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REMEDIAL DESIGN ENGINEERING REPORT

Storonske Cooperage Site
Town of Schodack,
Rensselaer County, New York
(Site Registry No. 442021)

Dvirka and Bartilucci
Consulting Engineers

MARCH 1994

REMEDIAL DESIGN ENGINEERING REPORT

STORONSKE COOPERAGE SITE
TOWN OF SCHODACK
RENSSELAER COUNTY, NEW YORK

(SITE REGISTRY NO. 442021)

PREPARED FOR

THE NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION

BY

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SYOSSET, NEW YORK

MARCH 1994

STORONSKE COOPERAGE SITE
REMEDIAL DESIGN ENGINEERING REPORT

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1.0 INTRODUCTION

1.1 Site History

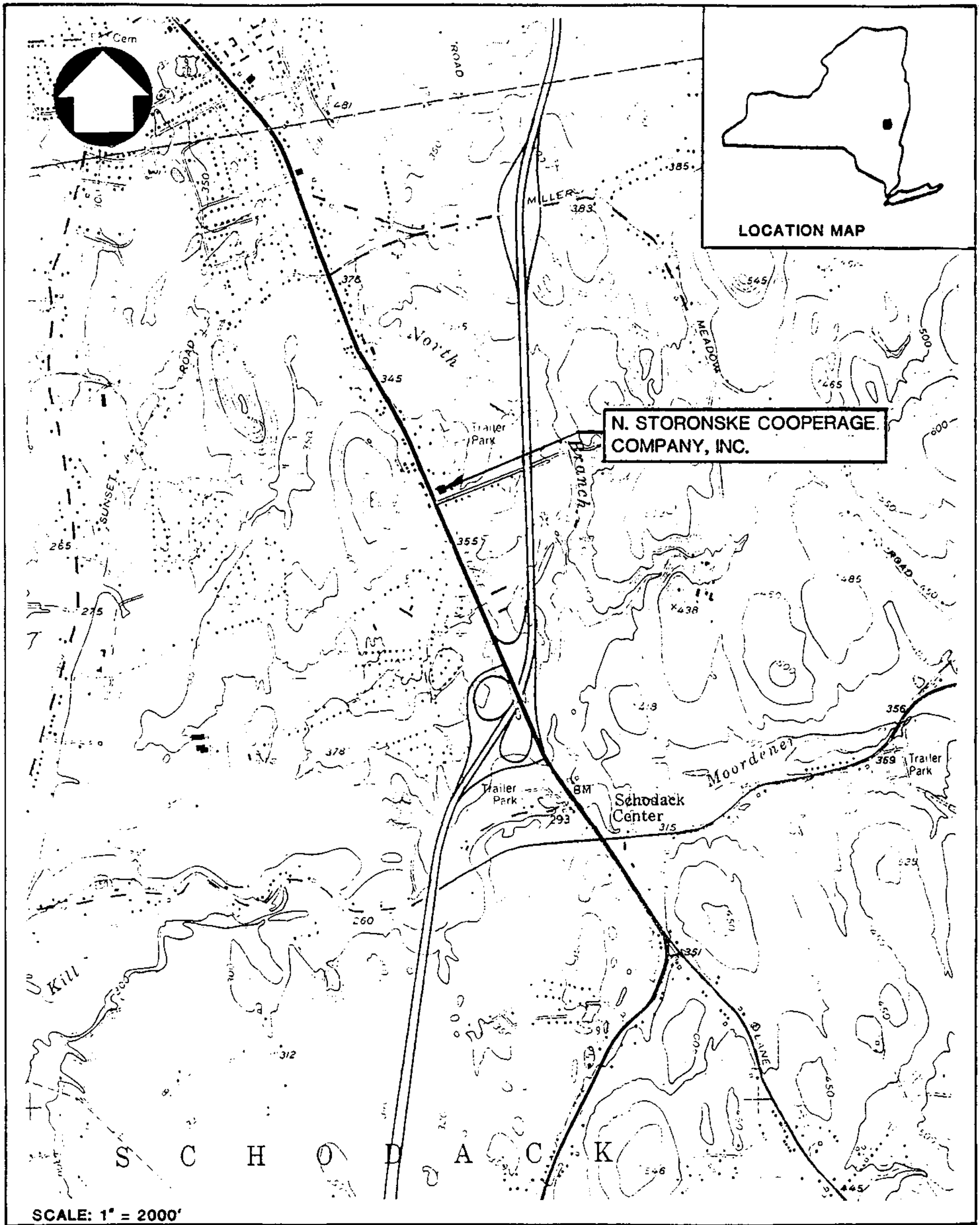
The Storonske Cooperage site, which is a New York State Superfund site, is a 5-acre parcel of land located in the Town of Schodack, Rensselaer County, New York. The site is located on the north side of Kraft Road, immediately east of the intersection of Kraft Road with U.S. Routes 9 and 20 (see Figure 1-1). The facility, until recently, was used for the cleaning and reconditioning of 55-gallon drums since it was purchased by N. Storonske Cooperage, Inc. in 1973. Prior to 1973, the property was utilized by the Albany-Nassau Bus Company as a bus garage and depot.

The earliest known concern regarding the Storonske Cooperage site as a possible source of contamination was reported by the Rensselaer County Department of Health in 1979, because of the large number of drums stored and processed on the site. It was also reported that soil samples collected on the site in 1980 showed elevated levels of benzene and xylene.

1.2 Previous Investigations

In March 1984, the New York State Department of Environmental Conservation (NYSDEC) conducted a facility inspection under the Resource Conservation and Recovery Act (RCRA) program. The sludge in the former wastewater lagoon at the site, which received rinse water from drum cleaning, was sampled and found to exceed the EP Toxicity limits for lead, which characterized the material as a hazardous waste. This resulted in N. Storonske Cooperage, Inc., entering into a Consent Order with the State of New York in March 1986, to remove the lagoon from operation and to conduct an investigation of the impacts of the lagoon (see Figure 1-2).

Since 1984, six investigations have been conducted at the site, four of which were commissioned by the site owner and two undertaken by NYSDEC. Provided below is a list of investigation reports prepared for the site, including both groundwater and soils:



STORONSKE COOPERAGE SITE
FEASIBILITY STUDY

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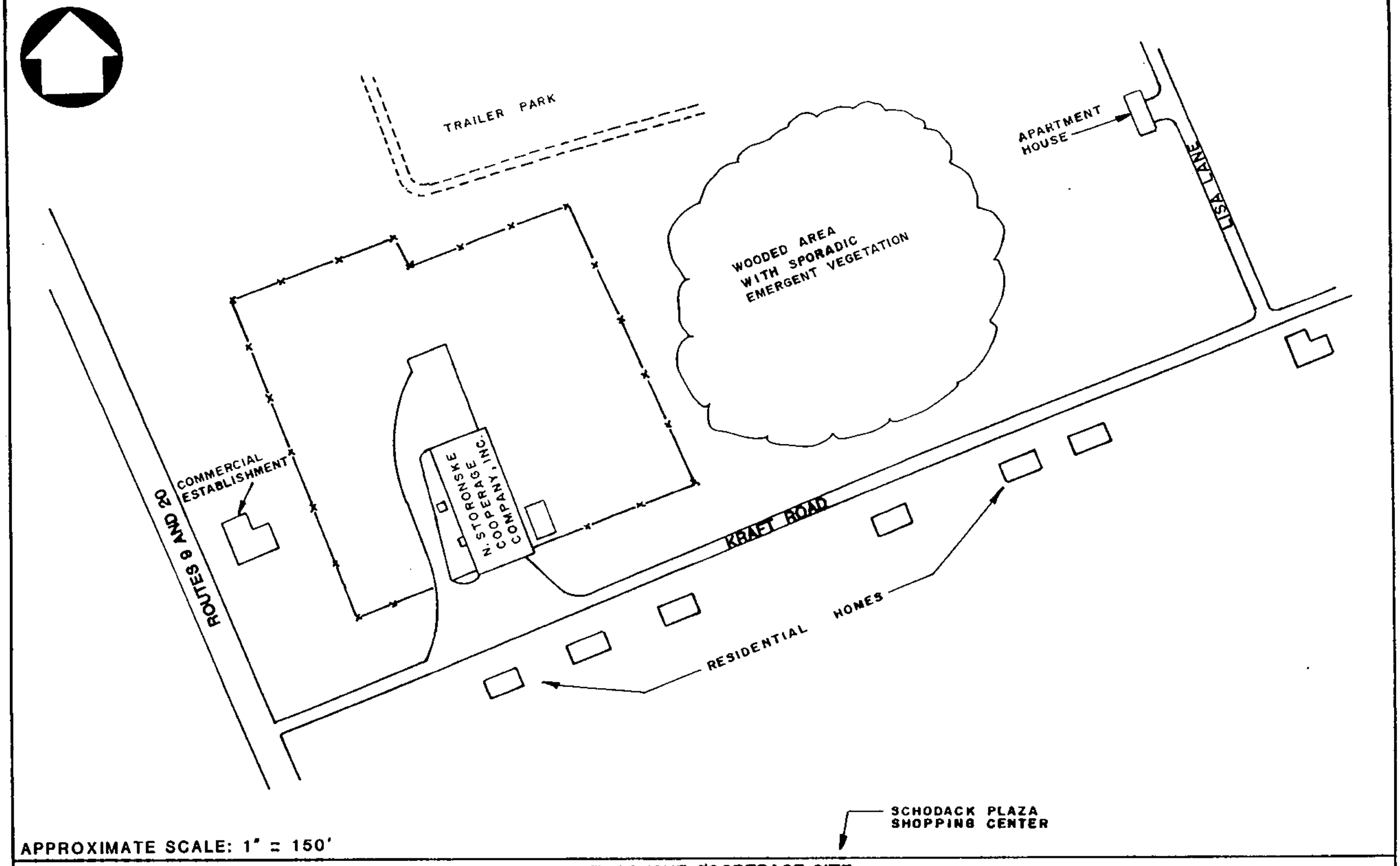
SITE LOCATION MAP

FIGURE 1-1



APPROXIMATE SCALE: 1" = 150'

STORONSKE COOPERAGE SITE
FEASIBILITY STUDY

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FACILITY LOCATION MAP

FIGURE 1-2

- "Field Investigation and Monitoring Proposal," June 1986, by Fraser Associates.
- "Preliminary Hydrogeologic Assessment," October 1986, by Fraser Associates, Empire Soils Investigations, Inc. and Thomsen Associates.
- "Phase I Hydrogeologic Investigation," September 1987, by Malcolm Pirnie, Inc.
- "Phase II Hydrogeologic Investigation," December 1988, by Malcolm Pirnie, Inc.
- "Focused RI/FS Work Plan," April 1989 and "Focused Remedial Investigation and Feasibility Study Report," April 1990, by Malcolm Pirnie, Inc.
- "Phase I Remedial Investigation Report," November 1990, by Dvirka and Bartilucci Consulting Engineers.
- "Phase II Remedial Investigation Report," August 1992, by Dvirka and Bartilucci Consulting Engineers.

Based on the site investigations indicated above, groundwater samples collected from monitoring wells installed as part of the investigations indicated the presence of volatile organic compounds (VOCs). The latest round of groundwater sampling conducted in April 1992, indicated the following VOCs and highest concentrations in samples collected from the on-site groundwater monitoring wells: trichloroethene (19 ug/l), benzene (7 ug/l), chlorobenzene (8 ug/l), 1,1-dichloroethane (30 ug/l), tetrachloroethane (10 ug/l), 1,1,1-trichloroethane (15 ug/l) and xylene (63 ug/l). Levels of VOCs were also detected above New York State Drinking Water Standards at several residences along Kraft Road prompting the continued use of carbon filtration devices on private water supply systems.

Soil at the site was found to be contaminated with various volatile and semivolatile organic compounds, metals and polychlorinated biphenyls (PCBs) based upon the results reported in the Focused Remedial Investigation and Feasibility Study Report, dated April 1990, by Malcolm Pirnie, Inc. as indicated on Table 1-1. The most contaminated soils appeared to be confined to the area of the former lagoon and eastward to the site's eastern property boundary. Other contaminated areas included drum unloading and storage areas.

Table 1-1

SUMMARY OF CONTAMINATION DETECTED IN ON-SITE SOIL SAMPLES[1] STORONSKE COOPERAGE SITE

	Frequency of Detection	Range of Detected Values (ppb)	Average of Detected Values (ppb)
Volatile Organics			
Tetrachloroethene	24/111	2-3,500	332
1,1,1-Trichloroethane	24/111	1-1,300	172
Total Xylenes	17/111	10-58,500	15,029
Ethylbenzene	16/111	2-20,000	5,474
Toluene	14/111	12-41,000	8,558
Chlorobenzene	10/111	2-3,900	1,230
Trichloroethene	10/111	2-2,600	321
1,1-Dichloroethane	7/111	1-3	1.9
Total 1,2-Dichloroethene	5/111	1-6	4.4
1,2-Dichloroethane	3/111	6-2,000	792
Styrene	2/111	8,900-19,000	13,950
Benzene	1/111	810	810
Semivolatile Organics			
Di-n-Butylphthalate	21/97	30-316,000	19,505
Naphthalene	19/97	41-9,100	1,151
2-Methylnaphthalene	17/97	41-3,900	965
Phenol	16/97	130-26,000	3,474
Hexachlorobenzene	13/97	160-1,900	655
Bis(2-ethylhexyl)phthalate	11/97	1,300-12,000	4,255
1,2,4-Trichlorobenzene	10/97	140-1,800	710
4-Methylphenol	9/97	100-1,900	1,050
Phenanthrene	7/97	42-800	326
Isophorone	6/97	93-1,400	392
2,4-Dimethylphenol	6/97	130-1,300	538
Di-n-octylphthalate	6/97	57-360	130
Butylbenzylphthalate	6/97	210-3,700	1,268
2-Methylphenol	4/97	390-790	610
Fluorene	3/97	73-380	224
Fluoranthene	3/97	310-830	587
Pyrene	3/97	220-560	453

Table 1-1 (continued)

SUMMARY OF CONTAMINATION DETECTED IN ON-SITE SOIL SAMPLES[1] STORONSKE COOPERAGE SITE

	Frequency of Detection	Range of Detected Values (ppb)	Average of Detected Values (ppb)
Chrysene	3/97	150-420	300
Benzo(a)anthracene	2/97	310-370	340
1,2-Dichlorobenzene	1/97	440	440
Diethylphthalate	1/97	430	430
Anthracene	1/97	220	220
Benzo(a)fluoranthene	1/97	560	560
Benzo(a)pyrene	1/97	240	240
PCB			
Aroclor-1242 (as PCBs)	21/87	110-20,000	2,035
Metals			
Cadmium	100/103	ND-317,000	11,290
Chromium	82/82	11.1-943,000	40,950
Copper	103/103	8,700-15.1E4	33,870
Lead	103/103	3.1E3-508E4	113,130
Mercury	25/32	ND-1,810	398
Selenium	3/103	ND-7,500	3,600
Zinc	102/102	365E2-246E4	149,150

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[1] As reported in N. Storonske Cooperage Focused Remedial Investigation and Feasibility Study Report, April 1990, by Malcolm Pirnie, Inc.

The depth of contaminated soil was determined to vary with respect to on-site location and type of contaminant. In general, highest concentrations of total VOCs were detected in the former lagoon area at depths from 0.5 to 10 feet at 110 ppm. The VOCs extend generally eastward from the lagoon and were detected at depths extending to 10-16 feet at the eastern property boundary with total VOC concentrations greater than 2 ppm. The highest concentration of total VOCs at this eastern boundary location was 85.5 ppm at a depth of 4-10 feet. Significant contamination was typically not detected at depths greater than 10-16 feet. Note that the depth to groundwater in the former lagoon area (well MW-15) extending to the eastern site boundary (well MW-25) ranges from 16.5 feet to 13 feet, respectively.

Supplemental Surface and Subsurface Soil Sampling

As part of the Predesign Investigation, Dvirka and Bartilucci Consulting Engineers performed additional soil sample collection in April 1993, to further define areas of contamination at the site. These samples were collected for VOCs, PCBs and lead analysis. The analytical data from this predesign sampling is provided in Appendix A. The results further identified areas requiring remediation for PCBs and lead, however, VOCs were not detected in site surface soils.

1.3 Record of Decision

As a result of the on-site investigations and evaluation of remedial alternatives to address on-site soil contamination, a Record of Decision (ROD) was issued by NYSDEC in March 1992, which sets forth the selected remedial action plan for the Storonske Cooperage site Operable Unit 1 - On-site Soils. The remedial plan was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the New York State Environmental Conservation Law (ECL). The ROD was based upon the Administrative Record for the Storonske Cooperage site and public input to the Proposed Remedial Action Plan (PRAP). The final screening of remedial alternatives as presented in the Focused RI/FS Report by Malcolm Pirnie, Inc., included a number of options, of which In Situ Vacuum Extraction and Off-site Disposal of Soils Contaminated with Heavy Metals, was selected by NYSDEC as appropriate for the Storonske Cooperage site contaminants and site conditions for the on-site soils. Table 1-2 indicates the cleanup goals established for remediation activities for on-site soils.

The major components of the selected remedy include the following:

1. Predesign pilot testing to determine the number and locations of vacuum extraction wells.
2. Design and installation of a vacuum extraction system to remove and treat volatile organic contaminants from the soils. Methods for enhancing the removal of contaminants will be evaluated.
3. End-point sampling of subsurface soil to determine if treatment goals for soil vapor gas have been achieved.
4. Demobilization of the soil vapor gas extraction system.
5. Additional surface soil sampling to determine the areal extent of soil contaminated with volatile organic compounds, PCBs and lead. Areas of the site which exceed the cleanup goal for lead of 200 parts per million (ppm) will be identified to determine the limits of soil excavation.
6. Excavation and removal of contaminated soils from the site. Testing will be performed to ensure that the soil meets the applicable disposal facility requirements.
7. Soil/excavation end-point sampling to verify that the cleanup goals have been achieved.
8. Backfill of excavated areas with clean soil and the overall site covered with six inches of clean soil, regraded to promote proper drainage and revegetated to prevent erosion.
9. Long-term groundwater and water supply sampling to monitor the effectiveness of the remedial actions taken.

Table 1-2

CLEANUP GOALS ESTABLISHED FOR ON-SITE SOILS
STORONSKE COOPERAGE SITE

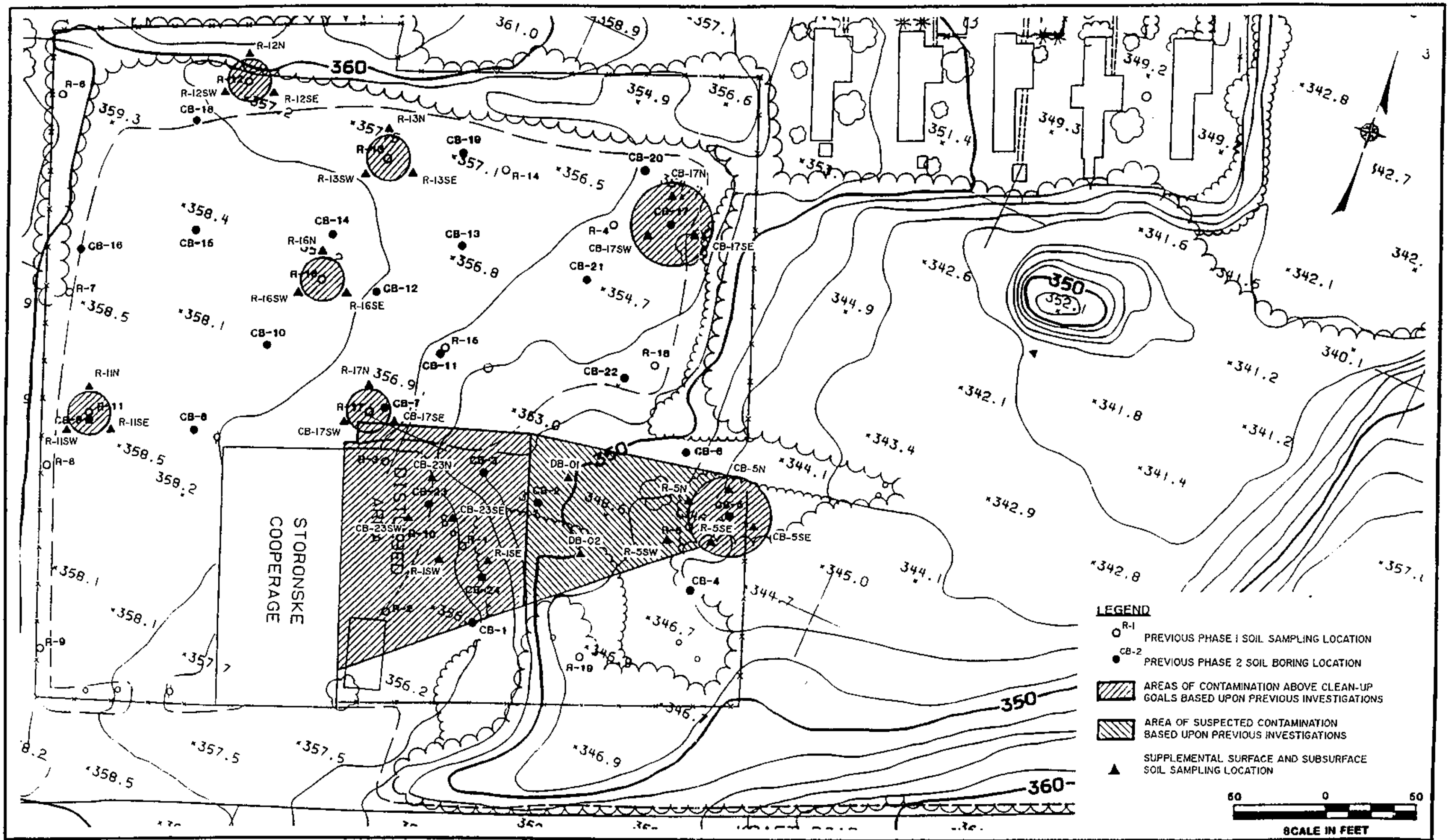
Organic Compounds	Soil Cleanup Goal (ppm)
Tetrachloroethene	1.5
1,1,1-Trichloroethane	1.0
Trichloroethene	1.0
1,2-Dichloroethane	0.1
Ethylbenzene	5.5
Chlorobenzene	1.5
Toluene	1.5
Total Xylenes	1.2
Phenols	0.33
PCB Aroclor-1242	1.0
Metals	
Lead	200

2.0 REMEDIAL DESIGN ACTIVITIES PERFORMED TO DATE

2.1 Supplemental Surface and Subsurface Soil Sampling Program

On April 19 and 20, 1993, Dvirka and Bartilucci Consulting Engineers conducted a supplemental/predesign surface and subsurface soil sampling program in areas at the site in which limits of the contamination had not been defined. The sampling consisted of the collection of 30 samples at locations identified in Figure 2-1. Seven of the 30 samples for PCB analysis were collected at a depth of 2 to 4 feet in the area of the former lagoon. All of the remaining samples were collected at or just below ground surface. All 30 of the sample locations were in areas which had been identified as exceeding or suspected of exceeding cleanup goals based upon previous investigations. The surficial samples were analyzed for Target Compound List (TCL) volatiles +10, TCL PCBs and lead. Surface samples were collected at a depth of 0 to 6 inches below vegetative cover or ground surface utilizing disposable sterile polystyrene scoops and sterile wooden tongue depressors. The seven subsurface samples collected at a depth of 2-4 feet in the former lagoon area were obtained utilizing stainless steel shovels and a hand auger, and analyzed for PCBs only. Detailed descriptions of the sampling procedures are provided in Section 6.7 of the Remedial Design Work Plan, dated January 1993.

A summary of elevated analytical results of this supplemental sampling program are indicated in Figure 2-2. The actual analytical data from this predesign sampling is provided in Appendix A. Areas of the site which exceed site specific cleanup goals based upon interpolation of previous and supplemental analytical results are shaded. As illustrated on Figure 2-2, areas which exceed the cleanup goals represent an area of approximately 2,600 sy. Excavation of these areas is planned to be conducted to an estimated depth from 0.5 to 6 feet based upon results of the remedial and supplemental investigations for protection of human health and the environment. The quantity of soils estimated to require excavation and off-site treatment/disposal is 3,300 cy.



STORONSKE COOPERAGE SITE
TOWN OF SHODACK, NEW YORK

SUPPLEMENTAL SURFACE AND SUBSURFACE SOIL SAMPLING LOCATION MAP

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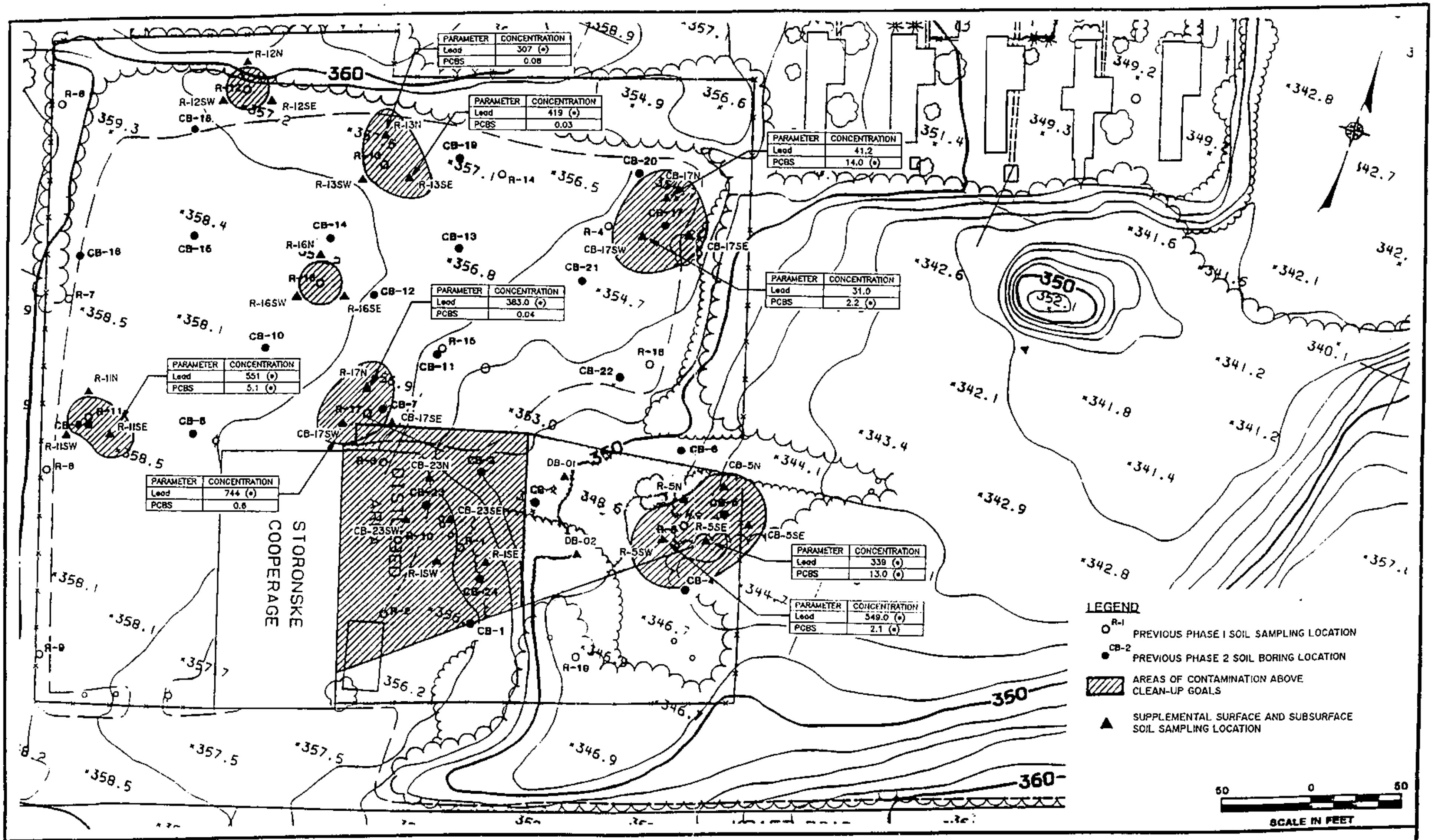
FIGURE 2-1



STORONSKE COOPERAGE SITE
TOWN OF SHODACK, NEW YORK

AREAS EXCEEDING SITE SURFACE AND SUBSURFACE CLEAN-UP GOALS

FIGURE 2 - 2

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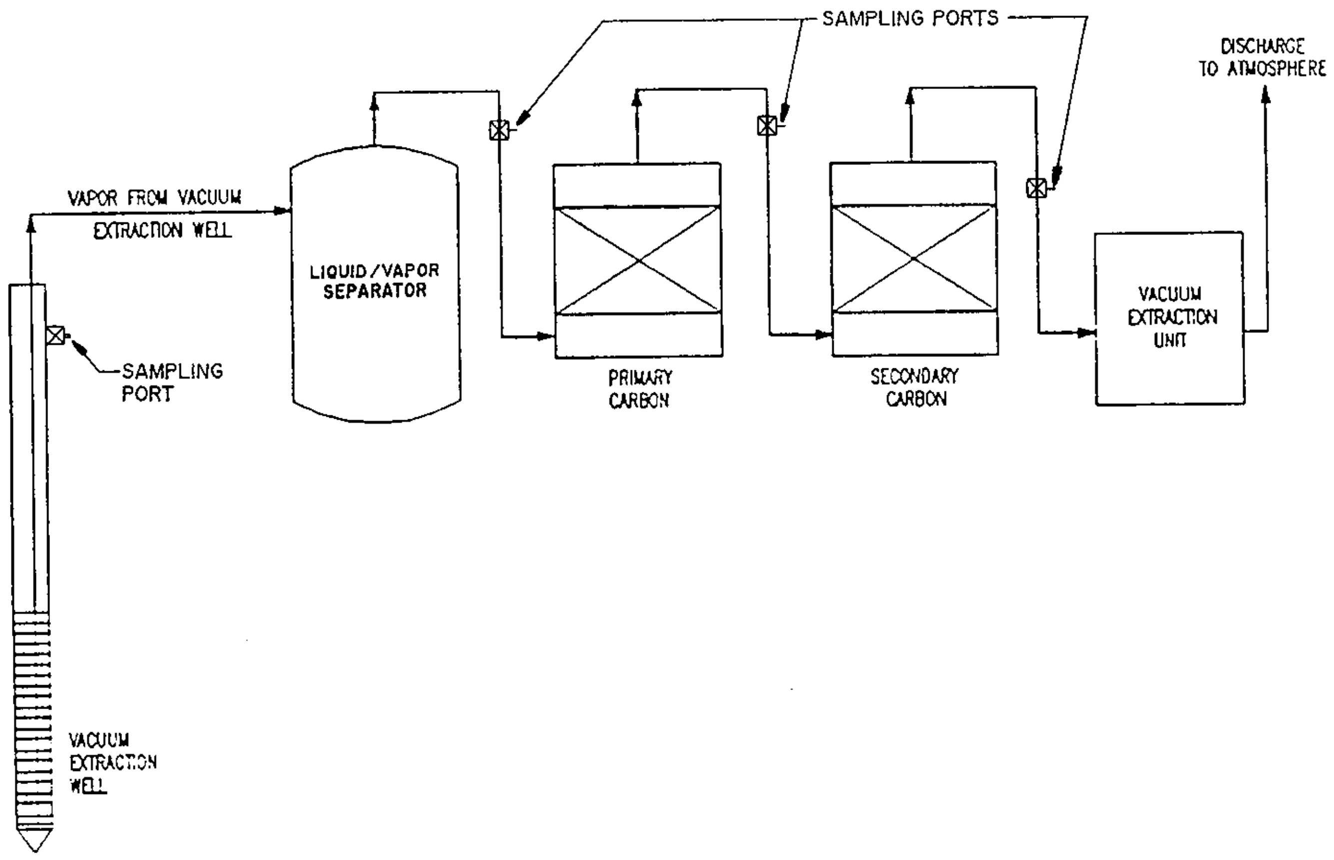
2.2 Vapor Extraction/Air Sparging Pilot Test

Based upon the Record of Decision (ROD), a predesign pilot test was to be conducted to determine the number and locations of vacuum extraction wells. Included in the ROD was the design and installation of the full scale vacuum extraction system with an additional evaluation of methods to enhance the removal of contaminants. The pilot testing conducted at the Storonske Cooperage site included vapor extraction to remove contaminants from the unsaturated zone, air sparging which enhances contaminant removal from the aquifer by bubbling air into the saturated zone above bedrock and dual vapor extraction which extracts groundwater to expose additional unsaturated soil to the vapor extraction system. A pilot testing process schematic is illustrated in Figure 2-3.

On October 27, 1993, vapor extraction/air sparging pilot testing activities were initiated with the construction of one injection well, one extraction well and two monitoring wells. Pilot testing commenced on November 2, 1993, with vacuum radius of influence testing. Sparging cone-of-influence testing and dual vacuum extraction testing were conducted on subsequent days.

Based upon the information derived from the pilot test, the following conclusions were determined:

- Vacuum extraction (VE) is an effective method of remediating the unsaturated soils at the site, regardless of the method chosen to remediate the saturated zone.
- A minimum radius of influence of 12 feet was measured in monitoring wells/probes. The calculated radius of influence for vacuum extraction based upon measurements from the wells/probes and soil specific assumptions is from 15 to 17 feet, depending on the applied vacuum.
- Carbon adsorption is an effective method of vapor treatment for this site.
- Increased vacuums provided larger radii of influence, higher flows and higher extraction rates.
- The effectiveness of air sparging is limited due to the thin saturated thickness encountered in the source area.



STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

PILOT TESTING PROCESS SCHEMATIC

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Consulting Engineers

FIGURE 2 - 3

- Dual vacuum extraction (DVE) is an effective method of dewatering the source area, given the thin saturated thickness.

- The remedial system chosen for cleanup of the saturated zone should be flexible to handle changing water level conditions.

- Although the DVE integrated remediation system to cleanup the saturated and unsaturated soils at the site is a viable technology, based upon the depth of most prevalent VOC contamination at the site and the limited saturated thickness of the overburden aquifer in the area of the former lagoon, simple vapor extraction is recommended. This system would include 17 vacuum extraction wells in the source area and 3 vapor extraction wells in the eastern fence area. Carbon adsorption would be used for vapor treatment and for treatment of condensate from the water/vapor separator. The operating time of this system would be approximately 1.5 years.

A detailed description of the pilot test procedures and results is provided in Appendix B.

3.0 PILOT TESTING EVALUATION

3.1 Design Organic Compounds

There are ten organic compounds with recommended clean-up goals for on-site soils indicated in the Storonske Cooperage site Record of Decision. These organic compounds and their respective recommended cleanup goals are indicated in Table 3-1. Two of the organic compounds, phenols and PCBs, are not volatile and are not directly affected by induced vacuums in the soil as conducted during the vapor extraction pilot test. Phenols may, however, be affected by the increased oxygen levels in the soil which tend to increase biological degradation of this compound. All of the other organic compounds with cleanup goals were selected for vapor and groundwater analysis during the pilot test to determine testing effectiveness for removal of these compounds from the soil and groundwater.

Table 3-2 indicates the volatile organic compound clean-up goals for the site and the maximum concentration reduction required to achieve the goals based upon maximum soil concentrations. As indicated on the table, total xylenes require the most significant reduction in concentration (97.9%) to achieve cleanup goals at the site. Also significant are 1,2-dichloroethane (95.0%) and toluene (96.3%). Based upon detailed bench scale testing, approximately 9000 pore volumes may be required to achieve a 98% reduction in soil concentration for xylene.

3.2 Impact of Other Organic Compounds

Nonvolatile organic compounds at the site will, in general, not affect the operation of the soil vapor extraction system. Only volatile organic compounds will be removed from contaminated soil and require exhaust gas treatment. As previously indicated, semivolatile contamination (phenols) present in site soils may be indirectly affected by operation of the system. The oxygen levels in soils will be increased due to the drawing of atmospheric air into soil. This typically results in increased biological degradation of semivolatile organic compounds by aerobic bacteria. No impacts are likely to be observed with nonvolatile, highly chlorinated compounds, such as PCBs.

Table 3-1

ORGANIC COMPOUND CLEANUP GOALS
STORONSKE COOPERAGE SITE

Compound	Soil Cleanup Goal (ppm)
Tetrachloroethene	1.5
1,1,1-Trichloroethane	1.0
Trichloroethane	1.0
1,2-Dichloroethene	0.1
Ethylbenzene	5.5
Chlorobenzene	1.5
Toluene	1.5
Total Xylenes	1.2
Phenols	0.33
PCB Aroclor-1242	1.0

Table 3-2

VOLATILE ORGANIC COMPOUND
REQUIRED CONCENTRATION REDUCTIONS
STORONSKE COOPERAGE SITE

Compound	Average Soil Conc. (ppb)	Maximum Soil Conc. (ppb)	Cleanup Goal (ppb)	Maximum Reduction Required
Tetrachloroethene	332	3500	1500	57.1%
1,1,1-Trichloroethane	172	1300	1000	23.1%
Trichloroethene	321	2600	1000	61.5%
1,2-Dichloroethane	790	2000	100	95.0%
Xylenes	15,029	58,500	1200	97.9%
Ethylbenzene	5474	20,000	5500	72.5%
Toluene	8558	41,000	1500	96.3%
Chlorobenzene	1230	3900	1500	61.5%

3.3 Required Volatile Organic Compound Removal Efficiency

Based upon the maximum concentrations of VOCs in the soil, and site clean-up goals required, removal efficiencies were calculated as indicated in Table 3-2. Based upon these efficiencies it has been determined that total xylenes will be the limiting compound for achievement of clean-up goals at the site due to a required removal efficiency of 97.9%. In order to achieve this level of removal efficiency, bench scale testing in the laboratory of soil with similar properties has determined an estimated withdrawal of 9000 pore volumes of soil vapor will be required. Based upon site specific radius of influence testing (determined to be 17 feet) assumptions of soil porosity (35%) and flow rates achieved during pilot testing (60 standard cubic feet per minute [scfm]), it is estimated that a duration of approximately 1.5 years will be necessary to achieve the required removal efficiency.

3.4 Air Quality Impacts

Results of analysis performed both prior and subsequent to vapor treatment during pilot testing indicated that activated carbon was effective in removing contaminants from the vapor stream prior to exhaust discharge. Based upon estimated mass removal rates for full scale system operation, vapor treatment will be required. Initially, it is estimated that VOCs will be extracted at the rates indicated in Table 3-3. The total VOC production rate could be initially as high as 7.9 lbs/hr and therefore will require treatment. Mass removal rates have been utilized to estimate the quantity of activated carbon necessary for treatment based upon a system operation duration of 1.5 years. The estimated quantity of carbon based upon an assumed loading rate of 10% is approximately 18,000 lbs. An air monitoring program will be developed as part of the Monitoring and Maintenance Plan for the full scale system to ensure activated carbon treatment of the discharge is effective in eliminating potential air quality impacts from operation of the system. A copy of the application for a permit to construct a process, exhaust or ventilation system is provided as Appendix C.

Table 3-3

VOLATILE ORGANIC COMPOUND
ESTIMATED INITIAL EXTRACTED PRODUCTION RATES
STORONSKE COOPERAGE SITE

Compound	Vapor Concentration* (mg/l)	Estimated Production Rate**(lbs/hr)
Tetrachloroethene	0.4026	1.96
1,1,1 Trichloroethane	0.0014	0.01
Trichloroethene	0.1704	0.83
1,2 Dichloroethane	0.0135	0.06
Xylenes	0.2386	1.16
Ethylbenzene	0.2147	1.04
Toluene	0.5363	2.61
Chlorobenzene	0.0471	0.23

*Based upon Pilot Test concentrations at extracted rate of 22 scfm.

**Assumes vapor concentration remains constant at total system flow rate of 1,300 scfm.

Catalytic or thermal oxidation could also be utilized for vapor treatment. However, based upon pilot testing, the expected total mass of VOCs to be extracted is 1,800 lbs and it is not likely that thermal or catalytic methods of vapor treatment would be cost effective.

3.5 Condensate Treatment

Water collected in the vapor/water separator would require treatment prior to discharge on-site. The water could also be transported off-site for disposal. It is anticipated that on-site treatment utilizing two 55-gallon liquid phase carbon adsorption drums can be economically utilized for this purpose. The drums would likely be effective for treatment without carbon exchange for the 1.5-year duration of the project. Separated water requiring treatment is anticipated to amount to approximately 150 to 500 gallons per month.

3.6 Testing Equipment

Vapor samples collected at the extraction wellheads and the carbon vapor treatment system influent, midpoint and effluent sample taps were performed utilizing gas-tight syringes. The samples were taken directly to a transportable GC on-site and analyzed for VOCs with site specific clean-up goals and additional compounds. These compounds consisted of tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, xylenes, ethylbenzene, toluene, chlorobenzene, 1,2-dichloroethane, styrene and benzene. Other equipment utilized during system testing included a portable organic vapor monitor, flow measurement devices, vacuum and pressure gages, a dissolved oxygen meter and a water level gauging probe.

Equipment utilized during the pilot test generally operated satisfactorily and generated the necessary data for system performance evaluation.

3.7 Test Conditions and Procedures

The groundwater level conditions under which the pilot test was conducted were inconsistent with groundwater elevation measurements obtained previously at the site. In general, groundwater elevations were approximately 3 feet lower than had been experienced during several rounds of groundwater elevation measurements conducted at the site during the RI/FS.

The lower water table had the effect of exposing additional soil volume to the pilot vapor extraction system which would tend to significantly increase the system effectiveness in removing the total mass of VOCs from the unsaturated zone. This effect is the same as that achieved by extracting groundwater and lowering groundwater levels during dual vapor extraction. Since the saturated thickness at the location of pilot testing was approximately only 1.5 feet, this limited observable effects of air sparging and rendered this portion of the test inconclusive at the test location, as well as for the thicker saturated locations of the site further removed from the former lagoon area.

Due to the low groundwater condition identified at the site, dual vapor extraction pilot testing was conducted which exposed additional quantities of soil to vapor extraction by lowering the water table the remaining 1.5 feet to bedrock. Results of dual vapor extraction system testing indicated increased total mass VOC removal rates as a result of exposure of this additional volume of contaminated soil to vacuum induced by the vapor extraction system.

3.8 Test Results

3.8.1 Vacuum Extraction Testing

The one day vacuum extraction test demonstrated the effectiveness of using vacuum extraction to remediate the unsaturated zone. A total mass of 1.8 lbs of VOCs was extracted from a single well in less than 3 hours of operation. Subsurface vacuums were detected up to 12 feet from the extraction well. Regression analysis performed on the collected data indicated that the calculated radius of influence is 15 feet for a 3 inch mercury (Hg) applied vacuum and 17 feet for a 6.5 inch Hg applied vacuum.

3.8.2 Air Sparging Testing

Because the saturated overburden thickness was 1.5 feet, which is substantially less than previous observations at the site, only limited air sparging data was able to be obtained. A determination of the pressure required to overcome hydrostatic forces and provide the point at which increasing pressure only marginally provides increases in air flow due to increasing turbulence and air flow was made. For the aquifer conditions observed at the site, 3 pounds per square inch gauge (psig) or six times the pressure needed to overcome hydrostatic forces was determined to be the point of significantly diminishing returns. No discernable increases in VOC concentrations or VOC extraction rates as a result of increasing air injection pressure were identified. Since the saturated thickness affected by the injection well was less than 1 foot, the cone of influence from sparging was likely only 1 to 2 feet in radius.

No significant increases in overall VOC removal during sparging as compared to vacuum extraction alone were observed. This was likely because of the limited area impacted by the injection well due to the low water table and the highest VOC soil concentrations identified in the upper 6 feet of soil (above the saturated zone). Noticeable decreases in groundwater VOC concentrations were observed, however, indicating that air sparging was effectively removing VOCs from the saturated zone.

3.8.3 Dual Vacuum Extraction Testing

Based upon regression analysis of measured subsurface vacuum at three monitoring wells, the calculated radius of influence during dual vacuum extraction (DVE) testing was 29 feet. The possible reasons for the significant increase in area affected by DVE is that a thicker unsaturated zone and a deeper well screen provide a larger area of influence.

In general, vapor concentrations during the DVE testing were lower than during either the vapor extraction (VE) testing or the air sparging testing. This may have been due to decreasing VOC soil concentrations in the area as a result of the previous tests or the additional exposed soil has lower contaminant concentrations. Mass removal rates of VOCs during the dual vapor extraction testing were similar to those encountered during the VE testing.due to the higher flow rate utilized during DVE testing. Increases in VOC concentrations were observed during the first several hours after each of the two DVE start-ups providing evidence that the dewatering action exposed new areas to vapor flow.

4.0 PROPOSED SOIL VAPOR EXTRACTION AND TREATMENT SYSTEM

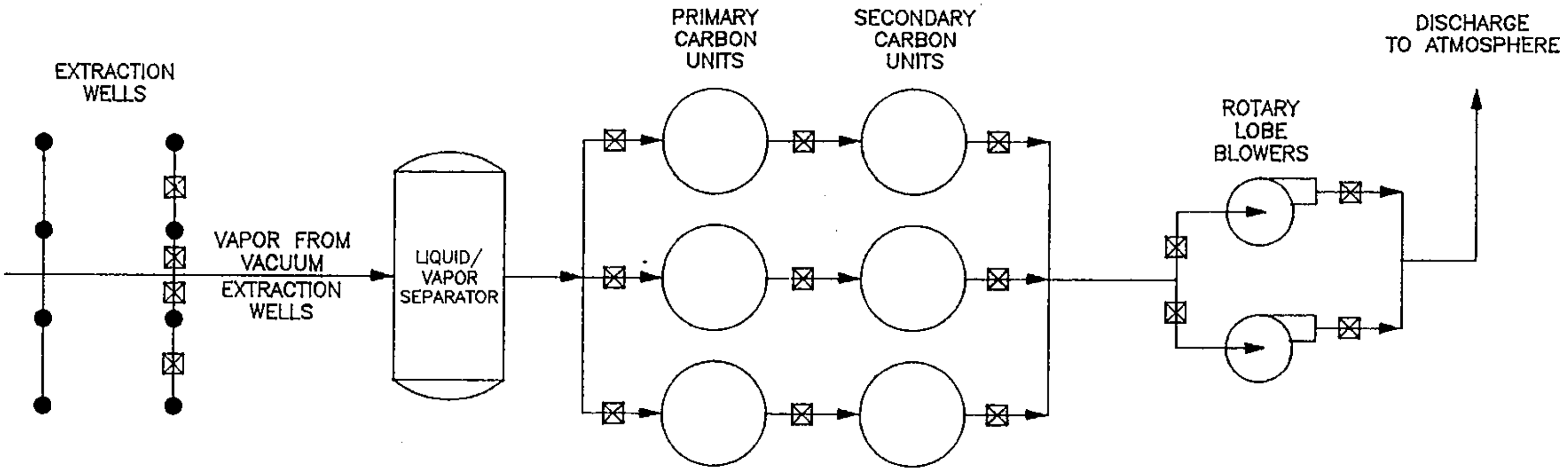
4.1 System Design Parameters

Vacuum extraction induces a negative pressure gradient within the soil matrix through wells specifically designed for this purpose. As the vacuum gradient propagates through the subsurface, liquid contaminants volatilize as the air and contaminant vapors migrate to the extraction well, where they are drawn to the surface for treatment. The process enhances the volatilization of VOCs in the soil matrix and desorbs contaminants from the soil matrix over time. A soil vapor extraction and treatment system schematic is illustrated in Figure 4-1.

The effectiveness of the vacuum extraction process at recovering VOCs is controlled by several factors including:

- Contaminant specific conditions, such as physical and chemical properties of the VOCs (vapor pressure, Henry's law constant and solubility);
- Subsurface soil characteristics (porosity, moisture content and permeability); and
- System operating parameters (well spacing and applied vacuum).

The equipment required for the implementation of a vacuum extraction system includes extraction wells, vacuum unit, liquid/vapor separation and subsequent treatment, vapor treatment unit, and system controls and instrumentation. The number of extraction wells required to attain cleanup goals is controlled by subsurface conditions. Generally, as the porosity and permeability of the subsurface soil decreases, the number of extraction wells required will increase. The vacuum unit design is based upon air flow rates and associated vacuum levels required to achieve the flow rates. Pilot testing conducted at the site established site specific conditions and estimates of required system design parameters necessary to achieve cleanup goals at the site as discussed below.



