The interference check solution is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Spike the sample with the elements of interest at approximate

5.7 The interference check solution is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Spike the sample with the elements of interest at approximate concentrations of 10 times the instrumental detection limits. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, this spiking procedure will not be necessary.

5.8 The quality control sample should be prepared in the same acid matrix as the calibration standards at 10 times the instrumental detection limits and in accordance with the instructions provided by the supplier.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 See the material in Chapter Three, Metallic Analytes, Steps 3.1 through 3.3.

7.0 PROCEDURE

7.1 Preliminary treatment of most matrices is necessary because of the complexity and variability of sample matrices. Water samples which have been prefiltered and acidified will not need acid digestion as long as the samples and standards are matrix matched Solubilization and digestion procedures are presented in Sample Preparation Methods (Methods 3005A-3050A).

7.2 Set up the instrument with proper operating parameters established in Step 4.2. The instrument must be allowed to become thermally stable before beginning (usually requiring at least 30 minutes of operation prior to calibration).

7.3 Profile and calibrate the instrument according to the instrument manufacturer's recommended procedures, using the typical mixed calibration standard solutions described in Step 5.4. Flush the system with the calibration blank (Step 5.5.1) between each standard or as the manufacturer recommends. (Use the average intensity of multiple exposures for both standardization and sample analysis to reduce random error.) The calibration curve should consist of a blank and three standards.

7.4 Before beginning the sample run, reanalyze the highest mixed calibration standard as if it were a sample. Concentration values obtained should not deviate from the actual values by more than 5% (or the established control limits, whichever is lower). If they do, follow the recommendations of the instrument manufacturer to correct for this condition.

7.5 Flush the system with the calibration blank solution for at least 1 minute (Step 5.5.1) before the analysis of each sample (see Note to Step 7.3). Analyze the instrument check standard (Step 5.6) and the calibration blank (Step 5.5.1) after each 10 samples.

8.0 QUALITY CONTROL

8.1 All quality control data should be maintained and available for easy reference or inspection. Refer to Chapter One for additional quality control procedures.

8.2 Dilute and reanalyze samples that are more concentrated than the linear calibration limit or use an alternate, less sensitive line for which quality control data is already established.

8.3 Employ a minimum of one method blank per sample batch to determine if contamination or any memory effects are occurring. A method blank is a volume of reagent water acidified with the same amounts of acids as were the standards and samples.

8.4 Analyze one replicate sample for every twenty samples or per analytical batch, whichever is more frequent. A replicate sample is a sample brought through the whole sample preparation and analytical process in duplicate. Refer to Chapter One for a more detailed description of an analytical batch.

8.5 It is recommended that whenever a new or unusual sample matrix is encountered, a series of tests be performed prior to reporting concentration data for analyte elements. These tests, as outlined in Steps 8.5.1 and 8.5.2, will ensure the analyst that neither positive nor negative interferences are operating on any of the analyte elements to distort the accuracy of the reported values.

8.5.1 Serial dilution: If the analyte concentration is sufficiently high (minimally, a factor of 10 above the instrumental detection limit after dilution), an analysis of a 1:4 dilution should agree within ± 10% of the original determination. If not, a chemical or physical interference effect should be suspected.

8.5.2 Post digestion spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 75% to 125% of the known value. The spike addition should produce a minimum level of 10 times and a maximum of 100 times the instrumental detection limit. If the spike is not recovered within the specified limits, a matrix effect should be suspected.

<u>CAUTION</u>: If spectral overlap is suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

8.6 Check the instrument standardization by analyzing appropriate check standards as follows.

8.6.1 Verify calibration every 10 samples and at the end of the analytical run, using a calibration blank (Step 5.5.1) and a check standard (Step 5.6).

8.6.1.1 The results of the check standard are to agree within 10% of the expected value; if not, terminate the analysis, correct the problem, and reanalyze the previous ten samples.

8.6.1.2 The results of the calibration blank are to agree within three standard deviations of the mean blank value. If not, repeat the analysis two more times and average the results. If the average is not within three standard deviations of the background mean, terminate the analysis, correct the problem, recalibrate, and reanalyze the previous 10 samples.

8.6.2 Verify the interelement and background correction factors at the beginning and end of an analytical run or twice during every 8-hour work shift, whichever is more frequent. Do this by analyzing the interference check solution (Step 5.7). Results should be within ± 20% of the true value obtained in Step 8.6.1.1.

8.6.3 Spiked replicate samples are to be analyzed at a frequency of 5% or per analytical batch, whichever is more frequent.

8.6.3.1 The relative percent difference between replicate determinations is to be calculated as follows:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

where:

RPD = relative percent difference.
D_1 = first sample value.
D_2 = second sample value (replicate)

(A control limit of ± 20% RPD shall be used for sample values greater than ten times the instrument detection limit.)

8.6.3.2 The spiked replicate sample recovery is to be within ± 20% of the actual value.

9.0 METHOD PERFORMANCE

9.1 In an EPA round-robin Phase 1 study, seven laboratories applied the ICP technique to acid-distilled water matrices that had been spiked with various metal concentrates. Table 4 lists the true values, the mean reported values, and the mean percent relative standard deviations.

9.2 In a single laboratory evaluation, seven wastes were analyzed for 22 elements by this method. The mean percent relative standard deviation from triplicate analyses for all elements and wastes was 9 ± 2%. The mean percent recovery of spiked elements for all wastes was 93 ± 6%. Spike levels ranged from 100 ug/L to 100 mg/L. The wastes included sludges and industrial wastewaters.

10.0 REFERENCES

1. Winge, R.K.; Peterson, V.J.; Fassel, V.A. *Inductively Coupled Plasma-Atomic Emission Spectroscopy: Prominent Lines* (final report, March 1977 -February 1978); EPA-600/4-79-017, Environmental Research Laboratory, Athens, GA, March 1979; Ames Laboratory: Ames IA

2. *Test Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*; U.S. Environmental Protection agency. Office of Research and Development. Environmental Monitoring and Support Laboratory. ORD Publication Offices of Center for Environmental Research Information: Cincinnati, OH, 1982; EPA-600/4-82-057.

3. Patel, B.K.; Raab, G.A.; et al. *Report on a Single Laboratory Evaluation of Inductively Coupled Optical Emission Method 6010*; EPA Contract No. 68-03-3050, December 1984.

4. *Sampling and Analysis Methods for Hazardous Waste Combustion*; U.S. Environmental Protection Agency; Air and Energy Engineering Research Laboratory, Office of Research and Development: Research Triangle Park, NC, 1986; Prepared by Arthur D. Little, Inc.

5. Bowmand, P.W.J.M. *Line Coincidence Tables for Inductively Coupled Plasma Atomic Emission Spectrometry*, 2nd ed.; Pergamon: 1984.

6. Rohrbough, W.G., et al. *Reagent Chemicals, American Chemical Society Specifications*, 7th ed., American Chemical Society: Washington, DC, 1986.

7. *1985 Annual Book of ASTM Standards*, Vol. 11.01; "Standard Specification for Reagent Water"; ASTM: Philadelphia, PA, 1985; D1193-77.

TABLE 4.
ICP PRECISION AND ACCURACY DATA[a]

	Sample No. 1			Sample No. 2			Sample No. 3		
Element	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD[b] (%)	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD[b] (%)	True Value (ug/L)	Mean Reported Value (ug/L)	Mean SD[b] (%)
Be	750	733	6.2	20	20	9.8	180	176	5.2
Mn	350	345	2.7	15	15	6.7	100	99	3.3
V	750	749	1.8	70	69	2.9	170	169	1.1
As	200	208	7.5	22	19	23	60	63	17
Cr	150	149	3.8	10	10	18	50	50	3.3
Cu	250	235	5.1	11	11	40	70	67	7.9
Fe	600	594	3.0	20	19	15	180	178	6.0
Al	700	696	5.6	60	62	33	160	161	13
Cd	50	48	12	2.5	2.9	16	14	13	16
Co	700	512	10	20	20	4.1	120	108	21
Ni	250	245	5.8	30	28	11	60	55	14
Pb	250	236	16	24	30	32	80	80	14
Zn	200	201	5.6	16	19	45	80	82	9.4
Se[c]	40	32	21.9	6	8.5	42	10	8.5	8.3

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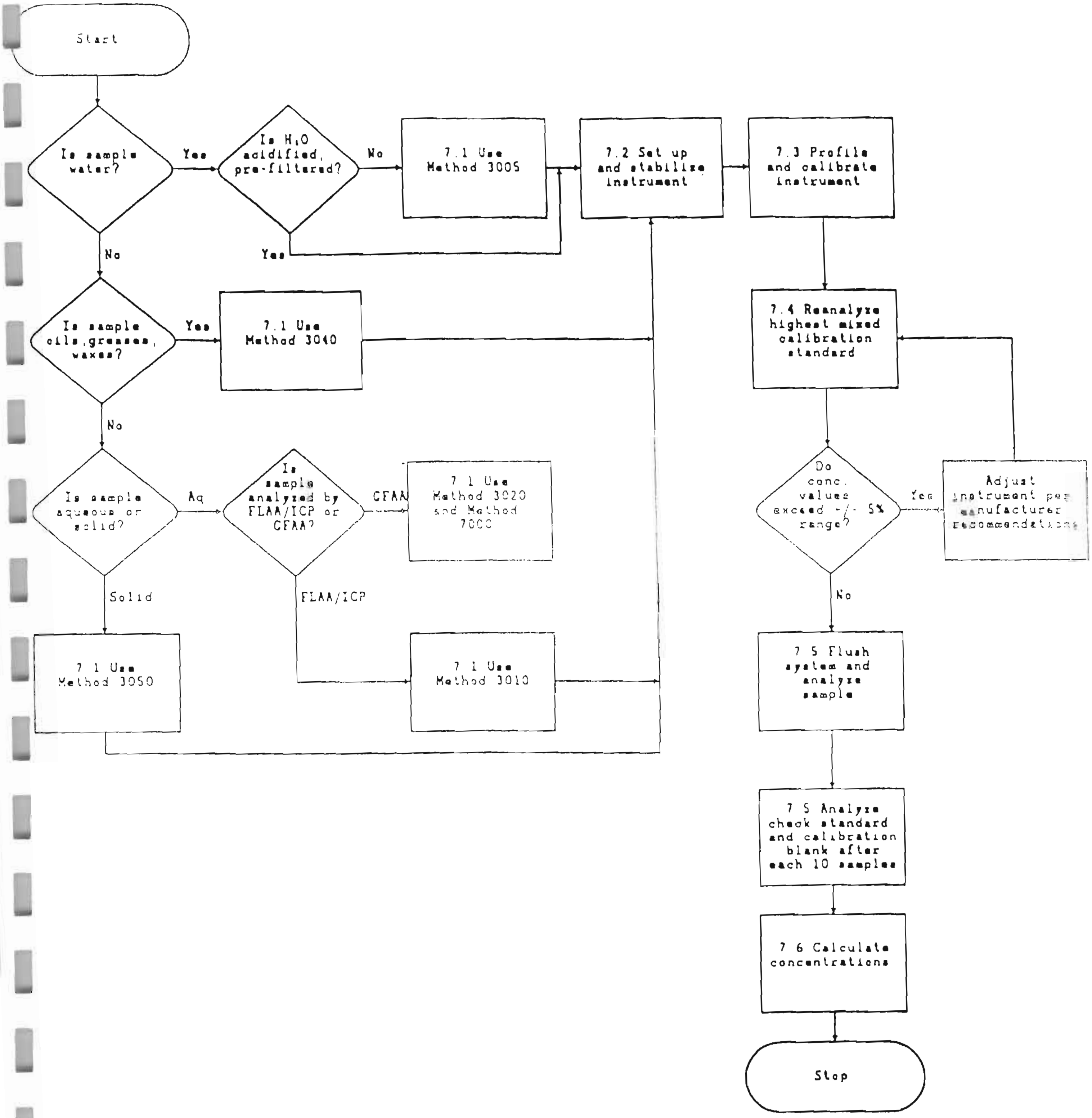
[a] Not all elements were analyzed by all laboratories.

[b] SD = standard deviation.

[c] Results for Se are from two laboratories.

METHOD 6010A
INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY



METHOD 7471A

MERCURY IN SOLID OR SEMISOLID WASTE (MANUAL COLD-VAPOR TECHNIQUE)

1.0 SCOPE AND APPLICATION

1.1 Method 7471 is approved for measuring total mercury (organic and inorganic) in soils, sediments, bottom deposits, and sludge-type materials. All samples must be subjected to an appropriate dissolution step prior to analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, then this method is not applicable for that matrix.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, the solid or semi-solid samples must be prepared according to the procedures discussed in this method.

2.2 Method 7471, a cold-vapor atomic absorption method, is based on the absorption of radiation at the 253.7-nm wavelength by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

2.3 The typical instrument detection limit (IDL) for this method is 0.0002 mg/L.

3.0 INTERFERENCES

3.1 Potassium permanganate is added to eliminate possible interference from sulfide. Concentrations as high as 20 mg/Kg of sulfide, as sodium sulfide, do not interfere with the recovery of added inorganic mercury in reagent water.

3.2 Copper has also been reported to interfere; however, copper concentrations as high as 10 mg/Kg had no effect on recovery of mercury from spiked samples.

3.3 Samples high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation of 253 nm. Care must therefore be taken to ensure that free chlorine is absent before the mercury is reduced and swept into the cell. This may be accomplished by using an excess of hydroxylamine sulfate reagent (25 mL). In addition, the dead air space in the BOD bottle must be purged before adding stannous sulfate.

3.4 Certain volatile organic materials that absorb at this wavelength may also cause interference. A preliminary run without reagents should determine if this type of interference is present.

4.0 APPARATUS AND MATERIALS

4.1 Atomic absorption spectrophotometer or equivalent: Any atomic absorption unit with an open sample presentation area in which to mount the absorption cell is suitable. Instrument settings recommended by the particular manufacturer should be followed. Instruments designed specifically for the measurement of mercury using the cold-vapor technique are commercially available and may be substituted for the atomic absorption spectrophotometer.

4.2 Mercury hollow cathode lamp or electrodeless discharge lamp

4.3 Recorder: Any multi-range variable-speed recorder that is compatible with the UV detection system is suitable.

4.4 Absorption cell: Standard spectrophotometer cells 10 cm long with quartz end windows may be used. Suitable cells may be constructed from Plexiglas tubing, 1 in. O.D. x 4.5 in. The ends are ground perpendicular to the longitudinal axis, and quartz windows (1 in. diameter x 1/16 in. thickness) are cemented in place. The cell is strapped to a burner for support and aligned in the light beam by use of two 2-in. x 2-in. cards. One-in.-diameter holes are cut in the middle of each card. The cards are then placed over each end of the cell. The cell is then positioned and adjusted vertically and horizontally to give the maximum transmittance.

4.5 Air pump: Any peristaltic pump capable of delivering 1 L/min air may be used. A Masterflex pump with electronic speed control has been found to be satisfactory.

4.6 Flowmeter: Capable of measuring an air flow of 1 L/min.

4.7 Aeration tubing: A straight glass frit with a coarse porosity. Tygon tubing is used for passage of the mercury vapor from the sample bottle to the absorption cell and return.

4.8 Drying tube: 6-in. x 3/4-in.-diameter tube containing 20 g of magnesium perchlorate or a small reading lamp with 60-W bulb which may be used to prevent condensation of moisture inside the cell. The lamp should be positioned to shine on the absorption cell so that the air temperature in the cell is about 10°C above ambient.

4.9 The cold-vapor generator is assembled as shown in Figure 1 of reference 1 or according to the instrument manufacturers instructions. The apparatus shown in Figure 1 is a closed system. An open system, where the mercury vapor is passed through the absorption cell only once, may be used instead of the closed system. Because mercury vapor is toxic, precaution must be taken to avoid its inhalation. Therefore, a bypass has been included in the system either to vent the mercury vapor into an exhaust hood or to pass the vapor through some absorbing medium, such as:

1. equal volumes of 0.1 M $KMnO_4$ and 10% H_2SO_4, or
2. 0.25% iodine in a 3% KI solution.

A specially treated charcoal that will adsorb mercury vapor is also available from Barneby and Cheney, East 8th Avenue and North Cassidy Street, Columbus, Ohio 43219, Cat. #580-13 or #580-22.

4.10 Hot plate or equivalent - Adjustable and capable of maintaining a temperature of 90-95°C.

4.11 Graduated cylinder or equivalent.

5.0 REAGENTS

5.1 Reagent Water: Reagent water will be interference free. All references to water in this method refer to reagent water unless otherwise specified.

5.2 Aqua regia: Prepare immediately before use by carefully adding three volumes of concentrated HCl to one volume of concentrated HNO_3.

5.3 Sulfuric acid, 0.5 N: Dilute 14.0 mL of concentrated sulfuric acid to 1 liter.

5.4 Stannous sulfate: Add 25 g stannous sulfate to 250 mL of 0.5 N sulfuric acid. This mixture is a suspension and should be stirred continuously during use. A 10% solution of stannous chloride can be substituted for stannous sulfate.

5.5 Sodium chloride-hydroxylamine sulfate solution: Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulfate in reagent water and dilute to 100 mL. Hydroxylamine hydrochloride may be used in place of hydroxylamine sulfate.

5.6 Potassium permanganate, mercury-free, 5% solution (w/v): Dissolve 5 g of potassium permanganate in 100 mL of reagent water.

5.7 Mercury stock solution: Dissolve 0.1354 g of mercuric chloride in 75 mL of reagent water. Add 10 mL of concentrated nitric acid and adjust the volume to 100.0 mL (1.0 mL = 1.0 mg Hg).

5.8 Mercury working standard: Make successive dilutions of the stock mercury solution to obtain a working standard containing 0.1 ug/mL. This working standard and the dilution of the stock mercury solutions should be prepared fresh daily. Acidity of the working standard should be maintained at 0.15% nitric acid. This acid should be added to the flask, as needed, before adding the aliquot.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must have been collected using a sampling plan that addresses the considerations discussed in Chapter Nine of this manual.

6.2 All sample containers must be prewashed with detergents, acids, and reagent water. Plastic and glass containers are both suitable.

6.3 Non-aqueous samples shall be refrigerated, when possible, and analyzed as soon as possible."

7.0 PROCEDURE

7.1 Sample preparation: Weigh triplicate 0.2-g portions of untreated sample and place in the bottom of a BOD bottle. Add 5 mL of reagent water and 5 mL of aqua regia. Heat 2 min in a water bath at 95°C. Cool; then add 50 mL reagent water and 15 mL potassium permanganate solution to each sample bottle. Mix thoroughly and place in the water bath for 30 min at 95°C. Cool and add 6 mL of sodium chloride-hydroxylamine sulfate to reduce the excess permanganate.

> CAUTION: Do this addition under a hood, as Cl_2 could be evolved. Add 55 mL of reagent water. Treating each bottle individually, add 5 mL of stannous sulfate and immediately attach the bottle to the aeration apparatus. Continue as described under step 7.4.

7.2 An alternate digestion procedure employing an autoclave may also be used. In this method, 5 mL of concentrated H_2SO_4 and 2 mL of concentrated HNO_3 are added to the 0.2 g of sample. Add 5 mL of saturated $KMnO_4$ solution and cover the bottle with a piece of aluminum foil. The samples are autoclaved at 121°C and 15 lb for 15 min. Cool, dilute to a volume of 100 mL with reagent water, and add 6 mL of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Purge the dead air space and continue as described under step 7.4. Refer to the caution statement in section 7.1 for the proper protocol in reducing the excess permanganate solution and adding stannous sulfate.

7.3 Standard preparation: Transfer 0.0-, 0.5-, 1.0-, 2.0-, 5.0-, and 10-mL aliquots of the mercury working standard, containing 0-1.0 ug of mercury, to a series of 300-mL BOD bottles or equivalent. Add enough reagent water to each bottle to make a total volume of 10 mL. Add 5 mL of aqua regia and heat 2 min in a water bath at 95°C. Allow the sample to cool; add 50 mL reagent water and 15 mL of $KMnO_4$ solution to each bottle and return to the water bath for 30 min. Cool and add 6 mL of sodium chloride-hydroxylamine sulfate solution to reduce the excess permanganate. Add 50 mL of reagent water. Treating each bottle individually, add 5 mL of stannous sulfate solution, immediately attach the bottle to the aeration apparatus, and continue as described in Step 7.4.

7.4 Analysis: At this point, the sample is allowed to stand quietly without manual agitation. The circulating pump, which has previously been adjusted to a rate of 1 L/min, is allowed to run continuously. The absorbance, as exhibited either on the spectrophotometer or the recorder, will increase and reach maximum within 30 sec. As soon as the recorder pen levels off (approximately 1 min), open the bypass valve and continue the aeration until the absorbance returns to its minimum value. Close the bypass valve, remove the fritted tubing from the BOD bottle, and continue the aeration.

7.5 Construct a calibration curve by plotting the absorbances of standards versus micrograms of mercury. Determine the peak height of the unknown from the chart and read the mercury value from the standard curve. Duplicates, spiked samples, and check standards should be routinely analyzed.

7.6 Calculate metal concentrations: (1) by the method of standard additions, (2) from a calibration curve, or (3) directly from the instrument's concentration read-out. All dilution or concentration factors must be taken into account. Concentrations reported for multiphased or wet samples must be appropriately qualified (e.g., 5 ug/g dry weight).

8.0 QUALITY CONTROL

8.1 Refer to section 8.0 of Method 7000

9.0 METHOD PERFORMANCE

9.1 Precision and accuracy data are available in Method 245.5 of Methods for Chemical Analysis of Water and Wastes.

9.2 The data shown in Table 1 were obtained from records of state and contractor laboratories. The data are intended to show the precision of the combined sample preparation and analysis method.

10.0 REFERENCES

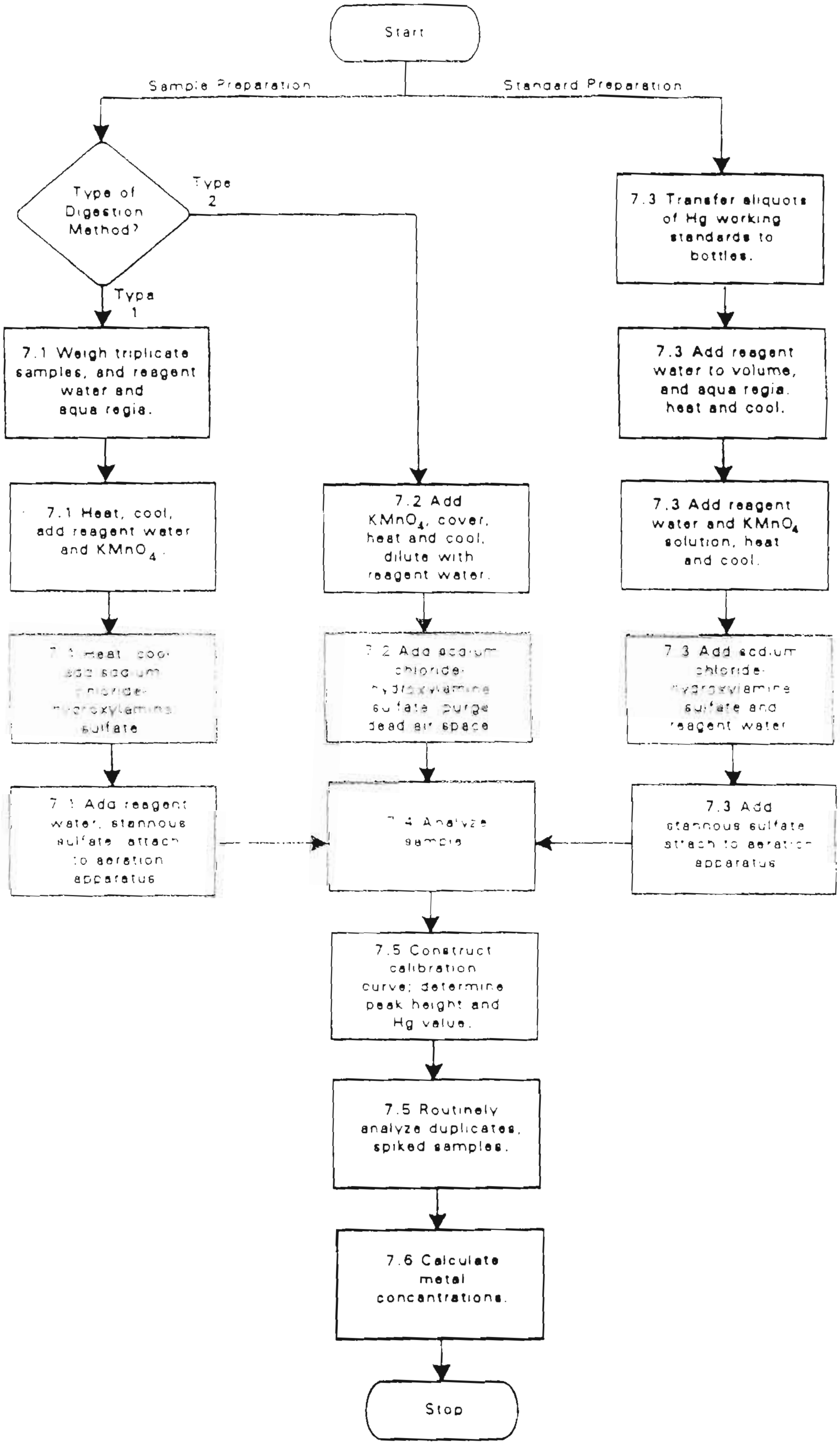
1. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-82-055, December 1982, Method 245.5.

2. Gaskill, A., Compilation and Evaluation of RCRA Method Performance Data, Work Assignment No. 2, EPA Contract No. 68-01-7075, September 1986.

TABLE 1. METHOD PERFORMANCE DATA

Sample Matrix	Preparation Method	Laboratory Replicates
Emission control dust	Not known	12, 12 ug/g
Wastewater treatment sludge	Not known	0.4, 0.28 ug/g

METHOD 7471A
MERCURY IN SOLID OR SEMISOLID WASTE (MANUAL COLD-VAPOR TECHNIQUE)



METHOD 8240B

VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

1.0 SCOPE AND APPLICATION

1.1 Method 8240 is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including ground water, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments. The following compounds can be determined by this method:

		Appropriate Technique	
Analyte	CAS No.[b]	Purge-and-Trap	Direct Injection
Acetone	67-64-1	pp	a
Acetonitrile	75-05-8	pp	a
Acrolein (Propenal)	107-02-8	pp	a
Acrylonitrile	107-13-1	pp	a
Allyl alcohol	107-18-6	pp	a
Allyl chloride	107-05-1	a	a
Benzene	71-43-2	a	a
Benzyl chloride	100-44-7	pp	a
Bromoacetone	598-31-2	pp	a
Bromochloromethane (I.S.)	74-97-5	a	a
Bromodichloromethane	75-27-4	a	a
4-Bromofluorobenzene (surr.)	460-00-4	a	a
Bromoform	75-25-2	a	a
Bromomethane	74-83-9	a	a
2-Butanone (MEK)	78-93-3	pp	a
Carbon disulfide	75-15-0	pp	a
Carbon tetrachloride	56-23-5	a	a
Chloral hydrate	302-17-0	pp	a
Chlorobenzene	108-90-7	a	a
Chlorobenzene-d_5 (I.S.)	3114-55-4	a	a
Chlorodibromomethane	124-48-1	a	a
Chloroethane	75-00-3	a	a
2-Chloroethanol	107-07-3	pp	a
bis-(2-Chloroethyl) sulfide	505-60-2	pp	a
2-Chloroethyl vinyl ether	110-75-8	a	a
Chloroform	67-66-3	a	a
Chloromethane	74-87-3	a	a
Chloroprene	126-99-8	a	pc
3-Chloropropionitrile	542-76-7	ND	pc
1,2-Dibromo-3-chloropropane	96-12-8	pp	a
1,2-Dibromoethane	106-93-4	a	a

		Appropriate Technique	
Analyte	CAS No.	Purge-and-Trap	Direct Injection
Dibromomethane	74-95-3	a	a
1,4-Dichloro-2-butene	764-41-0	pp	a
Dichlorodifluoromethane	75-71-8	a	a
1,1-Dichloroethane	75-34-3	a	a
1,2-Dichloroethane	107-06-2	a	a
1,2-Dichloroethane-d_4(surr.)	107-06-2	a	a
1,1-Dichloroethene	75-35-4	a	a
trans-1,2-Dichloroethene	156-60-5	a	a
1,2-Dichloropropane	78-87-5	a	a
1,3-Dichloro-2-propanol	96-23-1	pp	a
cis-1,3-Dichloropropene	10061-01-5	a	a
trans-1,3-Dichloropropene	10061-02-6	a	a
1,2,3,4-Diepoxybutane	1464-53-5	a	a
1,4-Difluorobenzene (I.S.)	540-36-3	a	a
1,4-Dioxane	123-91-1	pp	a
Epichlorohydrin	106-89-8	i	a
Ethanol	64-17-5	i	a
Ethylbenzene	100-41-4	a	a
Ethylene oxide	75-21-8	pp	a
Ethyl methacrylate	97-63-2	a	a
2-Hexanone	591-78-6	pp	a
2-Hydroxypropionitrile	78-97-7	ND	pc
Iodomethane	74-88-4	a	a
Isobutyl alcohol	78-83-1	pp	a
Malononitrile	109-77-3	pp	a
Methacrylonitrile	126-98-7	pp	a
Methylene chloride	75-09-2	a	a
Methyl iodide	74-88-4	a	a
Methyl methacrylate	80-62-6	a	a
4-Methyl-2-pentanone	108-10-1	pp	a
Pentachloroethane	76-01-7	i	pc
2-Picoline	109-06-8	pp	a
Propargyl alcohol	107-19-7	pp	a
ß-Propiolactone	57-57-8	pp	a
Propionitrile	107-12-0	pp	a
n-Propylamine	107-10-8	a	a
Pyridine	110-86-1	i	a
Styrene	100-42-5	a	a
1,1,1,2-Tetrachloroethane	630-20-6	a	a
1,1,2,2-Tetrachloroethane	79-34-5	a	a
Tetrachloroethene	127-18-4	a	a
Toluene	108-88-3	a	a
Toluene-d_8 (surr.)	2037-26-5	a	a
1,1,1-Trichloroethane	71-55-6	a	a
1,1,2-Trichloroethane	79-00-5	a	a
Trichloroethene	79-01-6	a	a
Trichlorofluoromethane	75-69-4	a	a

		Appropriate Technique	
Analyte	CAS No[b]	Purge-and-Trap	Direct Injection
1,2,3-Trichloropropane	96-18-4	a	a
Vinyl acetate	108-05-4	a	a
Vinyl chloride	75-01-4	a	a
Xylene (Total)	1330-20-7	a	a

a	Adequate response by this technique.
b	Chemical Abstract Services Registry Number.
pp	Poor purging efficiency resulting in high EQLs.
i	Inappropriate technique for this analyte.
pc	Poor chromatographic behavior.
surr	Surrogate
I.S.	Internal Standard
ND	Not determined

1.2 Method 8240 can be used to quantitate most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water soluble compounds can be included in this analytical technique. However, for the more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency. The method is also limited to compounds that elute as sharp peaks from a GC column packed with graphitized carbon lightly coated with a carbowax. Such compounds include low molecular weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides. See Table 1 for a list of compounds, retention times, and their characteristic ions that have been evaluated on a purge-and-trap GC/MS system.

1.3 The estimated quantitation limit (EQL) of Method 8240 for an individual compound is approximately 5 µg/kg (wet weight) for soil/sediment samples, 0.5 mg/kg (wet weight) for wastes, and 5 µg/L for ground water (see Table 2). EQLs will be proportionately higher for sample extracts and samples that require dilution or reduced sample size to avoid saturation of the detector.

1.4 This method is restricted to use by, or under the supervision of, analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers, and skilled in the interpretation of mass spectra and their use as a quantitative tool.

1.5 To increase purging efficiencies of acrylonitrile and acrolein, refer to Methods 5030 and 8030 for proper purge-and-trap conditions.

2.0 SUMMARY OF METHOD

2.1 The volatile compounds are introduced into the gas chromatograph by the purge-and-trap method or by direct injection (in limited applications). The components are separated via the gas chromatograph and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information. The chromatographic conditions, as well as typical mass spectrometer operating parameters, are given.

2.2 If the above sample introduction techniques are not applicable, a portion of the sample is dispersed in methanol to dissolve the volatile organic constituents. A portion of the methanolic solution is combined with organic-free reagent water in a specially designed purging chamber. It is then analyzed by purge-and-trap GC/MS following the normal water method.

2.3 The purge-and-trap process - An inert gas is bubbled through the solution at ambient temperature, and the volatile components are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components, which are detected with a mass spectrometer.

3.0 INTERFERENCES

3.1 Interferences purged or coextracted from the samples will vary considerably from source to source, depending upon the particular sample or extract being tested. The analytical system, however, should be checked to ensure freedom from interferences, under the analysis conditions, by analyzing method blanks.

3.2 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal into the sample during shipment and storage. A trip blank, prepared from organic-free reagent water and carried through the sampling and handling protocol, can serve as a check on such contamination.

3.3 Cross contamination can occur whenever high-concentration and low-concentration samples are analyzed sequentially. Whenever an unusually concentrated sample is analyzed, it should be followed by the analysis of organic-free reagent water to check for cross contamination. The purge-and-trap system may require extensive bake-out and cleaning after a high-concentration sample.

3.4 The laboratory where volatile analysis is performed should be completely free of solvents.

3.5 Impurities in the purge gas and from organic compounds out-gassing from the plumbing ahead of the trap account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running calibration and reagent blanks. The use of non-TFE plastic coating, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

4.0 APPARATUS AND MATERIALS

4.1 Microsyringes - 10 µL, 25 µL, 100 µL, 250 µL, 500 µL, and 1,000 µL. These syringes should be equipped with a 20 gauge (0.006 in. ID) needle having a length sufficient to extend from the sample inlet to within 1 cm of the glass frit in the purging device. The needle length will depend upon the dimensions of the purging device employed.

4.2 Syringe valve - Two-way, with Luer ends (three each), if applicable to the purging device.

4.3 Syringe - 5 mL, gas-tight with shutoff valve.

4.4 Balances - Analytical, 0.0001 g, and top-loading, 0.1 g.

4.5 Glass scintillation vials - 20 mL, with screw caps and Teflon liners or glass culture tubes with a screw cap and Teflon liner.

4.6 Volumetric flasks, Class A - 10 mL and 100 mL, with ground-glass stoppers.

4.7 Vials - 2 mL, for GC autosampler.

4.8 Spatula - Stainless steel.

4.9 Disposable pipets - Pasteur.

4.10 Heater or heated oil bath - Should be capable of maintaining the purging chamber to within 1°C over the temperature range of ambient to 100°C.

4.11 Purge-and-trap device - The purge-and-trap device consists of three separate pieces of equipment: the sample purger, the trap, and the desorber. Several complete devices are commercially available.

4.11.1 The recommended purging chamber is designed to accept 5 mL samples with a water column at least 3 cm deep. The gaseous headspace between the water column and the trap must have a total volume of less than 15 mL. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3 mm at the origin. The purge gas must be introduced no more than 5 mm from the base of the water column. The sample purger, illustrated in Figure 1, meets these design criteria. Alternate sample purge devices may be utilized, provided equivalent performance is demonstrated.

4.11.2 The trap must be at least 25 cm long and have an inside diameter of at least 0.105 in. Starting from the inlet, the trap should contain the following amounts of adsorbents: 1/3 of 2,6-diphenylene oxide polymer, 1/3 of silica gel, and 1/3 of coconut charcoal. It is recommended that 1.0 cm of methyl silicone coated packing be inserted at the inlet to extend the life of the trap (see Figure 2). If it is not necessary to analyze for dichlorodifluoromethane or other fluorocarbons of similar volatility, the charcoal can be eliminated and the polymer increased to fill 2/3 of the trap. If only compounds boiling above 35°C are to be analyzed, both the silica gel and charcoal can be eliminated and the polymer increased to fill the entire trap. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Vent the trap effluent to the room, not to the analytical column. Prior to daily use, the trap should be conditioned for 10 minutes at 180°C with backflushing. The trap may be vented to the analytical column during daily conditioning. However, the column must be run through the temperature program prior to analysis of samples.

4.11.3 The desorber should be capable of rapidly heating the trap to 180°C for desorption. The polymer section of the trap should not be heated higher than 180°C, and the remaining sections should not exceed 220°C during bake out mode. The desorber design illustrated in Figure 2 meets these criteria.

4.11.4 The purge-and-trap device may be assembled as a separate unit or may be coupled to a gas chromatograph, as shown in Figures 3 and 4.

4.11.5 Trap Packing Materials

4.11.5.1 2,6-Diphenylene oxide polymer - 60/80 mesh, chromatographic grade (Tenax GC or equivalent).

4.11.5.2 Methyl silicone packing - OV-1 (3%) on Chromosorb-W, 60/80 mesh or equivalent.

4.11.5.3 Silica gel - 35/60 mesh, Davison, grade 15 or equivalent.

4.11.5.4 Coconut charcoal - Prepare from Barnebey Cheney, CA-580-26, lot #M-2649, by crushing through 26 mesh screen (or equivalent).

4.12 Gas chromatograph/mass spectrometer system

4.12.1 Gas chromatograph - An analytical system complete with a temperature programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases.

4.12.2 Column - 6 ft x 0.1 in. ID glass, packed with 1% SP-1000 on Carbopack-B (60/80 mesh) or equivalent.

4.12.3 Mass spectrometer - Capable of scanning from 35-260 amu every 3 seconds or less, using 70 volts (nominal) electron energy in the electron impact mode and producing a mass spectrum that meets all the criteria in Table 3 when 50 ng of 4-bromofluorobenzene (BFB) are injected through the gas chromatograph inlet.

4.12.4 GC/MS interface - Any GC-to-MS interface that gives acceptable calibration points at 50 ng or less per injection for each of the analytes and achieves all acceptable performance criteria (see

Table 3) may be used. GC-to-MS interfaces constructed entirely of glass or of glass-lined materials are recommended. Glass can be deactivated by silanizing with dichlorodimethylsilane.

4.12.5 Data system - A computer system that allows the continuous acquisition and storage on machine readable media of all mass spectra obtained throughout the duration of the chromatographic program must be interfaced to the mass spectrometer. The computer must have software that allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between specified time or scan number limits. The most recent version of the EPA/NIST Mass Spectral Library should also be available.

5.0 REAGENTS

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 Organic-free reagent water - All references to water in this method refer to organic-free reagent water, as defined in Chapter One.

5.3 Stock solutions - Stock solutions may be prepared from pure standard materials or purchased as certified solutions. Prepare stock standard solutions in methanol, using assayed liquids or gases, as appropriate.

5.3.1 Place about 9.8 mL of methanol in a 10 mL tared ground-glass-stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 minutes or until all alcohol wetted surfaces have dried. Weigh the flask to the nearest 0.0001 g.

5.3.2 Add the assayed reference material, as described below.

5.3.2.1 Liquids - Using a 100 μL syringe, immediately add two or more drops of assayed reference material to the flask; then reweigh. The liquid must fall directly into the alcohol without contacting the neck of the flask.

5.3.2.2 Gases - To prepare standards for any compounds that boil below 30°C (e.g. bromomethane, chloroethane, chloromethane, or vinyl chloride), fill a 5 mL valved gas-tight syringe with the reference standard to the 5.0 mL mark. Lower the needle to 5 mm above the methanol meniscus. Slowly introduce the reference standard above the surface of the liquid. The heavy gas will rapidly dissolve in the methanol. Standards may also be prepared by using a lecture bottle equipped with a Hamilton Lecture

Bottle Septum (#86600). Attach Teflon tubing to the side-arm relief valve and direct a gentle stream of gas into the methanol meniscus.

5.3.3 Reweigh, dilute to volume, stopper, and then mix by inverting the flask several times. Calculate the concentration in milligrams per liter (mg/L) from the net gain in weight. When compound purity is assayed to be 96% or greater, the weight may be used without correction to calculate the concentration of the stock standard. Commercially prepared stock standards may be used at any concentration if they are certified by the manufacturer or by an independent source.

