

**SOIL REMEDIATION  
IMPLEMENTATION DESIGN REPORT**

Prepared for

**BLACK & DECKER (U.S.) INC.**  
Hampstead, Maryland

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## SECTION 1 INTRODUCTION

### 1.1 OVERVIEW

A *Soil Remediation Plan* was prepared in August 1995 (WESTON, 1995) to meet the requirements of the Administrative Consent Order between the State of Maryland Department of the Environment (MDE) and Black & Decker (U.S.) Inc. This plan identified soil vapor extraction (SVE) and bioventing as the recommended remedial technologies for treatment of subsurface soil at the Black and Decker (U.S.) Inc. Hampstead, Maryland facility (the "site"). As prescribed by the plan, a pilot study was conducted to verify the effectiveness of SVE and bioventing at the site. This *Soil Remediation Implementation Design Report* presents the findings of the SVE and bioventing pilot study, and provides a conceptual design for full-scale implementation of the soil remediation.

### 1.2 OBJECTIVES

The objective of this *Soil Remediation Implementation Design Report* is to present and evaluate data obtained during the SVE and bioventing pilot study conducted at the site in accordance with the *Soil Remediation Plan* (WESTON, 1995). In addition, the data evaluation has been used as the basis for a conceptual design of a full-scale soil remediation system. With the concurrence of MDE, the full-scale system will be permitted, installed, and operated in accordance with the schedule provided in Subsection 5.7.

## SECTION 2

### SVE PILOT-SCALE SYSTEM INSTALLATION

The pilot-scale SVE system was installed between 30 October and 20 November 1996 following plans described in the Soil Remediation Plan (WESTON, 1995). Procedures used for system installation are described below:

Figure 2-1 shows the layout of the SVE system components, including extraction vents, subsurface pressure monitoring probes, trailer-mounted blower, vapor treatment system, and above-ground piping. As shown on Figure 2-1, the pilot study was conducted in two areas: the Tank Farm 2 area and the area beneath the northeast corner of the main building.

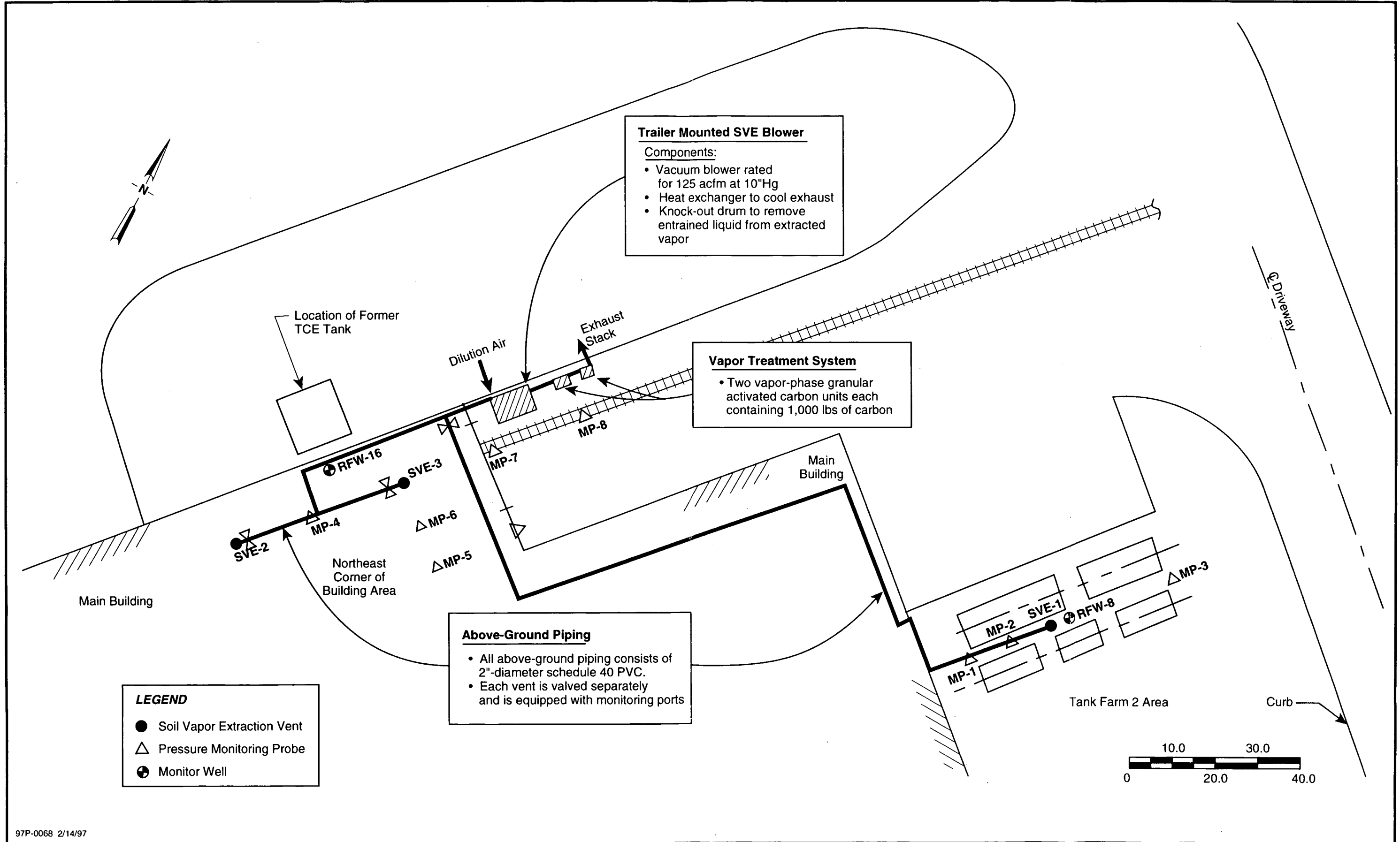
#### **2.1 TANK FARM 2 VENT CONSTRUCTION**

One extraction vent, designated as SVE-1, was located near the center of the Tank Farm 2 area as shown on Figure 2-1. This vent was installed inside a 12-inch diameter borehole which was constructed using hollow-stem auger drilling techniques. Subsurface soil samples were collected as discussed in Subsection 2.4. Borehole logs were also completed during vent construction and are included in Appendix A. The screened interval for SVE-1 extends from 16 to 25 feet (ft) below ground surface (bgs). This interval was selected based on previous investigations which defined the extent of vertical contamination in this area as discussed in the *Soil Remediation Plan* (WESTON, 1995). Construction details for SVE-1 are illustrated in Figure 2-2.

#### **2.2 NORTHEAST CORNER OF BUILDING VENT CONSTRUCTION**

Two pairs of nested extraction vents, SVE-2 and SVE-3, were installed beneath the concrete floor inside the northeast corner of the main building as shown in Figure 2-1. Each pair of nested vents was installed inside a 12-inch diameter borehole which was constructed using hollow-stem auger drilling techniques. Subsurface soil samples were collected as discussed in Subsection 2.4. Borehole logs were also completed during vent construction and are included in Appendix A. Boreholes were advanced to a depth of approximately 36 ft bgs, which corresponded to the first





**Trailer Mounted SVE Blower**  
**Components:**  
 • Vacuum blower rated for 125 acfm at 10"Hg  
 • Heat exchanger to cool exhaust  
 • Knock-out drum to remove entrained liquid from extracted vapor

**Vapor Treatment System**  
 • Two vapor-phase granular activated carbon units each containing 1,000 lbs of carbon

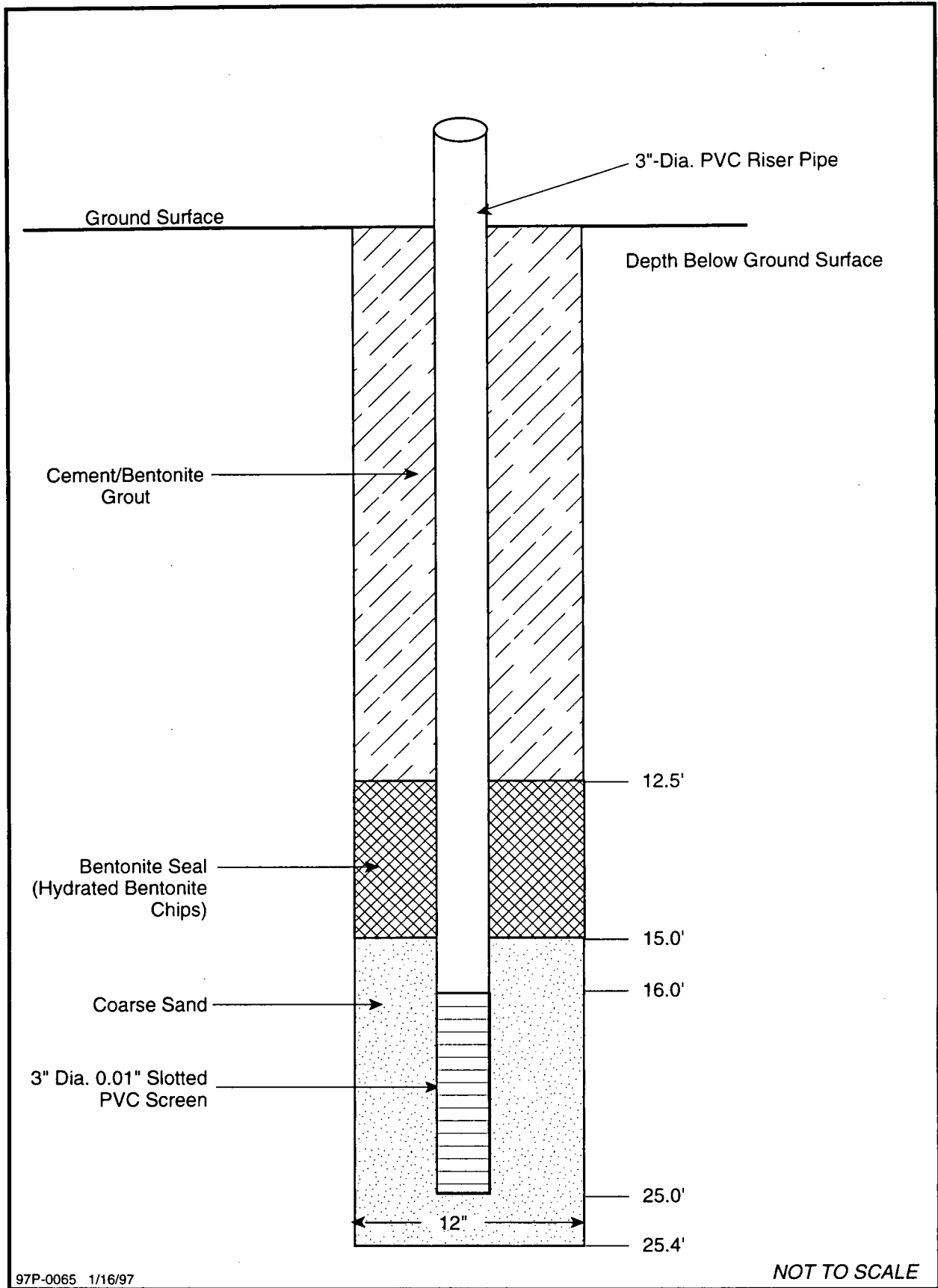
**Above-Ground Piping**  
 • All above-ground piping consists of 2"-diameter schedule 40 PVC.  
 • Each vent is valved separately and is equipped with monitoring ports

**LEGEND**  
 ● Soil Vapor Extraction Vent  
 △ Pressure Monitoring Probe  
 ⊕ Monitor Well

0 10.0 20.0 30.0 40.0

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**FIGURE 2-1 PILOT-SCALE SOIL VAPOR EXTRACTION SYSTEM LAYOUT**



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NOT TO SCALE

**FIGURE 2-2 CONSTRUCTION DETAILS OF  
EXTRACTION VENT AT TANK FARM 2**

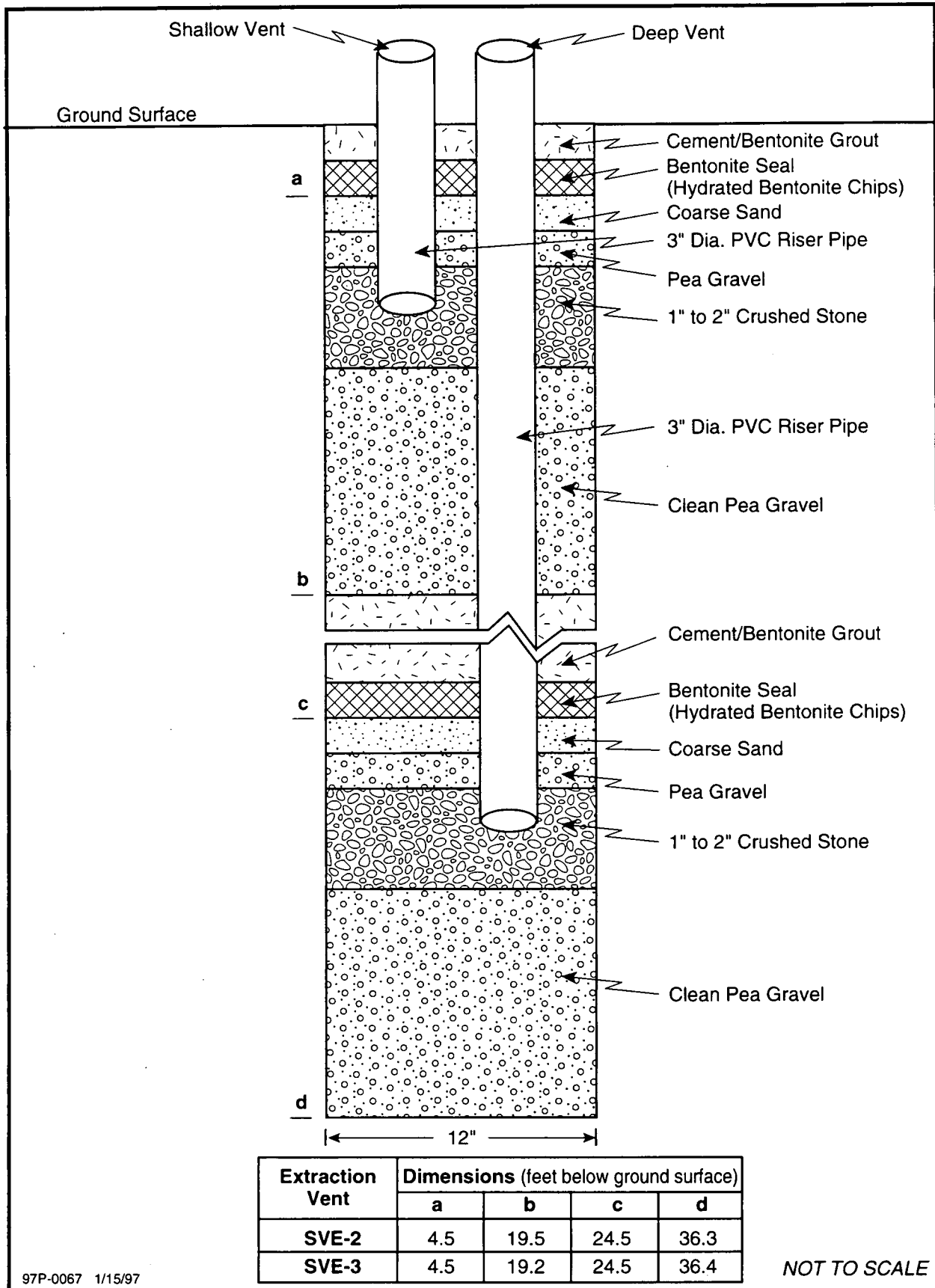
occurrence of groundwater. Termination of the boreholes at this depth, consistent with Subsection 4.2 of the *Soil Remediation Plan* (WESTON, 1995), was necessary to maximize the effective treatment zone while minimizing the collection of groundwater into the SVE system. One shallow and one deep vent (i.e., a nested vent pair) was installed in each borehole. Extraction vents were designated as SVE-2(S), SVE-2(D), SVE-3(S) and SVE-3(D) where the suffixes (S) and (D) denote shallow and deep vents, respectively. Construction details for the nested vents are illustrated on Figure 2-3.