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STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

SOIL VAPOR EXTRACTION AND TREATMENT SYSTEM SCHEMATIC

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FIGURE 4-1

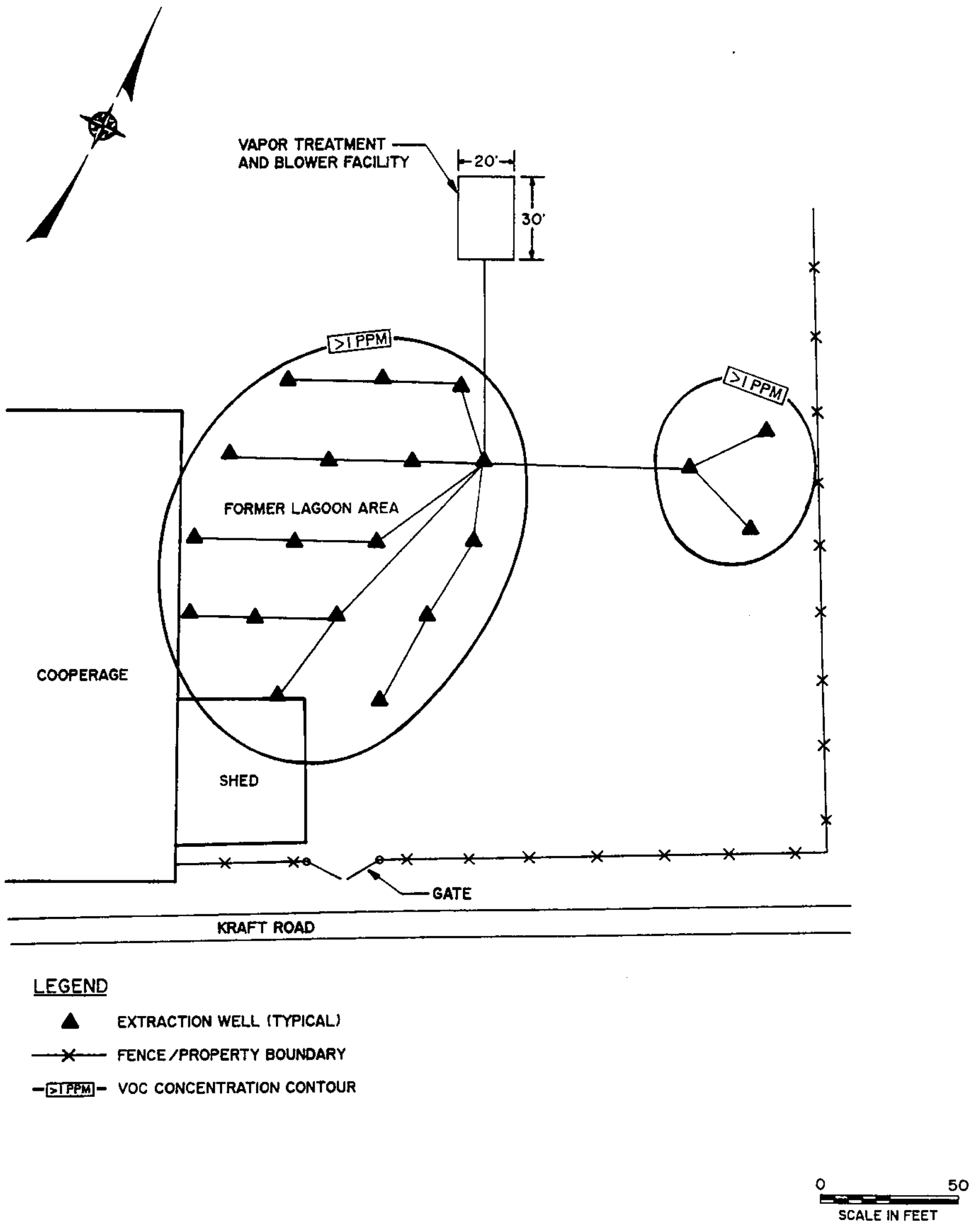
4.2 Extraction Wells

The determination of the number of extraction wells required is based upon the area of influence indicated by pilot testing measurements and the necessary duration to achieve cleanup goals. The duration is based upon the number of pore volumes of air drawn through the soil and increases in this volume are typically observed with closer well spacings. Based upon observations during the pilot testing, the radius of influence was calculated to be 17 feet. With assumptions of porosity (35%), an estimated 9,000 pore volumes necessary for required contaminant reductions, an unsaturated overburden thickness of 18 feet and a flow rate of 65 scfm measured during pilot testing, a duration to achieve cleanup goals at the site can be approximated at 1.5 years.

Based upon the areas of the site at which concentrations of total VOCs have been detected at greater than 1 ppm, approximately 20 vapor extraction wells would be required at the site. A soil vapor extraction and treatment system site plan is illustrated in Figure 4-2. Wells utilized for extraction can be constructed of 2-inch diameter PVC, since little difference in flow per foot of well screen was detected during pilot testing of 2-inch and 4-inch diameter extraction wells. The wells will be approximately 12 feet in depth to prevent drawing groundwater into the system and will have a screen length of 5 to 10 feet. Well screen lengths will be dependent upon permeability of soil during construction of the soil borings. An extraction well construction diagram is illustrated in Figure 4-3.

4.3 Monitoring Wells

Installation of monitoring wells to measure vacuum influences within the soil and determine vapor extraction system effectiveness on soil remediation will not be required. Monitoring can be performed by isolating extraction wells from the system and determining vacuums resulting from adjacent wells to monitor system influence effectiveness. In addition, it may be appropriate after performing half of the estimated system operation duration to perform soil borings within



STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

SOIL VAPOR EXTRACTION AND TREATMENT SYSTEM
SITE PLAN

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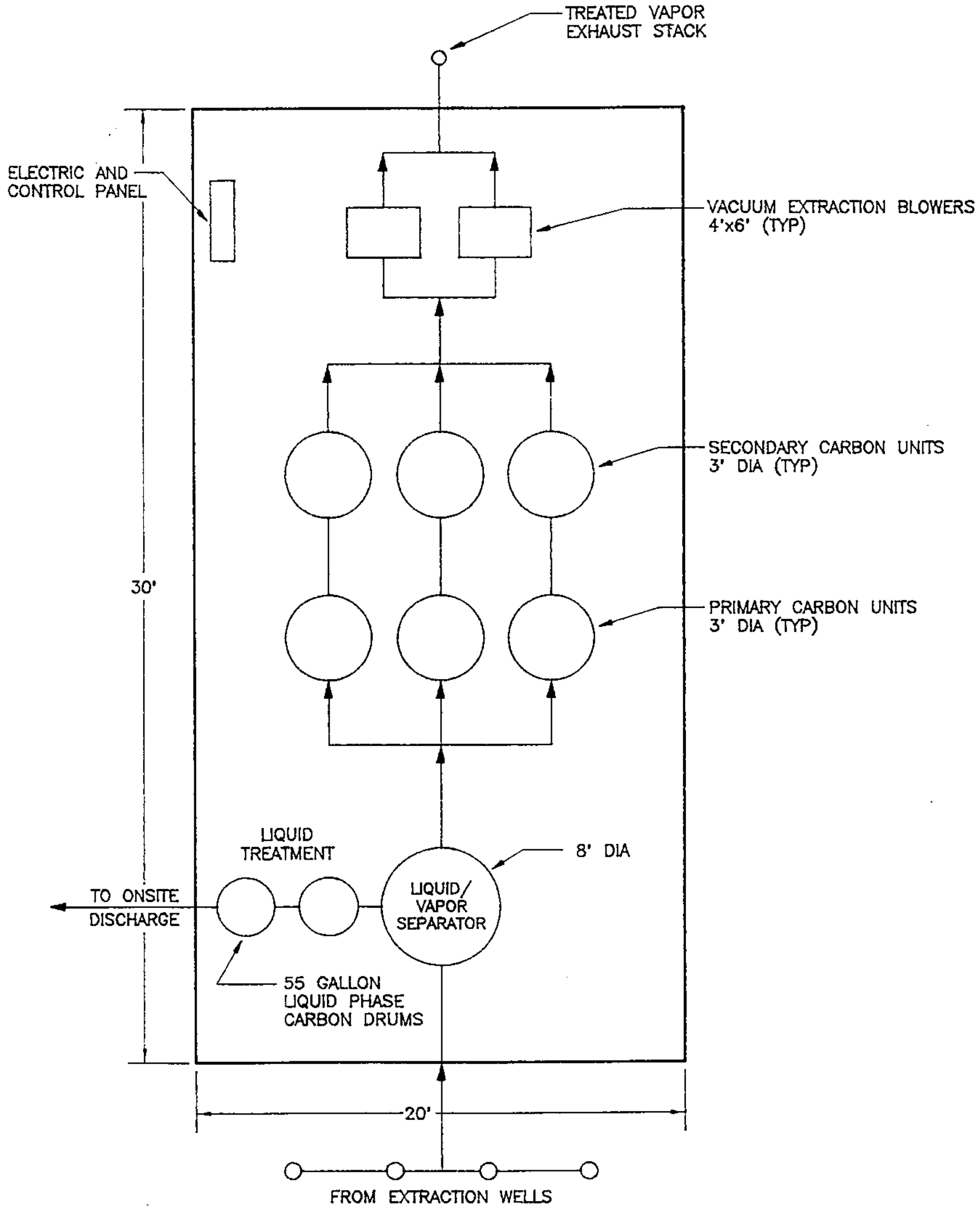
FIGURE 4 - 2



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STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

PROPOSED VAPOR TREATMENT AND BLOWER FACILITY FLOOR PLAN

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FIGURE 4-3

the extraction well network to determine progress in achieving cleanup goals at the site. If significant contamination is determined to be present after the system has been in operation for a while, installation of additionalextraction wells resulting in a closer spacing may be appropriate. Testing locations and times may be based upon total VOC extraction rates from the individual wells.

4.4 Blowers

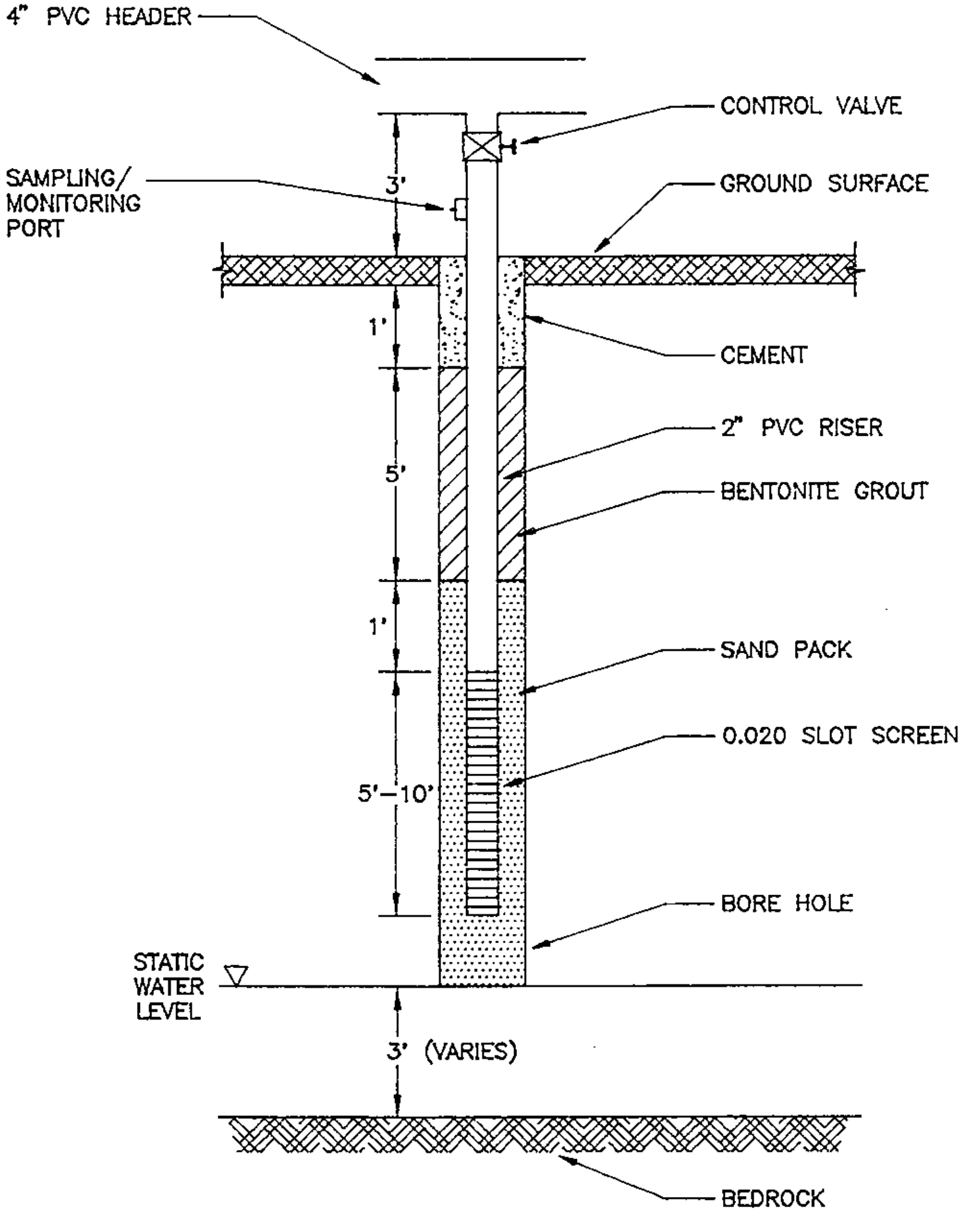
Based upon the pilot test, the size of the extraction system anticipated at the site consists of approximately 20 extraction wells and a total flow rate of 1300 scfm. A minimum well vacuum of 6.5 inches of mercury will be necessary to achieve the desired flow rates and an additional vacuum of 3.5 inches Hg are likely to be required to account for friction loses in system piping. The 1300 scfm at 10 inches Hg can be achieved by a 75-horsepower, positive displacement rotary lobe blower. To increase reliability and flexibility, use of two 40-hp blowers is recommended to meet vacuum/flow rate requirements. The proposed blower/vapor treatment facility plan is illustrated in Figure 4-4.

4.5 Piping

It is anticipated that schedule 40 PVC above ground piping can be utilized for all system piping. Size of piping will be 2-inch diameter at the well heads, increasing in size to 6-inch diameter at the main header entering the blowers through to ultimate discharge to atmosphere.

4.6 Vapor Treatment System

Based upon the results of the pilot test, a mass removal rate of 5 pounds per day per well is expected. Since the estimated total number of wells for vapor extraction is 20, a conservative initial estimate of the rate of total VOC extraction is 100 pounds per day. This is conservative due to the pilot test being conducted at the location of the former lagoon known to have the



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STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

EXTRACTION WELL CONSTRUCTION DIAGRAM

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FIGURE 4-4

highest concentrations of total VOCs present. The actual average concentration over the duration of operation and for wells outside of the lagoon area is likely to be significantly less than this value. The average total VOC concentrations in soil as detected in prior investigations at the site was determined to be 50 mg/kg. Based upon an estimated total soil volume of 375,000 cubic feet from which soil samples with elevated VOC concentrations were collected, the total mass of VOCs in the soil is estimated to be approximately 1,800 lbs.

Carbon adsorption of VOCs was determined to be very effective during pilot testing. Based on an estimated initial system extraction rate of 100 lbs of VOCs per day and a carbon loading rate of 10%, carbon utilization rates may be as high as 1000 pounds per day during initial system operation. Based upon the estimated total mass of VOCs in the soil of 1,800 lbs, total carbon usage for vapor treatment during the duration of system operation is about 18,000 lbs. A conceptual design for the carbon adsorption system includes six 1000 lb vessels in three pairs. Each pair would operate in series and the three primary carbon vessels would require carbon replacement six times during the 1.5 year project duration.

4.7 Control System

System operation would be primarily controlled by manual methods. Valving arrangements would be designed to allow isolation and adjustment of individual extraction wells and isolation of equipment including blowers, water separator and carbon adsorption vessels. The system will be designed with fail safe operation in the event of power failure, so that no damage to equipment or discharge of untreated vapor would occur.

Sensors will be placed at appropriate locations to provide automatic shutdown of blowers should elevated operational temperatures or pressures be detected. Initially, monitoring of the system will be performed daily to determine actual carbon utilization rates and identify any potential operational problems. Approximately four weeks after start-up, an evaluation of system performance will be made to determine if weekly system inspections are adequate or if system modifications are required.

4.8 Auxiliary Power

As indicated in Section 4.7, the extraction system will be designed to allow fail safe operation. This is due to power outages being infrequent occurrences and they will have no long term effects on system operation other than to potentially increase the duration that the system will remain on-site equivalent to the period during which the system did not operate due to power loss. Since including auxiliary power activation at times of power failure would contribute significantly to the costs of the project while providing minimal operational benefits, including auxiliary power as part of the vapor extraction system will not be included in the contract documents.

4.9 Equipment Enclosure

Although equipment to be utilized at the site will be specified to be weather resistant, including electrical housings, placement of the blowers and water separator in an enclosure will provide additional noise abatement benefits as well as provide protection from temperature extremes which may contribute to premature failure of mechanical equipment. The enclosure will provide protection from precipitation, but it is not anticipated that it will be necessary to heat the structure due to heat generated in the blowers which will be transferred by way of the blower exhaust to the water separator and subsequently to the carbon adsorption vessels.

Should a prolonged shutdown occur due to power failure during subfreezing temperatures, thawing of the water separator may be required.

4.10 Sampling Taps

Sampling taps will be required on all extraction wells to determine the effectiveness of individual extraction locations. Measurements will include total VOCs, flow rate and static vacuums. Sampling taps will also be provided on the common header to the blower to determine total system VOC extraction concentrations, flow rates and static vacuums. There will be three sample taps provided on each pair of carbon adsorption vessels. One of these taps will be provided prior to the primary vessel, one tap between the primary and secondary vessel and one tap will be located after the secondary vessel. These taps will be utilized to determine carbon removal efficiencies and time for contaminant break through, and carbon replacement.

4.11 Monitoring Frequency

Monitoring of all sampling taps should be performed daily during the first four weeks of system operation. This data will be useful in optimizing system effectiveness. Subsequent to the above start-up period, monitoring should be performed weekly to identify changes in system operating performance and determine adjustments that might be appropriate. Monitoring data will be evaluated to determine if adjustment is appropriate.

5.0 SOIL EXCAVATION, STORAGE, REMOVAL, BACKFILL AND REGRADING

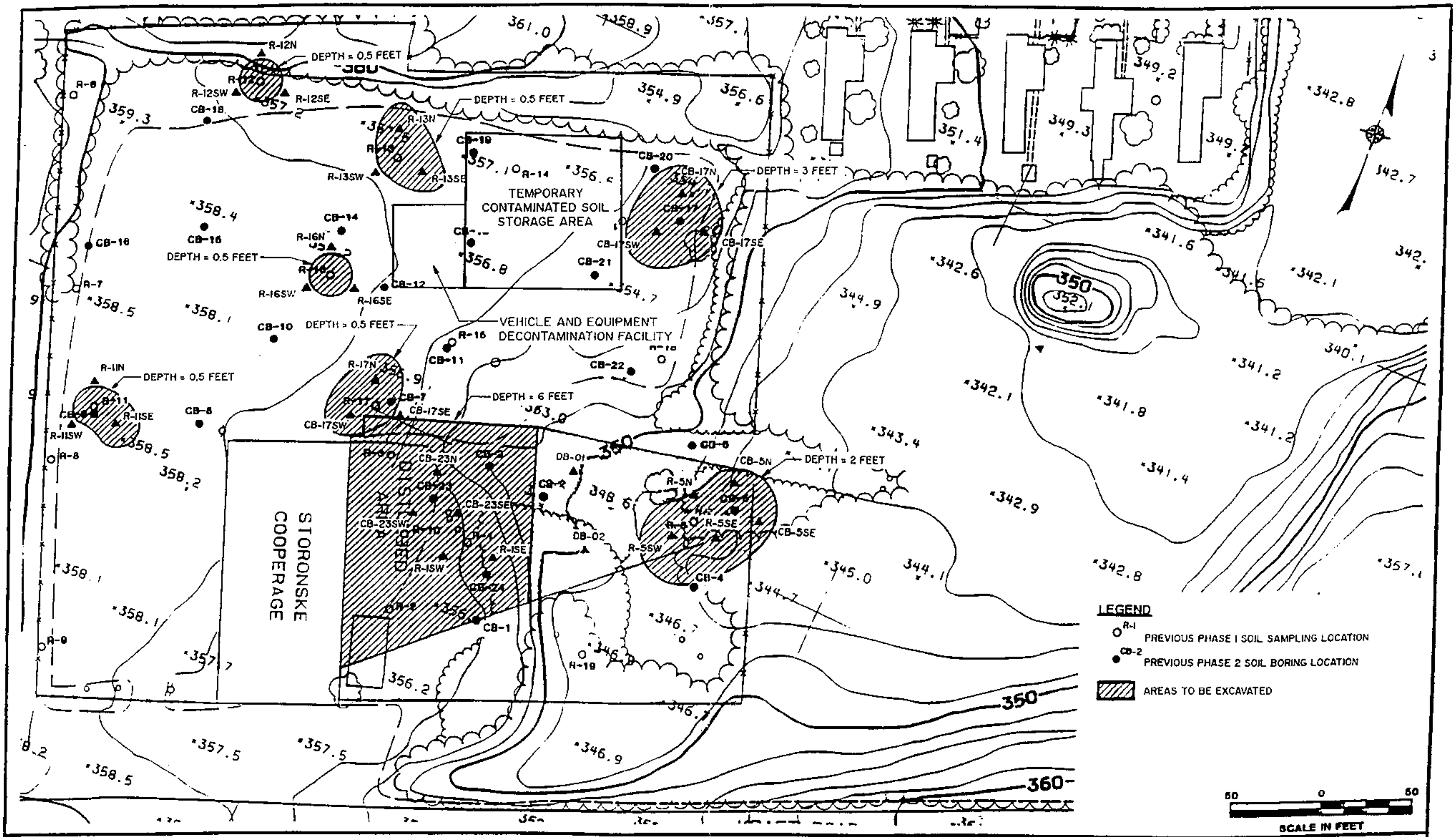
5.1 Definition of Limits of Excavation

Excavation limits have been identified based upon surface and subsurface samples from previous investigations which exceeded cleanup goals at the site, and the supplemental predesign soil sampling program which further defined the extent of contamination in known areas, as well as provided analytical data in areas of suspected contamination. Figure 5-1 indicates the aerial extent and depths of planned soil excavation based on previous and predesign investigations. In some locations, such as R-12 and R-16, the supplemental soil sampling program confirmed that the previously identified locations of contamination were confined to small areas less than 15 feet in radius from the original sampling location which exceeded the cleanup goal.

At location R-11, one sample (R-11SE) collected as part of the supplemental sampling program exceeded the cleanup goal for PCBs and lead, and the area to be excavated was extended in the south-east direction. End point sampling will be conducted after excavation of the contaminated soil to confirm that the soil cleanup goals have been attained as discussed in Section 5.5.

Locations R-5, R-13, R-17 and CB-17 had two of the three samples collected as part of the supplemental sampling program exceed the cleanup goals for PCBs, lead or both. The planned excavations in these areas were extended in the directions where the samples exceeding the cleanup criteria were detected.

The depths to which excavation will be performed in these identified areas is based upon the depth at which original and supplemental sampling results exceeded the cleanup criteria, the mobility of the contaminants of concern, site operations, and the need to protect human health and the environment.



STORONSKE COOPERAGE SITE
TOWN OF SHODACK, NEW YORK

LIMITS OF EXCAVATION, TEMPORARY CONTAMINATED SOIL STORAGE AND DECONTAMINATION FACILITIES

Dvirka and Bartilucci

FIGURE 5 - I

Locations R-11, R-12, R-13, R-16 and R-7 were all surface soil samples which exceeded cleanup goals. Based upon operations at the site, the likely cause of the release of contaminants in these areas is attributable to leakage of drums stored on the site. As a result, excavation of soil to a depth of 6 inches, with 6 inched of backfill and an additional 6-inch soil cover and vegetation was determined to provide adequate protection of human health and the environment.

Soil contamination at locations CB-5 and CB-17 were identified at lower depths as a result of soil borings. Based upon the analytical results obtained in these areas, it was determined to excavate area CB-5 with additional area R-5 to a depth of 2 feet and area CB-17 to a depth of 3 feet.

The area of the former lagoon was identified as the primary source of contamination at the site. The area adjacent to the building and extending outward approximately 100 feet will be excavated to a depth of 4 feet. All excavated areas will be backfilled with an amount of clean fill equal to the contaminated material excavated as indicated in Section 5.5, and an additional 6 inches of soil or other permeable material (such as crushed stone) will be placed on top of the backfilled areas and remaining portions of the site.

5.2 Temporary On-Site Storage

Temporary on-site storage may be necessary to allow sampling of excavated soil to determine disposal requirements. Contaminated soil may need to be placed into roll-off containers or a lined area for staging. If staging is required, the temporary storage site will be located in an area that has been identified as not having elevated levels of contaminants in the soil and where it will not interfere with remediation of the site or disrupt of facility use to the greatest degree possible. The location of temporary on-site storage area is illustrated in Figure 5-1. If several samples indicated that no hazardous waste transportation or disposal restrictions are necessary, excavated material may be placed directly in vehicles for transportation to the disposal facility.

It should be noted that the preferred approach to securing approval from the disposal facility for acceptance of the contaminated soil will be to provide existing data and obtain additional samples for analysis prior to excavation if required by the disposal facility, so that temporary on-site storage of excavated soil will not be necessary.

5.3 Decontamination Facilities

On-site decontamination will be necessary to prevent spread of contaminants off-site or into additional on-site areas as a result of truck traffic or movement of excavation equipment from one location to another.

The decontamination pad will consist of a 60-mil high density polyethylene (HDPE) lined containment area which will be covered with 6 inches of sand and overlain by wood to support trucks and excavation equipment during decontamination. The pad will be sloped to a sump which will have a pump that will discharge wash water to drums or directly to carbon adsorption canisters for treatment prior to on-site discharge.

A steam cleaner along with scrub brushes and appropriate cleaning solutions will be utilized to ensure equipment is properly decontaminated prior to moving off-site or to other areas of the site. Visual inspection will be utilized to determine that decontamination has been undertaken properly.

5.4 Transportation and Disposal Requirements

Transportation of the contaminated soil will be regulated under New York State Department of Transportation (NYSDOT) regulations. These regulations limit the weight of vehicles/shipments and require precautions including information placards identifying the hazard classification of the material being transported. The ultimate disposal location has restrictions on waste entering the facility. These restrictions include contaminants such as PCBs that, when in concentrations greater than 50 ppm, are banned from direct landfilling and must undergo stabilization/fixation prior to landfilling or be incinerated. Due to the low concentrations and types of contaminants present at the Storonske Cooperage site, it is unlikely that contaminated soil will require special handling and, depending upon characterization, may be classified as a nonhazardous waste with less significant transportation and disposal requirements.

5.5 Confirmatory Sampling

In all areas to be excavated, it will be necessary to perform end-point sampling to ensure that all contaminated soils associated with the location have been removed. Recommended parameters for analysis of end-point samples will be limited to PCBs and total lead based upon nonvolatile contaminants present in the on-site soil. It is recommended that field immuno assay techniques for PCBs with detection limits of 0.4 to 4 ppm, be performed at a minimum of three locations in the bottom of the excavation. If the field screening confirms that PCB contamination has been removed, it is recommended that samples be collected for laboratory analysis for lead and one sample from the highest concentration field screening location be analyzed for PCBs. These samples should be sent to a New York State Department of Health Environmental Laboratory Approval Program (ELAP) certified laboratory for analysis.

In locations where excavations will be performed to a depth greater than 6 inches, a minimum of four side wall field immuno assay PCB samples and will be obtained to ensure that the appropriate aerial extent of excavation has been performed. Should these samples confirm that appropriate excavation limits have been achieved, it is recommended that total lead samples be collected from the same locations as where the screening samples were collected and a PCB sample be collected from the side wall location with the highest field screen concentration. These samples should be sent to an ELAP certified laboratory to confirm the results of the field screening.

If the end-point and/or side wall samples indicate PCB levels greater than the cleanup criteria, additional soil excavation and end-point/side wall screening/confirmatory sample analysis will be conducted until the soil cleanup criteria is achieved. Should excavation to depths greater than 4 feet be required based upon results of confirmatory sampling, a concentration of 10 ppm will be utilized as the screening criteria because the depth of clean fill will provide an effective barrier to PCB dermal exposure and therefore be adequately protective of human health.

5.6 Backfill Requirements

Excavations resulting from the removal of contaminated soil from the site will be backfilled with clean fill to the original grade. Fill will consist of clean material that has been tested for Target Compound List (TCL) +30 parameters to ensure that it is free of contaminants prior to placement at the site. The material will consist of a bank run sand or gravel which will not be of a low permeability such that precipitation infiltration would be inhibited.

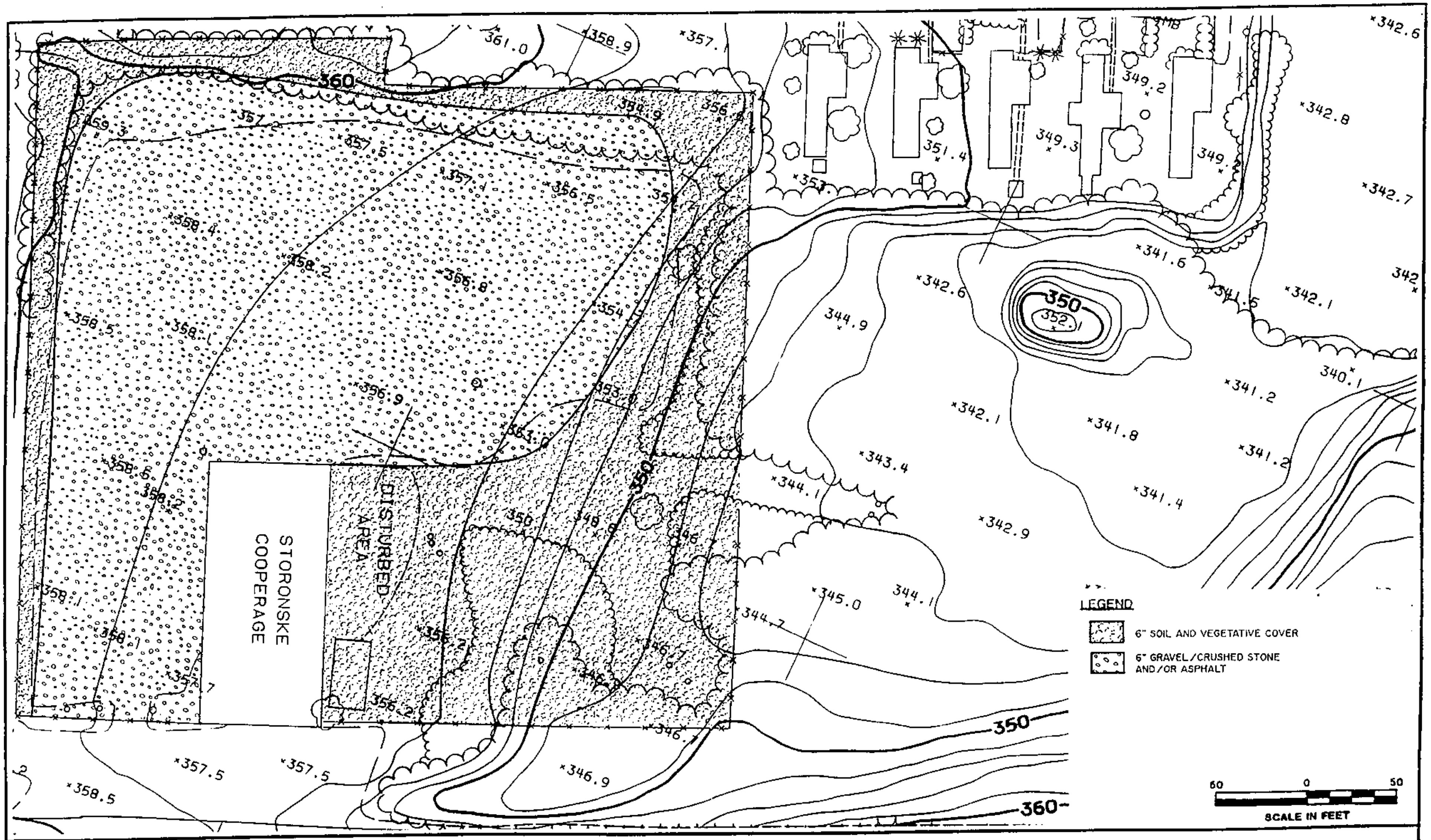
Once the backfill has been placed, minor regrading will be performed at the site in preparation for the final cover of 6 inches of soil or other suitable material (such as crushed stone) to be placed at the site as discussed in Sections 5.7 and 5.8.

5.7 Site Regrading

Site regrading will be necessary at the Storonske Cooperage site to provide suitable slopes for proper drainage and erosion control. A proposed site regrading and revegetation plan is illustrated in Figure 5-2. Although much of the area of the site is relatively flat, the most significantly contaminated area of the former lagoon has several short and steep slopes which may cause erosion of the final cover if not modified. Regrading may also be appropriate to minimize storm water from discharging off-site.

5.8 Placement of an Additional Six Inches of Clean Soil

The entire site, exclusive of the facility building, will be covered with 6 inches of clean soil or other suitable material. This cover will prevent contact with any potentially contaminated surface soil which has not been removed as part of excavation planned at the site. In areas of the site which are currently utilized to route vehicle traffic, and for parking and other vehicle



STORONSKE COOPERAGE SITE
TOWN OF SHODACK, NEW YORK

SITE GRADING COVER AND REVEGETATION PLAN

FIGURE 5 - 2

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traffic and equipment storage, placement of 6 inches of crushed stone, gravel or asphalt may be performed to prevent vehicle traffic from eroding these areas. All soil or other suitable material will be tested for TCL +30 parameters to ensure no contamination is present prior to transportation to the site. Portions of the site which are currently vegetated will have soil placed which is suitable for the establishment of a vegetative cover. These areas are illustrated in Figure 5-2.

5.9 Revegetation

Areas of the site which will not be utilized for vehicle traffic will be seeded with a grass mixture to allow the establishment of grass cover. Maintenance of the cover will be necessary to ensure that grass is established at the site and growth kept low to allow inspection and identification of burrowing animals, as well as prevention of growth which may cause a compromising of the protective cover. A quick growth/annual seed mixture to prevent erosion and a perennial seed will be utilized to establish the vegetation cover.

6.0 ESTIMATION OF CONSTRUCTION COSTS

Table 6-1 provides capital and O&M costs for the planned 1.5-year operation of both the vapor extraction and dual vapor extraction systems based on the data generated as a result of the pilot test. As indicated on the table, dual vapor extraction is significantly more costly ($751,000) than standard vapor extraction ($487,000). Since dual vapor extraction exposes only limited additional soil to the vacuum extraction process, the additional exposed soil has been identified to be less contaminated than the soil above, and the process would create treatment and disposal problems for the extracted groundwater, the DVE system is not recommended.

Table 6-2 provides estimated costs for soil excavation/disposal, backfill, regrading and revegetation. As indicated on the table, this portion of site remediation is expected to cost approximately $421,000. Therefore, the total estimated cost for remediation of the Storonske Cooperage site, including vapor extraction is $908,000.

Table 6-1

ESTIMATED COST FOR VAPOR EXTRACTION STORONSKE COOPERAGE SITE

	VE System		DVE System	
		CAPITAL COST		
Well Installation	20 wells, 15 ft deep	$30,000	53 wells, 20 ft deep	$86,000
Vacuum Extraction Blower	75 HP	$35,000	100 HP	$45,000
Carbon, vapor phase	18,600 lbs	$56,000	18,600 lbs	$56,000
Carbon, liquid phase			2,000 lbs	$6,000
Utility Installation		$28,000		$30,000
Shed and Foundation Construction		$35,000		$35,000
Piping and System Installation		$33,000		$52,000
TOTAL CAPITAL COST		$217,000		$310,000
		OPERATING COST		
Labor, per month		$6,000		$11,000
Materials and Expenses	$500		$1,000	
Analytical and Laboratory		$4,500		$7,000
Utilities		$4,000		$5,500
OPERATING COST PER MONTH	$15,000		$24,500	
TOTAL OPERATING COST	18 months	$270,000	18 months	$441,000
TOTAL COST		$487,000		$751,000

Table 6-2

ESTIMATED COST FOR EXCAVATION AND COVER STORONSKE COOPERAGE SITE

Item	Quantity	Units	Unit Cost	Total Cost
Excavation and Disposal				
Excavate contaminated material	2,400	cy	$14	$33,600
Additional soil cuttings contained in drums	50	cy	$20	$1,000
Transport to Seneca Meadows Landfill disposal facility in Waterloo, NY (soil)	2,450	cy	$25	$61,250
Disposal at off-site facility (nonhazardous soil)	2,400	cy	$50	$120,000
Backfill, Cover Material and Installation				
Purchase/haul/place backfill material (bank run)	2,400	cy	$12	$28,800
Purchase/haul/place 6 inches topsoil	2,500	cy	$18	$45,000
Seed, fertilizer and mulch	15,000	sy	$1	$15,000
Other Costs				
Safety program	---	lump sum	$8,000	$8,000
Dust control	---	lump sum	$5,000	$5,000
Runoff control	---	lump sum	$5,000	$5,000
Equipment decontamination	---	lump sum	$4,000	$4,000
Mobilization/demobilization	---	lump sum	$10,000	$10,000
Contingency Allowance (25%)				$84,000
TOTAL COST				$421,000

APPENDIX A

PRE-DESIGN INVESTIGATION ANALYTICAL DATA

TABLE A-1
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
VOLATILE ORGANIC COMPOUND RESULTS

SAMPLE ID	01D&B	02D&B	CB-5N	CB-5SE	CB-17N	CB-17SE	CB-17SW	SITE SPECIFIC CLEAN-UP GOALS
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/19/93	4/20/93	4/20/93	4/20/93	
% MOISTURE	18	19	13	5	13	21	7	
DILUTION FACTOR	1	1	1	1	1	1	1	
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Chloromethane	U	U	U	U	U	U	U	NA
Bromomethane	U	U	U	U	U	U	U	NA
Vinyl Chloride	U	U	U	U	U	U	U	NA
Chloroethane	U	U	U	U	U	U	U	NA
Methylene Chloride	6 BJ	5 BJ	3 BJ	16 BJ	3 BJ	14 BJ	3 BJ	NA
Acetone	9 BJ	11 BJ	3 BJ	29 BJ	4 BJ	19 BJ	4 BJ	NA
Carbon Disulfide	U	U	U	U	U	U	U	NA
1,1-Dichloroethene	U	U	U	U	U	U	U	NA
1,1-Dichloroethane	U	U	U	U	U	U	U	NA
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	NA
Chloroform	U	U	U	U	U	U	U	NA
1,2-Dichloroethane	U	U	U	U	U	U	U	100
2-Butanone	U	U	U	27 J	2 J	10 BJ	3 J	NA
1,1,1-Trichloroethane	U	U	U	U	2 J	U	2 J	1000
Carbon Tetrachloride	U	U	U	U	U	U	U	NA
Vinyl Acetate	U	U	U	U	U	U	U	NA
Bromodichloromethane	U	U	U	U	U	U	U	NA
1,2-Dichloropropane	U	U	U	U	U	U	U	NA
cis-1,3-Dichloropropene	U	U	U	U	U	U	1 J	NA
Trichloroethene	U	U	U	U	U	U	U	1000
Dibromochloromethane	U	U	U	U	U	U	U	NA
1,1,2-Trichloroethane	U	U	U	U	U	U	U	NA
Benzene	U	U	U	U	U	U	U	NA
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Bromoform	U	U	U	U	U	U	U	NA
4-Methyl-2-pentanone	U	U	U	U	U	U	U	NA
2-Hexanone	U	U	U	U	U	U	7 J	NA
Tetrachloroethene	U	U	U	U	U	U	U	1500
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	NA
Toluene	U	U	U	U	U	U	U	1500
Chlorobenzene	U	U	U	U	U	U	U	1500
Ethylbenzene	U	U	U	U	U	U	U	5500
Styrene	U	U	U	U	U	U	U	NA
Xylene (total)	U	U	U	U	U	U	U	1200

QUALIFIERS
B: Compound found in the blank as well as the sample
J: Compound found below the CRDL, value is estimated
U: Compound analyzed for but not detected

NOTES:
NA: Not Applicable

NOTE: No site specific clean-up goals for volatile organic compounds were exceeded.

TABLE A-2
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
VOLATILE ORGANIC COMPOUND RESULTS

SAMPLE ID	CB-23N	CB-23SE	CB-23SW	R-1SE	R-1SW	R-5N	R-5SE	SITE SPECIFIC CLEAN-UP GOALS (ug/kg)
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93	
% MOISTURE	13	11	8	7	12	24	18	
DILUTION FACTOR	1	1	1	1	1	1	1	
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	
Chloromethane	U	U	U	U	U	U	U	NA
Bromomethane	U	U	U	U	U	U	U	NA
Vinyl Chloride	U	U	U	U	U	U	U	NA
Chloroethane	U	U	U	U	U	U	U	NA
Methylene Chloride	6 BJ	5 BJ	4 BJ	2 BJ	2 BJ	3 BJ	4 BJ	NA
Acetone	7 BJ	7 BJ	5 BJ	5 BJ	U	15 B	8 BJ	NA
Carbon Disulfide	U	U	U	U	U	U	U	NA
1,1-Dichloroethene	U	U	U	U	U	U	U	NA
1,1-Dichloroethane	U	U	U	U	U	U	U	NA
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	NA
Chloroform	U	U	U	U	U	U	U	NA
1,2-Dichloroethane	U	U	U	U	U	U	U	100
2-Butanone	U	U	U	U	U	U	U	NA
1,1,1-Trichloroethane	U	U	U	U	U	U	U	1000
Carbon Tetrachloride	U	U	U	U	U	U	U	NA
Vinyl Acetate	U	U	U	U	U	U	U	NA
Bromodichloromethane	U	U	U	U	U	U	U	NA
1,2-Dichloropropane	U	U	U	U	U	U	U	NA
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Trichloroethene	U	U	U	U	U	U	U	1000
Dibromochloromethane	U	U	U	U	U	U	U	NA
1,1,2-Trichloroethane	U	U	U	U	U	U	U	NA
Benzene	U	U	U	U	U	U	U	NA
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Bromoform	U	U	U	U	U	U	U	NA
4-Methyl-2-pentanone	U	U	U	U	U	U	U	NA
2-Hexanone	U	U	U	U	U	U	U	NA
Tetrachloroethene	U	U	2 J	U	U	U	2 J	1500
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	NA
Toluene	2 J	U	U	U	U	U	U	1500
Chlorobenzene	U	U	U	U	U	U	U	1500
Ethylbenzene	U	U	U	U	U	U	U	5500
Styrene	U	U	U	U	U	U	U	NA
Xylene (total)	11 J	U	U	U	U	6 J	5 J	1200

QUALIFIERS
B: Compound found in the blank as well as the sample
J: Compound found below the CRDL, value is estimated
U: Compound analyzed for but not detected

NOTES:
NA: Not Applicable

NOTE: No site specific clean-up goals for volatile organic compounds were exceeded.

TABLE A-3
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
VOLATILE ORGANIC COMPOUND RESULTS

SAMPLE ID	R-5SERE	R-5SW	R-5SWDL	R-11N	R-11SE	R-11SW	R-12N	SITE SPECIFIC CLEAN-UP GOALS (ug/kg)
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/20/93	4/20/93	4/20/93	4/20/93	
% MOISTURE	18	24	24	2	9	6	13	
DILUTION FACTOR	1	1	5	1	1	1	1	
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	
Chloromethane	U	U	U	U	U	U	U	NA
Bromomethane	U	U	U	U	U	U	U	NA
Vinyl Chloride	U	U	U	U	U	U	U	NA
Chloroethane	U	U	U	U	U	U	U	NA
Methylene Chloride	4 BJ	10 BJ	21 BJ	2 BJ	5 BJ	4 BJ	U	NA
Acetone	10 BJ	10 BJ	28 BJ	4 BJ	5 BJ	10 BJ	5 BJ	NA
Carbon Disulfide	U	U	U	U	U	U	U	NA
1,1-Dichloroethene	U	U	U	U	U	U	U	NA
1,1-Dichloroethane	U	U	U	U	U	U	U	NA
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	NA
Chloroform	U	U	U	U	U	U	U	NA
1,2-Dichloroethane	U	U	U	U	U	U	U	100
2-Butanone	U	U	U	U	U	U	U	NA
1,1,1-Trichloroethane	U	U	U	U	U	U	U	1000
Carbon Tetrachloride	U	U	U	U	U	U	U	NA
Vinyl Acetate	U	U	U	U	U	U	U	NA
Bromodichloromethane	U	U	U	U	U	U	U	NA
1,2-Dichloropropane	U	U	U	U	U	U	U	NA
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Trichloroethene	U	U	U	U	U	U	U	1000
Dibromochloromethane	U	U	U	U	U	U	U	NA
1,1,2-Trichloroethane	U	U	U	U	U	U	U	NA
Benzene	U	U	U	U	U	U	U	NA
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Bromoform	U	U	U	U	U	U	U	NA
4-Methyl-2-pentanone	U	U	U	U	U	U	U	NA
2-Hexanone	U	U	U	U	U	U	U	NA
Tetrachloroethene	U	U	U	U	U	U	U	1500
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	NA
Toluene	U	2 J	U	U	U	2 J	U	1500
Chlorobenzene	U	U	U	U	U	U	U	1500
Ethylbenzene	U	U	U	U	U	U	U	5500
Styrene	U	U	U	U	U	U	U	NA
Xylene (total)	U	U	U	U	U	U	U	1200

QUALIFIERS
B: Compound found in the blank as well as the sample
J: Compound found below the CRDL, value is estimated
U: Compound analyzed for but not detected

NOTES
RE: Sample was reanalyzed
DL: Sample was analyzed at a secondary dilution
NA: Not Applicable

NOTE: No site specific clean-up goals for volatile organic compounds were exceeded.

TABLE A-4
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
VOLATILE ORGANIC COMPOUND RESULTS

SAMPLE ID	R-12SE	R-12SW	R-13N	R-13SE	R-13SW	R-16N	R-16SE	SITE SPECIFIC CLEAN-UP GOALS (ug/kg)
DATE OF COLLECTION	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	
% MOISTURE	14	9	10	8	8	17	8	
DILUTION FACTOR	1	1	1	1	1	1	1	
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	
Chloromethane	U	U	U	U	U	U	U	NA
Bromomethane	U	U	U	U	U	U	U	NA
Vinyl Chloride	U	U	U	U	U	U	U	NA
Chloroethane	U	U	U	U	U	U	U	NA
Methylene Chloride	2 BJ	2 BJ	2 BJ	1 BJ	U	2 BJ	2 BJ	NA
Acetone	7 BJ	3 BJ	4 BJ	3 BJ	U	5 BJ	4 BJ	NA
Carbon Disulfide	U	U	U	U	U	U	U	NA
1,1-Dichloroethene	U	U	U	2 J	U	U	U	NA
1,1-Dichloroethane	U	U	U	U	U	U	U	NA
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	NA
Chloroform	U	U	U	U	U	U	U	NA
1,2-Dichloroethane	U	U	U	U	U	U	U	100
2-Butanone	U	U	U	U	U	U	U	NA
1,1,1-Trichloroethane	U	U	U	U	U	U	8 J	1000
Carbon Tetrachloride	U	U	U	U	U	U	U	NA
Vinyl Acetate	U	U	U	U	U	U	U	NA
Bromodichloromethane	U	U	U	U	U	U	U	NA
1,2-Dichloropropane	U	U	U	U	U	U	U	NA
cis-1,3-Dichloropropene	U	U	U	U	U	U	50	NA
Trichloroethene	U	U	U	2 J	U	U	U	1000
Dibromochloromethane	U	U	U	U	U	U	U	NA
1,1,2-Trichloroethane	U	U	U	U	U	U	U	NA
Benzene	U	U	U	2 J	U	U	U	NA
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	NA
Bromoform	U	U	U	U	U	U	U	NA
4-Methyl-2-pentanone	U	U	U	U	U	U	U	NA
2-Hexanone	U	U	U	U	U	U	2 J	NA
Tetrachloroethene	U	U	U	U	U	U	U	1500
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	2 J	NA
Toluene	2 J	U	U	3 J	U	U	U	1500
Chlorobenzene	U	U	U	2 J	U	U	U	1500
Ethylbenzene	U	U	U	U	U	U	U	5500
Styrene	U	U	U	U	U	U	U	NA
Xylene (total)	U	U	U	U	U	U	U	1200

QUALIFIERS
B: Compound found in the blank as well as the sample
J: Compound found below the CRDL, value is estimated
U: Compound analyzed for but not detected

NOTES:
NA: Not Applicable

NOTE: No site specific clean-up goals for volatile organic compounds were exceeded.