5.3.4 Transfer the stock standard solution into a Teflon sealed screw cap bottle. Store, with minimal headspace, at -10°C to -20°C and protect from light.

5.3.5 Prepare fresh stock standards for gases weekly or sooner if comparison with check standards indicates a problem. Reactive compounds such as 2-chloroethyl vinyl ether and styrene may need to be prepared more frequently. All other standards must be replaced after six months. Both gas and liquid standards must be monitored closely by comparison to the initial calibration curve and by comparison to QC check standards. It may be necessary to replace the standards more frequently if either check exceeds a 20% drift.

5.3.6 Optionally, calibration using a certified gaseous mixture can be accomplished daily utilizing commercially available gaseous analyte mixture of bromomethane, chloromethane, chloroethane, vinyl chloride, dichlorodifluoromethane and trichlorofluoromethane in nitrogen. These mixtures of documented quality are stable for as long as six months without refrigeration. (VOA-CYL III, RESTEK Corporation, Cat. #20194 or equivalent).

5.4 Secondary dilution standards - Using stock standard solutions, prepare in methanol, secondary dilution standards containing the compounds of interest, either singly or mixed together. Secondary dilution standards must be stored with minimal headspace and should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them.

5.5 Surrogate standards - The surrogates recommended are toluene-d_8, 4-bromofluorobenzene, and 1,2-dichloroethane-d_4. Other compounds may be used as surrogates, depending upon the analysis requirements. A stock surrogate solution in methanol should be prepared as described in Sec. 5.3, and a surrogate standard spiking solution should be prepared from the stock at a concentration of 250 μg/10 mL in methanol. Each water sample undergoing GC/MS analysis must be spiked with 10 μL of the surrogate spiking solution prior to analysis.

5.6 Internal standards - The recommended internal standards are bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5. Other compounds may be used as internal standards as long as they have retention times similar to the compounds being detected by GC/MS. Prepare internal standard stock and secondary dilution standards in methanol using the procedures described in Secs. 5.3 and 5.4. It is recommended that the secondary dilution standard should be prepared at a concentration of 25 mg/L of each internal standard compound. Addition of 10 µL of this standard to 5.0 mL of sample or calibration standard would be the equivalent of 50 µg/L.

5.7 4-Bromofluorobenzene (BFB) standard - A standard solution containing 25 ng/µL of BFB in methanol should be prepared.

5.8 Calibration standards - Calibration standards at a minimum of five concentrations should be prepared from the secondary dilution of stock standards (see Secs. 5.3 and 5.4). Prepare these solutions in organic-free reagent water. One of the concentrations should be at a concentration near, but above, the method detection limit. The remaining concentrations should correspond to the expected range of concentrations found in real samples but should not exceed the working range of the GC/MS system. Each standard should contain each analyte for detection by this method. It is EPA's intent that all target analytes for a particular analysis be included in the calibration standard(s). However, these target analytes may not include the entire List of Analytes (Sec. 1.1) for which the method has been demonstrated. However, the laboratory shall not report a quantitative result for a target analyte that was not included in the calibration standard(s). Calibration standards must be prepared daily.

5.9 Matrix spiking standards - Matrix spiking standards should be prepared from volatile organic compounds which will be representative of the compounds being investigated. The suggested compounds are 1,1-dichloroethene, trichloroethene, chlorobenzene, toluene, and benzene. The standard should be prepared in methanol, with each compound present at a concentration of 250 µg/10.0 mL.

5.10 Great care must be taken to maintain the integrity of all standard solutions. It is recommended that all standards in methanol be stored at -10°C to -20°C in screw cap amber bottles with Teflon liners.

5.11 Methanol, CH_3OH. Pesticide quality or equivalent. Store apart from other solvents.

5.12 Reagent Tetraglyme - Reagent tetraglyme is defined as tetraglyme in which interference is not observed at the method detection limit of compounds of interest.

5.12.1 Tetraglyme (tetraethylene glycol dimethyl ether, Aldrich #17, 240-5 or equivalent), $C_8H_{18}O_5$. Purify by treatment at reduced pressure in a rotary evaporator. The tetraglyme should have a peroxide content of less than 5 ppm as indicated by EM Quant Test Strips (available from Scientific Products Co., Catalog No. P1126-8 or equivalent).

CAUTION: Glycol ethers are suspected carcinogens. All solvent handling should be done in a hood while using proper protective equipment to minimize exposure to liquid and vapor.

Peroxides may be removed by passing the tetraglyme through a column of activated alumina. The tetraglyme is placed in a round bottom flask equipped with a standard taper joint, and the flask is affixed to a rotary evaporator. The flask is immersed in a water bath at 90-100°C and a vacuum is maintained at < 10 mm Hg for at least two hours using a two stage mechanical pump. The vacuum system is equipped with an all glass trap, which is maintained in a dry ice/methanol bath. Cool the tetraglyme to ambient temperature and add 100 mg/L of 2,6-di-tert-butyl-4-methyl-phenol to prevent peroxide formation. Store the tetraglyme in a tightly sealed screw cap bottle in an area that is not contaminated by solvent vapors.

5.12.2 In order to demonstrate that all interfering volatiles have been removed from the tetraglyme, an organic-free reagent water/tetraglyme blank must be analyzed.

5.13 Polyethylene glycol, $H(OCH_2CH_2)_nOH$. Free of interferences at the detection limit of the analytes.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 See the introductory material to this chapter, Organic Analytes, Sec. 4.1.

7.0 PROCEDURE

Samples may be introduced into the GC by either direct injection or purge-and-trap procedures. Whichever procedure is used, the instrument calibration and sample introduction must be performed by the same procedure.

Regardless of which sample introduction procedure is employed, establish GC/MS operating conditions using the following recommendations as guidance.

Recommended GC/MS operating conditions:

Electron energy:	70 volts (nominal).
Mass range:	35-260 amu.
Scan time:	To give 5 scans/peak, but not to exceed 1 sec/scan.
Initial column temperature:	45°C.
Initial column holding time:	3 minutes.
Column temperature program:	8°C/minute.
Final column temperature:	220°C.
Final column holding time:	15 minutes.
Injector temperature:	200-225°C.
Source temperature:	According to manufacturer's specifications.
Transfer line temperature:	250-300°C.
Carrier gas:	Hydrogen at 50 cm/sec or helium at 30 cm/sec.

7.1 Direct injection - In very limited applications (e.g. aqueous process wastes), direct injection of the sample into the GC/MS system with a 10 μL syringe may be appropriate. One such application is for verification of the alcohol content of an aqueous sample prior to determining if the sample is ignitable (Methods 1010 or 1020). In this case, it is suggested that direct injection be used. The detection limit is very high (approximately 10,000 µg/L); therefore, it is only permitted when concentrations in excess of 10,000 µg/L are expected or for water soluble compounds that do not purge. The system must be calibrated by direct injection using the procedures described in Sec. 7.2., but bypassing the purge-and-trap device.

7.2 Initial calibration for purge-and-trap procedure

7.2.1 Establish the GC/MS operating conditions, using the recommendations in Sec. 7.0 as guidance.

7.2.2 Each GC/MS system must be hardware tuned to meet the criteria in Table 3 for a 50 ng injection or purging of 4-bromofluorobenzene (2 µL injection of the BFB standard). Analyses must not begin until these criteria are met.

7.2.3 Assemble a purge-and-trap device that meets the specification in Sec. 4.11. Condition the trap overnight at 180°C in the purge mode with an inert gas flow of at least 20 mL/min. Prior to use, condition the trap daily for 10 min while backflushing at 180°C with the column at 220°C.

7.2.4 Connect the purge-and-trap device to a gas chromatograph.

7.2.5 Prepare the final solutions containing the required concentrations of calibration standards, including surrogate standards, directly in the purging device (use freshly prepared stock solutions when preparing the calibration standards for the initial calibration.) Add 5.0 mL of organic-free reagent water to the purging device. The organic-free reagent water is added to the purging device using a 5 mL glass syringe fitted with a 15 cm, 20 gauge needle. The needle is inserted through the sample inlet shown in Figure 1. The internal diameter of the 14 gauge needle that forms the sample inlet will permit insertion of the 20 gauge needle. Next, using a 10 µL or 25 µL microsyringe equipped with a long needle (Sec. 4.1), take a volume of the secondary dilution solution containing appropriate concentrations of the calibration standards (Sec. 5.6). Add the aliquot of calibration solution directly to the organic-free reagent water in the purging device by inserting the needle through the sample inlet. When discharging the contents of the microsyringe, be sure that the end of the syringe needle is well beneath the surface of the organic-free reagent water. Similarly, add 10 µL of the internal standard solution (Sec. 5.4). Close the 2 way syringe valve at the sample inlet.

7.2.6 Carry out the purge-and-trap analysis procedure as described in Sec. 7.4.1.

7.2.7 Tabulate the area response of the characteristic ions (see Table 1) against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation of the RF for a compound should be the internal standard that has a retention time closest to the compound being measured (Sec. 7.5.2). The RF is calculated as follows:

$$RF = (A_x C_{is})/(A_{is} C_x)$$

where:

A_x = Area of the characteristic ion for the compound being measured.
A_{is} = Area of the characteristic ion for the specific internal standard.
C_{is} = Concentration of the specific internal standard.
C_x = Concentration of the compound being measured.

7.2.8 The average RF must be calculated for each compound using the 5 RF values calculated for each compound from the initial (5-point) calibration curve. A system performance check should be made before this calibration curve is used. Five compounds (the System Performance Check Compounds, or SPCCs) are checked for a minimum average relative response factor. These compounds are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The minimum acceptable average RF for these compounds should be 0.300 (>0.10 for bromoform). These compounds typically have RFs of 0.4-0.6 and are used to check compound instability and to check for degradation caused by contaminated lines or active sites in the system. Examples of these occurrences are:

7.2.8.1 Chloromethane - This compound is the most likely compound to be lost if the purge flow is too fast.

7.2.8.2 Bromoform - This compound is one of the compounds most likely to be purged very poorly if the purge flow is too slow. Cold spots and/or active sites in the transfer lines may adversely affect response. Response of the quantitation ion (m/z 173) is directly affected by the tuning of BFB at ions m/z 174/176. Increasing the m/z 174/176 relative to m/z 95 ratio may improve bromoform response.

7.2.8.3 Tetrachloroethane and 1,1-dichloroethane - These compounds are degraded by contaminated transfer lines in purge-and-trap systems and/or active sites in trapping materials.

7.2.9 Using the RFs from the initial calibration, calculate and record the percent relative standard deviation (%RSD) for all compounds. The percent RSD is calculated as follows:

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

where:

$\underline{RSD}$ = relative standard deviation.
$\overline{RF}$ = mean of 5 initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - \overline{RF})^2}{N - 1}}$$

where

RF_i = RF for each of the 5 calibration levels
N = Number of RF values (i.e., 5)

The percent relative standard deviation should be less than 15% for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) must be less than 30%. Late-eluting compounds usually have much better agreement. The CCCs are:

1,1-Dichloroethene,
Chloroform,
1,2-Dichloropropane,
Toluene,
Ethylbenzene, and
Vinyl chloride.

7.2.9.1 If a %RSD greater than 30 percent is measured for any CCC, then corrective action to eliminate a system leak and/or column reactive sites is required before reattempting calibration.

7.2.10 Linearity - If the %RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation (Sec. 7.5.2.2).

7.2.10.1 If the %RSD of any compound is greater than 15%, construct calibration curves of area ratio (A/A_{is}) versus concentration using first or higher order regression fit of the five calibration points. The analyst should select the regression order which introduces the least calibration error into the quantitation (Sec. 7.5.2.4). The use of calibration curves is a recommended alternative to average response factor calibration, and a useful diagnostic of standard preparation accuracy and absorption activity in the chromatographic system.

7.2.11 These curves are verified each shift by purging a performance standard. Recalibration is required only if calibration and on-going performance criteria cannot be met.

7.3 Daily GC/MS calibration

7.3.1 Prior to the analysis of samples, inject or purge 50 ng of the 4-bromofluorobenzene standard. The resultant mass spectra for the BFB must meet all of the criteria given in Table 3 before sample analysis begins. These criteria must be demonstrated each 12 hour shift.

7.3.2 The initial calibration curve (Sec. 7.2) for each compound of interest must be checked and verified once every 12 hours of analysis time. This is accomplished by analyzing a calibration standard that is at a concentration near the midpoint concentration for the working range of the GC/MS and checking the SPCC (Sec. 7.3.3) and CCC (Sec. 7.3.4).

7.3.3 System Performance Check Compounds (SPCCs): A system performance check must be made each 12 hours. If the SPCC criteria are met, a comparison of relative response factors is made for all compounds. This is the same check that is applied during the initial calibration. If the minimum relative response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. The minimum relative response factor for volatile SPCCs is 0.300 (>0.10 for Bromoform). Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system.

7.3.4 Calibration Check Compounds (CCCs): After the system performance check is met, CCCs listed in Sec. 7.2.9 are used to check the validity of the initial calibration.

Calculate the percent drift using the following equation:

$$\% \text{ Drift} = \frac{C_I - C_C}{C_I} \times 100$$

where.

C_I = Calibration Check Compound standard concentration.
C_C = Measured concentration using selected quantitation method.

If the percent difference for each CCC is less than 20%, the initial calibration is assumed to be valid. If the criterion is not met (> 20% drift), for any one CCC, corrective action must be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five point calibration MUST be generated. This criterion MUST be met before quantitative sample analysis begins. If the CCCs are not required analytes by the permit, then all required analytes must meet the 20% drift criterion.

7.3.5 The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from the last calibration check (12 hours), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (- 50% to + 100%) from the last daily calibration check standard, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is necessary.

7.4 GC/MS analysis

7.4.1 Water samples

7.4.1.1 Screening of the sample prior to purge-and-trap analysis will provide guidance on whether sample dilution is necessary and will prevent contamination of the purge-and-trap system. Two screening techniques that can be used are: the headspace sampler (Method 3810) using a gas chromatograph (GC) equipped with a photo ionization detector (PID) in series with an electrolytic conductivity detector (HECD); and extraction of the sample with hexadecane and analysis of the extract on a GC with a FID and/or an ECD (Method 3820).

7.4.1.2 All samples and standard solutions must be allowed to warm to ambient temperature before analysis.

7.4.1.3 Set up the GC/MS system as outlined in Sec. 7.2.1.

7.4.1.4 BFB tuning criteria and daily GC/MS calibration criteria must be met (Sec. 7.3) before analyzing samples.

7.4.1.5 Adjust the purge gas (helium) flow rate to 25-40 mL/min on the purge-and-trap device. Optimize the flow rate to provide the best response for chloromethane and bromoform, if these compounds are analytes. Excessive flow rate reduces chloromethane response, whereas insufficient flow reduces bromoform response (see Sec. 7.2.8).

7.4.1.6 Remove the plunger from a 5 mL syringe and attach a closed syringe valve. Open the sample or standard bottle, which has been allowed to come to ambient temperature, and carefully pour the sample into the syringe barrel to just short of overflowing. Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 mL. This process of taking an aliquot destroys the validity of the liquid sample for future analysis; therefore, if there is only one VOA vial, the analyst should fill a second syringe at this time to protect against possible loss of sample integrity. This second sample is maintained only until such time when the analyst has determined that the first sample has been analyzed properly. Filling one 20 mL syringe would allow the use of only one syringe. If a second analysis is needed from a syringe, it must be analyzed within 24 hours. Care must be taken to prevent air from leaking into the syringe.

7.4.1.7 The following procedure is appropriate for diluting purgeable samples. All steps must be performed without delays until the diluted sample is in a gas tight syringe.

7.4.1.7.1 Dilutions may be made in volumetric flasks (10 to 100 mL). Select the volumetric flask that will allow for the necessary dilution. Intermediate dilutions may be necessary for extremely large dilutions.

7.4.1.7.2 Calculate the approximate volume of organic free reagent water to be added to the volumetric flask selected and add slightly less than this quantity of organic-free reagent water to the flask.

7.4.1.7.3 Inject the proper aliquot of samples from the syringe prepared in Sec. 7.4.1.6 into the flask. Aliquots of less than 1 mL are not recommended. Dilute the sample to the mark with organic-free reagent water. Cap the flask, invert, and shake three times. Repeat above procedure for additional dilutions.

7.4.1.7.4 Fill a 5 mL syringe with the diluted sample as in Sec. 7.4.1.6.

7.4.1.8 Add 10.0 µL of surrogate spiking solution (Sec. 5.5) and 10 µL of internal standard spiking solution (Sec. 5.6) through the valve bore of the syringe; then close the valve. The surrogate and internal standards may be mixed and added as a single spiking solution. The addition of 10 µL of the surrogate spiking solution to 5 mL of sample is equivalent to a concentration of 50 µg/L of each surrogate standard.

7.4.1.9 Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valves and inject the sample into the purging chamber.

7.4.1.10 Close both valves and purge the sample for 11.0 ± 0.1 minutes at ambient temperature.

7.4.1.11 At the conclusion of the purge time, attach the trap to the chromatograph, adjust the device to the desorb mode, and begin the gas chromatographic temperature program and GC/MS data acquisition. Concurrently, introduce the trapped materials to the gas chromatographic column by rapidly heating the trap to 180°C while backflushing the trap with inert gas between 20 and 60 mL/min for 4 minutes. If this rapid heating requirement cannot be met, the gas chromatographic column must be used as a secondary trap by cooling it to 30°C (or subambient, if problems persist) instead of the recommended initial program temperature of 45°C.

7.4.1.12 While the trap is being desorbed into the gas chromatograph, empty the purging chamber. Wash the chamber with a minimum of two 5 mL flushes of organic-free reagent water (or methanol followed by organic-free reagent water) to avoid carryover of pollutant compounds into subsequent analyses.

7.4.1.13 After desorbing the sample for 4 minutes, recondition the trap by returning the purge-and-trap device to the purge mode. Wait 15 seconds; then close the syringe valve on the purging device to begin gas flow through the trap. The trap temperature should be maintained at 180°C. Trap temperatures up to 220°C may be employed; however, the higher temperature will shorten the useful life of the trap. After approximately 7 minutes, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When cool, the trap is ready for the next sample.

7.4.1.14 If the initial analysis of a sample or a dilution of the sample has a concentration of analytes that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion. When a sample is analyzed that has saturated ions from a compound, this analysis must be followed by a blank organic-free reagent water analysis. If the blank analysis is not free of interferences, the system must be decontaminated. Sample analysis may not resume until a blank can be analyzed that is free of interferences.

7.4.1.15 For matrix spike analysis, add 10 μL of the matrix spike solution (Sec. 5.9) to the 5 mL of sample to be purged. Disregarding any dilutions, this is equivalent to a concentration of 50 μg/L of each matrix spike standard.

7.4.1.16 All dilutions should keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve. Proceed to Secs. 7.5.1 and 7.5.2 for qualitative and quantitative analysis.

7.4.2 Water miscible liquids

7.4.2.1 Water miscible liquids are analyzed as water samples after first diluting them at least 50 fold with organic-free reagent water.

7.4.2.2 Initial and serial dilutions can be prepared by pipetting 2 mL of the sample to a 100 mL volumetric flask and diluting to volume with organic-free reagent water. Transfer immediately to a 5 mL gas tight syringe.

7.4.2.3 Alternatively, prepare dilutions directly in a 5 mL syringe filled with organic-free reagent water by adding at least 20 μL, but not more than 100 μL of liquid sample. The sample is ready for addition of internal and surrogate standards.

7.4.3 Sediment/soil and waste samples - It is highly recommended that all samples of this type be screened prior to the purge-and-trap GC/MS analysis. The headspace method (Method 3810) or the hexadecane extraction and screening method (Method 3820) may be used for this purpose. These samples may contain percent quantities of purgeable organics that will contaminate the purge-and-trap system, and require extensive cleanup and instrument downtime. Use the screening data to determine whether to use the low-concentration method (0.005-1 mg/kg) or the high-concentration method (> 1 mg/kg).

7.4.3.1 Low-concentration method - This is designed for samples containing individual purgeable compounds of < 1 mg/kg. It is limited to sediment/soil samples and waste that is of a similar consistency (granular and porous). The low-concentration method is based on purging a heated sediment/soil sample mixed with organic-free reagent water containing the surrogate and internal standards. Analyze all reagent blanks and standards under the same conditions as the samples. See Figure 5 for an illustration of a low soils impinger.

7.4.3.1.1 Use a 5 g sample if the expected concentration is < 0.1 mg/kg or a 1 g sample for expected concentrations between 0.1 and 1 mg/kg.

7.4.3.1.2 The GC/MS system should be set up as in Secs. 7.4.1.2-7.4.1.4. This should be done prior to the preparation of the sample to avoid loss of volatiles from standards and samples. A heated purge calibration curve must be prepared and used for the quantitation of all samples analyzed with the low-concentration method. Follow the initial and daily calibration instructions, except for the addition of a 40°C purge temperature.

7.4.3.1.3 Remove the plunger from a 5 mL Luerlock type syringe equipped with a syringe valve and fill until overflowing with organic-free reagent water. Replace the plunger and compress the water to vent trapped air. Adjust the volume to 5.0 mL. Add 10 μL each of surrogate spiking solution (Sec. 5.5) and internal standard solution (Sec. 5.6) to the syringe through the valve. (Surrogate spiking solution and internal standard solution may be mixed together.) The addition of 10 μL of the surrogate spiking solution to 5 g of sediment/soil is equivalent to 50 μg/kg of each surrogate standard.

7.4.3.1.4 The sample (for volatile organics) consists of the entire contents of the sample container. Do not discard any supernatant liquids. Mix the contents of the sample container with a narrow metal spatula. Weigh the amount determined in Sec. 7.4.3.1.1 into a tared purge device. Note and record the actual weight to the nearest 0.1 g.

7.4.3.1.5 Determine the percent dry weight of the soil/sediment sample. This includes waste samples that are amenable to percent dry weight determination. Other wastes should be reported on a wet-weight basis.

7.4.3.1.5.1 Immediately after weighing the sample for extraction, weigh 5-10 g of the sample into a tared crucible. Determine the % dry weight of the sample by drying overnight at 105°C. Allow to cool in a desiccator before re-weighing. Concentrations of individual analytes are reported relative to the dry weight of sample.

<u>WARNING</u>: The drying oven should be contained in a hood or vented. Significant laboratory contamination may result from a heavily contaminated hazardous waste sample.

$$\% \text{ dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$

7.4.3.1.6 Add the spiked water to the purge device, which contains the weighed amount of sample, and connect the device to the purge-and-trap system.

<u>NOTE</u>: Prior to the attachment of the purge device, the procedures in Secs. 7.4.3.1.4 and 7.4.3.1.6 must be performed rapidly and without interruption to avoid loss of volatile organics. These steps must be performed in a laboratory free of solvent fumes.

7.4.3.1.7 Heat the sample to 40°C ± 1°C and purge the sample for 11.0 ± 0.1 minute.

7.4.3.1.8 Proceed with the analysis as outlined in Secs. 7.4.1.11-7.4.1.16. Use 5 mL of the same organic-free reagent water as in the reagent blank. If saturated peaks occurred or would occur if a 1 g sample were analyzed, the high-concentration method must be followed.

7.4.3.1.9 For low-concentration sediment/soils add 10 µL of the matrix spike solution (Sec. 5.9) to the 5 mL of organic-free reagent water (Sec. 7.4.3.1.3). The concentration for a 5 g sample would be equivalent to 50 µg/kg of each matrix spike standard.

7.4.3.2 High-concentration method - The method is based on extracting the sediment/soil with methanol. A waste sample is either extracted or diluted, depending on its solubility in methanol. Wastes (i.e. petroleum and coke wastes) that are insoluble in methanol are diluted with reagent tetraglyme or possibly polyethylene glycol (PEG). An aliquot of the extract is added to organic-free reagent water containing internal standards. This is purged at ambient temperature. All samples with an expected concentration of > 1.0 mg/kg should be analyzed by this method.

7.4.3.2.1 The sample (for volatile organics) consists of the entire contents of the sample container. Do not discard any supernatant liquids. Mix the contents of the sample container with a narrow metal spatula. For sediment/soil and solid wastes that are insoluble in methanol, weigh 4 g (wet weight) of sample into a tared 20 mL vial. Use a top loading balance. Note and record the actual weight to 0.1 gram and determine the percent dry weight of the sample using the procedure in Sec. 7.4.3.1.5. For waste that is soluble in methanol, tetraglyme, or PEG, weigh 1 g (wet weight) into a tared scintillation vial or culture tube or a 10 mL volumetric flask. (If a vial or tube is used, it must be calibrated prior to use. Pipet 10.0 mL of solvent into the vial and mark the bottom of the meniscus. Discard this solvent.)

7.4.3.2.2 Quickly add 9.0 mL of appropriate solvent; then add 1.0 mL of the surrogate spiking solution to the vial. Cap and shake for 2 minutes.

NOTE: Secs. 7.4.3.2.1 and 7.4.3.2.2 must be performed rapidly and without interruption to avoid loss of volatile organics. These steps must be performed in a laboratory free from solvent fumes.

7.4.3.2.3 Pipet approximately 1 mL of the extract to a GC vial for storage, using a disposable pipet. The remainder may be disposed of. Transfer approximately 1 mL of appropriate solvent to a separate GC vial for use as the method blank for each set of samples. These extracts may be stored at 4°C in the dark, prior to analysis. The addition of a 100 µL aliquot of each of these extracts in Sec. 7.4.3.2.6 will give a concentration equivalent to 6,200 µg/kg of each surrogate standard.

7.4.3.2.4 The GC/MS system should be set up as in Secs. 7.4.1.2-7.4.1.4. This should be done prior to the addition of the solvent extract to organic-free reagent water.

7.4.3.2.5 Table 4 can be used to determine the volume of solvent extract to add to the 5 mL of organic-free reagent water for analysis. If a screening procedure was followed (Method 3810 or 3820), use the estimated concentration to determine the appropriate volume. Otherwise, estimate the concentration range of the sample from the low-concentration analysis to determine the appropriate volume. If the sample was submitted as a high-concentration sample, start with 100 µL. All dilutions must keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve.

7.4.3.2.6 Remove the plunger from a 5.0 mL Luerlock type syringe equipped with a syringe valve and fill until overflowing with organic-free reagent water. Replace the plunger and compress the water to vent trapped air. Adjust the volume to 4.9 mL. Pull the plunger back to 5.0 mL to allow volume for the addition of the sample extract and of standards. Add 10 µL of internal standard solution. Also add the volume of solvent extract determined in Sec. 7.4.3.2.5 and a volume of extraction or dissolution solvent to total 100 µL (excluding methanol in standards).

7.4.3.2.7 Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valve and inject the organic-free reagent water/methanol sample into the purging chamber.

7.4.3.2.8 Proceed with the analysis as outlined in Sec. 7.4.1.11-7.4.1.16. Analyze all reagent blanks on the same instrument as that use for the samples. The standards and blanks should also contain 100 µL of solvent to simulate the sample conditions.

7.4.3.2.9 For a matrix spike in the high-concentration sediment/soil samples, add 8.0 mL of methanol, 1.0 mL of surrogate spike solution (Sec. 5.5), and 1.0 mL of matrix spike solution (Sec. 5.9) as in Sec. 7.4.3.2.2. This results in a 6,200 µg/kg concentration of each matrix spike standard when added to a 4 g sample. Add a 100 µL aliquot of this extract to 5 mL of organic-free reagent water for purging (as per Sec. 7.4.3.2.6).

7.5 Data interpretation

7.5.1 Qualitative analysis

7.5.1.1 The qualitative identification of compounds determined by this method is based on retention time, and on comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met.

7.5.1.1.1 The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

7.5.1.1.2 The RRT of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

7.5.1.1.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.)

7.5.1.1.4 Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

7.5.1.1.5 Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes coelute (i.e., only one chromatographic peak is apparent), the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

7.5.1.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the type of analyses being conducted. Guidelines for making tentative identification are:

(1) Relative intensities of major ions in the reference spectrum (ions > 10% of the most abundant ion) should be present in the sample spectrum.

(2) The relative intensities of the major ions should agree within ± 20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

(3) Molecular ions present in the reference spectrum should be present in the sample spectrum.

(4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

(5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

Computer generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification.

7.5.2 Quantitative analysis

7.5.2.1 When a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantitation will take place using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte (e.g. see Table 5).

7.5.2.2 When linearity exists, as per Sec. 7.2.10, calculate the concentration of each identified analyte in the sample as follows:

Water

$$\text{concentration } (\mu g/L) = \frac{(A_x)(I_s)}{(A_{is})(\overline{RF})(V_o)}$$

where:

A_x = Area of characteristic ion for compound being measured.

I_s = Amount of internal standard injected (ng).

A_{is} = Area of characteristic ion for the internal standard.

$\overline{RF}$ = Mean relative response factor for compound being measured (Sec. 7.2.8).

V_o = Volume of water purged (mL), taking into consideration any dilutions made.

Sediment/Soil Sludge (on a dry-weight basis) and Waste (normally on a wet-weight basis)

$$\text{concentration } (\mu g/kg) = \frac{(A_x)(I_s)(V_t)}{(A_{is})(RF)(V_i)(W_s)(D)}$$

where:

A_x, I_s, A_{is}, $\overline{RF}$, = Same as for water.
V_t = Volume of total extract (μL) (use 10,000 μL or a factor of this when dilutions are made).

V_i = Volume of extract added (μL) for purging.
W_s = Weight of sample extracted or purged (g).
D = % dry weight of sample/100, or 1 for a wet-weight basis.

7.5.2.3 Where applicable, an estimate of concentration for noncalibrated components in the sample should be made. The formulae given above should be used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms, and the RF for the compound should be assumed to be 1. The concentration obtained should be reported indicating (1) that the value is an estimate and (2) which internal standard was used to determine concentration. Use the nearest internal standard free of interferences.

7.5.2.4 Alternatively, the regression line fitted to the initial calibration (Sec. 7.2.10.1) may be used for determination of analyte concentration.

8.0 QUALITY CONTROL

8.1 Each laboratory that uses these methods is required to operate a formal quality control program. The minimum requirements of this program consist of an initial demonstration of laboratory capability and an ongoing analysis of spiked samples to evaluate and document data quality. The laboratory must maintain records to document the quality of the data generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a quality control reference sample must be analyzed to confirm that the measurements were performed in an in-control mode of operation.

8.2 Before processing any samples, the analyst should demonstrate, through the analysis of a method blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of sample preparation and measurement.

8.3 The experience of the analyst performing GC/MS analyses is invaluable to the success of the methods. Each day that analysis is performed, the daily calibration standard should be evaluated to determine if the chromatographic system is operating properly. Questions that should be asked are: Do the peaks look normal?; Is the response obtained comparable to the response from previous calibrations? Careful examination of the standard chromatogram can indicate whether the column is still useable, the injector is leaking, the injector septum needs replacing, etc. If any changes are made to the system (e.g. column changed), recalibration of the system must take place.

8.4 Required instrument QC is found in the following section:

8.4.1 The GC/MS system must be tuned to meet the BFB specifications in Sec. 7.2.2.

8.4.2 There must be an initial calibration of the GC/MS system as specified in Sec. 7.2.

8.4.3 The GC/MS system must meet the SPCC criteria specified in Step 7.3.3 and the CCC criteria in Sec. 7.3.4, each 12 hours.

8.5 To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations.

8.5.1 A quality control (QC) reference sample concentrate is required containing each analyte at a concentration of 10 mg/L in methanol. The QC reference sample concentrate may be prepared from pure standard materials or purchased as certified solutions. If prepared by the laboratory, the QC reference sample concentrate must be made using stock standards prepared independently from those used for calibration.

8.5.2 Prepare a QC reference sample to contain 20 μg/L of each analyte by adding 200 μL of QC reference sample concentrate to 100 mL of water.

8.5.3 Four 5-mL aliquots of the well mixed QC reference sample are analyzed according to the method beginning in Sec. 7.4.1.

8.5.4 Calculate the average recovery ($\bar{x}$) in μg/L, and the standard deviation of the recovery (s) in μg/L, for each analyte using the four results.

8.5.5 For each analyte compare s and $\bar{x}$ with the corresponding acceptance criteria for precision and accuracy, respectively, found in Table 6. If s and $\bar{x}$ for all analytes meet the acceptance criteria, the system performance is acceptable and analysis of actual samples can begin. If any individual s exceeds the precision limit or any individual $\bar{x}$ falls outside the range for accuracy, then the system performance is unacceptable for that analyte.

<u>NOTE</u>: The large number of analytes in Table 6 present a substantial probability that one or more will fail at least one of the

acceptance criteria when all analytes of a given method are determined.

8.5.6 When one or more of the analytes tested fail at least one of the acceptance criteria, the analyst must proceed according to Sec 8.5.6.1 or 8.5.6.2

8.5.6.1 Locate and correct the source of the problem and repeat the test for all analytes beginning with Sec. 8.5.2.

8.5.6.2 Beginning with Sec. 8.5.2, repeat the test only for those analytes that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with Sec. 8.5.2.

8.6 The laboratory must, on an ongoing basis, analyze a method blank and a spiked replicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy. For soil and waste samples where detectable amounts of organics are present, replicate samples may be appropriate in place of spiked replicates. For laboratories analyzing one to ten samples per month, at least one spiked sample per month is required.

8.6.1 The concentration of the spike in the sample should be determined as follows:

8.6.1.1 If, as in compliance monitoring, the concentration of a specific analyte in the sample is being checked against a regulatory concentration limit, the spike should be at that limit or 1 to 5 times higher than the background concentration determined in Sec. 8.6.2, whichever concentration would be larger.

8.6.1.2 If the concentration of a specific analyte in a water sample is not being checked against a specific limit, the spike should be at 20 μg/L or 1 to 5 times higher than the background concentration determined in Sec. 8.6.2, whichever concentration would be larger. For other matrices, recommended spiking concentration is 10 times the EQL.

8.6.2 Analyze one 5-mL sample aliquot to determine the background concentration (B) of each analyte. If necessary, prepare a new QC reference sample concentrate (Sec. 8.5.1) appropriate for the background concentration in the sample. Spike a second 5-mL sample aliquot with 10 μL of the QC reference sample concentrate and analyze it to determine the concentration after spiking (A) of each analyte. Calculate each percent recovery (p) as 100(A-B)%/T, where T is the known true value of the spike.

8.6.3 Compare the percent recovery (p) for each analyte in a water sample with the corresponding QC acceptance criteria found in Table 6. These acceptance criteria were calculated to include an allowance for error in measurement of both the background and spike concentrations, assuming a spike to background ratio of 5:1. This error will be accounted for to the extent that the analyst's spike to background ratio approaches 5:1. If spiking was performed at a concentration lower than 20 µg/L, the analyst must use either the QC acceptance criteria presented in Table 6, or optional QC acceptance criteria calculated for the specific spike concentration. To calculate optional acceptance criteria for the recovery of an analyte: (1) Calculate accuracy (x') using the equation found in Table 7, substituting the spike concentration (T) for C; (2) calculate overall precision (S') using the equation in Table 7, substituting x' for $\bar{x}$; (3) calculate the range for recovery at the spike concentration as $(100x'/T) \pm 2.44(100S'/T)\%$.

8.6.4 If any individual p falls outside the designated range for recovery, that analyte has failed the acceptance criteria. A check standard containing each analyte that failed the criteria must be analyzed as described in Sec. 8.7.

8.7 If any analyte in a water sample fails the acceptance criteria for recovery in Sec. 8.6, a QC reference sample containing each analyte that failed must be prepared and analyzed.

NOTE: The frequency for the required analysis of a QC reference sample will depend upon the number of analytes being simultaneously tested, the complexity of the sample matrix, and the performance of the laboratory. If the entire list of analytes in Table 6 must be measured in the sample in Sec. 8.6, the probability that the analysis of a QC reference sample will be required is high. In this case, the QC reference sample should be routinely analyzed with the spiked sample.

8.7.1 Prepare the QC reference sample by adding 10 µL of the QC reference sample concentrate (Sec. 8.5.1 or 8.6.2) to 5 mL of reagent water. The QC reference sample needs only to contain the analytes that failed criteria in the test in Sec. 8.6.

8.7.2 Analyze the QC reference sample to determine the concentration measured (A) of each analyte. Calculate each percent recovery (p_s) as $100(A/T)\%$, where T is the true value of the standard concentration.

8.7.3 Compare the percent recovery (p_s) for each analyte with the corresponding QC acceptance criteria found in Table 6. Only analytes that failed the test in Sec. 8.6 need to be compared with these criteria. If the recovery of any such analyte falls outside the designated range, the laboratory performance for that analyte is judged to be out of control, and the problem must be immediately identified and corrected. The result for that analyte in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.

8.8 As part of the QC program for the laboratory, method accuracy for each matrix studied must be assessed and records must be maintained. After the analysis of five spiked samples (of the same matrix) as in Sec. 8.6, calculate the average percent recovery (p) and the standard deviation of the percent recovery (s_p). Express the accuracy assessment as a percent recovery interval from $\bar{p} - 2s_p$ to $\bar{p} + 2s_p$. If $\bar{p} = 90\%$ and $s_p = 10\%$, for example, the accuracy interval is expressed as 70-110%. Update the accuracy assessment for each analyte on a regular basis (e.g., after each five to ten new accuracy measurements).

8.9 To determine acceptable accuracy and precision limits for surrogate standards the following procedure should be performed.

8.9.1 For each sample analyzed, calculate the percent recovery of each surrogate in the sample.

8.9.2 Once a minimum of thirty samples of the same matrix have been analyzed, calculate the average percent recovery (P) and standard deviation of the percent recovery (s) for each of the surrogates.

8.9.3 For a given matrix, calculate the upper and lower control limit for method performance for each surrogate standard. This should be done as follows:

Upper Control Limit (UCL) = P + 3s
Lower Control Limit (LCL) = P - 3s

8.9.4 For aqueous and soil matrices, these laboratory established surrogate control limits should, if applicable, be compared with the control limits listed in Table 8. The limits given in Table 8 are multi-laboratory performance based limits for soil and aqueous samples, and therefore, the single-laboratory limits established in Sec. 8.9.3 must fall within those given in Table 8 for these matrices.

8.9.5 If recovery is not within limits, the following procedures are required.

- Check to be sure there are no errors in calculations, surrogate solutions and internal standards. Also, check instrument performance.
- Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.
- Reextract and reanalyze the sample if none of the above are a problem or flag the data as "estimated concentration".

8.9.6 At a minimum, each laboratory should update surrogate recovery limits on a matrix-by-matrix basis, annually.

8.10 It is recommended that the laboratory adopt additional quality assurance practices for use with this method. The specific practices that are most productive depend upon the needs of the laboratory and the nature of the samples. Field duplicates may be analyzed to assess the precision of the environmental measurements. When doubt exists over the identification of a peak on the chromatogram, confirmatory techniques such as gas chromatography with a dissimilar column or a different ionization mode using a mass spectrometer must be used. Whenever possible, the laboratory should analyze standard reference materials and participate in relevant performance evaluation studies.

9.0 METHOD PERFORMANCE

9.1 This method was tested by 15 laboratories using organic-free reagent water, drinking water, surface water, and industrial wastewaters spiked at six concentrations over the range 5-600 µg/L. Single operator precision, overall precision, and method accuracy were found to be directly related to the concentration of the analyte and essentially independent of the sample matrix. Linear equations to describe these relationships are presented in Table 7.

10.0 REFERENCES

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2. U.S. EPA Contract Laboratory Program, Statement of Work for Organic Analysis, July 1985, Revision.

3. Bellar, T.A., and J.J. Lichtenberg, J. Amer. Water Works Assoc., 66(12), 739-744, 1974.

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5. Budde, W.L. and J.W. Eichelberger, "Performance Tests for the Evaluation of Computerized Gas Chromatography/Mass Spectrometry Equipment and Laboratories," EPA-600/4-79-020, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268, April 1980.

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7. "Method Detection Limit for Methods 624 and 625," Olynyk, P., W.L. Budde, and J.W. Eichelberger, Unpublished report, October 1980.