### **2.3 SUBSURFACE PRESSURE MONITORING PROBE CONSTRUCTION**

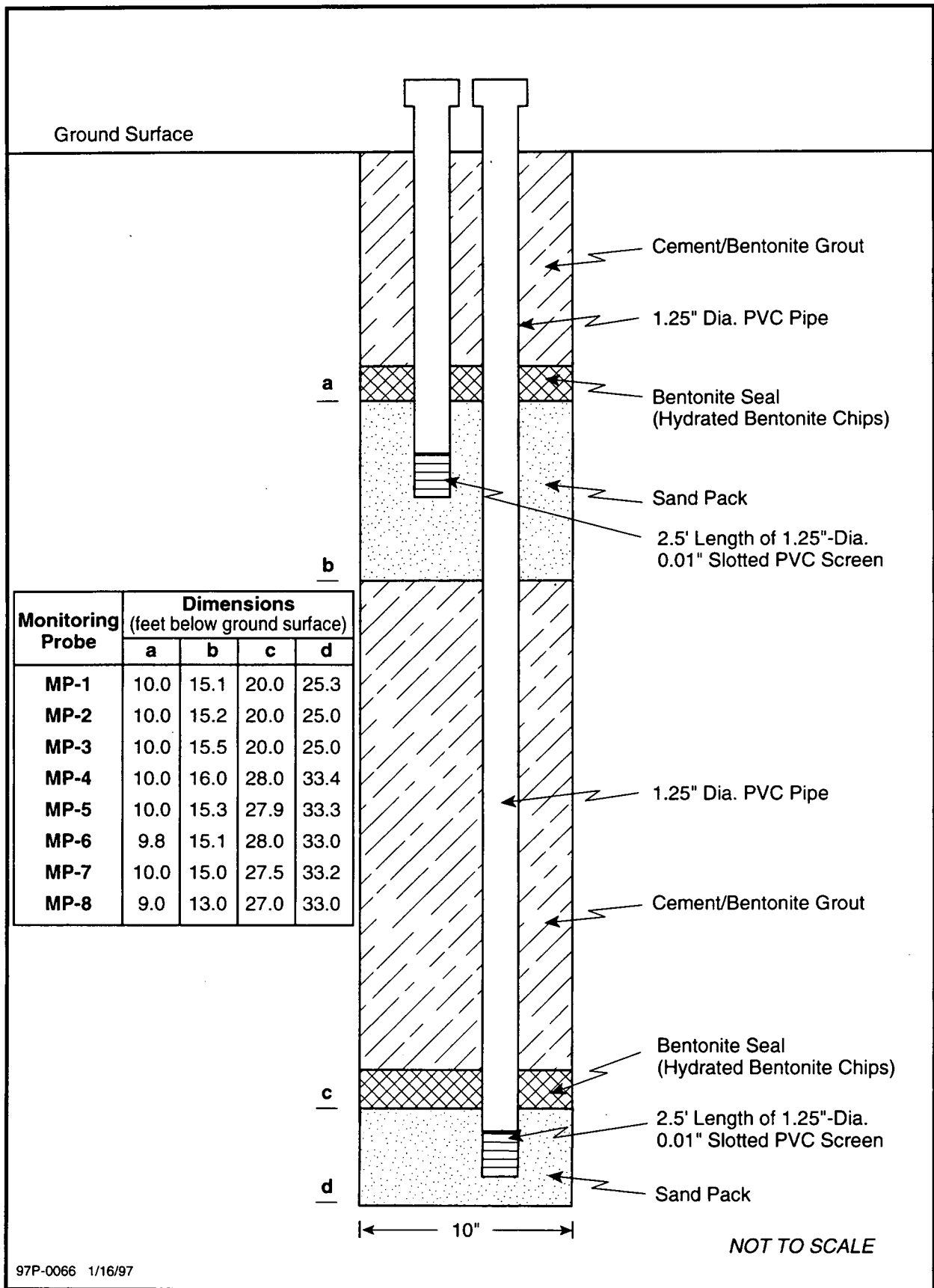
As shown in Figure 2-1, a total of eight pairs of nested subsurface monitoring probes were installed. Three of the probes, MP-1, MP-2, and MP-3 were constructed outside of the building in the Tank Farm 2 area. The remaining probes, MP-4, MP-5, MP-6, MP-7, and MP-8 were constructed in the vicinity of the northeast corner of the building. MP-7 and MP-8 were constructed outside the building beneath the ballast of the former railroad spur and MP-4, MP-5, and MP-6 were constructed inside the building through the concrete floor. Nested monitoring probes were installed inside 10-inch diameter boreholes which were constructed using hollow-stem auger drilling techniques. Subsurface soil samples were collected as discussed in Subsection 2.4. Borehole logs were also completed during probe construction and are included in Appendix A. The suffixes (S) and (D) were used to denote monitoring probes as shallow or deep, respectively. Construction details for the pressure monitoring probes are illustrated in Figure 2-4. All monitoring probes were equipped with quick-disconnect fittings. This allowed for vacuum gauges to be easily connected to the probes without a loss of negative pressure within the probe.

### **2.4 SUBSURFACE SOIL SAMPLING**

Soil samples were collected from the soil encountered in each extraction vent and monitoring probe borehole using split spoon samplers. Each borehole was logged for physical characteristics (see boring logs in Appendix A) and the subsurface soil samples were field-screened for volatile organic compounds (VOCs) using a direct reading photo-ionization detector (PID). A summary



**FIGURE 2-3 CONSTRUCTION DETAILS OF NESTED EXTRACTION VENTS AT NORTHEAST CORNER OF BUILDING**



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**FIGURE 2-4 CONSTRUCTION DETAILS OF NESTED PRESSURE MONITORING PROBES**

of subsurface soil samples collected for laboratory analysis is presented in Table 2-1. A summary of laboratory data for subsurface soil samples is presented in Table 2-2. Laboratory data packages are included in Appendix B of this report.

#### **2.4.1 Tank Farm 2**

Subsurface soil samples were collected from three depth intervals from the SVE-1 borehole and were analyzed for VOCs and Total Petroleum Hydrocarbons (TPH). Samples for laboratory analysis were selected from soil borings within target depth ranges (i.e., 0 to 7 ft bgs, 7 to 15 ft bgs, 15 to 25 ft bgs) at depths which appeared to contain the highest VOC concentrations based on field screening and visual observation. Additional samples also were collected to determine nutrient availability, geophysical characteristics, microbial plate counts, and iron content of subsurface soil at SVE-1 (see Table 2-1).

Single subsurface soil samples were also collected from monitoring probe boreholes MP-1 and MP-2 and were analyzed for VOCs and TPH. Samples were collected from depth intervals which appeared to contain the highest VOC concentrations based on field screening and visual observation.

#### **2.4.2 Northeast Corner of Building**

Subsurface soil samples were collected from three depth intervals from both the SVE-2 and SVE-3 boreholes and were analyzed for VOCs and TPH. Samples for laboratory analysis were selected from soil borings within target depth ranges (i.e., 0 to 10 ft bgs, 10 to 20 ft bgs, 20 to 35 ft bgs) at depths which appeared to contain the highest VOC concentrations based on field screening and visual observation.

Single subsurface soil samples were also collected from monitoring probe boreholes MP-4, MP-5, MP-6, and MP-7 and were analyzed for VOCs and TPH. Samples were collected from depth intervals which appeared to contain the highest VOC concentrations based on field screening and visual observation.

**Table 2-1**  
**Summary of Subsurface Soil Samples**  
**Black & Decker**  
**Hampstead, Maryland**

Vent/Probe ID	Sample ID	Sample Depth (ft bgs)	Analyses										
			VOC	TPH	Total Plate Count	Total Iron	Percent Moisture	TKN	pH	Alkalinity	Total Phos.	Hyd. Cond.*	Porosity*
<b>Tank Farm 2</b>													
SVE-1	SVE-1-005	2-5	X	X	X								
	SVE-1-009	7-9*										X	X
	SVE-1-011	9.0-10.8				X	X	X	X	X	X		
	SVE-1-013	11.0-12.3	X	X	X								
	SVE-1-015	13.0-15.0*										X	X
	SVE-1-017	15-16.8	X	X									
	SVE-1-019	17.0-18.8			X	X	X	X	X	X	X		
MP-1	MP-1-011	9.0-10.6	X	X									
MP-2	MP-2-011	9.0-10.5	X	X									
MP-3	NS	--											
<b>Northeast Corner</b>													
SVE-2	SVE-2-005	3.5-4.8	X	X									
	SVE-2-021	18.5-20.5	X	X									
	SVE-2-035	33.5-34.8	X	X									
SVE-3	SVE-3-011	8.5-10.4	X	X									
	SVE-3-020	18.5-20.0	X	X									
	SVE-3-036	34.0-35.3	X	X									
MP-4	MP-4-030	28.5-30.0	X	X									
MP-5	NS	--											
MP-6	MP-6-005	3.5-5.0	X	X									
MP-7	MP-7-031	29.0-30.3	X	X									
MP-8	NS	--											

Notes: ft bgs - feet below ground surface  
VOC - Volatile organic compounds  
TPH - Total petroleum hydrocarbons  
TKN - Total Kjeldahl nitrogen

Phos. - Phosphate  
Hyd. Cond. - Hydraulic conductivity  
NS - Not Sampled  
\* - Used Shelby Tubes

2-8

Table 2-2  
Analytical Data Summary for Subsurface Soil  
Black & Decker  
Hampstead, Maryland

Analyte	Units	Sample ID/Depth (ft bgs)					
		SVE-1-005 2.0 to 5.0	SVE-1-009 7.0 to 9.0	SVE-1-011 9.0 to 10.8	SVE-1-013 11.0 to 12.3	SVE-1-019 17.0 to 18.8	SVE-1-017 15.0 to 16.8
<b>Volatile Organic Compounds</b>							
Methylene Chloride	ug/kg	<b>11 B</b>	NA	NA	<b>11 B</b>	NA	<b>14 B</b>
Acetone	ug/kg	<b>10 BJ</b>	NA	NA	<b>10 BJ</b>	NA	<b>8 BJ</b>
1,1-Dichloroethene	ug/kg	6 U	NA	NA	6 U	NA	6 U
1,2-Dichloroethene (total)	ug/kg	6 U	NA	NA	6 U	NA	6 U
Chloroform	ug/kg	6 U	NA	NA	6 U	NA	6 U
2-Butanone	ug/kg	12 U	NA	NA	12 U	NA	12 U
1,1,1-Trichloroethane	ug/kg	6 U	NA	NA	6 U	NA	6 U
Trichloroethene	ug/kg	<b>10</b>	NA	NA	<b>10</b>	NA	6 U
1,1,2-Trichloroethane	ug/kg	6 U	NA	NA	6 U	NA	6 U
Benzene	ug/kg	6 U	NA	NA	6 U	NA	6 U
2-Hexanone	ug/kg	12 U	NA	NA	12 U	NA	12 U
Tetrachloroethene	ug/kg	<b>130</b>	NA	NA	<b>190</b>	NA	6 U
Toluene	ug/kg	<b>8</b>	NA	NA	6 U	NA	<b>1 J</b>
Xylenes (total)	ug/kg	<b>3 J</b>	NA	NA	6 U	NA	<b>1 J</b>
<b>TPH/Inorganic Analyses</b>							
% Solids	%	81.8	NA	83.5	79.9	84.6	84.8
Petroleum Hydrocarbons	mg/kg	<b>1320</b>	NA	NA	<b>118</b>	NA	<b>18.2</b>
Alkalinity	mg/kg	NA	NA	<b>150</b>	NA	<b>145</b>	NA
Total Kjeldahl Nitrogen	mg/kg	NA	NA	<b>121</b>	NA	<b>115</b>	NA
pH	pH units	NA	NA	7.4	NA	7.3	NA
Phosphate as P - Total	mg/kg	NA	NA	<b>850</b>	NA	<b>884</b>	NA
Iron	mg/kg	NA	NA	<b>44200</b>	NA	<b>29900</b>	NA
<b>Microbial Analyses</b>							
Total plate count	(2)	<b>1100000</b>	NA	NA	<b>&lt;12000</b>	<b>&lt;12000</b>	NA
<b>Geophysical Analyses</b>							
Hydraulic conductivity	cm/sec	NA	<b>1.00E-06</b>	NA	NA	NA	NA
Intrinsic permeability	darcys	NA	<b>1.04E-03</b>	NA	NA	NA	NA
Porosity	%	NA	<b>34.9 to 46.3</b> (3)	NA	NA	NA	NA

2-9

Notes: For Volatile Organic Compound (VOC) analyses, only those compounds detected are shown. Boldface type indicates chemical result above the detection limit.