TABLE A-5
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
VOLATILE ORGANIC COMPOUND RESULTS

SAMPLE ID	R-16SW	R-17N	R-17NRE	R-17SE	R-17SW	R-17SWDL	SITE SPECIFIC CLEAN-UP GOALS
DATE OF COLLECTION	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	
% MOISTURE	6	12	12	13	11	11	
DILUTION FACTOR	5	1	1	1	1	1.67	
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Chloromethane	U	U	U	U	U	U	NA
Bromomethane	U	U	U	U	U	U	NA
Vinyl Chloride	U	U	U	U	U	U	NA
Chloroethane	U	U	U	U	U	U	NA
Methylene Chloride	15 BJ	5 BJ	4 BJ	3 BJ	6 BJ	6 BJD	NA
Acetone	50 BJ	4 BJ	5 BJ	3 BJ	7 BJ	5 BJD	NA
Carbon Disulfide	U	U	U	U	U	U	NA
1,1-Dichloroethene	U	U	U	U	U	U	NA
1,1-Dichloroethane	U	U	U	U	9 J	U	NA
1,2-Dichloroethene (total)	U	U	U	U	3 J	2 JD	NA
Chloroform	U	U	U	U	U	U	NA
1,2-Dichloroethane	U	U	U	U	2 J	U	100
2-Butanone	U	U	U	U	U	U	NA
1,1,1-Trichloroethane	U	U	U	U	210	120 D	1000
Carbon Tetrachloride	U	U	U	U	U	U	NA
Vinyl Acetate	U	U	U	U	U	U	NA
Bromodichloromethane	U	U	U	U	U	U	NA
1,2-Dichloropropane	U	U	U	U	U	U	NA
cis-1,3-Dichloropropene	U	U	U	U	2 J	U	NA
Trichloroethene	U	U	U	U	U	U	1000
Dibromochloromethane	U	U	U	U	U	U	NA
1,1,2-Trichloroethane	U	U	U	U	U	U	NA
Benzene	U	U	U	U	U	U	NA
trans-1,3-Dichloropropene	U	U	U	U	U	U	NA
Bromoform	U	U	U	U	U	U	NA
4-Methyl-2-pentanone	U	U	U	U	U	U	NA
2-Hexanone	U	U	U	U	6 J	8 JD	NA
Tetrachloroethene	920	9 J	6 J	U	U	U	1500
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	NA
Toluene	U	U	U	U	U	U	1500
Chlorobenzene	U	U	U	U	U	U	1500
Ethylbenzene	U	U	U	U	U	U	5500
Styrene	U	U	U	U	U	U	NA
Xylene (total)	U	U	U	U	U	U	1200

QUALIFIERS
B: Compound found in the blank as well as the sample
D: Concentration is from a diluted run
J: Compound found below the CRDL, value is estimated
U: Compound analyzed for but not detected

NOTES
RE: Sample was reanalyzed
DL: Sample was analyzed at a secondary dilution
NA: Not Applicable

NOTE: No site specific clean-up goals for volatile organic compounds were exceeded.

TABLE A-6
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
PCB RESULTS

SAMPLE ID	01D&B	02D&B	CB-5N	CB-5SE	CB-17N	CB-17SE	CB-17SW
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/19/93	4/20/93	4/20/93	4/20/93
% MOISTURE	18	19	13	5	13	21	7
DILUTION FACTOR	1	1	1	10	1	1	5
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Aroclor-1016	U	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U	U
Aroclor-1248	U	U	U	U	38 P	80 P	620 P
Aroclor-1254	U	U	U	U	U	U	U
Aroclor-1260	U	U	U	280 JP	5.5 JP	12 J	U

QUALIFIERS

C: Compound indentification confirmed by GC/MS

J: Compound found below the CRDL, value is estimated

P: Percent difference in concentrations is >25% between the 2 columns, lower value is reported

U: Compound analyzed for but not detected

▨: Result exceeds clean-up goal

NOTE: Clean-up goal for individual Aroclors is 1000 ug/kg

TABLE A-7
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
PCB RESULTS

SAMPLE ID	CB-23N	CB-23SE	CB-23SW	R-1SE	R-1SW	R-5N	R-5SE
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93	4/19/93
% MOISTURE	13	11	8	7	12	24	18
DILUTION FACTOR	1	10	1	1	1	1	10
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Aroclor-1016	U	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U	U
Aroclor-1248	U	U	U	U	U	U	8800 PC
Aroclor-1254	U	U	U	U	U	U	U
Aroclor-1260	21 J	76 JP	U	32 J	U	6.9 J	U

QUALIFIERS

C: Compound indentification confirmed by GC/MS

J: Compound found below the CRDL, value is estimated

P: Percent difference in concentrations is >25% between the 2 columns, lower value is reported

U: Compound analyzed for but not detected

▨ : Result exceeds clean-up goal

NOTE: Clean-up goal for individual Aroclors is 1000 ug/kg

TABLE A-8
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
PCB RESULTS

SAMPLE ID	R-5SEDL	R-5SW	R-5SWDL	R-11N	R-11SE	R-11SEDL	R-11SW	R-12N
DATE OF COLLECTION	4/19/93	4/19/93	4/19/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93
% MOISTURE	18	24	24	2	9	9	6	13
DILUTION FACTOR	100	2	20	5	10	100	2	1
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Aroclor-1016	U	U	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U	U	U
Aroclor-1248	13000 PC	2000 PC	2100 PC	780	4900 C	5100 C	210 P	U
Aroclor-1254	U	U	U	U	U	U	U	U
Aroclor-1260	U	580 P	570 JP	76 J	140	U	11 J	4.7 JP

QUALIFIERS

C: Compound indentification confirmed by GC/MS

J: Compound found below the CRDL, value is estimated

P: Percent difference in concentrations is >25% between the 2 columns, lower value is reported

U: Compound analyzed for but not detected

NOTES

RE: Sample was reanalyzed

DL: Sample was analyzed at a secondary dilution

▨ :Result exceeds clean-up goal

NOTE: Clean-up goal for individual Aroclors is 1000 ug/kg

TABLE A-9
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
PCB RESULTS

SAMPLE ID	R-12SE	R-12SW	R-13N	R-13SE	R-13SW	R-16N	R-16SE
DATE OF COLLECTION	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93
% MOISTURE	14	9	10	8	8	17	8
DILUTION FACTOR	1	1	1	1	1	1	1
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Aroclor-1016	U	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U	U
Aroclor-1248	49 P	U	80 P	33 J	U	200	U
Aroclor-1254	U	U	U	U	U	U	U
Aroclor-1260	25 J	U	36 JP	14 J	U	280	15 J

QUALIFIERS

C: Compound indentification confirmed by GC/MS

J: Compound found below the CRDL, value is estimated

P: Percent difference in concentrations is >25% between the 2 columns, lower value is reported

U: Compound analyzed for but not detected

▒: Result exceeds clean-up goal

NOTE: Clean-up goal for individual Aroclors is 1000 ug/kg

TABLE A-10
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
PCB RESULTS

SAMPLE ID	R-16SW	R-17N	R-17NRE	R-17SE	R-17SW	R-17SWDL
DATE OF COLLECTION	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93	4/20/93
% MOISTURE	6	12	12	13	11	11
DILUTION FACTOR	5	50	500	1	10	100
COMPOUNDS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Aroclor-1016	U	U	U	U	U	U
Aroclor-1221	U	U	U	U	U	U
Aroclor-1232	U	U	U	U	U	U
Aroclor-1242	U	U	U	U	U	U
Aroclor-1248	14 J	11000 PC	14000 JPC	78	2200	2600 JP
Aroclor-1254	U	U	U	U	U	U
Aroclor-1260	23 J	U	U	150 P	540 P	630 JP

QUALIFIERS

C: Compound indentification confirmed by GC/MS

J: Compound found below the CRDL, value is estimated

P: Percent difference in concentrations is >25% between the 2 columns, lower value is reported

U: Compound analyzed for but not detected

NOTES

RE: Sample was reanalyzed

DL: Sample was analyzed at a secondary dilution

▨ :Result exceeds clean-up goal

NOTE: Clean-up goal for individual Aroclors is 1000 ug/kg

TABLE A-11
STORONSKE COOPERAGE SITE
PRE-DESIGN INVESTIGATION
SOIL SAMPLING
LEAD RESULTS

SAMPLE ID	DATE OF COLLECTION	% SOLIDS	DILUTION FACTOR	LEAD (mg/kg)
01D&B	4/19/93	82.4	1	13.60
02D&B	4/19/93	78.2	1	27.90
CB-17N	4/20/93	88.5	1	41.20
CB-17SE	4/20/93	77.3	1	48.80
CB-17SW	4/20/93	91.2	1	31.00
CB-23N	4/19/93	86.2	1	30.20
CB-23SE	4/19/93	86.4	1	193.00
CB-23SW	4/19/93	92.9	1	25.50
CB-5N	4/19/93	85.7	1	31.70
CB-5SE	4/19/93	73	1	66.00
R-1SE	4/19/93	90.5	1	57.30
R-1SW	4/19/93	89	1	20.10
R-5N	4/19/93	78.1	1	25.40
R-5SE	4/19/93	86.9	1	339.00
R-5SW	4/19/93	74.8	1	549.00
R-11N	4/20/93	96.4	1	143.00
R-11SE	4/20/93	90.1	1	551.00
R-11SW	4/20/93	93.7	1	27.90
R-12N	4/20/93	85.8	1	28.30
R-12SE	4/20/93	91.4	1	25.20
R-12SW	4/20/93	89.8	1	82.10
R-13N	4/20/93	91	1	307.00
R-13SE	4/20/93	92.4	1	419.00
R-13SW	4/20/93	92.3	1	14.60
R-16N	4/20/93	90.4	1	67.30
R-16SE	4/20/93	91.3	1	15.90
R-16SW	4/20/93	91.9	1	37.10
R-17N	4/20/93	87.2	1	383.00
R-17SE	4/20/93	85.5	1	109.00
R-17SW	4/20/93	82.1	1	744.00

NOTE: Clean-up goal for Total Lead is 200 mg/kg.

▨ : Result exceeds clean-up goal

APPENDIX B

VAPOR EXTRACTION/AIR SPARGING PILOT TEST REPORT

LIST OF FIGURES

FIGURE

APPENDICES

FINAL

EXECUTIVE SUMMARY

Terra Vac was contracted to perform a vacuum extraction/air sparging pilot test at the Storonske Cooperage, a former drum recycling facility in Schodack, New York. Field work began on October 27, 1993, with the installation of an injection well, an extraction well, and two monitoring wells. The pilot test equipment, consisting of an extraction blower, an injection blower, a water/vapor separator, and two carbon canisters, was mobilized to the site on October 29; and testing began on November 2.

The testing was planned to consist of one day of vacuum extraction testing and four days of air sparging testing. However, because of very low water levels in the test area limiting the effectiveness of air sparging, the air sparging testing was shortened to two days, and one day of Dual Vacuum Extraction testing was added.

The testing showed that vacuum extraction is a viable means of removing volatile organic compounds (VOCs) from the unsaturated soils. The air sparging testing indicated that the low water table prevented air sparging from being effective, though it was successful at lower groundwater concentrations in the area of the test. The Dual Vacuum Extraction testing showed that entrainment extraction is an effective method of dewatering the overburden and removing residual VOCs.

Based on the results of this testing, Terra Vac recommends the installation of a Dual Vacuum Extraction system at this site. The system would include 53 wells, one or two extraction blowers, and activated carbon for vapor treatment.

1.0 INTRODUCTION

Storonske Cooperage is a former drum recycling facility undergoing environmental investigation by the New York State Department of Environmental Conservation (NYDEC). The nature and extent of soil contamination at the site has been characterized during previous investigations. The subsurface soils have been contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and PCBs. The pilot test addressed the feasibility of removing VOCs and some SVOCs from the soils and groundwater by using an air sparging/vacuum extraction system. Primary volatile contaminants of concern include xylenes, styrene, ethylbenzene, toluene, chlorobenzene, 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and tetrachloroethene (PCE).

The primary objective of the SpargeVac™ pilot study was to determine the site-specific design parameters for the most-effective full scale system design and implementation. Specific objectives were to:

- Determine the number and location of extraction wells and their expected radius of influence;
- Determine the number and location of injection or inlet wells;
- Determine the equipment requirements, including blower size and vapor treatment;
- Determine the aquifer parameters and means of enhancing remediation effectiveness; and,
- Determine the likely mass removal rates and estimated length of system operations.

The work conducted for this pilot test was the design, installation and operation of an air sparging/vapor extraction pilot-scale system at the former Storonske Cooperage facility in Schodack, New York. The pilot-scale system was installed near the former lagoon area, the suspected source area of the contamination.

All work was conducted in accordance with the Workplan, Health and Safety Plan (HASP), and the Quality Assurance Project Plan (QAPP) submitted previously by Terra Vac.

2.0 BACKGROUND

2.1 SITE CHARACTERISTICS

The Storonske Cooperage site is a 5-acre parcel of land located in the Town of Schodack, Rensselaer County, New York. The site is located on the north side of Kraft Road, immediately east of the intersection of Kraft Road with U.S. Routes 9 and 20 (see Figure 1).

The facility was purchased by N. Storonske Cooperage, Inc. in 1973, and used for the cleaning and reconditioning of 55-gallon drums. The facility is no longer in use.

Soils at the site generally consist of approximately 20 feet of glacial till overlying bedrock. The glacial till has been described as mostly sandy silt, with gravels and some clay stringers. Grain size distribution tests performed by Malcom Pirnie indicate a preponderance of gravels and sands.

The depth to groundwater was reported to range from 16.5 feet in the former lagoon area to 13 feet at the eastern site boundary. Groundwater flow was reported to the east.

2.2 SITE CONTAMINATION

The Storonske Cooperage site was reported as a possible source of contamination as early as 1979, by the Rensselaer County Department of Health. In 1980 it was reported that soil samples collected at the site showed elevated levels of benzene and xylene.

In March 1984 the NYDEC conducted a facility inspection, and found the sludge in the former wastewater lagoon to exceed toxicity limits for lead. Since 1984, six additional studies were conducted prior to this pilot study.

Soils at the site were found to be contaminated with various volatile and semi-volatile organic compounds, metals, and PCBs as reported by Malcom Pirnie, Inc. in their *Focused Remedial Investigation and Feasibility Study Report* dated April 1990. The most contaminated soils appeared to be confined to the area of the former lagoon and eastward to the site's eastern boundary. Other contaminated areas included drum unloading and storage areas.

The depth of contaminated soil was determined to vary with respect to on-site location and type of contaminant. In general, highest concentrations of total VOCs were detected in the former lagoon area at depths from 0.5 to 10 feet. The VOCs extend generally eastward from the lagoon and were detected at depths extending to 10-16 feet at the eastern property boundary with total VOC concentrations greater than 2 ppm. The highest concentration of total VOCs at this eastern boundary location was 85.5 ppm at a depth of 4-10 feet. Significant contamination was not detected at depths greater than 10-16 feet.

The latest round of groundwater sampling prior to this pilot study were conducted in April of 1992. This sampling indicated the following VOCs and highest concentrations: TCE (19 mg/l), benzene (7 mg/l), chlorobenzene (8 mg/l), DCA (30 mg/l), PCE (10 mg/l), TCA (15 mg/l), and xylenes (63 mg/l).

3.0 PROCESS DESCRIPTION

3.1 VACUUM EXTRACTION

Vacuum extraction induces a negative pressure gradient within the soil matrix through a nearby extraction well. As the vacuum gradient propagates through the subsurface, liquid contaminants vaporize as air and contaminant vapors migrate to the extraction well, where they are drawn to the surface for treatment. The process enhances the volatilization of VOCs in the soil matrix, and desorbs contaminants from the soil matrix over time.

The effectiveness of the vacuum extraction process at recovering VOCs is controlled by several factors. Contaminant-specific conditions, such as the physical and chemical properties of the VOCs (vapor pressure, Henry's Law Constant and solubility), the subsurface characteristics (porosity, moisture content and permeability), in addition to such system operating parameters as well spacing and applied vacuum, make each site unique and the application of the process site-specific.

The equipment required for the implementation of a vacuum extraction system includes horizontal or vertical extraction wells, a vacuum unit, a liquid/vapor separator, a vapor treatment system and system controls and instrumentation. The number of extraction wells is controlled by subsurface conditions. As the porosity and permeability of the subsurface decreases, the number of extraction wells will generally increase. The vacuum unit design is dictated by the air flow rates and vacuum levels required. A variety of units are available for use, ranging from low vacuum, single stage centrifugal blowers to high vacuum rotary vane or positive displacement blowers. Vapor can be discharged to atmosphere or treated by either adsorption of extracted vapors onto activated carbon, catalytic oxidation or thermal incineration. Selection of a vapor treatment system will depend upon regulatory agency requirements and vapor phase VOC extraction rates.

3.2 SPARGEVAC™

SpargeVac™ is Terra Vac's trade name for its remedial technology using injection of air into the saturated zone to remove volatile compounds. SpargeVac™ (also referred to as air sparging or sparging) removes VOCs from saturated soils by introducing contaminant-free air into the saturated zone through specially designed injection wells. As the air leaves the well and moves outward and upward through the aquifer, it creates three zones, as shown in Figure 3.

The innermost zone, known as the pore-water displacement zone, extends radially from the well approximately 1/3 of the depth of the injection well below the water table. In the pore-water displacement zone, almost all of the water in the soil pore spaces has been displaced by air. The VOCs partition from the dissolved phase to the vapor phase, and are transported to the unsaturated zone and then to the vapor extraction system by the movement of air upwards. Some volatization of residual VOCs also occurs. Significant mounding of the water table can be seen in this zone.

The next zone outward from the injection well is known as the micro-channel airflow zone. This zone extends from the end of the pore-water displacement zone radially outward to one to two times the depth of the sparging point beneath the water table. In this zone, the air travels along micro-fracture paths, displacing much less water than in the pore-water displacement zone. Again, the primary removal mechanism is the partitioning of the VOCs from the dissolved phase to the vapor phase, followed by mass transfer of the vapors upwards. Groundwater mounding in this zone is insignificant; however, this zone can be detected by measuring air flow through monitoring points.

The final zone is the dissolved oxygen zone, extending from the micro-channel air zone outward beyond three times the depth of the sparging point below the static water table. No air flow occurs in this zone; however, elevated levels of dissolved oxygen can be detected. The dissolved oxygen spreads from the micro-channel air flow through diffusion, due to the concentration gradient of dissolved oxygen produced by the sparging air flow. No significant mass transfer mechanisms exist in this zone; however, the increased dissolved oxygen levels may enhance the biodegradation of petroleum-based compounds.

The groundwater sparging process in the micro-channel airflow zone relies on the natural equilibrium which occurs between contaminants within the saturated zone and the contaminant-free air passed through it. The vapor/dissolved phase equilibrium concentrations are based on Henry's Law constants (H_c) for the contaminants of concern. Generally, contaminants with higher H_c values will partition to the vapor phase at a faster rate than those with lower values.

In addition, the equilibrium between the adsorbed and dissolved phase contaminants must be considered. This equilibrium is expressed by the octanol-water partition coefficient (K_{ow}). Typically, the lower the value, the higher the tendency of the contaminant to dissolve. For purposes of air sparging, contaminants with high K_{ow} values, which tend to adsorb within the soil matrix, will be remediated at a faster rate by sparging than by conventional pump and treat methods.

Most of the contaminants of concern (all except Arochlor 1242 and lead) at this site are readily recovered by the sparging process. The ability of the sparging process to treat contaminated groundwater and soils *in situ* reduces the costs and concerns regarding liquid-phase treatment and the disposal of treated groundwater.

3.3 DUAL VACUUM EXTRACTION

Dual Vacuum Extraction (DVE) is a synergistic combination of vacuum extraction and groundwater extraction, removing both vapors and water from the same well. Groundwater is extracted to lower the water table, thus exposing the contaminated saturated soil to vapor flow. Since vapor mass transport is considered 40 times as effective as water transport at removing contaminants from soil, exposing the saturated zone to air flow greatly speeds the remediation.

The vacuum applied to the soil via the extraction well not only extracts vapors, but also increases the well pumping capacity, drawdown, and capture zone. By increasing the well production, the remediation timeframe is again reduced.

Once the saturated soils are clean, the source of continuing contamination of the groundwater is removed, and the groundwater quickly cleans up.

In Terra Vac's Entrainment Extraction process, (a refinement of DVE), the water is extracted by entrainment in the vapor stream. A specially-designed entrainment tube is inserted down the well into the water. A vacuum is applied to the tube. The velocity of the air moving from the well into the entrainment tube causes water to be drawn up with the air. The vapor/water mixture is drawn into a separator tank, where the water is removed from the air stream. Both the vapors and water are then sent to separate appropriate treatment methods. A process flow diagram is provided as Figure 4.

4.0 FIELD ACTIVITIES

4.1 WELL INSTALLATION

Parratt-Wolfe Drillers, of Syracuse, New York, were contracted by Terra Vac to install one injection well, one extraction well, and two monitoring wells. Drilling was conducted on October 27 and 28, 1993. Under the supervision of a Terra Vac geologist, three borings were advanced in the vicinity of existing well MW-1S using an 8.5-inch outside diameter hollow stem auger. Well locations are shown on Figure 2.

Soil samples were taken continuously from the first boring (TVE-1/TVI-1) using a 2-inch diameter driven split-spoon. Soil descriptions were logged using the split spoon samples. The samples were screened for the presence of VOCs using an organic vapor monitor (OVM). Groundwater was encountered deeper than expected, at approximately 18 feet below grade.

This first boring was advanced to 20 feet 3 inches, and completed as an injection/extraction well nest. The injection well was completed to a depth of 19 feet 6 inches, using 6" of 0.020 inch slot screen and 20 feet of 2" diameter PVC riser. The extraction well was completed to a depth of 11 feet six inches, using 5 feet of screen and 10 feet of 2" PVC riser. Both screens were seated in Morie #1 (10-20 mesh) sand, with six feet of hydrated bentonite chips between the screens, and one foot of hydrated bentonite chips above the upper screen. The upper three feet was sealed with a Portland Cement-bentonite mixture.

The other two borings (TVM-1 and TVM-2) were advanced to depths of 19 feet 3 inches and 19 feet 9 inches, respectively. At these depths augur refusal occurred, indicating bedrock. No soil samples were collected during drilling.

TVM-1 and TVM-2 were completed as monitoring wells, using 10 feet of 4-inch diameter, 0.020 slot PVC screen and 10 feet of 4-inch diameter PVC riser in each. Each screen was rested in Morie #1 (10-20 mesh) sand, and capped with one foot of hydrated bentonite chips. The wells were then finished with a black-iron riser cap set in a Portland Cement-bentonite mixture.

Not enough water was found in TVM-1 to allow development. Two gallons of water was bailed from TVM-2 for partial development.

Detailed lithological descriptions and well construction details can be found in Appendix A.

4.2 PILOT TESTING

4.2.1 Pilot System Installation

On October 29, 1993, a vacuum extraction/air sparging system was mobilized to the site. The system consisted of a 10 horsepower, positive-displacement air injection blower, a 10 horsepower, positive-displacement extraction blower, a 75-gallon vapor/water separator, and two 200 pound activated carbon canisters. A diesel generator was used for electrical power. A process flow diagram for the extraction system is provided in Figure 4.

In addition, a Terra Vac van equipped with a gas chromatograph (GC) and two flame ionization detectors (FID) was brought to the site.

5.2.4 Vapor Treatment System Efficiency

No VOCs were detected in the outlet of the primary or secondary carbon throughout the test. Analytical results of vapor samples from the carbon treatment system are presented in Table 4.

5.3 AIR SPARGING TESTING

5.3.1 Injection Pressures and Flow Rates

Injection pressures were varied from 2 pounds per square inch gauge (psig) to 6 psig. The resulting injection flow rates ranged from 38.8 SCFM to 59.4 SCFM. These are presented as Table 5. Higher pressures were not used due to the small saturated thickness of approximately one foot.

5.3.2 Cone-of-Influence Airflow Measurements

No airflow in the saturated zone was measured in any of the monitoring wells, at any depth, during the duration of the test, due to the small saturated thickness encountered at the time of the test.

5.3.3 Dissolved Oxygen Measurements

Dissolved oxygen measurements were taken from each of the monitoring wells seven times over the course of the air sparging testing. These readings ranged from 0 mg/L to 8 mg/L, and are provided as Table 6. The measurements taken on the afternoon of November 3, 1993, are suspect, as the meter was operating erratically during that time. The meter was subsequently recalibrated and groomed for measurements taken on November 4. Dissolved oxygen measurements taken on November 4 ranged from 1.1 mg/L, in MW-1S at the beginning of the day's testing, to 5.7 mg/L in TVM-1, also taken at the beginning of the testing. MW-1S showed a noticeable increase in dissolved oxygen during testing on the 4th; while TMW-1 and TMW-2 stayed relatively constant or increased slightly.

5.3.4 Water Table Mounding

During the air sparging test, water levels in the monitoring wells were routinely measured. This data is presented in Table 7. The water levels in the wells dropped by up to 1.5 feet during the morning of the 3rd; recovering to near their original levels by the end of the day. On the second day of sparging testing, the water levels in TVM-1 and TVM-2 fluctuated by less than 0.06 feet; while the level in MW-1S (furthest from the injection well) increased by 0.4 feet. (Note that the recorded depths to water are measured from the top of each individual well casing, and are intended to measure relative changes in each well only. The Terra Vac-installed wells were not surveyed for absolute elevations.)

5.3.5 Extracted Vapor Concentrations

Extracted vapor concentrations during the air sparging portion of the testing ranged from a total VOC concentration of 1.05 mg/L to a high of 11.04 mg/L. For most of the test, the total VOC concentration stayed between 1.4 mg/L and 1.6 mg/L. The primary compounds removed were toluene, PCE, ethylbenzene, and xylenes. Benzene was only detected in three of the 29 samples, these three being in conjunction with the extremely high total VOC peak noted during mid-day on November 3. Styrene, chlorobenzene, TCE, and 1,2-DCA were generally less than 0.1 mg/L each. The vapor analysis results are detailed on Table 8.

Extraction rates generally ranged from 0.08 to 0.1 pounds per hour during the extraction test. (Note, however, that extraction flow rates were significantly less than during the previous vapor extraction testing). A total of 2.72 pounds of VOCs were extracted during the two days of air sparging testing.

5.3.6 Groundwater Concentrations

Groundwater VOC concentrations measured before and during the air sparging test are presented in Table 1. VOC concentrations in wells TMW-1 and TMW-2 decreased by approximately 60% over the two days of testing. VOC concentrations in MW-1S showed an initial increase, followed by a decrease back to the original levels.

5.3.7 Vapor Treatment System Efficiency

No VOCs were detected in the outlet of the primary or secondary carbon throughout the test. Analytical results of vapor samples from the carbon treatment system are presented in Table 4.

5.4 DUAL VACUUM EXTRACTION TESTING

5.4.1 Extraction Flow Rates and Applied Vacuums

During the Dual Vacuum Extraction portion of the test, the vacuum applied to TVM-2 was initially set at 58.5 inches of water vacuum, then allowed to stabilize to 45.5 inches of water vacuum. The vacuum was again allowed to develop after the system re-start following the unintentional shut-down of the diesel generator. This data is presented in tabular format in Table 9. Flow was initially 66 SCFM, and developed to 74 SCFM as the area was dewatered. It took approximately one hour initially for steady-state conditions to develop;

following the system restart, steady-state conditions were obtained in approximately one-half hour.

Overall, for similar applied vacuums, a greater flow rate was achieved during the DVE testing compared to the initial VE testing. For instance, during the initial VE testing, an applied vacuum of 78 inches of water achieved a flow rate of only 65 SCFM, while during the DVE test a vacuum of 45.5 inches of water obtained a flow rate of 74 SCFM.

5.4.2 Induced Vacuums in Monitoring Wells

The induced vacuum in each of the wells surrounding TVM-2 was monitored every thirty minutes during the DVE test. This data is also presented in Table 9. Induced vacuums ranged from 0.4 inches of water vacuum in MW-1S (18.5 feet from TVM-2) to 0.54 inches of water vacuum in TVE-1 (eight feet from TVM-2). Induced vacuums dropped off only slightly with increasing distance from the extraction well. In addition, induced vacuums increased during the initial development period, as the area was dewatered.

In general, the induced vacuums during the DVE test were higher than those noted during the initial vacuum influence testing, for similarly spaced wells. For instance, during the initial VE testing, with a vacuum of 65 inches of water applied to TVE-1, a vacuum of 0.24 inches of water was recorded at TVM-2. During the DVE testing, with a vacuum of only 45.5 inches of water applied to TVM-2, a vacuum of 0.54 was recorded at TVE-1.

5.4.3 Water Table Drawdown and Water Extraction Rate

Because of the entrainment process used to extract groundwater from the well, direct measurements of water flow were not possible. The water extraction rate was calculated by determining the total amount of water extracted by observation of water level in the water/vapor separator, and dividing by the run time.

At the end of the DVE test, the water/vapor separator was approximately 1/4 full. This equates to roughly 70 gallons of water. Since the DVE test ran for 5.5 hours, this gives a pumping rate of 12.7 gallons per hour, or 0.2 gallons per minute. At this pumping rate, the extraction well was kept de-watered.

Water table drawdowns measured in the surrounding monitoring wells are presented in Table 11. MW-1S and TMW-1 (located eighteen feet and ten feet from TMW-2, respectively) showed slight increases in water level. TVI-1, located eight feet from TMW-2, showed a decrease of approximately 0.12 feet.

5.4.4 Extracted Vapor Concentrations

Vapor concentrations in the extracted vapor stream during the vacuum extraction testing ranged from 0.18 mg/L to 0.81 mg/L. The primary compounds detected were PCE (maximum concentration of 0.26 mg/L), toluene (maximum concentration of 0.17 mg/L), ethylbenzene (maximum concentration of 0.12 mg/L) and xylenes (maximum combined concentration of 0.15 mg/L). Benzene was only detected once, during the first sample of the day. A detailed tabulation of analytical results is presented in Table 10.

In general, VOC concentrations increased during the first few hours of operation, as the area was dewatered. Following the system shut-down, concentrations dropped off sharply, then again increased as the area was de-watered. Towards the end of the day, concentrations began slowly decreasing, as is typical for VE systems.

Overall, a total of 0.91 pounds of VOCs were removed during the five and one-half hour test, corresponding to an extraction rate of 3.97 pounds per day.

5.4.5 Vapor Treatment System Efficiency

No VOCs were detected in the outlet of the primary or secondary carbon throughout the test. Analytical results of vapor samples from the carbon treatment system are presented in Table 4.

6.0 EVALUATIONS

The VE testing demonstrated the effectiveness of using vapor extraction to remove VOCs from the unsaturated zone at the site. The air sparging testing showed that, although VOCs can be removed from the saturated zone using air sparging, the thin saturated thickness will limit the overall effectiveness of the technology due to the large number of air injection points needed. The DVE testing, although limited in scope, demonstrated the effectiveness of using the DVE process to dewater the saturated zone and extract VOCs.

6.1 VACUUM EXTRACTION TESTING

The one-day vacuum extraction test demonstrated the effectiveness of using vacuum extraction to remediate the unsaturated zone, by removing 1.8 pounds of VOCs from a single well in less than eight hours of operations. Subsurface vacuums were detected up to twelve feet from the extraction well.

6.1.1 Radius of Influence

Figure 5 graphically displays the measured subsurface vacuums at the three monitoring wells for three different applied vacuums. A significant vacuum was measured at twelve feet from the extraction well, from the monitoring well furthest from the extraction well.

Theoretically, the subsurface vacuum should decrease logarithmically with increasing distance from the extraction well. Regression analysis was performed on this data, using the log of the vacuum. The results are presented in Figure 6, for a 3-inches of mercury ("Hg) applied vacuum, and in Figure 7 for a 6.5"Hg applied vacuum. Using 0.01 inches of water as the arbitrary cut-off point, the calculated radius of influence is 15 feet for a 3"Hg applied vacuum, and 17 feet for a 6.5" applied vacuum. This correlates with empirical data gathered at similar sites.

The measured induced vacuums are indicative of a low permeability soil type. This correlates with the clayey soils noted during the drilling of TVI-1/TVE-1. Previous investigations reported grain size analyses indicating that the soils were composed of silty sands. This classification is not supported by the findings during this pilot test.

6.1.2 Vacuum/Flow Relationship

Regression analysis performed on the flow obtained from each magnitude of induced vacuum indicates a linear relationship between vacuum and flow. This is presented graphically in Figure 8. Although the range of vacuums used during the pilot test provided a linear relationship with the resulting flow, it can be expected that at some point, turbulence will develop, resulting in proportionally less flow for increasing vacuum. However, for moderate levels of vacuum, an increase in vacuum will result in a corresponding increase in flow.

6.1.3 Vapor Extraction Rates

Figure 9 shows the VOC extraction rates as a function of run time. Also displayed are the applied vacuum levels as a function of run time. This graph shows how increasing the vacuum each time increased the extraction rates. Therefore, by applying a greater vacuum, and obtaining a greater flow rate, the remediation time can be reduced.

6.2 AIR SPARGING TESTING

The saturated overburden thickness was only 1.5 feet, which was smaller than expected. Because of this thin saturated thickness, only limited air sparging data was able to be obtained.

6.2.1 Pressure/Flow Relationship

With one foot of water covering the injection screen, the calculated minimum injection pressure to overcome the hydrostatic forces is 1/2 psig. The sparging test was run with injection pressures ranging from 2 to 6 psig.

Figure 14 presents a graph of injection air flow versus injection pressure, with a best-fit curve added. At a certain pressure, further increases in pressure provide only marginal increases in air flow, due to increasing turbulence and friction losses. For the aquifer conditions found at the site, this point appears to be approximately 3 psig, or six times the pressure needed to overcome the hydrostatic pressure.

No discernable increases in VOC concentrations or VOC extraction rates as a result of increasing injection pressure were noted.

6.2.2 Cone-of-Influence

No measurable bubble flow was encountered in any monitoring well. The cone-of-influence for the aquifer conditions present at the site, with a saturated thickness of 1 foot, is therefore less than 4 feet. This correlates with published reports and prior experience, which suggest that the measurable airflow typically extends out one to two times the thickness of the saturated zone. For the 1-foot saturated zone encountered, this would equate to an expected measurable cone of influence of one to two feet in radius.

The dissolved oxygen measurements indicate that the sparging may have increased dissolved oxygen levels up to 12 feet from the sparging well. Increased dissolved oxygen levels can assist in the bioremediation of petroleum-based hydrocarbons. However, because of the high concentrations of chlorinated compounds, biodegradation of the petroleum compounds may not be occurring.

6.2.3 Effectiveness of Air Sparging

No significant increases in overall VOC removal during sparging as compared to vacuum extraction alone were noted. This is likely due to (a) the limited area impacted by the injection well due to the low water table; and (b) the fact that the highest soil concentrations were found in the upper 6 feet of soil. Because of these two factors, the additional VOC mass released by the sparging process was negligible compared to the mass being removed from the unsaturated zone.

However, noticeable decreases in groundwater VOC concentrations were seen (Table 1). This indicates that the air sparging system was effectively removing VOCs from the saturated zone. In addition, a very high VOC concentration spike was noted for 1-1/2 hours during mid-day on November 3, indicating that the injected air had found a 'pocket' of VOCs, volatized them, and transported them to the extraction well. This demonstrates that these 'pockets' of VOCs can be cleaned up using air sparging.

The major limitation to the use of air sparging at this site is the small saturated thickness in the source area, necessitating a large number of injection points to provide adequate coverage.

6.3 DUAL VACUUM EXTRACTION TESTING

Because the DVE testing was not originally included in the pilot test plan, the scope of the testing was limited. However, the DVE testing did demonstrate that (a) Entrainment extraction can be used to dewater the saturated zone; (b) the expected water extraction rates are low; and (c) DVE can provide greater areas of influence than VE testing alone.

6.3.1 Radius of Influence

Figure 10 displays the measured subsurface vacuums at the three monitoring wells during the DVE testing. Regression analysis was performed on this data, using the log of the vacuum. The results are also presented in Figure 10. Using 0.01 inches of water as the arbitrary cut-off point, the calculated radius of influence is 29 feet. This is significantly larger than that measured during the initial VE testing.

Although this difference may be due to lithological differences in the soil surrounding TMW-2 versus TVE-1, because of the short distance between the two wells, and the fair amount of uniformity seen across the site, this is not likely. A more probable explanation is that in general, a thicker unsaturated zone and a deeper well screen will provide a larger radius of influence. In this case, the dewatering action of DVE increased the thickness of the unsaturated zone for TMW-2 as compared to TVE-1. In addition, TMW-2 was screened down to approximately 19 feet below grade, whereas TVE-1's screen extended down to only 11 feet below grade.

The effects of de-watering can be seen in Figure 11, showing the induced vacuum in the monitoring wells over time during the DVE test. In general, it took over one and one-half hours for steady-state vacuums to be achieved. This can be compared to the initial VE testing (Table 2), where steady-state vacuums were reached almost immediately, and further increases were slight.

6.3.2 Vacuum/Flow Relationship

Figure 12 displays the vacuum and flow during the DVE testing as a function of time. Again, steady-state conditions took over one and one-half hours to develop, as compared to the initial VE testing (Table 2), during which vacuums and flows stabilized almost immediately.

The flow rate per foot of screen for TVM-2 at 3.5" Hg (45" water) vacuum was 7.4 SCFM per foot. By interpolating from Figure 8, the flow rate per foot of screen for well TVE-1 at the same vacuum would be 7.2 SCFM. This shows that the flow characteristic of the soil near each well were similar, and that the longer screen provided additional flow capability.

6.3.3 Vapor Extraction Rates

In general, vapor concentrations during the DVE testing were lower than during either the VE testing or the air sparging testing. This may be due to varying VOC soil concentrations between TVE-1 and TVM-2. Mass removal rates during the DVE testing were similar to those encountered during the VE testing, due to the higher airflow rate.

Increases in VOC concentrations were noted during the first several hours after each of the two DVE start-ups (Figure 13). This also provides evidence of the dewatering action exposing new areas to vapor flow.

Based on the results of this one-day test, VOC extraction rates during DVE operations of 4 pounds per day per well can be expected.

6.3.4 Dewatering

A pumping rate of 0.2 gpm was able to keep the extraction well dewatered. A noticeable decrease in water level was recorded eight feet away, after only five hours of extraction. Based on this limited information, the saturated soils can be effectively dewatered using a network of properly spaced DVE wells.

As shown in section 6.3.2, the flow rate per foot of screen during the DVE testing was equal to or greater than the flow rate per foot of screen during the VE testing, for a similar vacuum. Since this calculation used the entire length of screen TVM-2, without an adjustment for the portion of the screen covered by water, this demonstrates that the DVE extraction process effectively kept the well screen clear of water.

7.0 RECOMMENDATIONS

Based on the results of the four days of pilot testing, a dual vacuum extraction system will be the most effective method of remediating all of the overburden. Although air sparging was able to remove VOCs from the saturated zone, the small saturated thickness makes the use of air sparging less effective than dual vacuum extraction.

Terra Vac's recommendations for a full scale system follow:

7.1 EXTRACTION WELLS

7.1.1 Vacuum Extraction Well Radius of Influence

When spacing vapor extraction wells, the measured vacuum influence is not the only factor to consider. Rather, this is only a maximum well spacing. The other factor to take into consideration is the desired remedial time frame. In general, with closer well spacings, more pore volumes of air are drawn through the soil per unit time, and remediation is faster.

The determination of required pore volumes can be calculated using the initial soil concentrations, desired final concentrations, and a detailed benchtop study. In absence of a bench-top study for a particular site, information from similar sites can be used.

Table 12 presents a summary of the initial VOC soil concentrations and the targeted clean-up goals, along with the required percent reduction for each compound. At similar sites where detailed bench testing was performed, approximately 9,000 pore volumes were required to achieve a 98% reduction. This correlates with other published data for removal of xylenes (the limiting compound per Table 12).

Using the radius of influence calculated during the VE testing of 17 feet (Section 6.1.1), an assumed porosity of 35%[1], and an unsaturated thickness of 18 feet, the pore volume is calculated as:

$$V_{pore} = \pi r^2 hn$$

where n is the soil porosity, h equals thickness of soil zone, and r is the radius of influence. For the parameters listed above, this becomes:

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[1] Theoretical porosities for uniform tight packed spheres ranges from 25.9% to 47.9%, depending on the packing pattern. Terra Vac's actual porosity measurements at various remedial sites shows that porosity values almost always fall between 30% and 45%. In addition, any retained soil moisture will occupy pore space, thereby lowering the effective porosity. Therefore, the assumed value of 35% provides a conservative estimate of the remedial timeframe.

$$V_{pore} = \pi \ x \ (17 \ ft\ )^2 \ x \ 18 \ ft \quad x \ 35\,\%$$

$$V_{pore} = 5,720 \ ft^{\ 3}$$

Using the flow rate of 65 scfm measured during the VE testing, the time required to attain the remediation goals using the maximum well spacing is then:

$$T = \frac{N_{pore} \ V_{pore}}{Q}$$

$$T = \frac{9000 \ pores \quad x \ 5,720 \ ft^{\ 3}}{65 \ ft^{\ 3}/\min \ \ x \ 525,600 \ \min/year}$$

$$T = 1.5 \ years$$

This provides a recommended well spacing of 17 feet for the unsaturated zone. However, this does not take into account the need for some remediation of the saturated zone. This can be accomplished using dual vacuum extraction (below) or air sparging (see section 7.2).

7.1.2 Dual Vacuum Extraction Well Radius of Influence

For the spacing of DVE wells, both the vapor radius of influence and the water table drawdown need to be considered. However, detailed modeling of the aquifer parameters to ensure adequate drawdown is beyond the scope of this pilot test. The recommendations provided herein are based upon observations during the test and experience at similar sites. A more thorough examination of the hydrogeological properties is recommended.

Using the calculated DVE radius of influence of 29 feet (Section 6.3.1), an assumed porosity of 35%, and an overburden thickness of 20 feet, the pore volume is calculated as:

$$V_{pore} = \pi r^2 hn$$

where n is the soil porosity, h equals thickness of soil zone, and r is the radius of influence. For the parameters listed above, this becomes:

$$V_{pore} = \pi x (29 \ ft\ )^2 x 20 \ ft \ \ x 35\,\%$$

$$V_{pore} = 18,494 \ ft^{\ 3}$$

FINAL

Using the measured flow rate of 74 scfm, the time required to attain the remediation goals using the maximum well spacing is then:

$$T = \frac{N_{pore} \; V_{pore}}{Q}$$

$$T = \frac{9000 \; pores \;\; x \; 18,494 \; ft^{3}}{74 \; ft^{3}/\min \;\; x \; 525,600 \; \min/year}$$

$$T = 4.3 \; years$$

The well spacing required to reduce the remedial time frame to 1.5 years (to match the cleanup time frame presented for the unsaturated zone) can be calculated by rearranging the equations to solve for the maximum allowable pore volume:

$$V_{pore} = \frac{1.5 \, years \;\; x \; 74 \; ft^{3}/\min \;\; x \; 525,600 \; \min/year}{9,000 \; pore \;\; volumes}$$

$$V_{pore} = 6,482 \; ft^{3}$$

then solving for r:

$$r = \sqrt{\frac{6,482 \; ft^{3}}{20 \, ft \;\; x \; \pi \; x \; 35\%}}$$

$$r = 17.2 \, feet$$

This provides a well spacing of 34 feet. However, the necessary dewatering of the unsaturated zone must also be factored in..

At a spacing of 34 feet, it is unlikely that the saturated zone will be sufficiently dewatered based on the drawdowns seen during the DVE testing. From the limited data available, a spacing of no more than 20 feet is recommended for dewatering of the saturated zone. Terra Vac recommends conducting a more detailed aquifer analysis to verify this spacing. This modeling is beyond the scope of this pilot test.

Wells constructed for either DVE or vacuum extraction can be constructed of 2-inch diameter PVC, since little difference in flow per foot of screen was seen between the 2-inch well (TVE-1) and a four-inch well (TVM-2).

7.1.3 Number and Location of Extraction Wells

According to the most recent soil sampling data (Figure 3-1 of *Request for Proposal for Soil Vapor Extraction Pilot Test*, D&B, July, 1993, reprinted herein as Figure 15), there are two major areas of the site requiring remediation of soils. The first is the suspected source area, an area 125 feet by 125 feet located near the former lagoon. The second area is 40 feet by 75 feet, located near the eastern fence line. These areas are located within the ">1 ppm VOC" contour lines.

The first area, with a total approximate area of 15,625 square feet, would require 17 wells at a spacing of 34 feet for a VE system to remediate the unsaturated zone. To dewater this area using DVE would require up to 50 wells using a 20-foot spacing.

The second area, with an area of approximately 3,000 square feet, would require approximately 3 wells at a 34 foot spacing to remediate the unsaturated zone. To dewater the overburden in this area would require at least 10 wells. However, DVE is not recommended in this area because (a) the saturated thickness is greater in this area (up to ten feet thick) than in the source area; and (b) VOCs in this area appear to be concentrated in the shallower soils. Due to the greater saturated thickness, air sparging is likely to be more effective in this part of the site; again, though, air sparging may not be warranted, as the VOCs appear to be concentrated in the upper soils.

Figure 16 shows the recommended well placement for the VE system. Figure 17 shows the recommended well placement for the DVE system.

7.2 NUMBER AND LOCATION OF INJECTION WELLS

As described above, air sparging is not recommended in the source area due to the small saturated thickness. Complete coverage with an air sparging network in this area would require between 1200 and 5000 injection points, using a spacing of 2 to 4 feet. These injection points would be 1/2" or 1" driven steel pipes with perforated sections near the bottom.

Sparging is an attractive option in the eastern area of the site, where the saturated thickness is greater. Given a saturated thickness of 10 feet, an injection point spacing of 20 feet would be reasonable. The number of sparging points to cover the eastern fence boundary area of 3000 square feet would then be 10 sparging points.

Sparging could also become an attractive option in the source area of the site, if the water table rises significantly, thereby extending the cone of influence for sparging, while requiring higher water extraction rates for DVE.

7.3 EQUIPMENT REQUIREMENTS

7.3.1 Extraction Blower

For a vacuum extraction system consisting of 17 wells in the source area and 3 wells in the eastern fence area, a total flow rate of 1300 scfm can be expected. A minimum well vacuum of 6.5 inches of mercury is recommended; so to account for friction losses in the piping system, a minimum capability of 1300 SCFM at 10" Hg is recommended. This could be met with a 75-horsepower, positive-displacement rotary-lobe blower. It may be desirable to use two blowers to meet this requirement, for reliability and flexibility; in this case, two 40-hp blowers would also meet the requirement.

If a DVE system is installed, using 50 wells in the source area and 3 wells in the eastern fence area, a total flow rate of 3920 scfm can be expected. A minimum vacuum of 3.5 inches will be required at the well; therefore, allowing for friction losses, the blower must be capable of at least 6" Hg. For the DVE system, centrifugal blowers may be used in place of rotary lobe blowers. It is recommended that excess blower capacity be provided, to allow for increased water extraction rates should the water table rise.