8. "Interlaboratory Method Study for EPA Method 624-Purgeables," Final Report for EPA Contract 68-03-3102.

9. "Method Performance Data for Method 624," Memorandum from R. Slater and T. Pressley, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268, January 17, 1984.

10. Gebhart, J.E.; Lucas, S.V.; Naber, S.J.; Berry, A.M.; Danison, T.H.; Burkholder, H.M. "Validation of SW-846 Methods 8010, 8015, and 8020"; U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268, July 1987, Contract No. 68-03-1760.

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TABLE 1.
RETENTION TIMES AND CHARACTERISTIC IONS FOR VOLATILE COMPOUNDS

Compound	Retention Time (minutes)	Primary Ion	Secondary Ion(s)
Ethylene oxide	1.30	44	44, 43, 42
Chloromethane	2.30	50	52, 49
Dichlorodifluoromethane	2.47	85	85, 87, 101, 103
Bromomethane	3.10	94	96, 79
Vinyl chloride	3.80	62	64, 61
Acetonitrile	3.97	41	41, 40, 39
Chloroethane	4.60	64	66, 49
Methyl iodide	5.37	142	142, 127, 141
Methylene chloride	6.40	84	49, 51, 86
Carbon disulfide	7.47	76	76, 78, 44
Trichlorofluoromethane	8.30	101	103, 66
Propionitrile	8.53	54	54, 52, 55, 40
Allyl chloride	8.83	76	76, 41, 39, 78
1,1-Dichloroethene	9.00	96	61, 98
Bromochloromethane (I.S.)	9.30	128	49, 130, 51
Allyl alcohol	9.77	57	57, 58, 39
trans-1,2-Dichloroethene	10.00	96	61, 98
1,2-Dichloroethane	10.10	62	64, 98
Propargyl alcohol	10.77	55	55, 39, 38, 53
Chloroform	11.40	83	85, 47
1,2-Dichloroethane-d_4 (surr)	12.10	65	102
2-Butanone	12.20	72	43, 72
Methacrylonitrile	12.37	41	41, 67, 39, 52, 66
Dibromomethane	12.53	93	93, 174, 95, 172, 176
2-Chloroethanol	12.93	49	49, 44, 43, 51, 80
b-Propiolactone	13.00	42	42, 43, 44
Epichlorohydrin	13.10	57	57, 49, 62, 51
1,1,1-Trichloroethane	13.40	97	99, 117
Carbon tetrachloride	13.70	117	119, 121
1,4-Dioxane	13.70	88	88, 58, 43, 57
Isobutyl alcohol	13.80	43	43, 41, 42, 74
Bromodichloromethane	14.30	83	85, 129
Chloroprene	14.77	53	53, 88, 90, 51
1,2:3,4-Diepoxybutane	14.87	55	55, 57, 56
1,2-Dichloropropane	15.70	63	62, 41
Chloral hydrate (b)	15.77	82	44, 84, 86, 111
cis-1,3-Dichloropropene	15.90	75	77, 39
Bromoacetone	16.33	136	43, 136, 138, 93, 95
Trichloroethene	16.50	130	95, 97, 132
Benzene	17.00	78	52, 71
trans-1,3-Dichloropropene	17.20	75	77, 39
1,1,2-Trichloroethane	17.20	97	83, 85, 99
3-Chloropropionitrile	17.37	54	54, 49, 89, 91
1,2-Dibromoethane	18.40	107	107, 109, 93, 188
Pyridine	18.57	79	79, 52, 51, 50

TABLE 1.
(Continued)

Compound	Retention Time (minutes)	Primary Ion	Secondary Ion(s)
2-Chloroethyl vinyl ether	18.60	63	65,106
2-Hydroxypropionitrile	18.97	44	44,43,42,53
1,4-Difluorobenzene (I.S.)	19.60	114	63,88
Malononitrile	19.60	66	66,39,65,38
Methyl methacrylate	19.77	69	69,41,100,39
Bromoform	19.80	173	171,175,252
1,1,1,2-Tetrachloroethane	20.33	131	131,133,117,119,95
1,3-Dichloro-2-propanol	21.83	79	79,43,81,49
1,1,2,2-Tetrachloroethane	22.10	83	85,131,133
Tetrachloroethene	22.20	164	129,131,166
1,2,3-Trichloropropane	22.20	75	75,77,110,112,97
1,4-Dichloro-2-butene	22.73	75	75,53,77,124,89
n-Propylamine	23.00	59	59,41,39
2-Picoline	23.20	93	93,66,92,78
Toluene	23.50	92	91,65
Ethyl methacrylate	23.53	69	69,41,99,86,114
Chlorobenzene	24.60	112	114,77
Pentachloroethane[a]	24.83	167	167,130,132,165,169
Ethylbenzene	26.40	106	91
1,2-Dibromo-3-chloropropane	27.23	157	157,75,155,77
4-Bromofluorobenzene (surr.)	28.30	95	174,176
Benzyl chloride	29.50	91	91,126,65,128
Styrene	30.83	104	104,103,78,51,77
bis-(2-Chloroethyl) sulfide(b)	33.53	109	111, 158, 160
Acetone	--	43	58
Acrolein	--	56	55,58
Acrylonitrile	--	53	52,51
Chlorobenzene-d_5 (I.S.)	--	117	82,119
Chlorodibromomethane	--	129	208,206
1,1-Dichloroethane	--	63	65,83
Ethanol	--	31	45,27,46
2-Hexanone	--	43	58,57, 100
Iodomethane	--	142	127,141
4-Methyl-2-pentanone	--	43	58,57,100
Toluene-d_8 (surr.)	--	98	70,100
Vinyl acetate	--	43	86
Xylene (Total)	--	106	91

a The base peak at m/e 117 was not used due to an interference at that mass with a nearly coeluting internal standard, chlorobenzene-d_5.

b Response factor judged to be too low (less than 0.02) for practical use.

(I.S.) = Internal Standard

(surr) = Surrogate

TABLE 2.
ESTIMATED QUANTITATION LIMITS (EQL) FOR VOLATILE ORGANICS

	Estimated Quantitation Limits[a]	
Volatiles	Ground water µg/L	Low Soil/Sediment[b] µg/kg
Acetone	100	100
Acetonitrile	100	100
Allyl chloride	5	5
Benzene	5	5
Benzyl chloride	100	100
Bromodichloromethane	5	5
Bromoform	5	5
Bromomethane	10	10
2-Butanone	100	100
Carbon disulfide	100	100
Carbon tetrachloride	5	5
Chlorobenzene	5	5
Chlorodibromomethane	5	5
Chloroethane	10	10
2-Chloroethyl vinyl ether	10	10
Chloroform	5	5
Chloromethane	10	10
Chloroprene	5	5
1,2-Dibromo-3-chloropropane	100	100
1,2-Dibromoethane	5	5
Dibromomethane	5	5
1,4-Dichloro-2-butene	100	100
Dichlorodifluoromethane	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethane	5	5
1,1 Dichloroethene	5	5
trans-1,2-Dichloroethene	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
trans-1,3-Dichloropropene	5	5
Ethylbenzene	5	5
Ethyl methacrylate	5	5
2-Hexanone	50	50
Isobutyl alcohol	100	100
Methacrylonitrile	100	100
Methylene chloride	5	5
Methyl iodide	5	5
Methyl methacrylate	5	50
4-Methyl-2-pentanone	50	50
Pentachloroethane	10	10

TABLE 2.
(Continued)

	Estimated Quantitation Limits[a]	
Volatiles	Ground water µg/L	Low Soil/Sediment[b] µg/kg
Propionitrile	100	100
Styrene	5	5
1,1,1,2-Tetrachloroethane	5	5
1,1,2,2-Tetrachloroethane	5	5
Tetrachloroethene	5	5
Toluene	5	5
1,1,1-Trichloroethane	5	5
1,1,2-Trichloroethane	5	5
Trichloroethene	5	5
1,2,3-Trichloropropane	5	5
Vinyl acetate	50	50
Vinyl chloride	10	10
Xylene (Total)	5	5

a Sample EQLs are highly matrix dependent. The EQLs listed herein are provided for guidance and may not always be achievable.

b EQLs listed for soil/sediment are based on wet weight. Normally data are reported on a dry weight basis; therefore, EQLs will be higher, based on the percent dry weight of each sample.

Other Matrices	Factor[c]
Water miscible liquid waste	50
High-concentration soil and sludge	125
Non-water miscible waste	500

[c]EQL = [EQL for low soil/sediment (see Table 2)] X [Factor found in this table]. For non-aqueous samples, the factor is on a wet weight basis.

TABLE 3.
BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

TABLE 4.
QUANTITY OF METHANOL EXTRACT REQUIRED FOR ANALYSIS OF HIGH-CONCENTRATION SOILS/SEDIMENTS

Approximate Concentration Range	Volume of Methanol Extract[a]
500- 10,000 µg/kg	100 µL
1,000- 20,000 µg/kg	50 µL
5,000-100,000 µg/kg	10 µL
25,000-500,000 µg/kg	100 µL of 1/50 dilution[b]

Calculate appropriate dilution factor for concentrations exceeding this table.

[a] The volume of methanol added to 5 mL of water being purged should be kept constant. Therefore, add to the 5 mL syringe whatever volume of methanol is necessary to maintain a volume of 100 µL added to the syringe.

[b] Dilute and aliquot of the methanol extract and then take 100 µL for analysis.

TABLE 5.
VOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

Bromochloromethane

Acetone
Acrolein
Acrylonitrile
Bromomethane
Carbon disulfide
Chloroethane
Chloroform
Chloromethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,2-Dichloroethane-d_4 (surrogate)
1,1-Dichloroethene
trans-1,2-Dichloroethene
Iodomethane
Methylene chloride
Trichlorofluoromethane
Vinyl chloride

1,4-Difluorobenzene

Benzene
Bromodichloromethane
Bromoform
2-Butanone
Carbon tetrachloride
Chlorodibromomethane
2-Chloroethyl vinyl ether
Dibromomethane
1,4-Dichloro-2-butene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Vinyl acetate

Chlorobenzene-d_5

Bromofluorobenzene (surrogate)
Chlorobenzene
Ethylbenzene
Ethyl methacrylate
2-Hexanone
4-Methyl-2-pentanone
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
Toluene-d_8 (surrogate)
1,2,3-Trichloropropane
Xylene

TABLE 6.
CALIBRATION AND QC ACCEPTANCE CRITERIA[a]

Parameter	Range for Q (μg/L)	Limit for s (μg/L)	Range for $\bar{x}$ (μg/L)	Range p, p_s (%)
Benzene	12.8-27.2	6.9	15.2-26.0	37-151
Bromodichloromethane	13.1-26.9	6.4	10.1-28.0	35-155
Bromoform	14.2-25.8	5.4	11.4-31.1	45-169
Bromomethane	2.8-37.2	17.9	D-41.2	D-242
Carbon tetrachloride	14.6-25.4	5.2	17.2-23.5	70-140
Chlorobenzene	13.2-26.8	6.3	16.4-27.4	37-160
2-Chloroethyl vinyl ether	D-44.8	25.9	D-50.4	D-305
Chloroform	13.5-26.5	6.1	13.7-24.2	51-138
Chloromethane	D-40.8	19.8	D-45.9	D-273
Dibromochloromethane	13.5-26.5	6.1	13.8-26.6	53-149
1,2-Dichlorobenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,3-Dichlorobenzene	14.6-25.4	5.5	17.0-28.8	59-156
1,4-Dichlorobenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,1-Dichloroethane	14.5-25.5	5.1	14.2-28.4	59-155
1,2-Dichloroethane	13.6-26.4	6.0	14.3-27.4	49-155
1,1-Dichloroethene	10.1-29.9	9.1	3.7-42.3	D-234
trans-1,2-Dichloroethene	13.9-26.1	5.7	13.6-28.4	54-156
1,2-Dichloropropane	6.8-33.2	13.8	3.8-36.2	D-210
cis-1,3-Dichloropropene	4.8-35.2	15.8	1.0-39.0	D-227
trans-1,3-Dichloropropene	10.0-30.0	10.4	7.6-32.4	17-183
Ethyl benzene	11.8-28.2	7.5	17.4-26.7	37-162
Methylene chloride	12.1-27.9	7.4	D-41.0	D-221
1,1,2,2-Tetrachloroethane	12.1-27.9	7.4	13.5-27.2	46-157
Tetrachloroethene	14.7-25.3	5.0	17.0-26.6	64-148
Toluene	14.9-25.1	4.8	16.6-26.7	47-150
1,1,1-Trichloroethane	15.0-25.0	4.6	13.7-30.1	52-162
1,1,2-Trichloroethane	14.2-25.8	5.5	14.3-27.1	52-150
Trichloroethene	13.3-26.7	6.6	18.5-27.6	71-157
Trichlorofluoromethane	9.6-30.4	10.0	8.9-31.5	17-181
Vinyl chloride	0.8-39.2	20.0	D-43.5	D-251

Q = Concentration measured in QC check sample, in μg/L.
s = Standard deviation of four recovery measurements, in μg/L.
$\bar{x}$ = Average recovery for four recovery measurements, in μg/L.
p, p_s = Percent recovery measured.
D = Detected; result must be greater than zero.

[a] Criteria from 40 CFR Part 136 for Method 624 and were calculated assuming a QC check sample concentration of 20 μg/L. These criteria are based directly upon the method performance data in Table 7. Where necessary, the limits for recovery have been broadened to assure applicability of the limits to concentrations below those used to develop Table 7.

TABLE 7.
METHOD ACCURACY AND PRECISION AS FUNCTIONS OF CONCENTRATION[a]

Parameter	Accuracy, as recovery, x′ (µg/L)	Single analyst precision, s_r' (µg/L)	Overall precision, S′ (µg/L)
Benzene	0.93C+2.00	0.26$\bar{x}$-1.74	0.25$\bar{x}$-1.33
Bromodichloromethane	1.03C-1.58	0.15$\bar{x}$+0.59	0.20$\bar{x}$+1.13
Bromoform	1.18C-2.35	0.12$\bar{x}$+0.34	0.17$\bar{x}$+1.38
Bromomethane	1.00C	0.43$\bar{x}$	0.58$\bar{x}$
Carbon tetrachloride	1.10C-1.68	0.12$\bar{x}$+0.25	0.11$\bar{x}$+0.37
Chlorobenzene	0.98C+2.28	0.16$\bar{x}$-0.09	0.26$\bar{x}$-1.92
Chloroethane	1.18C+0.81	0.14$\bar{x}$+2.78	0.29$\bar{x}$+1.75
2-Chloroethylvinyl ether[a]	1.00C	0.62$\bar{x}$	0.84$\bar{x}$
Chloroform	0.93C+0.33	0.16$\bar{x}$+0.22	0.18$\bar{x}$+0.16
Chloromethane	1.03C-1.81	0.37$\bar{x}$+2.14	0.58$\bar{x}$+0.43
Dibromochloromethane	1.01C-0.03	0.17$\bar{x}$-0.18	0.17$\bar{x}$+0.49
1,2-Dichlorobenzene[b]	0.94C+4.47	0.22$\bar{x}$-1.45	0.30$\bar{x}$-1.20
1,3-Dichlorobenzene	1.06C+1.68	0.14$\bar{x}$-0.48	0.18$\bar{x}$-0.82
1,4-Dichlorobenzene[b]	0.94C+4.47	0.22$\bar{x}$-1.45	0.30$\bar{x}$-1.20
1,1-Dichloroethane	1.05C+0.36	0.13$\bar{x}$-0.05	0.16$\bar{x}$+0.47
1,2-Dichloroethane	1.02C+0.45	0.17$\bar{x}$-0.32	0.21$\bar{x}$-0.38
1,1-Dichloroethene	1.12C+0.61	0.17$\bar{x}$+1.06	0.43$\bar{x}$-0.22
trans-1,2,-Dichloroethene	1.05C+0.03	0.14$\bar{x}$+0.09	0.19$\bar{x}$+0.17
1,2-Dichloropropane[a]	1.00C	0.33$\bar{x}$	0.45$\bar{x}$
cis-1,3-Dichloropropene[a]	1.00C	0.38$\bar{x}$	0.52$\bar{x}$
trans-1,3-Dichloropropene[a]	1.00C	0.25$\bar{x}$	0.34$\bar{x}$
Ethyl benzene	0.98C+2.48	0.14$\bar{x}$+1.00	0.26$\bar{x}$-1.72
Methylene chloride	0.87C+1.88	0.15$\bar{x}$+1.07	0.32$\bar{x}$+4.00
1,1,2,2-Tetrachloroethane	0.93C+1.76	0.16$\bar{x}$+0.69	0.20$\bar{x}$+0.41
Tetrachloroethene	1.06C+0.60	0.13$\bar{x}$-0.18	0.16$\bar{x}$-0.45
Toluene	0.98C+2.03	0.15$\bar{x}$-0.71	0.22$\bar{x}$-1.71
1,1,1-Trichloroethane	1.06C+0.73	0.12$\bar{x}$-0.15	0.21$\bar{x}$-0.39
1,1,2-Trichloroethane	0.95C+1.71	0.14$\bar{x}$+0.02	0.18$\bar{x}$+0.00
Trichloroethene	1.04C+2.27	0.13$\bar{x}$+0.36	0.12$\bar{x}$+0.59
Trichlorofluoromethane	0.99C+0.39	0.33$\bar{x}$-1.48	0.34$\bar{x}$-0.39
Vinyl chloride	1.00C	0.48$\bar{x}$	0.65$\bar{x}$

x′ = Expected recovery for one or more measurements of a sample containing a concentration of C, in µg/L.

s_r' = Expected single analyst standard deviation of measurements at an average concentration of $\bar{x}$, in µg/L.

S′ = Expected interlaboratory standard deviation of measurements at an average concentration found of $\bar{x}$, in µg/L.

C = True value for the concentration, in µg/L.

$\bar{x}$ = Average recovery found for measurements of samples containing a concentration of C, in µg/L.

a Estimates based upon the performance in a single laboratory.

b Due to chromatographic resolution problems, performance statements for these isomers are based upon the sums of their concentrations.

TABLE 8.
SURROGATE SPIKE RECOVERY LIMITS FOR WATER AND SOIL/SEDIMENT SAMPLES

Surrogate Compound	Low/High Water	Low/High Soil/Sediment
4-Bromofluorobenzene	86-115	74-121
1,2-Dichloroethane-d_4	76-114	70-121
Toluene-d_8	88-110	81-117

FIGURE 1.
PURGING CHAMBER

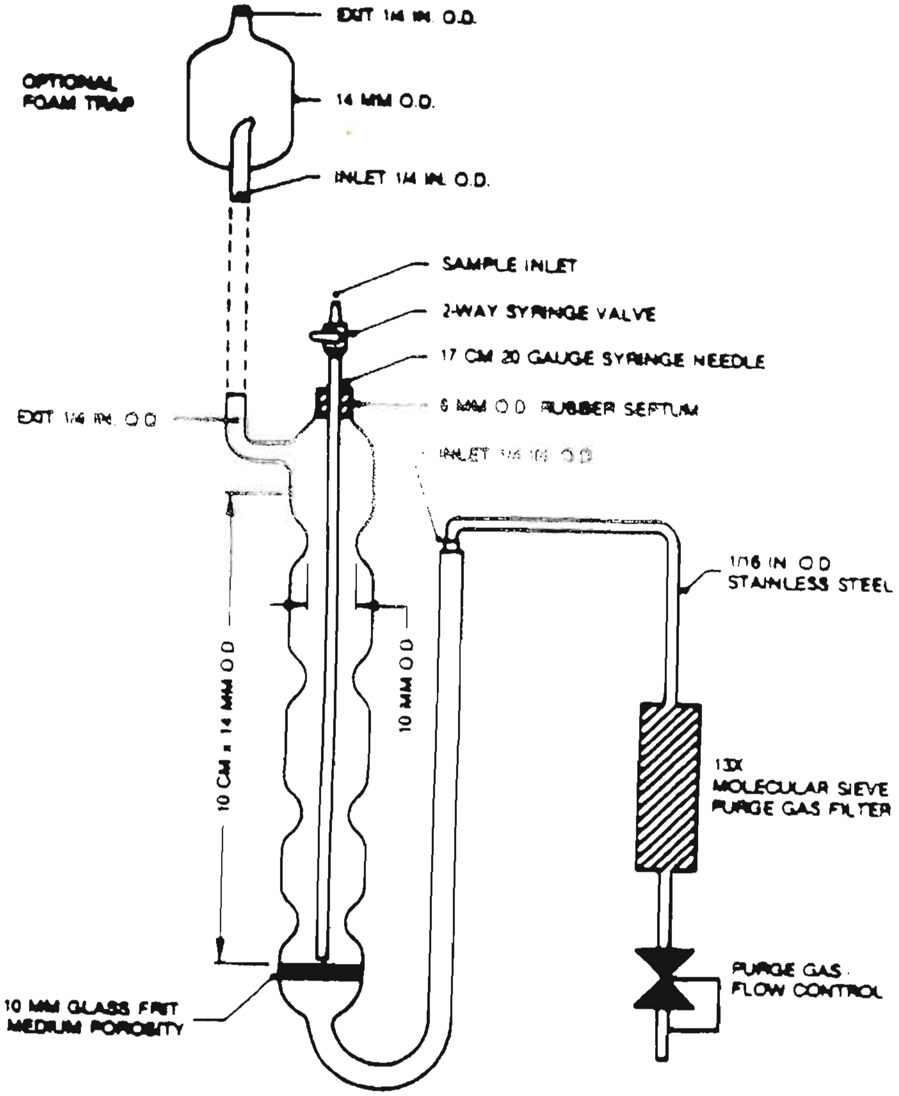


FIGURE 2.
TRAP PACKINGS AND CONSTRUCTION TO INCLUDE DESORB CAPABILITY FOR METHOD 8240B

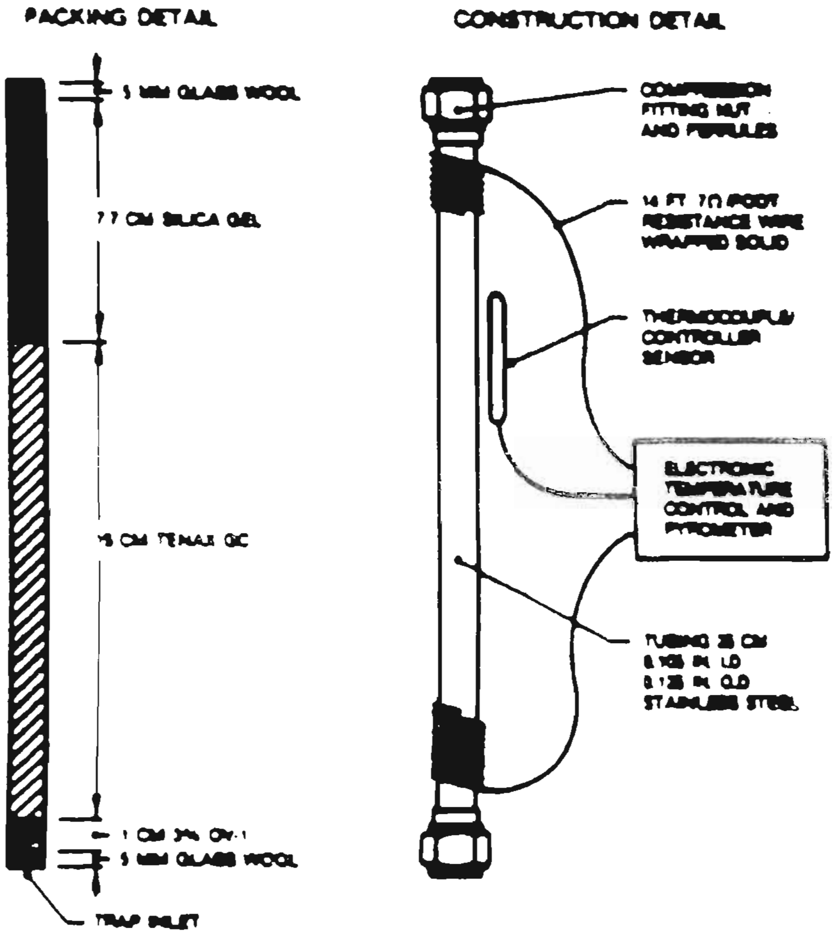


FIGURE 3.
SCHEMATIC OF PURGE-AND-TRAP DEVICE - PURGE MODE FOR METHOD 8240B

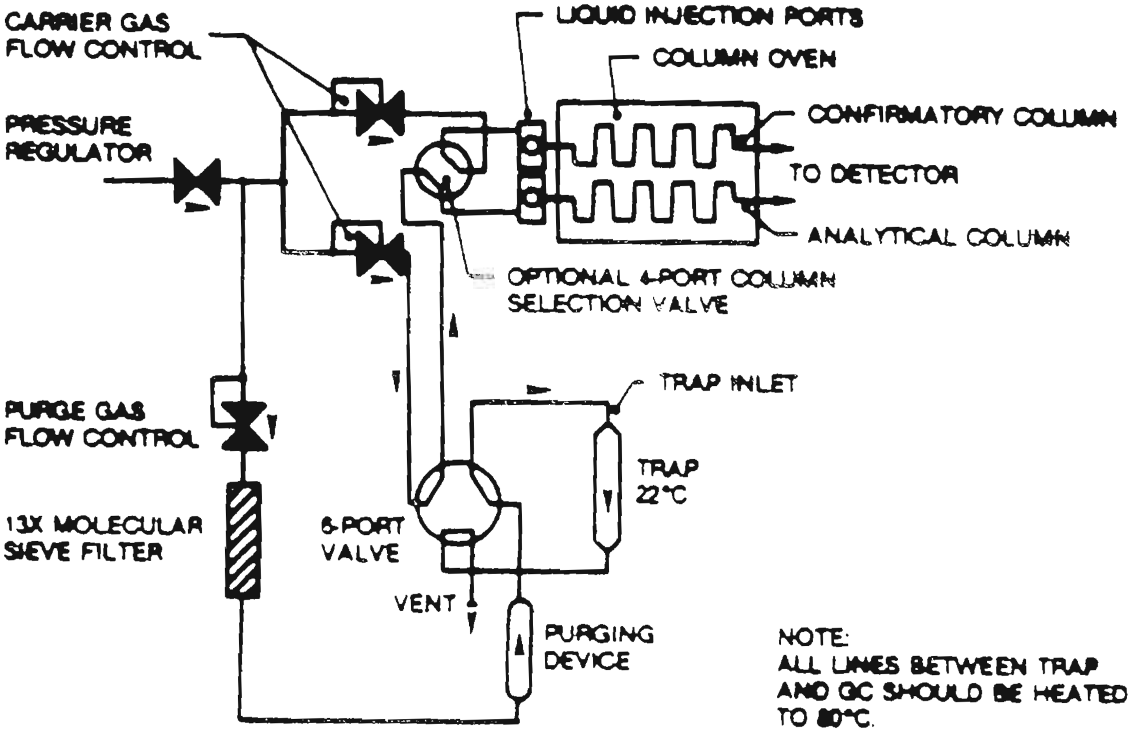


FIGURE 4.
SCHEMATIC OF PURGE-AND-TRAP DEVICE - DESORB MODE FOR METHOD 8240B

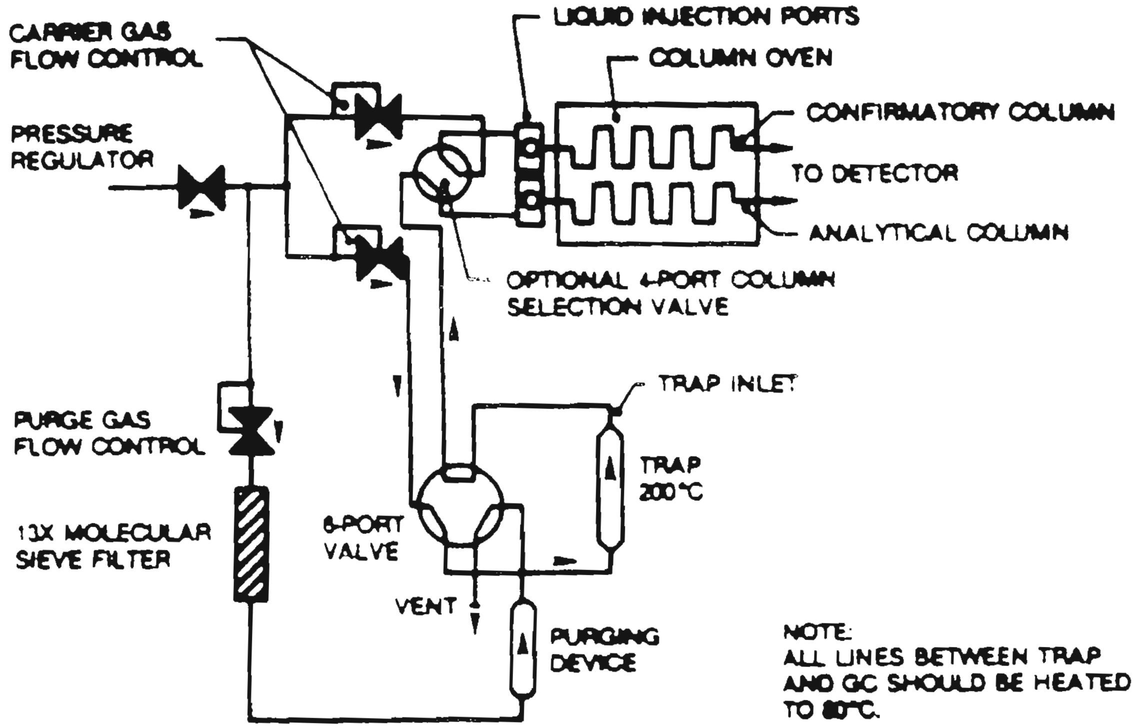
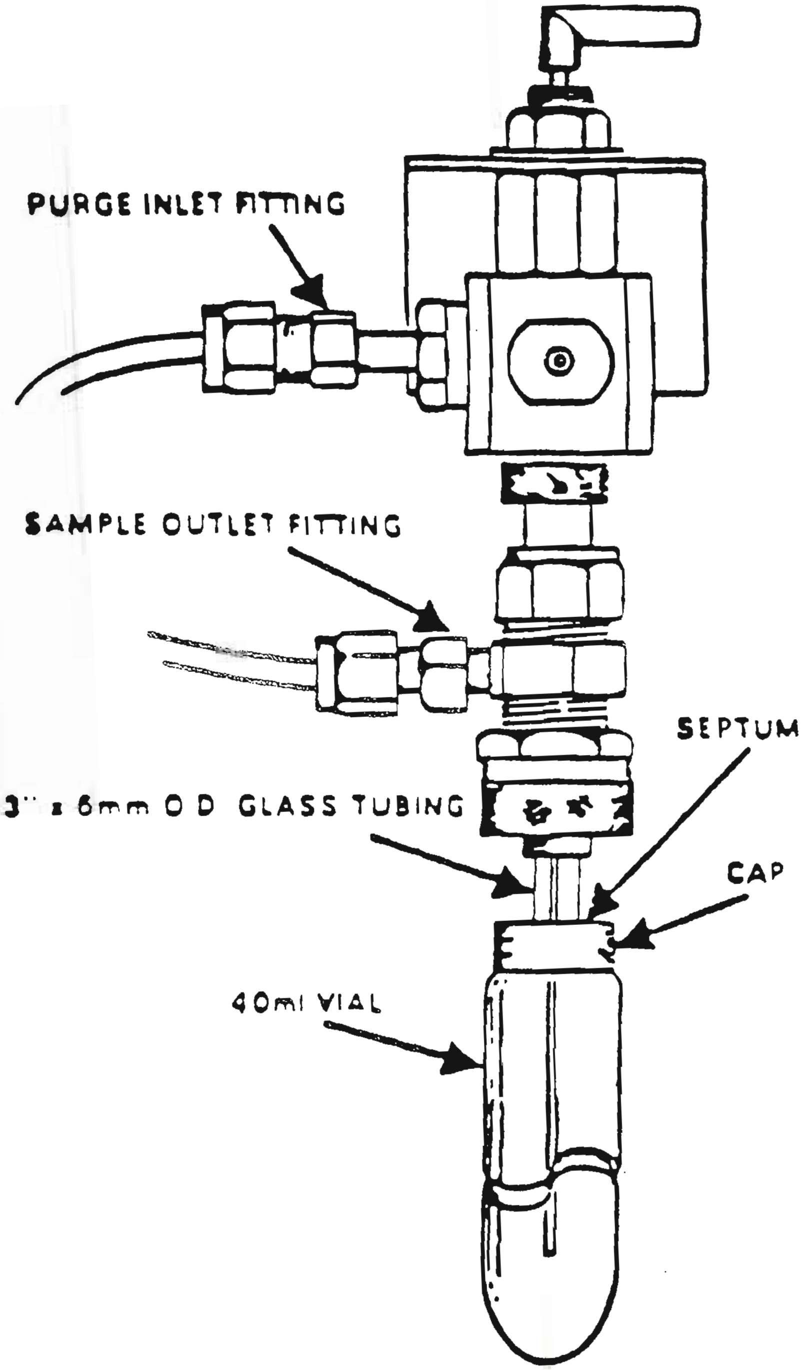
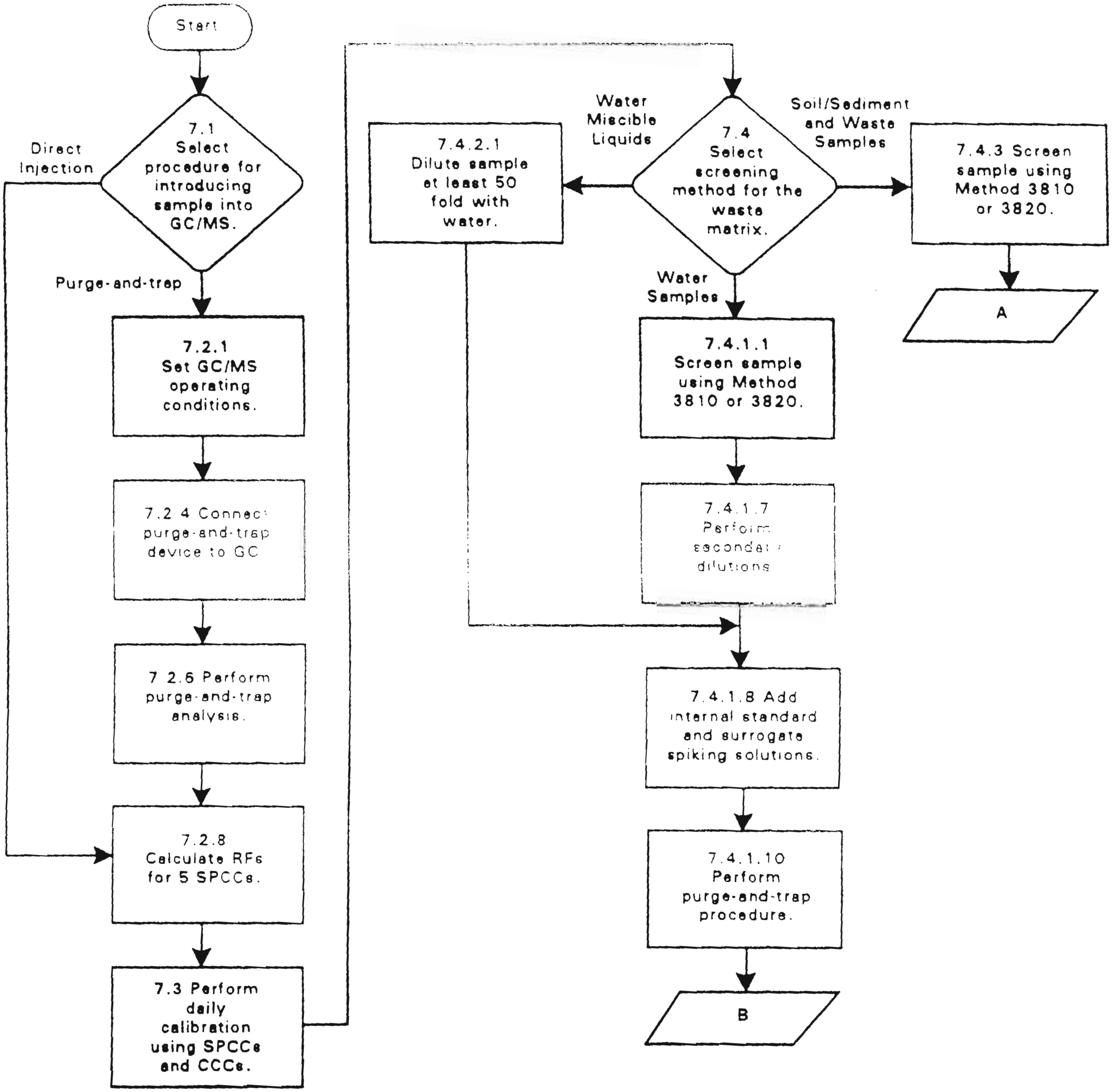
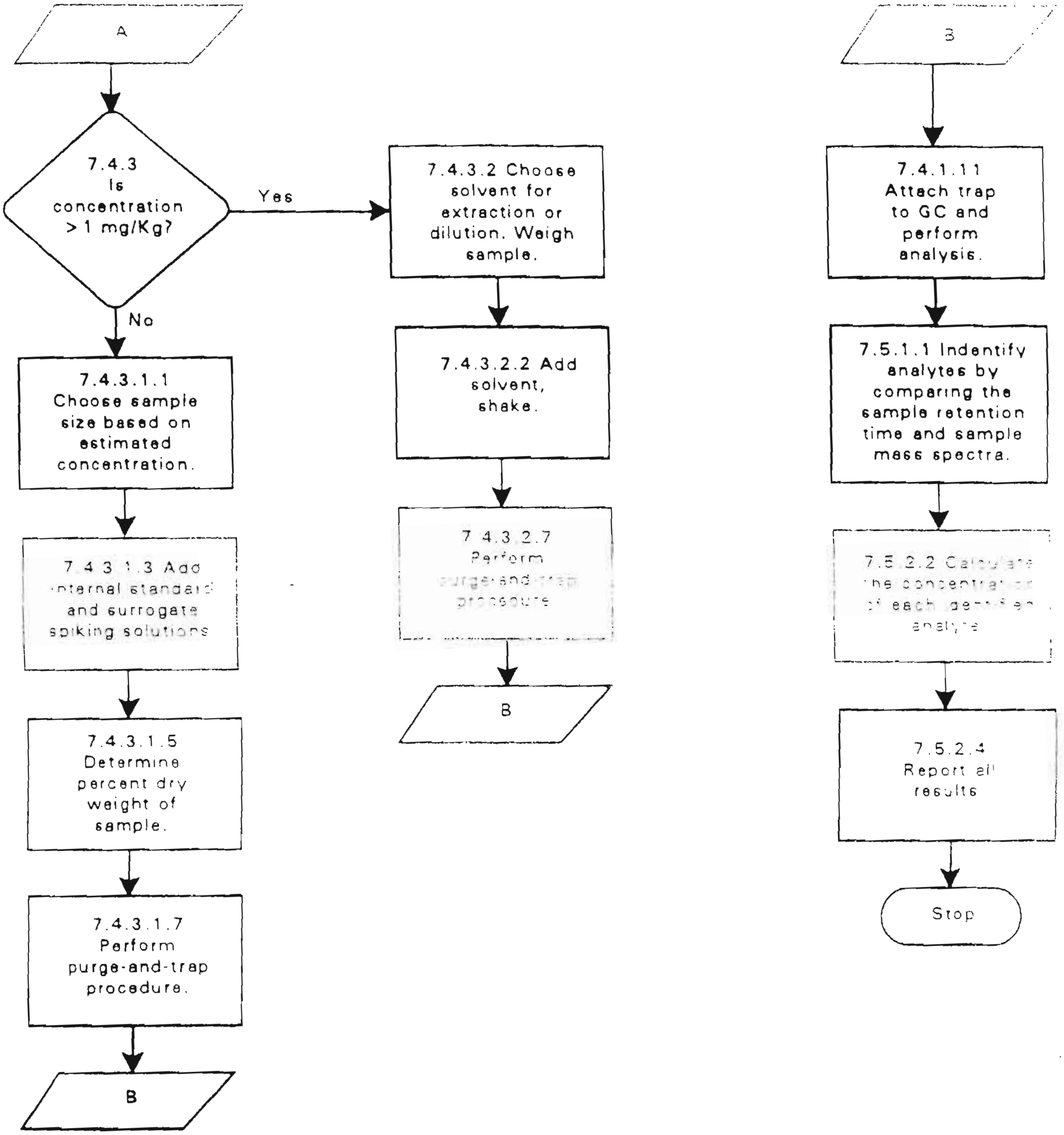