(1) Sample collected using a 30-inch long shelly tube.

(2) Results expressed as a colony forming unit (cfu) per gram on a dry weight basis.

(3) Initial value prior to saturation and consolidation.

ft bgs = feet below ground surface

U = Not Detected

J = Detected below quantification limit

B = Detected in laboratory blank

NA = Not analyzed



Table 2-2 (continued)  
Analytical Data Summary for Subsurface Soil  
Black & Decker  
Hampstead, Maryland

Analyte	Units	Sample ID/Depth (ft bgs)					
		MP-1-011 9.0 to 10.6	MP-2-011 9.0 to 10.5	MP-2-011(DL) 9.0 to 10.5	SVE-2-005 3.5 to 4.8	SVE-2-021 18.5 to 20.5	SVE-2-035 33.5 to 34.8
<b>Volatile Organic Compounds</b>							
Methylene Chloride	ug/kg	11 B	17 B	1900 B	9 B	9 B	6 B
Acetone	ug/kg	7 JB	35 B	4700 B	13 B	12 U	12 U
1,1-Dichloroethene	ug/kg	6 U	82	NA	6 U	6 U	6 U
1,2-Dichloroethene (total)	ug/kg	6 U	350	390 J	6 U	6 U	6 U
Chloroform	ug/kg	6 U	17	NA	6 U	6 U	6 U
2-Butanone	ug/kg	11 U	10 J	NA	12 U	12 U	12 U
1,1,1-Trichloroethane	ug/kg	6 U	E	3900	6 U	6 U	6 U
Trichloroethene	ug/kg	6 U	E	11000	4 J	6 U	6 U
1,1,2-Trichloroethane	ug/kg	6 U	20	NA	6 U	6 U	6 U
Benzene	ug/kg	6 U	7	NA	6 U	6 U	6 U
2-Hexanone	ug/kg	11 U	26	NA	12 U	12 U	12 U
Tetrachloroethene	ug/kg	6 U	E	33000	6 U	6 U	6 U
Toluene	ug/kg	6 U	10	NA	6 U	6 U	6 U
Xylenes (total)	ug/kg	6 U	6 U	NA	6 U	6 U	6 U
<b>TPH/Inorganic Analyses</b>							
% Solids	%	90.8	81.7	NA	86.2	80.9	85.4
Petroleum Hydrocarbons	mg/kg	11.1	80600	NA	13.2	13.1	8.8
Alkalinity	mg/kg	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/kg	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA
Phosphate as P - Total	mg/kg	NA	NA	NA	NA	NA	NA
Iron	mg/kg	NA	NA	NA	NA	NA	NA
<b>Microbial Analyses</b>							
Total plate count	(2)	NA	NA	NA	NA	NA	NA
<b>Geophysical Analyses</b>							
Hydraulic conductivity	cm/sec	NA	NA	NA	NA	NA	NA
Intrinsic permeability	darcys	NA	NA	NA	NA	NA	NA
Porosity	%	NA	NA	NA	NA	NA	NA

2-10

Notes: For Volatile Organic Compound (VOC) analyses, only those compounds detected are shown. Boldface type indicates chemical result above the detection limit.

- (1) Sample collected using a 30-inch long shelly tube.
- (2) Results expressed as a colony forming unit (cfu) per gram on a dry weight basis.
- (3) Initial value prior to saturation and consolidation.

ft bgs = feet below ground surface

U = Not Detected

J = Detected below quantification limit

B = Detected in laboratory blank

NA = Not analyzed

Table 2-2 (continued)  
Analytical Data Summary for Subsurface Soil  
Black & Decker  
Hampstead, Maryland

Analyte	Units	Sample ID/Depth (ft bgs)					
		SVE-3-011 8.5 to 10.4	SVE-3-020 18.5 to 20.0	SVE-3-036 34.0 to 35.3	MP-4-30 28.5 to 30.0	MP-6-005 3.5 to 5.0	MP-7-031 29.0 to 30.3
<b>Volatile Organic Compounds</b>							
Methylene Chloride	ug/kg	<b>8 B</b>	<b>11 B</b>	<b>9 B</b>	<b>9 B</b>	<b>8 B</b>	<b>11 B</b>
Acetone	ug/kg	<b>10 BJ</b>	<b>11 BJ</b>	<b>7 BJ</b>	12 U	11 U	<b>8 BJ</b>
1,1-Dichloroethene	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
Chloroform	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
2-Butanone	ug/kg	12 U	13 U	12 U	12 U	11 U	12 U
1,1,1-Trichloroethane	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
Trichloroethene	ug/kg	6 U	<b>18</b>	6 U	<b>10</b>	6 U	6 U
1,1,2-Trichloroethane	ug/kg	6 U	6 U	6 U	<b>22</b>	6 U	6 U
Benzene	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
2-Hexanone	ug/kg	12 U	13 U	12 U	12 U	11 U	12 U
Tetrachloroethene	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
Toluene	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
Xylenes (total)	ug/kg	6 U	6 U	6 U	6 U	6 U	6 U
<b>TPH/Inorganic Analyses</b>							
% Solids	%	84.4	77.2	86.3	81.9	82.6	84.8
Petroleum Hydrocarbons	mg/kg	<b>8.5</b>	<b>13.2</b>	<b>9.6</b>	<b>19.9</b>	4 U	NA
Alkalinity	mg/kg	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/kg	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA
Phosphate as P - Total	mg/kg	NA	NA	NA	NA	NA	NA
Iron	mg/kg	NA	NA	NA	NA	NA	NA
<b>Microbial Analyses</b>							
Total plate count	(2)	NA	NA	NA	NA	NA	NA
<b>Geophysical Analyses</b>							
Hydraulic conductivity	cm/sec	NA	NA	NA	NA	NA	NA
Intrinsic permeability	darcys	NA	NA	NA	NA	NA	NA
Porosity	%	NA	NA	NA	NA	NA	NA

2-11

Notes: For Volatile Organic Compound (VOC) analyses, only those compounds detected are shown. Boldface type indicates chemical result above the detection limit.

(1) Sample collected using a 30-inch long Shelby tube.

(2) Results expressed as a colony forming unit (cfu) per gram on a dry weight basis.

(3) Initial value prior to saturation and consolidation.

ft bgs = feet below ground surface

U = Not Detected

J = Detected below quantification limit

B = Detected in laboratory blank

NA = Not analyzed

## **2.5 ABOVE-GROUND COMPONENTS**

The layout and specifications for the above-ground components of the pilot-scale SVE system are shown on Figure 2-1. These components are briefly discussed in the following subsections.

### **2.5.1 Above-Ground Piping**

Upon installation of the extraction vents and monitoring probes, the extraction vents were piped to a common manifold using 2-inch diameter Schedule 40 polyvinyl chloride (PVC) piping. Each extraction vent was equipped with a ball-valve to allow testing of individual vents or any combination of vents during test runs. These valves also made it possible to adjust the vacuum applied to individual vents during runs involving the simultaneous operation of multiple vents. The manifold was equipped with a dilution air valve just upstream of the blower intake. This valve allowed the system operating pressure to be adjusted and also prevented overload of the positive displacement blower.

### **2.5.2 Trailer-Mounted SVE Blower System**

The trailer mounted SVE blower system included the following major components:

- Positive displacement vacuum blower rated for 125 actual cubic feet per minute (acfm) at a vacuum of 10 inches of mercury.
- Knock-out drum to remove entrained liquid from the extracted vapor.
- Air to air heat exchanger to cool blower exhaust prior to the vapor treatment system.

### **2.5.3 Vapor Treatment System**

Extracted soil vapor was treated prior to emission using two, 1000-lb. granular activated carbon (GAC) bins connected in series.

## SECTION 3

### SVE PILOT STUDY EVALUATION

#### 3.1 TEST RUN OVERVIEW

A total of 12 individual test runs were conducted at various operating pressures (vacuums) and vent configurations. Test Run Nos. 1 through 3 were conducted in the Tank Farm 2 area while Run Nos. 4 through 12 were conducted in the northeast corner of the building area. Test Run No. 12 was designed to determine the optimal operating conditions so that the SVE system could be adjusted for efficient VOC removal during sustained operations. Once these operating conditions were determined during Run No. 12, sustained operations were initiated using the final adjustments made at the end of Run No. 12 without interruption of SVE operation.

Physical parameters including static pressure, air flow, temperature, relative humidity, and relative VOC concentrations (collected using a direct reading flame ionization detector [FID]) were collected from several locations including:

- Extraction vent(s).
- Manifold upstream from blower.
- Dilution air pipe. (FID measurement not required at this location)
- Blower exhaust.

In addition, FID readings were periodically collected from the discharge port on both the primary and secondary carbon units. These ports were denoted as GAC1-OUT and GAC2-OUT, respectively. One air sample was collected at the end of each test run using 6-liter Summa canisters. These samples were collected from blower exhaust and were analyzed for VOCs by EPA Method TO-14

The test runs are summarized on Table 3-1. A summary of laboratory data for air samples is included on Table 3-2. VOC mass removal rates and total VOCs removed are summarized on Table 3-3 for each of the twelve test runs. Laboratory data packages are included in Appendix B. The SVE pilot study raw data are included in Tables 1 through 12 of Appendix C.

**Table 3-1  
Summary of Test Runs  
Black & Decker  
Hampstead, Maryland**

Test Run	Configuration	Operating Pressure (inches of water)	Key Measurements	Air Samples Collected	Purpose
1	SVE-1 open	-40	Q, P, SP, OVA	AS01-OUT	To determine AP, ROI, MR, and Q at low vacuum.
2	SVE-1 open	-80	Q, P, SP, OVA	AS02-OUT	To determine AP, ROI, MR, and Q at moderate vacuum.
3	SVE-1 open	-135	Q, P, SP, OVA	AS03-OUT	To determine AP, ROI, MR, and Q at high vacuum.
4	SVE-3(S) open	-40	Q, P, ROI, OVA	AS04-OUT	To determine ROI, MR, and Q at low vacuum.
5	SVE-3(D) open	-40	Q, P, ROI, OVA	AS05-OUT	To determine ROI, MR, and Q at low vacuum.
6	SVE-3(S) open	-80	Q, P, SP, OVA	AS06-OUT	To determine AP, ROI, MR, and Q at moderate vacuum.
7	SVE-3(D) open	-80	Q, P, SP, OVA	AS07-OUT	To determine AP, ROI, MR, and Q at moderate vacuum.
8	SVE-2(S) open	-140	Q, P, SP, OVA	AS08-OUT	To determine AP, ROI, MR, and Q at high vacuum.
9	SVE-2(D) open	-140	Q, P, SP, OVA	AS09-OUT	To determine AP, ROI, MR, and Q at high vacuum.
10	SVE-3(S) open	-140	Q, P, SP, OVA	AS10-OUT	To determine AP, ROI, MR, and Q at high vacuum.
11	SVE-3(D) open	-140	Q, P, SP, OVA	AS11-OUT	To determine AP, ROI, MR, and Q at high vacuum.
12	SVE-3(D), SVE-3(S) SVE-2(D), SVE-2(S) open.	-40, -80, -125, -110	Q, P, SP, OVA	AS12-OUT	To determine optimal operating conditions.
SO	SVE-3(D), SVE-3(S) SVE-2(D), SVE-2(S) open.	-110	Q, P, SP, OVA	ASS01-OUT, ASS02- OUT, ASS03-OUT, ASS04-OUT	To determine steady-state mass removal rate and cumulative mass removal rate.

3-2

Notes: Q = Air Flowrate  
P = Operating Pressure  
SP = Subsurface Pressure

OVA = Organic Vapor Analyzer  
AP = Air Permeability  
ROI = Radius of Influence

MR = Mass Removal Rate  
SO = Sustained Operations

**Table 3-2**  
**Summary of VOC Results for Air Samples**  
**Black & Decker**  
**Hampstead, Maryland**

Sample ID	Date/Time Collected	Run No.	TCE (mg/scm)	PCE (mg/scm)	TCA (mg/scm)
<b>Tank Farm 2</b>					
AS01-OUT	3-Dec-96 16:15	1	0.71	7.6	ND
AS02-OUT	3-Dec-96 20:00	2	2	17	1.2
AS03-OUT	4-Dec-96 11:35	3	3.9	30	2.2
<b>Northeast Corner</b>					
AS04-OUT	4-Dec-96 15:16	4	87	1.2	ND
AS05-OUT	5-Dec-96 11:25	5	25	ND	ND
AS06-OUT	5-Dec-96 15:30	6	260	ND	ND
AS07-OUT	5-Dec-96 18:40	7	60	ND	ND
AS08-OUT	6-Dec-96 10:40	8	130	ND	ND
AS09-OUT	6-Dec-96 16:15	9	170	ND	ND
AS10-OUT	9-Dec-96 13:10	10	310	ND	ND
AS11-OUT	9-Dec-96 18:35	11	150	ND	ND
AS12-OUT	10-Dec-96 13:40	12	420	ND	ND
ASS01-OUT	10-Dec-96 17:05	SO	330	ND	ND
ASS02-OUT	11-Dec-96 13:40	SO	240	ND	ND
ASS03-OUT	12-Dec-96 14:20	SO	160	ND	ND
ASS04-OUT	13-Dec-96 9:30	SO	150	ND	ND

Notes: TCE - Trichloroethene  
PCE - Tetrachloroethene  
TCA - 1,1,1-Trichloroethane  
mg/scm - milligrams per standard cubic meter  
SO - Sustained operations  
ND - Not detected