7.3.2 Injection Blower

If an air sparging network is installed in the eastern fence zone, 10 wells are envisioned. The hydrostatic pressure required for 10 feet of water is 5 psig; per Figure 10, 8 psig would then provide the optimal injection air flow. (3 psig above the minimum pressure required). The expected air flow would be 45 scfm per point, or 450 scfm total. This can be provided by a rotary lobe blower, or by an oil-free compressor with a pressure regulating valve.

7.3.3 Vapor Treatment Requirements

Based on the results of the pilot test, a mass removal rate of 5 pounds per day per well is expected. For a VE system of 20 wells total (17 + 3), an initial total VOC extraction rate of 100 pounds per day can be expected. (This is a conservative estimate, since the pilot test was performed in the center of the source area). Given this, vapor treatment will be required by the NYDEC.

By summing the average values of soil VOC concentrations measured in prior investigations, an average total VOC concentration in the site soils of 50 millegrams per kilogram (mg/kg, or ppm) is derived. Using a total volume of 372,500 cubic feet (from the area and depth presented above), the total mass of VOCs in the soil is calculated at 1863 pounds of VOCs.

Carbon adsorption was proven to be effective during the pilot testing. Using a carbon loading rate of 10%, this means that carbon usage rates will start out as high as 1000 pounds of carbon per day for a VE-only system. With a total mass of VOCs of 1863 pounds, total carbon usage is estimated at 18,600 pounds over the life of the project. A conceptual design for the carbon adsorption system would include six 1000-pound vessels, in three pairs. The three primary carbon vessels would require change-out six times over the 1.5 year project life.

A DVE system would expend approximately the same amount of carbon over the life of the project, as the total mass extracted would remain the same. However, additional carbon vessels would be required to handle the higher flow rates required; but change-outs would be less frequent. To handle the expected flows, the system would require sixteen 1000-pound vessels in eight pairs.

Catalytic or thermal oxidation could also be used for vapor treatment. Thermal oxidation involves heating the air stream to approximately 1400°F, and oxidizing the organic compounds. Catalytic oxidation involves heating the air stream to approximately 750°F and passing the heated vapors over a catalyst bed, where the organic compounds are then oxidized. However, because of the low expected total mass of VOCs (only 1800 pounds), it is not likely that thermal oxidation or catalytic oxidation would be cost-effective due to the signicant amounts of energy that are required to heat the air stream.

7.4 DVE WATER TREATMENT

With an anticipated 50 DVE wells, and an expected extraction rate of 0.2 gpm, a water treatment system of at least 10 gpm would be required. This would most easily be handled using a pair of carbon adsorption vessels, with discharge to a nearby drainage channel, storm drain, or sewage system. It is recommended that excess water treatment capacity be provided, to allow for increased groundwater extraction rates should the water table rise.

7.5 MEANS OF ENHANCING REMEDIATION EFFECTIVENESS

Two enhancement methods, DVE and air sparging, have been explored in depth in this study. Other possible methods of enhancing the remediation are air injection into the unsaturated zone, steam injection, and capping the surface.

Air injection into the unsaturated zone is often used in very tight, low permeability soils. Also, injected hot air can increase the volatility of semi-volatile compounds. However, at this site adequate subsurface flow was easily achieved, and most of the compounds of concern are easily removed by vacuum extraction. Two semi-volatile compounds, phenol and PCBs, are a concern at the site. Experience with phenol has shown that it can be removed at a slow rate with vacuum extraction; and that heating the soil does little to improve the extraction rate. PCB has not been found to be amenable to vapor extraction even with soil heating. In addition, these two compounds are primarily found in areas of the site also impacted with metals; and these areas are scheduled for excavation. Therefore, air injection into the unsaturated zone is not recommended.

Steam injection is another method of increasing the volatility of longer-chain hydrocarbons such as phenols. Again, because phenol is primarily found in areas of the site scheduled to be excavated due to metals contamination, and because experience has shown only minimal increases in extraction rates of phenol from soil heating, the cost of steam injection is not recommended.

A cap on the area undergoing vacuum extraction is often used to attempt to increase the radius of influence, especially where the unsaturated zone is very thin. The cap also serves to limit water infiltration into the area. However, an adequate radius of influence was developed without a cap; and water infiltration into the area of concern does not appear to be a significant problem. Therefore, installation of a cap for improving the VE process is not recommended.

7.6 BUDGET ESTIMATES FOR RECOMMENDED REMEDIAL SYSTEMS

A vacuum extraction system to treat the unsaturated zone only, consisting of 20 wells, a vacuum extraction blower, and a carbon adsorption vapor treatment system, is expected to have a capital cost of approximately $148,000, and an operations and maintenance cost of $270,000 over 1.5 years.

A dual vacuum extraction system to treat both the unsaturated zone and the saturated zone, consisting of 53 wells, a vacuum extraction blower, a carbon adsorption vapor treatment system, and a carbon adsorption water treatment system, is expected to have a capital cost of approximately $250,000, and an operations and maintenance cost of $441,000 over 1.5 years.

A breakdown of these estimates is provided in Table 13.

8.0 CONCLUSIONS

Based upon the information derived from the pilot test, the following conclusions are provided:

* Vacuum Extraction (VE) is an effective method of remediating the volatile compounds in the unsaturated soils at the site, regardless of the method chosen to remediate the saturated zone.

* A minimum radius of influence of 12 feet was measured. The calculated radius of influence for vacuum extraction is from 15 to 17 feet, depending on the applied vacuum.

* Carbon adsorption is an effective method of vapor treatment for this site.

* Increased vacuums provided larger radii of influence, higher flows, and higher extraction rates.

* The effectiveness of air sparging was limited due to the thin saturated thickness encountered in the source area.

* Dual Vacuum Extraction was an effective method of dewatering the source area, given the thin saturated thickness.

* The remedial system chosen for cleanup of the saturated zone should be flexible to handle changing water level conditions.

* Installation of an integrated remediation system to clean up the saturated and unsaturated soils at the site is recommended. This system would include 50 Dual Vacuum Extraction wells in the source area, and 3 vapor extraction wells in the eastern fence area. Carbon adsorption would be used for vapor treatment and for treatment of extracted groundwater. The operating time of this system would be approximately 1.5 years.

TABLE 1
GROUNDWATER VOC ANALYSES

WELL	DATE	TIME	1,2 DCA (mg/L)	BENZENE/ TCA (mg/L)	TCE (mg/L)	TOLUENE (mg/L)	PCE (mg/L)	CHLORO-BENZENE (mg/L)	ETHYL-BENZENE (mg/L)	P,M-XYLENES (mg/L)	STYRENE (mg/L)	O-XYLENE (mg/L)	TOTAL VOC (mg/L)
MW-1S	11/03/93	08:30	0.000	0.000	0.000	0.000	0.025	0.052	0.132	0.000	0.000	0.000	0.21
	11/03/93	16:50	0.000	0.000	0.080	0.000	0.000	0.161	0.177	0.000	0.021	0.000	0.44
	11/04/93	11:30	0.000	0.000	0.000	0.000	0.029	0.102	0.102	0.000	0.000	0.000	0.23
TMW-1	11/03/93	08:30	0.000	0.015	0.035	2.816	0.099	0.280	1.466	1.337	0.172	0.453	6.67
	11/03/93	17:03	0.000	0.009	0.000	1.085	0.000	0.138	0.747	0.628	0.061	0.234	2.90
	11/04/93	11:02	0.000	0.013	0.000	1.035	0.000	0.116	0.637	0.536	0.072	0.225	2.63
TMW-2	11/03/93	08:30	0.000	0.006	0.017	0.635	0.029	0.185	1.071	0.931	0.000	0.270	3.14
	11/03/93	16:53	0.000	0.000	0.000	0.448	0.000	0.073	0.670	0.590	0.000	0.171	1.95
	11/04/93	11:04	0.000	0.000	0.012	0.219	0.000	0.111	0.451	0.354	0.000	0.117	1.26

TABLE 2
VACUUM EXTRACTION VACUUMS AND FLOWS

DATE	TIME		TVE-1	TVM-1	TVM-2	MW-1S
		DISTANCE FROM TVE-1 (feet)	0	4	8.17	11.75
		FLOW SCFM	VACUUM In. H20	VACUUM In. H_2O	VACUUM In. H_2O	VACUUM In. H_2O
11/02/93	08:30	22	39	1.00	0.10	0.08
	09:00	24	39	1.10	0.12	0.10
	09:30	24	39	1.25	0.12	0.10
	10:00	25	39	1.25	0.14	0.12
	10:30	25	39	1.25	0.14	0.12
	11:00	42	65	2.25	0.20	0.20
	11:30	42	65	2.25	0.24	0.22
	12:00	44	65	2.40	0.22	0.22
	12:30	44	65	2.40	0.24	0.22
	13:00	62	91	3.40	0.32	0.32
	13:30	64	90	3.50	0.34	0.31
	14:00	64	90	3.50	0.34	0.31
	14:30	65	85	3.60	0.37	0.34
	15:00	65	78	3.60	0.35	0.34
	15:30	65	78	3.60	0.35	0.32
	16:00	65	78	3.60	0.34	0.33
	16:30	65	75	3.70	0.37	0.35

TABLE 3
VAPOR ANALYSES
VE TESTING
WELL TVE-1

DATE	TIME	RUN HOURS (TOTAL)	SCFM	WELL VACUUM (In. Hg)	1,2 DCA (mg/L)	BENZENE/ TCA (mg/L)	TCE (mg/L)	TOLUENE (mg/L)	PCE (mg/L)	CHLORO-BENZENE (mg/L)	ETHYL-BENZENE (mg/L)	P,M-XYLENES (mg/L)	STYRENE (mg/L)	O-XYLENE (mg/L)	TOTAL VOCs (mg/L)	TOTAL POUNDS PER HOUR	CUMULATIVE LBS VOC'S RECOVERED
11/02/93	08:48	0.00	22.0	3.0	0.0135	0.0014	0.1704	0.5363	0.4026	0.0471	0.2147	0.1931	0.0084	0.0455	1.63	0.134	0.00
11/02/93	08:48	0.00	22.0	3.0	0.0099	0.0073	0.1323	0.4022	0.2444	0.0351	0.1525	0.1285	0.0065	0.0299	1.15	0.095	0.00
11/02/93	09:25	0.62	24.0	3.0	0.0167	0.0006	0.1008	0.6945	0.5666	0.0705	0.2755	0.2587	0.0119	0.0562	2.05	0.184	0.09
11/02/93	09:51	1.05	24.0	3.0	0.0186	0.0017	0.0879	0.5868	0.6663	0.0616	0.227	0.2216	0.0129	0.0492	1.93	0.174	0.16
11/02/93	10:28	1.67	25.0	3.0	0.0165	0.001	0.0853	0.7071	0.6845	0.0846	0.2979	0.3022	0.0224	0.07	2.27	0.212	0.28
11/02/93	10:54	2.10	25.0	3.0	0.0198	0.002	0.0755	0.6203	0.5247	0.0733	0.2549	0.2634	0.0171	0.0581	1.91	0.179	0.37
11/02/93	11:19	2.52	42.0	5.0	0.0144	0	0.0546	0.4375	0.4377	0.066	0.1973	0.2192	0.0156	0.05	1.49	0.234	0.45
11/02/93	11:45	2.95	42.0	5.0	0.0117	0	0.0463	0.3655	0.4031	0.0501	0.1613	0.1784	0.0131	0.0406	1.27	0.200	0.55
11/02/93	12:10	3.37	44.0	5.0	0.0107	0.0006	0.0441	0.405	0.3391	0.0537	0.178	0.1982	0.0163	0.0446	1.29	0.212	0.63
11/02/93	12:46	3.97	44.0	5.0	0.0156	0.001	0.0522	0.4104	0.4357	0.0614	0.2005	0.2341	0.0186	0.0546	1.48	0.244	0.77
11/02/93	12:46	3.97	44.0	5.0	0.0096	0.0006	0.0399	0.3716	0.3355	0.0528	0.1726	0.1958	0.0155	0.0447	1.24	0.204	0.77
11/02/93	13:11	4.38	62.0	7.0	0.0131	0	0.0411	0.3096	0.4044	0.0551	0.1506	0.1787	0.0146	0.0408	1.21	0.280	0.87
11/02/93	13:49	5.02	64.0	6.9	0.0079	0.0022	0.0526	0.3055	0.3654	0.0551	0.1648	0.2192	0.0051	0.0505	1.23	0.294	1.05
11/02/93	14:16	5.47	64.0	6.9	0.011	0	0.0396	0.3467	0.3199	0.0576	0.1863	0.2235	0.0201	0.0545	1.26	0.301	1.19
11/02/93	14:49	6.02	65.0	6.5	0.0144	0	0.0402	0.3257	0.2581	0.0544	0.1802	0.2204	0.0209	0.0541	1.17	0.284	1.35
11/02/93	15:16	6.47	65.0	6.0	0.0133	0	0.0394	0.2783	0.3072	0.0513	0.1452	0.1809	0.0156	0.0425	1.07	0.261	1.47
11/02/93	15:44	6.93	65.0	6.0	0.0122	0	0.0382	0.2947	0.422	0.059	0.1695	0.2328	0.008	0.053	1.29	0.313	1.60
11/02/93	16:19	7.52	65.0	6.0	0.0092	0	0.0334	0.2561	0.2044	0.0423	0.1363	0.1787	0.0071	0.0402	0.91	0.221	1.76

TABLE 4
VAPOR ANALYSIS
VAPOR TREATMENT SYSTEM

PRIMARY CARBON EFFLUENT

DATE	TIME	TOTAL VOCs (mg/L)
11/02/93	08:54	0.000
11/02/93	09:58	0.000
11/02/93	10:43	0.000
11/02/93	12:10	0.000
11/02/93	13:01	0.000
11/02/93	14:39	0.000
11/02/93	15:34	0.000
11/03/93	10:37	0.000
11/03/93	15:50	0.000
11/04/93	09:10	0.000
11/04/93	13:02	0.000
11/04/93	15:40	0.000
11/05/93	07:59	0.000
11/05/93	11:48	0.000
11/05/93	13:25	0.000

DISCHARGE STACK

DATE	TIME	TOTAL VOCs (mg/L)
11/02/93	09:41	0.000
11/02/93	10:17	0.000
11/02/93	11:35	0.000
11/02/93	13:40	0.000
11/02/93	15:06	0.000
11/03/93	15:50	0.000
11/04/93	08:20	0.000
11/05/93	08:14	0.000
11/05/93	15:50	0.000
11/05/93	15:50	0.000

TABLE 5
AIR SPARGING PRESSURES AND FLOWS

WELL TVI-1

SAMPLE DATE	SAMPLE TIME	FLOW D/P inches H20	FLOW scfm	PRESSURE psig
11/03/93	10:30	(ns)	(ns)	2.0
	11:00	(ns)	(ns)	2.2
	11:30	0.90	42.4	5.0
	12:00	1.55	55.6	5.0
	12:30	1.40	52.8	5.0
	13:00	1.30	51.9	4.6
	13:30	1.30	52.2	4.5
	14:00	1.90	58.4	6.0
	14:30	1.55	55.6	5.0
	15:00	1.75	59.4	4.9
	15:30	1.60	57.6	4.6
	16:00	1.30	52.2	4.5
	16:30	1.45	55.1	4.5
11/04/93	08:45	0.90	48.3	2.0
	09:15	0.58	38.8	2.0
	09:45	0.80	45.6	2.0
	10:15	0.82	46.1	2.0
	10:45	0.64	40.8	2.0
	11:15	0.92	48.9	2.0
	11:45	0.88	47.8	2.0
	12:15	1.05	52.2	2.0
	12:45	1.35	54.4	4.0
	13:15	1.30	53.4	4.0
	13:45	1.50	57.4	4.0
	14:15	1.50	57.4	4.0
	14:45	1.55	58.3	4.0
	15:15	1.30	53.7	3.9
	15:45	1.25	52.6	3.9

TABLE 6
DISSOLVED OXYGEN MEASUREMENTS
AIR SPARGING TESTING

DATE	TIME	TMW-1 DISSOLVED OXYGEN (mg/L)	TMW-2 DISSOLVED OXYGEN (mg/L)	MW-1S DISSOLVED OXYGEN (mg/L)
11/03/93	08:30	1.0	0.0	8.0
11/03/93	11:10	1.6	3.4	6.8
11/03/93	14:30	0*	0*	0*
11/03/93	16:10	0*	0*	0*
11/04/93	07:15	5.7	2.2	1.1
11/04/93	11:40	2.9	1.9	2.5
11/04/93	16:30	4.4	2.5	4.3

* Readings questionable due to erratically operating meter

TABLE 7
WATER LEVELS
AIR SPARGING TEST

DATE	TIME	DEPTH TO WATER*			
		TVI-1	TMW-1	TMW-2	MW-1S
11/02/93	08:30	19.90			
11/02/93	16:30	19.70	19.60	20.60	18.60
11/03/93	07:00	19.60	19.45	20.50	18.70
11/03/93	11:00		19.95	20.54	20.40
11/03/93	14:00		19.55	20.41	20.27
11/03/93	16:00		19.43	20.45	20.24
11/04/93	07:10		19.22	20.49	19.75
11/04/93	11:55		19.28	20.54	20.17
11/04/93	15:20		19.21	20.50	20.15

* Measured From Top of Well Casing

TABLE 8

VAPOR ANALYSES

AIR SPARGING TESTING

WELL TVE-1

DATE	TIME	RUN HOURS (TOTAL)	SCFM	WELL VACUUM (In. Hg)	1,2 DCA (mg/L)	BENZENE/ TCA (mg/L)	TCE (mg/L)	TOLUENE (mg/L)	PCE (mg/L)	CHLORO-BENZENE (mg/L)	ETHYL-BENZENE (mg/L)	P,M-XYLENES (mg/L)	STYRENE (mg/L)	O-XYLENE (mg/L)	TOTAL VOCs (mg/L)	TOTAL POUNDS PER HOUR	CUMULATIVE LBS VOC'S RECOVERED
11/03/93	10:17	7.52	34.0	1.0	0.0162	0	0.0678	0.3928	0.4007	0.0649	0.1998	0.2434	0.0103	0.0536	1.45	0.184	1.76
11/03/93	10:17	7.52	34.0	1.0	0.0217	0	0.0796	0.468	0.5192	0.0853	0.2475	0.3012	0.0109	0.0691	1.80	0.229	1.76
11/03/93	10:47	8.02	48.6	0.5	0.0164	0	0.0619	0.4228	0.4659	0.0696	0.2083	0.2571	0.0108	0.0562	1.57	0.285	1.89
11/03/93	11:12	8.43	24.3	0.5	0.0267	0	0.0674	0.3717	0.4673	0.0635	0.1843	0.2123	0.0165	0.0493	1.46	0.133	1.98
11/03/93	11:12	8.43	24.3	0.5	0.0209	0	0.0664	0.4247	0.402	0.0751	0.2089	0.255	0.0094	0.0566	1.52	0.138	1.98
11/03/93	12:21	9.58	20.3	0.5	0.0204	0	0.0651	0.4237	0.5286	0.0703	0.2159	0.2643	0.0242	0.0638	1.68	0.127	2.13
11/03/93	12:48	10.03	15.4	0.5	0.0186	0	0.065	0.4002	0.4474	0.0727	0.2165	0.2633	0.0218	0.0623	1.57	0.090	2.18
11/03/93	13:22	10.60	15.4	0.5	0.1191	0.0555	0.3653	3.442	1.628	1.003	1.482	1.824	0.3383	0.653	10.91	0.628	2.38
11/03/93	13:53	11.12	19.6	0.5	0.1142	0.0531	0.3508	3.362	1.866	0.9912	1.474	1.8219	0.3449	0.6646	11.04	0.809	2.75
11/03/93	14:23	11.62	34.6	1.5	0	0.0408	0.0695	2.95	1.179	0.8643	1.239	1.4747	0.2773	0.5316	8.63	1.116	3.23
11/03/93	14:50	12.07	32.4	1.5	0.0158	0	0.053	0.3674	0.4044	0.0738	0.2069	0.2558	0.0215	0.0606	1.46	0.177	3.52
11/03/93	15:26	12.67	39.4	1.3	0.0112	0	0.0446	0.3506	0.5407	0.0674	0.1891	0.2351	0.0177	0.0536	1.51	0.223	3.64
11/03/93	15:26	12.67	39.4	1.2	0.0121	0	0.0459	0.3829	0.4426	0.0747	0.2197	0.2693	0.0284	0.0728	1.55	0.228	3.64
11/03/93	16:13	13.45	37.3	1.0	0.0109	0	0.0419	0.3428	0.4592	0.065	0.1933	0.2514	0.0235	0.0597	1.45	0.202	3.81
11/03/93	16:13	13.45	37.3	1.0	0.0111	0	0.0426	0.3499	0.3907	0.0615	0.1994	0.2627	0.0275	0.0622	1.41	0.196	3.81
11/04/93	08:20	13.45	11.6	3.0	0.0206	0	0.0621	0.2835	0.4996	0.0633	0.1541	0.1844	0.0273	0.0409	1.34	0.058	3.81
11/04/93	08:44	13.85	16.4	3.0	0.015	0	0.0568	0.3628	0.5343	0.0694	0.1968	0.2582	0.0116	0.0566	1.56	0.096	3.84
11/04/93	08:44	13.85	16.4	3.0	0.0115	0	0.0535	0.354	0.4255	0.0701	0.1891	0.221	0.0216	0.0542	1.40	0.086	3.84
11/04/93	09:47	14.90	16.4	3.0	0.0089	0	0.0397	0.2802	0.2716	0.0478	0.1537	0.1976	0.0079	0.0444	1.05	0.065	3.92
11/04/93	11:32	16.65	19.4	3.0	0.0118	0	0.0517	0.3834	0.5752	0.0782	0.2169	0.2736	0.0234	0.0651	1.68	0.122	4.09
11/04/93	12:07	17.23	15.6	3.0	0.0149	0	0.0515	0.3318	0.4191	0.0684	0.1867	0.229	0.0197	0.0553	1.38	0.080	4.14
11/04/93	12:07	17.23	15.6	3.0	0.0144	0	0.0504	0.3668	0.4514	0.0644	0.202	0.2604	0.0106	0.0599	1.48	0.086	4.14
11/04/93	13:02	18.15	14.7	3.0	0.0124	0	0.0515	0.3847	0.4814	0.07	0.2109	0.2538	0.0251	0.0628	1.55	0.085	4.22
11/04/93	13:42	18.82	16.4	3.0	0.0113	0	0.0493	0.3498	0.4469	0.0641	0.1998	0.2524	0.0215	0.0605	1.46	0.089	4.28
11/04/93	13:42	18.82	16.4	3.0	0.0115	0	0.0486	0.3737	0.4006	0.0673	0.2111	0.2774	0.0105	0.0639	1.46	0.090	4.28
11/04/93	14:21	19.47	14.7	3.0	0.0069	0	0.0491	0.3465	0.4467	0.0647	0.1958	0.2443	0.0215	0.0573	1.43	0.079	4.34
11/04/93	15:11	20.30	15.6	3.0	0.0107	0	0.0466	0.3498	0.5403	0.0708	0.1988	0.268	0.0126	0.0608	1.56	0.091	4.41
11/04/93	15:20	20.45	15.6	3.0	0.0118	0	0.0484	0.3597	0.4524	0.0648	0.2005	0.2576	0.011	0.0591	1.47	0.085	4.42
11/04/93	16:00	21.12	16.4	3.0	0.0075	0	0.1341	0.2811	0.4769	0.0598	0.1576	0.2196	0.0241	0.0545	1.42	0.087	4.48

TABLE 9
DVE TESTING VACUUMS AND FLOWS

			TMW-2	TVE-1	TMW-1	MW-1S
		DISTANCE FROM TMW-2 (feet)	0	8	10	18.5
DATE	TIME	FLOW SCFM	VACUUM In. H20	VACUUM In. H2O	VACUUM In. H2O	VACUUM In. H2O
11/05/93	07:00	66	58.5		0.00	0.00
	07:30	70	48.8		0.47	0.37
	08:00	72	45.5		0.38	0.29
	08:30	72	45.5		0.50	0.37
	09:00	72	45.5		0.50	0.38
	09:30	72	45.5		0.51	0.37
	10:00	72	45.5		0.50	0.37
	10:30	0	0		0	0
	11:00	0	0		0	0
	11:30	72	46.8		0.52	0.36
	12:00	72	45.5	0.50	0.45	0.35
	12:30	74	45.5	0.54	0.53	0.42
	13:00	72	45.5	0.54	0.53	0.40
	13:30	74	45.5	0.54	0.52	0.40
	14:00	74	45.5	0.51	0.52	0.40
	14:30	74	45.5	0.52	0.52	0.40
	15:00	74	45.5	0.54	0.53	0.40

TABLE 10

VAPOR ANALYSES

DVE TESTING

WELL TVM-2

DATE	TIME	RUN HOURS (TOTAL)	SCFM	WELL VACUUM (In. Hg)	1,2 DCA (mg/L)	BENZENE/ TCA (mg/L)	TCE (mg/L)	TOLUENE (mg/L)	PCE (mg/L)	CHLORO-BENZENE (mg/L)	ETHYL-BENZENE (mg/L)	P,M-XYLENES (mg/L)	STYRENE (mg/L)	O-XYLENE (mg/L)	TOTAL VOCs (mg/L)	TOTAL POUNDS PER HOUR	CUMULATIVE LBS VOC'S RECOVERED
11/05/93	07:44	21.12	66.0	4.5	0.0035	0.0004	0.0506	0.1202	0.1168	0.0221	0.0715	0.0716	0.0055	0.0154	0.48	0.118	4.48
11/05/93	08:06	21.48	72.0	3.5	0.006	0	0.0587	0.168	0.1843	0.0323	0.1155	0.1254	0.0041	0.0251	0.72	0.194	4.53
11/05/93	08:50	22.22	72.0	3.5	0.0066	0	0.0532	0.1487	0.1966	0.0273	0.0956	0.0973	0.0063	0.0205	0.65	0.176	4.67
11/05/93	08:52	22.25	72.0	3.5	0.0062	0	0.0489	0.1465	0.1572	0.027	0.0969	0.0962	0.007	0.021	0.61	0.163	4.68
11/05/93	09:25	22.80	72.0	3.5	0.0065	0	0.0491	0.1574	0.2486	0.0351	0.11	0.1153	0.0078	0.0258	0.76	0.203	4.78
11/05/93	09:30	22.88	72.0	3.5	0.0054	0	0.039	0.1244	0.1161	0.0223	0.0817	0.0801	0.0051	0.0167	0.49	0.132	4.79
11/05/93	11:50	23.72	72.0	3.5	0.0081	0	0.0082	0.0192	0.003	0.0113	0.0899	0.0057	0.0276	0.0038	0.18	0.048	4.87
11/05/93	12:18	24.18	74.0	3.5	0.0062	0	0.0419	0.1337	0.2042	0.0235	0.0832	0.0829	0.0053	0.0175	0.60	0.166	4.92
11/05/93	12:48	24.68	72.0	3.5	0.0074	0	0.0441	0.1577	0.1981	0.0315	0.1088	0.1122	0.0061	0.024	0.69	0.186	5.00
11/05/93	13:24	25.28	74.0	3.5	0.0075	0	0.045	0.1577	0.1977	0.0323	0.1089	0.1098	0.0065	0.0237	0.69	0.191	5.12
11/05/93	14:08	26.02	74.0	3.5	0.0089	0	0.0451	0.1711	0.2631	0.0357	0.1222	0.1247	0.0076	0.0271	0.81	0.223	5.27
11/05/93	14:20	26.22	74.0	3.5	0.0064	0	0.0366	0.1283	0.1336	0.026	0.0881	0.0842	0.0059	0.0188	0.53	0.146	5.30
11/05/93	15:00	26.88	74.0	3.5	0.005	0	0.0301	0.0948	0.1234	0.0211	0.0636	0.0611	0.0035	0.0131	0.42	0.115	5.39

TABLE 11
WATER LEVELS
DUAL VACUUM EXTRACTION TEST

DATE	TIME	DEPTH TO WATER (feet)*				DRAWDOWN (feet)			
		TVI-1	TMW-1	TMW-2	MW-1S	TVI-1	TMW-1	TMW-2	MW-1S
11/05/93	07:00	19.48	19.00	20.50	19.70	0.00	0.00	0.00	0.00
11/05/93	12:40	19.59	18.95	22.35	19.60	0.11	-0.05	1.85	-0.10
11/05/93	14:20	19.6	18.95	22.35	19.60	0.12	-0.05	1.85	-0.10

TABLE 12
SOIL CONCENTRATIONS AND CLEAN-UP GOALS

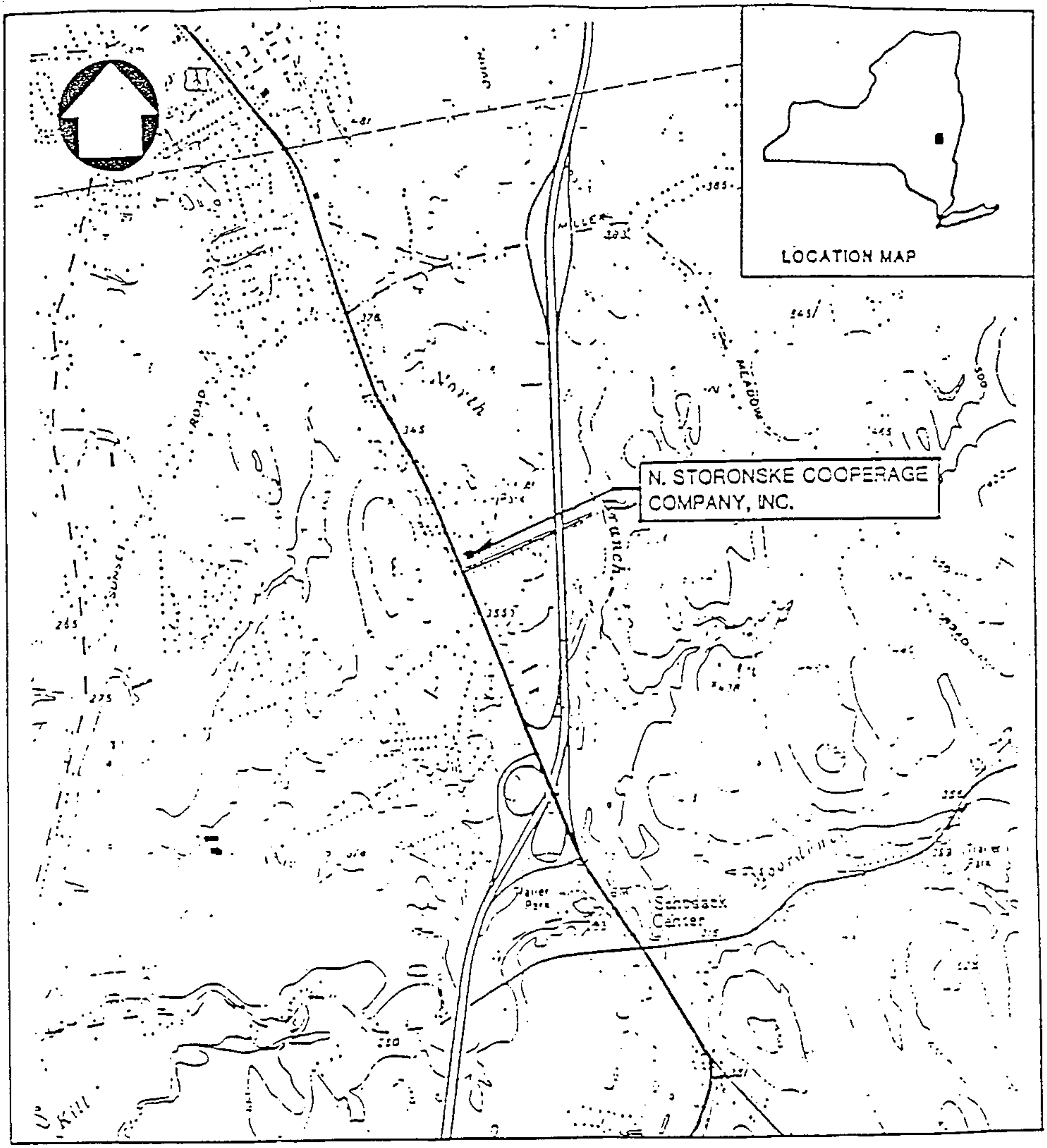
Compound	Abbrev.	Average Soil Conc. (ppb)	Maximum Soil Conc. (ppb)	Cleanup Goal (ppb)	Maximum Reduction Required
Tetrachloroethylene	PCE	332	3500	1500	57.1%
1,1-Trichloroethane	TCA	172	1300	1000	23.1%
Trichloroethylene	TCE	321	2600	1000	61.5%
1,2-Dichloroethane	1,2-DCA	790	2000	100	95.0%
Xylenes	X	15029	58500	1200	97.9%
Ethylbenzene	EB	5474	20000	5500	72.5%
Toluene	T	8558	41000	1500	96.3%
Chlorobenzene	CB	1230	3900	1500	61.5%

TABLE 13
BUDGETARY COST BREAKDOWN
STORONSKE COOPERAGE
SCHODACK, NEW YORK

	VE SYSTEM		DVE SYSTEM	
CAPITAL COSTS				
Well Installation	20 wells, 15 ft deep	$30,000	53 wells, 20 ft deep	$86,000
Vacuum Extraction Blower	75 hp	$35,000	100 hp	$45,000
Carbon, vapor phase	18,600 lbs	$56,000	18,600 lbs	$56,000
Carbon, liquid phase			2,000 lbs	$6,000
Utility Installation		$28,000		$30,000
Piping & System Installation		$33,000		$52,000
TOTAL CAPITAL COSTS		**$182,000**		**$275,000**
OPERATING COSTS				
Labor, per month		$6,000		$11,000
Materials & Expenses		$500		$1,000
Analytical & Laboratory		$4,500		$7,000
Utilities		$4,000		$5,500
OPERATING COST PER MONTH		$15,000		$24,500
TOTAL OPERATING COST	**18 months**	**$270,000**	**18 months**	**$441,000**

FIGURE 1

SITE MAP



*Taken from *Phase II Remedial Investigation Report*, August 1992, by Dvirka & Bartilucci

FIGURE 2
WELL LOCATIONS

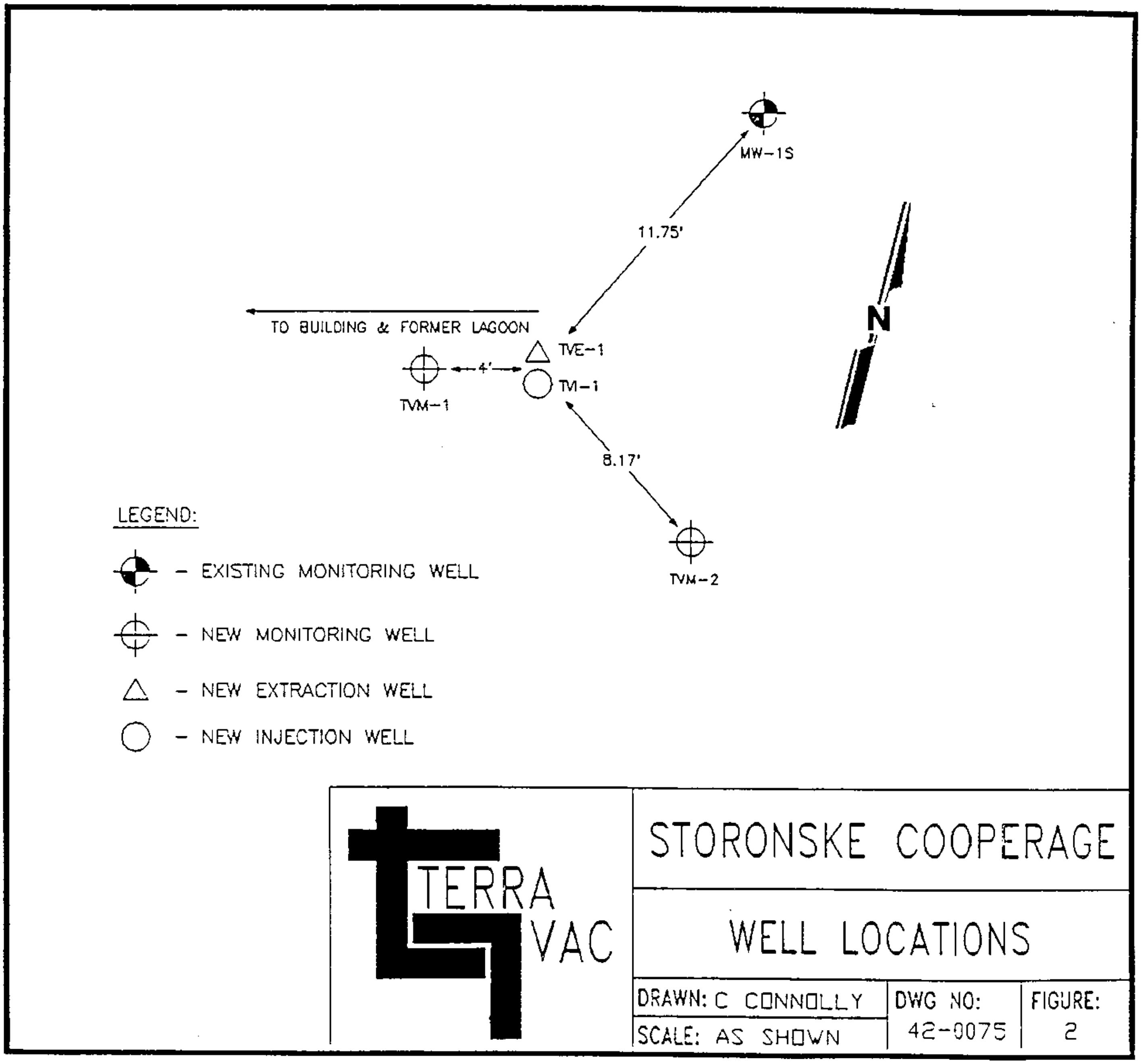


FIGURE 3
SPARGEVAC™ DIAGRAM

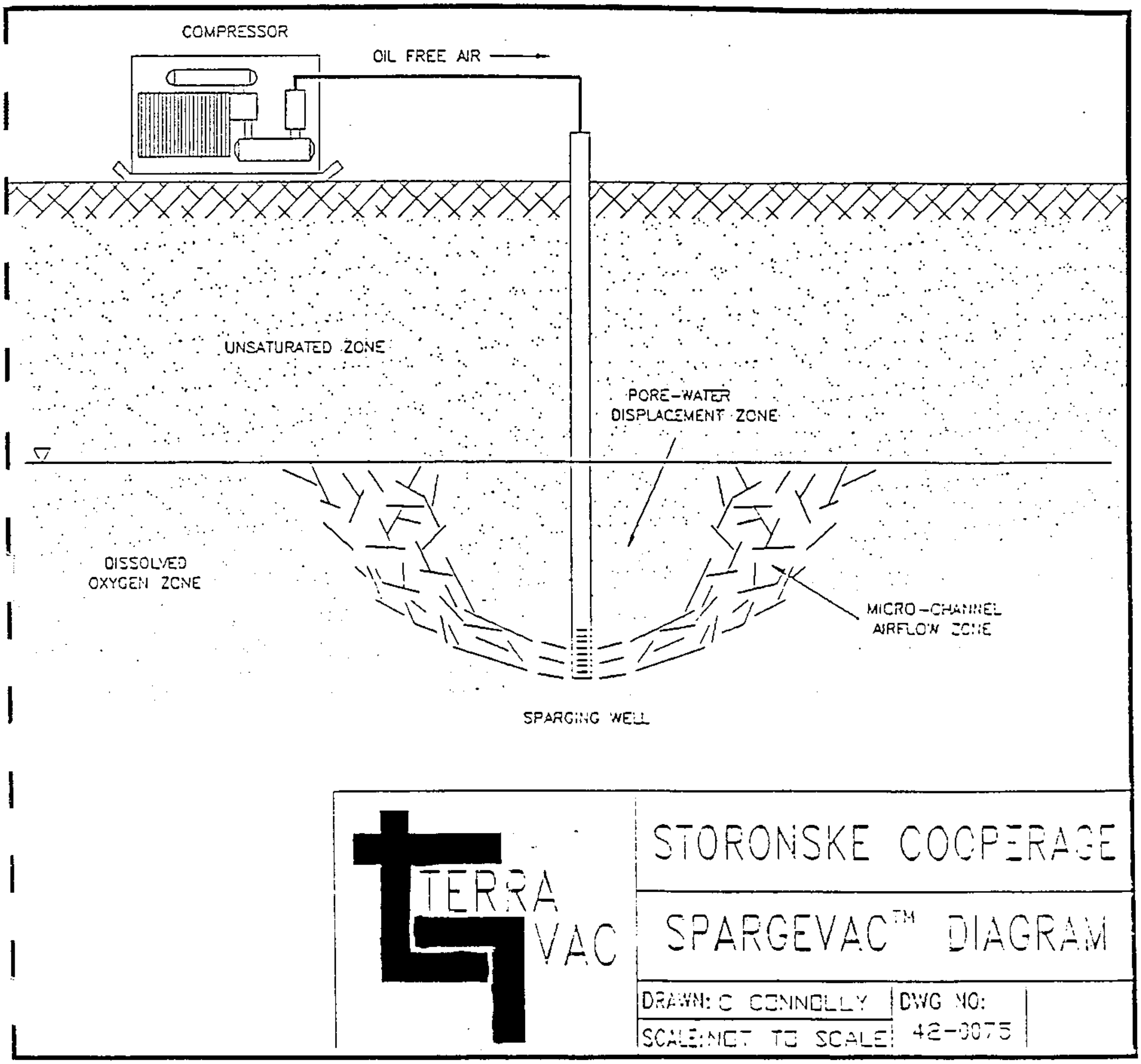
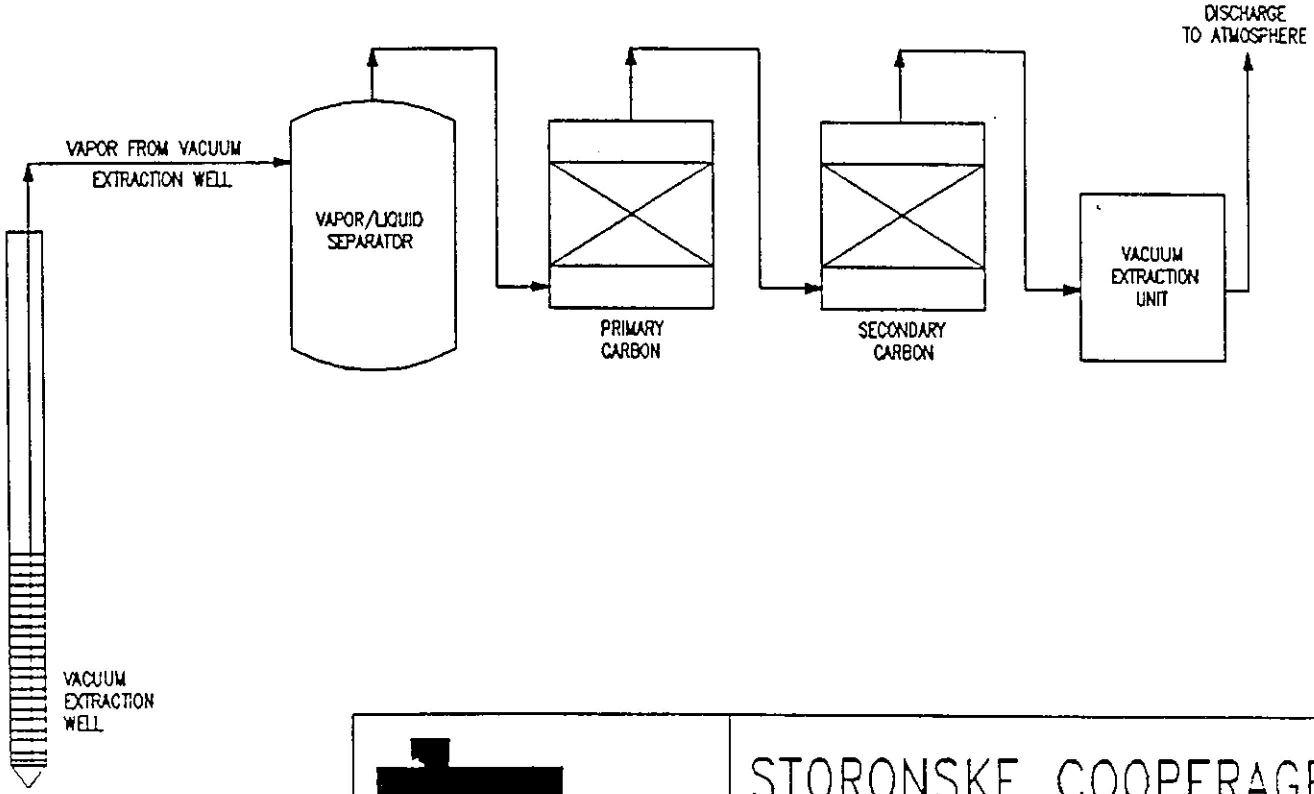