FIGURE 5.
LOW SOILS IMPINGER



METHOD 8240B
VOLATILE ORGANICS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)




A
7.4.3 Is concentration > 1 mg/Kg?
Yes
No
7.4.3.1.1 Choose sample size based on estimated concentration.
7.4.3.1.3 Add internal standard and surrogate spiking solutions
7.4.3.1.5 Determine percent dry weight of sample.
7.4.3.1.7 Perform purge-and-trap procedure.
B
7.4.3.2 Choose solvent for extraction or dilution. Weigh sample.
7.4.3.2.2 Add solvent, shake.
7.4.3.2.7 Perform purge-and-trap procedure
B
B
7.4.1.11 Attach trap to GC and perform analysis.
7.5.1.1 Indentify analytes by comparing the sample retention time and sample mass spectra.
7.5.2.2 Calculate the concentration of each identified analyte
7.5.2.4 Report all results
Stop

APPENDIX C

SOIL TREATABILITY STUDY
BOREHOLE STRATIGRAPHIC LOGS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

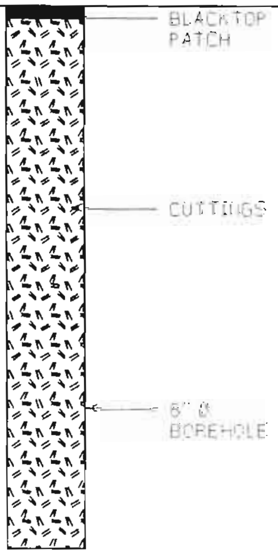
(WL105)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: BH-B1
DATE COMPLETED: SEPTEMBER 5, 1995
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. BGS
	GROUND SURFACE	.00
	ASPHALT and CONCRETE, some gravel, dry	-.30
	ML-SILT (FILL), some sand, dark brown, dry	-.60
-2.5	GM-GRAVEL, some sand, little silt, gray and brown, dry	-1.00
-5.0	ML-SILT (NATIVE), trace sand, little silt and clay, red-brown, dry	-6.90
-7.5	SM-SAND, little to some silt, trace clay, gray-brown, moist to wet, slight odor	
-10.0	- little fine gravel	-12.20
-12.5	GM-GRAVEL, little sand and silt, fine to medium grained, subangular, gray	-12.50
	CL-CLAY, little silt, gray, moist	-13.00
-15.0	SP-SAND (TILL), some gravel, little silt and clay, dense, gray, dry to moist	-13.50
	END OF HOLE @ 13.5ft. BGS NOTES: 1. Soil sample composited with BH-B2 soils for bench scale treatability testing. 2. Borehole backfilled with auger cuttings with blacktop patch at surface.	
-17.5		
-20.0		
-22.5		
-25.0		
-27.5		
-30.0		
-32.5		

MONITOR INSTALLATION



SAMPLE

NUMBER	STATE	'N' VALUE	HNu (ppm)
1SS		18	
2SS		23	
3SS		20	
4SS		9	
5SS		32	
6SS		50	
7SS		>100	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

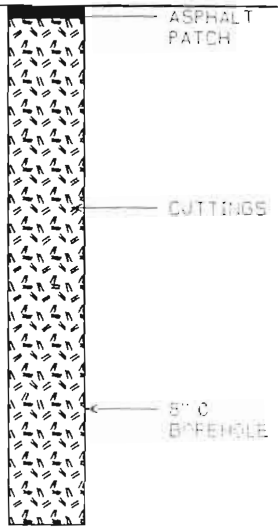
(WL106)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: BH-B2
DATE COMPLETED: SEPTEMBER 5, 1995
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. BGS	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE HNu (ppm)
	GROUND SURFACE	.00				
	ASPHALT	-.20				
	SM-SAND (FILL), some gravel, little silt, brown to dark brown, dry	-1.70	1SS	☒	20	
-2.5	ML-SILT (NATIVE), little sand, little clay, trace fine subrounded gravel, brown, dry to moist - slight sour odor		2SS	☒	32	
-5.0			3SS	☒	19	
	SM-SAND, little silt, little fine gravel, gray-brown, moist to wet, strong chemical odor	-6.60				
-7.5			4SS	☒	16	
			5SS	☒	94	
-10.0			6SS	☒	50	
	SP-SAND (TILL), some subangular gravel, little silt and clay, dense, gray, dry to moist	-12.00	7SS	☒	>100	
-12.5	END OF HOLE @ 12.9ft BGS NOTES: 1. Soil sample composited with BH-B1 soils for bench scale treatability testing. 2. Borehole backfilled with auger cuttings with asphalt patch at surface.	-12.90				
-15.0						
-17.5						
-20.0						
-22.5						
-25.0						
-27.5						
-30.0						
-32.5						

MONITOR INSTALLATION



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(WL107)
Page 1 of 1

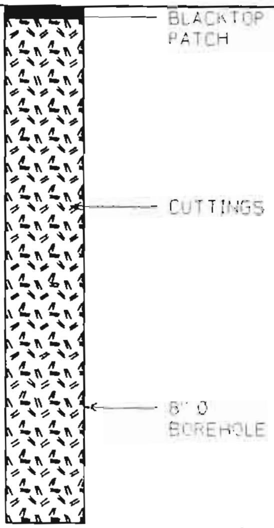
PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: BH-C1
DATE COMPLETED: SEPTEMBER 5, 1995
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS: -2.5, -5.0, -7.5, -10.0, -12.5, -15.0, -17.5, -20.0, -22.5, -25.0, -27.5, -30.0, -32.5

STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. BGS
GROUND SURFACE	.00
ASPHALT and GRAVEL	-.40
SM-SILT (FILL), little to some gravel and sand, red-brown, dry	-1.40
ASH and CINDERS, black, dry to moist	-3.00
ML-SILT (NATIVE), little sand, soft, slightly plastic, dark brown, moist, slight odor	-3.80
ML-SILT, trace sand, trace fine gravel, dense, laminated, red-brown, dry to moist - slight odor	-10.20
SM-SAND, little to trace silt, gray, moist to wet - trace brown NAPL	-12.90
END OF HOLE @ 12.9ft BGS NOTES: 1. Soil sample composited with BH-C2 soils for bench scale treatability testing. 2. Borehole backfilled with auger cuttings with blacktop patch at surface.	

MONITOR INSTALLATION



SAMPLE NUMBER	STATE	'N' VALUE	HNu (ppm)
1SS	☒	9	
2SS	☒	8	
3SS	☒	17	
4SS	☒	33	
5SS	☒	19	
6SS	☒	11	
7SS	☒	>50	

<u>NOTES:</u> MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

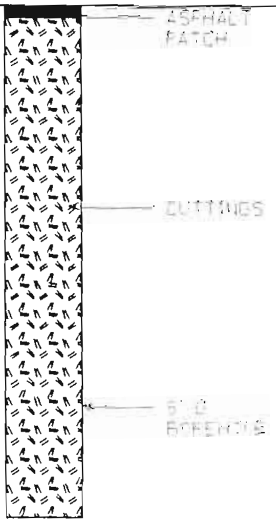
(WL108)
Page 1 of 1

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: BH-C2
DATE COMPLETED: SEPTEMBER 5, 1995
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. BGS
	GROUND SURFACE	.00
	ASPHALT and GRAVEL	-.40
	GM-GRAVEL (FILL), some sand, trace red brick, coal, black ash, metal, gray, dry	-2.00
-2.5	ML-SILT, little sand and clay, gray and black, moist, slight musty odor	-4.80
-5.0	ML-SILT (NATIVE), little to some sand, trace clay, dense, laminated, red-brown, dry to moist, musty to chemical odor	-9.00
-7.5		
-10.0	SM-SAND, little silt, gray, moist to wet, chemical odor, slight sheen - NAPL	-12.40
-12.5	SP-SAND (TILL), some gravel, stiff, gray, dry to moist	-12.60
	END OF HOLE @ 12.6ft BGS NOTES: 1. Soil sample composited with BH-C1 soils for bench scale treatability testing. 2. Borehole backfilled with auger cuttings with asphalt patch at surface.	
-15.0		
-17.5		
-20.0		
-22.5		
-25.0		
-27.5		
-30.0		
-32.5		

MONITOR INSTALLATION



SAMPLE NUMBER	STATE	'N' VALUE	HNu (ppm)
1SS	☒	17	
2SS	☒	5	
3SS	☒	6	
4SS	☒	12	
5SS	☒	[illegible]	
6SS	☒	[illegible]	
7SS	☒	[illegible]	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

APPENDIX D

SOIL TREATABILITY STUDY
ANALYTICAL RESULTS

Key To Sample ID For Analytical Samples- Initial Characterization

Sample ID	Description
#3967-Area B-1	Area B Soil, Dup1
#3967-Area B-2	Area B Soil, Dup2
#3967-Area C-1	Area C Soil, Dup1
#3967-Area C-2	Area C Soil, Dup2
#3967-NAPL-1	NAPL, Dup1
#3967-NAPL-2	NAPL, Dup2

Ross Analytical Services, Inc.
16433 Foltz Industrial Parkway • Strongsville, Ohio 44136
(216) 572-3200 • Fax (216) 572-7620 • 1-800-325-2737

CERTIFICATE OF ANALYSIS

Client:

Conestoga-Rover Associates
2055 Niagara Falls Blvd.
Niagara Falls, NY 14304

Attn: Cindy Lin

Work Order #: 95-09-126
Client Code: CONES_ROVER
Report Date: 09/21/95
Work ID: Soils for metals & VOA's
Date Received: 09/14/95

Purchase Order: Proj# 3967

SAMPLE IDENTIFICATION

Lab Number	Sample Description	Lab Number	Sample Description
01	Soil 3967-Area B-1	02	Soil 3967-Area B-2
03	Soil 3967-Area C-1	04	Soil 3967-Area C-2
05	Soil 3967-NAPL-1	06	Soil 3967-NAPL-2

Data are reported on an as-received basis unless stated otherwise. Estimated Quantitation Limits (EQL's) are listed for most analytes. EQL's are the lowest concentrations that can be reliably measured under routine laboratory conditions. Unless otherwise noted, method blanks had no targets found above their EQL's and results were not corrected for blanks.

Craig H Caldwell
Certificate approved by
Craig H. Caldwell

Sample Description: Soil 3967-Area B-1 **Lab No.:** 01

Analyte Description	**Result**	**Units**	**EQL**
Moisture by EPA 160.3	14.6	%	0.5
Antimony by ICP	<EQL	mg/Kg	12
Arsenic by ICP	<EQL	mg/Kg	24
Beryllium by ICP	0.65	mg/Kg	0.23
Cadmium by ICP	<EQL	mg/Kg	0.58
Chromium by ICP	8.3	mg/Kg	1.2
Copper by ICP	21.7	mg/Kg	2.3
Lead by ICP	29.3	mg/Kg	5.8
Nickel by ICP	9.7	mg/Kg	2.3
Selenium by ICP	<EQL	mg/Kg	12
Silver by ICP	<EQL	mg/Kg	1.2
Thallium by ICP	<EQL	mg/Kg	46
Zinc by ICP	62.5	mg/Kg	2.3
Mercury by CVAA	<EQL	mg/Kg	0.094
Moisture by EPA 160.3 (for VOC's)	12.3	%	0.5

Sample Description: Soil 3967-Area B-2 **Lab No.:** C2

Analyte Description	**Result**	**Units**	**EQL**
Moisture by EPA 160.3	17.4	%	0.5
Antimony by ICP	<EQL	mg/Kg	12
Arsenic by ICP	<EQL	mg/Kg	24
Beryllium by ICP	0.51	mg/Kg	0.24
Cadmium by ICP	<EQL	mg/Kg	0.58
Chromium by ICP	7.0	mg/Kg	1.2
Copper by ICP	19.8	mg/Kg	2.0
Lead by ICP	17.8	mg/Kg	5.8
Nickel by ICP	8.3	mg/Kg	2.3
Selenium by ICP	<EQL	mg/Kg	12
Silver by ICP	<EQL	mg/Kg	1.2
Thallium by ICP	<EQL	mg/Kg	47
Zinc by ICP	73.0	mg/Kg	2.3
Mercury by CVAA	<EQL	mg/Kg	0.097
Moisture by EPA 160.3 (for VOC's)	12.3	%	0.5

Sample Description: Soil 3967-Area C-1 **Lab No.:** 03

Analyte Description	**Result**	**Units**	**EQL**
Moisture by EPA 160.3	16.1	%	0.5
Antimony by ICP	<EQL	mg/Kg	12
Arsenic by ICP	<EQL	mg/Kg	24
Beryllium by ICP	0.44	mg/Kg	0.24
Cadmium by ICP	<EQL	mg/Kg	0.59
Chromium by ICP	14.2	mg/Kg	1.2
Copper by ICP	27.5	mg/Kg	2.4
Lead by ICP	41.6	mg/Kg	6.0
Nickel by ICP	17.2	mg/Kg	2.4
Selenium by ICP	<EQL	mg/Kg	12
Silver by ICP	<EQL	mg/Kg	1.2
Thallium by ICP	<EQL	mg/Kg	47
Zinc by ICP	84.5	mg/Kg	2.4
Mercury by CVAA	<EQL	mg/Kg	0.10
Moisture by EPA 160.3 (for VOC's)	15.6	%	0.5

Sample Description: Soil 3967-Area C-2 **Lab No.:** 04

Analyte Description	Result	Units	EQL
Moisture by EPA 160.3	13.7	%	0.5
Antimony by ICP	<EQL	mg/Kg	12
Arsenic by ICP	<EQL	mg/Kg	23
Beryllium by ICP	0.50	mg/Kg	0.23
Cadmium by ICP	<EQL	mg/Kg	0.58
Chromium by ICP	16.8	mg/Kg	1.2
Copper by ICP	49.0	mg/Kg	2.3
Lead by ICP	137	mg/Kg	5.8
Nickel by ICP	18.8	mg/Kg	2.3
Selenium by ICP	<EQL	mg/Kg	12
Silver by ICP	<EQL	mg/Kg	1.2
Thallium by ICP	<EQL	mg/Kg	46
Zinc by ICP	91.5	mg/Kg	2.3
Mercury by CVAA	<EQL	mg/Kg	0.093
Moisture by EPA 160.3 (for VOC's)	15.2	%	0.5

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-Area B-1 Lab No. 01
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/19/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	23	78-87-5	1,2-Dichloropropane	<EQL	11
74-83-9	Bromomethane	<EQL	23	10061-02-6	trans-1,3-Dichloropropene	<EQL	11
75-01-4	Vinyl chloride	<EQL	23	79-01-6	Trichloroethene	33	11
75-00-3	Chloroethane	<EQL	23	124-48-1	Dibromochloromethane	<EQL	11
75-09-2	Methylene chloride	<EQL	11	79-00-5	1,1,2-Trichloroethane	<EQL	11
67-64-1	Acetone	62	23	71-43-2	Benzene	<EQL	11
75-15-0	Carbon disulfide	<EQL	11	10061-01-5	cis-1,3-Dichloropropene	<EQL	11
75-35-4	1,1-Dichloroethene	<EQL	11	110-75-8	2-Chloroethyl vinyl ether	<EQL	450
75-34-3	1,1-Dichloroethane	<EQL	11	75-25-2	Bromoform	<EQL	11
156-60-5	1,2-Dichloroethene (total)	<EQL	11	591-78-6	2-Hexanone	<EQL	23
67-66-3	Chloroform	<EQL	11	108-10-1	4-Methyl-2-pentanone	<EQL	23
107-06-2	1,2-Dichloroethane	<EQL	11	127-18-4	Tetrachloroethene	<EQL	11
78-93-3	2-Butanone	<EQL	23	108-88-3	Toluene	<EQL	11
71-55-6	1,1,1-Trichloroethane	29	11	108-90-7	Chlorobenzene	<EQL	11
56-23-5	Carbon tetrachloride	<EQL	11	100-41-4	Ethyl benzene	14	11
108-05-4	Vinyl acetate	<EQL	23	100-42-5	Styrene	<EQL	11
75-27-4	Bromodichloromethane	<EQL	11		Xylenes	91	1
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	11				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	96	70 -	121
Toluene-d8	103	81 -	117
4-Bromofluorobenzene	97	74 -	121

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-Area B-2 Lab No. 02
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/19/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	23	78-87-5	1,2-Dichloropropane	<EQL	11
74-83-9	Bromomethane	<EQL	23	10061-02-6	trans-1,3-Dichloropropene	<EQL	11
75-01-4	Vinyl chloride	<EQL	23	79-01-6	Trichloroethene	69	11
75-00-3	Chloroethane	<EQL	23	124-48-1	Dibromochloromethane	<EQL	11
75-09-2	Methylene chloride	<EQL	11	79-00-5	1,1,2-Trichloroethane	<EQL	11
67-64-1	Acetone	49	23	71-43-2	Benzene	<EQL	11
75-15-0	Carbon disulfide	<EQL	11	10061-01-5	cis-1,3-Dichloropropene	<EQL	11
75-35-4	1,1-Dichloroethene	<EQL	11	110-75-8	2-Chloroethyl vinyl ether	<EQL	450
75-34-3	1,1-Dichloroethane	<EQL	11	75-25-2	Bromoform	<EQL	11
156-60-5	1,2-Dichloroethene (total)	<EQL	11	591-78-6	2-Hexanone	<EQL	23
67-66-3	Chloroform	<EQL	11	108-10-1	4-Methyl-2-pentanone	<EQL	23
107-06-2	1,2-Dichloroethane	<EQL	11	127-18-4	Tetrachloroethene	<EQL	11
78-93-3	2-Butanone	<EQL	23	108-88-3	Toluene	<EQL	11
71-55-6	1,1,1-Trichloroethane	140	11	108-90-7	Chlorobenzene	<EQL	11
56-23-5	Carbon tetrachloride	<EQL	11	100-41-4	Ethyl benzene	40	11
108-05-4	Vinyl acetate	<EQL	23	100-42-5	Styrene	<EQL	11
75-27-4	Bromodichloromethane	<EQL	11		Xylenes	210	11
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	11				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	91	70	121
Toluene-d8	107	81	117
4-Bromofluorobenzene	101	74	121

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-Area C-1 Lab No. 03
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/15/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	1500	78-87-5	1,2-Dichloropropane	<EQL	730
74-83-9	Bromomethane	<EQL	1500	10061-02-6	trans-1,3-Dichloropropene	<EQL	730
75-01-4	Vinyl chloride	<EQL	1500	79-01-6	Trichloroethene	4400	730
75-00-3	Chloroethane	<EQL	1500	124-48-1	Dibromochloromethane	<EQL	730
75-09-2	Methylene chloride	<EQL	730	79-00-5	1,1,2-Trichloroethane	<EQL	730
67-64-1	Acetone	<EQL	1500	71-43-2	Benzene	<EQL	730
75-15-0	Carbon disulfide	<EQL	730	10061-01-5	cis-1,3-Dichloropropene	<EQL	730
75-35-4	1,1-Dichloroethene	<EQL	730	110-75-8	2-Chloroethyl vinyl ether	<EQL	29000
75-34-3	1,1-Dichloroethane	<EQL	730	75-25-2	Bromoform	<EQL	730
156-60-5	1,2-Dichloroethene (total)	<EQL	730	591-78-6	2-Hexanone	<EQL	1500
67-66-3	Chloroform	<EQL	730	108-10-1	4-Methyl-2-pentanone	<EQL	1500
107-06-2	1,2-Dichloroethane	<EQL	730	127-18-4	Tetrachloroethene	<EQL	730
78-93-3	2-Butanone	<EQL	1500	108-88-3	Toluene	<EQL	730
71-55-6	1,1,1-Trichloroethane	<EQL	730	108-90-7	Chlorobenzene	<EQL	730
56-23-5	Carbon tetrachloride	<EQL	730	100-41-4	Ethyl benzene	<EQL	730
108-05-4	Vinyl acetate	<EQL	1500	100-42-5	Styrene	<EQL	730
75-27-4	Bromodichloromethane	<EQL	730		Xylenes	6300	730
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	730				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	96	70 -	121
Toluene-d8	106	81	117
4-Bromofluorobenzene	102	74 -	121

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-Area C-2 Lab No. 04
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/19/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	1400	78-87-5	1,2-Dichloropropane	<EQL	720
74-83-9	Bromomethane	<EQL	1400	10061-02-6	trans-1,3-Dichloropropene	<EQL	720
75-01-4	Vinyl chloride	<EQL	1400	79-01-6	Trichloroethene	5600	720
75-00-3	Chloroethane	<EQL	1400	124-48-1	Dibromochloromethane	<EQL	720
75-09-2	Methylene chloride	<EQL	720	79-00-5	1,1,2-Trichloroethane	<EQL	720
67-64-1	Acetone	<EQL	1400	71-43-2	Benzene	<EQL	720
75-15-0	Carbon disulfide	<EQL	720	10061-01-5	cis-1,3-Dichloropropene	<EQL	720
75-35-4	1,1-Dichloroethene	<EQL	720	110-75-8	2-Chloroethyl vinyl ether	<EQL	29000
75-34-3	1,1-Dichloroethane	<EQL	720	75-25-2	Bromoform	<EQL	720
156-60-5	1,2-Dichloroethene (total)	850	720	591-78-6	2-Hexanone	<EQL	1400
67-66-3	Chloroform	<EQL	720	108-10-1	4-Methyl-2-pentanone	<EQL	1400
107-06-2	1,2-Dichloroethane	<EQL	720	127-18-4	Tetrachloroethene	<EQL	720
78-93-3	2-Butanone	<EQL	1400	108-88-3	Toluene	<EQL	720
71-55-6	1,1,1-Trichloroethane	<EQL	720	108-90-7	Chlorobenzene	<EQL	720
56-23-5	Carbon tetrachloride	<EQL	720	100-41-4	Ethyl benzene	<EQL	720
108-05-4	Vinyl acetate	<EQL	1400	100-42-5	Styrene	<EQL	720
75-27-4	Bromodichloromethane	<EQL	720		Xylenes	8100	720
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	720				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	105	70 -	121
Toluene-d8	104	81 -	117
4-Bromofluorobenzene	106	74 -	121

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-NAPL-1 Lab No. 05
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/19/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	27000	78-87-5	1,2-Dichloropropane	<EQL	14000
74-83-9	Bromomethane	<EQL	27000	10061-02-6	trans-1,3-Dichloropropene	<EQL	14000
75-01-4	Vinyl chloride	<EQL	27000	79-01-6	Trichloroethene	360000	14000
75-00-3	Chloroethane	<EQL	27000	124-48-1	Dibromochloromethane	<EQL	14000
75-09-2	Methylene chloride	<EQL	14000	79-00-5	1,1,2-Trichloroethane	<EQL	14000
67-64-1	Acetone	<EQL	27000	71-43-2	Benzene	<EQL	14000
75-15-0	Carbon disulfide	<EQL	14000	10061-01-5	cis-1,3-Dichloropropene	<EQL	14000
75-35-4	1,1-Dichloroethene	<EQL	14000	110-75-8	2-Chloroethyl vinyl ether	<EQL	550000
75-34-3	1,1-Dichloroethane	<EQL	14000	75-25-2	Bromoform	<EQL	14000
156-60-5	1,2-Dichloroethene (total)	<EQL	14000	591-78-6	2-Hexanone	<EQL	27000
67-66-3	Chloroform	<EQL	14000	108-10-1	4-Methyl-2-pentanone	<EQL	27000
107-06-2	1,2-Dichloroethane	<EQL	14000	127-18-4	Tetrachloroethene	<EQL	14000
78-93-3	2-Butanone	<EQL	27000	108-88-3	Toluene	<EQL	14000
71-55-6	1,1,1-Trichloroethane	<EQL	14000	108-90-7	Chlorobenzene	<EQL	14000
56-23-5	Carbon tetrachloride	<EQL	14000	100-41-4	Ethyl benzene	<EQL	14000
108-05-4	Vinyl acetate	<EQL	27000	100-42-5	Styrene	<EQL	14000
75-27-4	Bromodichloromethane	<EQL	14000		Xylenes	<EQL	14000
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	14000				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	103	70	121
Toluene-d8	98	81	117
4-Bromofluorobenzene	103	74	121

Work Order # 95-09-126 Ross Analytical Services, Inc Reported: 09/21/95

Sample Description Soil 3967-NAPL-2 Lab No. 06
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 09/19/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	5500	78-87-5	1,2-Dichloropropane	<EQL	2700
74-83-9	Bromomethane	<EQL	5500	10061-02-6	trans-1,3-Dichloropropene	<EQL	2700
75-01-4	Vinyl chloride	<EQL	5500	79-01-6	Trichloroethene	91000	2700
75-00-3	Chloroethane	<EQL	5500	124-48-1	Dibromochloromethane	<EQL	2700
75-09-2	Methylene chloride	5000	2700	79-00-5	1,1,2-Trichloroethane	<EQL	2700
67-64-1	Acetone	<EQL	5500	71-43-2	Benzene	<EQL	2700
75-15-0	Carbon disulfide	<EQL	2700	10061-01-5	cis-1,3-Dichloropropene	<EQL	2700
75-35-4	1,1-Dichloroethene	<EQL	2700	110-75-8	2-Chloroethyl vinyl ether	<EQL	110000
75-34-3	1,1-Dichloroethane	<EQL	2700	75-25-2	Bromoform	<EQL	2700
156-60-5	1,2-Dichloroethene (total)	<EQL	2700	591-78-6	2-Hexanone	<EQL	5500
67-66-3	Chloroform	<EQL	2700	108-10-1	4-Methyl-2-pentanone	<EQL	5500
107-06-2	1,2-Dichloroethane	<EQL	2700	127-18-4	Tetrachloroethene	<EQL	2700
78-93-3	2-Butanone	<EQL	5500	108-88-3	Toluene	<EQL	2700
71-55-6	1,1,1-Trichloroethane	<EQL	2700	108-90-7	Chlorobenzene	<EQL	2700
56-23-5	Carbon tetrachloride	<EQL	2700	100-41-4	Ethyl benzene	<EQL	2700
108-05-4	Vinyl acetate	<EQL	5500	100-42-5	Styrene	<EQL	2700
75-27-4	Bromodichloromethane	<EQL	2700		Xylenes	5100	2700
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	2700				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	94	70	121
Toluene-d8	97	81	117
4-Bromofluorobenzene	100	74	121

Key To Sample ID For Analytical Samples- T=0

Sample ID	Description
#3967-951916-1	Area B Soil, Tpl1
#3967-951916-2	Area B Soil, Tpl2
#3967-951916-3	Area B Soil, Tpl3
#3967-951916-4	Area C Soil + 5% vermiculite, Tpl1
#3967-951916-5	Area C Soil + 5% vermiculite, Tpl2
#3967-951916-6	Area C Soil + 5% vermiculite, Tpl3
#3967-951917-1	Area C Soil + 5% NAPL + 5 % vermiculite, Tpl1
#3967-951917-2	Area C Soil + 5% NAPL + 5 % vermiculite, Tpl2
#3967-951917-3	Area C Soil + 5% NAPL + 5 % vermiculite, Tpl3

ROSS
Ross Analytical Services, Inc.
16433 Foltz Industrial Parkway • Strongsville, Ohio 44136
(216) 572-3200 • Fax (216) 572-7620 • 1-800-325-7737

CERTIFICATE OF ANALYSIS

Client:

Treatek - CRA
2055 Niagara Falls Blvd
Suite 3
Niagara Falls, NY 14304
Attn: Cindy Lin

Work Order #: 95-10-173
Client Code: CRA
Report Date: 10/25/95
Work ID: Soils for 8240
Date Received: 10/17/95

Purchase Order: 3967

SAMPLE IDENTIFICATION

Lab Number	Sample Description	Lab Number	Sample Description
01	Soil 3967-951016-1	02	Soil 3967-951016-2
03	Soil 3967-951016-3	04	Soil 3967-951016-4
05	Soil 3967-951016-5	06	Soil 3967-951016-6

Data are reported on an as-received basis unless stated otherwise. Estimated Quantitation Limits (EQL's) are listed for most analytes. EQL's are the lowest concentrations that can be reliably measured under routine laboratory conditions. Unless otherwise noted, method blanks had no targets found above their EQL's and results were not corrected for blanks.

These results are reported on a dry-weight basis.

Craig H Caldwell

Certificate approved by
Craig H. Caldwell

ROSS **Ross Analytical Services, Inc.**
16433 Foltz Industrial Parkway • Strongsville, Ohio 44136
(216) 572-3200 • Fax (216) 572-7620 • 1-800-325-7737

CERTIFICATE OF ANALYSIS

Client:

Treatek - CRA
2055 Niagara Falls Blvd
Suite 3
Niagara Falls, NY 14304
Attn: Cindy Lin

Work Order #: 95-10-194
Client Code: CRA
Report Date: 10/25/95
Work ID: Soils for 8240
Date Received: 10/18/95

Purchase Order: 3967

SAMPLE IDENTIFICATION

Lab Number	Sample Description	Lab Number	Sample Description
01	Soil 3967-951017-1	02	Soil 3967-951017-2
03	Soil 3967-951017-3		

Data are reported on an as-received basis unless stated otherwise. Estimated Quantitation Limits (EQL's) are listed for most analytes. EQL's are the lowest concentrations that can be reliably measured under routine laboratory conditions. Unless otherwise noted, method blanks had no targets found above their EQL's and results were not corrected for blanks.

These results are reported on a dry-weight basis.

Craig H Caldwell

Certificate approved by
Craig H. Caldwell

Work Order # 95-10-173   Ross Analytical Services, Inc   Reported: 10/25/95

Sample Description Soil 3967-951016-1   Lab No. 01
Test Description Volatiles by GC/MS   Test Code 8240

DATE ANALYZED 10/23/95   DILUTION FACTOR 1   UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	58	78-87-5	1,2-Dichloropropane	<EQL	29
74-83-9	Bromomethane	<EQL	58	10061-02-6	trans-1,3-Dichloropropene	<EQL	29
75-01-4	Vinyl chloride	<EQL	58	79-01-6	Trichloroethene	200	29
75-00-3	Chloroethane	<EQL	58	124-48-1	Dibromochloromethane	<EQL	29
75-09-2	Methylene chloride	51	29	79-00-5	1,1,2-Trichloroethane	<EQL	29
67-64-1	Acetone	<EQL	58	71-43-2	Benzene	<EQL	29
75-15-0	Carbon disulfide	<EQL	29	10061-01-5	cis-1,3-Dichloropropene	<EQL	2
75-35-4	1,1-Dichloroethene	<EQL	29	110-75-8	2-Chloroethyl vinyl ether	<EQL	1200
75-34-3	1,1-Dichloroethane	<EQL	29	75-25-2	Bromoform	<EQL	2
156-60-5	1,2-Dichloroethene (total)	44	29	591-78-6	2-Hexanone	<EQL	58
67-66-3	Chloroform	<EQL	29	108-10-1	4-Methyl-2-pentanone	<EQL	5
107-06-2	1,2-Dichloroethane	<EQL	29	127-18-4	Tetrachloroethene	<EQL	2
78-93-3	2-Butanone	<EQL	58	108-88-3	Toluene	<EQL	29
71-55-6	1,1,1-Trichloroethane	<EQL	29	108-90-7	Chlorobenzene	<EQL	2
56-23-5	Carbon tetrachloride	<EQL	29	100-41-4	Ethyl benzene	<EQL	29
108-05-4	Vinyl acetate	<EQL	58	100-42-5	Styrene	<EQL	2
75-27-4	Bromodichloromethane	<EQL	29		Xylenes	310	2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	29				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	105	70 -	121
Toluene-d8	105	81 -	117
4-Bromofluorobenzene	98	74 -	121

Work Order # 95-10-173 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951016-2 Lab No. 02
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/23/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	57	78-87-5	1,2-Dichloropropane	<EQL	28
74-83-9	Bromomethane	<EQL	57	10061-02-6	trans-1,3-Dichloropropene	<EQL	28
75-01-4	Vinyl chloride	<EQL	57	79-01-6	Trichloroethene	380	28
75-00-3	Chloroethane	<EQL	57	124-48-1	Dibromochloromethane	<EQL	28
75-09-2	Methylene chloride	<EQL	28	79-00-5	1,1,2-Trichloroethane	<EQL	28
67-64-1	Acetone	<EQL	57	71-43-2	Benzene	<EQL	28
75-15-0	Carbon disulfide	<EQL	28	10061-01-5	cis-1,3-Dichloropropene	<EQL	28
75-35-4	1,1-Dichloroethene	<EQL	28	110-75-8	2-Chloroethyl vinyl ether	<EQL	1100
75-34-3	1,1-Dichloroethane	<EQL	28	75-25-2	Bromoform	<EQL	28
156-60-5	1,2-Dichloroethene (total)	90	28	591-78-6	2-Hexanone	<EQL	57
67-66-3	Chloroform	<EQL	28	108-10-1	4-Methyl-2-pentanone	<EQL	57
107-06-2	1,2-Dichloroethane	<EQL	28	127-18-4	Tetrachloroethene	<EQL	28
78-93-3	2-Butanone	<EQL	57	108-88-3	Toluene	<EQL	28
71-55-6	1,1,1-Trichloroethane	<EQL	28	108-90-7	Chlorobenzene	<EQL	28
56-23-5	Carbon tetrachloride	<EQL	28	100-41-4	Ethyl benzene	<EQL	28
108-05-4	Vinyl acetate	<EQL	57	100-42-5	Styrene	<EQL	28
75-27-4	Bromodichloromethane	<EQL	28		Xylenes	480	28
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	28				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	105	70 - 121
Toluene-d8	111	81 - 117
4-Bromofluorobenzene	94	74 - 121

Work Order # 95-10-173 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description	Soil 3967-951016-3	Lab No.	03
Test Description	Volatiles by GC/MS	Test Code	8240

DATE ANALYZED 10/23/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	110	78-87-5	1,2-Dichloropropane	<EQL	56
74-83-9	Bromomethane	<EQL	110	10061-02-6	trans-1,3-Dichloropropene	<EQL	5
75-01-4	Vinyl chloride	<EQL	110	79-01-6	Trichloroethene	540	56
75-00-3	Chloroethane	<EQL	110	124-48-1	Dibromochloromethane	<EQL	5
75-09-2	Methylene chloride	<EQL	56	79-00-5	1,1,2-Trichloroethane	<EQL	56
67-64-1	Acetone	<EQL	110	71-43-2	Benzene	<EQL	56
75-15-0	Carbon disulfide	<EQL	56	10061-01-5	cis-1,3-Dichloropropene	<EQL	5
75-35-4	1,1-Dichloroethene	<EQL	56	110-75-8	2-Chloroethyl vinyl ether	<EQL	2200
75-34-3	1,1-Dichloroethane	<EQL	56	75-25-2	Bromoform	<EQL	5
156-60-5	1,2-Dichloroethene (total)	120	56	591-78-6	2-Hexanone	<EQL	110
67-66-3	Chloroform	<EQL	56	108-10-1	4-Methyl-2-pentanone	<EQL	1
107-06-2	1,2-Dichloroethane	<EQL	56	127-18-4	Tetrachloroethene	<EQL	
78-93-3	2-Butanone	<EQL	110	108-88-3	Toluene	<EQL	56
71-55-6	1,1,1-Trichloroethane	<EQL	56	108-90-7	Chlorobenzene	<EQL	
56-23-5	Carbon tetrachloride	<EQL	56	100-41-4	Ethyl benzene	<EQL	56
108-05-4	Vinyl acetate	<EQL	110	100-42-5	Styrene	<EQL	
75-27-4	Bromodichloromethane	<EQL	56		Xylenes	680	
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	56				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	99	70 - 121
Toluene-d8	108	81 - 117
4-Bromofluorobenzene	96	74 - 121

Work Order # 95-10-173   Ross Analytical Services, Inc   Reported: 10/25/95

Sample Description Soil 3967-951016-4   Lab No. 04
Test Description Volatiles by GC/MS   Test Code 8240

DATE ANALYZED 10/23/95   DILUTION FACTOR 1   UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	56	78-87-5	1,2-Dichloropropane	<EQL	28
74-83-9	Bromomethane	<EQL	56	10061-02-6	trans-1,3-Dichloropropene	<EQL	28
75-01-4	Vinyl chloride	<EQL	56	79-01-6	Trichloroethene	230	28
75-00-3	Chloroethane	<EQL	56	124-48-1	Dibromochloromethane	<EQL	28
75-09-2	Methylene chloride	<EQL	28	79-00-5	1,1,2-Trichloroethane	<EQL	28
67-64-1	Acetone	86	56	71-43-2	Benzene	<EQL	28
75-15-0	Carbon disulfide	<EQL	28	10061-01-5	cis-1,3-Dichloropropene	<EQL	28
75-35-4	1,1-Dichloroethene	<EQL	28	110-75-8	2-Chloroethyl vinyl ether	<EQL	1100
75-34-3	1,1-Dichloroethane	<EQL	28	75-25-2	Bromoform	<EQL	28
156-60-5	1,2-Dichloroethene (total)	86	28	591-78-6	2-Hexanone	<EQL	56
67-66-3	Chloroform	<EQL	28	108-10-1	4-Methyl-2-pentanone	<EQL	56
107-06-2	1,2-Dichloroethane	<EQL	28	127-18-4	Tetrachloroethene	<EQL	28
78-93-3	2-Butanone	<EQL	56	108-88-3	Toluene	<EQL	28
71-55-6	1,1,1-Trichloroethane	<EQL	28	108-90-7	Chlorobenzene	<EQL	28
56-23-5	Carbon tetrachloride	<EQL	28	100-41-4	Ethyl benzene	<EQL	28
108-05-4	Vinyl acetate	<EQL	56	100-42-5	Styrene	<EQL	28
75-27-4	Bromodichloromethane	<EQL	28		Xylenes	150	28
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	28				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	90	70 - 121
Toluene-d8	102	81 - 117
4-Bromofluorobenzene	92	74 - 121

Work Order # 95-10-173 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951016-5 Lab No. 05
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/24/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	58	78-87-5	1,2-Dichloropropane	<EQL	29
74-83-9	Bromomethane	<EQL	58	10061-02-6	trans-1,3-Dichloropropene	<EQL	29
75-01-4	Vinyl chloride	<EQL	58	79-01-6	Trichloroethene	220	29
75-00-3	Chloroethane	<EQL	58	124-48-1	Dibromochloromethane	<EQL	29
75-09-2	Methylene chloride	<EQL	29	79-00-5	1,1,2-Trichloroethane	<EQL	29
67-64-1	Acetone	<EQL	58	71-43-2	Benzene	<EQL	29
75-15-0	Carbon disulfide	<EQL	29	10061-01-5	cis-1,3-Dichloropropene	<EQL	29
75-35-4	1,1-Dichloroethene	<EQL	29	110-75-8	2-Chloroethyl vinyl ether	<EQL	1200
75-34-3	1,1-Dichloroethane	<EQL	29	75-25-2	Bromoform	<EQL	2
156-60-5	1,2-Dichloroethene (total)	47	29	591-78-6	2-Hexanone	<EQL	58
67-66-3	Chloroform	<EQL	29	108-10-1	4-Methyl-2-pentanone	<EQL	5
107-06-2	1,2-Dichloroethane	<EQL	29	127-18-4	Tetrachloroethene	<EQL	29
78-93-3	2-Butanone	<EQL	58	108-88-3	Toluene	<EQL	29
71-55-6	1,1,1-Trichloroethane	<EQL	29	108-90-7	Chlorobenzene	<EQL	2
56-23-5	Carbon tetrachloride	<EQL	29	100-41-4	Ethyl benzene	<EQL	29
108-05-4	Vinyl acetate	<EQL	58	100-42-5	Styrene	<EQL	2
75-27-4	Bromodichloromethane	<EQL	29		Xylenes	180	29
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	29				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	94	70	121
Toluene-d8	104	81	117
4-Bromofluorobenzene	89	74	121