Table 3-3  
VOC Mass Removal Rates  
Black & Decker  
Hampstead, Maryland

Run	Run Start Date/Time	Run Stop Date/Time	Duration (hours)	TCE (mg/scm)	PCE (mg/scm)	TCA (mg/scm)	Total VOC (mg/scm)	Air Flow (scfm)	Mass Removal Rate (lb/hr)	Total Mass Removed (lb)
<b>Tank Farm 2</b>										
1	3-Dec-96 13:32	3-Dec-96 16:15	2.7	0.71	7.6	ND	8	142	0.00	0.01
2	3-Dec-96 17:35	3-Dec-96 20:02	2.4	2	17	1.2	20	109	0.01	0.02
3	4-Dec-96 8:35	4-Dec-96 11:45	3.2	3.9	30	2.2	36	92	0.01	0.04
<b>Subtotal</b>										<b>0.07</b>
<b>Northeast Corner</b>										
4	4-Dec-96 11:55	4-Dec-96 15:22	3.4	87	1.2	ND	88	139	0.05	0.16
5	5-Dec-96 8:25	5-Dec-96 11:30	3.1	25	ND	ND	25	131	0.01	0.04
6	5-Dec-96 13:00	5-Dec-96 15:35	2.6	260	ND	ND	260	112	0.11	0.28
7	5-Dec-96 16:25	5-Dec-96 18:45	2.3	60	ND	ND	60	111	0.02	0.06
8	6-Dec-96 7:25	6-Dec-96 10:44	3.3	130	ND	ND	130	75	0.04	0.12
9	6-Dec-96 12:40	6-Dec-96 16:20	3.7	170	ND	ND	170	87	0.06	0.20
10	9-Dec-96 9:10	9-Dec-96 13:15	4.1	310	ND	ND	310	103	0.12	0.49
11	9-Dec-96 15:35	9-Dec-96 18:40	3.1	150	ND	ND	150	81	0.05	0.14
12	10-Dec-96 8:10	10-Dec-96 13:40	5.5	420	ND	ND	420	93	0.15	0.80
<b>Subtotal</b>										<b>2.29</b>
Sustained Operations	10-Dec-96 12:50	10-Dec-96 13:40	0.8	420	ND	ND	420	93	0.15	0.12
	10-Dec-96 13:40	10-Dec-96 17:05	3.4	330	ND	ND	330	96	0.12	0.45
	10-Dec-96 17:05	11-Dec-96 13:40	20.6	240	ND	ND	240	94	0.08	2.09
	11-Dec-96 13:40	12-Dec-96 14:20	24.7	160	ND	ND	160	97	0.06	1.76
	12-Dec-96 14:20	13-Dec-96 9:30	19.2	150	ND	ND	150	97	0.05	1.08
<b>Subtotal</b>										<b>5.50</b>
<b>Total</b>										<b>7.86</b>

3-4

Notes: Air flowrates and concentrations represent conditions at the blower outlet.  
TCE - Trichloroethene  
PCE - Tetrachloroethene  
TCA - 1,1,1-Trichloroethane

mg/scm - milligrams per standard cubic meter  
scfm - standard cubic feet per minute  
ND - Not detected

### 3.2 SUSTAINED OPERATIONS

The primary purpose of the sustained operation was to determine the steady-state contaminant mass removal rate. Sustained operations were initiated on 10 December 1996 at 12:50 p.m. and continued to 13 December 1996 at 12:15 p.m. Sustained operations were conducted only on the vents in the northeast corner of the building, consistent with the objectives of the *Soil Remediation Plan* (WESTON, 1995). Sustained operations were conducted at an operating pressure of -110 inches of water. This pressure appeared to be the highest vacuum that could be achieved without causing groundwater to be pulled into the extraction vents. This resulted in a total extracted soil vapor flow rate of approximately 60 scfm. During sustained operations, sand from the borehole annulus was pulled into SVE-2(S). The flow of sand into the vent was stopped by partially closing the valve for SVE-2(S) until the vacuum applied to the vent was reduced to approximately -70 inches of water. This resulted in a reduction in extracted vapor flow rate from 17 scfm to 11 scfm at SVE-2(S).

Air sampling and physical parameter measurements were performed in a manner consistent with the test runs previously discussed. A total of five air samples were collected during sustained operations from the blower exhaust and were analyzed for TO-14 VOCs.

A summary of laboratory data for air samples is included in Table 3-2. Laboratory data packages are included in Appendix B. The SVE pilot study raw data for sustained operations are included in Table 13 of Appendix C..

### 3.3 EVALUATION OF SVE DATA

The data obtained from the test runs and sustained operations is evaluated by area in the following subsections.



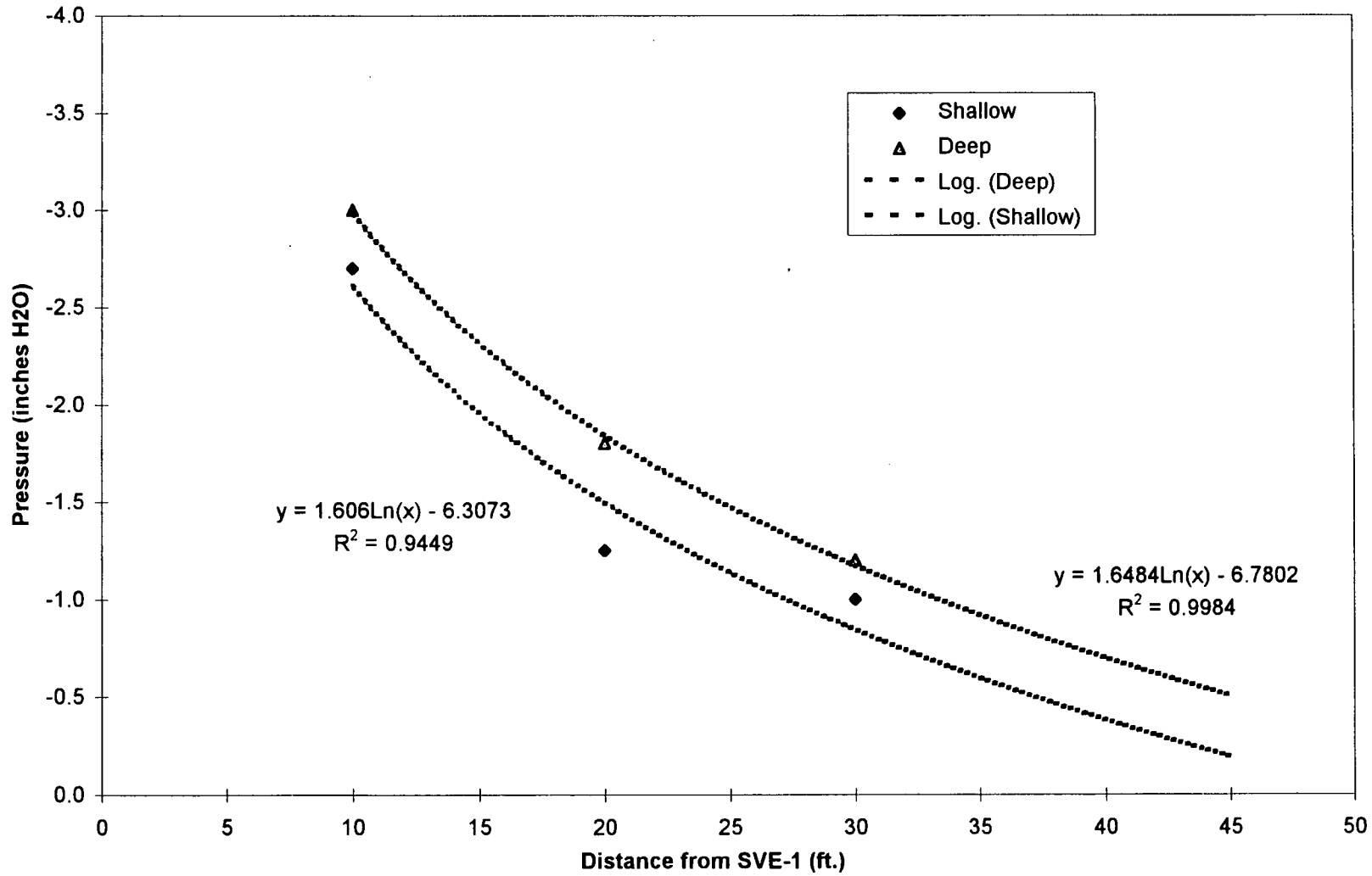
### 3.3.1 Tank Farm 2 Area

Operational data from Test Run Nos. 1, 2, 3 were used to evaluate the following relationships in the Tank Farm 2 area:

- Subsurface pressure in both shallow and deep soil stratum as a function of lateral distance from SVE-1 (radius of influence).
- Subsurface pressure in shallow and deep probes as a function of time (air permeability).
- Air flow rate as a function of operating pressure.
- VOC mass removal rate as a function of operating pressure.

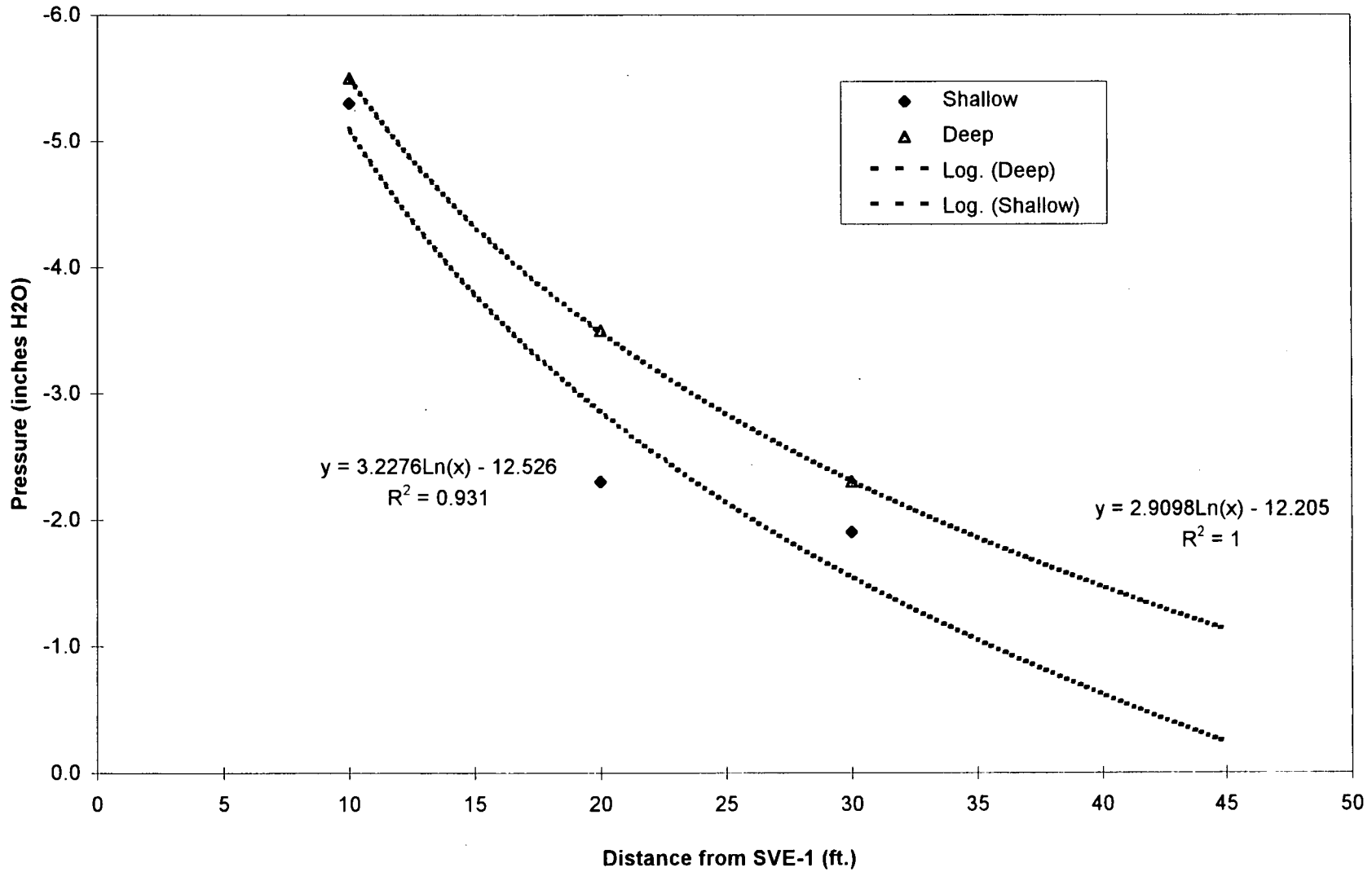
Radius of Influence: The radius of influence is defined as the maximum lateral distance from an extraction vent at which the process of vapor extraction impacts the subsurface soil vapor pressure resulting in a lower than ambient subsurface pressure measurement (i.e., less than 0 inches of water). A subsurface pressure of -0.1 to -1.0 inches of water is used to estimate the radius at which significant treatment occurs. Lateral distance versus subsurface pressures collected during the medium and high vacuum (-80 and -120 inches of water operating pressure) test runs conducted at SVE-1 are plotted on Figures 3-1 and 3-2. The data was fitted to an equation of the form  $y = m \ln(x) + b$  using a regression method. The correlation coefficient ( $R^2$ ) measures the "fit" of the data. In general, an  $R^2$  above 0.9 indicates a good fit, while values less than 0.7 indicate that the data do not fit the equation. Radius of influence values measured in deep monitoring probes were only slightly higher than those measured in the shallow monitoring probes indicating that short-circuiting of air from the surface is not occurring in the shallow vents. This trend was evident in all three test runs conducted on SVE-1. Subsurface pressures did not vary significantly with increasing vacuum and were similar for all three runs. A radius of influence of 30 ft would be sufficient to encompass the area of contaminated soils in Tank Farm 2 based upon data collected in the *Soil Remediation Plan* (WESTON, 1995) and in this pilot study. Based upon Figures 3-1 and 3-2, a radius of influence of 40 ft is conservatively estimated.