FIGURE 4
PROCESS FLOW DIAGRAM



TERRA VAC

STORONSKE COOPERAGE

PROCESS FLOW DIAGRAM

DRAWN: C CONNOLLY
SCALE: NOT TO SCALE
DWG NO: 42-0075
FIGURE: 4

FIGURE 5

VACUUM EXTRACTION INFLUENCE TESTING

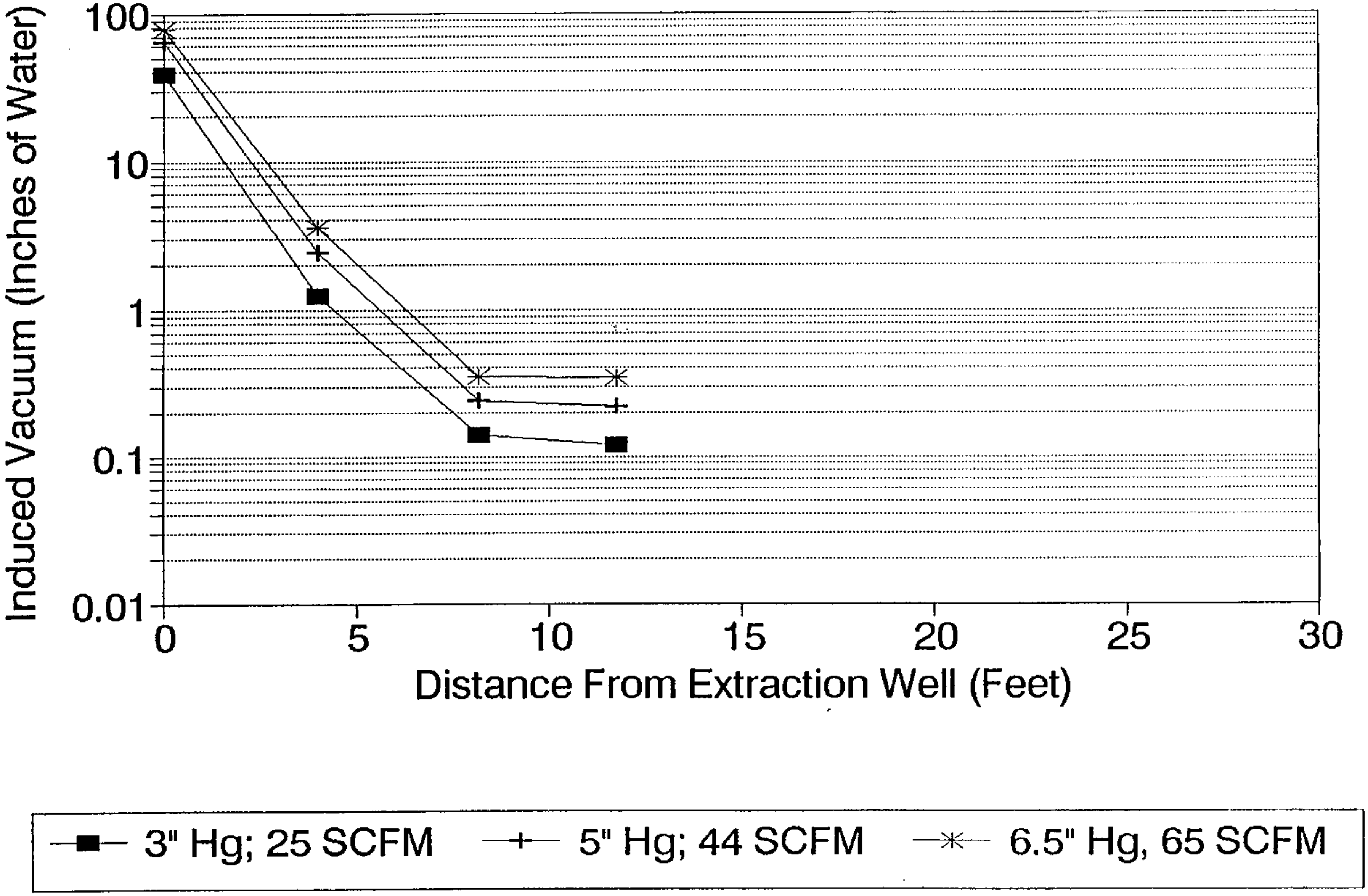


FIGURE 6

RADIUS OF INFLUENCE REGRESSION @ 3" Hg

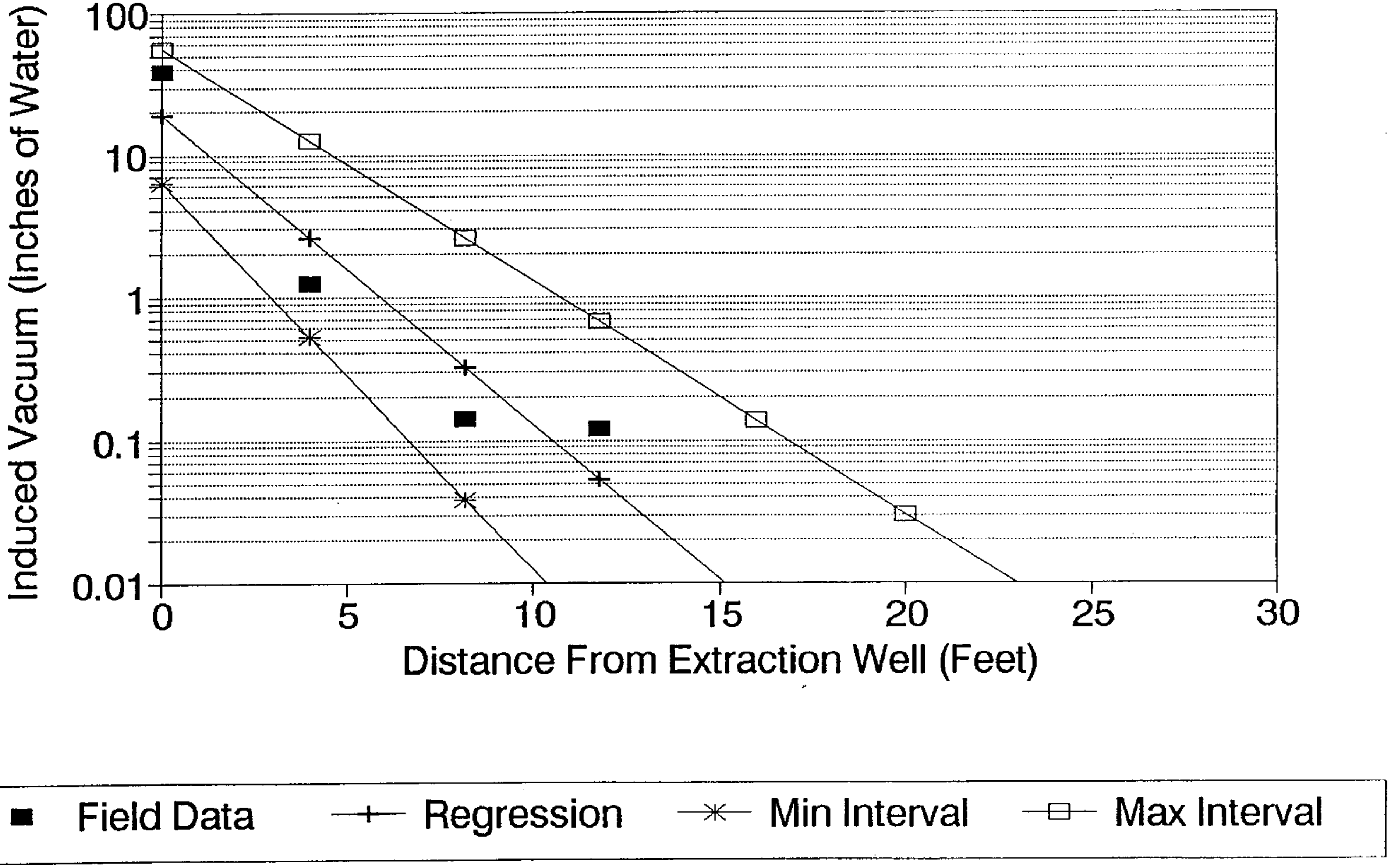


FIGURE 7

RADIUS OF INFLUENCE REGRESSION @6.5" Hg

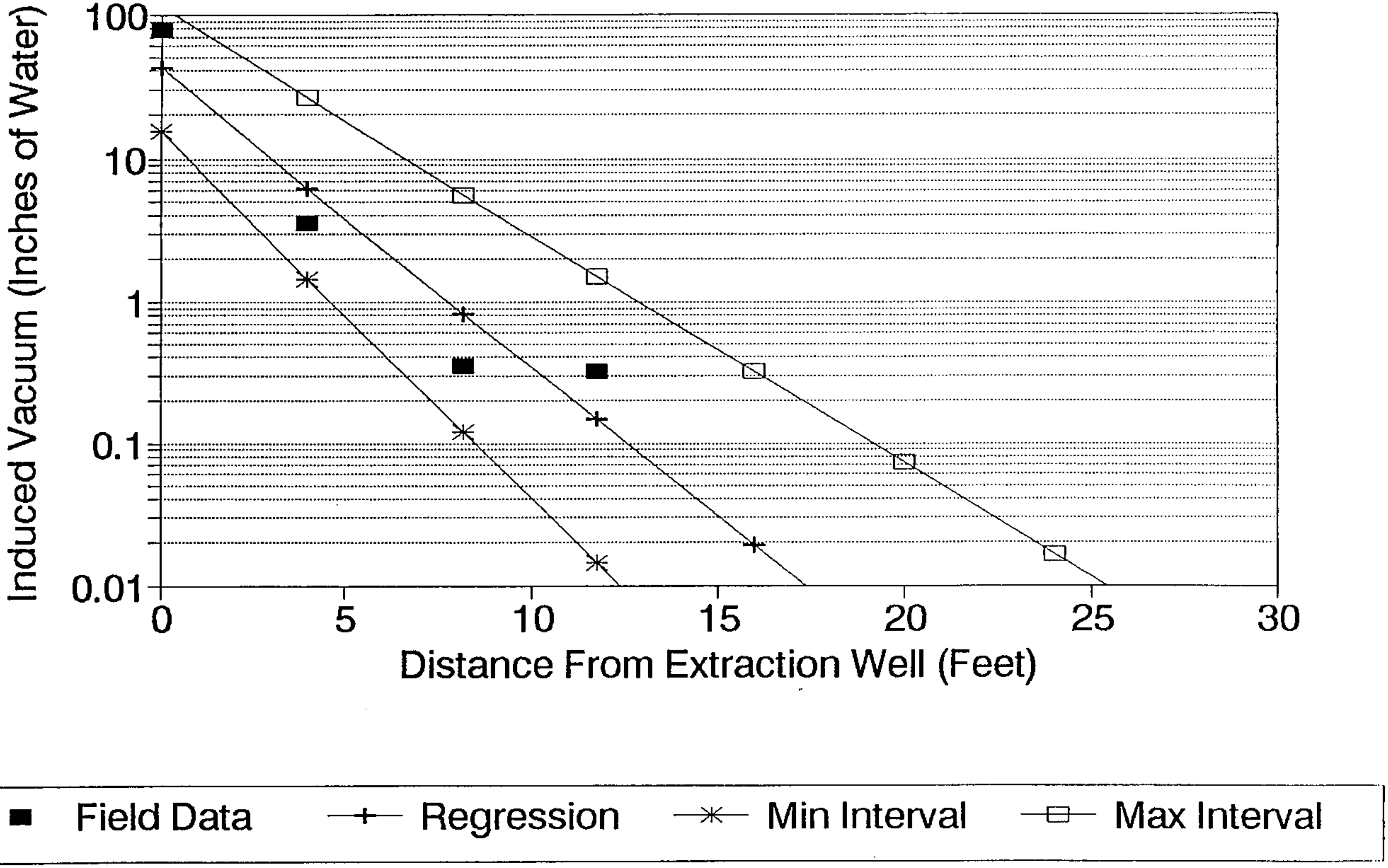


FIGURE 8

VE TESTING FLOW vs. VACUUM

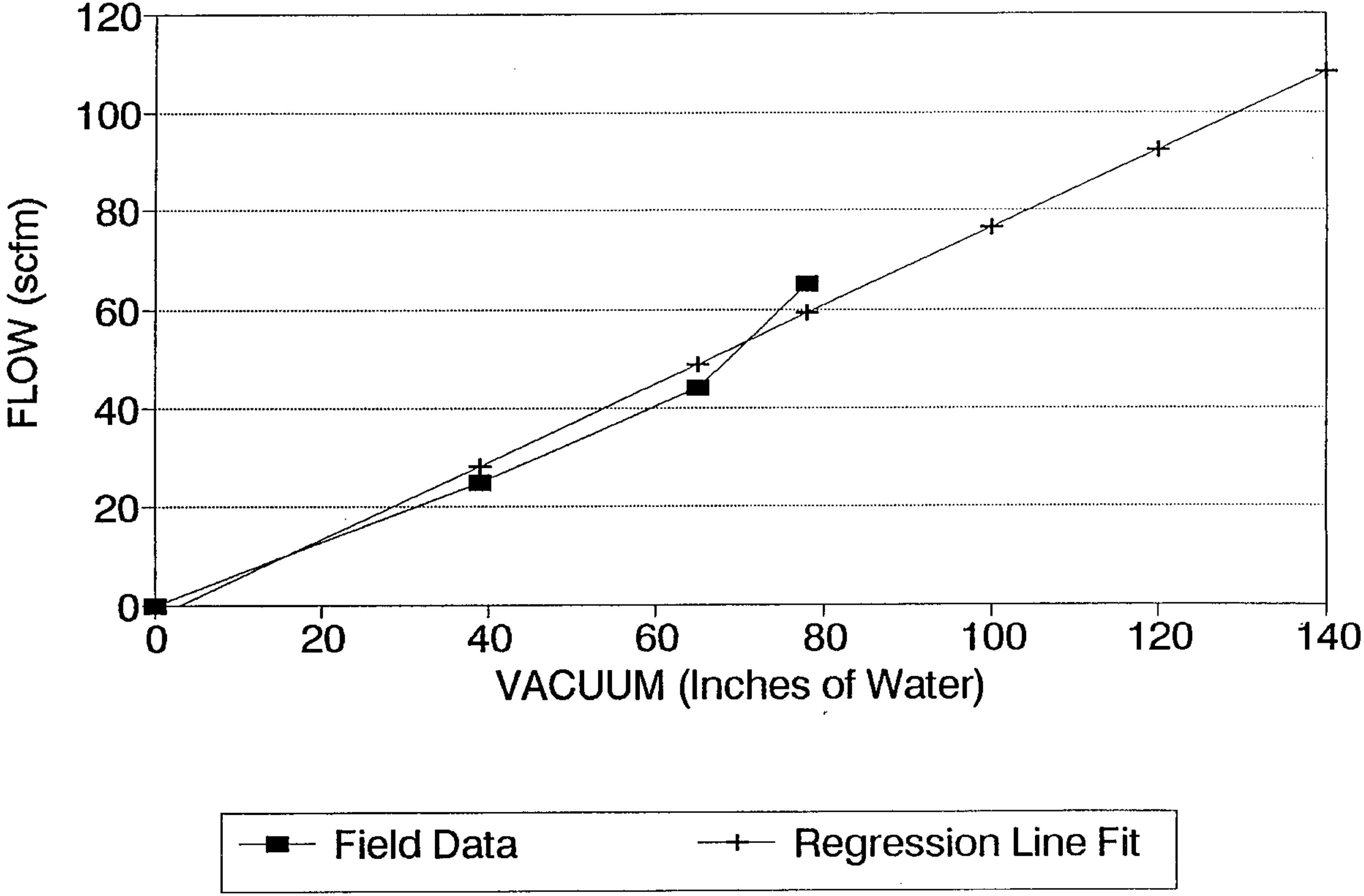


FIGURE 9
VE TEST EXTRACTION RATES

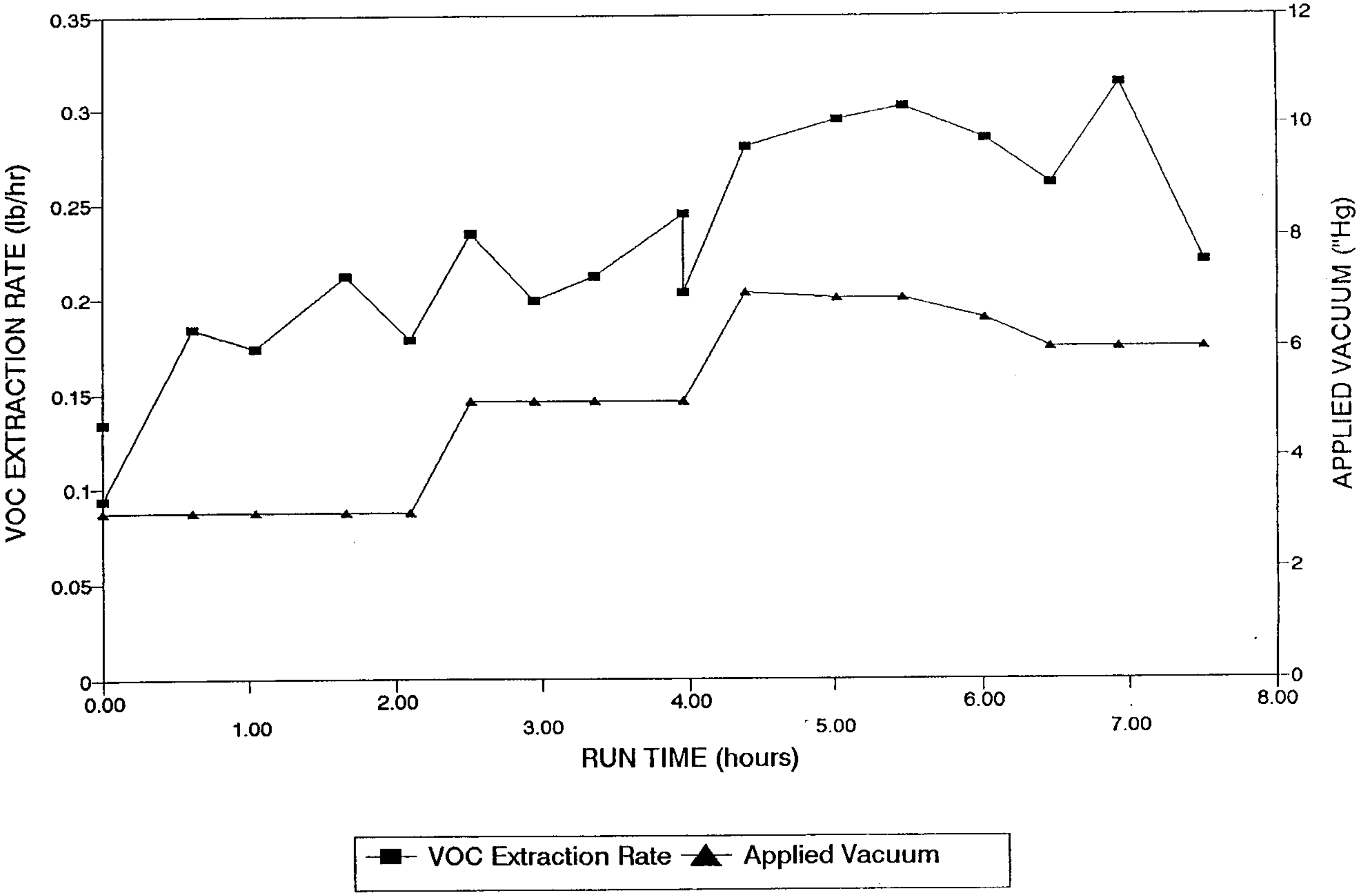


FIGURE 14

SPARGING FLOW VERSUS PRESSURE

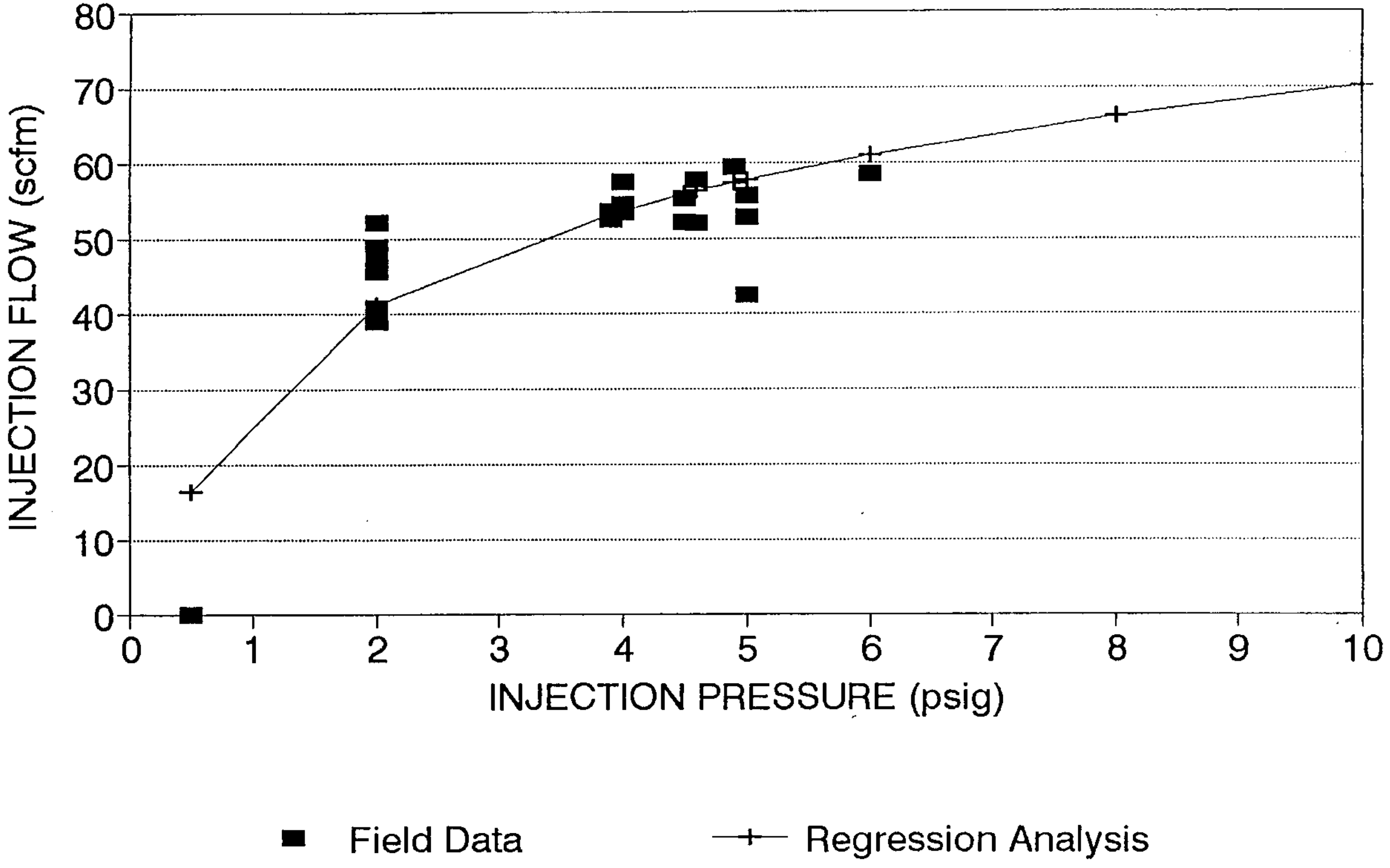
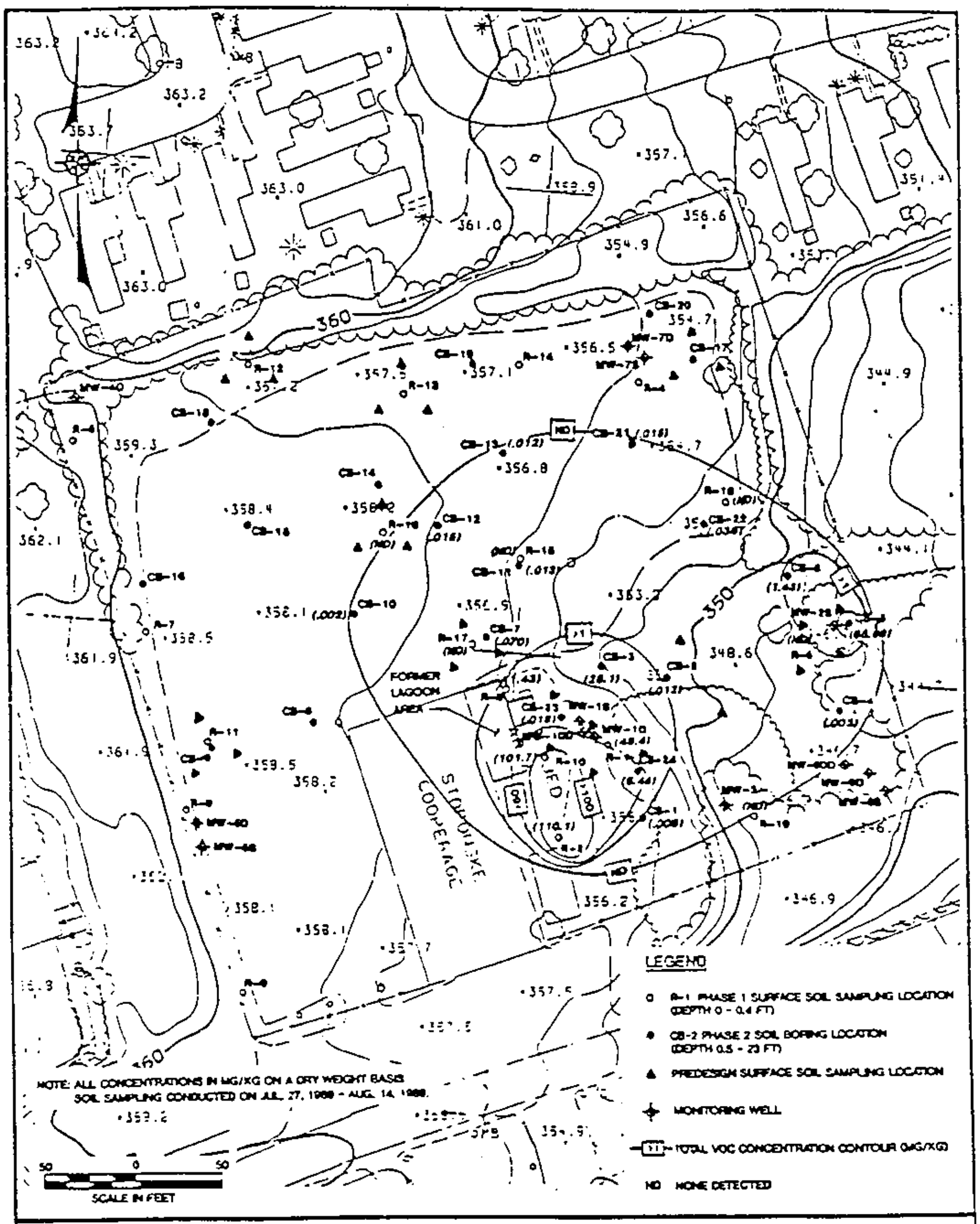


FIGURE 15
SOIL CONCENTRATION CONTOURS



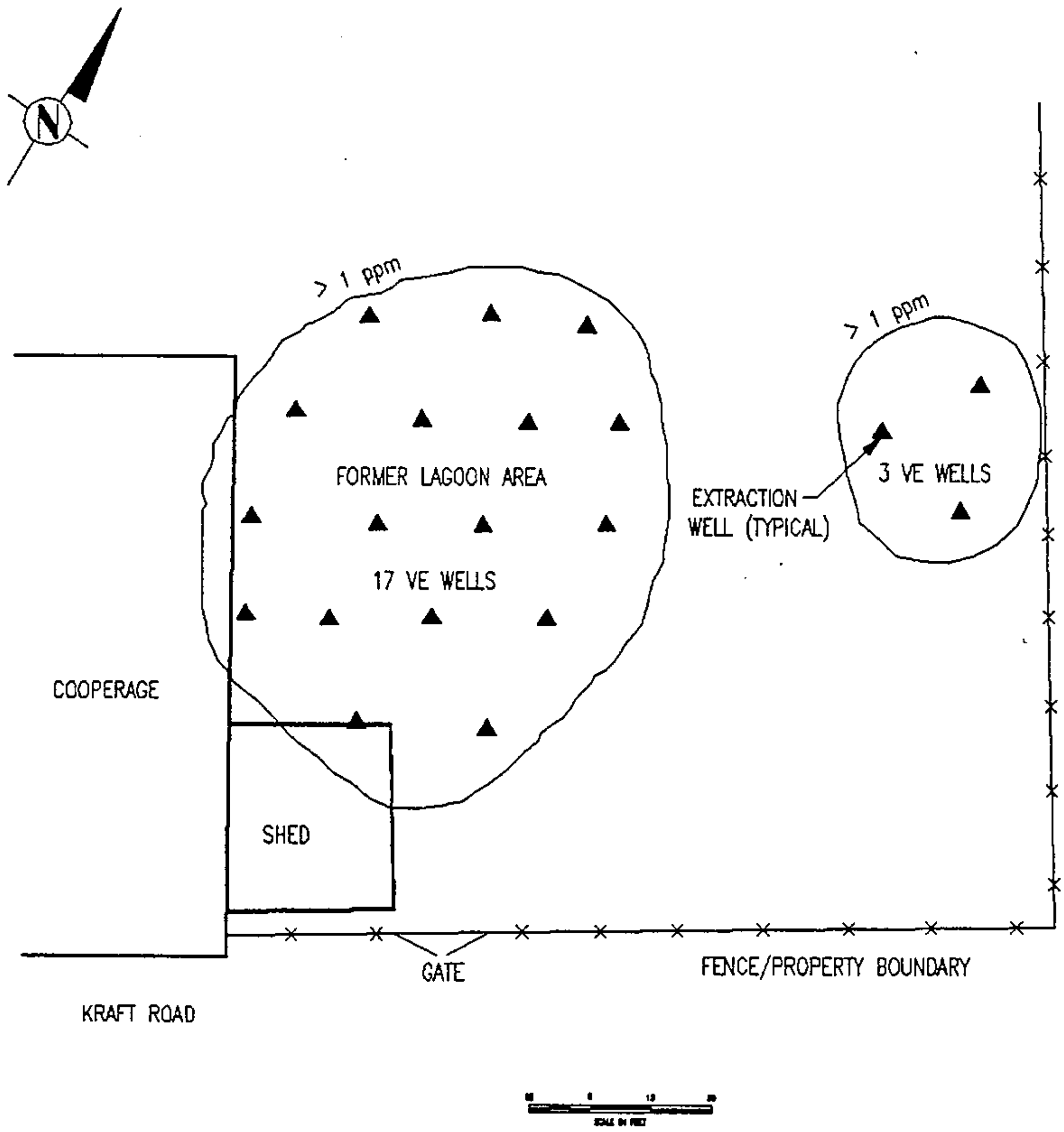
NOTE: ALL CONCENTRATIONS IN MG/KG ON A DRY WEIGHT BASIS
SOIL SAMPLING CONDUCTED ON JUL. 27, 1988 - AUG. 14, 1988.

STORONSKE COOPERAGE SITE
TOWN OF SCHODACK, NEW YORK

Dvirka
and
Bartilucci

TOTAL VOC ISOPLETHS
FOR SUBSURFACE SOIL SAMPLING

FIGURE 3 - 1

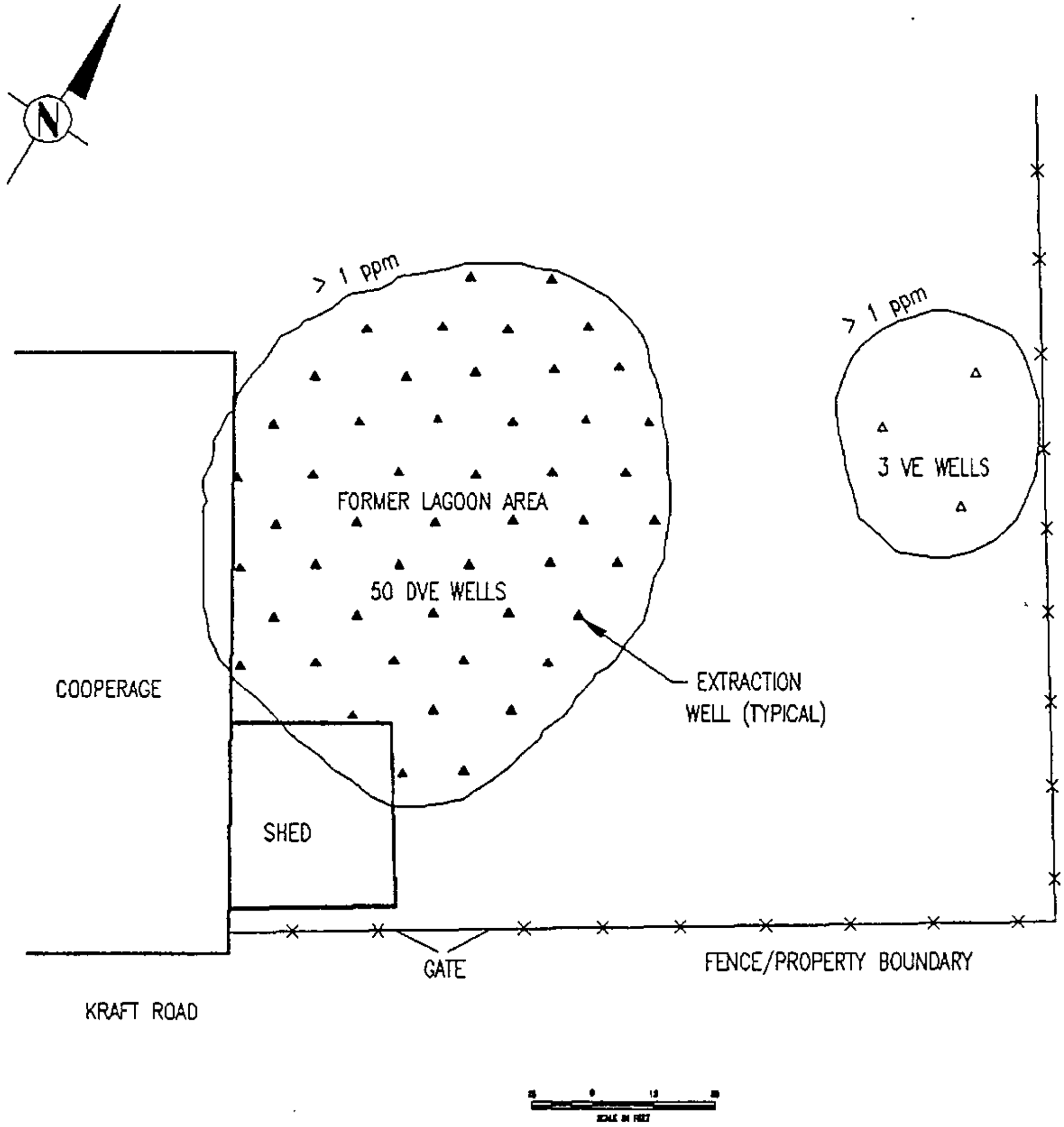


TERRA VAC

STORONSKE COOPERAGE
SCHODACK, NY

RECOMMENDED WELL LOCATIONS
VE SYSTEM

DRAWN: C CONNOLLY
SCALE: AS SHOWN
DWG NO: 42-0075
FIGURE: 16



TERRA VAC

STORONSKE COOPERAGE
SCHODACK, NY

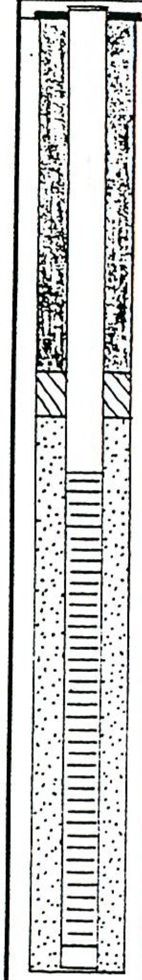
RECOMMENDED WELL LOCATIONS
DVE SYSTEM

DRAWN: C CONNOLLY SCALE: AS SHOWN	DWG NO: 42-0075	FIGURE: 17

TERRA VAC

BORING/WELL NUMBER: TMW-2 DATE DRILLED: 10-28-93
Project: STORONSKE COOPERAGE Schodack, NY Project Number: 42-0075
Drilling Contractor: Parratt-Wolff; E. Syracuse, NY
Drilling Method: 6.25" I.D. Hollow Stem Augers
Log by: J.W. Busanus
Driller: Jim Hammond

SCREEN DIAM.: 4 inches LENGTH: 10' 0" MATERIAL: Sch. 40 PVC
RISER DIAM.: 4 inches LENGTH: 10' 0" MATERIAL: Sch. 40 PVC TOT. DEPTH: 19' 9"
FILTER MATL.: silica sand FILTER SIZE: Morie #1(10-20 mesh) SLOT SIZE: 0.020"

WELL COMPLETION	DEPTH (ft.)	GRAPHIC LOG	USCS	SAMPLE	BLOWS PER 6"	REC. IN INCHES	GEOLOGIC DESCRIPTION (Color, Texture, Structure, etc.)	SOIL VAPOR (ppm) OVA Headspace in Bag	SOIL VAPOR (ppm) OVA in Breath. Zone	SOIL VAPOR (ppm) OVA at hole
	0		GC GC GC		NO SPLIT SPOONS TAKEN	NO SPLIT SPOONS TAKEN	Clay, silty & cobbly, brn-gry, moist, cobbles are well rnd Clay, silty, dk gry to gry-brn, w/ abund well rnd pebbles & cobbles throughout	NO SOIL SAMPLES COLLECTED		
	2		GC GC				Clay, A.A., cobbly, v moist			
	4		CL CL CL				Clay, silty, dk gry, crumbly, v moist, w/ rare cobbles to pebbles, A.A., silty @ base		0.0	2.0
	6		CL CL CL				Clay, A.A., dns., v. moist, sli silty, w/ rare to comm cobbles to pebbles, A.A. Clay, sli silty, brn-gry, w/ rare well rnd pebbles			
	8		CL				Clay, silty, gry-brn, crumbly, v. moist, w/ comm well rnd cobbles, pebbles & crs. sand		0.0	40
	10		GC GC				Cobbles, Crs. gravel & pebbles in silty clay matrix, dk gry to gry, crumbly, v. moist to wet		0.0	0.0
	12		GC GC				Cobbles, Ss., well rnd, in silty clay matrix, A.A., dk gry-brn Crs. Sand, gravelly & pebbly, dk gry, w/ silty clay matrix, A.A., loose & crumbly		0.0	0.0
	14		GC				Cobbles, well rnd, comp. A.A., w/ silty clay matrix, dk gry-brn, loose, wet, crsly sdy @ base		0.0	0.0
	16		GP GM				Cobble, frag., gry-tan, silty Ss. comp. Pebbles, well rnd, dk gry, w/sdy & silty clay Cobble, gry-olive, silty Sh. comp., lam.			
	18		CL GP GP				Clay, silty, comm pebb. & sd., dk gry, wet Clay, silty to pebbly, gry-blue, dns, wet Cobble frags., Siltst. & Agillite, well rnd, w/ comm clay matrix, wet		0.0	0.0
	20									
	22						TOTAL DEPTH OF BORING TAPED AT 19' 9" BGL.			

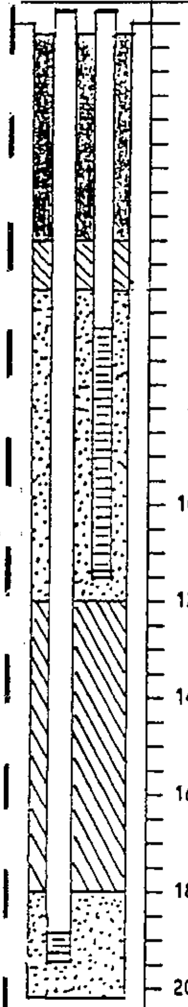
Remarks: 6.25-inch I.D., 8.5-inch O.D. hollow-stem augers driven to a total depth of 19' 9" where refusal occurred. Soil vapor monitored with OVA throughout augering. Ova read 1000+ ppm inside augers at total depth. Taped total boring depth @ 19' 9". Inserted four-inch I.D., Schedule 40 PVC screw-on end cap (0'4"), 0.020" slot screen (10'0") and riser (10'0") into boring through augers. Added Morie #1 (10-20 mesh) sand to 8'3" below ground level (BGL). Added bentonite chips to 7'4" BGL (11") and wet @ 15:20. Pulled last augers from boring and grouted to 3.5 feet BGL with 1.5 sacks Portland #1-bentonite cement and one pound expansion agent additive per sack. Let stand overnight. Inserted 5.0 foot long, 6-inch I.D. black iron standpipe in boring. Grouted to surface with Portland #1 cement-bentonite mixture with one pound expansion agent per sack. Let stand 1.5 hours. Added round pad form and grouted to 5" above ground level with Sacrete mix. In A.M. on 10-29-93, bailed about 2.0 gallons of water from well to partiallly develop it.

Soil descriptions from boring for well TVE-1 & TVI-1.

TERRA VAC

BORING/WELL NUMBER: TVE-1 & TVI-1 DATE DRILLED: 10-27-93
Project: STORONSKE COOPERAGE Schodack, NY Project Number: 42-0075
Drilling Contractor: Parratt-Wolff; E. Syracuse, NY Log by: J.W. Busanus
Drilling Method: Split Spoons through 6.25" I.D. Hollow Stem Augers Driller: Jim Hammond

SCREEN DIAM.: 2 inches LENGTH: TVI-1 = 0'6"; TVE-1 = 5'0" MATERIAL: Sch. 40 PVC TOT. DEPTH(TVI-1): 19'6"
RISER DIAM.: 2 inches LENGTH: TVI-1 = 20'0"; TVE-1 = 10'0" MATERIAL: Sch. 40 PVC TOT. DEPTH(TVE-1): 11'6"
FILTER MATL.: silica sand FILTER SIZE: Morie #1(10-20 mesh) SLOT SIZE: 0.020"



WELL COMPLETION	DEPTH (ft.)	GRAPHIC LOG	USCS	SAMPLE	BLOWS PER 6"	REC. IN INCHES	GEOLOGIC DESCRIPTION (Color, Texture, Structure, etc.)	SOIL VAPOR (ppm) OVA Headspace in Bag	SOIL VAPOR (ppm) OVA in Breath. Zone	SOIL VAPOR (ppm) OVA at hole
	0		GC GC GC	*	5-8-8-6	19"	Clay, silty & cobbly, brn-gry, moist, cobbles are well rnd: 11" Clay, silty, dk gry to gry-brn, w/ abund well rnd pebbles to cobbles throughout: 8"	140	0.0	0.0
	2		GC GC	*	4-3-3-4	11"	Clay, A.A., cobbly, v moist: 11"	1000+	0.0	0.0
	4		CL CL CL	*	1-2-1-2	21"	Clay, silty, dk gry, crumbly, v moist, w/ rare cobbles to pebbles, A.A., silty @ base: 21"	1000+	0.0	
	6		CL CL CL	*	2-2-3-8	16"	Clay, A.A., dns, v. moist, sli silty, w/ rare to comm cobbles to pebbles, A.A.: 9" Clay, sli silty, brn-gry, w/ rare well rnd pebbles: 7"	M =600 St=350	0.0	0.0
	8		CL	*	4-11-10-9	8"	Clay, silty, gry-brn, crumbly, v. moist, w/ comm well rnd cobbles, pebbles & crs. sand: 8"	400	0.0	
	10		GC GC	*	10-11-10-9	13"	Cobbles, Crs. gravel & pebbles in silty clay matrix, dk gry to gry, crumbly, v. moist to wet: 13"	160	0.0	0.0
	12		GC GC	*	7-10-11-14	9"	Cobbles, Ss., well rnd, in silty clay matrix, A.A., dk gry-brn: 7" Crs. Sand, gravelly & pebbly, dk gry, w/ silty clay matrix, A.A., loose & crumbly: 2"	100	5.0	60
	14		GC	*	10-10-12-14	8"	Cobbles, well rnd, comp. A.A., w/ silty clay matrix, dk gry-brn, loose, wet, crsly sdy @ base: 8"	150	0.0	
	16		GP GM	*	42-14-15-10	11"	Cobble, frag., gry-tan, silty Ss. comp.: 3" Pebbles, well rnd, dk gry, w/sdy & silty clay:2" Cobble, gry-olive, silty Sh. comp., lam.: 4" Clay, silty, comm pebb. & sd., dk gry, wet: 2"	105	5.5	50
	18		CL CL	*	5-8-27-15	13"	Clay, silty to pebbly, gry-blue, dns, wet: 9" Cobble, frag., Siltst. comp., well lam., dns: 3" Silt, gry to gry-blue, w/ abund Sd. & Pebbs., A.A., wet: 1"	250	0.0	0.0
	20		GP	*	100/3"	6"	Cobble, Argillite, frag., in dk gry-blue clay matrix, wet: 6"	190	0.0	0.0
	22						NOTES: M=Maximum OVA rdg. St=Stabilized OVA rdg.			

Remarks: Continuous 2-inch I.D., 2-foot long split spoons driven ahead of 6.25-inch I.D., 8.5-inch O.D. hollow-stem augers to a total depth of 20'3". Soil sample for head space analysis in baggie collected from each split spoon. Taped total boring depth @ 19' 6". Inserted two-inch I.D., Schedule 40 PVC slip-on end cap (0'2"), 0.020" slot screen (0'6"), & riser (20'0") into boring through augers. Added Morie #1 (10-20 mesh) sand to 18'0" below ground level (BGL). Added bentonite chips to 12'0" BGL and wet @ 13:20. Added Morie #1 sand to 11'6" BGL. Inserted two-inch I.D., Schedule 40 end cap (0'2"), 0.020" slot screen (5'0"), & riser (10'0") into boring through augers. Added Morie #1 (10-20 mesh) sand to 5'6" BGL. Added bentonite chips to 4'6" BGL and wet @ 17:15. Let stand overnight. Pulled last auger from boring and grouted to 3.0' BGL with 1.5 sack Portland #1-bentonite cement and one pound expansion agent additive per sack. Let stand overnight. In A.M. of 10-29-93, bailed about 3 gallons of water to partiallt develop well. Grouted to 6 inches below ground surface with Portland #1 cement-bentonite mixture witn one pound expansion agent per sack. No standpipe on this well cluster at present. No water found in TVE-1. TVI-1 screened interval is 19'4" to 18'10" BGL. TVE-1 screened interval is 11'4" to 6'4" BGL.

APPENDIX C

APPLICATION FOR PERMIT TO CONSTRUCT A PROCESS, EXHAUST OR VENTILATION SYSTEM

LOCATION FACILITY EMISSION POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 76-11-12 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

COPIES
WHITE - ORIGINAL
GREEN - DIVISON OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

SECTION A

11. NAME OF OWNER / FIRM: NYSDEC, Division of Hazardous Waste Remediation
12. NUMBER AND STREET ADDRESS: 50 Wolf Rd
13. CITY - TOWN - VILLAGE: Albany 14. STATE: NY 15. ZIP: 12233
OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☒ STATE F ☐ MUNICIPAL G ☐ EDUC. INST. H ☐ HOSPITAL ☐ RESIDENTIAL ☐ OTHER
NAME & TITLE OF OWNERS REPRESENTATIVE / TELEPHONE: Brian Heneveld, Proj. Mgr (516)364-9892

9. NAME OF AUTHORIZED AGENT: Dvirka and Bartilucci Consulting Engineers 10. TELEPHONE: (516) 364 9892
11. NUMBER AND STREET ADDRESS: 6800 Jericho Tnpk.
12. CITY - TOWN - VILLAGE: Syosset 13. STATE: NY 14. ZIP: 11791
NAME OF P.E. OR ARCHITECT PREPARING APPLICATION: Brian J. Heneveld N.Y.S. P.E. OR ARCHITECT LICENSE NO: 066088 TELEPHONE: (516) 364 9892
SIGNATURE OF OWNERS REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT: Brian J. Heneveld

19. FACILITY NAME IF DIFFERENT FROM OWNER / FIRM: Storonske Cooperage Site
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): Kraft Rd
21. CITY - TOWN - VILLAGE: E. Greenbush, Town of Schodack 22. ZIP: 12061
23. BUILDING NAME OR NUMBER: NA 24. FLOOR NAME OR NUMBER: NA
25. START UP DATE: 8 / 94 26. DRAWING NUMBERS OF PLANS SUBMITTED: Figure 1
PERMIT TO CONSTRUCT: A ☒ NEW SOURCE B ☐ MODIFICATION
CERTIFICATE TO OPERATE: A ☐ NEW SOURCE C ☐ EXISTING SOURCE B ☐ MODIFICATION

SECTION B

29 EMISSION POINT	30 GROUND ELEVATION (FT)	31 HEIGHT ABOVE STRUCTURES (FT)	32 STACK HEIGHT (FT)	33 INSIDE DIMENSIONS (IN)	34 EXIT TEMP (°F)	35 EXIT VELOCITY (FT/SEC)	36 EXIT FLOW RATE (ACFM)
001	356	5	20	6	60	110	1300

SOURCE CODE	HRS / DAY	DAYS / YR	Winter	Spring	Summer	Fall
	24	365	25	25	25	25

SECTION C

DESCRIBE PROCESS OR UNIT: SOIL VAPOR EXTRACTION SYSTEM

SECTION D

EMISSION CONTROL EQUIPMENT I.D.	CONTROL TYPE	MANUFACTURER'S NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
01	20	LIQUID/VAPOR SEPARATOR	9	8 / 94	1.5
02	17	VAPOR PHASE ACTIVATED CARBON ADSORPTION	9	8 / 94	1.5

Note: Manufacturer and model number for these items will be identified after contract award.

SECTION E

CALCULATIONS

XYLENES* $0.2386\ mg/l\,air \left(\frac{1g}{1000mg}\right)\left(\frac{lb}{454g}\right)\left(\frac{28.32\,l}{ft^3}\right)\left(\frac{1300\,ft^3}{min}\right)\left(\frac{60\,min}{1\,hr}\right) = 1.16\ lb/hr$ Extracted

Treatment Efficiency = 99%
(Vapor Phase Activated Carbon in Series)

Actual Emissions = $1.16\ lb/hr\,(1-0.99) = 0.012\ lb/hr$

Note: Activated Carbon will be regenerated offsite

NA = Not Applicable

SECTION F

CONTAMINANT NAME	CAS NUMBER	INPUT OF PRODUCTION	UNIT	ENV RATING	EMISSIONS ACTUAL	UNIT	HOW DET.	PERMISSIBLE	% CONTROL EFFICIENCY	HOURLY EMISSIONS (LBS/HR) ERP	HOURLY EMISSIONS (LBS/HR) ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	10³	PERMISSIBLE
Xylenes	01330-20-7				0.012	1	3		99	0.012	0.012	105	0	
Toluene	00108-88-3				0.026	1	3		99	0.026	0.026	228	0	
Ethylbenzene	00100-41-4				0.010	1	3		99	0.010	0.010	87.6	0	
Chlorobenzene	00108-90-7				0.002	1	3		99	0.002	0.002	17.5	0	
Tetrachloroethene	00127-18-4				0.020	1	3		99	0.020	0.020	175	0	
Trichloroethene	00079-01-6				0.008	1	3		99	0.008	0.008	70.1	0	

SECTION G

SOLID FUEL TYPE TONS / YR | LIQUID FUEL TYPE THOUSANDS OF GALLONS / YR | GAS TYPE THOUSANDS OF CU. FT. BTU/CF

APPLICABLE RULE 152 | APPLICABLE RULE 154

Upon completion of construction sign the statement below and return to the appropriate regional office.