Work Order # 95-10-173 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951016-6 Lab No. 06
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/24/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	58	78-87-5	1,2-Dichloropropane	<EQL	29
74-83-9	Bromomethane	<EQL	58	10061-02-6	trans-1,3-Dichloropropene	<EQL	29
75-01-4	Vinyl chloride	<EQL	58	79-01-6	Trichloroethene	180	29
75-00-3	Chloroethane	<EQL	58	124-48-1	Dibromochloromethane	<EQL	29
75-09-2	Methylene chloride	<EQL	29	79-00-5	1,1,2-Trichloroethane	<EQL	29
67-64-1	Acetone	<EQL	58	71-43-2	Benzene	<EQL	29
75-15-0	Carbon disulfide	<EQL	29	10061-01-5	cis-1,3-Dichloropropene	<EQL	29
75-35-4	1,1-Dichloroethene	<EQL	29	110-75-8	2-Chloroethyl vinyl ether	<EQL	1200
75-34-3	1,1-Dichloroethane	<EQL	29	75-25-2	Bromoform	<EQL	29
156-60-5	1,2-Dichloroethene (total)	49	29	591-78-6	2-Hexanone	<EQL	58
67-66-3	Chloroform	<EQL	29	108-10-1	4-Methyl-2-pentanone	<EQL	58
107-06-2	1,2-Dichloroethane	<EQL	29	127-18-4	Tetrachloroethene	<EQL	29
78-93-3	2-Butanone	<EQL	58	108-88-3	Toluene	<EQL	29
71-55-6	1,1,1-Trichloroethane	<EQL	29	108-90-7	Chlorobenzene	<EQL	29
56-23-5	Carbon tetrachloride	<EQL	29	100-41-4	Ethyl benzene	<EQL	29
108-05-4	Vinyl acetate	<EQL	58	100-42-5	Styrene	<EQL	29
75-27-4	Bromodichloromethane	<EQL	29		Xylenes	170	29
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	29				

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	91	70 -	121
Toluene-d8	105	81 -	117
4-Bromofluorobenzene	93	74 -	121

Work Order # 95-10-194 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951017-1 Lab No. 01
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/24/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	11	78-87-5	1,2-Dichloropropane	<EQL	5.5
74-83-9	Bromomethane	<EQL	11	10061-02-6	trans-1,3-Dichloropropene	<EQL	5.5
75-01-4	Vinyl chloride	<EQL	11	79-01-6	Trichloroethene	15	5.5
75-00-3	Chloroethane	<EQL	11	124-48-1	Dibromochloromethane	<EQL	5.5
75-09-2	Methylene chloride	15	5.5	79-00-5	1,1,2-Trichloroethane	<EQL	5.5
67-64-1	Acetone	<EQL	11	71-43-2	Benzene	<EQL	5.5
75-15-0	Carbon disulfide	<EQL	5.5	10061-01-5	cis-1,3-Dichloropropene	<EQL	5.
75-35-4	1,1-Dichloroethene	<EQL	5.5	110-75-8	2-Chloroethyl vinyl ether	<EQL	220
75-34-3	1,1-Dichloroethane	<EQL	5.5	75-25-2	Bromoform	<EQL	5.
156-60-5	1,2-Dichloroethene (total)	<EQL	5.5	591-78-6	2-Hexanone	<EQL	11
67-66-3	Chloroform	<EQL	5.5	108-10-1	4-Methyl-2-pentanone	<EQL	1
107-06-2	1,2-Dichloroethane	<EQL	5.5	127-18-4	Tetrachloroethene	<EQL	5.
78-93-3	2-Butanone	<EQL	11	108-88-3	Toluene	<EQL	5.5
71-55-6	1,1,1-Trichloroethane	9.6	5.5	108-90-7	Chlorobenzene	<EQL	5.
56-23-5	Carbon tetrachloride	<EQL	5.5	100-41-4	Ethyl benzene	<EQL	5.5
108-05-4	Vinyl acetate	<EQL	11	100-42-5	Styrene	<EQL	5.
75-27-4	Bromodichloromethane	<EQL	5.5		Xylenes	<EQL	5.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	5.5				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	106	70 - 121
Toluene-d8	108	81 - 117
4-Bromofluorobenzene	99	74 - 121

Work Order # 95-10-194 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951017-2 Lab No. 02
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/24/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	11	78-87-5	1,2-Dichloropropane	<EQL	5.4
74-83-9	Bromomethane	<EQL	11	10061-02-6	trans-1,3-Dichloropropene	<EQL	5.4
75-01-4	Vinyl chloride	<EQL	11	79-01-6	Trichloroethene	22	5.4
75-00-3	Chloroethane	<EQL	11	124-48-1	Dibromochloromethane	<EQL	5.4
75-09-2	Methylene chloride	11	5.4	79-00-5	1,1,2-Trichloroethane	<EQL	5.4
67-64-1	Acetone	<EQL	11	71-43-2	Benzene	<EQL	5.4
75-15-0	Carbon disulfide	<EQL	5.4	10061-01-5	cis-1,3-Dichloropropene	<EQL	5.4
75-35-4	1,1-Dichloroethene	<EQL	5.4	110-75-8	2-Chloroethyl vinyl ether	<EQL	220
75-34-3	1,1-Dichloroethane	<EQL	5.4	75-25-2	Bromoform	<EQL	5.4
156-60-5	1,2-Dichloroethene (total)	<EQL	5.4	591-78-6	2-Hexanone	<EQL	11
67-66-3	Chloroform	<EQL	5.4	108-10-1	4-Methyl-2-pentanone	<EQL	11
107-06-2	1,2-Dichloroethane	<EQL	5.4	127-18-4	Tetrachloroethene	<EQL	5.4
78-93-3	2-Butanone	<EQL	11	108-88-3	Toluene	<EQL	5.4
71-55-6	1,1,1-Trichloroethane	14	5.4	108-90-7	Chlorobenzene	<EQL	5.4
56-23-5	Carbon tetrachloride	<EQL	5.4	100-41-4	Ethyl benzene	<EQL	5.4
108-05-4	Vinyl acetate	<EQL	11	100-42-5	Styrene	<EQL	5.4
75-27-4	Bromodichloromethane	<EQL	5.4		Xylenes	<EQL	5.4
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	5.4				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	106	70 - 121
Toluene-d8	111	81 - 117
4-Bromofluorobenzene	93	74 - 121

Work Order # 95-10-194 Ross Analytical Services, Inc Reported: 10/25/95

Sample Description Soil 3967-951017-3 Lab No. 03
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 10/24/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT	EQL	CAS NO.	PARAMETER	RESULT	EQL
74-87-3	Chloromethane	<EQL	11	78-87-5	1,2-Dichloropropane	<EQL	5.7
74-83-9	Bromomethane	<EQL	11	10061-02-6	trans-1,3-Dichloropropene	<EQL	5.7
75-01-4	Vinyl chloride	<EQL	11	79-01-6	Trichloroethene	<EQL	5.7
75-00-3	Chloroethane	<EQL	11	124-48-1	Dibromochloromethane	<EQL	5.7
75-09-2	Methylene chloride	6.4	5.7	79-00-5	1,1,2-Trichloroethane	<EQL	5.7
67-64-1	Acetone	<EQL	11	71-43-2	Benzene	<EQL	5.7
75-15-0	Carbon disulfide	<EQL	5.7	10061-01-5	cis-1,3-Dichloropropene	<EQL	5.7
75-35-4	1,1-Dichloroethene	<EQL	5.7	110-75-8	2-Chloroethyl vinyl ether	<EQL	230
75-34-3	1,1-Dichloroethane	<EQL	5.7	75-25-2	Bromoform	<EQL	5.7
156-60-5	1,2-Dichloroethene (total)	<EQL	5.7	591-78-6	2-Hexanone	<EQL	11
67-66-3	Chloroform	<EQL	5.7	108-10-1	4-Methyl-2-pentanone	<EQL	1
107-06-2	1,2-Dichloroethane	<EQL	5.7	127-18-4	Tetrachloroethene	<EQL	5.7
78-93-3	2-Butanone	<EQL	11	108-88-3	Toluene	<EQL	5.7
71-55-6	1,1,1-Trichloroethane	<EQL	5.7	108-90-7	Chlorobenzene	<EQL	5.7
56-23-5	Carbon tetrachloride	<EQL	5.7	100-41-4	Ethyl benzene	<EQL	5.7
108-05-4	Vinyl acetate	<EQL	11	100-42-5	Styrene	<EQL	5.7
75-27-4	Bromodichloromethane	<EQL	5.7		Xylenes	<EQL	5.7
79-34-5	1,1,2,2-Tetrachloroethane	<EQL	5.7				

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	98	70 - 121
Toluene-d8	104	81 - 117
4-Bromofluorobenzene	107	74 - 121

Moisture by EPA 160.3 **Method(s):** 160.3

Lab No.	Sample Description	Result	Units	EQL
01A	Soil 3967-951016-1	13.9	%	0.5
02A	Soil 3967-951016-2	15.1	%	0.5
03A	Soil 3967-951016-3	11.7	%	0.5
04A	Soil 3967-951016-4	15.2	%	0.5
05A	Soil 3967-951016-5	13.8	%	0.5
06A	Soil 3967-951016-6	16.5	%	0.5

Moisture by EPA 160.3 Method(s): 160.3

Lab No.	Sample Description	Result	Units	EQL
01A	Soil 3967-951017-1	11.6	%	0.5
02A	Soil 3967-951017-2	12.4	%	0.5
03A	Soil 3967-951017-3	11.9	%	0.5

Key To Sample ID For Analytical Samples- T=2 Weeks

Sample ID	Description
#3967-Area B-T2-1A	Area B soil- sterile control, Dup1
#3967-Area B-T2-1B	sterile control, Dup2
#3967-Area B-T2-2A	Area B soil- soil alone, Dup1
#3967-Area B-T2-2B	soil alone, Dup2
#3967-Area B-T2-3A	Area B soil- soil + nutrients, Dup1
#3967-Area B-T2-3B	soil + nutrients, Dup2
#3967-Area B-T2-4A	Area B soil- soil + nutrients + carbon source, Dup1
#3967-Area B-T2-4B	soil + nutrients + carbon source, Dup2
#3967-Area B-T2-5A	Area B soil- soil + nutrients + carbon + bacteria, Dup1
#3967-Area B-T2-5B	soil + nutrients + carbon + bacteria, Dup2
#3967-Area C-T2-1A	Area C soil + 5% vermiculite, sterile control, Dup1
#3967-Area C-T2-1B	soil + 5% vermiculite, sterile control, Dup2
#3967-Area C-T2-2A	Area C soil + 5% vermiculite, Dup1
#3967-Area C-T2-2B	soil + 5% vermiculite, Dup2
#3967-Area C-T2-3A	Area C soil + 5% vermiculite + nutrients, Dup1
#3967-Area C-T2-3B	soil + 5% vermiculite + nutrients, Dup2
#3967-Area C-T2-4A	Area C soil + 5% vermiculite + nutrients + carbon, Dup1
#3967-Area C-T2-4B	soil + 5% vermiculite + nutrients + carbon, Dup2
#3967-Area C-T2-5A	Area C soil + 5% vermiculite + nutrients + carbon + bacteria, Dup1
#3967-Area C-T2-5B	soil + 5% vermiculite + nutrients + carbon + bacteria, Dup2
#3967-Area C/N-T2-1A	Area C soil + 5% NAPL+5% vermiculite, sterile control, Dup1
#3967-Area C/N-T2-1B	Area C soil + 5% NAPL+5% vermiculite, sterile control, Dup2
#3967-Area C/N-T2-2A	Area C soil + 5% NAPL+5% vermiculite, Dup1
#3967-Area C/N-T2-2B	Area C soil + 5% NAPL+5% vermiculite, Dup2
#3967-Area C/N-T2-3A	Area C soil + 5% NAPL+5% vermiculite + nutrients, Dup1
#3967-Area C/N-T2-3B	Area C soil + 5% NAPL+5% vermiculite + nutrients, Dup2
#3967-Area C/N-T2-4A	Area C soil + 5% NAPL+5% vermiculite + nutrients + carbon, Dup1
#3967-Area C/N-T2-4B	Area C soil + 5% NAPL+5% vermiculite + nutrients + carbon, Dup2
#3967-Area C/N-T2-5A	Area C soil + 5% NAPL+5% vermiculite + nutrients + carbon + bacteria, Dup1
#3967-Area C/N-T2-5B	Area C soil + 5% NAPL+5% vermiculite + nutrients + carbon + bacteria, Dup2

ROSS Ross Analytical Services, Inc.
16433 Foltz Industrial Parkway • Strongsville, Ohio 44136
(216) 572-3200 • Fax (216) 572-7620 • 1-800-325-7737

CERTIFICATE OF ANALYSIS

Client:

Treatek - CRA
2055 Niagara Falls Blvd
Suite 3
Niagara Falls, NY 14304
Attn: Cindy Lin

Work Order #: 95-10-326
Client Code: CRA
Report Date: 11/27/95
Work ID: Soils for 8240
Date Received: 10/31/95

Purchase Order: tt0003798 proj #3967

SAMPLE IDENTIFICATION

Lab Number	Sample Description	Lab Number	Sample Description
01	Soil 3967-Area B-T2-1A	02	Soil 3967-Area B-T2-1B
03	Soil 3967-Area B-T2-2A	04	Soil 3967-Area B-T2-2B
05	Soil 3967-Area B-T2-3A	06	Soil 3967-Area B-T2-3B
07	Soil 3967-Area B-T2-4A	08	Soil 3967-Area B-T2-4B
09	Soil 3967-Area B-T2-5A	10	Soil 3967-Area B-T2-5B
11	Soil 3967-Area C-T2-1A	12	Soil 3967-Area C-T2-1B
13	Soil 3967-Area C-T2-2A	14	Soil 3967-Area C-T2-2B
15	Soil 3967-Area C-T2-3A	16	Soil 3967-Area C-T2-3B
17	Soil 3967-Area C-T2-4A	18	Soil 3967-Area C-T2-4B
19	Soil 3967-Area C-T2-5A	20	Soil 3967-Area C-T2-5B
21	Soil 3967-Area C/N-T2-1A	22	Soil 3967-Area C/N-T2-1B
23	Soil 3967-Area C/N-T2-2A	24	Soil 3967-Area C/N-T2-2B
25	Soil 3967-Area C/N-T2-3A	26	Soil 3967-Area C/N-T2-3B
27	Soil 3967-Area C/N-T2-4A	28	Soil 3967-Area C/N-T2-4B
29	Soil 3967-Area C/N-T2-5A	30	Soil 3967-Area C/N-T2-5B

Data are reported on an as-received basis unless stated otherwise. Estimated Quantitation Limits (EQL's) are listed for most analytes. EQL's are the lowest concentrations that can be reliably measured under routine laboratory conditions. Unless otherwise noted, method blanks had no targets found above their EQL's and results were not corrected for blanks.

These results are reported on a dry-weight basis.
CLP Form 4's are included to allow samples to be matched to their associated blanks and LCS's.

Craig H Caldwell

Certificate approved by
Craig H. Caldwell

Moisture by EPA 160.3 Method(s): 160.3

Lab No.	Sample Description	Result	Units	EQL
01A	Soil 3967-Area B-T2-1A	15.5	%	0.5
02A	Soil 3967-Area B-T2-1B	16.6	%	0.5
03A	Soil 3967-Area B-T2-2A	15.7	%	0.5
04A	Soil 3967-Area B-T2-2B	16.2	%	0.5
05A	Soil 3967-Area B-T2-3A	18.1	%	0.5
06A	Soil 3967-Area B-T2-3B	16.7	%	0.5
07A	Soil 3967-Area B-T2-4A	17.7	%	0.5
08A	Soil 3967-Area B-T2-4B	18.2	%	0.5
09A	Soil 3967-Area B-T2-5A	16.3	%	0.5
10A	Soil 3967-Area B-T2-5B	18.4	%	0.5
11A	Soil 3967-Area C-T2-1A	17.8	%	0.5
12A	Soil 3967-Area C-T2-1B	18.1	%	0.5
13A	Soil 3967-Area C-T2-2A	18.5	%	0.5
14A	Soil 3967-Area C-T2-2B	19.1	%	0.5
15A	Soil 3967-Area C-T2-3A	19.2	%	0.5
16A	Soil 3967-Area C-T2-3B	16.0	%	0.5
17A	Soil 3967-Area C-T2-4A	17.6	%	0.5
18A	Soil 3967-Area C-T2-4B	19.1	%	0.5
19A	Soil 3967-Area C-T2-5A	16.9	%	0.5
20A	Soil 3967-Area C-T2-5B	18.8	%	0.5
21A	Soil 3967-Area C/N-T2-1A	18.8	%	0.5
22A	Soil 3967-Area C/N-T2-1B	20.2	%	0.5
23A	Soil 3967-Area C/N-T2-2A	19.8	%	0.5
24A	Soil 3967-Area C/N-T2-2B	19.5	%	0.5
25A	Soil 3967-Area C/N-T2-3A	19.7	%	0.5
26A	Soil 3967-Area C/N-T2-3B	19.3	%	0.5
27A	Soil 3967-Area C/N-T2-4A	21.2	%	0.5
28A	Soil 3967-Area C/N-T2-4B	18.8	%	0.5
29A	Soil 3967-Area C/N-T2-5A	18.8	%	0.5
30A	Soil 3967-Area C/N-T2-5B	19.1	%	0.5

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-1A Lab No. 01
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		5.9
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		5.9
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	2.7	J	5.9
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		5.
75-09-2	Methylene chloride	5.4	JB	5.9	79-00-5	1,1,2-Trichloroethane	<EQL		5.9
67-64-1	Acetone	42		12	71-43-2	Benzene	<EQL		5.
75-15-0	Carbon disulfide	<EQL		5.9	10061-01-5	cis-1,3-Dichloropropene	<EQL		5.
75-35-4	1,1-Dichloroethene	<EQL		5.9	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		5.9	75-25-2	Bromoform	<EQL		5
156-60-5	1,2-Dichloroethene (total)	<EQL		5.9	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		5.9	108-10-1	4-Methyl-2-pentanone	<EQL		[illegible]
107-06-2	1,2-Dichloroethane	<EQL		5.9	127-18-4	Tetrachloroethene	<EQL		[illegible]
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		5.
71-55-6	1,1,1-Trichloroethane	1.9	J	5.9	108-90-7	Chlorobenzene	<EQL		[illegible]
56-23-5	Carbon tetrachloride	<EQL		5.9	100-41-4	Ethyl benzene	<EQL		5.
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		[illegible]
75-27-4	Bromodichloromethane	<EQL		5.9		Xylenes	3.4	J	[illegible]
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		5.9					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	12
Toluene-d8	104	81 -	11
4-Bromofluorobenzene	100	74 -	1

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-1B Lab No. 02
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/07/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.0
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.0
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	6.3		6.0
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.0
75-09-2	Methylene chloride	1.7	J	6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.0
67-64-1	Acetone	16		12	71-43-2	Benzene	<EQL		6.0
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.0
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.0	75-25-2	Bromoform	<EQL		6.0
156-60-5	1,2-Dichloroethene (total)	<EQL		6.0	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6.0
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.0
71-55-6	1,1,1-Trichloroethane	8.4		6.0	108-90-7	Chlorobenzene	<EQL		6.0
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	2.3	J	6.0
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	15		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	80	70 -	121
Toluene-d8	104	81 -	117
4-Bromofluorobenzene	96	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description	Soil 3967-Area B-T2-2A	Lab No.	03
Test Description	Volatiles by GC/MS	Test Code	8240

DATE ANALYZED 11/07/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		5.
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		5.
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		5.9
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		5.
75-09-2	Methylene chloride	1.9	JB	5.9	79-00-5	1,1,2-Trichloroethane	<EQL		5.9
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		5.
75-15-0	Carbon disulfide	<EQL		5.9	10061-01-5	cis-1,3-Dichloropropene	<EQL		5
75-35-4	1,1-Dichloroethene	<EQL		5.9	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		5.9	75-25-2	Bromoform	<EQL		5
156-60-5	1,2-Dichloroethene (total)	<EQL		5.9	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		5.9	108-10-1	4-Methyl-2-pentanone	<EQL		
107-06-2	1,2-Dichloroethane	<EQL		5.9	127-18-4	Tetrachloroethene	<EQL		5
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		5.9
71-55-6	1,1,1-Trichloroethane	9.9		5.9	108-90-7	Chlorobenzene	<EQL		5
56-23-5	Carbon tetrachloride	<EQL		5.9	100-41-4	Ethyl benzene	<EQL		5.
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		5
75-27-4	Bromodichloromethane	<EQL		5.9		Xylenes	<EQL		5
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		5.9					

SURROGATE	% RECOVERY	LIMITS		
1,2-Dichloroethane-d4	81	70	-	121
Toluene-d8	103	81	-	117
4-Bromofluorobenzene	90	74	-	12

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-2B Lab No. 04
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQ
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		6.
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.
75-09-2	Methylene chloride	6.5	B	6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		24
75-34-3	1,1-Dichloroethane	0.9	J	6.0	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.0	591-78-6	2-Hexanone	<EQL		1
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6
71-55-6	1,1,1-Trichloroethane	9.5		6.0	108-90-7	Chlorobenzene	<EQL		6
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	<EQL		6
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	<EQL		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS		
1,2-Dichloroethane-d4	103	70	-	12
Toluene-d8	106	81	-	11
4-Bromofluorobenzene	100	74	-	12

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-3A Lab No. 05
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	8.4	B	6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.1
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.1
71-55-6	1,1,1-Trichloroethane	12		6.1	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6.1
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	<EQL		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	104	70 -	121
Toluene-d8	106	81 -	117
4-Bromofluorobenzene	100	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-3B Lab No. 06
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQ
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	11		6.
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.
75-09-2	Methylene chloride	6.0	JB	6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		24
75-34-3	1,1-Dichloroethane	0.6	J	6.0	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.0	591-78-6	2-Hexanone	<EQL		1
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6
71-55-6	1,1,1-Trichloroethane	9.9		6.0	108-90-7	Chlorobenzene	<EQL		6
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	<EQL		6
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	<EQL		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	121
Toluene-d8	106	81 -	11
4-Bromofluorobenzene	100	74 -	12

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-4A Lab No. 07
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	8.7		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	6.9	B	6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.1
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.1
156-60-5	1,2-Dichloroethene (total)	<EQL		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.1
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.1
71-55-6	1,1,1-Trichloroethane	6.0	J	6.1	108-90-7	Chlorobenzene	<EQL		6.1
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6.1
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	<EQL		6.1
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	107	70 -	121
Toluene-d8	106	81 -	117
4-Bromofluorobenzene	99	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-4B Lab No. 08
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQ
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	19		6.
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.
75-09-2	Methylene chloride	3.9	J	6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.
67-64-1	Acetone	40	B	12	71-43-2	Benzene	<EQL		6.
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		24
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.1	591-78-6	2-Hexanone	<EQL		1
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.
71-55-6	1,1,1-Trichloroethane	15		6.1	108-90-7	Chlorobenzene	<EQL		6
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	<EQL		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	103	70 - 121
Toluene-d8	104	81 - 117
4-Bromofluorobenzene	95	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-5A Lab No. 09
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.0
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.0
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	12		6.0
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.0
75-09-2	Methylene chloride	3.0	J	6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.0
67-64-1	Acetone	28	B	12	71-43-2	Benzene	<EQL		6.0
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	1.0	J	6.0	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.0	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.0
71-55-6	1,1,1-Trichloroethane	13		6.0	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	<EQL		6.0
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	4.5	J	6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	104	70 - 121
Toluene-d8	106	81 - 117
4-Bromofluorobenzene	100	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area B-T2-5B Lab No. 10
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	11		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	2.9	J	6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	100	B	12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.1
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	0.8	J	6.1	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	<EQL		6.1	591-78-6	2-Hexanone	<EQL		1
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	0.8	J	6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.
71-55-6	1,1,1-Trichloroethane	14		6.1	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	4.9	J	6.
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	31		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	121
Toluene-d8	106	81 -	117
4-Bromofluorobenzene	101	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-1A Lab No. 11
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.
75-01-4	Vinyl chloride	8.7	J	12	79-01-6	Trichloroethene	25		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6
75-09-2	Methylene chloride	10		6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	170		12	71-43-2	Benzene	<EQL		6
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6
156-60-5	1,2-Dichloroethene (total)	47		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		[illegible]
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6 1
78-93-3	2-Butanone	29		12	108-88-3	Toluene	1.2	J	6.1
71-55-6	1,1,1-Trichloroethane	<EQL		6.1	108-90-7	Chlorobenzene	<EQL		1
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	2.4	J	6.1
108-05-4	Vinyl acetate	72		12	100-42-5	Styrene	<EQL		1
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	43	B	[illegible]
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	107	70 -	1
Toluene-d8	114	81 -	117
4-Bromofluorobenzene	93	74 -	1

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-1B Lab No. 12
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	12		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	7.0	B	6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	84	B	12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.1
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.1
156-60-5	1,2-Dichloroethene (total)	13		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.1
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.1
71-55-6	1,1,1-Trichloroethane	<EQL		6.1	108-90-7	Chlorobenzene	<EQL		6.1
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6.1
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.1
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	34		6.1
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	98	70 -	121
Toluene-d8	113	81 -	117
4-Bromofluorobenzene	90	74 -	121

Work Order # 95-10-326　　Ross Analytical Services, Inc　　Reported: 11/27/95

Sample Description　Soil 3967-Area C-T2-2A　　Lab No. 13
Test Description　Volatiles by GC/MS　　Test Code 8240

DATE ANALYZED 11/09/95　　DILUTION FACTOR 1　　UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	7.2	J	12	79-01-6	Trichloroethene	31		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	7.8		6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	33		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.1
71-55-6	1,1,1-Trichloroethane	<EQL		6.1	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6.1
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	<EQL		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	121
Toluene-d8	113	81 -	117
4-Bromofluorobenzene	94	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-2B Lab No. 14
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	5.7	J	12	79-01-6	Trichloroethene	30		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	8.1		6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	44		6.2	591-78-6	2-Hexanone	<EQL		1
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	<EQL		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	107	70 -	121
Toluene-d8	106	81 -	117
4-Bromofluorobenzene	97	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-3A Lab No. 15
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	11		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	4.9	J	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	11		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	<EQL		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	100	70 - 121
Toluene-d8	110	81 - 117
4-Bromofluorobenzene	93	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-3B Lab No. 16
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.0
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.0
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	17		6.0
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.0
75-09-2	Methylene chloride	10	B	6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.0
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.0
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.0
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.0	75-25-2	Bromoform	<EQL		6.0
156-60-5	1,2-Dichloroethene (total)	23		6.0	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6.0
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.0
71-55-6	1,1,1-Trichloroethane	<EQL		6.0	108-90-7	Chlorobenzene	<EQL		6.0
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	<EQL		6.0
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.0
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	<EQL		6.0
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	100	70 - 121
Toluene-d8	113	81 - 117
4-Bromofluorobenzene	94	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-4A Lab No. 17
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.1
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.1
75-01-4	Vinyl chloride	9.8	J	12	79-01-6	Trichloroethene	20		6.1
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.1
75-09-2	Methylene chloride	9.4		6.1	79-00-5	1,1,2-Trichloroethane	<EQL		6.1
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.1
75-15-0	Carbon disulfide	<EQL		6.1	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.1
75-35-4	1,1-Dichloroethene	<EQL		6.1	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.1	75-25-2	Bromoform	<EQL		6.1
156-60-5	1,2-Dichloroethene (total)	17		6.1	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.1	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.1	127-18-4	Tetrachloroethene	<EQL		6.1
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.1
71-55-6	1,1,1-Trichloroethane	<EQL		6.1	108-90-7	Chlorobenzene	<EQL		6.1
56-23-5	Carbon tetrachloride	<EQL		6.1	100-41-4	Ethyl benzene	<EQL		6.1
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.1
75-27-4	Bromodichloromethane	<EQL		6.1		Xylenes	1.6	J	6.1
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.1					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	121
Toluene-d8	111	81 -	117
4-Bromofluorobenzene	93	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-4B Lab No. 18
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	22		12	79-01-6	Trichloroethene	32		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	8.5		6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	30		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.2
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.2
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	2.2	J	6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	105	70 - 121
Toluene-d8	111	81 - 117
4-Bromofluorobenzene	93	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-5A Lab No. 19
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.0
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.0
75-01-4	Vinyl chloride	6.4	J	12	79-01-6	Trichloroethene	28		6.0
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.0
75-09-2	Methylene chloride	10		6.0	79-00-5	1,1,2-Trichloroethane	<EQL		6.0
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.0
75-15-0	Carbon disulfide	<EQL		6.0	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.0
75-35-4	1,1-Dichloroethene	<EQL		6.0	110-75-8	2-Chloroethyl vinyl ether	<EQL		240
75-34-3	1,1-Dichloroethane	<EQL		6.0	75-25-2	Bromoform	<EQL		6.0
156-60-5	1,2-Dichloroethene (total)	26		6.0	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.0	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.0	127-18-4	Tetrachloroethene	<EQL		6.0
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	0.8	J	6.0
71-55-6	1,1,1-Trichloroethane	<EQL		6.0	108-90-7	Chlorobenzene	<EQL		6.0
56-23-5	Carbon tetrachloride	<EQL		6.0	100-41-4	Ethyl benzene	1.0	J	6.0
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.0
75-27-4	Bromodichloromethane	<EQL		6.0		Xylenes	19		6.0
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.0					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	106	70 - 121
Toluene-d8	111	81 - 117
4-Bromofluorobenzene	93	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C-T2-5B Lab No. 20
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	20		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	5.2	J	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	20		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	20		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	22		6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	82	70 - 121
Toluene-d8	107	81 - 117
4-Bromofluorobenzene	83	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-1A Lab No. 21
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	7.0		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	4.9	JB	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	100		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	8.3		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.2
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.2
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	13		6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	89	70 -	121
Toluene-d8	113	81 -	117
4-Bromofluorobenzene	85	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-1B Lab No. 22
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/09/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		13	78-87-5	1,2-Dichloropropane	<EQL		6.3
74-83-9	Bromomethane	<EQL		13	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.3
75-01-4	Vinyl chloride	<EQL		13	79-01-6	Trichloroethene	9.2		6.3
75-00-3	Chloroethane	<EQL		13	124-48-1	Dibromochloromethane	<EQL		6.3
75-09-2	Methylene chloride	5.8	JB	6.3	79-00-5	1,1,2-Trichloroethane	<EQL		6.3
67-64-1	Acetone	60		13	71-43-2	Benzene	<EQL		6.3
75-15-0	Carbon disulfide	<EQL		6.3	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.3
75-35-4	1,1-Dichloroethene	<EQL		6.3	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.3	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	13		6.3	591-78-6	2-Hexanone	<EQL		13
67-66-3	Chloroform	<EQL		6.3	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.3	127-18-4	Tetrachloroethene	<EQL		6.3
78-93-3	2-Butanone	<EQL		13	108-88-3	Toluene	<EQL		6.3
71-55-6	1,1,1-Trichloroethane	<EQL		6.3	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.3	100-41-4	Ethyl benzene	<EQL		6.3
108-05-4	Vinyl acetate	<EQL		13	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.3		Xylenes	13		6.3
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.3					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	89	70 -	121
Toluene-d8	104	81 -	117
4-Bromofluorobenzene	87	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-2A Lab No. 23
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	5.9	JB	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	17		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	12		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.2
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.2
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	6.4		6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	90	70 -	121
Toluene-d8	101	81 -	117
4-Bromofluorobenzene	91	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-2B Lab No. 24
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	12		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	10	B	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	16		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	12		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	5.6	J	6.
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	93	70 - 121
Toluene-d8	101	81 - 117
4-Bromofluorobenzene	89	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-3A Lab No. 25
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	19		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	7.4	B	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	16		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	19		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.2
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.2
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	11		6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	83	70 - 121
Toluene-d8	110	81 - 117
4-Bromofluorobenzene	87	74 - 121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-3B Lab No. 26
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	17		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	8.4	B	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	26		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	15		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		1
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	7.2		6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	89	70 -	121
Toluene-d8	107	81 -	117
4-Bromofluorobenzene	87	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-4A Lab No. 27
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		13	78-87-5	1,2-Dichloropropane	<EQL		6.3
74-83-9	Bromomethane	<EQL		13	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.3
75-01-4	Vinyl chloride	10	J	13	79-01-6	Trichloroethene	22		6.3
75-00-3	Chloroethane	<EQL		13	124-48-1	Dibromochloromethane	<EQL		6.3
75-09-2	Methylene chloride	5.8	JB	6.3	79-00-5	1,1,2-Trichloroethane	<EQL		6.3
67-64-1	Acetone	10	J	13	71-43-2	Benzene	<EQL		6.3
75-15-0	Carbon disulfide	<EQL		6.3	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.3
75-35-4	1,1-Dichloroethene	<EQL		6.3	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.3	75-25-2	Bromoform	<EQL		6.3
156-60-5	1,2-Dichloroethene (total)	24		6.3	591-78-6	2-Hexanone	<EQL		13
67-66-3	Chloroform	<EQL		6.3	108-10-1	4-Methyl-2-pentanone	<EQL		13
107-06-2	1,2-Dichloroethane	<EQL		6.3	127-18-4	Tetrachloroethene	<EQL		6.3
78-93-3	2-Butanone	<EQL		13	108-88-3	Toluene	<EQL		6.3
71-55-6	1,1,1-Trichloroethane	<EQL		6.3	108-90-7	Chlorobenzene	<EQL		6.3
56-23-5	Carbon tetrachloride	<EQL		6.3	100-41-4	Ethyl benzene	<EQL		6.3
108-05-4	Vinyl acetate	<EQL		13	100-42-5	Styrene	<EQL		6.3
75-27-4	Bromodichloromethane	<EQL		6.3		Xylenes	6.9	J	6.3
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.3					

SURROGATE	% RECOVERY	LIMITS
1,2-Dichloroethane-d4	106	70 - 121
Toluene-d8	111	81 - 117
4-Bromofluorobenzene	93	74 - 121

Work Order # 95-10-326   Ross Analytical Services, Inc   Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-4B   Lab No. 28
Test Description Volatiles by GC/MS   Test Code 8240

DATE ANALYZED 11/10/95   DILUTION FACTOR 1   UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	4.6	JB	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	16		12	71-43-2	Benzene	<EQL		6.
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	14		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	6.8		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	105	70	121
Toluene-d8	111	81	117
4-Bromofluorobenzene	93	74	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-5A Lab No. 29
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	10		6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.2
75-09-2	Methylene chloride	5.6	JB	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	16		12	71-43-2	Benzene	<EQL		6.2
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.2
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.2
156-60-5	1,2-Dichloroethene (total)	9.7		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		12
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6.2
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	0.8	J	6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6.2
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.2
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6.2
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	12		6.2
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	106	70 -	121
Toluene-d8	104	81 -	117
4-Bromofluorobenzene	100	74 -	121

Work Order # 95-10-326 Ross Analytical Services, Inc Reported: 11/27/95

Sample Description Soil 3967-Area C/N-T2-5B Lab No. 30
Test Description Volatiles by GC/MS Test Code 8240

DATE ANALYZED 11/10/95 DILUTION FACTOR 1 UNITS ug/Kg

CAS NO.	COMPOUND	RESULT		EQL	CAS NO.	PARAMETER	RESULT		EQL
74-87-3	Chloromethane	<EQL		12	78-87-5	1,2-Dichloropropane	<EQL		6.2
74-83-9	Bromomethane	<EQL		12	10061-02-6	trans-1,3-Dichloropropene	<EQL		6.2
75-01-4	Vinyl chloride	<EQL		12	79-01-6	Trichloroethene	5.6	J	6.2
75-00-3	Chloroethane	<EQL		12	124-48-1	Dibromochloromethane	<EQL		6.
75-09-2	Methylene chloride	7.1	B	6.2	79-00-5	1,1,2-Trichloroethane	<EQL		6.2
67-64-1	Acetone	<EQL		12	71-43-2	Benzene	<EQL		6.
75-15-0	Carbon disulfide	<EQL		6.2	10061-01-5	cis-1,3-Dichloropropene	<EQL		6.
75-35-4	1,1-Dichloroethene	<EQL		6.2	110-75-8	2-Chloroethyl vinyl ether	<EQL		250
75-34-3	1,1-Dichloroethane	<EQL		6.2	75-25-2	Bromoform	<EQL		6.
156-60-5	1,2-Dichloroethene (total)	8.5		6.2	591-78-6	2-Hexanone	<EQL		12
67-66-3	Chloroform	<EQL		6.2	108-10-1	4-Methyl-2-pentanone	<EQL		
107-06-2	1,2-Dichloroethane	<EQL		6.2	127-18-4	Tetrachloroethene	<EQL		6
78-93-3	2-Butanone	<EQL		12	108-88-3	Toluene	<EQL		6.2
71-55-6	1,1,1-Trichloroethane	<EQL		6.2	108-90-7	Chlorobenzene	<EQL		6
56-23-5	Carbon tetrachloride	<EQL		6.2	100-41-4	Ethyl benzene	<EQL		6.
108-05-4	Vinyl acetate	<EQL		12	100-42-5	Styrene	<EQL		6
75-27-4	Bromodichloromethane	<EQL		6.2		Xylenes	8.8		6
79-34-5	1,1,2,2-Tetrachloroethane	<EQL		6.2					

SURROGATE	% RECOVERY	LIMITS	
1,2-Dichloroethane-d4	107	70 -	121
Toluene-d8	110	81 -	117
4-Bromofluorobenzene	95	74 -	12

Key To Sample ID For Analytical Samples- T=4 Weeks

Lab ID	Description
11160-01A	Area B soil- sterile control, Dup1
11160-02A	sterile control, Dup2
11160-03A	Area B soil- soil alone, Dup1
11160-04A	soil alone, Dup2
11160-05A	Area B soil- soil + nutrients, Dup1
11160-06A	soil + nutrients, Dup2
11160-07A	Area B soil- soil + nutrients + carbon source, Dup1
11160-08A	soil + nutrients + carbon source, Dup2
11160-09A	Area B soil- soil + nutrients + carbon + bacteria, Dup1
11160-10A	soil + nutrients + carbon + bacteria, Dup2
11160-11A	Area C soil + 5% vermiculite, sterile control, Dup1
11160-12A	soil + 5% vermiculite, sterile control, Dup2
11160-13A	Area C soil + 5% vermiculite, Dup1
11160-14A	soil + 5% vermiculite, Dup2
11160-15A	Area C soil + 5% vermiculite + nutrients, Dup1
11160-16A	soil + 5% vermiculite + nutrients, Dup2
11160-17A	Area C soil + 5% vermiculite + nutrients + carbon, Dup1
11160-18A	soil + 5% vermiculite + nutrients + carbon, Dup2
11160-19A	Area C soil + 5% vermiculite + nutrients + carbon + bacteria, Dup1
11160-20A	soil + 5% vermiculite + nutrients + carbon + bacteria, Dup2
11160-21A	Area C soil + 5% NAPL + 5% vermiculite, sterile control, Dup1
11160-22A	soil + 5% NAPL + 5% vermiculite, sterile control, Dup2
11160-23A	Area C soil + 5% NAPL + 5% vermiculite, Dup1
11160-24A	soil + 5% NAPL + 5% vermiculite, Dup2
11160-25A	Area C soil + 5% NAPL + 5% vermiculite + nutrients, Dup1
11160-26A	soil + 5% NAPL + 5% vermiculite + nutrients, Dup2
11160-27A	Area C soil + 5% NAPL + 5% vermiculite + nutrients + carbon, Dup1
11160-28A	soil + 5% NAPL + 5% vermiculite + nutrients + carbon, Dup2
11160-29A	Area C soil + 5% NAPL + 5% vermiculite + nutrients + carbon + bacteria, Dup1
11160-30A	soil + 5% NAPL + 5% vermiculite + nutrients + carbon + bacteria, Dup2

ROSS **Ross Analytical Services, Inc.**
16433 Foltz Industrial Parkway • Strongsville, Ohio 44136
(216) 572-3200 • Fax (216) 572-7620 • 1-800-325-7737

CERTIFICATE OF ANALYSIS

Client:

Treatek - CRA
2055 Niagara Falls Blvd
Suite 3
Niagara Falls, NY 14304
Attn: Cindy Lin

Work Order #: 95-11-160
Client Code: CRA
Report Date: 12/07/95
Work ID: Soils for 8240
Date Received: 11/16/95

Purchase Order: Leica, 3967

SAMPLE IDENTIFICATION

Lab Number	Sample Description	Lab Number	Sample Description
01	Soil 3967-Area B-T4-1A	02	Soil 3967-Area B-T4-1B
03	Soil 3967-Area B-T4-2A	04	Soil 3967-Area B-T4-2B
05	Soil 3967-Area B-T4-3A	06	Soil 3967-Area B-T4-3B
07	Soil 3967-Area B-T4-4A	08	Soil 3967-Area B-T4-4B
09	Soil 3967-Area B-T4-5A	10	Soil 3967-Area B-T4-5B
11	Soil 3967-Area C-T4-1A	12	Soil 3967-Area C-T4-1B
13	Soil 3967-Area C-T4-2A	14	Soil 3967-Area C-T4-2B
15	Soil 3967-Area C-T4-3A	16	Soil 3967-Area C-T4-3B
17	Soil 3967-Area C-T4-4A	18	Soil 3967-Area C-T4-4B
19	Soil 3967-Area C-T4-5A	20	Soil 3967-Area C-T4-5B
21	Soil 3967-Area CN-T4-1A	22	Soil 3967-Area CN-T4-1B
23	Soil 3967-Area CN-T4-2A	24	Soil 3967-Area CN-T4-2B
25	Soil 3967-Area CN-T4-3A	26	Soil 3967-Area CN-T4-3B
27	Soil 3967-Area CN-T4-4A	28	Soil 3967-Area CN-T4-4B
29	Soil 3967-Area CN-T4-5A	30	Soil 3967-Area CN-T4-5B

Data are reported on an as-received basis unless stated otherwise. Estimated Quantitation Limits (EQL's) are listed for most analytes. EQL's are the lowest concentrations that can be reliably measured under routine laboratory conditions. Unless otherwise noted, method blanks had no targets found above their EQL's and results were not corrected for blanks.