Figure 3-1  
Lateral Distance versus Subsurface Pressure  
SVE-1 at -80 Inches of Water



3-7

Figure 3-2  
Lateral Distance versus Subsurface Pressure  
SVE-1 at -135 inches of Water



Air Permeability: Subsurface pressure data from the low and high vacuum test runs (-40 and -135 inches of water operating pressure) are plotted vs. time on Figures 3-3 and 3-4 for air permeability determination. Air permeability data was collected at the beginning of each test run conducted at SVE-1; however, data from the test run conducted at medium vacuum did not produce a useful air permeability curve and therefore a plot is not presented. Air permeability values were calculated using the following equation (EPA, 1991):

$$k = (10^{-8} r^2 e \mu / 4P)^{(B/A+0.5772)}$$

Where:

k = air permeability (cm<sup>2</sup>).

r = radial distance from extraction well (m).

e = air filled soil porosity.

$\mu$  = viscosity of air (1.8 x 10<sup>-4</sup> g/cm-sec).

P = ambient atmospheric pressure (g/cm-s<sup>2</sup>)

A = slope of time versus subsurface pressure plot

B = y-intercept of time versus subsurface pressure plot

Air permeability values of 10<sup>-10</sup> to 10<sup>-11</sup> cm<sup>2</sup> were calculated for the subsurface soil at SVE-1. These values correlate with the laboratory-derived intrinsic permeability of 1.04 x 10<sup>-11</sup> cm<sup>2</sup> reported for the Shelby tube sample collected from SVE-1 (see Table 2-1).

Vacuum Versus Flow Rate: Data from all three runs was used to plot operating vacuum versus air flow rate from SVE-1 as shown on Figure 3-5. This plot indicates that the air flow rate from SVE-1 increased linearly as increasing vacuum was applied, within the range tested.

Vacuum Versus VOC Mass Removal Rate: Data from all three runs was used to plot vacuum versus the total VOC mass removal rate as shown on Figure 3-6. The VOCs detected in air samples collected from SVE-1 consisted of tetrachloroethene (PCE) and lesser amounts of 1,1,1-trichloroethane (TCA) and trichloroethene (TCE). As shown on Figure 3-6, the VOC mass removal rate increased proportionately as increasing vacuum was applied. The overall projected daily VOC removal rate was 0.2 to 0.3 lb at operating pressures of -70 to -120 inches of water. It

Figure 3-3  
Air Permeability Test  
SVE-1 at -40 Inches of Water

3-10

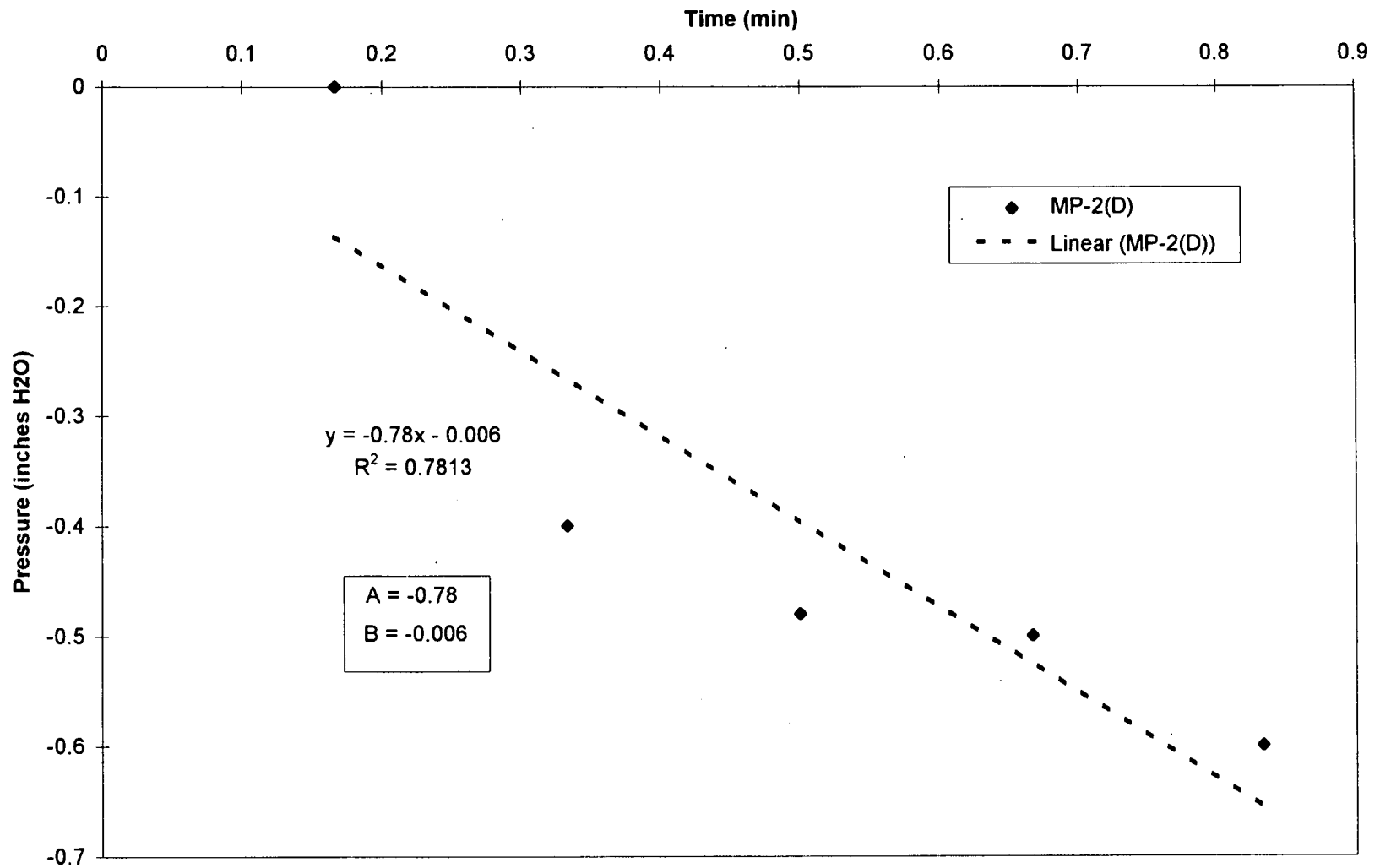


Figure 3-4  
Air Permeability Test  
SVE-1 at -135 Inches of Water

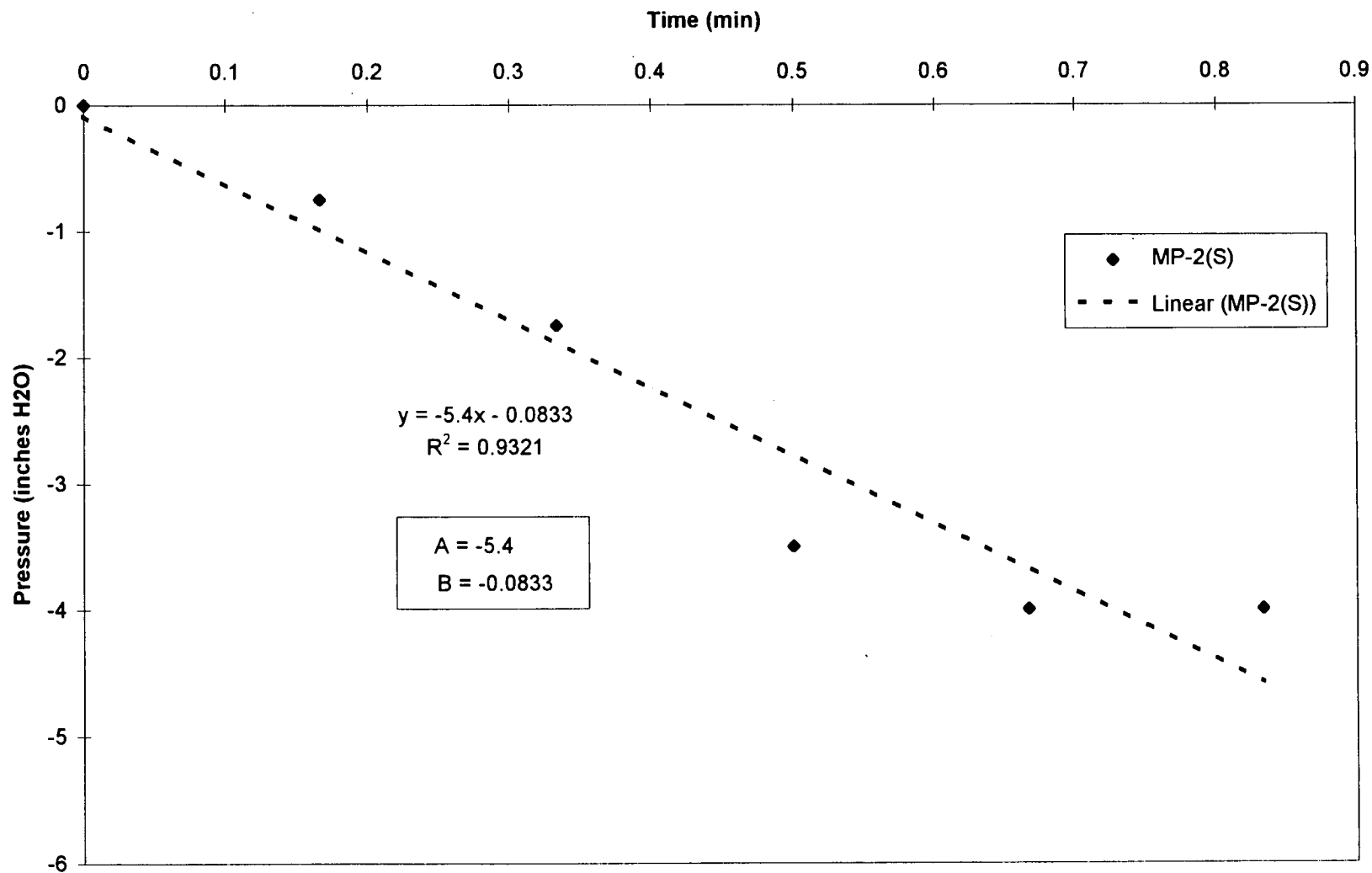


Figure 3-5  
Vacuum versus Air Flowrate for SVE-1

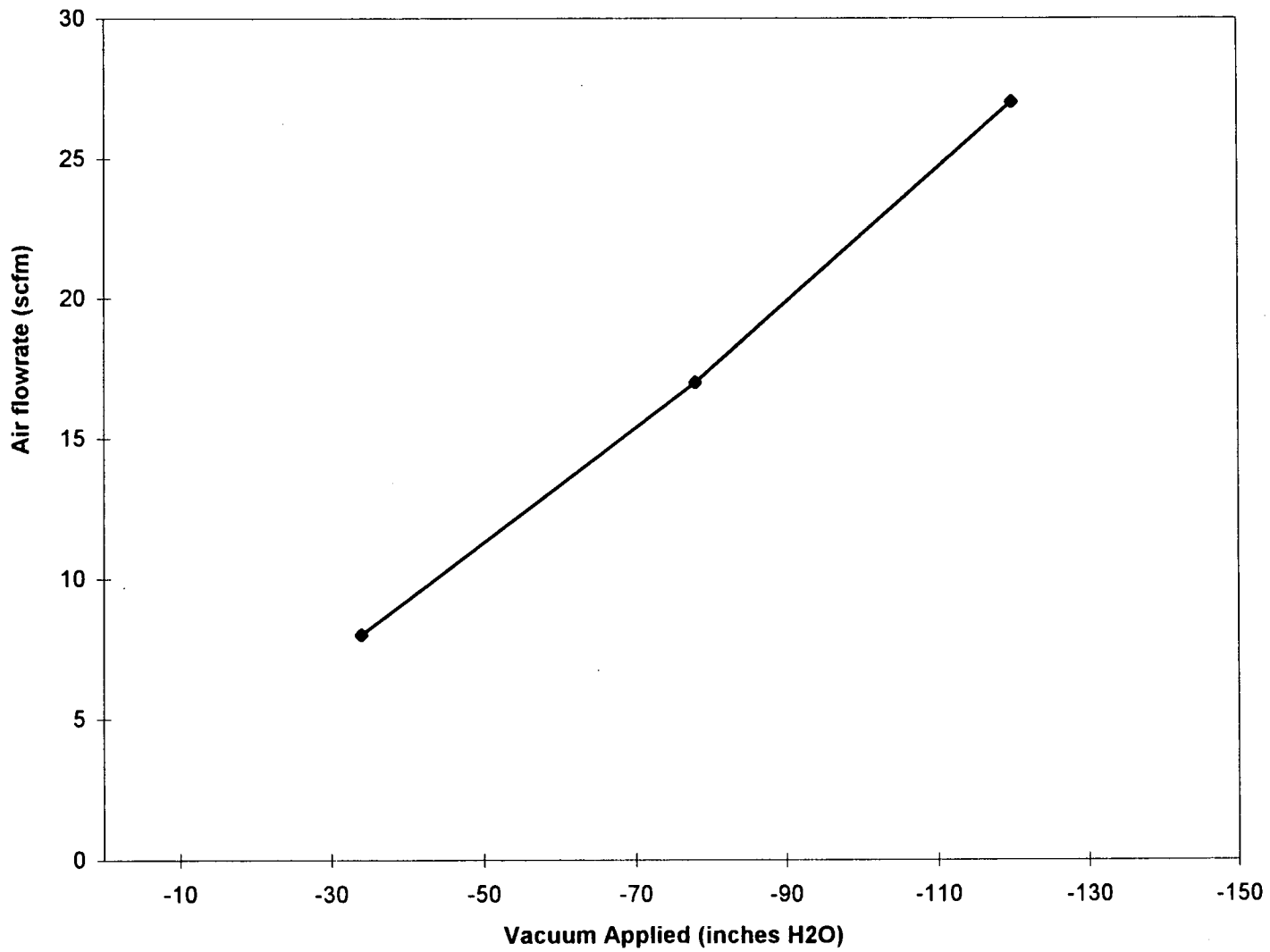
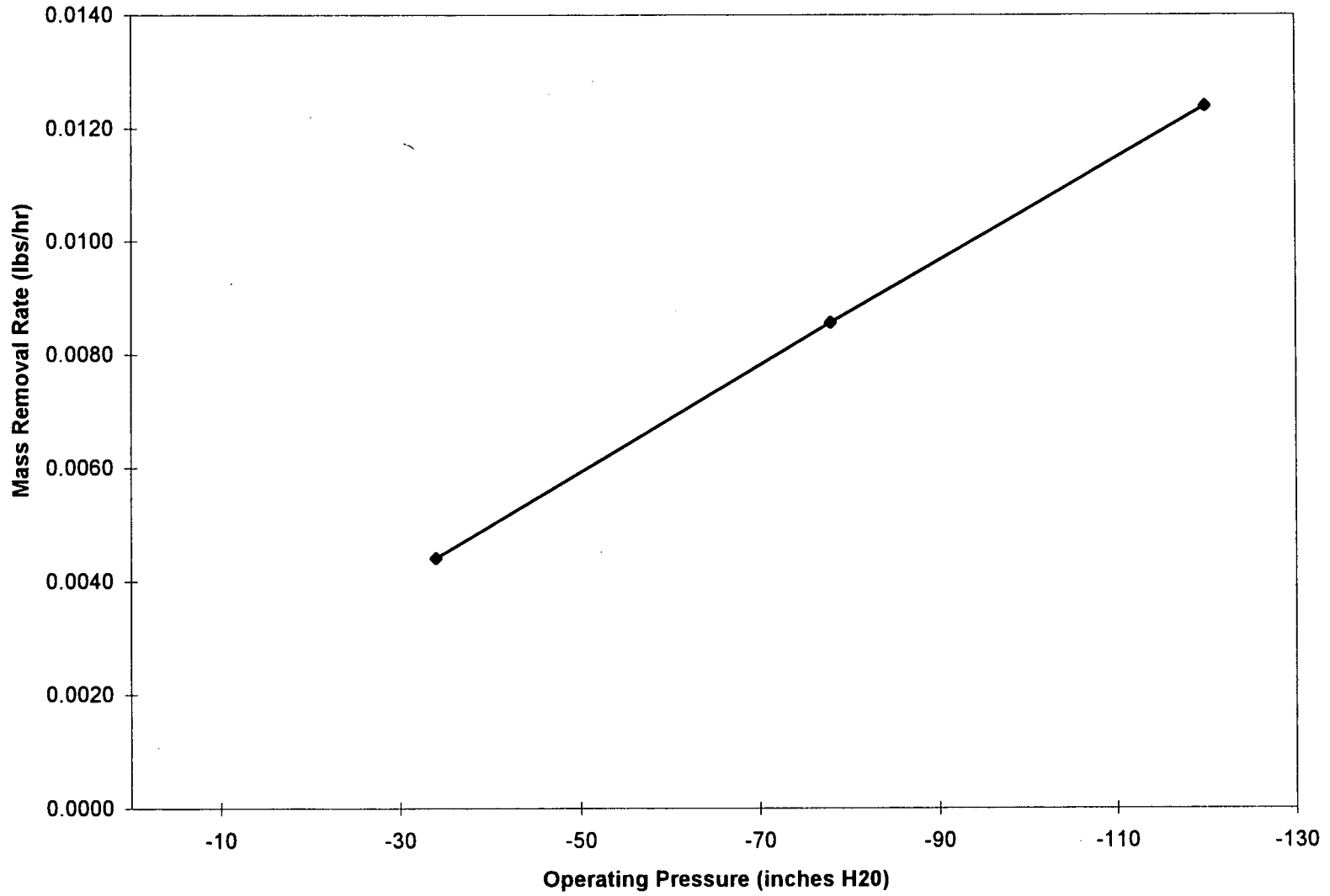