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS.

155 SIGNATURE OF AUTHORIZED REPRESENTATIVE OF AGENT DATE

156 LOCATION CODE 157. FACILITY ID NO. 158 U.T.M. E 159 U.T.M. N 160 S.C NUMBER 161 DATE APPL. RECEIVED 162 DATE APPL. REVIEWED 163 REVIEWED BY

PERMIT TO CONSTRUCT

164 DATE ISSUED 165 EXPIRATION DATE 166 SIGNATURE OF APPROVAL

- DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
- THIS IS NOT A CERTIFICATE TO OPERATE
- TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

DATE ISSUED EXPIRATION DATE SIGNATURE OF APPROVAL

☐ INSPECTED BY DATE
☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS PERMIT, SHOWN ON ATTACHED
☐ [illegible]
☐ [illegible]

APPENDIX D

ANALYTICAL DATA FOR SURFACE AND SUBSURFACE SOIL SAMPLES

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-5A 890727R01	CB-5B 890727R02	CB-5D 890727R04	CB-5E 890727R05	Trip Blank 890727R06	CB-3A 890728J01	CB-3B 890728J03	CB-3C 890728J04	Trip Blank 890728J05	CB-4A 890801A01	CB-4B 890801A02	CB-4C 890801A03	Trip Blank 890801A04	CB-2A 890801Z01	CB-2B 890801Z02
Remarks		Analyzed Twice Medium Level	Medium Level	Analyzed Twice	Medium Level		Medium Level									
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
Chloromethane	10															
Bromomethane	10															
Vinyl Chloride	10															
Chloroethane	10															
Methylene Chloride	5.0			3.0 B/6.0 B	270 B			3.0 B	4.0 B		5.0 B	6.0 B			5.0 B	4.0 B
Acetone	10			50 B/56 B				23 B	53 B			20 B			11 B	
Carbon Disulfide	5.0															
1,1-Dichloroethene	5.0															
1,1-Dichloroethane	5.0												2.0 J			
Total 1,2-Dichloroethene	5.0															
Chloroform	5.0				98 B	0.9 J							2.0 B	0.8 J	2.0 B	2.0 B
1,2-Dichloroethane	5.0															
2-Butanone	10			R/-				R	R		R	R	R		R	
1,1,1-Trichloroethane	5.0															
Carbon Tetrachloride	5.0															
Vinyl Acetate	10						R							R	R	
Bromodichloromethane	5.0															
1,1,2,2-Tetrachloroethane	5.0															
1,2-Dichloropropane	5.0															
trans-1,3-Dichloropropene	5.0															
Trichloroethene	5.0															
Dibromochloromethane	5.0															
1,1,2-Trichloroethane	5.0															
Benzene	5.0															

NORGANIC ANALYSIS   ANALYTICAL RESULTS   All Solids Reported on a Dry Weight Basis

alcolm Pirnie Sample Number aboratory Sample Number			CB-23A 890801I05	CB-23D 890801E09	CB-6A 890803B01	CB-25A 890803B02	CB-6B 890803B04	CB-20A 890803B06	CB-20B 890803B07	CB 20B 890803B08	CB-20C 890803B10	Rinsate #1 890803AA01	CB-22A 890803AA02
ent Solids			88	92	84	77	92	90	92	94	86	-	94
nits			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L	mg/kg
NORGANIC ELEMENTS		Detection Limit											
luminum	P	10	NR	NR	NR	NR	NR	NR	NR	NR	NR		NR
ntimony	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
rsenic	P	0.25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
arium	P	0.50	NR	NR	NR	NR	NR	NR	NR	NR	NR		NR
eryllium	P	0.25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
admium	F/P	0.05/0.50	5.2 J	0.87 J	0.84 J	0.95 J		1.0 J	0.87 J	0.69 J	0.93 J		0.96 J
alcium	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
hromium	P	0.50	26.8 J	21.1 J	23.7 J	26.6 J	22.0 J	25.3 J	23.6 J	19.9 J	25.4 J	NR	34.2 J
obalt	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
er	P	1.25	30.0 J	27.0 J	33.6 J	35.0 J	30.3 J	35.1 J	35.6 J	30.1 J	30.0 J	NR	39.0 J
ron	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
ead	F/P	0.25/2.5	95.2	13.8	41.2	35.8	16.1	25.1	11.3	16.6	14.9	NR	44.7
agnesium	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR		NR
anganese	P	0.75	NR	NR	NR	NR	NR	NR	NR	NR	NR		NR
ercury	CV	0.02	1.08 J	0.03 B	0.01 B	0.12 B	0.05 B	0.07 B	0.05 B	0.04 B	0.04 B	NR	0.06 B
ickel	P	2.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
otassium	P	25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
elenium	H	0.50										NR	
ilver	P	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
odium	P	25	NR	NR	NR	NR	NR	NR	NR	NR	NR	(848) B	NR
hallium	F	0.25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
anadium	P	2.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	P	0.50	102 J	81.2 J	90.5 J	102 J	91 J	106 J	86.9 J	89.6 J	97.5 J	NR	106 J
yanide	DC	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	

NOTES:

- \- Element was not detected.
- (#) - The result is greater than or equal to the instrument detection limit, but less than the CLP required detection limit.
- J - Quantitation is approximate due to limitations identified in the quality assurance review.
- B - This result is qualitatively suspect since this constituent was detected in a field and/or laboratory blank(s) at a similar level.
- R - Unreliable results - Analyte may or may not be present in this sample.
- UL - Not detected, but the detection limit is probably higher than reported based upon a low bias identified during the quality assurance review.
- NR - Analyses for that analyte not requested.

ANALYTICAL METHOD:

- P Inductively Coupled Plasma
- F Graphite Furnace Atomic Absorption
- CV - Cold Vapor Atomic Absorption
- H - Hydride Generation
- DC - Distillation/Colorimetric

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-13B 890811A06	CB-13C 890811A07	CB-13D 890811A09	CB-11A 890811A10	CB-11B 890811A11	CB-27B 890811A12	CB-11C 890811A13	CB-7A 890811A15	CB-7B 890811A16	CB-7C 890811B01	CB-10A 890811B02	CB-27A 890811B03	CB-10B 890811B04	CB-12A 890811B05	CB-20A 890811B06
Xs							Duplicate CB-11B						Duplicate CB-10A		-	Duplicate CB-12A
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
Chloromethane	10															
Bromomethane	10															
Vinyl Chloride	10															
Chloroethane	10															
Methylene Chloride	5.0	3.0 B	3.0 B	6.0 B	5.0 B	6.0 B	7.0 B	5.0 B	3.0 B	5.0 B	3.0 B	4.0 B	3.0 B	3.0 B	4.0 B	4.0 B
Acetone	10			27 B	24 B	26 B		19 B			17 B	12 B		11 B	11 B	
Carbon Disulfide	5.0															
1,1-Dichloroethene	5.0															
1,1-Dichloroethane	5.0					1.0 J		1.0 J		3.0 J						
Total 1,2-Dichloroethene	5.0								2.0 J	8.0	3.0 J					
Chloroform	5.0					1.0 B	1.0 B	0.9 B	1.0 B	1.0 B	1.0 B	1.0 B	1.0 B	1.0 B	2.0 B	1.0 B
1,2-Dichloroethane	5.0															
2-Butanone	10															
1,1,1-Trichloroethane	5.0	2.0 J	4.0 J	2.0 J	1.0 J		1.0 J	3.0 J	2.0 J	2.0 J	2.0 J		1.0 J	2.0 J		
Carbon Tetrachloride	5.0															
Vinyl Acetate	10															
Bromodichloromethane	5.0															
1,1,2,2-Tetrachloroethane	5.0															
1,2-Dichloropropane	5.0															
trans-1,3-Dichloropropene	5.0															
Trichloroethene	5.0					6.0 J	3.0 J		7.0	18	13					
Dibromochloromethane	5.0															
,2-Trichloroethane	5.0															
Benzene	5.0															

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-13B 890811A06	CB-13C 890811A07	CB-13D 890811A09	CB-11A 890811A10	CB-11B 890811A11	CB-27B 890811A12	CB-11C 890811A13	CB-7A 890811A15	CB-7B 890811A16	CB-7C 890811B01	CB-10A 890811B02	CB 27A 890811B03	CB-10B 890811B04	CB-12A 890811B05	CB-20A 890811B06
ks							Duplicate CB-11B						Duplicate CB-10A			Duplicate CB-12A
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
Cis-1,3-Dichloropropene	5.0															
Bromoform	5.0															
2-Hexanone	10															
4-Methyl-2-pentanone	10															
Tetrachloroethene	5.0	3.0 J	8.0	7.0		6.0 J	4.0 J	6.0	10	23	52					
Toluene	5.0															
Chlorobenzene	5.0															
Ethylbenzene	5.0															
ene	5.0															
Total Xylenes	5.0															
Quantitation Limit Multiplier		1.2	1.1	1.3	1.3	1.2	1.3	1.1	1.2	1.1	1.1	1.2	1.1	1.1	1.3	1.2
Date Received by Laboratory		8/10/89	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89	8/11/89	8/11/89	8/11/89	8/11/89	8/11/89	8/11/89
Date of Analysis		8/23/89	8/23/89	8/24/89	8/24/89	8/24/89	8/24/89	8/24/89	8/24/89	8/24/89	8/25/89	8/25/89	8/25/89	8/25/89	8/25/89	8/25/89
Instrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A

NOTES:
- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

EXTRACTABLE ORGANIC ANALYSIS   ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CB 13B 890811A06	CB-13C 890811A07	CB-13D 890811A09	CB-11A 890811A10	CB 11B 890811A11	CB 27B 890811A12	CB 13C 890811A13	CB-7A 890811A15	CB-7B 890811A16	CB 7C 890811R01	CB 10A 890811R02	CB 27A 890811R03	CB-10B 890811R04	CB-12A 890811R05	CB-28A 890811R06
Remarks								Duplicate CB-11B						Duplicate CB 10A			Duplicate CB-12A
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Phenol	10	330	NA	NA	NA		UL		NA						NA		
bis(2-Chloroethyl)ether	10	330	NA	NA	NA		UL		NA						NA		
2-Chlorophenol	10	330	NA	NA	NA		UL		NA						NA		
1,3-Dichlorobenzene	10	330	NA	NA	NA		UL		NA						NA		
1,4-Dichlorobenzene	10	330	NA	NA	NA		UL		NA						NA		
Benzyl Alcohol	10	330	NA	NA	NA		UL		NA						NA		
1,2-Dichlorobenzene	10	330	NA	NA	NA		UL		NA						NA		
2-Methylphenol	10	330	NA	NA	NA		UL		NA						NA		
bis(2-chloroisopropyl)ether	10	330	NA	NA	NA		UL		NA						NA		
4-methylphenol	10	330	NA	NA	NA		UL		NA						NA		
N-Nitroso-di-n-propylamine	10	330	NA	NA	NA		UL		NA						NA		
Hexachloroethane	10	330	NA	NA	NA		UL		NA						NA		
Nitrobenzene	10	330	NA	NA	NA		UL		NA						NA		
Isophorone	10	330	NA	NA	NA	430 J	UL		NA	140 J		93 J			NA		
2-Nitrophenol	10	330	NA	NA	NA		UL		NA						NA		
2,4-Dimethylphenol	10	330	NA	NA	NA		UL		NA						NA		
Benzoic Acid	50	1650	NA	NA	NA		UL		NA						NA		
bis(2-Chloroethoxy)methane	10	330	NA	NA	NA		UL		NA						NA		
2,4-Dichlorophenol	10	330	NA	NA	NA		UL		NA						NA		
1,2,4-Trichlorobenzene	10	330	NA	NA	NA		UL		NA						NA		
Naphthalene	10	330	NA	NA	NA		UL		NA						NA		
4-Chloroaniline	10	330	NA	NA	NA		UL		NA						NA		
...achlorobutadiene	10	330	NA	NA	NA		UL		NA						NA		
4-Chloro-3-methylphenol	10	330	NA	NA	NA		UL		NA						NA		
2-Methylnaphthalene	10	330	NA	NA	NA		UL		NA						NA		

Malcolm Pirnie Sample Number Laboratory Sample Number			CB-13B 890811A06	CB-13C 890811A07	CB-13D 890811A09	CB-11A 890811A10	CB-11B 890811A11	CB-27B 890811A12	CB-11C 890811A13	CB-7A 890811A15	CB-7B 890811A16	CB-7C 890811B01	CB 10A 890811B02	CB-27A 890811B03	CB-10B 890811B04	CB-12A 890811B05	CB-28A 890811B06
rks								Duplicate CB-11B						Duplicate CB-10A			Duplicate CB-12A
Basis			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Hexachlorocyclopentadiene	10	330	NA	NA	NA		UL		NA						NA		
2,4,6-Trichlorophenol	10	330	NA	NA	NA		UL		NA						NA		
2,4,5-Trichlorophenol	50	1650	NA	NA	NA		UL		NA						NA		
2-Chloronaphthalene	10	330	NA	NA	NA		UL		NA						NA		
2-Nitroaniline	50	1650	NA	NA	NA		UL		NA						NA		
Dimethylphthalate	10	330	NA	NA	NA		UL		NA						NA		
Acenaphthylene	10	330	NA	NA	NA		UL		NA						NA		
3-Nitroaniline	50	1650	NA	NA	NA		R	R	NA				R	R	NA	R	R
aphthene	10	330	NA	NA	NA		UL		NA						NA		
2,4-Dinitrophenol	50	1650	NA	NA	NA		UL		NA						NA		
4-Nitrophenol	50	1650	NA	NA	NA		UL		NA						NA		
Dibenzofuran	10	330	NA	NA	NA		UL		NA						NA		
2,4-Dinitrotoluene	10	330	NA	NA	NA		UL		NA						NA		
2,6-Dinitrotoluene	10	330	NA	NA	NA		UL		NA						NA		
Diethylphthalate	10	330	NA	NA	NA		UL		NA						NA		
4-Chlorophenylphenylether	10	330	NA	NA	NA		UL		NA						NA		
Fluorene	10	330	NA	NA	NA		UL		NA						NA		
4-Nitroaniline	50	1650	NA	NA	NA		UL		NA						NA		
4,6-Dinitro-2-methylphenol	50	1650	NA	NA	NA		UL		NA						NA		
N-Nitrosodiphenylamine	10	330	NA	NA	NA		UL		NA						NA		
4-Bromophenylphenylether	10	330	NA	NA	NA		UL		NA						NA		
Hexachlorobenzene	10	330	NA	NA	NA		UL		NA						NA		
Pentachlorophenol	50	1650	NA	NA	NA		UL		NA						NA		
Phenanthrene	10	330	NA	NA	NA		UL		NA						NA		

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number			CB-13B	CB-13C	CB-13D	CB-11A	CB-11B	CB-27B	CB-11C	CB-7A	CB-7B	CB-7C	CB-10A	CB-27A	CB-10B	CB-12A	CB-20A
Laboratory Sample Number			890811A06	890811A07	890811A09	890811A10	890811A11	890811A12	890811A13	890811A15	890811A16	890811R01	890811R02	890811R03	890811R04	890811R05	890811R06
'ks								Duplicate CB-11B						Duplicate CB-10A			Duplicate CB-12A
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Anthracene	10	330	NA	NA	NA		UL		NA						NA		
Di-n-butylphthalate	10	330	NA	NA	NA		UL		NA				300 J	73 J	NA		
Fluoranthene	10	330	NA	NA	NA		UL		NA						NA		
Pyrene	10	330	NA	NA	NA		UL		NA						NA		
Butylbenzylphthalate	10	330	NA	NA	NA		UL		NA						NA		
3,3'-Dichlorobenzidine	20	660	NA	NA	NA		UL	R	NA				R	R	NA	R	R
Benzo(a)anthracene	10	330	NA	NA	NA		UL		NA						NA		
bis(2-Ethylhexyl)phthalate	10	330	NA	NA	NA		UL		NA		890 B	430 B	92 B		NA	95 B	
ene	10	330	NA	NA	NA		UL		NA						NA		
Di-n-octylphthalate	10	330	NA	NA	NA		UL		NA						NA		
Benzo(b)fluoranthene	10	330	NA	NA	NA		UL		NA						NA		
Benzo(k)fluoranthene	10	330	NA	NA	NA		UL		NA						NA		
Benzo(a)pyrene	10	330	NA	NA	NA		UL		NA						NA		
Indeno(1,2,3-cd)pyrene	10	330	NA	NA	NA		UL		NA						NA		
Dibenz(a,h)anthracene	10	330	NA	NA	NA		UL		NA						NA		
Benzo(g,h,i)perylene	10	330	NA	NA	NA		UL		NA						NA		
Quantitation Limit Multiplier			NA	NA	NA	1.21	1.21	1.27	NA	1.18	1.12	1.09	1.24	1.06	NA	1.30	1.26
Date Received by Laboratory			NA	NA	NA	8/10/89	8/10/89	8/10/89	NA	8/10/89	8/10/89	8/11/89	8/11/89	8/11/89	NA	8/11/89	8/11/89
Date Sample Extracted			NA	NA	NA	8/17/89	8/17/89	8/17/89	NA	8/17/89	8/17/89	8/17/89	8/17/89	8/17/89	NA	8/17/89	8/17/89
Date of Analysis			NA	NA	NA	9/21/89	9/20/89	9/25/89	NA	9/21/89	9/21/89	9/22/89	9/25/89	9/25/89	NA	9/25/89	9/25/89
Instrument Used for Analysis			NA	NA	NA	7002B	7002B	7002B	NA	7002B	7002B	7002B	7002B	7002B	NA	7002B	7002B

EXTRACTABLE ORGANIC ANALYSIS   ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CB-13B 890811A06	CB-13C 890811A07	CB-13D 890811A09	CB-11A 890811A10	CB-11B 890811A11	CB-27B 890811A12	CB-11C 890811A13	CB-7A 890811A15	CB-7B 890811A16	CB 7C 890811R01	CB 10A 890811R02	CB-27A 890811R03	CB-10B 890811R04	CB-12A 890811R05	CB-20A 890811R06
QA								Duplicate of CB 11B						Duplicate of CB-10A			Duplicate of CB-12A
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Quantitation Limit (aq.)	Quantitation Limit (soil).															
Aroclor-1242	0.5	80	NA	NA	NA		NA	NA	NA					NA	NA		NA
Quantitation Limit Multiplier			NA	NA	NA	1.25	NA	NA	NA	1.19	1.125	1.125	1.25	NA	NA	1.31	NA
Date Sample Received			NA	NA	NA	8/10/89	NA	NA	NA	8/10/89	8/10/89	8/11/89	8/11/89	NA	NA	8/11/89	NA
Date Sample Extracted			NA	NA	NA	8/17/89	NA	NA	NA	8/17/89	8/17/89	8/17/89	8/17/89	NA	NA	8/17/89	NA
Date of Analysis			NA	NA	NA	9/3/89	NA	NA	NA	9/3/89	9/3/89	9/3/89	9/3/89	NA	NA	9/3/89	NA

NOTES:

-	Compound was not detected
J	Quantitation is approximate due to limitations identified during the quality control review (data validation).
B	This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
R	Unreliable result - Analyte may or may not be present in this sample.
UL	This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

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Malcolm Pirnie Sample Number		CB-1[illegible]	Rinsate #4	CB-20D	CB-21A	CB-21B	CB 21C	Rinsate #5	Trip Blank #11	CB 3A
Laboratory Sample Number		89G811R07	890811R08	890814Z01	890814Z03	890814Z04	890814Z05	890814Z07	890814Z06	890728J02
ite										
Units		ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
OLATILE COMPOUNDS	Quantitation Limit									
Chloromethane	10									NA
Bromomethane	10									NA
inyl Chloride	10									NA
hloroethane	10									NA
Methylene Chloride	5.0	4.0 B	3.0 B	4.0 B	2.0 B	5.0 B	5.0 B	5.0 B	4.0 J	NA
Acetone	10						9.0 B		9.0 J	NA
arbon Disulfide	5.0									NA
,1-Dichloroethene	5.0									NA
,1-Dichloroethane	5.0	2.0 J								NA
s 1,2-Dichloroethene	5.0									NA
hloroform	5.0	2.0 B	3.0 B				0.7 B			NA
,2-Dichloroethane	5.0									NA
-Butanone	10									NA
,1,1-Trichloroethane	5.0	4.0 J					3.0 J			NA
arbon Tetrachloride	5.0									NA
inyl Acetate	10									NA
romodichloromethane	5.0									NA
,1,2,2-Tetrachloroethane	5.0									NA
,2-Dichloropropane	5.0									NA
rans-1,3-Dichloropropene	5.0									NA
richloroethene	5.0						2.0 J			NA
ibromochloromethane	5.0									NA
,2-Trichloroethane	5.0									NA
enzene	5.0									NA

OLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number		CB-12B	Rinsate #4	CB-20D	CB-21A	CB-21B	CB-21C	Rinsate #5	Trip Blank #11	CB-3A
aboratory Sample Number		890811R07	890811R08	890814R01	890814R03	890814R04	890814R05	890814R07	890814R08	890720J02
nits		ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
OLATILE COMPOUNDS	Quantitation Limit									
is-1,3-Dichloropropene	5.0									NA
romoform	5.0									NA
-Hexanone	10									NA
-Methyl-2-pentanone	10									NA
etrachloroethene	5.0				9.0	8.0	10			NA
oluene	5.0									NA
hlorobenzene	5.0									NA
thylbenzene	5.0									NA
tyrene	5.0									NA
al Xylenes	5.0									NA
uantitation Limit Multiplier		1.2	1.0	1.1	1.1	1.2	1.1	1.0	1.0	NA
ate Received by Laboratory		8/11/89	8/11/89	8/14/89	8/14/89	8/14/89	8/14/89	8/14/89	8/14/89	NA
ate of Analysis		8/25/89	8/15/89	8/25/89	8/25/89	8/25/89	8/25/89	8/15/89	8/15/89	NA
nstrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	NA

NOTES:
- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

Malcolm Pirnie Sample Number			CB-12B #4	Rinsate #4	CB-20D	CB-21A	CB-21B	CB-21C #5	Rinsate #5	Trip Blank #11	CB-3A
Laboratory Sample Number			890811R07	890811R08	890814R02	890814R03	890814R04	890814R06	890814R07	890814R08	890728R02
Remarks											Analyzed Twice
Units			ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit									
Phenol	10	330	NA	UL			NA	NA	UL	NA	
bis(2-Chloroethyl)ether	10	330	NA	R			NA	NA	UL	NA	
2-Chlorophenol	10	330	NA	UL			NA	NA	UL	NA	
1,3-Dichlorobenzene	10	330	NA	R			NA	NA	UL	NA	
1,4-Dichlorobenzene	10	330	NA	R			NA	NA	UL	NA	
Benzyl Alcohol	10	330	NA	R			NA	NA	UL	NA	
1,2-Dichlorobenzene	10	330	NA	R			NA	NA	UL	NA	
2-Methylphenol	10	330	NA	UL			NA	NA	UL	NA	
bis(2-chloroisopropyl)ether	10	330	NA	R			NA	NA	UL	NA	
4-Methylphenol	10	330	NA	UL			NA	NA	UL	NA	
N-Nitroso-di-n-propylamine	10	330	NA	R			NA	NA	UL	NA	
Hexachloroethane	10	330	NA	R			NA	NA	UL	NA	
Nitrobenzene	10	330	NA	R			NA	NA	UL	NA	
Isophorone	10	330	NA	R			NA	NA	UL	NA	
2-Nitrophenol	10	330	NA	UL			NA	NA	UL	NA	
2,4-Dimethylphenol	10	330	NA	UL			NA	NA	UL	NA	
Benzoic Acid	50	1650	NA	UL			NA	NA	UL	NA	
bis(2-Chloroethoxy)methane	10	330	NA	R			NA	NA	UL	NA	
2,4-Dichlorophenol	10	330	NA	UL			NA	NA	UL	NA	
1,2,4-Trichlorobenzene	10	330	NA	R			NA	NA	UL	NA	710 J/-
Naphthalene	10	330	NA	R			NA	NA	UL	NA	500 J/960 J
4-Chloroaniline	10	330	NA	R			NA	NA	UL	NA	
Hexachlorobutadiene	10	330	NA	R			NA	NA	UL	NA	
4-Chloro-3-methylphenol	10	330	NA	UL			NA	NA	UL	NA	
2-Methylnaphthalene	10	330	NA	R			NA	NA	UL	NA	300 J/550 J

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number			CD-12B #4	Rinsate #4	CD-20D	CD-21A	CD-21B	CD-21C #5	Rinsate #5	Trip Blank #11	CD-3A
Laboratory Sample Number			890811R07	890811R08	890814R02	890814R03	890814R04	890814R06	890814R07	890814R08	890728J02
Remarks											Analyzed Twice
Units			ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit									
Hexachlorocyclopentadiene	10	330	NA	R			NA	NA	UL	NA	
2,4,6-Trichlorophenol	10	330	NA	UL			NA	NA	UL	NA	
2,4,5-Trichlorophenol	50	1650	NA	UL			NA	NA	UL	NA	
2-Chloronaphthalene	10	330	NA	R			NA	NA	UL	NA	
2-Nitroaniline	50	1650	NA	R			NA	NA	UL	NA	
Dimethylphthalate	10	330	NA	R			NA	NA	UL	NA	
Acenaphthylene	10	330	NA	R			NA	NA	UL	NA	
troaniline	50	1650	NA	R			NA	NA	R	NA	
Acenaphthene	10	330	NA	R			NA	NA	UL	NA	
2,4-Dinitrophenol	50	1650	NA	UL			NA	NA	UL	NA	
-Nitrophenol	50	1650	NA	UL			NA	NA	UL	NA	
ibenzofuran	10	330	NA	R			NA	NA	UL	NA	
,4-Dinitrotoluene	10	330	NA	R			NA	NA	UL	NA	
,6-Dinitrotoluene	10	330	NA	R			NA	NA	UL	NA	
iethylphthalate	10	330	NA	R			NA	NA	UL	NA	
-Chlorophenylphenylether	10	330	NA	R			NA	NA	UL	NA	
luorene	10	330	NA	R			NA	NA	UL	NA	
-Nitroaniline	50	1650	NA	R			NA	NA	UL	NA	
,6-Dinitro-2-methylphenol	50	1650	NA	UL			NA	NA	UL	NA	
-Nitrosodiphenylamine	10	330	NA	R			NA	NA	UL	NA	
-Bromophenylphenylether	10	330	NA	R			NA	NA	UL	NA	
exachlorobenzene	10	330	NA	R			NA	NA	UL	NA	900/-
entachlorophenol	50	1650	NA	UL			NA	NA	UL	NA	
henanthrene	10	330	NA	R			NA	NA	UL	NA	

XTRACTABLE ORGANIC ANALYSIS   ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number			CB-12B 04	Rinsate 04	CB-20D	CB-21A	CB-21B	CB-21C 05	Rinsate 05	Trip Blank 011	CB-3A
aboratory Sample Number			890811R07	890811R08	890814X02	890814X03	890814X04	890814X06	890814X07	890814X08	890728J02
emarks											Analyzed Twice
nits			ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
EMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit									
nthracene	10	330	NA	R			NA	NA	UL	NA	
i-n-butylphthalate	10	330	NA	R			NA	NA	UL	NA	34,000J/83,000J
luoranthene	10	330	NA	R			NA	NA	UL	NA	
yrene	10	330	NA	R			NA	NA	UL	NA	
utylbenzylphthalate	10	330	NA	R			NA	NA	UL	NA	
,3'-Dichlorobenzidine	20	660	NA	R			NA	NA	R	NA	
enzo(a)anthracene	10	330	NA	R			NA	NA	UL	NA	
is(2-Ethylhexyl)phthalate	10	330	NA	R	210 B		NA	NA	7.0 B	NA	2000 B/2000 B
sene	10	330	NA	R			NA	NA	UL	NA	
i-n-octylphthalate	10	330	NA	R			NA	NA	UL	NA	
nzo(b)fluoranthene	10	330	NA	R			NA	NA	UL	NA	
nzo(k)fluoranthene	10	330	NA	R			NA	NA	UL	NA	
nzo(a)pyrene	10	330	NA	R			NA	NA	UL	NA	
deno(1,2,3-cd)pyrene	10	330	NA	R			NA	NA	UL	NA	
benz(a,h)anthracene	10	330	NA	R			NA	NA	UL	NA	
nzo(g,h,i)perylene	10	330	NA	R			NA	NA	UL	NA	
antitation Limit Multiplier			NA	1.0	1.12	1.09	NA	NA	1.0	NA	2.10/10.90
te Received by Laboratory			NA	8/11/89	8/14/89	8/14/89	NA	NA	8/14/89	NA	7/28/89
te Sample Extracted			NA	9/21/89	8/16/89	8/16/89	NA	NA	9/21/89	NA	8/1/89
te of Analysis			NA	9/25/89	9/22/89	9/22/89	NA	NA	9/25/89	NA	8/29 & 9/8
strument Used for Analysis			NA	7002B	7002B	7002B	NA	NA	7002B	NA	7002B

EXTRACTABLE ORGANIC ANALYSIS   ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

ncoln Parale Sample Number			CB-12B #6	Rinsate #4	CB-20D	CB-21A	CB-21B	CB-21C #5	Rinsate #5	Trip Blank #11	CB-JA
boratory Sample Number			890811R07	890811R08	890814R01	890814R03	890814R04	890814R05	890814R07	890814R08	890728J02
emarks											
nits			ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg
CBs	Aqueous Quantitation Limit	Solid Quantitation Limit									
roclor-1242	0.5	80	NA	NA			NA	510	NA	NA	500
uantitation Limit Multiplier			NA	NA	1.125	1.06	NA		NA	NA	
ate Sample Received			NA	NA	8/14/89	8/14/89	NA	8/14/89	NA	NA	7/28/89
ate sample extracted			NA	NA	8/16/89	8/16/89	NA	8/16/89	NA	NA	8/1/89
ate of analysis			NA	NA	9/3/89	9/3/89	NA	9/3/89	NA	NA	9/1/89

NOTES:
- · Compound was not detected.
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-5A 890727R01	CB-5B 890727R02	CB-5D 890727R04	CB-5E 890727R05	Trip Blank 890727R06	CB-3A 890728J01	CB-3B 890728J03	CB-3C 890728J04	Trip Blank 890728J05	CB-4A 890801A01	CB-4B 890801A02	CB-4C 890801A03	Trip Blank 890801A04	CB-2A 890801Z01	CB-2B 890801Z02
Remarks		Analyzed Twice Medium Level	Medium Level	Analyzed Twice	Medium Level		Medium Level									
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
cis-1,3-Dichloropropene	5.0															
Bromoform	5.0															
2-Hexanone	10															
4-Methyl-2-pentanone	10															
Tetrachloroethene	5.0			2.0 J/-												
Toluene	5.0	2000/2100		31 J/16 J			1200									
Chlorobenzene	5.0	740/560 J		6.0/8.0												
Ethylbenzene	5.0	16,000/12,000	1000	120 J/410 J	420 J		4900									2.0 J
Styrene	5.0															
Total Xylenes	5.0	66,000J/51,000	4000	500J/1200J	1600		22,000									10
Quantitation Limit Multiplier		130/270	140	1.2/2.4	140	1.0	140	1.1	1.1	1.0	1.1	1.1	1.1	1.0	1.3	1.1
Date Received by Laboratory		7/27/89	7/27/89	7/27/89	7/27/89	7/27/89	7/28/89	7/28/89	7/28/89	7/28/89	7/31/89	7/31/89	7/31/89	7/31/89	8/1/89	8/1/89
Date of Analysis		8/3 & 8/4	8/3/89	8/10/89	8/3/89	8/2/89	8/7/89	8/10/89	8/10/89	8/4/89	8/10/89	8/10/89	8/10/89	8/7/89	8/14/89	8/14/89
Instrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A

NOTES:
- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

Malcolm Pirnie Sample Number			CB-5A	CB-5B	CB-5D	CB-5E	Trip Blank	CB-3A	CB 3B	CB-3C	Trip Blank	CB 4A	CB 4B	CB-4C	Trip Blank	CB-2A	CB-2B
Laboratory Sample Number			890727R01	890727R02	890727R04	890727R05	890727R06	890728J01	890728J03	890728J04	890728J05	890801A01	890801A02	890801A03	890801A04	890801I01	890801I02
Remarks								Analyzed Twice	Analyzed Twice								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Phenol	10	330					NA	750 J/-			NA				NA	UL	130 J
bis(2-Chloroethyl)ether	10	330					NA				NA				NA	UL	
2-Chlorophenol	10	330					NA				NA				NA	UL	
1,3-Dichlorobenzene	10	330					NA				NA				NA	UL	
1,4-Dichlorobenzene	10	330					NA				NA				NA	UL	
Benzyl Alcohol	10	330					NA				NA				NA	UL	
1,2-Dichlorobenzene	10	330					NA				NA				NA	UL	
2-Methylphenol	10	330					NA				NA				NA	UL	
bis(2-chloroisopropyl)ether	10	330					NA				NA				NA	UL	
hylphenol	10	330					NA				NA				NA	UL	100 J
N-Nitroso-di-n-propylamine	10	330					NA				NA				NA	UL	
Hexachloroethane	10	330					NA				NA				NA	UL	
Nitrobenzene	10	330					NA				NA				NA	UL	
Isophorone	10	330					NA				NA				NA	UL	
2-Nitrophenol	10	330					NA				NA				NA	UL	
2,4-Dimethylphenol	10	330					NA				NA				NA	UL	130 J
Benzoic Acid	50	1650					NA				NA				NA	UL	
bis(2-Chloroethoxy)methane	10	330					NA				NA				NA	UL	
2,4-Dichlorophenol	10	330					NA				NA				NA	UL	
1,2,4-Trichlorobenzene	10	330	160 J	350 J			NA	1300/-	140 J/-		NA				NA	UL	
Naphthalene	10	330	810	1900	41 J	160 J	NA	960/-	120 J/-		NA				NA	UL	230 J
4-Chloroaniline	10	330					NA				NA				NA	UL	
chlorobutadiene	10	330					NA				NA				NA	UL	
4-Chloro-3-methylphenol	10	330					NA				NA				NA	UL	
2-Methylnaphthalene	10	330	280 J	700		41 J	NA	420 J/-	77 J/-		NA				NA	UL	350 J

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-5A 890727R01	CD-5B 890727R02	CD-5D 890727R04	CD-5E 890727R05	Trip Blank 890727R06	CD-3A 890728J01	CD-3B 890728J03	CD-3C 890728J04	Trip Blank 890728J05	CD-4A 890801A01	CD-4B 890801A02	CD-4C 890801A03	Trip Blank 890801A04	CD-2A 890801X01	CD-2B 890801X02
R[illegible]ks								Analyzed Twice	Analyzed Twice								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Hexachlorocyclopentadiene	10	330					NA				NA				NA	UL	
2,4,6-Trichlorophenol	10	330					NA				NA				NA	UL	
2,4,5-Trichlorophenol	10	330					NA				NA				NA	UL	
2-Chloronaphthalene	10	330					NA				NA				NA	UL	
2-Nitroaniline	10	330					NA				NA				NA	UL	
Dimethylphthalate	10	330					NA				NA				NA	UL	
Acenaphthylene	10	330					NA				NA				NA	UL	
3-Nitroaniline	10	330					NA				NA				NA	UL	R
Acenaphthene	10	330					NA				NA				NA	UL	
2,4-Dinitrophenol	10	330					NA				NA				NA	UL	
4-Nitrophenol	10	330					NA				NA				NA	UL	
Dibenzofuran	10	330					NA				NA				NA	UL	
2,4-Dinitrotoluene	10	330					NA				NA				NA	UL	
2,6-Dinitrotoluene	10	330					NA				NA				NA	UL	
Diethylphthalate	10	330					NA				NA				NA	UL	
4-Chlorophenylphenylether	10	330					NA				NA				NA	UL	
Fluorene	50	1650					NA				NA				NA	UL	
4-Nitroaniline	10	330	R				NA			R	NA				NA	UL	
4,6-Dinitro-2-methylphenol	10	330					NA				NA				NA	UL	
N-Nitrosodiphenylamine	10	330					NA				NA				NA	UL	
4-Bromophenylphenylether	10	330					NA				NA				NA	UL	
Hexachlorobenzene	10	330		160 J			NA	480 J/-	250 J/-		NA				NA	UL	200 J
Pentachlorophenol	10	330					NA				NA				NA	UL	
Phenanthrene	10	330	42 J	91 J			NA				NA				NA	UL	78 J

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CB-5A 890727R01	CB-5B 890727R02	CB-5D 890727R04	CB-5E 890727R05	Trip Blank 890727R06	CB-3A 890728J01	CB-3B 890728J03	CB-3C 890728J04	Trip Blank 890728J05	CB-4A 890801A01	CB-4B 890801A02	CB-4C 890801A03	Trip Blank 890801A04	CB-2A 890801I01	CB-2B 890801I02
:ks								Analyzed Twice	Analyzed Twice								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Anthracene	10	330					NA				NA				NA	UL	
Di-n-butylphthalate	10	330	200 J	210 J		30 J	NA	62,000J/570,000J	14,000J/16,000	52 J	NA				NA	78 J	
Fluoranthene	10	330					NA				NA				NA	UL	
Pyrene	10	330					NA				NA				NA	UL	
Butylbenzylphthalate	10	330	210 J	310 J			NA	440 J/-			NA				NA	UL	
3,3'-Dichlorobenzidine	10	660					NA				NA				NA	UL	
Benzo(a)anthracene	10	330					NA				NA				NA	UL	
bis(2-Ethylhexyl)phthalate	10	330	1000 B	4900	200 B	270 B	NA	2600 B/-	650 B/530 B	260 B	NA	160 B			NA	730 B	660 B
Chrysene	10	330					NA				NA				NA	UL	
Di-n-octylphthalate	10	330	57 J	100 J			NA				NA				NA	UL	
Benzo(b)fluoranthene	10	330					NA				NA				NA	UL	
Benzo(k)fluoranthene	10	330					NA				NA				NA	UL	
Benzo(a)pyrene	10	330					NA				NA				NA	UL	
Indeno(1,2,3-cd)pyrene	10	330					NA				NA				NA	UL	
Dibenz(a,h)anthracene	10	330					NA				NA				NA	UL	
Benzo(g,h,i)perylene	10	330					NA				NA				NA	UL	
Quantitation Limit Multiplier			1.09	1.23	1.10	1.12	NA	2.30/57.50	1.09/6.24	1.06	NA	1.12	1.09	1.12	NA	1.27	1.15
Date Received by Laboratory			7/27/89	7/27/89	7/27/89	7/27/89	NA	7/28/89	7/28/89	7/28/89	NA	7/31/89	7/31/89	7/31/89	NA	8/1/89	8/1/89
Date Sample Extracted			8/1/89	8/1/89	8/1/89	8/1/89	NA	8/1/89	8/1/89	8/1/89	NA	8/8/89	8/8/89	8/8/89	NA	9/22/89	8/8/89
Date of Analysis			8/28/89	8/29/89	8/29/89	8/29/89	NA	8/29 & 9/7	8/29 & 8/31	8/28/89	NA	9/9/89	9/9/89	9/9/89	NA	9/28/89	9/9/89
Instrument Used for Analysis			7002B	7002B	7002B	7002B	NA	7002B	7002B	7002B	NA	7002B	7002B	7002B	NA	7002B	7002B

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-5A 890727R01	CD-5B 890727R02	CD-5D 890727R04	CD-5E 890727R05	Trip Blank 890727R06	CD-3A 890728J01	CD-3B 890728J03	CD-3C 890728J04	Trip Blank 890728J05	CD-4A 890801A01	CD-4B 890801A02	CD-4C 890801A03	Trip Blank 890801A04	CD-2A 890801I01	CD-2B 890801I02
:ke								Analyzed Twice	Analyzed Twice								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Aroclor-1242	0.5	80					NA	440			NA				NA		
Quantitation Limit Multiplier			1.125	1.125	1.19	1.125	NA		1.06	1.06	NA	1.125	1.125	1.125	NA	1.25	1.19
Date Sample Received			7/27/89	7/27/89	7/27/89	7/27/89	NA	7/28/89	7/28/89	7/28/89	NA	7/31/89	7/31/89	7/31/89	NA	8/1/89	8/1/89
Date Sample Extracted			8/1/89	8/1/89	8/1/89	8/1/89	NA	8/1/89	8/1/89	8/1/89	NA	8/8/89	8/8/89	8/8/89	NA	8/8/89	8/8/89
Date of Analysis			9/1/89	9/1/89	9/1/89	9/1/89	NA	9/1/89	9/1/89	9/1/89	NA	9/2/89	9/2/89	9/2/89	NA	9/2/89	9/2/89

NOTES:

-	Compound was not detected.
J	Quantitation is approximate due to limitations identified during the quality control review (data validation).
B	This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
R	Unreliable result - Analyte may or may not be present in this sample.
UL	This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

VOLATILE ORGANIC ANALYSIS ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-2C 890801Z03	CB-2D 890801Z04	CB-23A 890801Z05	CB-23B 890801Z06	CB-23C 890801Z07	CB-23D 890801Z08	Trip Blank 890801Z10	CB-6A 890803B01	CB-25A 890803B02	Trip Blank 890803B03	CB-6B 890803B04	CB-6C 890803B05	CB-20A 890803B06	CB-20B 890803B07	CB-20C 890803B09
										Duplicate CB-6A						
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
Chloromethane	10															
Bromomethane	10															
Vinyl Chloride	10															
Chloroethane	10															
Methylene Chloride	5.0	7.0 B	6.0 B	6.0 B	3.0 B	3.0 B	6.0 B		6.0 B	3.0 B	2.0 B	6.0 B	23 B	6.0 B	6.0 B	
Acetone	10	160 B	40 B	7.0 B		25 B	30 B		12 B	95 B		66 B		87 B	59 B	20 B
Carbon Disulfide	5.0															
1,1-Dichloroethene	5.0															
1,1-Dichloroethane	5.0												2.0 J			
,2-Dichloroethene	5.0					6.0										
Chloroform	5.0	3.0 B	2.0 B	2.0 B	1.0 B	1.0 B	2.0 B			1.0 B		2.0 B	7.0 B	2.0 B	2.0 B	2.0 B
1,2-Dichloroethane	5.0															
2-Butanone	10	R	R										R			
1,1,1-Trichloroethane	5.0			3.0 J									2.0 J			
Carbon Tetrachloride	5.0															
Vinyl Acetate	10							R								
Bromodichloromethane	5.0															
1,1,2,2-Tetrachloroethane	5.0															
1,2-Dichloropropane	5.0															
trans-1,3-Dichloropropene	5.0															
Trichloroethene	5.0			4.0 J									5.0 J			
Dibromochloromethane	5.0															
2-Trichloroethane	5.0															
Benzene	5.0										BL					

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CD-2C 890801Z03	CD-2D 890801Z04	CD-23A 890801Z05	CD-23B 890801Z06	CD-23C 890801Z07	CD-23D 890801Z08	Trip Blank 890801Z10	CD-6A 890803B01	CD-25A 890803B02	Trip Blank 890803B03	CD-6B 890803B04	CD-6C 890803B05	CD-20A 890803B06	CD-20B 890803B07	CD-20C 890803B09
Remarks										Duplicate CD-6A						
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
cis-1,3-Dichloropropene	5.0															
Bromoform	5.0															
2-Hexanone	10															
4-Methyl-2-pentanone	10															
Tetrachloroethene	5.0			11	3.0 J	3.0 J						6.0 J	27			
Toluene	5.0										UL					
Chlorobenzene	5.0										UL					
Ethylbenzene	5.0										UL					
Styrene	5.0										UL					
Total Xylenes	5.0	10									UL					
Quantitation Limit Multiplier		1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.1	1.0	1.1	1.1	1.1	1.1	1.0
Date Received by Laboratory		8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	8/2/89	8/2/89	8/2/89	8/2/89	8/2/89	8/2/89	8/2/89	8/2/89
Date of Analysis		8/10/89	8/10/89	8/14/89	8/14/89	8/11/89	8/14/89	8/8/89	8/14/89	8/10/89	8/15/89	8/14/89	8/10/89	8/14/89	8/14/89	8/11/89
Instrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A

NOTES:
- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-2C 890801203	CD-2D 890801204	CD-23A 890801205	CD-23B 890801206	CD-23C 890801207	CD-23D 890801208	Trip Blank 890801210	CD-6A 890803801	CD-25A 890803802	Trip Blank 890803803	CD-6B 890803804	CD-6C 890803805	CD-20A 890803806	CD-20B 890803807	CD-20C 890803810
:ks											Duplicate CD-6A						
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Phenol	10	330							NA			NA					
bis(2-Chloroethyl)ether	10	330							NA			NA					
2-Chlorophenol	10	330							NA			NA					
1,3-Dichlorobenzene	10	330							NA			NA					
1,4-Dichlorobenzene	10	330							NA			NA					
Benzyl Alcohol	10	330							NA			NA					
1,2-Dichlorobenzene	10	330							NA			NA					
2-Methylphenol	10	330							NA			NA					
b' '2-chloroisopropyl)ether	10	330							NA			NA					
4-Methylphenol	10	330							NA			NA					
N-Nitroso-di-n-propylamine	10	330							NA			NA					
Hexachloroethane	10	330							NA			NA					
Nitrobenzene	10	330							NA			NA					
Isophorone	10	330							NA			NA					
2-Nitrophenol	10	330							NA			NA					
2,4-Dimethylphenol	10	330							NA			NA					
Benzoic Acid	50	1650							NA			NA					
bis(2-Chloroethoxy)methane	10	330							NA			NA					
2,4-Dichlorophenol	10	330							NA			NA					
1,2,4-Trichlorobenzene	10	330							NA			NA					
Naphthalene	10	330		62 J					NA			NA					
4-Chloroaniline	10	330							NA			NA					
Hexachlorobutadiene	10	330							NA			NA					
4-Chloro-3-methylphenol	10	330							NA			NA					
2-Methylnaphthalene	10	330		66 J					NA			NA					

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number aboratory Sample Number			CB-2C 890801I03	CB-2D 890801I04	CB-23A 890801I05	CB-23B 890801I06	CB-23C 890801I07	CB-23D 890801I09	Trip Blank 890801I10	CB-6A 890803B01	CB-25A 890803B02	Trip Blank 890803B03	CB-6B 890803B04	CB-6C 890803B05	CB-20A 890803B06	CB-20B 890803B07	CB-20C 890803B10
marks											Duplicate CB-6A						
nits			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/l	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
EMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
exachlorocyclopentadiene	10	330							NA			NA					
,4,6-Trichlorophenol	10	330							NA			NA					
,4,5-Trichlorophenol	10	330							NA			NA					
-Chloronaphthalene	10	330							NA			NA					
-Nitroaniline	10	330							NA			NA					
imethylphthalate	10	330							NA			NA					
cenaphthylene	10	330							NA			NA					
-Nitroaniline	10	330							NA			NA					
phthene	10	330							NA			NA					
,4-Dinitrophenol	10	330							NA			NA					
-Nitrophenol	10	330							NA			NA					
ibenzofuran	10	330							NA			NA					
,4-Dinitrotoluene	10	330							NA			NA					
,6-Dinitrotoluene	10	330							NA			NA					
iethylphthalate	10	330							NA			NA					
-Chlorophenylphenylether	10	330							NA			NA					
luorene	50	1650							NA			NA					
-Nitroaniline	10	330							NA			NA					
,6-Dinitro-2-methylphenol	10	330							NA			NA					
-Nitrosodiphenylamine	10	330							NA			NA					
-Bromophenylphenylether	10	330							NA			NA					
chlorobenzene	10	330			320 J				NA			NA					
entachlorophenol	10	330							NA			NA					
enanthrene	10	330							NA			NA					