Certificate approved by
Carol L. Turner

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-01A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773238

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073238A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	19	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-01A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773238

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073238A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-01A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773238

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073238A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-02A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773241

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073241A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 14 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	15	B
67-64-1	Acetone	10	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	1	J
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	2	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-02A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773241

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073241A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 14 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-02A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773241

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073241A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 14 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-03A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773242

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073242A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	18	B
67-64-1	Acetone	10	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	2	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-03A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773242

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073242A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-03A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773242

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073242A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-04A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31385 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773243

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073243A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 18 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	20	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A

SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

11160-04A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773243

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073243A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 18 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-04A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773243

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073243A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 18 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-05A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773244

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073244A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	17	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	2	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-05A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773244

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073244A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-05A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773244

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073244A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-06A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP.　Contract: 500955

Lab Code: COMPU　Case No.: 31388　SAS No.:　SDG No.: 00156

Matrix: (soil/water) SOIL　Lab Sample ID: 773245

Sample wt/vol: 5.0 (g/mL) G　Lab File ID: GH073245A56.D

Level: (low/med) LOW　Date Received: 11/24/95

% Moisture: not dec. 15　Date Analyzed: 11/27/95

GC Column:DB624　ID: 0.53 (mm)　Dilution Factor: 1.0

Soil Extract Volume: ______(uL)　Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	10	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	4	J
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	3	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

VOLATILE ORGANICS ANALYSIS DATA SHEET

11160-06A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773245

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073245A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-06A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773245

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073245A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-07A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773246

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073246A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	11	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	1	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-07A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773246

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073246A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-07A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773246

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073246A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-08A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773247

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073247A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-08A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773247

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073247A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

SAMPLE NO.

11160-08A

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773247

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073247A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-09A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773248

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073248A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	10	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	2	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

VOLATILE ORGANICS ANALYSIS DATA SHEET

11160-09A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773248

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073248A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	2	J
1330-20-7	o-Xylene	2	J

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-09A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773248

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073248A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-10A

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VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773249

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073249A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	14	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	1	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-10A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773249

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073249A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-10A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773249

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073249A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/27/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-11A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773250

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073250A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	19	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-11A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773250

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073250A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-11A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773250

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073250A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-12A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773251

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073251A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-12A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773251

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073251A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-12A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773251

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073251A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/27/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

11160-13A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773252

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073252A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	6	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-13A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773252

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073252A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	1	J
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-13A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773252

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073252A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-14A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773253

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073253A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	10	JB
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-14A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773253

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073253A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	2	J
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-14A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773253

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073253A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
Number TICs found: 0   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-15A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00156

Matrix: (soil/water) SOIL   Lab Sample ID: 773254

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073254A56.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	13	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
156-60-5	trans-1,2-Dichloroethene	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-15A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00156

Matrix: (soil/water) SOIL Lab Sample ID: 773254

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073254A56.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
156-59-2	cis-1,2-Dichloroethene	12	U
1330-20-7	m,p-Xylene	12	U
1330-20-7	o-Xylene	12	U

SAMPLE NO.

11160-16A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV CORP Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773255

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073255C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 14 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	21	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	2	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	2	J

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-16A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773255

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073255C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 14   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ________(uL)   Soil Aliquot Volume: ______(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-16A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773255

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073255C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 14 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ________(uL) Soil Aliquot Volume: ______(uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-17A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773256

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073256C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	15	B
67-64-1	Acetone	25	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	2	J

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-17A

Lab Name: COMPUCHEM ENV. CORP.　Contract: 500955

Lab Code: COMPU　Case No.: 31388　SAS No.:　SDG No.: 00157

Matrix: (soil/water) SOIL　Lab Sample ID: 773256

Sample wt/vol: 5.0 (g/mL) G　Lab File ID: GH073256C51.D

Level: (low/med) LOW　Date Received: 11/24/95

% Moisture: not dec. 16　Date Analyzed: 11/28/95

GC Column:DB624　ID: 0.53 (mm)　Dilution Factor: 1.0

Soil Extract Volume: _______ (uL)　Soil Aliquot Volume: _____ (uL)

CAS NO. COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7-------Xylene (total)	12	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-17A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773256

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073256C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-18A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773259

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073259C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 18   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	18	B
67-64-1	Acetone	17	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	1	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	2	J

SAMPLE NO.

11160-18A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773259

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073259C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 18 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

page 2 of 2 FORM I VOA

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-18A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773259

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073259C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 18 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-19A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773260

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073260C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	17	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-19A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773260

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073260C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
11160-19A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773260

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073260C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

11160-20A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773261

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073261C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	17	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	1	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	2	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-20A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773261

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073261C51.D

Level: (low/med)   LOW   Date Received: 11/24/95

% Moisture: not dec. 17   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-20A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773261

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073261C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 17   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-21A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773262

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073262C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 15   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	16	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-21A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773262

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073262C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-21A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773262

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073262C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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FORM I VOA-TIC

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-22A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773263

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073263C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	11	JB
67-64-1	Acetone	11	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-22A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773263

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073263C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-22A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773263

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073263C51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 17   Date Analyzed: 11/28/95

GC Column: DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______(uL)   Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
Number TICs found: 0   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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SAMPLE NO.

11160-23A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773264

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GR073264B51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 17   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	13	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-23A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773264

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GR073264B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-23A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773264

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GR073264B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-24A

Lab Name: COMPUCHEM ENV. CORP.　　Contract: 500955

Lab Code: COMPU　　Case No.: 31388　　SAS No.:　　SDG No.: 00157

Matrix: (soil/water) SOIL　　Lab Sample ID: 773265

Sample wt/vol: 5.0 (g/mL) G　　Lab File ID: GR073265B51.D

Level: (low/med) LOW　　Date Received: 11/24/95

% Moisture: not dec. 16　　Date Analyzed: 11/28/95

GC Column:DB624　　ID: 0.53 (mm)　　Dilution Factor: 1.0

Soil Extract Volume: ______(uL)　　Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	10	JB
67-64-1	Acetone	18	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-24A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773265

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GR073265B51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7-------	Xylene (total)	12	U

page 2 of 2   FORM I VOA

SAMPLE NO.

11160-24A

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773265

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GR073265B51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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FORM I VOA-TIC

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-25A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773266

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073266C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	15	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

SAMPLE NO.

11160-25A

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773266

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073266C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-25A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773266

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073266C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 17 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-26A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773267

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073267C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	27	B
67-64-1	Acetone	12	U
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-26A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773267

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073267C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-26A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773267

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073267C51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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FORM I VOA-TIC

SAMPLE NO.

11160-27A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773268

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073268B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	32	B
67-64-1	Acetone	17	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-27A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773268

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073268B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-27A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773268

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073268B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 15 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-28A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773269

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073269B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	20	B
67-64-1	Acetone	19	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
11160-28A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773269

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073269B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-28A

Lab Name: COMPUCHEM ENV. CORP.   Contract: 500955

Lab Code: COMPU   Case No.: 31388   SAS No.:   SDG No.: 00157

Matrix: (soil/water) SOIL   Lab Sample ID: 773269

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: GH073269B51.D

Level: (low/med) LOW   Date Received: 11/24/95

% Moisture: not dec. 16   Date Analyzed: 11/28/95

GC Column:DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: _______(uL)   Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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FORM I VOA-TIC

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-29A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773270

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073270B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	21	B
67-64-1	Acetone	16	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-29A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773270

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073270B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

11160-29A

Lab Name: COMPUCHEM ENV. CORP.　　Contract: 500955

Lab Code: COMPU　　Case No.: 31388　　SAS No.:　　SDG No.: 00157

Matrix: (soil/water) SOIL　　Lab Sample ID: 773270

Sample wt/vol: 5.0 (g/mL) G　　Lab File ID: GH073270B51.D

Level: (low/med) LOW　　Date Received: 11/24/95

% Moisture: not dec. 16　　Date Analyzed: 11/28/95

GC Column:DB624　　ID: 0.53 (mm)　　Dilution Factor: 1.0

Soil Extract Volume: _______(uL)　　Soil Aliquot Volume: _____(uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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FORM I VOA-TIC

SAMPLE NO.

11160-30A

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773271

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073271B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	19	B
67-64-1	Acetone	16	
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
108-05-4	Vinyl Acetate	120	U
540-59-0	1,2-Dichloroethene (total)	12	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

11160-30A

Lab Name: COMPUCHEM ENV. CORP. Contract: 500955

Lab Code: COMPU Case No.: 31388 SAS No.: SDG No.: 00157

Matrix: (soil/water) SOIL Lab Sample ID: 773271

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH073271B51.D

Level: (low/med) LOW Date Received: 11/24/95

% Moisture: not dec. 16 Date Analyzed: 11/28/95

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _______(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
1330-20-7	-------Xylene (total)	12	U

TREATEK CHAIN OF CUSTODY RECORD

PROJECT NO. 3967

PROJECT NAME Lee C.U

SAMPLERS: (SIGNATURE) Cynthia Lin

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	DESCRIPTION OF ANALYSIS & BOTTLE TYPE: particle size analysis					REMARKS (MEDIA TYPE, PRESERVATIVE, TOTAL OR DISSOLVED METALS, ETC.)
#3967-Area B-#	9/13/95	3 pm	✓			1						by sieve & hydrometer
#3967-Area C	9/13/95	3 pm	✓			1						

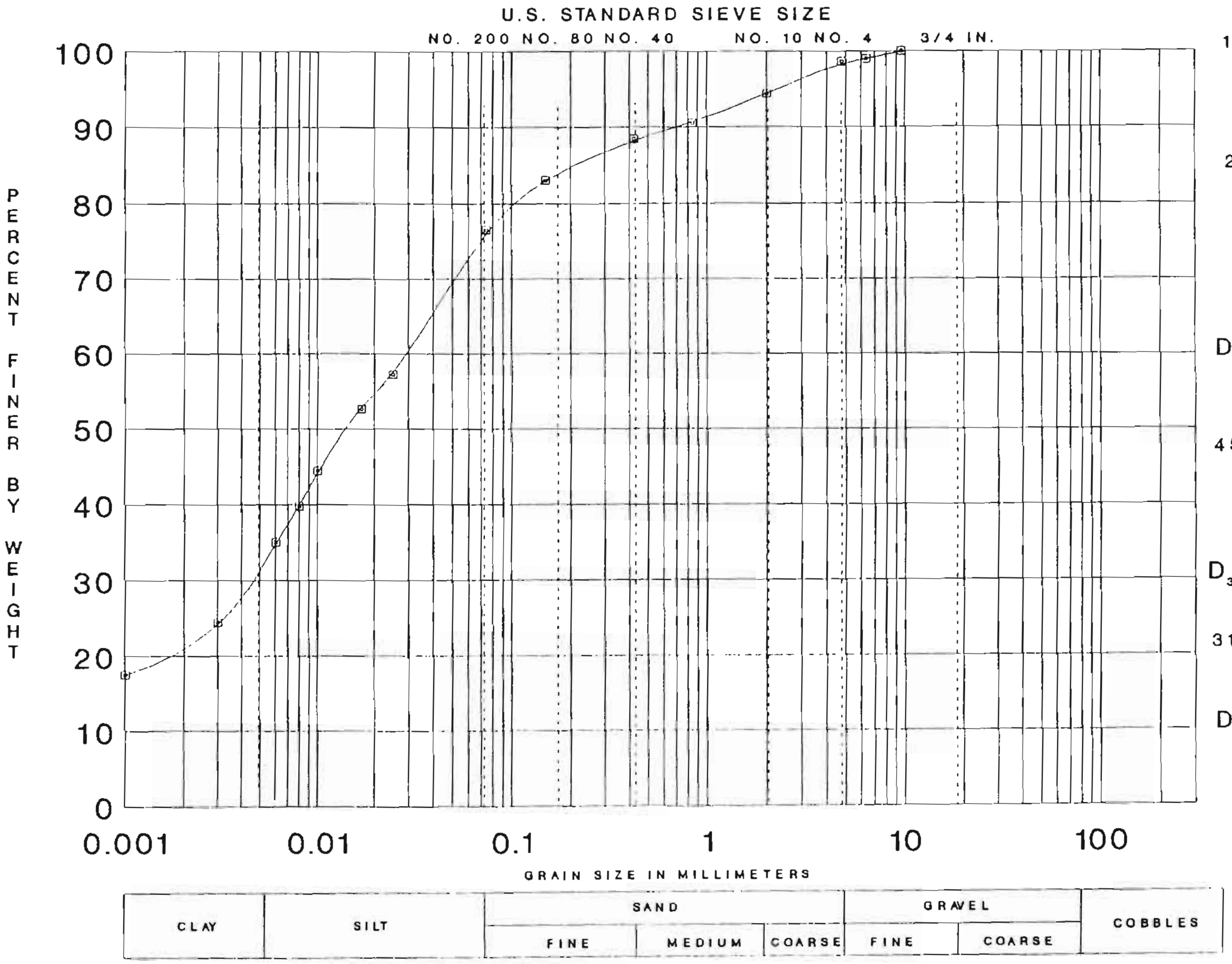
RELINQUISHED BY: (SIGNATURE) Greg Bach	TIME 1600	DATE 9/13/95	RECEIVED BY: (SIGNATURE) Rich Couch	TIME 1600	DATE 9/13/95	SHIPPERS TRACKING NO.
RELINQUISHED BY: (SIGNATURE)	TIME	DATE	RECEIVED BY: (SIGNATURE)	TIME	DATE	REMARKS.
RELINQUISHED BY: (SIGNATURE)	TIME	DATE	RECEIVED BY: (SIGNATURE)	TIME	DATE	

Nº 11469

GRAIN SIZE ANALYSIS

Area C 9/18/95 Job No: 95-1297

C_c = NA C_u = NA LL = NT PL = NT PI = NT USCS = ML



1.4% Gravel

22.1% Sand

D_{60} = NA

45.2% Silt

D_{30} = NA

31.3% Clay

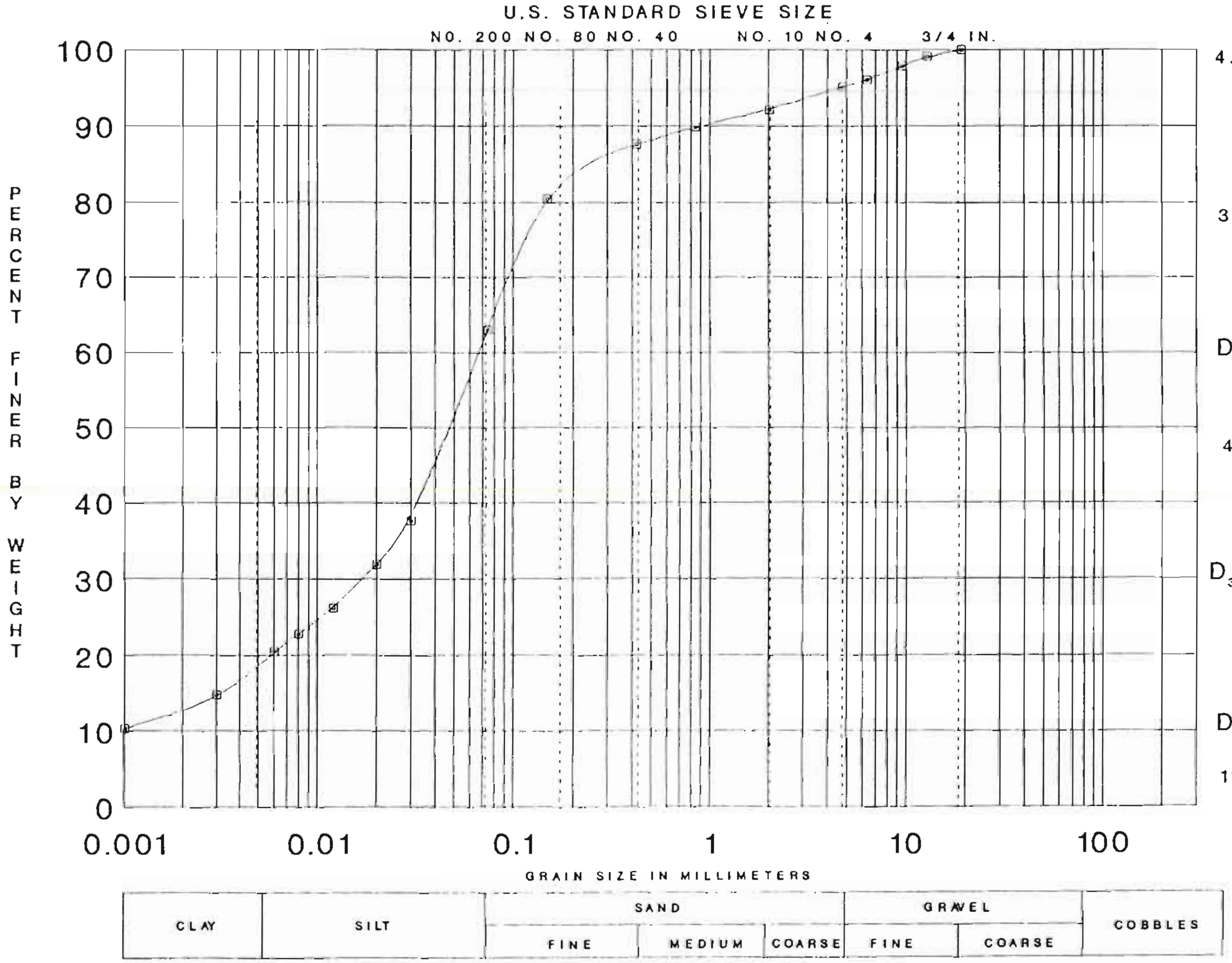
D_{10} = NA

BUFFALO DRILLING COMPANY, INC.

GRAIN SIZE ANALYSIS

Area B 9/18/95 Job No: 95-1297

C_c = NA C_u = NA LL = NT PL = NT PI = NT USCS = ML



4.9% Gravel

32.1% Sand

D_{60} = NA

43.8% Silt

D_{30} = NA

D_{10} = NA

19.2% Clay

BUFFALO DRILLING COMPANY, INC.

BUFFALO DRILLING COMPANY
INC.
10440 MAIN STREET
CLARENCE, NEW YORK
14031
(716) 759-7821
FAX (716) 759-7823

September 22, 1995 JOB NO.:95-1297

TreaTek-CRA Company
2055 Niagara Falls Boulevard, Suite Three
Niagara Falls, New York 14304

ATTN: Dr. Cindy Lin

RE: Grain Size Testing of a
Contaminated Soil Samples
Leica Project, Cheektowaga, New York
(TreaTek-CRA Project No. 3967)
(P.O. No. Pott0003705)

Ladies/Gentlemen:

Buffalo Drilling Company, Inc. (BDC) is enclosing the individual grain size analysis graphs for the above referenced project. The samples were tested in accordance with the following method:

- ASTM D422 Particle Size Analysis of Soils

The entire contents of each sample container was used. Note that, due to the presence of gravel sized material, the dry weight of sample #3967- Area B was less than that required for grain size testing purposes.

This data represents the laboratory testing results for the two samples that were provided by TreaTek-CRA on September 13, 1995. A copy of the chain-of-custody record is also enclosed.

Please call either James S. Barron, P.E. or the undersigned at your earliest convenience, if questions should arise.

Very truly yours,
BUFFALO DRILLING COMPANY, INC.

Carmen M. Panuccio

Carmen M. Panuccio
Geotechnical Engineer

encls.

CO$_2$ RESPIRATION

SAMPLING DATE: 10/5/95 (t = 21 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
Area C + NAPL:			
(20ml) Control ①	19.30	70	1,010 975
(20ml) Control ②	19.50	50	940
(20ml) Treatment 1 ①	14.60	540	2,500 2,415
(20ml) Treatment 1 ②	14.70	530	2,330
(20ml) Treatment 2 ①	13.40	660	3,190 3,105
(20ml) Treatment 2 ②	13.90	610	3,020
(20ml) Treatment 3 ①	15.90	410	4,340 4,280
(20ml) Treatment 3 ②	16.30	370	4,220

CO_2 RESPIRATION

SAMPLING DATE: 10/2/95 (t = 18 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
	Area C + NAPL:			
(20ml)	Control ①	18.90	110	940 > 915
(20ml)	Control ②	19.10	90	890
(20ml)	Treatment 1 ①	17.00	300	1,960 > 1,880
(20ml)	Treatment 1 ②	17.40	260	1,800
(20ml)	Treatment 2 ①	15.70	430	2,530 > 2,470
(20ml)	Treatment 2 ②	16.00	400	2,410
(20ml)	Treatment 3 ①	16.40	360	3,930 > 3,890
(20ml)	Treatment 3 ②	16.50	350	3,850

CO_2 RESPIRATION

SAMPLING DATE: 9/28/95 (t = 14 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
	<u>Area C + NAPL</u>:			
(20ml)	Control ①	19.10	90	830 → 815
(20ml)	Control ②	19.20	80	800
(20ml)	Treatment 1 ①	18.50	150	1,660 → 1,600
(20ml)	Treatment 1 ②	18.50	150	1,540
(20ml)	Treatment 2 ①	17.60	240	2,100 → 2,055
(20ml)	Treatment 2 ②	17.40	260	2,010
(20ml)	Treatment 3 ①	17.30	270	3,570 → 3,535
(20ml)	Treatment 3 ②	17.40	260	3,500

CO_2 RESPIRATION

SAMPLING DATE: 9/26/95 (t=12 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
	Area C+NAPL:			
(20ml)	Control ①	18.50	150	740 > 730
(20ml)	Control ②	18.40	160	720
(20ml)	Treatment 1 ①	16.50	350	1510 > 1,450
(20ml)	Treatment 1 ②	16.10	390	1,390
(20ml)	Treatment 2 ①	14.90	510	1,860 > 1,805
(20ml)	Treatment 2 ②	14.80	520	1,750
(20ml)	Treatment 3 ①	14.10	590	3,300 > 3,270
(20ml)	Treatment 3 ②	14.00	600	3,240

CO_2 RESPIRATION

SAMPLING DATE: 9/22/95 (t = 8 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
Area C + NAPL:			
(20ml) Control ①	18.70	130	590 > 575
(20ml) Control ②	18.40	160	560
(20ml) Treatment 1 ①	17.00	300	1,160 > 1080
(20ml) Treatment 1 ②	17.40	260	1,000
(20ml) Treatment 2 ①	16.10	390	1,350 > 1,290
(20ml) Treatment 2 ②	16.90	310	1,230
(20ml) Treatment 3 ①	14.00	600	2,710 > 2,675
(20ml) Treatment 3 ②	14.60	540	2,640
Std:			
20ml 0.1N KOH 19.8ml 0.1N HCl			

Start Date: 9/14/95

CO$_2$ RESPIRATION

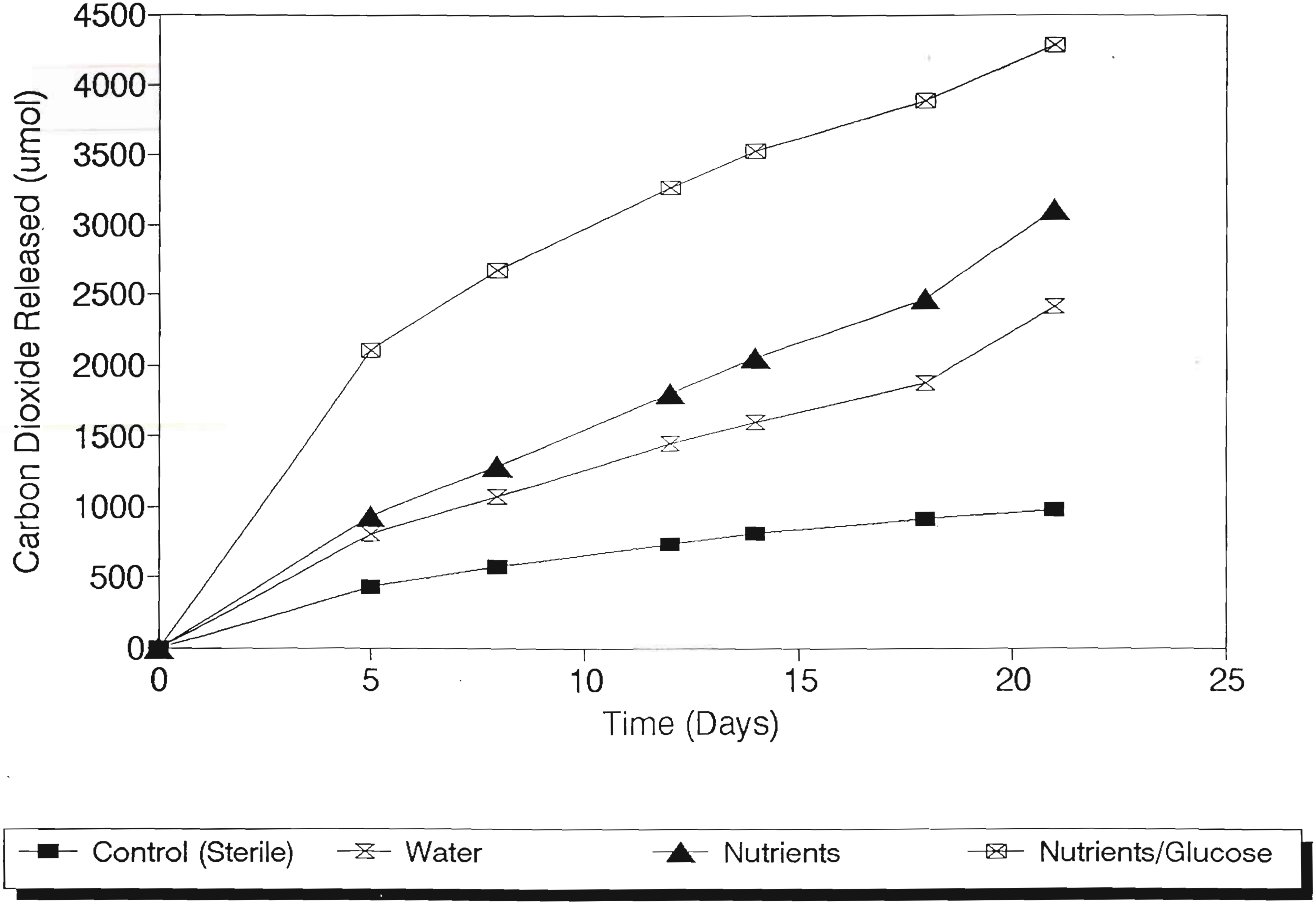
SAMPLING DATE: 9/19/95 (t=5days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
	Area C+NAPL:			
(20ml)	Control 1①	15.40	460	460 > 430
(20ml)	Control 1②	16.00	400	400
(20ml)	Treatment 1①	11.40	860	860 > 800
(20ml)	Treatment 1②	12.60	740	740
(20ml)	Treatment 2①	10.40	960	960 > 940
(20ml)	Treatment 2②	10.80	920	920
(30ml)	Treatment 3①	8.90	2,110	2,110 > 2105
(30ml)	Treatment 3②	9.00	2,100	2,100
	Std:			
	20ml 0.1N KOH 19.8ml 0.1N HCl			

Leica Site: Respirometric Test Results
Area C + NAPL Soil



CO_2 RESPIRATION

SAMPLING DATE: 10/5/95 (t = 21 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (μmol)	Cumulative CO_2 Released (μmol)
	Area C:			
(20ml)	Control ①	19.70	30	870 > 920
(20ml)	Control ②	19.40	60	970
(20ml)	Treatment 1 ①	18.30	170	2,200 > 2145
(20ml)	Treatment 1 ②	18.10	190	2,090
(20ml)	Treatment 2 ①	17.70	230	2,400 > 2,465
(20ml)	Treatment 2 ②	17.70	230	2,530
(20ml)	Treatment 3 ①	17.40	260	4,250 > 4,210
(20ml)	Treatment 3 ②	17.30	270	4,170

CO_2 RESPIRATION

SAMPLING DATE: 10/2/95 (t=18 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
Area C:			
(20ml) Control ①	19.00	100	840 ⟩ 875
(20ml) Control ②	18.80	120	910
(20ml) Treatment 1 ①	15.40	460	2,030 ⟩ 1,965
(20ml) Treatment 1 ②	15.70	430	1,900
(20ml) Treatment 2 ①	15.90	410	2,170 ⟩ 2,235
(20ml) Treatment 2 ②	15.90	410	2,300
(20ml) Treatment 3 ①	15.00	500	3,990 ⟩ 3,945
(20ml) Treatment 3 ②	15.40	460	3,900

CO$_2$ RESPIRATION

SAMPLING DATE: 9/28/95 (t=14 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
	Area C:			
(20ml)	Control ①	19.00	100	740 > 765
(20ml)	Control ②	19.00	100	790
(20 ml)	Treatment 1 ①	18.10	190	1,570 > 1,520
(20 ml)	Treatment 1 ②	18.20	180	1,470
(20ml)	Treatment 2 ①	17.70	230	1,760 > 1,825
(20ml)	Treatment 2 ②	17.40	260	1,890
(20 ml)	Treatment 3 ①	17.50	250	3,490 > 3,465
(20ml)	Treatment 3 ②	17.60	240	3,440
	Std:			
	20ml 0.1N KOH 19.8ml 0.1N HCl			

CO_2 RESPIRATION

SAMPLING DATE: 9/26/95 (t = 12 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
Area C:			
(20ml) Control ①	19.00	100	640 665
(20ml) Control ②	18.70	130	690
(20ml) Treatment 1 ①	16.30	370	1,380 1,335
(20ml) Treatment 1 ②	16.90	310	1,290
(20ml) Treatment 2 ①	16.20	380	1,530 1,580
(20ml) Treatment 2 ②	15.80	420	1,630
(20ml) Treatment 3 ①	14.60	540	3,240 3,220
(20ml) Treatment 3 ②	14.40	560	3,200
Std:			
20 ml 0.1N KOH 19.8 ml 0.1N HCl			

CO$_2$ RESPIRATION

SAMPLING DATE: 9/22/95 (t = 8 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
Area C:			
(20ml) Control 1 ①	18.70	130	540 } 550
(20ml) Control 1 ②	19.00	100	560
(20ml) Treatment 1 ①	18.00	200	1,010 } 995
(20ml) Treatment 1 ②	17.80	220	980
(20ml) Treatment 2 ①	17.40	260	1,150 } 1,180
(20ml) Treatment 2 ②	17.20	280	1,210
(20ml) Treatment 3 ①	14.60	540	2,700 } 2,670
(20ml) Treatment 3 ②	14.10	590	2,640
Std:			
20 ml 0.1N KOH 19.8 ml 0.1N HCl			

Start Date: 9/14/95

CO$_2$ RESPIRATION

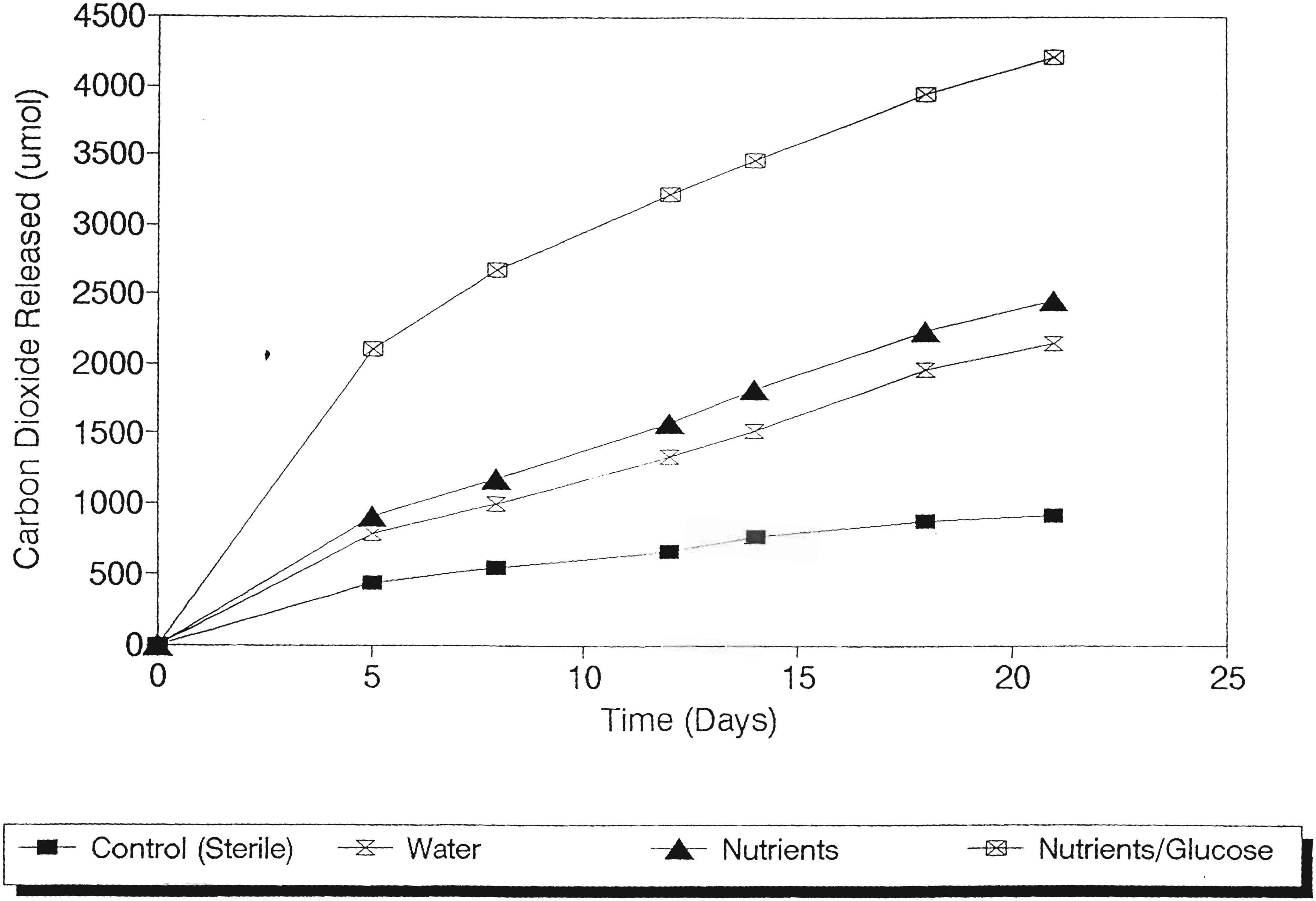
SAMPLING DATE: 9/19/95 (t = 5 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
Area C:			
(20ml) Control ①	15.90	410	410 435
(20ml) Control ②	15.40	460	460
(20ml) Treatment 1 ①	11.90	810	810 785
(20ml) Treatment 1 ②	12.40	760	760
(20ml) Treatment 2 ①	11.10	890	890 910
(20ml) Treatment 2 ②	10.70	930	930
(30ml) Treatment 3 ①	8.40	2,160	2160 2,105
(30ml) Treatment 3 ②	9.50	2,050	2,050
Std:			
20ml 0.1N KOH 19.8ml 0.1N HCl			

Leica Site: Respirometric Test Results
Area C Soil



CO_2 RESPIRATION

SAMPLING DATE: 10/5/95 (t = 21 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
	Area B:			
(20ml)	Control ①	19.80	20	420 } 480
(20ml)	Control ②	19.90	10	540
(20ml)	Treatment 1 ①	19.40	60	650 } 605
(20ml)	Treatment 1 ②	19.20	80	560
(20ml)	Treatment 2 ①	18.80	120	830 } 890
(20ml)	Treatment 2 ②	18.80	120	950
(20ml)	Treatment 3 ①	18.40	160	1,700 } 1,720
(20ml)	Treatment 3 ②	18.50	150	1,740
	Std			
	20 ml 0.1N KOH 19.9ml 0.1N HCl			

CO_2 RESPIRATION

SAMPLING DATE: 10/2/95 (t = 18 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
Area B:			
(20ml) Control ①	19.70	30	400 465
(20ml) Control ②	19.90	10	530
(20ml) Treatment 1 ①	19.40	60	590 535
(20ml) Treatment 1 ②	19.70	30	480
(20ml) Treatment 2 ①	18.10	190	710 770
(20ml) Treatment 2 ②	18.40	160	830
(20ml) Treatment 3 ①	17.80	220	1,540 1,565
(20ml) Treatment 3 ②	17.50	250	1,590
Std			
20ml 0.1N KOH 19.9ml 0.1N HCl			

CO$_2$ RESPIRATION

SAMPLING DATE: 9/28/95 (t=14 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (μmol)	Cumulative CO$_2$ Released (μmol)	
	Area B:				
(20ml)	Control ①	19.40	60	370	445
(20ml)	Control ②	19.60	40	520	
(20ml)	Treatment 1 ①	19.40	60	530	490
(20ml)	Treatment 1 ②	19.20	80	450	
(20ml)	Treatment 2 ①	19.00	100	520	595
(20ml)	Treatment 2 ②	19.00	100	670	
(20ml)	Treatment 3 ①	18.00	200	1,320	1,330
(20ml)	Treatment 3 ②	18.20	180	1,340	
	Std: 20ml 0.1N KOH 19.8ml 0.1N HCl				

CO_2 RESPIRATION

SAMPLING DATE: 9/26/95 (t = 12 days)

PROJECT: Leica

PROJECT #: 3967

	Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
	Area B:			
(20ml)	Control ①	19.30	70	310 395
(20ml)	Control ②	19.00	100	480
(20ml)	Treatment 1 ①	18.90	110	470 420
(20ml)	Treatment 1 ②	18.50	150	370
(20ml)	Treatment 2 ①	18.40	160	420 495
(20ml)	Treatment 2 ②	18.30	170	570
(20ml)	Treatment 3 ①	15.80	420	1,120 1,140
(20ml)	Treatment 3 ②	15.60	440	1,160
	Std			
	20 ml 0.1N KOH 19.8 ml 0.1 N HCl			