Figure 3-6

Vacuum versus Total VOC Mass Removal Rate for SVE-1





is important to note that the vent in this area will be used for bioventing, where the objective is to provide oxygen to subsurface soil to facilitate bioremediation of contaminants rather than to induce a vacuum.

Subsurface Soil Samples: As summarized on Table 2-2, TPH and VOCs (primarily TCE and PCE) were detected in subsurface soils. The highest concentrations of contaminants were detected in subsurface soil from the 9.0 to 10.5 ft. bgs interval at MP-2 which is near the center of the Tank Farm 2 area. Much lower concentrations were found at the 2.0 to 5.0 ft bgs interval in SVE-1. No significant concentrations were encountered at these same depths in MP-1. These results are consistent with prior studies in this area.

Semivolatile Air Sample Result at MP-2(D): One air sample was collected from monitoring probe MP-2(D) during the pilot study. This probe was selected for semivolatile organic compounds (SVOC) sampling based on the TPH results from subsurface soil samples collected during probe installation. This air sample was collected approximately 5 days after the completion of SVE test runs on SVE-1. The sample was collected by extracting soil vapor from MP-2(D) through a sorbent resin tube. Approximately 1100 liters of vapor were passed through the tube as measured using a rotometer. The air sample was analyzed for EPA TO-13 constituents as summarized on Table 3-4. Based on a maximum air extraction rate of 30 scfm from SVE-1 and the SVOC analytical results discussed above, an SVOC extraction rate of less than 1 lb per year would be expected.

The following conclusions can be made for the Tank Farm 2 area based on the pilot study data:

- Subsurface soil data indicate the highest concentrations of contaminants are located at MP-2 near the center of the Tank Farm 2. Based on analytical data and field observations, significant subsurface soil contamination appears to be confined to within 15 ft of MP-2.
- Based upon a comparison of the radius of influence at SVE-1 (approximately 40 ft.) with Figure 2-1, and considering historical sampling results in the Tank Farm 2 area, it is apparent that contaminated subsurface soils in the entire Tank Farm 2 area are well

**Table 3-4**  
**Analytical Results for Semivolatiles at MP-2(D)**  
**Black & Decker**  
**Hampstead, Maryland**

Analyte	Sample ID	
	ASMP2D-01 <sup>(1)</sup> (ug)	ASMP2D-01 <sup>(2)</sup> (ug/L)
1-Methylnaphthalene	15	0.014
2-Methylnaphthalene	17	0.015
Acenaphthylene	2.9	0.003

Notes:

Sample was collected by passing approximately 1100 L of air withdrawn from MP-2(D) through an XAD sorbent tube.

<sup>(1)</sup> Laboratory result indicating the mass of analyte detected on the XAD sorbent tube.

<sup>(2)</sup> Laboratory result divided by the volume of sample drawn across the sorbent tube.

- within the radius of influence treated at SVE-1, even at the lowest vacuum and flow rate tested.
- 
- Moderate air permeability values indicate that the subsurface soil in the vicinity of SVE-1 may not readily transmit large volumes. This is confirmed by the extracted air flow rate (7 to 27 scfm). However, these flow rates are more than sufficient to support bioventing, as discussed in Section 4.
- While data indicate that the VOC mass removal rate increases proportionately with increasing vacuum, the daily mass VOC removal rate, even at high vacuum operation, is relatively low. This supports the approach of using bioventing to biodegrade petroleum hydrocarbons to facilitate VOC removal.
- SVOC results collected from vapor extracted from MP-2(D) did not indicate the presence of significant quantities of SVOCs in the extracted vapor; therefore, SVOC vapor emissions will not be of concern for the full-scale SVE system.

### 3.3.2 Northeast Corner of Building Area

Operational data from Test Run Nos. 4 through 12 were used to evaluate the following relationships in the Northeast Corner of the Building area:

- Subsurface pressure in both shallow and deep soil stratum as a function of lateral distance from vent (radius of influence).
- Subsurface pressure in shallow and deep probes as a function of time (air permeability).
- Air flow rate as a function of operating pressure.
- TCE mass removal as a function of operating pressure.

Operational data from sustained operations were used to evaluate those relationships which depend on the duration of SVE operation:

- Contaminant mass removal rate as a function of time.
- Cumulative contaminant mass removal as a function of time.

Radius of Influence: The subsurface pressure measurements as a function of lateral distance from the vents are summarized on Figures 3-7 through 3-10. Figures 3-7 and 3-8 demonstrate a radius

Figure 3-7  
Lateral Distance versus Subsurface Pressure  
SVE-3(S) at -80 Inches of Water

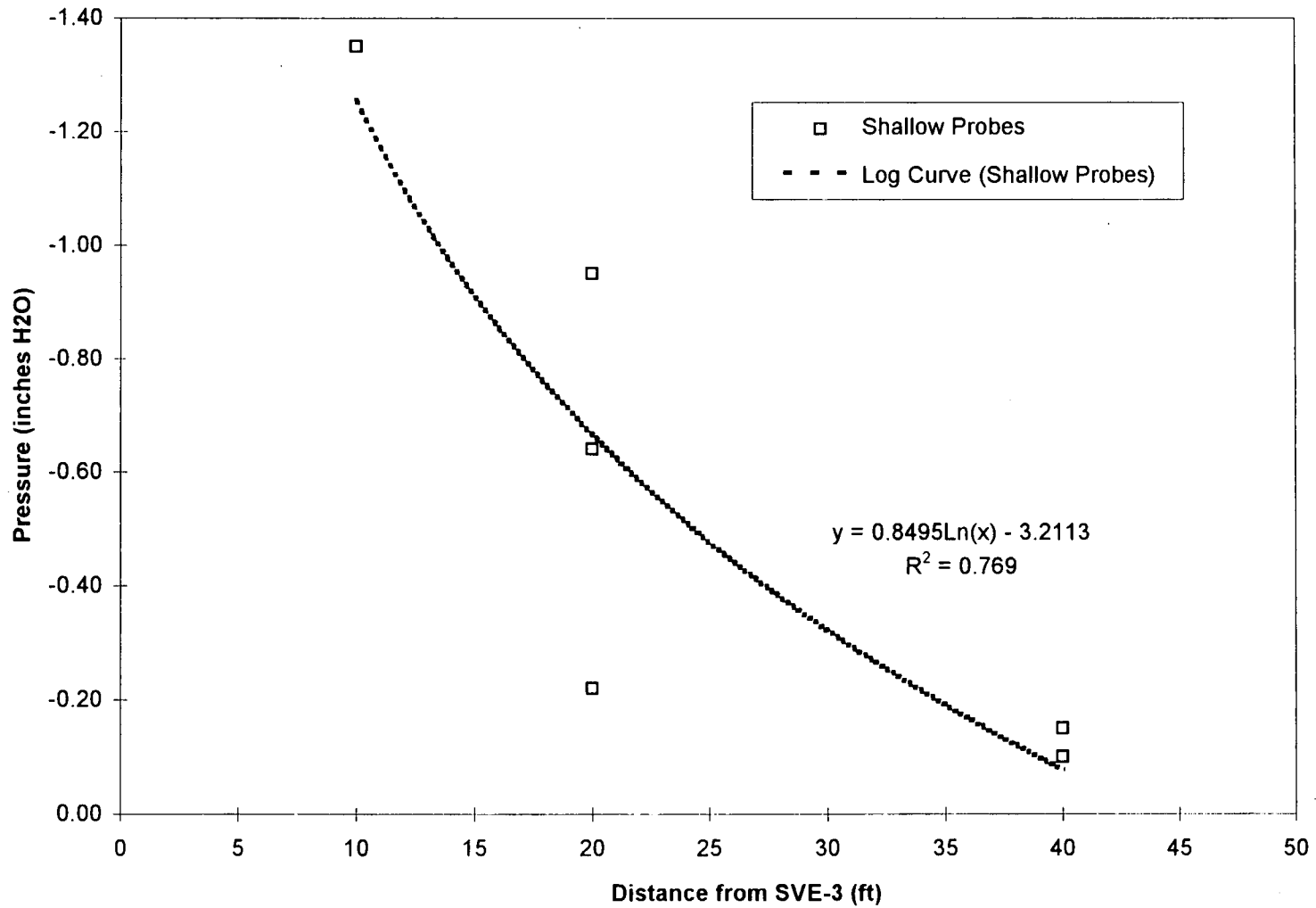


Figure 3-8  
Lateral Distance versus Subsurface Pressure  
SVE-3(D) at -80 Inches of Water

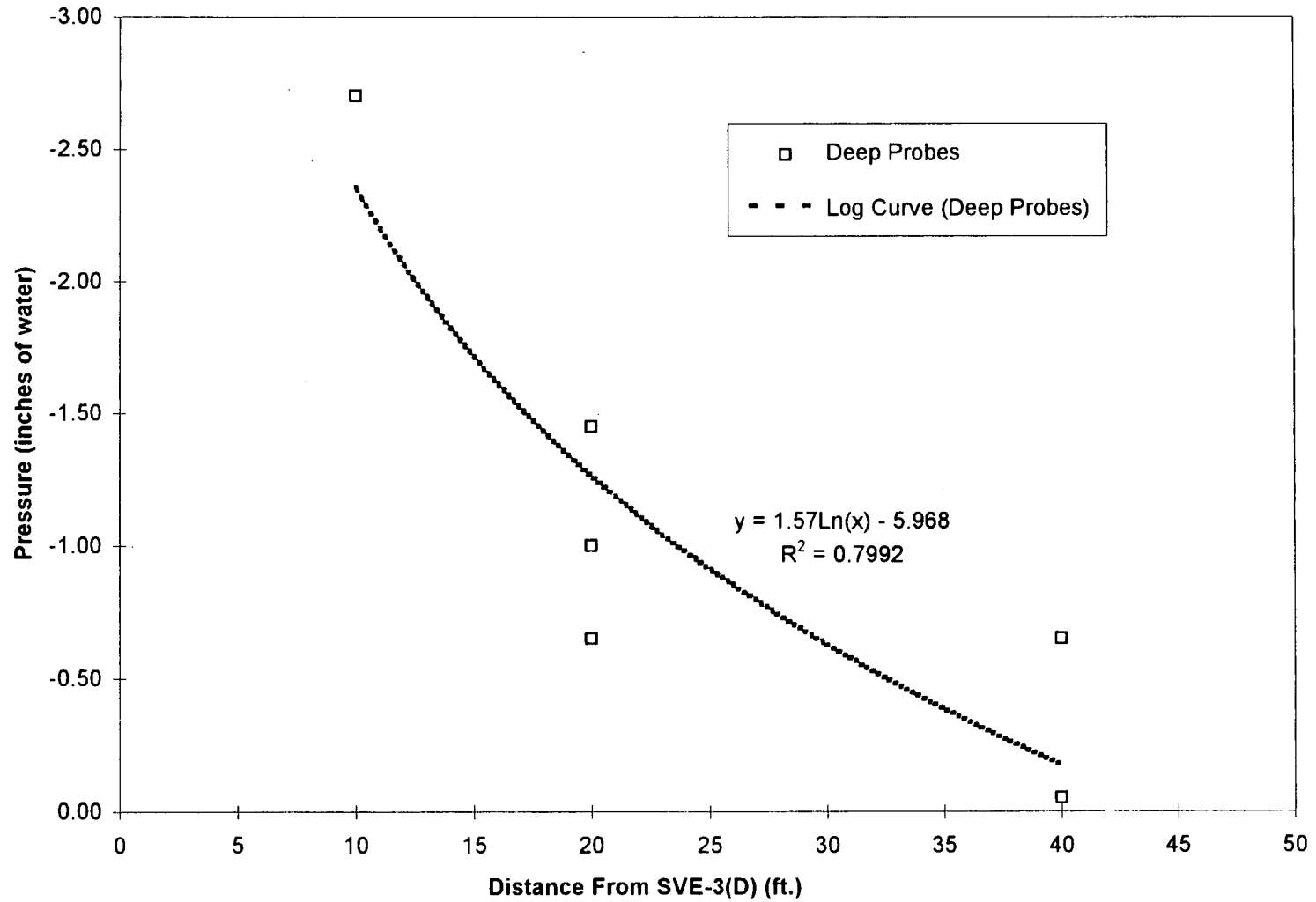


Figure 3-9  
Lateral Distance versus Subsurface Pressure  
SVE-2(S) at -140 Inches of Water