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CB-2C 890801I03	CB-2D 890801I04	CB-23A 890801I05	CB-23B 890801I06	CB-23C 890801I07	CB-23D 890801I09	Trip Blank 890801I10	CB-6A 890803J01	CB-25A 890803J02	Trip Blank 890803J03	CB-6B 890803J04	CB-6C 890803J05	CB-20A 890803J06	CB-20B 890803J07	CB-20C 890803J10
Remarks											Duplicate CB-6A						
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/l	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
Anthracene	10	330							NA			NA					
Di-n-butylphthalate	10	330		82 J					NA			NA					
Fluoranthene	10	330							NA			NA					
Pyrene	10	330							NA			NA					
Butylbenzylphthalate	10	330							NA			NA					
3,3'-Dichlorobenzidine	10	660							NA			NA					
Benzo(a)anthracene	10	330							NA			NA					
bis(2-Ethylhexyl)phthalate	10	330			830 B				NA			NA					230 B
sene	10	330							NA			NA					
Di-n-octylphthalate	10	330							NA			NA					
Benzo(b)fluoranthene	10	330							NA			NA					
Benzo(k)fluoranthene	10	330							NA			NA					
Benzo(a)pyrene	10	330							NA			NA					
Indeno(1,2,3-cd)pyrene	10	330							NA			NA					
Dibenz(a,h)anthracene	10	330							NA			NA					
Benzo(g,h,i)perylene	10	330							NA			NA					
Quantitation Limit Multiplier			1.12	1.06	1.12	1.12	1.09	1.15	NA	1.21	1.09	NA	1.09	1.09	1.12	1.09	1.10
Date Received by Laboratory			8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	NA	8/2/89	8/2/89	NA	8/2/89	8/2/89	8/2/89	8/2/89	8/2/89
Date Sample Extracted			8/8/89	8/8/89	8/8/89	8/8/89	8/8/89	8/8/89	NA	8/10/89	8/10/89	NA	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89
Date of Analysis			9/9/89	9/9/89	9/11/89	9/12/89	9/9/89	9/9/89	NA	9/12/89	9/12/89	NA	9/11/89	9/12/89	9/12/89	9/12/89	9/12/89
Instrument Used for Analysis			7002B	7002B	7002B	7002B	7002B	7002B	NA	7002D	7002D	NA	7002D	7002D	7002D	7002B	7002D

XTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number aboratory Sample Number			CD-2C 890801203	CD-2D 890801204	CD-23A 890801205	CD-23B 890801206	CD-23C 890801207	CD-23D 890801209	Trip Blank 890801210	CD-6A 890803001	CD-25A 890803002	Trip Blank 890803003	CD-6B 890803004	CD-6C 890803005	CD-20A 890803006	CD-20B 890803007	CD-20C 890803010
..te											Duplicate CD-6A						
nits			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l	ug/kg	ug/l	ug/l	ug/kg	ug/kg	ug/l	ug/kg	ug/kg
EMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit															
roclor-1262	0.5	80			20,000	3800			NA			NA				NA	NA
antitation Limit Multiplier			1.125	1.06			1.125	1.125	NA	1.19	1.06	NA	1.125	1.06	1.125	NA	NA
te Sample Received			8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	8/1/89	NA	8/2/89	8/2/89	NA	8/2/89	8/2/89	8/2/89	NA	NA
te Sample Extracted			8/8/89	8/8/89	8/8/89	8/8/89	8/8/89	8/8/89	NA	8/10/89	8/10/89	NA	8/10/89	8/10/89	8/10/89	NA	NA
te of Analysis			9/2/89	9/2/89	9/2/89	9/2/89	9/2/89	9/2/89	NA	9/2/89	9/2/89	NA	9/2/89	9/2/89	9/2/89	NA	NA

NOTES:

- \- Compound was not detected.
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CD-30D 890803J011	Rinsate 01 890803AA01	CD-22A 890803AA02	Trip Blank 05 890803AA03	CD-22B 890803AA04	CD-22C 890803AA06	CD-18A 890804L01	CD-16A 890804L03	Trip Blank 06 890804L04	CD-18B 890804L05	CD 19B 890808AP02	CD-24B 890808A05
ks													
Units		ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit												
Chloromethane	10												
Bromomethane	10												
Vinyl Chloride	10												
Chloroethane	10												
Methylene Chloride	5.0	19 B	3.0 B	4.0 B	2.0 J	4.0 B		5.0 B	5.0 B	3.0 J	6.0 B	3.0 B	25 B
Acetone	10	42 B		67 B	9.0 J	59 B	40 B	51 B	43 B		51 B		
Carbon Disulfide	5.0												
1,1-Dichloroethene	5.0												
1,1-Dichloroethane	5.0												
1,2-Dichloroethene	5.0												
Chloroform	5.0	6.0 B		3.0 B		3.0 B	1.0 B	4.0 B	3.0 B		4.0 B	1.0 B	9.0 B
1,2-Dichloroethane	5.0												
2-Butanone	10	R											
1,1,1-Trichloroethane	5.0						3.0 J						
Carbon Tetrachloride	5.0												
Vinyl Acetate	10												
Bromodichloromethane	5.0												
1,1,2,2-Tetrachloroethane	5.0												
1,2-Dichloropropane	5.0												
trans-1,3-Dichloropropene	5.0												
Trichloroethene	5.0												
Dibromochloromethane	5.0												
2-Trichloroethane	5.0												
Benzene	5.0		UL		UL					UL			

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CD-20D 890803B11	Rinsate 01 890803AA01	CD-22A 890803AA02	Trip Blank 05 890803AA03	' CD-22B 890803AA04	CD-22C 890803AA06	CD-10A 890804L01	CD-16A 890804L03	Trip Blank 06 890804L04	CD-18B 890804L05	CD-19D 890808AP02	CD-24B 890808AP05
jm													
Units		ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit												
cis-1,3-Dichloropropene	5.0												
Bromoform	5.0												
2-Hexanone	10												
4-Methyl-2-pentanone	10												
Tetrachloroethene	5.0					4.0 J	13						
Toluene	5.0		UL		UL					UL			560 J
Chlorobenzene	5.0		UL		UL					UL			380 J
Ethylbenzene	5.0		UL		UL					UL			1400 J
Styrene	5.0		UL		UL					UL			
'Xylenes	5.0		UL		UL					UL			1300 J
Quantitation Limit Multiplier		1.1	1.0	1.1	1.0	1.1	1.2	1.1	1.1	1.0	1.1	1.1	6.3
Date Received by Laboratory		8/2/89	8/3/89	8/3/89	8/3/89	8/3/89	8/3/89	8/4/89	8/4/89	8/4/89	8/4/89	8/8/89	8/8/89
Date of Analysis		8/10/89	8/15/89	8/14/89	8/15/89	8/14/89	8/11/89	8/14/89	8/14/89	8/15/89	8/14/89	8/22/89	8/22/89
Instrument Used For Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A

NOTES.
- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-20D 890803D01	Rinsate 01 890803AA01	CD-22A 890803AA02	Trip Blank 05 890803AA03	CD-22B 890803AA05	CD-22C 890803AA06	CD-10A 890804L01	CD-16A 890804L03	Trip Blank 06 890804L04	CD-14B 890804L02	CD-19D 890808AP02	CD-24B 890809Z01
:te														
Units			ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
Phenol	10	330	NA			NA					NA			
is(2-Chloroethyl)ether	10	330	NA			NA					NA			
-Chlorophenol	10	330	NA			NA					NA			
,3-Dichlorobenzene	10	330	NA			NA					NA			
,4-Dichlorobenzene	10	330	NA			NA					NA			
enzyl Alcohol	10	330	NA			NA					NA			
,2-Dichlorobenzene	10	330	NA			NA					NA			
-Methylphenol	10	330	NA			NA					NA			
is(2-chloroisopropyl)ether	10	330	NA			NA					NA			
:hylphenol	10	330	NA			NA					NA			
-Nitroso-di-n-propylamine	10	330	NA			NA					NA			
exachloroethane	10	330	NA			NA					NA			
itrobenzene	10	330	NA			NA					NA			
sophorone	10	330	NA			NA					NA			
-Nitrophenol	10	330	NA			NA					NA			
,4-Dimethylphenol	10	330	NA			NA					NA			
enzoic Acid	50	1650	NA			NA					NA			
is(2-Chloroethoxy)methane	10	330	NA			NA					NA			
,4-Dichlorophenol	10	330	NA			NA					NA			
,2,4-Trichlorobenzene	10	330	NA			NA					NA			
aphthalene	10	330	NA			NA					NA			
-Chloroaniline	10	330	NA			NA					NA			
chlorobutadiene	10	330	NA			NA					NA			
Chloro-3-methylphenol	10	330	NA			NA					NA			
Methylnaphthalene	10	330	NA			NA					NA			

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CB-20D 890803D011	Rinsate 01 890803JAA01	CB-22A 890803JAA02	Trip Blank 05 890803JAA03	CB-22D 890803JAA05	CB-22C 890803JAA06	CB-10A 890804L01	CB-16A 890804L03	Trip Blank 06 890804L04	CB 10B 890804L02	CB-19B 890808AP02	CB-24B 890809I01
cku														
Units			ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
Hexachlorocyclopentadiene	10	330	NA			NA					NA			
2,4,6-Trichlorophenol	10	330	NA			NA					NA			
2,4,5-Trichlorophenol	50	1650	NA			NA					NA			
2-Chloronaphthalene	10	330	NA			NA					NA			
2-Nitroaniline	50	1650	NA			NA					NA			
Dimethylphthalate	10	330	NA			NA					NA			
Acenaphthylene	10	330	NA			NA					NA			
3-Nitroaniline	50	1650	NA	R	R	NA	R	R	R	R	NA			
Acenaphthene	10	330	NA			NA					NA			
Dinitrophenol	50	1650	NA			NA					NA			
4-Nitrophenol	50	1650	NA			NA					NA			
Dibenzofuran	10	330	NA			NA					NA			
2,4-Dinitrotoluene	10	330	NA			NA					NA			
2,6-Dinitrotoluene	10	330	NA			NA					NA			
Diethylphthalate	10	330	NA			NA					NA			
4-Chlorophenylphenylether	10	330	NA			NA					NA			
Fluorene	10	330	NA			NA					NA			
4-Nitroaniline	50	1650	NA			NA					NA			
4,6-Dinitro-2-methylphenol	50	1650	NA			NA					NA			
N-Nitrosodiphenylamine (1)	10	330	NA			NA					NA			
4-Bromophenylphenylether	10	330	NA			NA					NA			
Hexachlorobenzene	10	330	NA			NA					NA			
achlorophenol	50	1650	NA			NA					NA			
Phenanthrene	10	330	NA			NA					NA			

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-20B 890803B11	Rinsate 03 890803AA01	CD-22A 890803AA02	Trip Blank #5 890803AA03	CD-22B 890803AA05	CD-22C 890803AA06	CD-18A 890804L01	CD-16A 890804L03	Trip Blank 06 890804L04	CD 18B 890804L02	CD-19B 890808AP02	CD-26B 890809Z01
cls														
Units			ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
Anthracene	10	330	NA			NA					NA			
Di-n-butylphthalate	10	330	NA			NA					NA		200 J	
Fluoranthene	10	330	NA			NA					NA			
Pyrene	10	330	NA			NA					NA			
Butylbenzylphthalate	10	330	NA			NA					NA			
3,3'-Dichlorobenzidine	20	660	NA			NA		R	R	R	NA			
Benzo(a)anthracene	10	330	NA			NA					NA			
bis(2-Ethylhexyl)phthalate	10	330	NA	200 B	400 B	NA	180 B	300 B	750 B	130 B	NA	73 B		
Chrysene	10	330	NA			NA					NA			
-octylphthalate	10	330	NA			NA					NA			
Benzo(b)fluoranthene	10	330	NA			NA					NA			
Benzo(k)fluoranthene	10	330	NA			NA					NA			
Benzo(a)pyrene	10	330	NA			NA					NA			
Indeno(1,2,3-cd)pyrene	10	330	NA			NA					NA			
Dibenz(a,h)anthracene	10	330	NA			NA					NA			
Benzo(g,h,i)perylene	10	330	NA			NA					NA			
Quantitation Limit Multiplier			NA	1.0	1.06	NA	1.21	1.10	1.06	1.09	NA	1.10	1.12	1.24
Date Received by Laboratory			NA	8/3/89	8/3/89	NA	8/3/89	8/3/89	8/4/89	8/4/89	NA	8/4/89	8/8/89	8/9/89
Date Sample Extracted			NA	8/8/89	8/10/89	NA	8/10/89	8/10/89	8/10/89	8/10/89	NA	8/10/89	8/10/89	8/16/89
Date of Analysis			NA	9/14/89	9/14/89	NA	9/14/89	9/15/89	9/15/89	9/15/89	NA	9/19/89	9/19/89	9/21/89
Instrument Used For Analysis			NA	7002 B	7002 B	NA	7002 B	7002 B	7002 B	7002 B	NA	7002 B	7002 B	7002 B

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-20B 890803JD11	Rinsate 01 890803JA01	CD-22A 890803JA02	Trip Blank 05 890803JA03	CD-22B 890803JA04	CD-22C 890803JA06	CD-18A 890804L01	CD-16A 890804L03	Trip Blank 06 890804L04	CD 18B 890804L05	CD 19B 890808AP02	CD-24B 890809Z01
[illegible]														
Units			ug/kg	ug/L	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg
PCBs	Aqueous Quantitation Limit	Solid Quantitation Limit												
Aroclor-1242	0.5	80	NA			NA	NA	NA			NA	NA		
Quantitation Limit Multiplier			NA	1.0	1.06	NA	NA	NA	1.06	1.125	NA	NA	1.125	1.25
Date Sample Received			NA	8/3/89	8/3/89	NA	NA	NA	8/4/89	8/4/89	NA	NA	8/8/89	8/9/89
Date Sample Extracted			NA	8/8/89	8/10/89	NA	NA	NA	8/10/89	8/10/89	NA	NA	8/16/89	8/16/89
Date of Analysis			NA	9/2/89	9/2/89	NA	NA	NA	9/2/89	9/2/89	NA	NA	9/3/89	9/3/89

NOTES:

-	Compound was not detected
J	Quantitation is approximate due to limitations identified during the quality control review (data validation).
B	This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
R	Unreliable result - Analyte may or may not be present in this sample.
UL	This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-26D 890800AP06	CB-24D 890800AP07	Trip Blank 890800AP12	CB-1A 890800P01	CB-1B 890800P02	CB-25D 890800P03	CB-1C 890800P04	CB-1D 890800P06	CB-17B 890800P09	CB-17D 890800P11	Trip Blank 07 890800P12	Rinsate 02 890800P13
Remarks		Duplicate CB-24D					Duplicate CB-1B						
Units		ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
VOLATILE COMPOUNDS	Quantitation Limit												
Chloromethane	10					UL	UL			UL			
Bromomethane	10					UL	UL			UL			
Vinyl Chloride	10					UL	UL			UL			
Chloroethane	10					UL	UL			UL			
Methylene Chloride	5.0	4.0 B	17 B	3.0 J		3.0 B	4.0 B	3.0 B		4.0 B	2.0 B	1.0 J	
Acetone	10	9.0 B		9.0 J	41 B	8.0 B	8.0 B	20 B	23 B	UL	15 B		
Carbon Disulfide	5.0					UL	UL			UL			
1,1-Dichloroethene	5.0					UL	UL			UL			
1,1-Dichloroethane	5.0					UL	UL		2.0 J	UL			
Total 1,2-Dichloroethene	5.0	3.0 J				UL	UL			UL			
Chloroform	5.0	1.0 B	9.0 B	1.0 J	4.0 B	1.0 B	UL	2.0 B	2.0 B	1.0 B			
1,2-Dichloroethane	5.0					UL	UL		6.0	UL			
2-Butanone	10					UL	UL			UL	R		
1,1,1-Trichloroethane	5.0					UL	UL			UL			
Carbon Tetrachloride	5.0					UL	UL			UL			
Vinyl Acetate	10					UL	UL			UL			
Bromodichloromethane	5.0					UL	UL			UL			
1,1,2,2-Tetrachloroethane	5.0					UL	UL			UL			
1,2-Dichloropropane	5.0					UL	UL			UL			
trans-1,3-Dichloropropene	5.0					UL	UL			UL			
Trichloroethene	5.0					UL	UL			UL			
Dibromochloromethane	5.0					UL	UL			UL			
1,1,2-Trichloroethane	5.0					UL	UL			UL			
Benzene	5.0					UL	UL			UL		UL	UL

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-26D 890808AP06	CB-24D 890808AP07	Trip Blank 890808AP12	CB-1A 890808P01	CB-1B 890808P02	CB-25B 890808P03	CB-1C 890808P04	CB-1D 890808P06	CB-17B 890808P09	CB-17D 890808P11	Trip Blank #7 890808P12	Rinsate #2 890808P13
Remarks		Duplicate CB-24D					Duplicate CB-1B						
Units		ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
VOLATILE COMPOUNDS	Quantitation Limit												
cis-1,3-Dichloropropene	5.0					UL	UL			UL			
Bromoform	5.0					UL	UL			UL			
2-Hexanone	10					UL	UL			UL			
4-Methyl-2-pentanone	10					UL	UL			UL			
Tetrachloroethene	5.0					UL	UL			UL		UL	UL
Toluene	5.0	12 J	550			UL	UL			UL		UL	UL
Chlorobenzene	5.0	2.0 J	190			UL	UL			UL		UL	UL
Ethylbenzene	5.0	8.0 J	810			UL	UL			UL		UL	UL
Styrene	5.0					UL	UL			UL		UL	UL
Total Xylenes	5.0	19 J	1600 J			UL	UL			UL		UL	UL
Quantitation Limit Multiplier		1.2	5.4	1.0	1.1	1.1	1.2	1.1	1.1	1.3	1.1	1.0	1.0
Date Received by Laboratory		8/8/89	8/8/89	8/8/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89
Date of Analysis		8/22/89	8/11/89	8/15/89	8/14/89	8/22/89	8/22/89	8/11/89	8/11/89	8/22/89	8/21/89	8/15/89	8/15/89
Instrument Used for Analysis		7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A	7001 A

NOTES:

- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number			CB-26D	CB-24D	Trip Blank 06	CB-1A	CB-1B	CB-25B	CB-1C	CB-1D	CB-17B	CB-17D	Trip Blank 07	Rinsate 02
Laboratory Sample Number			890809X02	890808AP11	890808AP12	890808P01	890808P02	890808P03	890808P05	890808P07	890808P09	890808P11	890808P12	890808P13
Remarks			Duplicate CB-24D				Duplicate CB-1B							
Units			ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
SEMIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
Phenol	10	330		4,000 J	NA						26,000 J		NA	
bis(2-Chloroethyl)ether	10	330		UL	NA								NA	
2-Chlorophenol	10	330		UL	NA								NA	
1,3-Dichlorobenzene	10	330		UL	NA								NA	
1,4-Dichlorobenzene	10	330		UL	NA								NA	
Benzyl Alcohol	10	330		UL	NA								NA	
1,2-Dichlorobenzene	10	330		UL	NA								NA	
2-Methylphenol	10	330		650 J	NA						610		NA	
bis(2-chloroisopropyl)ether	10	330		UL	NA								NA	
4-Methylphenol	10	330		UL	NA						1100 J		NA	
N-Nitroso-di-n-propylamine	10	330		UL	NA								NA	
Hexachloroethane	10	330		UL	NA								NA	
Nitrobenzene	10	330		UL	NA								NA	
Isophorone	10	330		UL	NA								NA	
2-Nitrophenol	10	330		UL	NA								NA	
2,4-Dimethylphenol	10	330		UL	NA						270 J		NA	
Benzoic Acid	50	330		UL	NA								NA	
bis(2-Chloroethoxy)methane	10	330		UL	NA								NA	
2,4-Dichlorophenol	10	330		UL	NA								NA	
1,2,4-Trichlorobenzene	10	330		450 J	NA								NA	
Naphthalene	10	330		9100 J	NA		130 J	88 J		53 J			NA	
4-Chloroaniline	10	330		UL	NA								NA	
Hexachlorobutadiene	10	330		UL	NA								NA	
4-Chloro-3-methylphenol	10	330		UL	NA								NA	
2-Methylnaphthalene	10	330		3400 J	NA		82 J						NA	

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number Laboratory Sample Number			CB-26D 890809X02	CB-24D 890808AP11	Trip Blank #8 890808AP12	CB-1A 890808P01	CB-1B 890808P02	CB-25B 890808P03	CB-1C 890808P05	CB-1D 890808P07	CB-17B 890808P09	CB-17D 890808P15	Trip Blank #7 890808P12	Rinsate #2 890808P13
emarks			Duplicate CB-24D					Duplicate CB-1B						
nits			ug/kg	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
SEMIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
xachlorocyclopentadiene	10	330		UL	NA								NA	
,4,6-Trichlorophenol	10	330		UL	NA								NA	
4,5-Trichlorophenol	50	1650		UL	NA								NA	
Chloronaphthalene	10	330		UL	NA								NA	
Nitroaniline	50	1650		UL	NA								NA	
methylphthalate	10	330		UL	NA								NA	
enaphthylene	10	330		UL	NA								NA	
Nitroaniline	50	1650		UL	NA	R	R		R	R			NA	
naphthene	10	330		UL	NA								NA	
-Dinitrophenol	50	1650		UL	NA								NA	
Nitrophenol	50	1650		UL	NA								NA	
enzofuran	10	330		UL	NA								NA	
-Dinitrotoluene	10	330		UL	NA								NA	
-Dinitrotoluene	10	330		UL	NA								NA	
thylphthalate	10	330		UL	NA						430		NA	
hlorophenylphenylether	10	330		UL	NA								NA	
orene	10	330		220 J	NA								NA	
itroaniline	50	1650		UL	NA								NA	
-Dinitro-2-methylphenol	50	1650		UL	NA								NA	
itrosodiphenylamine	10	330		UL	NA								NA	
omophenylphenylether	10	330		UL	NA								NA	
chlorobenzene	10	330		420 J	NA						510		NA	
achlorophenol	50	1650		UL	NA								NA	
anthrene	10	330		320 J	NA						800		NA	

TRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

lcolm Pirnie Sample Number boratory Sample Number			CD-26D 890809S02	CD-24D 890808AP11	Trip Blank 08 890808AP12	CD-1A 890808P01	CD-1B 890808P02	CD-25D 890808P03	CD-1C 890808P05	CD-1D 890808P07	CD-17B 890808P09	CD-17D 890808P11	Trip Blank 07 890808P12	Rinsate 02 890808P13
marks			Duplicate CD-24D					Duplicate CD-1B						
its			ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
MIVOLATILE COMPOUNDS	Aqueous Quant. Limit	Solid Quant. Limit												
thracene	10	330		UL	NA						220 J		NA	
-n-butylphthalate	10	330		2500 J	NA								NA	
oranthene	10	330		UL	NA						830		NA	
rene	10	330		UL	NA						560		NA	
tylbenzylphthalate	10	330		UL	NA								NA	
3'-Dichlorobenzidine	20	330		UL	NA								NA	
nzo(a)anthracene	10	330		UL	NA						310 J		NA	
s(2-Ethylhexyl)phthalate	10	330		1200 B	NA		530 B	680 B	110 B		390 B		NA	9.0 B
ysene	10	330		UL	NA						330 J		NA	
-n-octylphthalate	10	330		UL	NA		110 J	150 J					NA	
nzo(b)fluoranthene	10	330		UL	NA								NA	
nzo(k)fluoranthene	10	330		UL	NA								NA	
nzo(a)pyrene	10	330		UL	NA								NA	
deno(1,2,3-cd)pyrene	10	330		UL	NA								NA	
benz(a,h)anthracene	10	330		UL	NA								NA	
nzo(g,h,i)perylene	10	330		UL	NA								NA	
ntitation Limit Multiplier			1.10	1.15	NA	1.09	1.15	1.21	1.06	1.21	1.27	1.30	NA	1.0
te Received by Laboratory			8/9/89	8/8/89	NA	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	NA	8/7/89
te Sample Extracted			8/16/89	8/10/89	NA	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	NA	8/14/89
te of Analysis			9/22/89	9/20/89	NA	9/18/89	9/18/89	9/20/89	9/18/89	9/18/89	9/20/89	9/19/89	NA	9/20/89
strument Used for Analysis			7002 B	7002 B	NA	7002 B	7002 B	7002 B	7002 B	7002 B	7002 B	7002 B	NA	7002 B

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number Laboratory Sample Number			CB-24B 890809Y02	CB-24D 890808AP11	Trip Blank #8 890808AP12	CB-1A 890808P01	CB-1B 890808P02	CB-25B 890808P03	CB-1C 890808P05	CB-1D 890808P07	CB-17B 890808P09	CB-17D 890808P11	Trip Blank #7 890808P12	Rinsate #2 890808P13
Remarks			Duplicate CB-24D					Duplicate CB-1D						
Units			ug/kg	ug/kg	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
PCBs	Aqueous Quantitation Limit	Solid Quantitation Limit												
Aroclor-1242	0.5	80			NA						200		NA	
uantitation Limit Multiplier			1.19	1.125	NA	1.06	1.19	1.19	1.06	1.19		1.31	NA	1.0
ate Sample Received			8/9/89	8/8/89	NA	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	8/7/89	NA	8/7/89
ate Sample Extracted			8/10/89	8/10/89	NA	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	8/16/89	NA	8/16/89
ate of Analysis			9/3/89	9/3/89	NA	9/2/89	9/2/89	9/2/89	9/2/89	9/2/89	9/2/89	9/3/89	NA	9/2-9/3/89

NOTES:

- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number		CB-15A	CB-15B	CB-15C	CB-9A	CB-9B	CB-8A	CB-6B	CB-8C	Trip Blank #9	Rinsate #3	CB-14A	CB-24A	CB-14B	CB-14C	CB-13A
Laboratory Sample Number		890809Z03	890809Z04	890809Z05	890809Z06	890809Z07	890809Z09	890809Z10	890809Z11	890809Z12	890809Z13	890811A01	890811A02	890811A03	890811A04	890811A05
Remarks													Duplicate CB-14A			
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
Chloromethane	10															
Bromomethane	10															
Vinyl Chloride	10															
Chloroethane	10															
Methylene Chloride	5.0	4.0 B	6.0 B	2.0 B	5.0 B	5.0 B	4.0 B	5.0 B	25 B	2.0 J		4.0 B	3.0 B	4.0 B	3.0 B	4.0 B
Acetone	10		13 B	29 B		14 B	14 B	13 B	120 B							
Carbon Disulfide	5.0															
1,1-Dichloroethene	5.0															
ichloroethane	5.0															
Total 1,2-Dichloroethene	5.0															
Chloroform	5.0	1.0 B	0.7 B	2.0 B					9.0 B	1.0 J	1.0 B	1.0 B				
1,2-Dichloroethane	5.0															
2-Butanone	10															
1,1,1-Trichloroethane	5.0												3.0 J	2.0 J	9.0	3.0 J
Carbon Tetrachloride	5.0															
Vinyl Acetate	10															
Bromodichloromethane	5.0															
1,1,2,2-Tetrachloroethane	5.0															
1,2-Dichloropropane	5.0															
trans-1,3-Dichloropropene	5.0															
Trichloroethene	5.0															
nochloromethane	5.0															
1,1,2-Trichloroethane	5.0															
Benzene	5.0															

VOLATILE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number		CB-15A	CB-15B	CB-15C	CB-9A	CB-9B	CB-8A	CB-8B	CB-8C	Trip Blank 09	Rinsate 03	CB-14A	CB-26A	CB-14B	CB-14C	CB-13A
Laboratory Sample Number		890809X03	890809X04	890809X05	890809X06	890809X07	890809X09	890809X10	890809X11	890809X12	890809X13	890811A01	890811A02	890811A03	890811A04	890811A05
Remarks													Duplicate CB-14A			
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit															
cis-1,3-Dichloropropene	5.0															
Bromoform	5.0															
2-Hexanone	10															
4-Methyl-2-pentanone	10															
Tetrachloroethene	5.0															
Toluene	5.0															
Chlorobenzene	5.0															
Ethylbenzene	5.0															
Styrene	5.0															
Total Xylenes	5.0															
Quantitation Limit Multiplier		1.2	1.1	1.1	1.2	1.1	1.2	1.1	5.5	1.0	1.0	1.2	1.1	1.1	1.1	1.2
Date Received by Laboratory		8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/9/89	8/10/89	8/10/89	8/10/89	8/10/89	8/10/89
Date of Analysis		8/22/89	8/23/89	8/11/89	8/23/89	8/23/89	8/23/89	8/23/89	8/11/89	8/15/89	8/15/89	8/24/89	8/24/89	8/23/89	8/23/89	8/23/89
Instrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A	7001A

NOTES:		
	-	Compound was not detected
	J	Quantitation is approximate due to limitations identified during the quality control review (data validation).
	B	This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
	R	Unreliable result - Analyte may or may not be present in this sample.
	UL	This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

alcolm Pirnie Sample Number			CD-15A	CD-15B	CD-15C	CD-9A	CD-9B	CD-8A	CD-8B	CD-8C	Trip Blank 09	Rinsate 03	CD-14A	CD-26A	CD-14B	CD-14C	CD-13A
aboratory Sample Number			890809203	890809204	890809205	890809206	890809207	890809209	890809210	890809211	890809212	890809213	890811A01	890811A02	890811A03	890811A04	890811A05
emarks														Duplicate CD-14A			
nits			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
EMIVOLATILE COMPOUNDS	Quantitation Limit (aq.)	Quantitation Limit (sol.)															
henol	10	330		NA	NA		NA		NA	NA	NA		280 J	220 J		NA	
is(2-Chloroethyl)ether	10	330		NA	NA		NA		NA	NA	NA					NA	
-Chlorophenol	10	330		NA	NA		NA		NA	NA	NA					NA	
,3-Dichlorobenzene	10	330		NA	NA		NA		NA	NA	NA					NA	
4-Dichlorobenzene	10	330		NA	NA		NA		NA	NA	NA					NA	
nzyl Alcohol	10	330		NA	NA		NA		NA	NA	NA					NA	
2-Dichlorobenzene	10	330		NA	NA		NA		NA	NA	NA		440 J			NA	
Methylphenol	10	330		NA	NA		NA		NA	NA	NA					NA	
s(2-chloroisopropyl)ether	10	330		NA	NA		NA		NA	NA	NA					NA	
thylphenol	10	330		NA	NA		NA		NA	NA	NA					NA	
Nitroso-di-n-propylamine	10	330		NA	NA		NA		NA	NA	NA				BL	NA	
xachloroethane	10	330		NA	NA		NA		NA	NA	NA					NA	
trobenzene	10	330		NA	NA		NA		NA	NA	NA					NA	
ophorone	10	330		NA	NA		NA		NA	NA	NA			150 J		NA	140 J
Nitrophenol	10	330		NA	NA		NA		NA	NA	NA					NA	
4-Dimethylphenol	10	330		NA	NA		NA		NA	NA	NA					NA	
nzoic Acid	50	1650		NA	NA		NA		NA	NA	NA					NA	
s(2-Chloroethoxy)methane	10	330		NA	NA		NA		NA	NA	NA					NA	
4-Dichlorophenol	10	330		NA	NA		NA		NA	NA	NA					NA	
2,4-Trichlorobenzene	10	330		NA	NA		NA		NA	NA	NA					NA	
phthalene	10	330		NA	NA		NA		NA	NA	NA					NA	
Chloroaniline	10	330		NA	NA		NA		NA	NA	NA					NA	
chlorobutadiene	10	330		NA	NA		NA		NA	NA	NA					NA	
hloro-3-methylphenol	10	330		NA	NA		NA		NA	NA	NA					NA	
ethylnaphthalene	10	330		NA	NA		NA		NA	NA	NA					NA	

TRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

ncoln Pirnie Sample Number			CD-15A	CD-15B	CD-15C	CD-9A	CD-9B	CD-8A	CD-8B	CD-8C	Trip Blank 09	Rinsate 03	CD-14A	CD-26A	CD-14B	CD-14C	CD-13A
oratory Sample Number			890809R03	890809R04	890809R05	890809R06	890809R07	890809R09	890809R10	890809R11	890809R12	890809R13	890811A01	890811A02	890811A03	890811A04	890811A05
marks														Duplicate CD-14A			
its			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
MIVOLATILE COMPOUNDS	Quantitation Limit (aq.)	Quantitation Limit (sol.)															
tachlorocyclopentadiene	10	330		NA	NA		NA		NA	NA	NA					NA	
4,6-Trichlorophenol	10	330		NA	NA		NA		NA	NA	NA					NA	
4,5-Trichlorophenol	50	1650		NA	NA		NA		NA	NA	NA					NA	
Chloronaphthalene	10	330		NA	NA		NA		NA	NA	NA					NA	
Nitroaniline	50	1650		NA	NA		NA		NA	NA	NA					NA	
methylphthalate	10	330		NA	NA		NA		NA	NA	NA					NA	
enaphthylene	10	330		NA	NA		NA		NA	NA	NA					NA	
Nitroaniline	50	1650	R	NA	NA	R	NA		NA	NA	NA				R	NA	
aphthene	10	330		NA	NA		NA		NA	NA	NA					NA	
4-Dinitrophenol	50	1650		NA	NA		NA		NA	NA	NA					NA	
Nitrophenol	50	1650		NA	NA		NA		NA	NA	NA					NA	
benzofuran	10	330		NA	NA		NA		NA	NA	NA					NA	
4-Dinitrotoluene	10	330		NA	NA		NA		NA	NA	NA					NA	
6-Dinitrotoluene	10	330		NA	NA		NA		NA	NA	NA					NA	
ethylphthalate	10	330		NA	NA		NA		NA	NA	NA					NA	
Chlorophenylphenylether	10	330		NA	NA		NA		NA	NA	NA					NA	
uorene	10	330		NA	NA		NA		NA	NA	NA					NA	
Nitroaniline	50	1650		NA	NA		NA		NA	NA	NA					NA	
6-Dinitro-2-methylphenol	50	1650		NA	NA		NA		NA	NA	NA					NA	
Nitrosodiphenylamine	10	330		NA	NA		NA		NA	NA	NA					NA	
Bromophenylphenylether	10	330		NA	NA		NA		NA	NA	NA					NA	
chlorobenzene	10	330		NA	NA		NA		NA	NA	NA					NA	
ntachlorophenol	50	1650		NA	NA		NA		NA	NA	NA					NA	
enanthrene	10	330		NA	NA		NA		NA	NA	NA					NA	

XTRACTABLE ORGANIC ANALYSIS   ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

alcolm Pirnie Sample Number			CB 15A	CB-15B	CB-15C	CB-9A	CB-9B	CB-8A	CB 8B	CB 8C	Trip Blank 09	Rinsate 03	CB 14A	CB 26A	CB-14B	CB-14C	CB-13A
ratory Sample Number			890809E03	890809E04	890809E05	890809E06	890809E07	890809E09	890809E10	890809E11	890809E12	890809E13	890811A01	890811A02	890811A03	890811A04	890811A05
emarks														Duplicate CB-14A			
nits			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
MIVOLATILE COMPOUNDS	Quantitation Limit (aq.)	Quantitation Limit (sol.)															
nthracene	10	330		NA	NA		NA		NA	NA	NA					NA	
i-n-butylphthalate	10	330		NA	NA		NA		NA	NA	NA					NA	
luoranthene	10	330		NA	NA		NA		NA	NA	NA					NA	
yrene	10	330		NA	NA		NA		NA	NA	NA					NA	
utylbenzylphthalate	10	330		NA	NA		NA		NA	NA	NA		650 J			NA	
,3'-Dichlorobenzidine	20	660		NA	NA		NA		NA	NA	NA				R	NA	
enzo(a)anthracene	10	330		NA	NA		NA		NA	NA	NA					NA	
is(2-Ethylhexyl)phthalate	10	330		NA	NA	250 B	NA	210 B	NA	NA	NA	5.0 B	1200 B	730 B	710 B	NA	
ene	10	330		NA	NA		NA		NA	NA	NA					NA	
i-n-octylphthalate	10	330		NA	NA	120 J	NA		NA	NA	NA		240 J			NA	
enzo(b)fluoranthene	10	330		NA	NA		NA		NA	NA	NA					NA	
enzo(k)fluoranthene	10	330		NA	NA		NA		NA	NA	NA					NA	
enzo(a)pyrene	10	330		NA	NA		NA		NA	NA	NA					NA	
ndeno(1,2,3-cd)pyrene	10	330		NA	NA		NA		NA	NA	NA					NA	
ibenz(a,h)anthracene	10	330		NA	NA		NA		NA	NA	NA					NA	
enzo(g,h,i)perylene	10	330		NA	NA		NA		NA	NA	NA					NA	
uantitation Limit Multiplier			1.18	NA	NA	1.10	NA	1.18	NA	NA	NA	1.0	1.24	1.12	1.09	NA	1.10
te Received by Laboratory			8/9/89	NA	NA	8/9/89	NA	8/9/89	NA	NA	NA	8/9/89	8/10/89	8/10/89	8/10/89	NA	8/10/89
te Sample Extracted			8/16/89	NA	NA	8/16/89	NA	8/16/89	NA	NA	NA	8/16/89	8/17/89	8/17/89	8/17/89	NA	8/17/89
te of Analysis			9/19/89	NA	NA	9/19/89	NA	9/19/89	NA	NA	NA	9/20/89	9/22/89	9/22/89	9/25/89	NA	9/21/89
rument Used for Analysis			7002B	NA	NA	7002B	NA	7002B	NA	NA	NA	7002B	7002B	7002B	7002B	NA	7002B

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS

ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number			CB-15A	CB-15B	CB-15C	CB-9A	CB-9B	CB-8A	CB-8B	CB-8C	Trip Blank #9	Rinsate #3	CB-14A	CB-26A	CB-14B	CB-14C	CB-13A
Laboratory Sample Number			890809Z03	890809Z04	890809Z05	890809Z06	890809Z07	890809Z09	890809Z10	890809Z11	890809Z12	890809Z13	890811A01	890811A02	890811A03	890811A04	890811A05
Remarks														Duplicate CB-14A			
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Quantitation Limit (aq.)	Quantitation Limit (sol.)															
Aroclor-1242	0.5	80			NA		NA		NA	NA	NA		110	NA	NA	NA	
Quantitation Limit Multiplier			1.19	1.06	NA	1.19	NA	1.19	NA	NA	NA	1.0		NA	NA	NA	1.125
Date Sample Received			8/9/89	8/9/89	NA	8/9/89	NA	8/9/89	NA	NA	NA	8/9/89	8/10/89	NA	NA	NA	8/10/89
Date Sample Extracted			8/16/89	8/16/89	NA	8/16/89	NA	8/16/89	NA	NA	NA	8/16/89	8/17/89	NA	NA	NA	8/17/89
Date of Analysis			9/3/89	9/3/89	NA	9/3/89	NA	9/3/89	NA	NA	NA	9/3/89	9/3/89	NA	NA	NA	9/3/89

NOTES:

- Compound was not detected

J Quantitation is approximate due to limitations identified during the quality control review (data validation).

B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.

R Unreliable result - Analyte may or may not be present in this sample.

UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-19A 890808AP01	CB-19C 890808AP03	CB-24A 890808AP04	CB-26C 890808AP10	CB-17A 890803P08	CB-17C 890808P10
Remarks					Medium Level		
Units		ug kg	ug kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit						
Chloromethane	10						
Bromomethane	10						
Vinyl Chloride	10						
Chloroethane	10						
Methylene Chloride	5.0	2.0 B	3.0 B		880 B	8.0 B	7.0 B
Acetone	10				1400 B	11 B	
Carbon Disulfide	5.0						
1,1-Dichloroethene	5.0						
1,1-Dichloroethane	5.0						
[illegible] 1,2-Dichloroethene	5.0						
Chloroform	5.0						
1,2-Dichloroethane	5.0						
2-Butanone	10	R	R	R			
1,1,1-Trichloroethane	5.0						
Carbon Tetrachloride	5.0						
Vinyl Acetate	10						
Bromodichloromethane	5.0						
1,1,2,2-Tetrachloroethane	5.0						
1,2-Dichloropropane	5.0						
trans-1,3-Dichloropropene	5.0						
Trichloroethene	5.0				550 J		
Dibromochloromethane	5.0						
2-Trichloroethane	5.0						
Benzene	5.0						

Malcolm Pirnie Sample Number Laboratory Sample Number		CB-19A 8908081AP01	CB-19C 8908080AP03	CB-24A 8908080AP04	CB-24C 8908080AP10	CB-17A 8908080P08	CB-17C 8908080P10
Remarks					Medium Level		
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Quantitation Limit						
cis-1,3-Dichloropropene	5.0						
Bromoform	5.0						
2-Hexanone	10						
4-Methyl-2-pentanone	10						
Tetrachloroethene	5.0			8.0			
Toluene	5.0				13,000		
Chlorobenzene	5.0				3900		
Ethylbenzene	5.0				20,000		
Styrene	5.0						
Total Xylenes	5.0				31,000 J		
Quantitation Limit Multiplier		1.1	1.1	1.1	150	1.1	1.2
Date Received by Laboratory		8/8/89	8/8/89	8/8/89	8/8/89	8/7/89	8/7/89
Date of Analysis		8/21/89	8/21/89	8/21/89	8/22/89	8/17/89	8/17/89
Instrument Used for Analysis		7001A	7001A	7001A	7001A	7001A	7001A

NOTES:

- \- Compound was not detected
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

[illegible]

Laboratory Sample Number			CB-19A 890808AP01	CB-19C 890808AP03	CB-24A 890808AP04	CB-24C 890808AP10	CB-17A 890808AP08	CB-17C 890808P10
.ks								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit						
Phenol	10	330				250 J	530	
bis(2-Chloroethyl)ether	10	330						
2-Chlorophenol	10	330						
1,3-Dichlorobenzene	10	330						
1,4-Dichlorobenzene	10	330						
Benzyl Alcohol	10	330						
1,2-Dichlorobenzene	10	330						
2-Methylphenol	10	330						
bis(2-chloroisopropyl)ether	10	330						
4-Methylphenol	10	330				180 J		
N-Nitroso-di-n-propylamine	10	330					NL	
Hexachloroethane	10	330						
Nitrobenzene	10	330						
Isophorone	10	330						
2-Nitrophenol	10	330						
2,4-Dimethylphenol	10	330						
Benzoic Acid	50	1650						
bis(2-Chloroethoxy)methane	10	330						
2,4-Dichlorophenol	10	330						
1,2,4-Trichlorobenzene	10	330						
Naphthalene	10	330				1300		
4-Chloroaniline	10	330						
Hexachlorobutadiene	10	330						
4-Chloro-3-methylphenol	10	330						
2-Methylnaphthalene	10	330				310 J		

RACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS   ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

lcolm Pirnie Sample Number oratory Sample Number			CB-19A 890808AP01	CB-19C 890808AP03	CB-24A 890808AP04	CB-24C 890808AP10	CB-17A 890808P08	CB-17C 890808P10
ate								
its			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
IVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit						
achlorocyclopentadiene	10	330						
,6-Trichlorophenol	10	330						
,5-Trichlorophenol	50	1650						
hloronaphthalene	10	330						
itroaniline	50	1650						
ethylphthalate	10	330						
naphthylene	10	330						
itroaniline	50	1650	R	R	R	R	R	R
aphthene	10	330						
-Dinitrophenol	50	1650						
itrophenol	50	1650						
enzofuran	10	330						
-Dinitrotoluene	10	330						
-Dinitrotoluene	10	330						
thylphthalate	10	330						
hlorophenylphenylether	10	330						
orene	10	330					73 J	
itroaniline	50	1650						
-Dinitro-2-methylphenol	50	1650						
itrosodiphenylamine	10	330						
romophenylphenylether	10	330						
achlorobenzene	10	330					1900	
tachlorophenol	50	1650						
anthrene	10	330						

EXTRACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS

Malcolm Pirnie Sample Number Laboratory Sample Number			CD-19A 8908008AP01	CD-19C 8908008AP03	CD-24A 8908008AP06	CD-24C 8908008AP10	CD-17A 8908008P08	CD-17C 8908008P10
Remarks								
Units			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit						
Anthracene	10	330						
Di-n-butylphthalate	10	330	95 J					
Fluoranthene	10	330					310 J	
Pyrene	10	330					220 J	
Butylbenzylphthalate	10	330						
3,3'-Dichlorobenzidine	20	660	R	R	R	R	R	R
Benzo(a)anthracene	10	330						
bis(2-Ethylhexyl)phthalate	10	330			87 B	120 B	1000 B	260 B
[illegible]ene	10	330					150	
Di-n-octylphthalate	10	330						
Benzo(b)fluoranthene	10	330						
Benzo(k)fluoranthene	10	330						
Benzo(a)pyrene	10	330						
Indeno(1,2,3-cd)pyrene	10	330						
Dibenz(a,h)anthracene	10	330						
Benzo(g,h,i)perylene	10	330						
Quantitation Limit Multiplier			1.12	1.06	1.09	1.21	1.24	1.21
Date Received by Laboratory			8/8/89	8/8/89	8/8/89	8/8/89	8/7/89	8/7/89
Date Sample Extracted			8/10/89	8/10/89	8/10/89	8/10/89	8/16/89	8/16/89
Date of Analysis			9/15/89	9/15/89	9/15/89	9/15/89	9/15/89	9/15/89
Instrument Used for Analysis			7002B	7002B	7002B	7002B	7002B	7002B

TCLP - TENTATIVELY IDENTIFIED COMPOUNDS

Estimated Concentrations

Malcolm Pirnie Sample Number Laboratory Sample Number	CB-19A 890808AP01	CB-19C 890808AP03	CB-24A 890808AP04	CB-24C 890808AP10	CB-17A 890808P08	CB-17C 890808P10
Remarks						
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
COMPOUNDS						
VOLATILE COMPONENTS	-	-	-		-	-
Chloromethylbenzene				900 J		
SEMIVOLATILE COMPONENTS						
Laboratory artifact (column bleed)					14,100(11)R	
Laboratory artifact (aldol)	2000 R	3000 R	2600 R	1000 R	3000 R	2000 R
Unknown		400 (2) J	2500 (5) J		9000 (5) J	
Polyaromatic hydrocarbon					4000 (2) J	
achlorobenzene isomer					2000 J	
rimethylbenzene isomer				500 J		
lkyl benzene				4400 (5) J		
imethylethylbenzene				500 J		
aturated hydrocarbon				5200 (7) J		
ubstituted phenol				3500 (3) J		
exadecanoic acid				700 J		
enzene derivative				5000 J		

ACTABLE ORGANIC ANALYSIS - ANALYTICAL RESULTS | ALL SOLIDS REPORTED ON A DRY WEIGHT BASIS | -page 7

ele Parole Sample Number ratory Sample Number			CB-19A 8908008AP01	CB-19C 8908008AP03	CB-24A 8908008AP04	CB-24C 8908008AP10	CB-17A 8908000P08	CB-17C 8908000P10
rix								
s			ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOLATILE COMPOUNDS	Aqueous Quantitation Limit	Solid Quantitation Limit						
lor-1242	0.5	80					6500	
titation Limit Multiplier			1.125	1.06	1.125	1.19		1.19
Sample Received			8/8/89	8/8/89	8/8/89	8/8/89	8/7/89	8/7/89
Sample Extracted			8/10/89	8/10/89	8/10/89	8/10/89	8/16/89	8/16/89
of Analysis			9/2/89	9/2/89	9/3/89	9/3/89	9/2/89	9/2/89

NOTES:
- \- Compound was not detected.
- J Quantitation is approximate due to limitations identified during the quality control review (data validation).
- B This result is qualitatively suspect since this compound was detected in a field and/or laboratory blank(s) at a similar level.
- R Unreliable result - Analyte may or may not be present in this sample.
- UL This analyte was not detected, but the quantitation limit is probably higher due to a low bias identified during the quality assurance review.

APPENDIX E

SOIL BORING LOGS AND GRAIN SIZE DISTRIBUTION CURVES FOR SOIL BORINGS CONSTRUCTED IN AREA OF FORMER LAGOON

BORING NUMBER:CB-1

PROJECT NAME :N.Storonske Cooperage
DATE :8/7/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.

PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

SURFACE ELEV.: 355.51

DATUM :Ground level

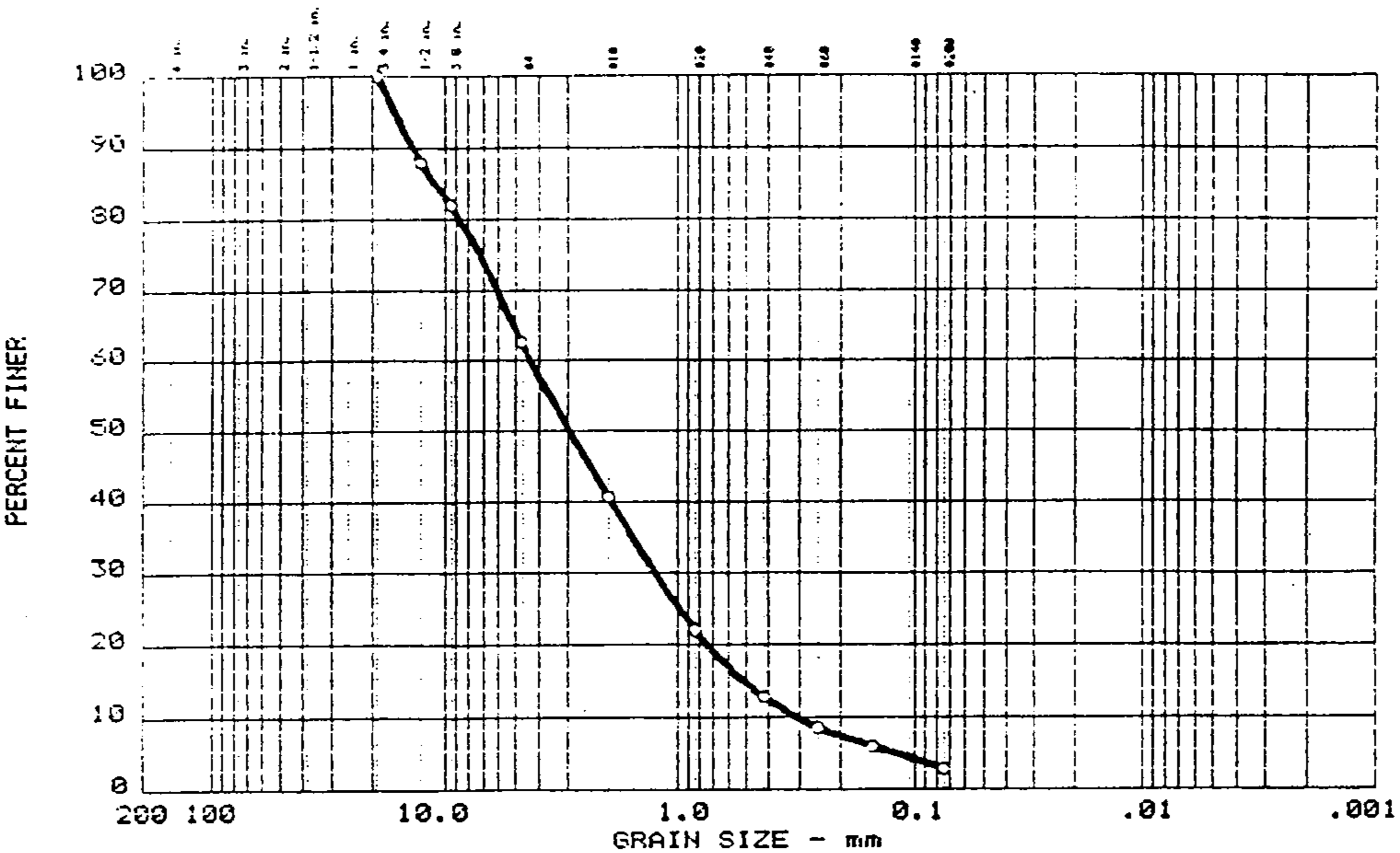
SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	3	1-3	Frm brn slt w/some m snd,tr f-m rnd gvl,tr rock frags,Fill,dry		0.0 PPME
2	3	5-7	Frm or-tan brn slt w/cl & snd becoming gry stained 6-7´,Fill dry-moist		9.0 PPME
3	28	12-14	Frm brn slt,f-c snd,f-m ang gvl tr rock frags,Fill,dry		0.0 PPME
4	11	14-16	Lse-frm brn snd,slt,gvl,Fill,dry		0.0 PPME
5	20	16-18	16-17´ Frm or brn slt & snd,dry 17-18´ Lse c snd & gvl w/ltl slt, f snd,Outwash,dry		
6	22	18-20	Stf grn gry slt,ltl cl,ang gvl Till,moist		
			Competent bedrock at 22.1´ as determined by hollow stem augers.		

BORING NUMBER:CB-2
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/1/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 349.83
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 10.2 Hnu
1	3	1-3	Frm brn sndy topsoil w/f ang gvl rd brick,moist		.2 PPME
2	9	5-7	Same, w/c snd,f-m gvl,Fill		.2 PPME
3	19	12-14	Frm dk gry slt & snd matrix,ltl cl f-c rnd gvl,poorly srt,Outwash,moist		.6 PPME
4	75	17-19	Frm-stf dk grn slt,snd matrix w/ f-c gvl,dry-moist,Till		
			Competent bedrock at 18.9′ as by split spoon.		

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	2	0.0	37.3	59.9	2.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.96	4.32	2.95	1.257	0.5123	0.3051	1.20	14.1

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND & GRAVEL, trace silt	SW	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO.INC. EAST GREENBUSH
○ Location: 2C (CB) - SAMPLE DEPTH= 12-14 ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

LAB NO. 288.002

GRAIN SIZE DISTRIBUTION TEST REPORT
EMPIRE SOILS INVESTIGATIONS, INC.

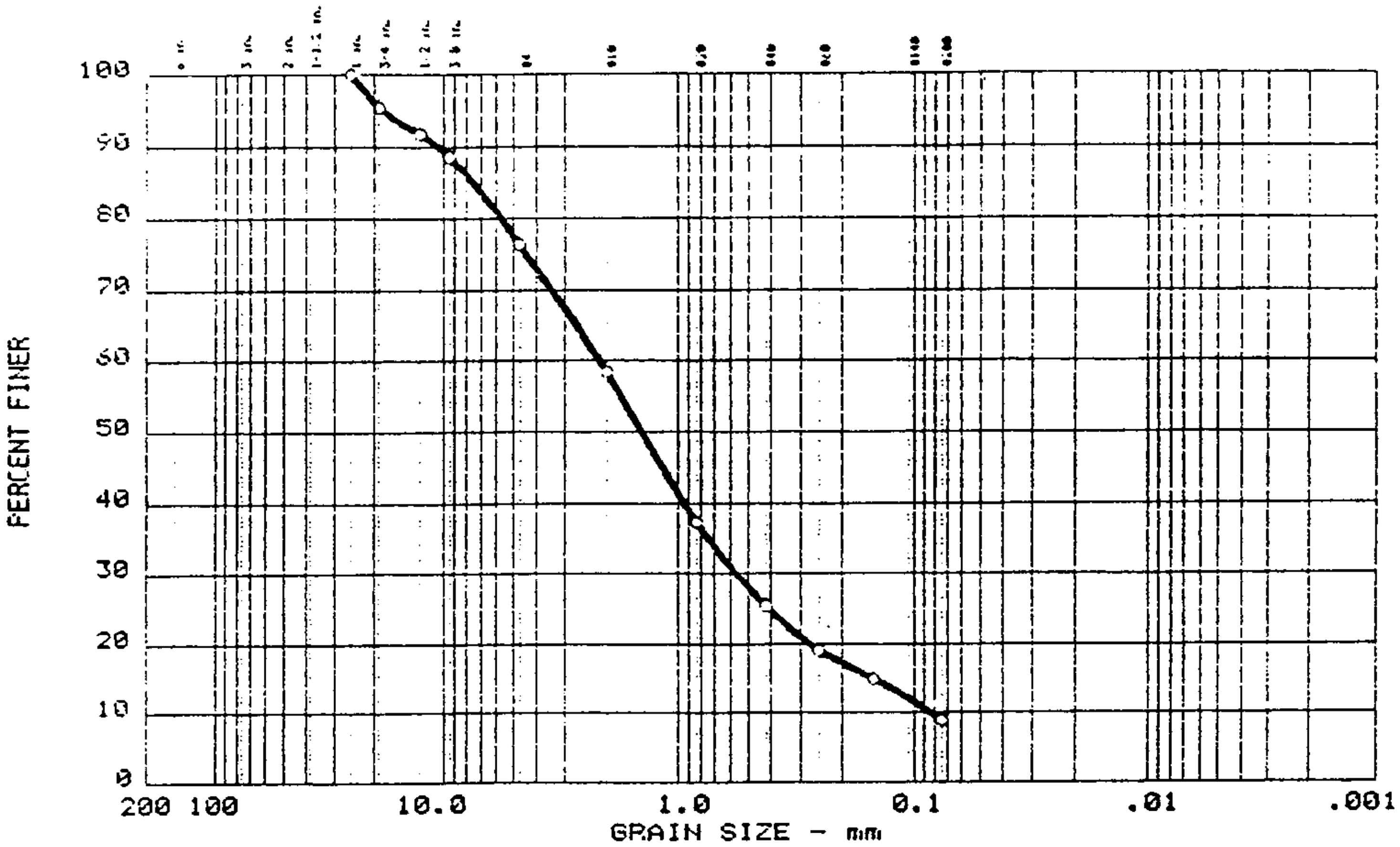
Fig. No.

BORING NUMBER:CB-3
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :7/28-7/31/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 351.52
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	2	1-3	Sft-frm,dk grn brn slt,ltl f.snd pbls,ltl cl,plastic,Fill,moist		1.4 PPME
2	4	3-5	Frm,brn-tan slt,snd,gvl,v.pooly srt,Fill,moist		100 PPME
3	33	5-7	Frm,brn slt,snd,abun pbls & gvl v.poorly srt,Fill,moist		
4	100	12- -12.3	Poor sample recovery, dns tan,slt snd,gvl		
5	10	13-15	Frm-stf,grn-gry,sndy slt w/ w rnd pbls & gvl,cl,sh frags,moist,Till		
6	100	17.7- 18.1	Hd gry slt-snd matrix w/gvl sh frags, Till		
			Competent bedrock at 19.1´ as determined by hollow stem augers		

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	3	0.0	23.7	67.4	8.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.50	2.13	1.41	0.568	0.1510	0.0830	1.82	25.7

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND, some Gravel, trace silt	SW-SM	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO. INC. EAST GREENBUSH
○ Location: 3A & 3B (cB) - SAMPLE DEPTH = A - 1-5ft
B - 5-7ft

Date: 01-18-90

Remarks:

CLIENT: MALCOLM PIRNIE

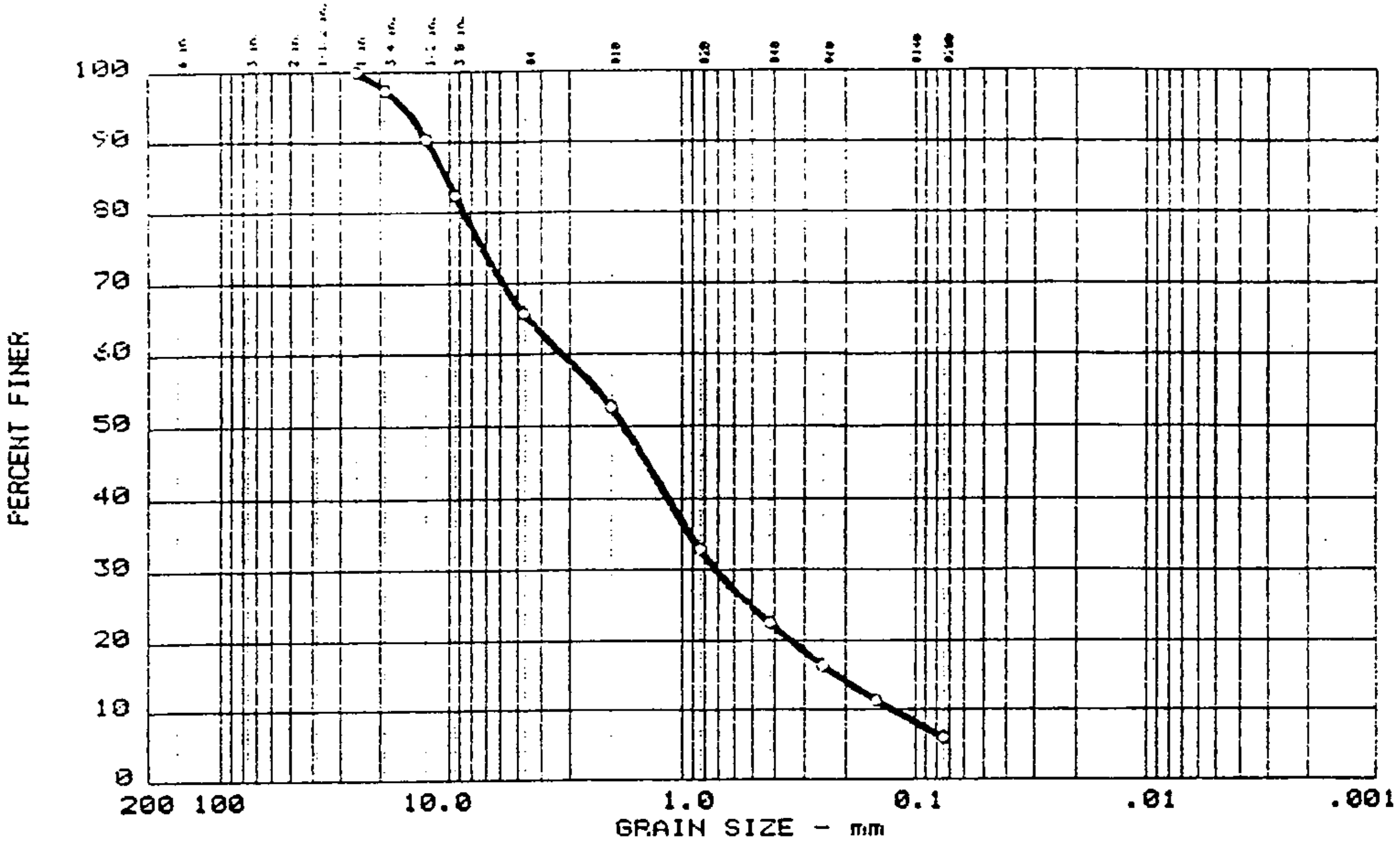
LAB NO. 288.003

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	1	0.0	34.3	59.7	6.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.35	3.24	1.76	0.715	0.2211	0.1257	1.26	25.7

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND & GRAVEL, trace silt	SW-SM	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO. INC. EAST GREENBUSH
○ Location: 3C (CB) - SAMPLE DEPTH = 13-15ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

LAB NO. 288.001

GRAIN SIZE DISTRIBUTION TEST REPORT
EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

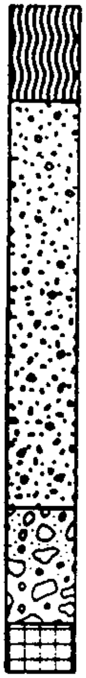
BORING NUMBER:CB-4
PROJECT NAME :N.Storonske Cooperage
DATE :7/31/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.
PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

SURFACE ELEV.: 345.55
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	15	1-3	Frm lt brn slt w/f-c snd,gvl,dry		3.1 PPME
2	25	5-7	Frm brn-gr slt matrix w/snd & f-m ang gvl,sh frags,Outwash,dry		.2 PPME
3	65	11-13	Frm-stf slt,f-c snd,f-c rnd gvl Outwash,moist		.4 PPME
4	96	18-18.6	No recovery		
			Competent bedrock at 19´ as determined by hollow stem augers		

BORING NUMBER:CB-5
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :7/27/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Investigati
INSPECTOR :N.Thompson & B.Nelson
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 345.07
DATUM :Ground level



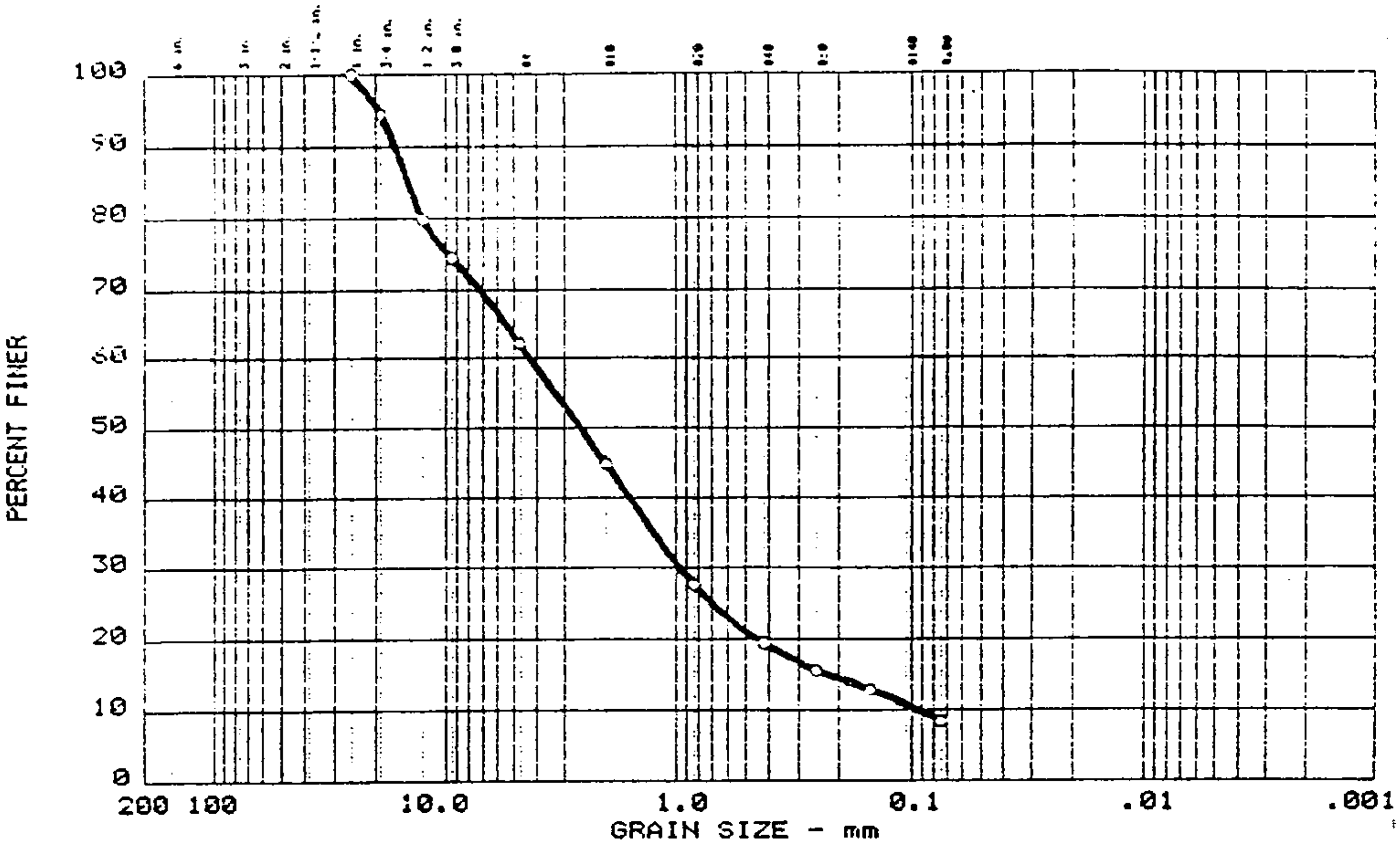
SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Well Construction
1	3	1-3	Lse,brn-gr sdy top soil,tr f.ang gvl,moist		
2	17	3-5	Lse,gr sdy top soil w/ c.ang gvl tr sltst,dry-moist		
3	9	7-9	Lse gr c.snd,slt,f.- m. rnd gvl, tr sltst,tr rd,Outwash,moist		
4	27	10-12	Same as above,wet at 11.5'		
5	22	14-16	Frm,gr gvly slt,w/fractured sltst & sm rnd m.gvl,sm rd brn c.snd, Outwash,wet		
6	78	19-20	Same as above w/ cl,Till		
7	45	21-22	Stf,gr sdy slt,moist		
		--	Weathered bedrock at 21.3'		

BORING NUMBER:CB-6
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/2/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 348.17
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 10.2 Hnu
1	3	1-3	Frm brn slt,snd,f rnd gvl,Fill, dry-moist		0.2 PPME
2	12	5-7	Lse brn m-c snd w/slt,f-m ang gvl Outwash,dry		0.0 PPME
3	23	11-13	Lse-frm c snd w/slt,f-c ang-rnd sh frags,dry Outwash		0.0 PPME
4	95	19-20.2	No recovery,wet		
			Competent bedrock at 20.2′ as determined by split spoon.		

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	5	0.0	37.8	53.8	8.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			14.74	4.25	2.56	0.963	0.2205	0.0930	2.34	45.7

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND & GRAVEL, trace silt	SW-SM	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO. INC. EAST GREENBUSH
○ Location: 6A(CB)-SAMPLE DEPTH= 1-3ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

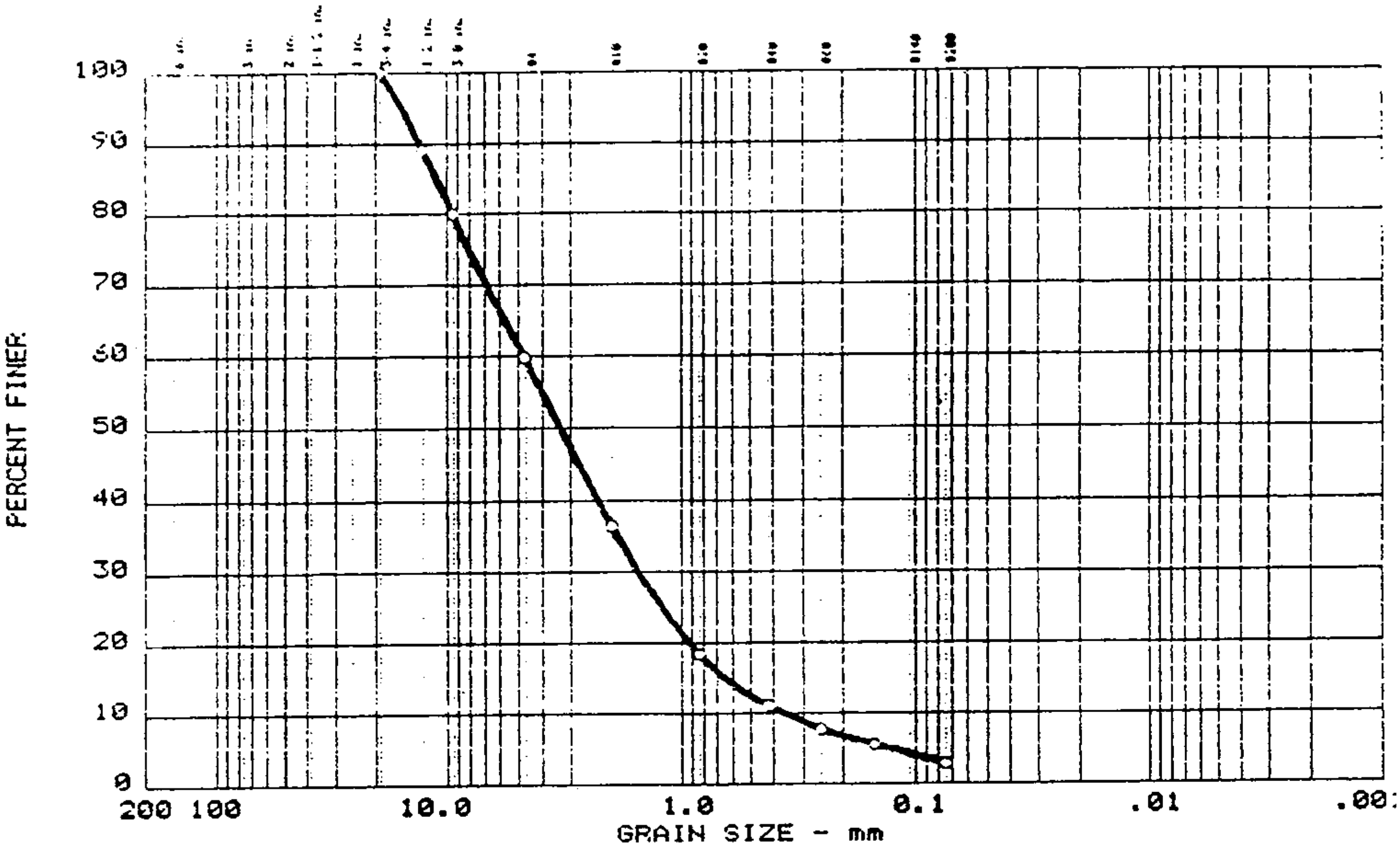
LAB. NO. 288.005

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	4	0.0	40.2	57.0	2.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.09	4.79	3.31	1.531	0.6383	0.3548	1.38	13.5

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND & GRAVEL, trace silt	SW	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO. INC. EAST GREENBUSH
○ Location: 6C (CB)-SAMPLE DEPTH = 11-13 ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

LAB. NO. 288.004

GRAIN SIZE DISTRIBUTION TEST REPORT

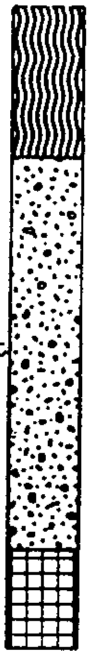
EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

BORING NUMBER:CB-7
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/10-8/11/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 356.45
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	3	2-4	Lse brn f-m snd,mod w srt,ltl slt Fill,dry		0.0 PPME
2	14	4-6	Lse brn f-c snd,f-c ang-rnd gvl Outwash at 4.2´,dry		0.0 PPME
3	19	8-10	Frm brn slt w/f-m snd,some ang f-m gvl,tr sh frag,Outwash,dry-moist		0.0 PPME
4	39	10-12	Lse gry brn f-c snd w/ang-rnd gvl some slt,Outwash,moist		
			Competent bedrock at 14.7´ as determined by hollow stem auger.		



BORING NUMBER:CB-9
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/9/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Investigati
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

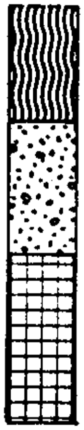
SURFACE ELEV.: 358.21
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	2	2-4	Lse brn slt,snd gvl,Fill,dry		0.6 PPME
2	15	6-8	Stf grn tan brn slt w/snd,gvl broken rock,Till,dry		0.0 PPME
3	46	8-9.2	Weathered & broken rock w/ltl cl & slt,Till,wet		
			Competent bedrock at 10.2 as determined by hollow stem augers.		

BORING NUMBER:CB-10
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/11/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 357.84
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	23	1-3	Lse -frm brn slt,snd,gvl,Fill,dry		
2	13	5-7	Lse brn f-c snd,f-c gvl,Outwash, dry		
3	91	11.5-13	Grn gry weathered bedrock,broken & ang Argillite w/rock fines.		



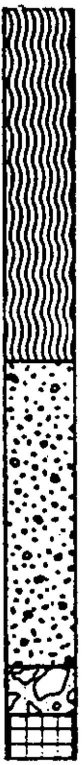
Weathered bedrock at 11.5 as determined by hollow stem augers and split spoon.

PROJECT NAME :N.Storonske Cooperage
DATE :8/10/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.

SURFACE ELEV.: 354.56

BORING NUMBER:CB-11
PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	5	1-3	Lse-frm brn slt & f snd,tr f-m ang-rnd gvl,tr sh frags,Fill,dry		0.2 PPME
		3-5	Lse or brn f snd,Fill,dry		
2	5	5-7	Lse brn f-m snd,tr ang-subrnd f-m gvl,Fill,dry		0.8 PPME
3	12	9-11	Frm-hd brn slt & snd matrix w/f-c ang-rnd gvl,tr sh frags,Outwash, dry		0.0 PPME
4	36	11-13	Frm-lse brn c-snd,f-c ang-rnd gvl some slt Outwash,dry-moist Note: Hd dns lt brn dry Till found on auger.		

Competent bedrock at 13.9′ as determined by hollow stem auger.

BORING NUMBER:CB-12

PROJECT NAME :N.Storonske Cooperage
DATE :8/11/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.

PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

SURFACE ELEV.: 357.29

DATUM :Ground level

SAMPLE No.	 N-Value	 Depth (ft.)	SOIL DESCRIPTION Density, color, SOIL, admixtures moisture, other, CONTAMINATION	Field screening of split spoon with 11.7 Hnu
1	10	1-3	Lse brn slt,snd,gvl,Fill,dry	
2	23	5-7	Lse-frm brn f-c snd w/gvl,Outwash dry	
3	100/.2	9.5 11.5	No recovery	
4	100/.4	12.5-13.8	No recovery	

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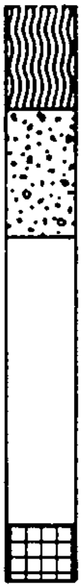
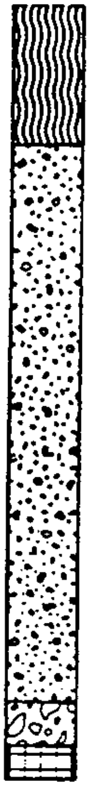


Competent bedrock at 12.8′ as determined by hollow stem augers and split spoon.

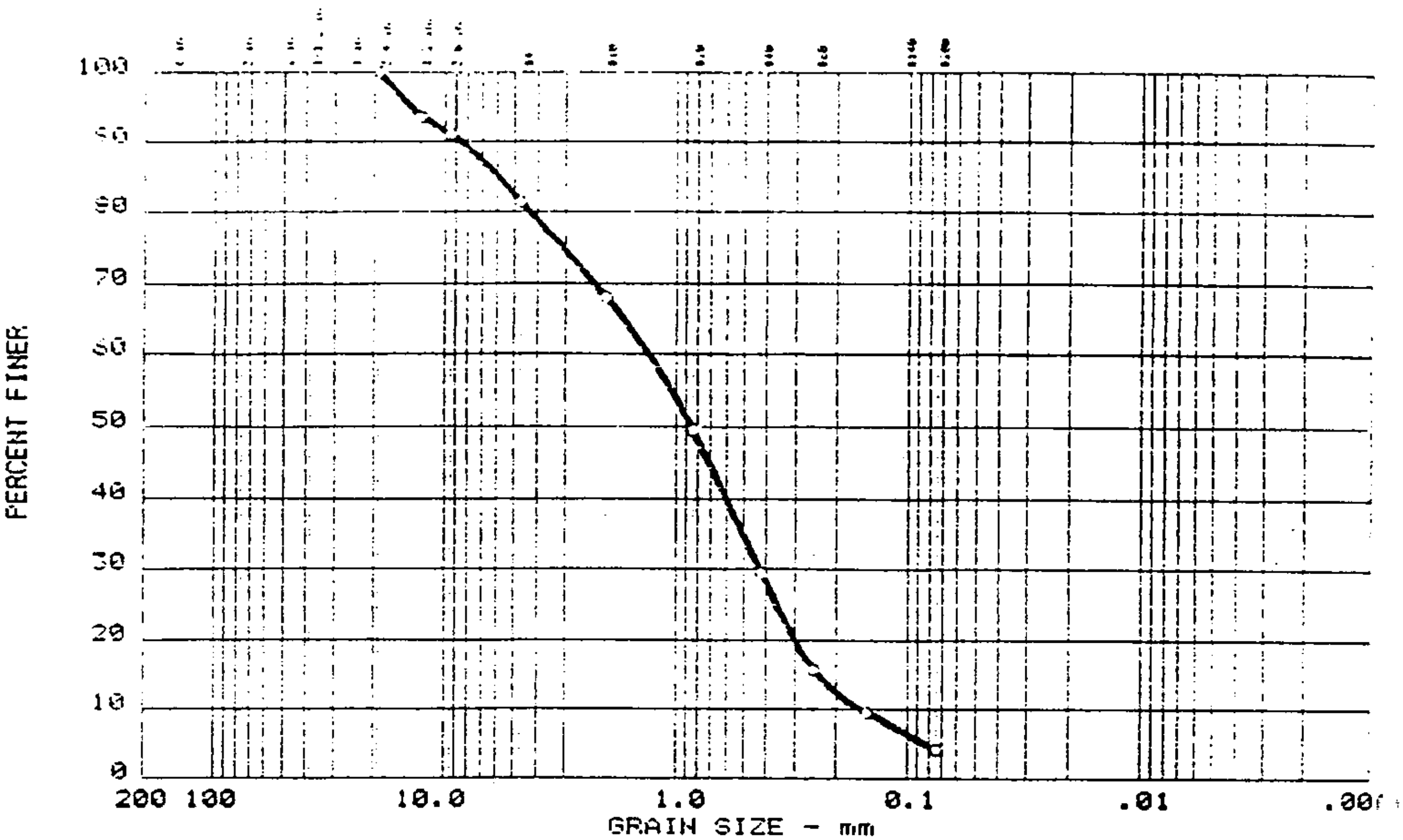
BORING NUMBER:CB-13
PROJECT NAME :N.Storonske Cooperage
DATE :8/10/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.
PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

SURFACE ELEV.: 356.65
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	3	1-3	Lse-frm tan-br slt & f snd some f-m rnd-ang gvl,fiil,dry		0.0 PPME
2	6	5-7	Frm brn c snd,some f-m snd & slt some f-m ang-subrnd gvl,Outwash, dry		0.0 PPME
3	23	9-11	Lse brn f-m snd w/ang-rnd gvl, slt,Outwash,dry		0.0 PPME
4	10	11-13	Same as above,abbundant gvl,dry		0-4.0 PPME
5	41	13-15	No recovery		
6	16	15-17	Lse brn c snd w/gvl,some slt & f snd,Outwash,moist-wet		

Competent bedrock at 19.7 as
determined by hollow stem augers.
Note: Till found on bottom of augers.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	9	0.0	18.6	77.2	4.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			5.96	1.30	0.85	0.427	0.2399	0.1567	0.89	8.3

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND, little gravel, trace silt	SP	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO.INC. EAST GREENBUSH
○ **Location:** 18A (CB) - SAMPLE DEPTH = 1-3 ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

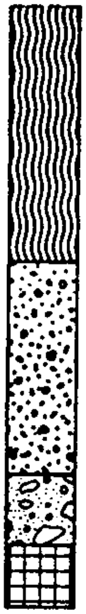
LAB. NO. 288.009

GRAIN SIZE DISTRIBUTION TEST REPORT
EMPIRE SOILS INVESTIGATIONS, INC.

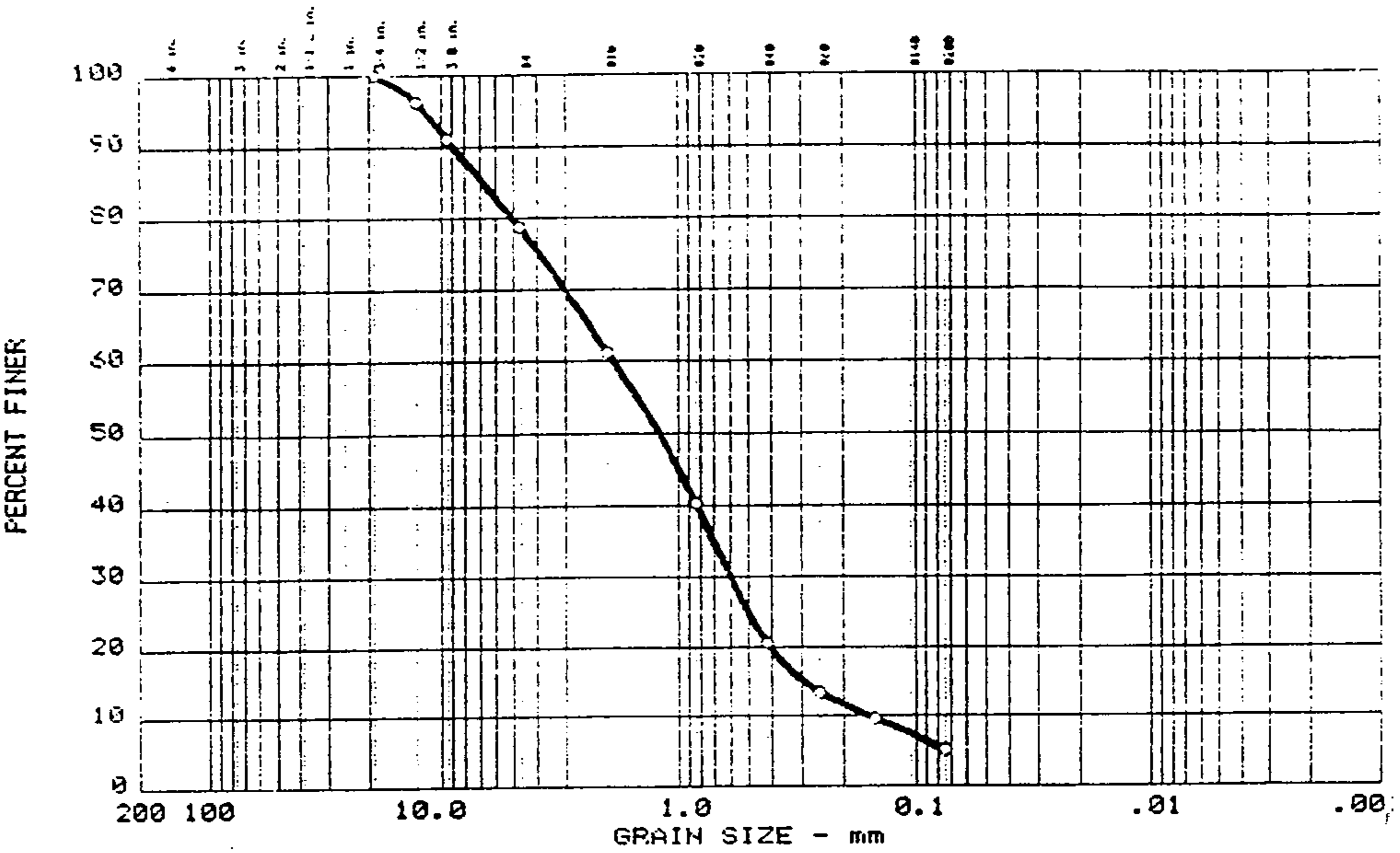
Fig. No.

BORING NUMBER:CB-17
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/7/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Invest.
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 354.47
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	3	1-3	Lse brn f-c snd w/slt & f-c gvl Fill,dry		11.0 PPME
2	12	5-7	Lse brn f-c snd,slt,ang gvl,Fill, dry		6.0 PPME
3	17	11-13	Lse brn m-c snd w/slt & gvl Outwash,dry		
4	37	19-21	Hd grn tan slt matrix w/f-c snd, sh frags,Till,dry		
			Competent bedrock at 22.4′ as determined by hollow stem augers.		

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	6	0.0	21.3	73.6	5.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.76	1.88	1.20	0.600	0.2938	0.1560	1.22	12.1

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND, some Gravel, trace silt	SW-SM	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO. INC. EAST GREENBUSH
○ Location: 17A / 17B (CB) - SAMPLE DEPTH A: 1-3ft
B: 5-7ft

Date: 01-18-90

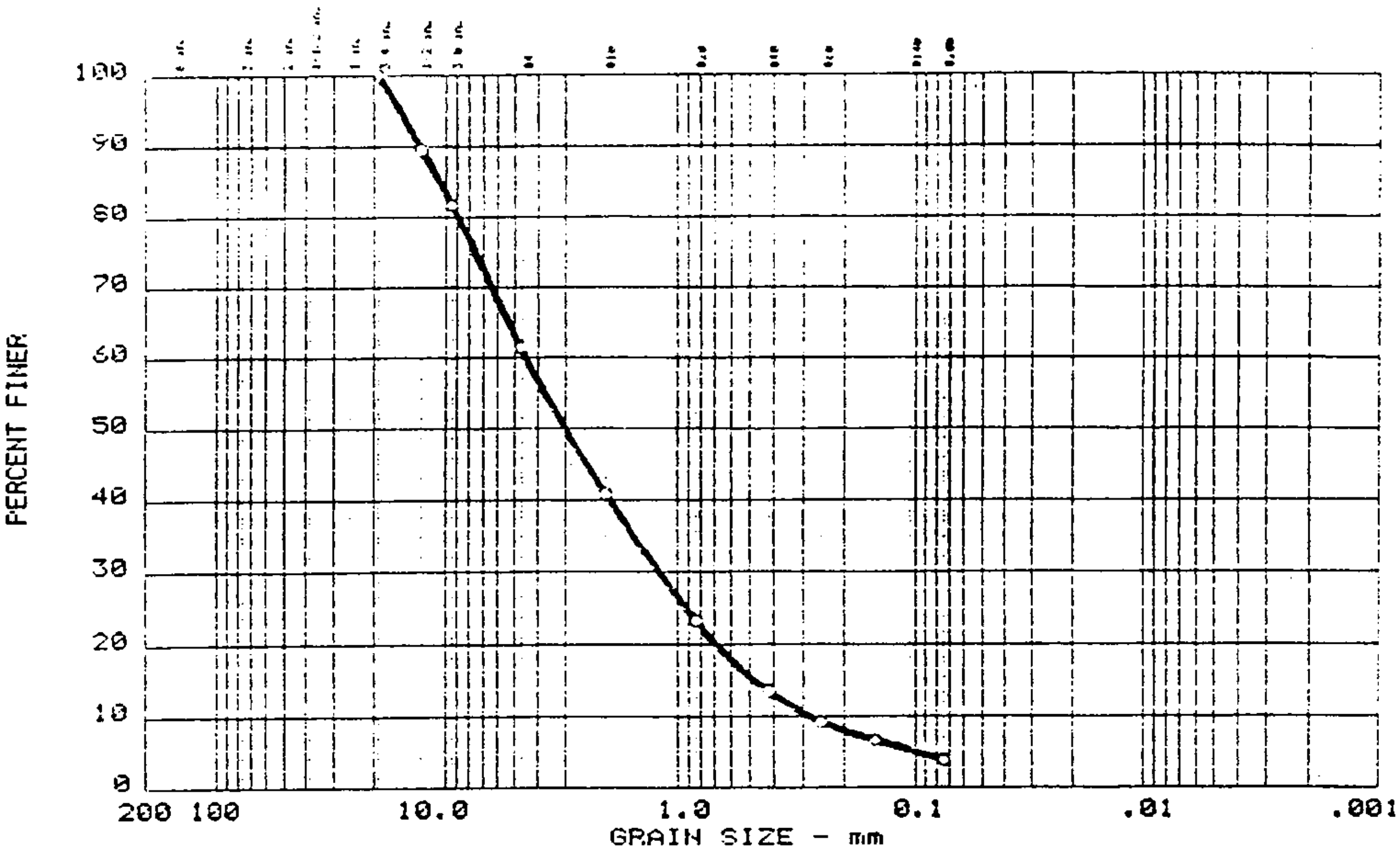
Remarks:
CLIENT: MALCOLM PIRNIE

LAB. NO. 288.006

GRAIN SIZE DISTRIBUTION TEST REPORT
EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	7	0.0	38.5	57.6	3.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.72	4.51	3.01	1.199	0.4775	0.2812	1.14	16.0

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown SAND & GRAVEL, trace silt	SW	

Project No.: AT-89-363
Project: STORONSKE COOPERAGE CO.INC. EAST GREENBUSH
○ Location: 17C (CB) - SAMPLE DEPTH = 11-13 ft

Date: 01-18-90

Remarks:
CLIENT: MALCOLM PIRNIE

LAB. NO. 288.007

GRAIN SIZE DISTRIBUTION TEST REPORT
EMPIRE SOILS INVESTIGATIONS, INC.

Fig. No.

BORING NUMBER: CB-21
PROJECT NAME : N.Storonske Cooperage
PROJECT NO. : 0852-13-1
DATE : 8/14/89
LOCATION : Schodack, N.Y.
CONTRACTOR : Empire Soils Invest.
INSPECTOR : N.Thompson & A.Murtaugh
DRILL. METHOD: 4.25" I.D. H.S.A.
SAMP. METHOD : Split spoon

SURFACE ELEV.: 354.88
DATUM : Ground level

SAMPLE			SOIL DESCRIPTION	
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	Field screening of split spoon with 11.7 Hnu
1	11	1-3	Frm brn slt w/ c snd gvl, pooly srt Fill, dry	
2	20	5-7	Lse brn c snd w/ang-rnd gvl, some f snd & slt, Outwash, dry	
3	100/.4	12-14	Boulder, no recovery	
4	20	15-17	Frm gry-brn c snd, f-m gvl w/slt Outwash, moist-wet	
5	43	18-20	Stf-hd grn-brn slt w/snd & gvl Till, wet	
6	100/.3	20-20.8	Same as above, Till, wet	

Competent bedrock at 20.8′ as determined by split spoon.

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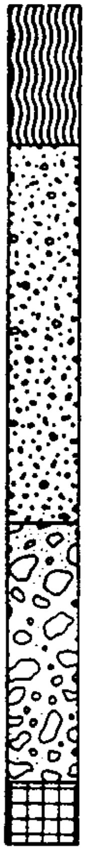

BORING NUMBER:CB-22

PROJECT NAME :N.Storonske Cooperage
DATE :8/3/89
CONTRACTOR :Empire Soils Invest.
DRILL. METHOD:4.25" I.D. H.S.A.

PROJECT NO. :0852-13-1
LOCATION :Schodack,N.Y.
INSPECTOR :N.Thompson & A.Murtaugh
SAMP. METHOD :Split spoon

SURFACE ELEV.: 352.56

DATUM :Ground level

SAMPLE			SOIL DESCRIPTION	
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	Field screening of split spoons with 11.7 Hnu
1	13	1-3	Frm brn-gry slt,snd,f-m ang gvl, Fill,dry	
2	70	5-7	Lse brn slt w/f-c snd,some f ang gvl,Fill,dry	1.0 PPME
3	16	7-9	7-8´ same as above 8-9´ Lse-frm brn c snd w/ f-c ang gvl,Outwash,dry	1.2 PPME
4	20	11-13	Stf-hd grn brn slt & snd matrix w/ ang-rnd f gvl,Outwash,dry	
5	14	13-15	Lse gry brn c snd w/some f snd & f ang gvl,Outwash,dry	0.0 PPME
6	75	18-20	No recovery	
7	30	20-22	Frm tan-lt brn f.snd & slt matrix ltl cl,some f gvl,Till, moist-wet	

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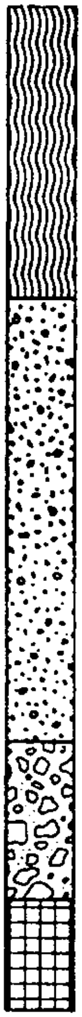
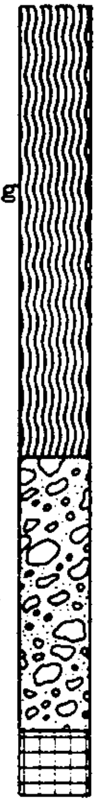


Competent bedrock at 21´ as determined by split spoon

BORING NUMBER:CB-23
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/1/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Investigati
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 353.30
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Well Construction
1	4	2-4	Frm br slt w/some f-c snd,f ang-rnd gvl,Fill,moist		
2	12	4-6	Frm brn slt w/f-c snd,some f-m ang gvl,dry-moist,Fill		
3	68	8-10	Frm brn slt,snd,c ang gvl,Fill		
4	24	10-12	Lse -frm brn f-c snd matrix w/ f-c ,ang-rnd gvl,Fill		
5	84	14-16	14-15′ Tan-brn slt & snd w/f-c ang gvl,dry 15-16′ Stf slt,snd matrix w/m rnd gvl tr cl,Till,moist		
6	50	16-17.8	Frm grn slt w/sh frags,moist-wet Till		
			Competent bedrock at 17.8′ as determined by split spoon		



BORING NUMBER:CB-24
PROJECT NAME :N.Storonske Cooperage
PROJECT NO. :0852-13-1
DATE :8/8/89
LOCATION :Schodack,N.Y.
CONTRACTOR :Empire Soils Investigati
INSPECTOR :N.Thompson & A.Murtaugh
DRILL. METHOD:4.25" I.D. H.S.A.
SAMP. METHOD :Split spoon

SURFACE ELEV.: 354.92
DATUM :Ground level

SAMPLE			SOIL DESCRIPTION		
No.	N-Value	Depth (ft.)	Density, color, SOIL, admixtures moisture, other, CONTAMINATION	STR.	Field screening of split spoon with 11.7 Hnu
1	6	2-4	Lse dk brn-blk slt,snd,gvl, Fill,moist		
2	5	4-6	Sft lt tan-brn cly slt w/few pbls Fill,moist-wet		7.0 PPME
3	10	8-10	Sft-frm grn-brn cly slt w/rock frags,Fill,moist		7.4 PPME
4	8	14-16	Sft-frm grn gry slt,snd,cl,w/ some gvl,v poorly srt,Outwash moist-wet		5 PPME
			Competent bedrock at 23.2´ as determined by hollow stem auger.