CO_2 RESPIRATION

SAMPLING DATE: 9/22/95 (t = 8 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO_2 Released (µmol)	Cumulative CO_2 Released (µmol)
Area B:			
(20ml) Control ①	19.10	90	240 > 310
(20ml) Control ②	19.10	90	380
(20ml) Treatment 1 ①	19.00	100	360 > 290
(20ml) Treatment 1 ②	18.90	110	220
(20ml) Treatment 2 ①	18.90	110	260 > 330
(20ml) Treatment 2 ②	18.30	170	400
(20ml) Treatment 3 ①	16.70	330	700 > 710
(20ml) Treatment 3 ②	17.10	290	720
Std:			
20ml 0.1N KOH 19.8ml 0.1N HCl			

Start Date: 9/14/95

CO$_2$ RESPIRATION

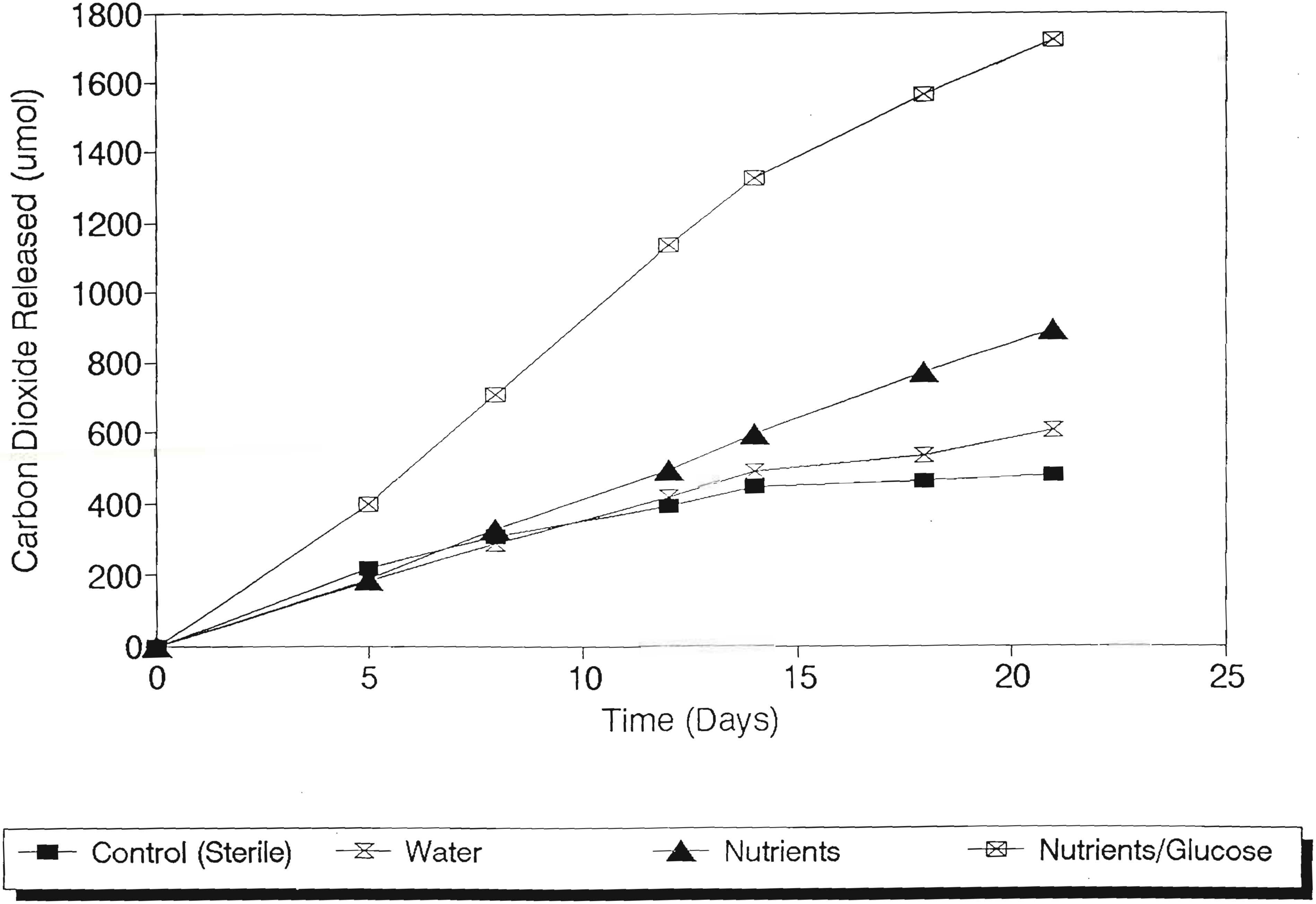
SAMPLING DATE: 9/19/95 (t = 5 days)

PROJECT: Leica

PROJECT #: 3967

Sample Description	HCl (0.1 N) Titrated (ml)	CO$_2$ Released (µmol)	Cumulative CO$_2$ Released (µmol)
Area B:			
(20ml) Control ①	18.50	150	150 220
(20ml) Control ②	17.10	290	290
(20ml) Treatment 1 ①	17.40	260	260 185
(20ml) Treatment 1 ②	18.90	110	110
(20ml) Treatment 2 ①	18.50	150	150 190
(20ml) Treatment 2 ②	17.70	230	230
(20ml) Treatment 3 ①	16.30	370	370 400
(20ml) Treatment 3 ②	15.70	430	430
Std:			
20ml/0.1N KOH 19.8ml 0.1N HCl			

Leica Site: Respirometric Test Results
Area B Soil



TreaTek - CRA® COMPANY *Total Petroleum Hydrocarbons (ppm)*

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 1/4/95

Project: Leica

Charge #: 3967

Sample Description: Reanalysis of Area C + NAPL Sample Microcosms (t=8 weeks)

Method Used: 418.1

Detection Limit:

Sample #	Sample Reading	Dilution Factor	Extractant Volume (ml)	Sample "Wet" Weight (g)	Moisture Content (%)	Sample "Dry" Weight (g)	TPH Concentration on Dry Basis (ppm)
1	0.48	1:2	50	10.09	14.62	8.61	1,115 1098
2	0.46	1:2	50	10.08	15.19	8.55	1,080 ±25
3	0.35	1:2	50	10.01	12.68	8.74	805 810±
4	0.36	1:2	50	10.05	11.88	8.86	815 7
5	0.50	—	50	10.08	11.62	8.91	565 565±0
6	0.49	—	50	10.00	12.90	8.71	565
7	0.58	—	50	10.02	12.28	8.79	660 670±
8	0.59	—	50	10.09	13.55	8.72	680 14
9	0.56	—	50	10.08	14.33	8.64	650 633±
10	0.53	—	50	10.00	13.49	8.65	615 25
50	0.25						
70	0.35						
90	0.45						
110	0.55						
130	0.65						

Analyst Remarks (*if any*): 1 & 2 - Control
3 & 4 - Soil Alone
5 & 6 - Soil + Nutrient
7 & 8 - Soil + Nutrient + Carbon
9 & 10 - Soil + Nutrient + Carbon + Bacteria

Analyst Signature: Karen A. Jackson Date: 1/5/95

Project Coordinator Signature: Date:

TreaTek - CRA® COMPANY *Total Petroleum Hydrocarbons (ppm)*

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 12/21/95

Project: Lecia

Charge #: 3967

Sample Description: Area B Microcosim, T=8wks

Method Used: 418.1

Detection Limit:

Sample #	Sample Reading	Dilution Factor	Extractant Volume (ml)	Sample "Wet" Weight (g)	Moisture Content (%)	Sample "Dry" Weight (g)	TPH Concentration on Dry Basis (ppm)
50	.250	-	-	-	-	-	-
70	.350	-	-	-	-	-	-
90	.450	-	-	-	-	-	-
110	.550	-	-	-	-	-	-
130	.650	-	-	-	-	-	-
1 A	0.380	-	0.05	10.13	.18	10.11	376
1 B	0.390	-	0.05	10.11	.20	10.09	387
2 A	0.300	-	0.05	10.22	.58	10.16	295
2 B	0.310	-	0.05	10.15	.73	10.08	308
3 A	0.250	-	0.05	10.11	.36	10.07	248
3 B	0.250	-	0.05	10.03	.21	10.01	250
4 A	0.250	-	0.05	10.02	.20	10.00	250
4 B	0.260	-	0.05	10.05	.24	10.03	259
5 B	0.25~~8~~5	-	0.05	10.00	.29	9.97	256
5 B	0.250	-	0.05	10.10	.37	10.06	249

Analyst Remarks (*if any*):

Analyst Signature: Gregory Bal Date: 12/28/95

Project Coordinator Signature: Date:

8/91

TreaTek - CRA® COMPANY *Moisture Content (%)*

Date Submitted: 12/21/95

Project: Lecia

Charge #: 3967

Sample Description: Area C + DNAPL - Microcosm T=8wks

Method Used: Adapted from Method of Soil Analysis

Sample #	Dish Weight (g)	"Wet" Dish/Soil Weight (g)	"Wet" Soil Weight (g)	"Dry" Dish/Soil Weight @ 105°C (g)	Moisture Content (%)
1 A	1.1078	11.4452	10.3374	9.9335	14.62
1 B	1.0933	11.2296	10.1363	9.6894	15.19
2 A	1.1091	11.2629	10.1538	~~10.~~ 9.9757	12.68
2 B	1.0969	11.4806	10.3837	10.2769	11.88
3 A	1.0961	11.2790	10.1829	10.0955	11.62
3 B	1.0903	11.2935	10.2032	9.9773	12.90
4 A	1.1006	11.1672	10.0666	9.9315	12.28
4 B	1.1052	11.1198	10.0146	9.7632	13.55
5 A	1.1056	11.1216	10.0160	~~9.7632~~ 9.6766	14.33
5 B	1.1091	11.2542	10.1451	9.8859	13.49

Analyst Remarks (*if any*):

Analyst Signature: **Date:** 12/21/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY *Moisture Content (%)*

Date Submitted: 12/01/95

Project: Lecia

Charge #: 3967

Sample Description: Area C - Microwave T= 8wks

Method Used: Adapted from Methods of Soil Analysis

Sample #	Dish Weight (g)	"Wet" Dish/Soil Weight (g)	"Wet" Soil Weight (g)	"Dry" Dish/Soil Weight @ 105°C (g)	Moisture Content (%)
1 A	1.0888	11.4027	10.3139	10.0543	13.07
1 B	1.1307	11.7373	10.6066	10.3772	12.82
2 A	1.1163	11.1527	10.0364	9.8821	12.66
2 B	1.1039	11.3931	10.2892	10.0847	12.72
3 A	1.0867	11.1604	10.0737	9.9935	11.58
3 B	1.0984	11.1996	10.1012	10.1227	10.66
4 A	1.1243	11.3695	10.2452	9.9022	14.32
4 B	1.0927	11.2559	10.1632	9.9942	12.41
5 A	1.0869	11.2702	10.1833	9.8777	13.67
5 B	1.1013	11.2323	10.1310	9.7698	14.44

Analyst Remarks *(if any)*:

Analyst Signature: **Date:** 12/21/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY *Moisture Content (%)*

Date Submitted: 12/21/95
Project: Lecia
Charge #: 3967
Sample Description: Area B Microcosm, T= 8 wks

Method Used: Adapted from Methods of Soil Analysis

Sample #	Dish Weight (g)	"Wet" Dish/Soil Weight (g)	"Wet" Soil Weight (g)	"Dry" Dish/Soil Weight @ 105°C (g)	Moisture Content (%)
1 A	1.0916	11.1988	10.1072	11.1805	.18
1 B	1.1046	11.3656	10.2610	11.3453	.20
2 A	1.1016	11.3343	10.2327	11.2754	.58
2 B	1.0998	11.2190	10.1192	11.1453	.73
3 A	1.1180	11.9355	10.8175	11.8969	.36
3 B	1.1079	11.5257	10.4175	11.5035	.21
4 A	1.0986	11.1636	10.0650	11.1436	.20
4 B	1.1042	11.4573	10.3531	11.4323	.24
5 A	1.1073	11.4306	10.3233	11.4007	.29
5 B	1.0928	11.1134	10.0206	11.0759	.37

Analyst Remarks *(if any)*:

Analyst Signature: **Date:** 12/21/95
Project Coordinator Signature: **Date:**

TreaTek - CRA™ COMPANY

Microbial Count

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 10/20/95

Project: Lecia

Charge #: 3967

Sample Description: Soils - Aera B, Aera C, Aerea DNAPL

Method Used:

Sample #	Media Used	Dilution Used	# of Colonies per Plate	Microbial Count (CFU's/ml or gm)
Aera B	TCE	10^2	15 x 4	6.00×10^3 6.60x10
Aera B	TCE	10^2	18 x 4	7.20×10^3
Aera C	TCE	10^2	11 x 4	4.40×10^3 3.60×10^3
Aerea C	TCE	10^2	7 x 4	2.80×10^3
Aerea DNAPL	TCE	10^2	2	200 250
Aera DNAPL	TCE	10^2	3	300

Analyst Remarks (*if any*):

Analyst Signature: Greg Beal **Date:** 10/25/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY *Moisture Content (%)*

Date Submitted: 10/24/95

Project: Lecia

Charge #: 3967

Sample Description: Area B + Area C with Vermiculite (5%)

Method Used: Adapted from Methods of Soil Analysis

Sample #	Dish Weight (g)	"Wet" Dish/Soil Weight (g)	"Wet" Soil Weight (g)	"Dry" Dish/Soil Weight @ 105°C (g)	Moisture Content (%)
B	1.16	11.17	10.01	9.60	15.68
C	1.16	11.16	10.00	9.80	13.60

Analyst Remarks *(if any)*:

Analyst Signature: **Date:** 10/24/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY Total Petroleum Hydrocarbons (ppm)

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 10/24/95

Project: Lecia

Charge #: 3967

Sample Description: Area B, Area C, Area C+ NAPL

Method Used: 418.1

Detection Limit:

Sample #	Sample Reading	Dilution Factor	Extractant Volume (ml)	Sample "Wet" Weight (g)	Moisture Content (%)	Sample "Dry" Weight (g)	TPH Concentration on Dry Basis (ppm)
50	.250	-	-	-	-	-	-
70	.350	-	-	-	-	-	-
90	.450	-	-	-	-	-	-
110	.550	-	-	-	-	-	-
130	~~.655~~ .650	-	-	-	-	-	-
B	0.160	-	0.05	10.01	15.68	8.44	189.57
B (Dup)	0.165	-	0.05	10.00	15.68	8.43	195.73
250	.250	-	-	-	-	-	-
350	.350	-	-	-	-	-	-
450	.450	-	-	-	-	-	-
550	.550	-	-	-	-	-	-
650	.650	-	-	-	-	-	-
C	.350	-	0.05	10.02	13.60	8.66	2,020.79
C (Dup)	.350	-	0.05	10.01	13.60	~~8.69~~ 8.65	2,023.12
C+D	.375	-	0.05	10.02	13.60	8.66	2,165.13
C+D Dup	.370	-	0.05	10.01	13.60	8.65	2,138.73

Analyst Remarks (if any): r = 1.000

Analyst Signature: Greg Bul **Date:** 10/24/95

Project Coordinator Signature: **Date:**

TreaTek - CRA™ COMPANY **Microbial Count**

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 9/25/95

Project: Lecia

Charge #: 3967

Sample Description: Soil - B or C or DNAPL

Method Used:

Sample #	MediaUsed	Dilution Used	# of Colonies per Plate	Microbial Count (CFU's/ml or gm)
B	Chloronated	10^{-2}	45	4.50×10^3 ⟩ 4.05 x
B (D)	Chloronated	10^{-2}	36	3.60×10^3
C	Chloronated	10^{-2}	22	2.20×10^3 ⟩ 2.55 x
C (D)	Chloronated	10^{-2}	29	2.90×10^3
DNAPL	Chloronated	10^{-2}	–	No growth
DNAPL	Chloronated	10^{-2}	–	No growth

Analyst Remarks ***(if any)*****:**

Analyst Signature: Guy Bal **Date:** 9/29/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY

Total Petroleum Hydrocarbons (ppm)

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted:

Project: Leica Inc.

Charge #: 3967

Sample Description: Initial Characterization

Method Used: IR 418.1

Detection Limit:

Sample #	Sample Reading	Dilution Factor	Extractant Volume (ml)	Sample "Wet" Weight (g)	Moisture Content (%)	Sample "Dry" Weight (g)	TPH Concentration on Dry Basis (ppm)
Std 130 ppm	0.130						
250	0.250						
350	0.340						
450	0.440						
550	0.520						
650	0.660						
Area B-1	0.02		50 ml	10.0gr	15.31	8.47	118
-2	0.02				15.31		118
Area C-1	0.05				16.47	8.35	299
-2	0.055				16.47		329
NAPL-1	0.230				15.33	8.47	1358
-2	0.330				15.33		1948

Analyst Remarks *(if any)*:

Analyst Signature: Cynthia Lin Date: 9/20/95

Project Coordinator Signature: Date:

TreaTek - CRA® COMPANY *Orthophosphate Phosphorus (ppm)*

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 9/8/95

Project: Lecia

Charge #: 3967

Sample Description: Soils B C DNAPL

Method Used: 365.3

Detection Limit:

Sample #	Dilution Factor	Concentration ~~Absorbance~~ (880 nm)	Moisture Content (%)	PO₄-P Concentration (ppm) on Dry Basis
B	–	4.15	15.31	4.90
B (D)	–	4.15	15.31	4.90
C	–	7.00	16.47	8.38
C (D)	–	7.05	16.47	8.44
DNAPL	–	6.50	15.33	7.68
DNAPL (D)	–	6.45	15.33	7.62

Analyst Remarks (*if any*):

Analyst Signature: Date: 9/12/95

Project Coordinator Signature: Date:

TreaTek - CRA™ COMPANY Microbial Count

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 9/8/95

Project: Leica

Charge #: 3967

Sample Description: Soils - B, C, + DNAPL

Method Used:

Sample #	MediaUsed	Dilution Used	# of Colonies per Plate	Microbial Count (CFU's/ml or gm)
B	TSA	10^{-4}	11 x 2	2.20×10^5 } 2.40×10^5
B (D)	TSA	10^{-4}	13 x 2	2.60×10^5
B	C16	10^{-7}	4	4.00×10^4 } 3.50×10^4
B (D)	C16	10^{-4}	3	3.00×10^4
C	TSA	10^{-4}	7 x 2	1.40×10^5 } 1.80×10^5
C (D)	TSA	10^{-4}	11 x 2	2.20×10^5
C	C16	10^{-4}	4	4.00×10^4 } 4.50x10
C (D)	C16	10^{-4}	5	5.00×10^4
DNAPL	TSA	10^{-2}	1	100 } 150
DNAPL (D)	TSA	10^{-2}	2	200
DNAPL	C16	10^{-2}	–	— No growth
DNAPL (D)	C16	10^{-2}	–	– No growth

Analyst Remarks *(if any)*:

Analyst Signature: **Date:** 9/4/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY *Orthophosphate Phosphorus (ppm)*

Matrix Type (circle one): Liquid [✓ Soil]

Date Submitted: 9/8/95

Project: Lecia

Charge #: 3967

Sample Description: Soils - B, C + D

Method Used: 365.3

Detection Limit:

Sample #	Dilution Factor	Concentration ~~Absorbance~~ (880 nm)	Moisture Content (%)	PO$_4$-P Concentration (ppm) on Dry Basis
B	–	0.83	15.31	0.98 } 0.98
B (D)	–	0.83	15.31	0.98
C	–	0.140	16.47	0.168 } 0.169
C (D)	–	0.141	16.47	0.169
DNAPL	–	0.130	15.33	0.154 } 0.153
DNAPL (D)	–	0.129	15.33	0.152

Analyst Remarks *(if any)*:

Analyst Signature: **Date:** 9/12/95

Project Coordinator Signature: **Date:**

4/9

TreaTek - CRA™ COMPANY *Ammonia Nitrogen (ppm)*

Matrix Type (circle one): Liquid [✓ ~~Soil~~]

Date Submitted: 9/8/95

Project: Lecia

Charge #: 3967

Sample Description: Soils - B, C, & DNAPL

Method Used: Tecator

Detection Limit:

Sample #	Sample "Wet" Weight (g)	Moisture Content (%)	Sample "Dry" Weight (g)	Sample Reading	NH_4-N Concentration on Dry Basis (ppm)
B	2.01	15.31	1.70	0.766	27.18 ⟩ 23.58
B (D)	2.02	15.31	1.71	0.723	19.98
C	2.00	16.47	1.67	0.680	13.25 ⟩ 11.21
C (D)	2.01	16.47	1.68	0.656	9.17
DNAPL	2.03	15.33	1.72	0.641	6.51 ⟩ 4.57
DNAPL (D)	2.02	15.33	1.71	0.617	2.62
Blank	–	–	–	0.601	–
STD.	–	–	–	10.21	–

Analyst Remarks *(if any)*:

Analyst Signature: Gregg Bird **Date:** 9/12/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY ***Total Organic Matter (%)***

Matrix Type ***(circle one)*****:** Liquid [✓ Soil]

Date Submitted: 9/8/95

Project: Lecia

Charge #: 3967

Sample Description: Soils B, C, & DNAPL

Method Used: 160.4

Sample #	Dish Weight (g)	"Dry" Dish/Soil Weight @105°C (g)	"Dry" Soil Weight @105°C (g)	"Dry" Dish/Soil Weight @ 550°C (g)	Total Organic Matter (%)	
B	48.006	68.552	20.546	68.384	0.82	0.93
B (D)	48.113	69.995	21.882	69.770	1.03	
C	45.500	65.872	20.372	65.565	1.51	1.45
C (D)	43.332	65.062	21.730	64.759	1.39	
DNAPL	45.954	67.331	21.377	66.954	1.76	1.45
DNAPL (D)	37.909	59.364	21.455	59.119	1.14	

Analyst Remarks ***(if any)*****:**

Analyst Signature: Greg Beal **Date:** 9/12/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY *Moisture Content (%)*

Date Submitted: 9/8/95

Project: Lecia

Charge #: 3967

Sample Description: Soils - B, C, + DNAPL

Method Used: Adapted from Methods of soil Analysis

Sample #	Dish Weight (g)	"Wet" Dish/Soil Weight (g)	"Wet" Soil Weight (g)	"Dry" Dish/Soil Weight @ 105°C (g)	Moisture Content (%)
B	48.006	73.012	25.006	68.552	17.84 > 15.31
B (D)	48.113	73.326	25.213	69.995	13.21
C	45.500	70.857	25.357	65.872	19.65 > 16.47
C (D)	43.332	68.390	25.058	65.062	13.28
DNAPL	45.954	71.314	25.360	67.331	15.71 > 15.33
DNAPL (D)	37.909	63.134	25.225	59.364	14.95

Analyst Remarks ***(if any)*****:**

Analyst Signature: **Date:** 9/12/95

Project Coordinator Signature: **Date:**

TreaTek - CRA® COMPANY

pH

Matrix Type (circle one): Liquid [✓ Soil]
Date Submitted: 9/8/95
Project: Lecia
Charge #: 3967
Sample Description: Soils - B, C, + DNAPL

Method Used: 9045

Sample #	pH
B	7.92 } 7.91
B (D)	7.90
C	7.96 } 7.95
C (D)	7.94
DNAPL	8.02 } 8.02
DNAPL (D)	8.02

Analyst Remarks (*if any*):

Analyst Signature: Date: 9/12/95
Project Coordinator Signature: Date:

APPENDIX E

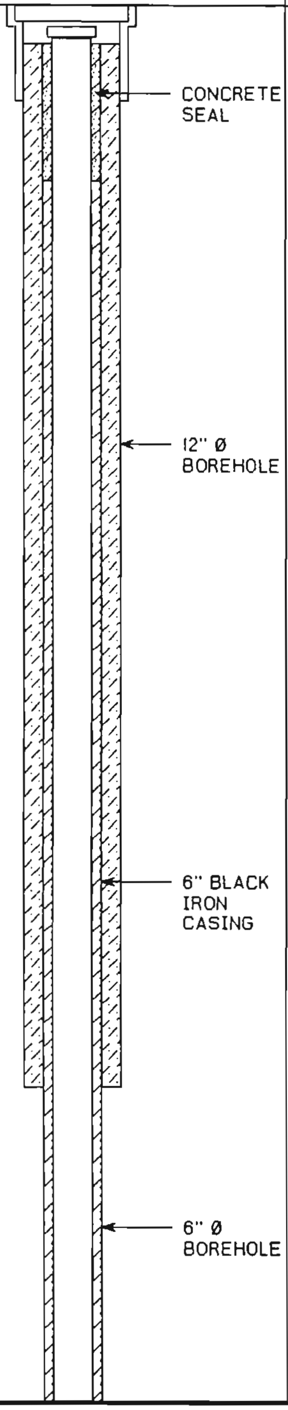
DEEP BEDROCK WELL STRATIGRAPHIC AND INSTRUMENTATION LOGS

STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

(WL-96)
Page 1 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-9B
DATE COMPLETED: NOVEMBER 30, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	GROUND SURFACE REFERENCE POINT (Top of Riser)	*.00* *.00*						
	OVERBURDEN							
—1.0								
—2.0								
—3.0								
—4.0								
—5.0								
—6.0								
—7.0								
—8.0								
—9.0								
—10.0								
—11.0								
—12.0								
	LIMESTONE (Onondaga Formation): light to medium gray, little dark gray chert, fine to medium grained, massively bedded, trace rugosan coral, occasional carbonaceous partings and stylolites, numerous slight to moderately weathered breaks	*-12.40*						
—13.0								
—14.0					1	76.9	11.5	50
—15.0								
	- rubble zone (15.2 to 15.4, 16.8 to 17.1 and 18.2 to 18.3ft BGS)				2	100	54.4	50

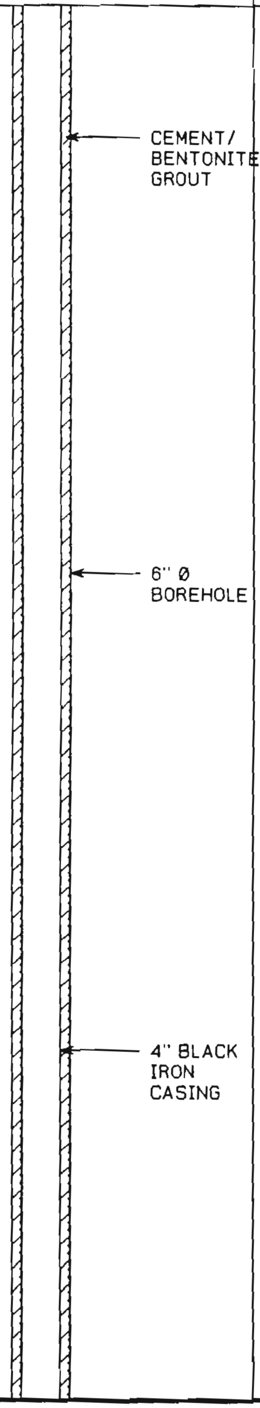
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

(WL-96)
Page 2 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-9B
DATE COMPLETED: NOVEMBER 30, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH



DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
17.0	- closed vertical fracture, no weathering (17.1 to 17.5ft BGS) - dark gray chert (17.0 to 17.1, 17.5 to 17.6 and 19.3 to 19.6ft BGS)		CEMENT/ BENTONITE GROUT					
18.0	- rugose coral (18.0 to 18.6ft BGS)				2	100	54.4	50
19.0	- slightly to moderately weathered breaks (@ 16.1, 16.5, 18.0, 18.1, 18.4, 18.6, 19.1, 19.2, 19.3, 19.6, 20.0 and 20.2ft BGS)							
20.0								
21.0	- some coral (rugose and fan), some chert, slight to no weathering, numerous carbonaceous layers and stylolites							
22.0	- chert, gray		6" 0 BOREHOLE					
23.0								
24.0								
25.0								
26.0	- chert becomes buff colored - chert, light gray to buff, very fine grained, little limestone intermixed				3	100	94	50
27.0	- coral zone, massive rugose and fan coral, open vanes, carbon deposits in vanes (20.7 to 22.0ft BGS)							
28.0	- fan coral, open vaned (25.6 to 25.8ft BGS) - brachiopod fossil (@ 25.6ft BGS)		4" BLACK IRON CASING					
29.0	- small calcite crystal in 1/2" long cavity (@ 26.8ft BGS) - fan coral, open vaned, some yellow-green discoloration (28.1 to 28.2ft BGS)							
30.0								
31.0	- dark gray and gray-brown chert and limestone (30.7 to 31.8ft BGS) - numerous stylolites (27.9 to 28.1ft BGS)				4	98.0	87.1	20/0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ∇ STATIC WATER LEVEL ▼

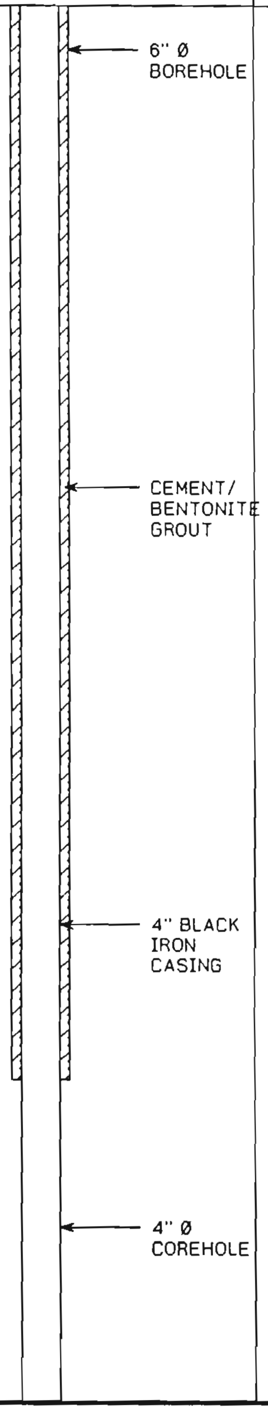
STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

(WL-96)
Page 3 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-9B
DATE COMPLETED: NOVEMBER 30, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	- limestone, no chert, light gray and gray-brown							
33.0	- lost all water (@ 32.5ft BGS)							
	- weathered break, 3" void (@ 32.9ft BGS)							
34.0	- solution pitting (33.8 to 34.7ft BGS)							
35.0	- numerous carbonaceous partings (34.7 to 36.3ft BGS)							
36.0								
	- heavily weathered (36.3 to 36.7ft BGS)				4	98.0	87.1	20/0
37.0	- rugose coral (@ 34.4ft BGS)							
38.0								
39.0								
40.0	- rugose coral (39.9 to 40.0ft BGS)							
41.0	- occasional small coral (40.8 to 41.4ft BGS)							
42.0	- coral (@ 41.9, 42.3, 43.7 to 43.9ft BGS)							
43.0					5	100	95.2	0
44.0								
45.0	- coral (@ 44.7, 45.7, 46.7 to 46.9, 49.2, 49.3, 49.6ft BGS)							
46.0								
					6	98.2	87.3	100
47.0	- slightly weathered breaks (@ 47.0, 47.7, 48.8ft BGS)							



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

(WL-96)
Page 4 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-9B
DATE COMPLETED: NOVEMBER 30, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
-49.0					6	98.2	87.3	100
-50.0			4" Ø COREHOLE					
-51.0	- coral with yellow discoloration and fuel oil odor, black carbon deposits in open vanes							
-52.0	- coral (52.0 to 54.7ft BGS)							
-53.0	- coral with yellow staining, fuel oil odor (53.4 to 54.0ft BGS)				7	98.0	98	100
-54.0	- coral (54.2 to 54.6ft BGS)							
-55.0								
-56.0	- coral with yellow staining, fuel oil odor (56.3 to 56.8ft BGS)							
-57.0								
-58.0	- coral (57.6 to 58.0ft BGS) - slight to moderately weathered breaks (@ 52.0, 52.4, 53.0, 54.0, 54.6, 57.5, 57.6, 59.0 and 59.5ft BGS)				8	100	84.4	100
-59.0	- moderately weathered zone (58.6 to 58.7ft BGS) - gray-green shale band 1/16" thick - more shaly, no coral							
-60.0	END OF HOLE @ 60.0ft BGS	-60.00						
-61.0								
-62.0								
-63.0								

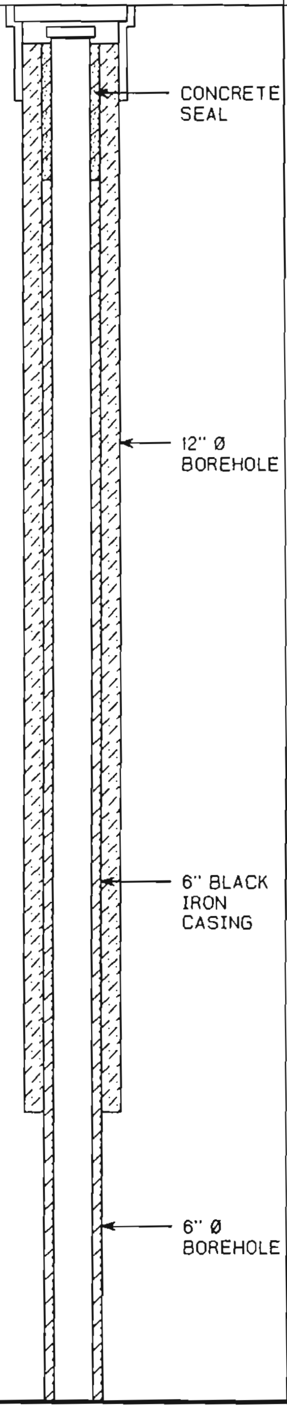
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

(WL-97)
Page 1 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-15B
DATE COMPLETED: NOVEMBER 27, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	GROUND SURFACE REFERENCE POINT (Top of Riser)	*.00* *.00*						
	For overburden stratigraphy refer to MW-15 stratigraphic log							
1.0								
2.0								
3.0								
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								
	LIMESTONE (Onondaga Formation) For shallow bedrock stratigraphy refer to MW-15A stratigraphic log	*-12.10*						
13.0								
14.0								
15.0								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

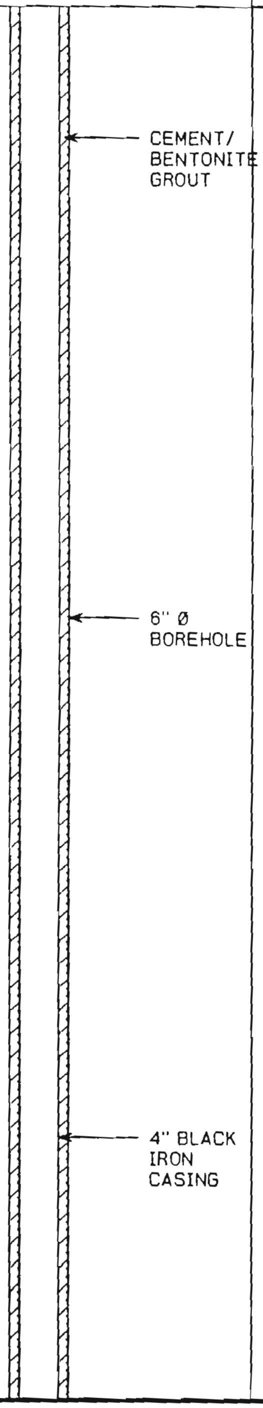
STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

(WL-97)
Page 2 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-15B
DATE COMPLETED: NOVEMBER 27, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
17.0								
18.0								
19.0								
20.0								
21.0								
22.0								
23.0								
24.0								
25.0								
26.0								
27.0								
28.0								
29.0								
30.0								
31.0								



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

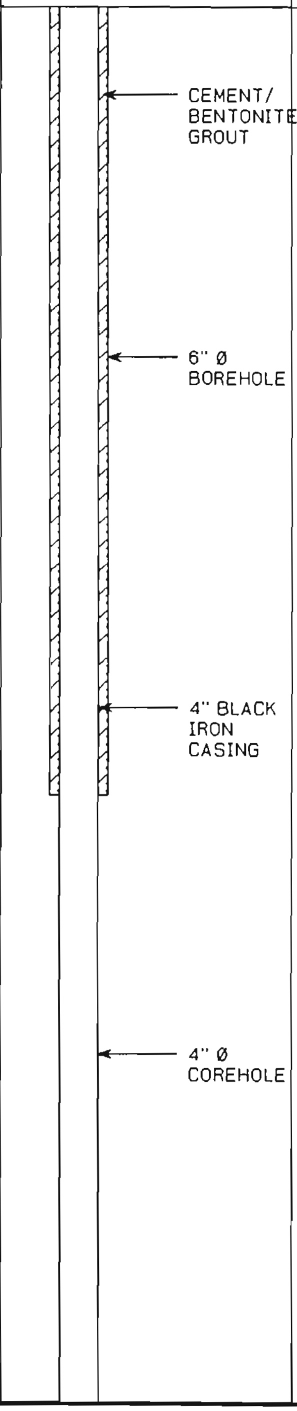
(WL-97)
Page 3 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-15B
DATE COMPLETED: NOVEMBER 27, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS
-33.0		
-34.0		
-35.0	LIMESTONE (Onondaga Formation): light to dark gray, fine grained to crystalline, thin to massively bedded, numerous carbonaceous partings, occasional brachiopods and fossil fragments, occasional dark gray chert, slight to moderately weathered - slightly weathered break (@ 35.1 and 35.4ft BGS) - carbonaceous parting, brachiopod fossil (@ 36.0 and 36.5ft BGS) - slightly weathered carbonaceous parting, brachipod fossil (@ 37.1ft BGS) - highly weathered (37.4 and 37.5ft BGS) - carbonaceous parting (@ 37.7, 38.0, 38.3, 38.5, 38.9, and 39.2ft BGS), slightly weathered - detrital zone, darker gray, numerous fossil fragments (39.6 to 39.9ft BGS) - no core (39.5 to 41.0ft BGS) - detrital zone, numerous fossil fragments (41.1 to 41.4ft BGS) - carbonaceous parting (@ 41.5ft BGS) - weathered zone (41.7 to 41.8ft BGS) - trace dark gray chert (42.8 to 43.0 and 43.4 to 43.6ft BGS) - detrital zone, numerous fossil fragments (43.6 to 43.7ft BGS) - carbonaceous parting (@ 43.6, 43.7 and 44.0ft BGS) - coral fragment (44.1 to 44.2ft BGS) - detrital zone, dark and light gray, massively bedded, numerous fossil fragments, trace dark gray chert (44.0 to 46.3ft BGS) - carbonaceous parting (@ 44.3ft BGS) - carbonaceous parting, slightly weathered (@ 44.6ft BGS) - carbonaceous parting (@ 44.8ft BGS) - rugose coral (@ 44.9ft BGS)	-35.00
-36.0		
-37.0		
-38.0		
-39.0		
-40.0		
-41.0		
-42.0		
-43.0		
-44.0		
-45.0		
-46.0		
-47.0		

MONITOR INSTALLATION



BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	1	95.5	68.8	85
	2	86.7	73.3	0
	3	100	78.9	0
	4	100	96.9	0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

(WL-97)
Page 4 of 4

PROJECT NAME: LEICA INC. RI/FS
PROJECT NUMBER: 3967
CLIENT: LEICA INC.
LOCATION: CHEEKTOWAGA, NY

HOLE DESIGNATION: MW-15B
DATE COMPLETED: NOVEMBER 27, 1995
DRILLING METHOD: ROTARY/WET ROTARY
CRA SUPERVISOR: K. LYNCH

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. BGS	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	- carbonaceous parting (@ 45.1, 45.5 and 46.0ft BGS)							
-49.0	- dark gray chert (46.2 to 46.3 and 46.5 to 46.6ft BGS)							
	- carbonaceous parting (@ 46.7ft BGS)							
-50.0	- detrital layer, numerous fossil fragments (46.9 and 47.3ft BGS)							
	- carbonaceous parting, slightly weathered (@ 47.5 and 47.6ft BGS)				4	100	96.9	0
-51.0	- very small crystal filled vug (@ 47.7ft BGS)		4" Ø COREHOLE					
	- carbonaceous parting (@ 47.9ft BGS)							
-52.0	- chert, dark gray (48.1 to 48.2ft BGS)							
	- carbonaceous parting (@ 48.2ft BGS)							
-53.0	- dark gray chert (48.4 to 48.6 and 49.2 to 49.4ft BGS)							
	- fossil fragments, little dark gray chert (49.6 to 50.0ft BGS)							
-54.0	- carbonaceous partings (@ 50.9 and 51.1ft BGS)							
	- small rugose coral (@ 51.1ft BGS)				5	100	66.7	0
-55.0	- large rugose coral (53.0 to 53.1ft BGS)							
	- dark gray chert (53.7 to 53.8ft BGS)							
-56.0	- rubble zone, dark gray chert (53.7 to 53.8ft BGS)	-56.10						
	- small open vug, trace calcite (@ 53.8ft BGS)							
-57.0	- slightly weathered fracture (@ 53.9, 54.1, 54.5, 54.8, 55.0, 56.3 and 55.6ft BGS)							
-58.0	END OF HOLE @ 56.1ft BGS							
-59.0								
-60.0								
-61.0								
-62.0								
-63.0								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ∇ STATIC WATER LEVEL ▼

APPENDIX F

ANALYTICAL DATA ASSESSMENT AND VALIDATION GROUNDWATER SAMPLES

ANALYTICAL DATA ASSESSMENT AND VALIDATION
GROUNDWATER SAMPLES
LEICA, INC.
CHEEKTOWAGA, NEW YORK
JANUARY 1996

TABLE OF CONTENTS

Page

LIST OF TABLES
(Following Report)

1.0 INTRODUCTION

The following details an assessment and validation of analytical results reported by H2M Labs, Inc. (H2M) for three groundwater samples (including one field duplicate) collected in January 1996 at the Leica, Inc. Site located in Cheektowaga, New York.