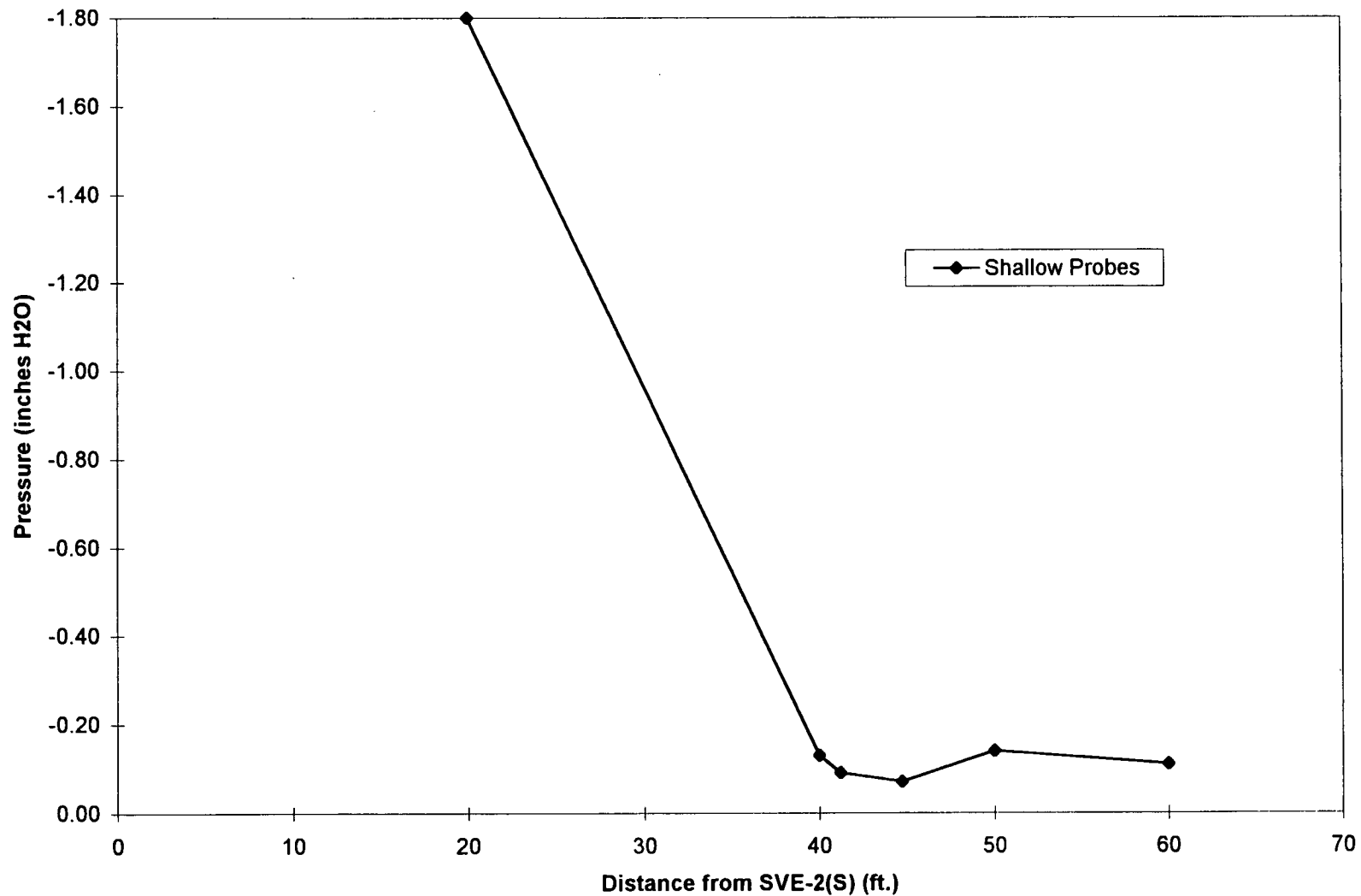
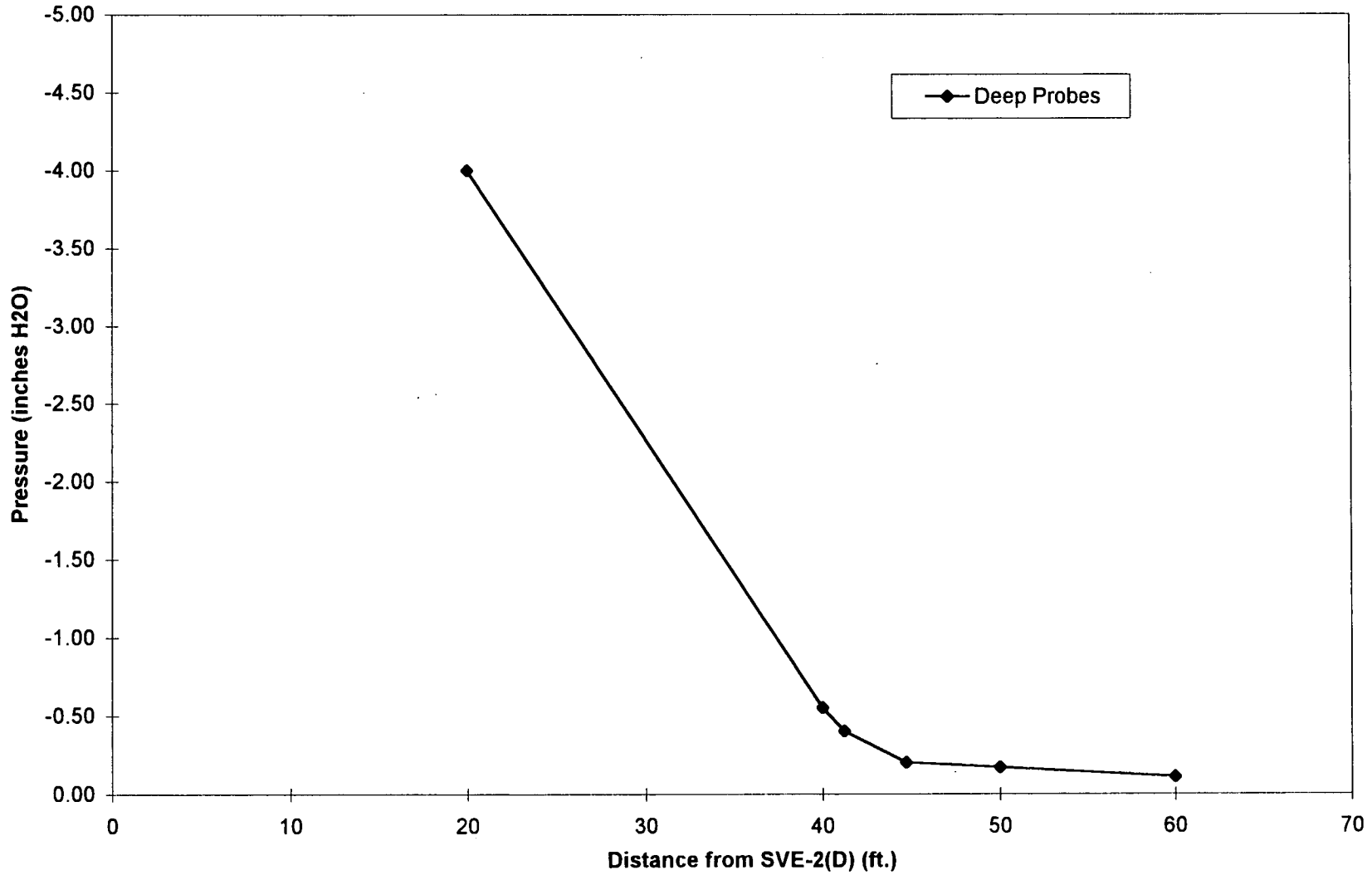


Figure 3-10  
Lateral Distance versus Subsurface Pressure  
SVE-2(D) at -140 Inches of Water



of influence of about 40 ft for SVE-3. Figures 3-9 and 3-10 for SVE-2 demonstrate that subsurface pressure is measurable even at a distance of 60 ft. The increase in subsurface pressure at 50 and 60 feet shown on Figure 3-9 may be due to the influence of the building footer which may serve as a preferential pathway for subsurface airflow. The overall radius of influence observed in the northeast corner of the building area is conservatively estimated to be 40 feet.

Air Permeability: Air permeability data (i.e., subsurface pressure as a function of time) for the vents in the northeast corner of the building area were plotted and air permeability values were calculated in a manner consistent with Subsection 3.3.1. Air permeability plots were included in Subsection 3.3.1 to illustrate the method used to calculate air permeabilities. Therefore, air permeability plots created for the northeast corner of the building area are not included in this report as they are only useful in providing slope (A) and y-intercept (B) values for the air permeability calculation. Air permeabilities calculated for the shallow vents range from  $10^{-12}$  to  $10^{-14}$   $\text{cm}^2$ , while air permeability for the deep vents ranged from  $10^{-17}$  to  $10^{-33}$   $\text{cm}^2$ . This range of air permeabilities is not uncommon as air permeability measurements can be significantly affected by soil stratigraphy, soil heterogeneity, soil moisture, and surface effects. Since the radius of influence was measured directly, knowledge of the precise air permeability is not necessary for evaluation/design purposes.

Vacuum Versus Flow Rate: The extracted air flow rate as a function of vacuum is shown on Figure 3-11. As illustrated on this figure, the air flow rate increased slightly at 3 of the 4 vents, while it increased more steadily at SVE-3(S). The total flow rate is strongly influenced by the SVE-3 flow rate.

Vacuum Versus VOC Mass Removal Rate: As shown on Figure 3-12, the TCE mass removal rate increased as increasing vacuum is applied. However, the removal rate reaches an inflection point at an operating pressure of -70 inches of water above which there is diminishing returns for further increases in vacuum.

Run Duration Versus Mass Removal Rate: Figure 3-13 shows the relationship between the TCE mass removal rate and operating time determined from sustained operations. The removal rate