The samples were submitted for Target Compound Lists (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), and Total Petroleum Hydrocarbon (TPH) analyses. A sample key is presented in Table 1, and a summary of the analytical results is presented in Table 2.

Evaluation of the data was based on information obtained from the raw data, Chain of Custody forms, blank data, duplicate data, and recovery data for matrix, blank, and surrogate spikes. The assessment of analytical and in-house data included checks for: data consistency (by observing comparability of duplicate analyses); adherence to accuracy and precision criteria; transmittal errors; and anomalously high and low parameter values.

The Quality Assurance/Quality Control (QA/QC) criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and the documents entitled:

i) "National Functional Guidelines for Organic Data Review, USEPA Office of Emergency and Remedial Response, February 1994; and

ii) Quality Assurance Project Plan (QAPP), Appendix C of the RI/FS Work Plan, Leica, Inc., Cheektowaga, New York, June 1993.

Hereinafter, item i) will be referred to as the "Guidelines".

2.0 SAMPLE HOLDING TIMES

According to the QAPP, the following sample holding time requirements have been established.

Parameter	*Matrix*	*Holding Time*
TCL VOCs	Water	10 days from VTSR to analysis
TCL SVOCs	Water	5 days from VTSR to extraction 40 days from extraction to analysis
TPH	Water	26 days from VTSR to analysis

Notes:

VTSR	Verified Time of Sample Receipt.

By comparing the VTSR of all samples (from the laboratory receipt date appearing on the Chain of Custody documents) with the sample analysis dates, it was noted that all samples were analyzed within the established holding times.

The samples collected for TCL VOCs were not acid preserved as specified in the QAPP. Qualification of the data was not necessary since the analyses were performed within seven days of VTSR, in accordance with Method 91-1.

In accordance with the QAPP, all TPH samples were properly preserved and all samples were transported and stored at 4°C (±2°C) after collection.

3.0 GAS CHROMATOGRAPH/MASS SPECTROMETER (GC/MS) - TUNING AND MASS CALIBRATION - VOLATILES AND SEMI-VOLATILES

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, Methods 91-1 and 91-2 require the analysis of the specific tuning compounds bromofluorobenzene (BFB) and decafluorotriphenyl phosphine (DFTPP), respectively. The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Tuning compounds were analyzed at the required frequency throughout the VOC and SVOC analysis periods. All tuning criteria were met, indicating proper optimization of the instrumentation.

4.0 INSTRUMENT CALIBRATION

4.1 GC/MS CALIBRATION - VOLATILES AND SEMI-VOLATILES

4.1.1 Initial Calibration

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a five point calibration curve containing all compounds of interest is analyzed.

Linearity of the curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent.

The initial calibration data for VOCs and SVOCs were received and all %RSDs and RRFs met the above criteria.

4.1.2 Continuing Calibration

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all RRF values must be greater than or equal to 0.05; and
ii) percent difference (%D) values must not exceed 25 percent.

All RRF values showed acceptable sensitivity. All %D values were acceptable except for 2-hexanone and bromomethane for the VOC standard analyzed on Jnauary 12, 1996 and 4-nitrophenol for the SVOC standard analyzed on January 15, 1996. No investigative sample results for these compounds were obtained from these analysis dates, so no qualification of the data was necessary.

4.2 TPH

As specified in the method, the infrared spectrophotometer is calibrated by analyzing a series of working standards. A calibration plot of absorbance versus milligrams (mg) petroleum hydrocarbons per 100 milliliters (ML) solution is then established and used to calculate the TPH content in samples. The correlation coefficient of the calibration curve must be 0.995 or greater.

Upon review of the data, it was noted that a six-point calibration curve ranging from 2.5 to 40 mg/100 mL was analyzed and employed for sample TPH calculations. A correlation coefficient of 0.999 was achieved. Prior to sample analysis, a 20 mg/L standard was analyzed and yielded a 106 percent recovery, indicating acceptable instrument calibration.

5.0 INTERNAL STANDARD RECOVERIES - VOLATILES AND SEMI-VOLATILES

In order to ensure that changes in GC/MS response and sensitivity do not affect sample analysis results, internal standards are added to all investigative and QA/QC samples prior to VOC and SVOC analyses. All results are calculated as a ratio of the internal standard response. The criteria by which the internal standard results are assessed is as follows:

i) internal standard area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and

ii) the retention time of the internal standard must not vary more than ±30 seconds from the associated calibration standard.

All internal standard recoveries and retention times were acceptable.

6.0 SURROGATE SPIKE RECOVERIES

In accordance with the methods employed, all samples, blanks and standards analyzed for VOCs and SVOCs were spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency. Acceptance limits are specified in the methods of analysis.

6.1 VOLATILES

Samples submitted for GC/MS VOC determinations were spiked with the surrogate compounds 4-bromofluorobenzene, toluene-d8, and 1,2-dichloroethane-d4 prior to sample analysis.

All surrogate recoveries were within the control limits, indicating acceptable analytical efficiency.

6.2 SEMI-VOLATILES

Samples submitted for SVOC determinations were spiked with eight surrogate compounds prior to sample extraction and analysis. Per the "Guidelines", it is acceptable for one surrogate recovery to be outside of control limits per fraction as long as the recovery is greater than ten percent.

All sample surrogate recoveries met the above criteria, indicating acceptable analytical efficiency.

7.0 LABORATORY BLANK ANALYSES

The purpose of assessing the results of laboratory blank analyses is to determine the existence and magnitude of sample contamination introduced during analysis. Laboratory blanks are prepared from deionized water and analyzed as samples. Laboratory blanks were analyzed at a minimum frequency of one per analytical batch.

7.1 VOLATILES

Laboratory blank analyses yielded non-detect results for all VOCs of interest, indicating that contamination was not a factor in this analysis.

7.2 SEMI-VOLATILES

Low levels of butylbenzyl phthalate and bis(2-ethylhexyl)phthalate were detected in the SVOC method blank. These compounds were not detected in the investigative samples, and no qualification of the data was necessary.

All remaining blank results were non-detect for the SVOCs of interest.

7.3 TPH

The laboratory blanks analyzed for TPH were non-detect, indicating that contamination from the laboratory was not a factor in this analysis.

8.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE MS/MSD) ANALYSES - ORGANICS

The recoveries of MS/MSD analyses are used to assess the analytical accuracy achieved on individual sample matrices. The Relative Percent Difference (RPD) between the MS and MSD are used to assess analytical precision. MS/MSD analyses were performed on sample MW-15B.

8.1 VOLATILES

Due to the trichloroethene level present in the sample, the trichloroethene MS/MSD analysis could not be evaluated. Analytical accuracy for this compound was evaluated based on the blank spike recovery (see Section 9.0). All remaining recoveries and RPDs were acceptable, indicating good analytical accuracy and precision.

8.2 SEMI-VOLATILES

All RPDs were acceptable. High recoveries were reported for 4-nitrophenol, 2,4-dinitrotoluene, and pentachlorophenol. All associated sample results were non-detect and would not be affected by the indicated high bias; no qualification of the data was necessary. All remaining recoveries were acceptable.

9.0 BLANK SPIKE ANALYSES - ORGANICS

The recoveries of blank spike analyses are used to assess the analytical accuracy achieved by the laboratory. As the blank spike analyses are independent of potential matrix effects, they give a true indication of the analytical accuracy achieved by the laboratory for the respective analyses performed. Blank spike analyses were performed at a frequency of one per analytical batch.

9.1 VOLATILES

All recoveries were acceptable, indicating good analytical accuracy.

9.2 SEMI-VOLATILES

All recoveries were acceptable except for a high 4-nitrophenol blank spike recovery. All associated sample results were non-detect and would not be affected by the indicated high bias; no qualification of the data was necessary.

10.0 MATRIX SPIKE (MS) ANALYSES - TPH

In order to evaluate the effects that the sample matrix may have on the accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS samples.

Sample MW-15B was analyzed as the MS sample for TPH. The MS recovery was within the general control limits of 75 to 125 percent, indicating acceptable analytical accuracy.

11.0 DUPLICATE SAMPLE ANALYSIS - TPH

A duplicate sample is analyzed to assess analytical precision. A sample is prepared and analyzed in duplicate at a minimum frequency of one per 20 investigative samples. The RPD value between the original and duplicate analysis results is then assessed against a general control limit of 20 percent for water samples.

For this study, sample MW-15B was analyzed in duplicate. Both results were non-detect, indicating acceptable analytical precision for this parameter.

12.0 TENTATIVELY IDENTIFIED COMPOUNDS (TICS)

Chromatographic peaks recorded during volatile and semi-volatile sample analyses which are not target compounds, surrogates, or internal standards, are potential TICs. The ten largest TICs for volatiles and the twenty largest TICs for semi-volatiles that exhibit areas greater than 10 percent of the area of the nearest internal standard are tentatively identified and quantified. A summary of the results follows.

No TICs were observed for the VOC analyses of samples MW-9B and MW-24B. Ether was reported for sample MW-15B at an estimated concentration of 12 micrograms per liter (µg/L).

For the SVOC analyses, unknown alcohols were reported for all three samples at estimated concentrations ranging from 2 µg/L to 14 µg/L. Sulfur was reported for samples MW-9B and MW-24B at estimated concentrations of 200 and 280 µg/L, respectively. Decamethyl cyclopentasiloxane was also reported for sample MW-9B at an estimated concentration of 2 µg/L. Cyclohexanone was reported for sample MW-15B at an estimated concentration of 7 µg/L.

No other TICs were reported for the VOC and SVOC analyses of the samples.

13.0 FIELD QA/QC

13.1 FIELD DUPLICATES

One field duplicate was collected and submitted "blind" to the laboratory for analysis to assess the overall analytical and sampling protocol precision as follows:

Sample I.D.	*Field Duplicate I.D.*	*Parameter*
MW-9B	MW-24B	TCL VOCs, SVOCs TPH

All sample and field duplicate results were non-detect, indicating acceptable sampling and analytical precision.

13.2 TRIP BLANKS - VOLATILES

To evaluate the possibility of contamination arising from sample shipment and storage activities, one trip blank was submitted to the laboratory for TCL VOCs analysis on January 4, 1996

The trip blank yielded non-detect concentrations for all VOCs of interest.

14.0 CONCLUSION

Based on the assessment detailed in the foregoing, the data produced by H2M are acceptable for use without qualification.

TABLE 1

SAMPLE SUMMARY KEY
GROUNDWATER SAMPLES
LEICA, INC.
CHEEKTOWAGA, NEW YORK
JANUARY 1996

Sample Number	*Sample Date*	*Sample Type*	*Parameter*	*Notes*
MW-15B	01/04/96	Groundwater	TCL VOCs, SVOCs, TPH	MS/MSD
MW-9B	01/04/96	Groundwater	TCL VOCs, SVOCs, TPH	
MW-24B	01/04/96	Groundwater	TCL VOCs, SVOCs, TPH	Dup. of MW-9B
Trip Blank	01/04/96	Water	TCL VOCs	

Notes:

MS/MSD	Matrix Spike /Matrix Spike Duplicate
Dup.	Field Duplicate
VOCs	Volatile Organic Compounds
SVOCs	Semi-Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbons
TCL	Target Compound List

TABLE 2

ANALYTICAL DATA SUMMARY
GROUNDWATER SAMPLES
LEICA INC.
CHEEKTOWAGA, NEW YORK
JANUARY 1996

Sample ID:	*MW-9B*	*MW-24B* *(Dup. of MW-9B)*	*MW-15B*
Sample Date:	*1/04/96*	*1/04/96*	*1/04/96*
Parameter			
TCL Volatiles (ug/L)			
Chloromethane	10U	10U	10U
Bromomethane	10U	10U	10U
Vinyl Chloride	10U	10U	41
Chlorethane	10U	10U	10U
Methylene Chloride	10U	10U	10U
Acetone	10U	10U	10U
Carbon Disulfide	10U	10U	10U
1,1-Dichloroethene	10U	10U	7J
1,1-Dichloroethane	10U	10U	52
1,2-Dichloroethene (Total)	10U	10U	790
Chloroform	10U	10U	10U
1,2-Dichloroethane	10U	10U	10U
2-Butanone	10U	10U	10U
1,1,1-Trichloroethane	10U	10U	64
Carbon Tetrachloride	10U	10U	10U
Bromodichloromethane	10U	10U	10U
1,2-Dichloropropane	10U	10U	10U
Cis-1,3-Dichloropropene	10U	10U	10U
Trichloroethene	10U	10U	190
Dibromochloromethane	10U	10U	10U
1,1,2-Trichloroethane	10U	10U	10U
Benzene	10U	10U	10U
Trans-1,3-Dichloropropene	10U	10U	10U
Bromoform	10U	10U	10U
4-Methyl-2-Pentanone	10U	10U	10U
2-Hexanone	10U	10U	10U
Tetrachloroethene	10U	10U	10U
1,1,2,2-Tetrachloroethane	10U	10U	10U
Toluene	10U	10U	10U
Chlorobenzene	10U	10U	10U
Styrene	10U	10U	10U
Ethylbenzene	10U	10U	10U
Xylene (Total)	10U	10U	10U
TCL Semi-Volatiles (μg/L)			
Phenol	10U	10U	5J
bis (2-Chloroethyl)ether	10U	10U	10U
2-Chlorophenol	10U	10U	10U
1,3-Dichlorobenzene	10U	10U	10U
1,4-Dichlorobenzene	10U	10U	10U
1,2-Dichlorobenzene	10U	10U	10U
2-Methylphenol	10U	10U	10U
2,2'-oxybis(1-Chloropropane)	10U	10U	10U
4-Methylphenol	10U	10U	10U
N-Nitroso-di-n-propylamine	10U	10U	10U
Hexachloroethane	10U	10U	10U
Nitrobenzene	10U	10U	10U
Isophorone	10U	10U	10U
2-Nitrophenol	10U	10U	10U
2,4-Dimethylphenol	10U	10U	10U
bis(2-Chloroethoxy)methane	10U	10U	10U
2,4-Dichlorophenol	10U	10U	10U
1,2,4-Trichlorobenzene	10U	10U	10U

TABLE 2

ANALYTICAL DATA SUMMARY
GROUNDWATER SAMPLES
LEICA INC.
CHEEKTOWAGA, NEW YORK
JANUARY 1996

Sample ID:	*MW-9B*	*MW-24B (Dup. of MW-9B)*	*MW-15B*
Sample Date:	*1/04/96*	*1/04/96*	*1/04/96*
Parameter			
TCL Semi-Volatiles (µg/L) (cont.)			
Naphthalene	10U	10U	10U
4-Chloroaniline	10U	10U	10U
Hexachlorobutadiene	10U	10U	10U
4-Chloro-3-methylphenol	10U	10U	10U
2-Methylnaphthalene	10U	10U	10U
Hexachlorocyclopentadiene	10U	10U	10U
2,4,6-Trichlorophenol	10U	10U	10U
2,4,5-Trichlorophenol	25U	25U	25U
2-Chloronaphthalene	10U	10U	10U
2-Nitroaniline	25U	25U	25U
Dimethylphthalate	10U	10U	10U
Acenaphthylene	10U	10U	10U
2,6-Dinitrotoluene	10U	10U	10U
3-Nitroaniline	25U	25U	25U
Acenaphthene	10U	10U	10U
2,4-Dinitrophenol	25U	25U	25U
4-Nitrophenol	25U	25U	25U
Dibenzofuran	10U	10U	10U
2,4-Dinitrotoluene	10U	10U	10U
Diethylphthalate	10U	10U	10U
Fluorene	10U	10U	10U
4-Chlorophenyl-phenylether	10U	10U	10U
4-Nitroaniline	25U	25U	25U
4,6-Dinitro-2-methylphenol	25U	25U	25U
N-Nitrosodiphenylamine	10U	10U	10U
4-Bromophenyl-phenylether	10U	10U	10U
Hexachlorobenzene	10U	10U	10U
Pentachlorophenol	25U	25U	25U
Phenanthrene	10U	10U	10U
Anthracene	10U	10U	10U
Carbazole	10U	10U	10U
Di-n-butylphthalate	10U	10U	10U
Fluoranthene	10U	10U	10U
Pyrene	10U	10U	10U
Butylbenzylphthalate	10U	10U	10U
Benzo(a)anthracene	10U	10U	10U
3,3'-Dichlorobenzidine	10U	10U	10U
Chrysene	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10U
Di-n-octylphthalate	10U	10U	10U
Benzo(b)fluoranthene	10U	10U	10U
Benzo(k)fluoranthene	10U	10U	10U
Benzo(a)pyrene	10U	10U	10U
Indeno(1,2,3-cd)pyrene	10U	10U	10U
Dibenz(a,h)anthracene	10U	10U	10U
Benzo(g,h,i)perylene	10U	10U	10U
Wet Chemistry Parameters (mg/L)			
Total Petroleum Hydrocarbon	2.5U	2.5U	2.5U

Notes:

U	Non-detect at associated value
J	Associated value is estimated
TCL	Target Compound List

TABLE 3

METHODS OF ANALYSIS
GROUNDWATER SAMPLES
LEICA, INC.
CHEEKTOWAGA, NEW YORK
JANUARY 1996

Parameter	*Methodology*
TCL VOCs	91-1 (1)
TCL SVOCs	91-2 (1)
TPH	EPA 418.1 (2)

Notes:

(1)	Method referenced from New York State Department of Environmental Conservation (NYSDEC), September 1989 Analytical Services Protocol (ASP) (9/93 Revision).
(2)	Method referenced from "Methods for Chemical Analysis of Water and Wastes", EPA-600 4-79-020, United States Environmental Protection Agency, March 1983.
TPH	Total Petroleum Hydrocarbons.
TCL	Target Compound List
VOCs	Volatile Organic Compounds
SVOCs	Semi-Volatile Organic Compounds

APPENDIX G

STEP DRAWDOWN TEST
ANALYTICAL RESULTS FOR INFLUENT AND EFFLUENT CHEMISTRY

TABLE G.1

SAMPLE KEY
STEP TESTS
LEICA INC.
CHEEKTOWAGA, NEW YORK
FEBRUARY 1996

Sample Location Designation	*Sample Date*	*Sample I.D.*	*Sample Matrix*	*Chemical Analysis*	*Comments*
MW-6A	02/13/96	Sample #1	Water	TCL VOCs	Influent 0 Hr.
MW-6A	02/13/96	Sample #2	Water	TCL VOCs	Effluent 0 Hr.
MW-6A	02/13/96	Sample #3	Water	TCL VOCs	Influent 4 Hrs.
MW-6A	02/13/96	Sample #4	Water	TCL VOCs	Effluent 4 Hrs.
MW-16A	02/14/96	Sample #5	Water	TCL VOCs	Influent 0 Hr.
MW-16A	02/14/96	Sample #6	Water	TCL VOCs	Effluent 0 Hr.
MW-16A	02/15/96	Sample #7	Water	TCL VOCs	Influent 3 Hrs.
MW-16A	02/15/96	Sample #8	Water	TCL VOCs	Effluent 3 Hrs.

Notes:

TCL	Target Compound List.
VOC	Volatile Organic Compound.

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #1

Date Sampled : 02/13/96 **GTC Order # :** 64660 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

ANALYTE	PQL	RESULT	UNITS
DATE ANALYZED : 02/16/96			
ANALYTICAL DILUTION: 100.0			
ACETONE	10	1000 U	UG/L
BENZENE	5.0	500 U	UG/L
BROMODICHLOROMETHANE	5.0	500 U	UG/L
BROMOFORM	5.0	500 U	UG/L
BROMOMETHANE	5.0	500 U	UG/L
2-BUTANONE (MEK)	10	1000 U	UG/L
CARBON DISULFIDE	10	1000 U	UG/L
CARBON TETRACHLORIDE	5.0	500 U	UG/L
CHLOROBENZENE	5.0	500 U	UG/L
CHLOROETHANE	5.0	500 U	UG/L
CHLOROFORM	5.0	500 U	UG/L
CHLOROMETHANE	5.0	500 U	UG/L
DIBROMOCHLOROMETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHANE	5.0	500 U	UG/L
1,2-DICHLOROETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHENE	5.0	500 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	20000	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	270 J	UG/L
1,2-DICHLOROPROPANE	5.0	500 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
ETHYLBENZENE	5.0	260 J	UG/L
2-HEXANONE	10	1000 U	UG/L
METHYLENE CHLORIDE	5.0	500 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	1000 U	UG/L
STYRENE	5.0	500 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	500 U	UG/L
TETRACHLOROETHENE	5.0	500 U	UG/L
TOLUENE	5.0	240 J	UG/L
1,1,1-TRICHLOROETHANE	5.0	500 U	UG/L
1,1,2-TRICHLOROETHANE	5.0	500 U	UG/L
TRICHLOROETHENE	5.0	500 U	UG/L
VINYL CHLORIDE	5.0	12000	UG/L
O-XYLENE	5.0	500 U	UG/L
M+P-XYLENE	5.0	410 J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	105	%
TOLUENE-D8	(88 - 110)	109	%
DIBROMOFLUOROMETHANE	(86 - 118)	106	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #2

Date Sampled : 02/13/96 **GTC Order # :** 64662 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/16/96
ANALYTICAL DILUTION: 1.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	10 U	UG/L
BENZENE	5.0	5.0 U	UG/L
BROMODICHLOROMETHANE	5.0	5.0 U	UG/L
BROMOFORM	5.0	5.0 U	UG/L
BROMOMETHANE	5.0	5.0 U	UG/L
2-BUTANONE (MEK)	10	10 U	UG/L
CARBON DISULFIDE	10	10 U	UG/L
CARBON TETRACHLORIDE	5.0	5.0 U	UG/L
CHLOROBENZENE	5.0	5.0 U	UG/L
CHLOROETHANE	5.0	5.0 U	UG/L
CHLOROFORM	5.0	5.0 U	UG/L
CHLOROMETHANE	5.0	5.0 U	UG/L
DIBROMOCHLOROMETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHANE	5.0	5.0 U	UG/L
1,2-DICHLOROETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHENE	5.0	5.0 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	46	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	5.0 U	UG/L
1,2-DICHLOROPROPANE	5.0	5.0 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
ETHYLBENZENE	5.0	5.0 U	UG/L
2-HEXANONE	10	10 U	UG/L
METHYLENE CHLORIDE	5.0	5.0 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	10 U	UG/L
STYRENE	5.0	5.0 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	5.0 U	UG/L
TETRACHLOROETHENE	5.0	5.0 U	UG/L
TOLUENE	5.0	2.5 J	UG/L
1,1,1-TRICHLOROETHANE	5.0	5.0 U	UG/L
1,1,2-TRICHLOROETHANE	5.0	5.0 U	UG/L
TRICHLOROETHENE	5.0	5.0 U	UG/L
VINYL CHLORIDE	5.0	4.4 J	UG/L
O-XYLENE	5.0	5.0 U	UG/L
M+P-XYLENE	5.0	2.0 J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	104	%
TOLUENE-D8	(88 - 110)	107	%
DIBROMOFLUOROMETHANE	(86 - 118)	105	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #3

Date Sampled : 02/13/96 **GTC Order # :** 64663 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/16/96
ANALYTICAL DILUTION: 100.0 , 200.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	1000 U	UG/L
BENZENE	5.0	500 U	UG/L
BROMODICHLOROMETHANE	5.0	500 U	UG/L
BROMOFORM	5.0	500 U	UG/L
BROMOMETHANE	5.0	500 U	UG/L
2-BUTANONE (MEK)	10	1000 U	UG/L
CARBON DISULFIDE	10	1000 U	UG/L
CARBON TETRACHLORIDE	5.0	500 U	UG/L
CHLOROBENZENE	5.0	500 U	UG/L
CHLOROETHANE	5.0	500 U	UG/L
CHLOROFORM	5.0	500 U	UG/L
CHLOROMETHANE	5.0	500 U	UG/L
DIBROMOCHLOROMETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHANE	5.0	500 U	UG/L
1,2-DICHLOROETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHENE	5.0	500 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	34000	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	180 J	UG/L
1,2-DICHLOROPROPANE	5.0	500 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
ETHYLBENZENE	5.0	120 J	UG/L
2-HEXANONE	10	1000 U	UG/L
METHYLENE CHLORIDE	5.0	500 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	1000 U	UG/L
STYRENE	5.0	500 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	500 U	UG/L
TETRACHLOROETHENE	5.0	500 U	UG/L
TOLUENE	5.0	120 J	UG/L
1,1,1-TRICHLOROETHANE	5.0	500 U	UG/L
1,1,2-TRICHLOROETHANE	5.0	500 U	UG/L
TRICHLOROETHENE	5.0	500 U	UG/L
VINYL CHLORIDE	5.0	12000	UG/L
O-XYLENE	5.0	500 U	UG/L
M+P-XYLENE	5.0	310 J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	106	%
TOLUENE-D8	(88 - 110)	110	%
DIBROMOFLUOROMETHANE	(86 - 118)	108	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #4

Date Sampled : 02/13/96 **GTC Order # :** 64664 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

ANALYTE	PQL	RESULT		UNITS
DATE ANALYZED : 02/16/96				
ANALYTICAL DILUTION: 10.0				
ACETONE	10	100	U	UG/L
BENZENE	5.0	50	U	UG/L
BROMODICHLOROMETHANE	5.0	50	U	UG/L
BROMOFORM	5.0	50	U	UG/L
BROMOMETHANE	5.0	50	U	UG/L
2-BUTANONE (MEK)	10	100	U	UG/L
CARBON DISULFIDE	10	100	U	UG/L
CARBON TETRACHLORIDE	5.0	50	U	UG/L
CHLOROBENZENE	5.0	50	U	UG/L
CHLOROETHANE	5.0	50	U	UG/L
CHLOROFORM	5.0	50	U	UG/L
CHLOROMETHANE	5.0	50	U	UG/L
DIBROMOCHLOROMETHANE	5.0	50	U	UG/L
1,1-DICHLOROETHANE	5.0	50	U	UG/L
1,2-DICHLOROETHANE	5.0	50	U	UG/L
1,1-DICHLOROETHENE	5.0	50	U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	1800		UG/L
TRANS-1,2-DICHLOROETHENE	5.0	50	U	UG/L
1,2-DICHLOROPROPANE	5.0	50	U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	50	U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	50	U	UG/L
ETHYLBENZENE	5.0	50	U	UG/L
2-HEXANONE	10	100	U	UG/L
METHYLENE CHLORIDE	5.0	50	U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	100	U	UG/L
STYRENE	5.0	50	U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	50	U	UG/L
TETRACHLOROETHENE	5.0	50	U	UG/L
TOLUENE	5.0	50	U	UG/L
1,1,1-TRICHLOROETHANE	5.0	50	U	UG/L
1,1,2-TRICHLOROETHANE	5.0	50	U	UG/L
TRICHLOROETHENE	5.0	50	U	UG/L
VINYL CHLORIDE	5.0	510		UG/L
O-XYLENE	5.0	50	U	UG/L
M+P-XYLENE	5.0	13	J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	107	%
TOLUENE-D8	(88 - 110)	109	%
DIBROMOFLUOROMETHANE	(86 - 118)	106	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #5

Date Sampled : 02/14/96 **GTC Order # :** 64666 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/20/96
ANALYTICAL DILUTION: 100.0 , 400.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	1000 U	UG/L
BENZENE	5.0	500 U	UG/L
BROMODICHLOROMETHANE	5.0	500 U	UG/L
BROMOFORM	5.0	500 U	UG/L
BROMOMETHANE	5.0	500 U	UG/L
2-BUTANONE (MEK)	10	1000 U	UG/L
CARBON DISULFIDE	10	1000 U	UG/L
CARBON TETRACHLORIDE	5.0	500 U	UG/L
CHLOROBENZENE	5.0	500 U	UG/L
CHLOROETHANE	5.0	500 U	UG/L
CHLOROFORM	5.0	500 U	UG/L
CHLOROMETHANE	5.0	500 U	UG/L
DIBROMOCHLOROMETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHANE	5.0	5900	UG/L
1,2-DICHLOROETHANE	5.0	500 U	UG/L
1,1-DICHLOROETHENE	5.0	580	UG/L
CIS-1,2-DICHLOROETHENE	5.0	45000	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	500 U	UG/L
1,2-DICHLOROPROPANE	5.0	500 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	500 U	UG/L
ETHYLBENZENE	5.0	1500	UG/L
2-HEXANONE	10	1000 U	UG/L
METHYLENE CHLORIDE	5.0	500 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	1000 U	UG/L
STYRENE	5.0	500 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	500 U	UG/L
TETRACHLOROETHENE	5.0	500 U	UG/L
TOLUENE	5.0	1600	UG/L
1,1,1-TRICHLOROETHANE	5.0	44000	UG/L
1,1,2-TRICHLOROETHANE	5.0	500 U	UG/L
TRICHLOROETHENE	5.0	50000	UG/L
VINYL CHLORIDE	5.0	3600	UG/L
O-XYLENE	5.0	2200	UG/L
M+P-XYLENE	5.0	5500	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	98	%
TOLUENE-D8	(88 - 110)	101	%
DIBROMOFLUOROMETHANE	(86 - 118)	99	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #6

Date Sampled : 02/14/96 **GTC Order # :** 64668 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/20/96
ANALYTICAL DILUTION: 2.0 , 1.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	280	UG/L
BENZENE	5.0	5.0 U	UG/L
BROMODICHLOROMETHANE	5.0	5.0 U	UG/L
BROMOFORM	5.0	5.0 U	UG/L
BROMOMETHANE	5.0	5.0 U	UG/L
2-BUTANONE (MEK)	10	52	UG/L
CARBON DISULFIDE	10	10 U	UG/L
CARBON TETRACHLORIDE	5.0	5.0 U	UG/L
CHLOROBENZENE	5.0	5.0 U	UG/L
CHLOROETHANE	5.0	5.0 U	UG/L
CHLOROFORM	5.0	5.0 U	UG/L
CHLOROMETHANE	5.0	5.0 U	UG/L
DIBROMOCHLOROMETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHANE	5.0	5.0 U	UG/L
1,2-DICHLOROETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHENE	5.0	5.0 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	5.0 U	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	5.0 U	UG/L
1,2-DICHLOROPROPANE	5.0	5.0 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
ETHYLBENZENE	5.0	5.0 U	UG/L
2-HEXANONE	10	10 U	UG/L
METHYLENE CHLORIDE	5.0	5.0 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	4.2 J	UG/L
STYRENE	5.0	5.0 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	5.0 U	UG/L
TETRACHLOROETHENE	5.0	5.0 U	UG/L
TOLUENE	5.0	5.0 U	UG/L
1,1,1-TRICHLOROETHANE	5.0	4.1 J	UG/L
1,1,2-TRICHLOROETHANE	5.0	5.0 U	UG/L
TRICHLOROETHENE	5.0	2.1 J	UG/L
VINYL CHLORIDE	5.0	5.0 U	UG/L
O-XYLENE	5.0	5.0 U	UG/L
M+P-XYLENE	5.0	2.3 J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	96	%
TOLUENE-D8	(88 - 110)	96	%
DIBROMOFLUOROMETHANE	(86 - 118)	97	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #7

Date Sampled : 02/15/96 **GTC Order # :** 64669 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/20/96
ANALYTICAL DILUTION: 250.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	2500 U	UG/L
BENZENE	5.0	1300 U	UG/L
BROMODICHLOROMETHANE	5.0	1300 U	UG/L
BROMOFORM	5.0	1300 U	UG/L
BROMOMETHANE	5.0	1300 U	UG/L
2-BUTANONE (MEK)	10	2500 U	UG/L
CARBON DISULFIDE	10	2500 U	UG/L
CARBON TETRACHLORIDE	5.0	1300 U	UG/L
CHLOROBENZENE	5.0	1300 U	UG/L
CHLOROETHANE	5.0	1300 U	UG/L
CHLOROFORM	5.0	1300 U	UG/L
CHLOROMETHANE	5.0	1300 U	UG/L
DIBROMOCHLOROMETHANE	5.0	1300 U	UG/L
1,1-DICHLOROETHANE	5.0	2900	UG/L
1,2-DICHLOROETHANE	5.0	1300 U	UG/L
1,1-DICHLOROETHENE	5.0	1300 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	45000	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	1300 U	UG/L
1,2-DICHLOROPROPANE	5.0	1300 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	1300 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	1300 U	UG/L
ETHYLBENZENE	5.0	790 J	UG/L
2-HEXANONE	10	2500 U	UG/L
METHYLENE CHLORIDE	5.0	1300 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	2500 U	UG/L
STYRENE	5.0	1300 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	1300 U	UG/L
TETRACHLOROETHENE	5.0	1300 U	UG/L
TOLUENE	5.0	840 J	UG/L
1,1,1-TRICHLOROETHANE	5.0	14000	UG/L
1,1,2-TRICHLOROETHANE	5.0	1300 U	UG/L
TRICHLOROETHENE	5.0	38000	UG/L
VINYL CHLORIDE	5.0	3600	UG/L
O-XYLENE	5.0	1200 J	UG/L
M+P-XYLENE	5.0	3000	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	95	%
TOLUENE-D8	(88 - 110)	95	%
DIBROMOFLUOROMETHANE	(86 - 118)	88	%

General Testing Corporation

VOLATILE ORGANICS
METHOD 8260 TCL
Reported: 02/23/96

Conestoga Rovers & Associates
Project Reference: CHEEKTOWAGA SITE PROJECT #3967
Client Sample ID : SAMPLE #8

Date Sampled : 02/15/96 **GTC Order # :** 64672 **Sample Matrix:** WATER
Date Received: 02/15/96 **Submission #:** 9602000178 **Analytical Run:** 6680

DATE ANALYZED : 02/21/96
ANALYTICAL DILUTION: 5.0 , 1.0

ANALYTE	PQL	RESULT	UNITS
ACETONE	10	540	UG/L
BENZENE	5.0	5.0 U	UG/L
BROMODICHLOROMETHANE	5.0	5.0 U	UG/L
BROMOFORM	5.0	5.0 U	UG/L
BROMOMETHANE	5.0	5.0 U	UG/L
2-BUTANONE (MEK)	10	140	UG/L
CARBON DISULFIDE	10	10 U	UG/L
CARBON TETRACHLORIDE	5.0	5.0 U	UG/L
CHLOROBENZENE	5.0	5.0 U	UG/L
CHLOROETHANE	5.0	5.0 U	UG/L
CHLOROFORM	5.0	5.0 U	UG/L
CHLOROMETHANE	5.0	5.0 U	UG/L
DIBROMOCHLOROMETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHANE	5.0	5.0 U	UG/L
1,2-DICHLOROETHANE	5.0	5.0 U	UG/L
1,1-DICHLOROETHENE	5.0	5.0 U	UG/L
CIS-1,2-DICHLOROETHENE	5.0	5.0 U	UG/L
TRANS-1,2-DICHLOROETHENE	5.0	5.0 U	UG/L
1,2-DICHLOROPROPANE	5.0	5.0 U	UG/L
CIS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
TRANS-1,3-DICHLOROPROPENE	5.0	5.0 U	UG/L
ETHYLBENZENE	5.0	5.0 U	UG/L
2-HEXANONE	10	7.1 J	UG/L
METHYLENE CHLORIDE	5.0	5.0 U	UG/L
4-METHYL-2-PENTANONE (MIBK)	10	30	UG/L
STYRENE	5.0	5.0 U	UG/L
1,1,2,2-TETRACHLOROETHANE	5.0	5.0 U	UG/L
TETRACHLOROETHENE	5.0	5.0 U	UG/L
TOLUENE	5.0	5.0 U	UG/L
1,1,1-TRICHLOROETHANE	5.0	5.0 U	UG/L
1,1,2-TRICHLOROETHANE	5.0	5.0 U	UG/L
TRICHLOROETHENE	5.0	1.2 J	UG/L
VINYL CHLORIDE	5.0	5.0 U	UG/L
O-XYLENE	5.0	5.0 U	UG/L
M+P-XYLENE	5.0	1.6 J	UG/L

SURROGATE RECOVERIES	QC LIMITS		
4-BROMOFLUOROBENZENE	(86 - 115)	100	%
TOLUENE-D8	(88 - 110)	99	%
DIBROMOFLUOROMETHANE	(86 - 118)	100	%

CHAIN OF CUSTODY RECORD

2-178

CRA
CONESTOGA-ROVERS & ASSOCIATES
2055 Niagara Falls Blvd. Suite Three
Niagara Falls, NY 14304 (716)297-6150

SHIPPED TO (Laboratory Name): GTC
Amherst, NY

REFERENCE NUMBER: 3967
Leica Inc. Step Tests

SAMPLER'S SIGNATURE:

PRINTED NAME: Kevin Lynch

SEQ. No.	DATE	TIME	SAMPLE No.		SAMPLE TYPE	No. OF CONTAINERS	PARAMETERS: Tal VOCs	REMARKS
	2/13/96		Sample #1	64660	Water	2	2	MW-6A Influent 0 hr.
	2/13/96		Sample #2	64662		2	2	MW-6A Effluent 0 hrs.
	2/13/96		Sample #3	64663		2	2	MW-6A Influent 4 hrs
	2/13/96		Sample #4	64664		2	2	MW-6A Effluent 4 hrs
	2/14/96		Sample #5	64666		2	2	MW 16A Influent 0 hrs
	2/14/96		Sample #6	64668		2	2	MW 16A Effluent 0 hrs
	2/15/96		Sample #7	64669		2	2	MW 16A Influent 3 hrs
	2/15/96		Sample #8	64672	↓	2	2	MW 16A Effluent 3 hrs

TOTAL NUMBER OF CONTAINERS: 16

HEALTH/CHEMICAL HAZARDS:

RELINQUISHED BY: ①	DATE: 2/15/96 TIME: 1630	RECEIVED BY: ②	DATE: 2/15/96 TIME: 1630
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: Auto

WAY BILL No. NA

White -Fully Executed Copy
Yellow -Receiving Laboratory Copy
Pink -Shipper Copy
Goldenrod -Sampler Copy

SAMPLE TEAM:
K. Lynch
G. Gill

RECEIVED FOR LABORATORY BY:

DATE: 2/16/96 TIME: 0800

№ NF-

1001 (D) OCT 31/94(NF) REV.1 (F-05)

CONESTOGA ROVERS