Figure 3-11  
Vacuum versus Air Flowrate

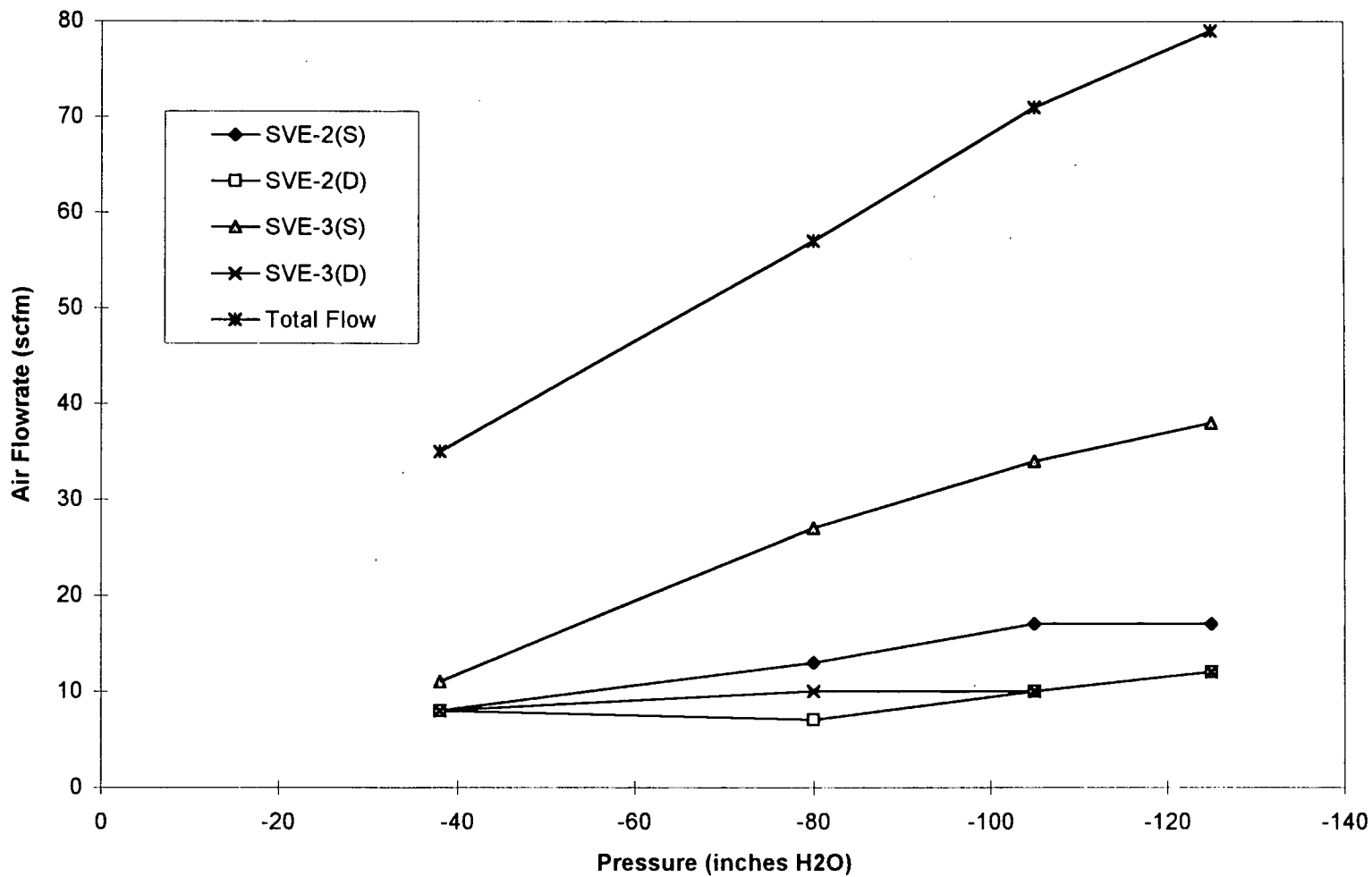
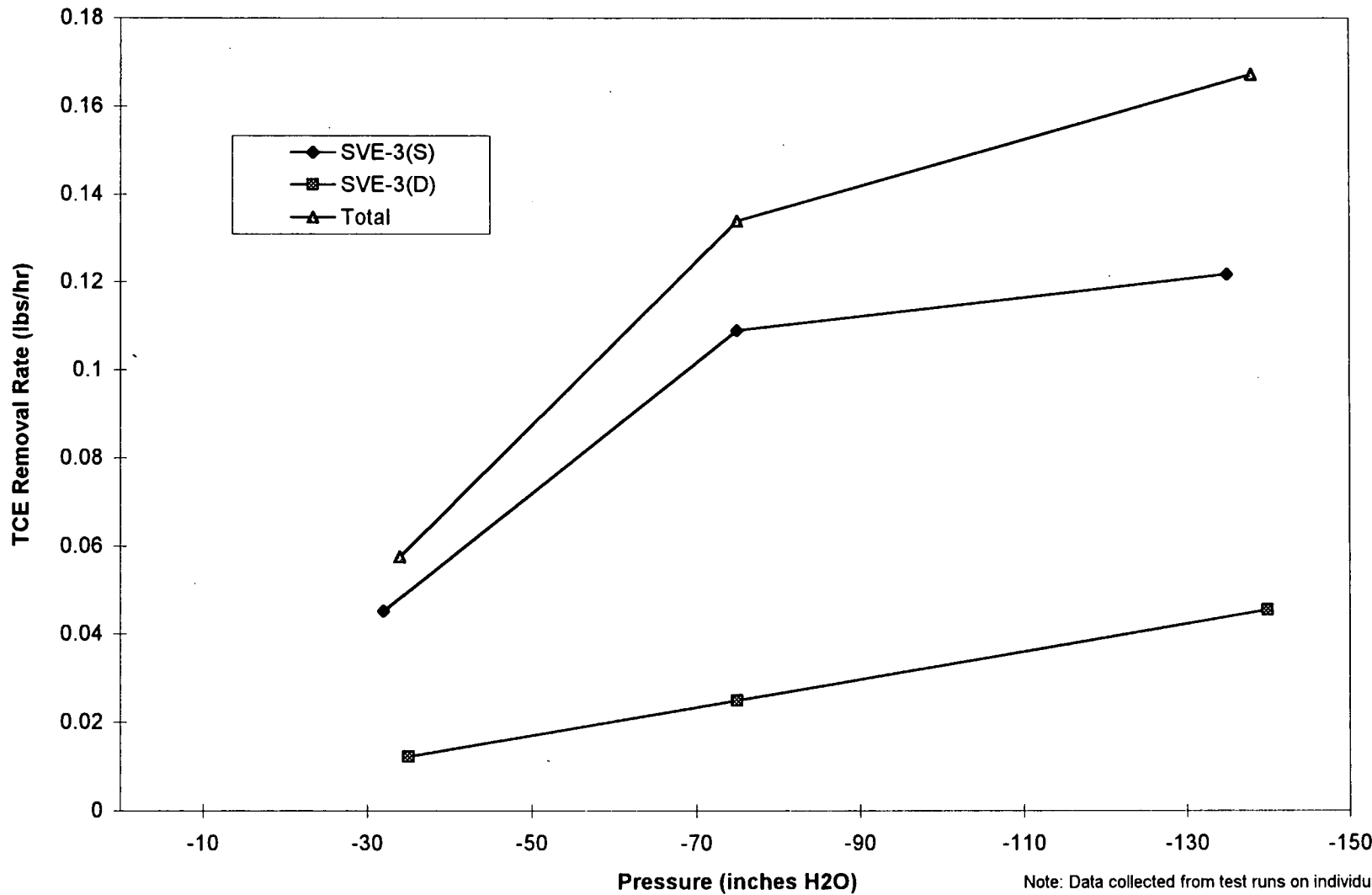
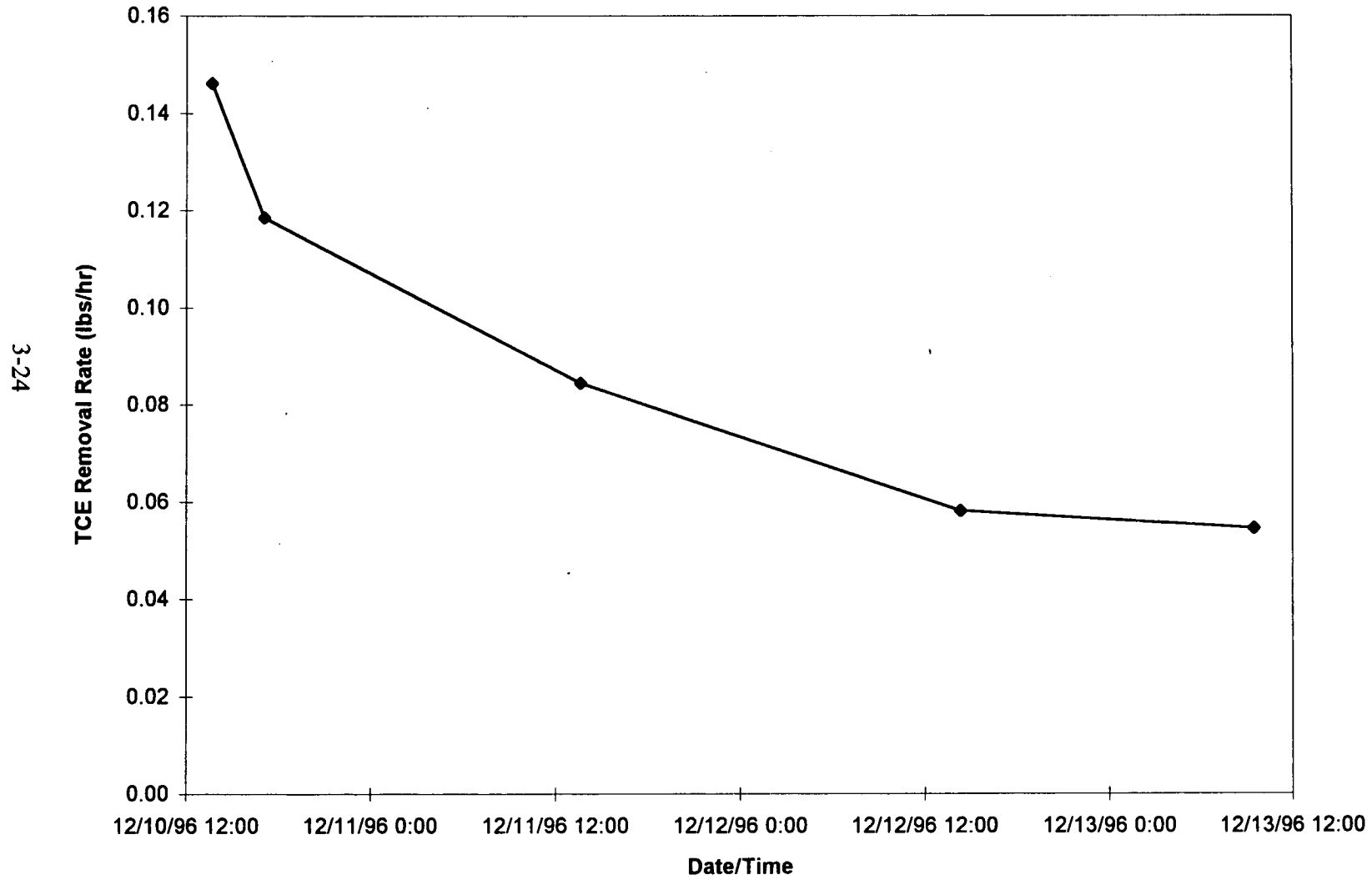


Figure 3-12  
Vacuum versus TCE Mass Removal Rate for SVE3(S) and SVE-3(D)



Note: Data collected from test runs on individual vents.

Figure 3-13  
TCE Removal Rate During Sustained Operations

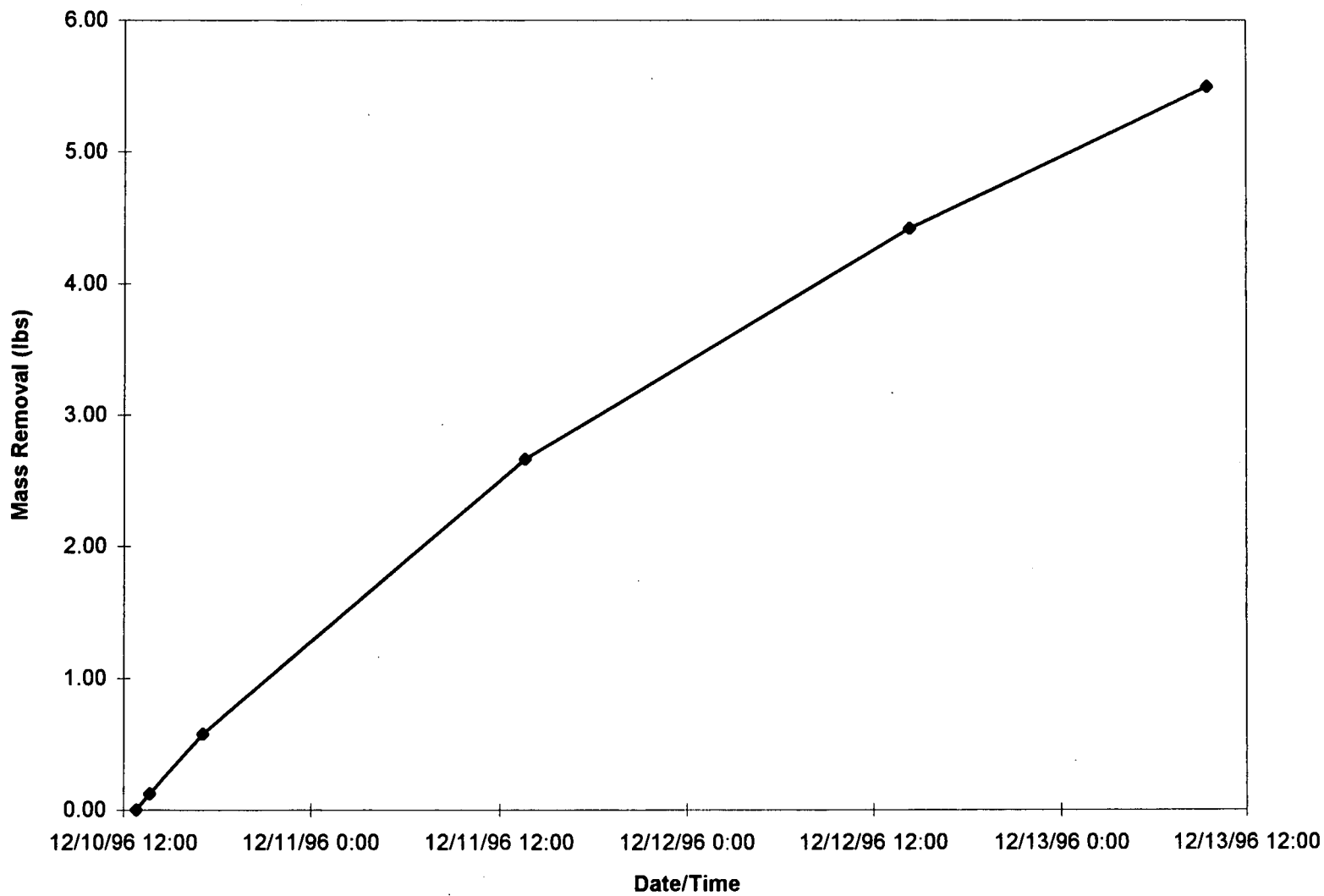


levels off at a value of approximately 0.06 lb./day. Figure 3-14 shows the cumulative TCE mass removal throughout the sustained operations and indicates that approximately 5.5 lb. of TCE was removed by the SVE system during the sustained operations period. The following conclusions can be made for the northeast corner of the building area based on the pilot study data:

- Subsurface soil data indicate the highest concentrations of contaminants are located at MP-4 at a depth of 28.5 to 30.0 ft bgs. Relatively low concentrations of chlorinated hydrocarbons (i.e., 10 µg/kg TCE) and TPH (19.9 mg/kg) were detected at this location. Air and soil sampling data together suggest that subsurface soil contamination appears to be confined to an area around monitor well RFW-16 extending outward as far as SVE-2 and SVE-3. No significant concentrations of contaminants were detected in MP-6 or MP-7.
- Based upon the concentrations of VOCs in the soil samples collected during the pilot study; the concentrations of VOCs in the soil collected from the boring outside the northeast corner of the building (installed during the 1987 Environmental Investigation); and the field screening readings detected in the well borehole for well RFW-16 located near the building wall (1991), it can be concluded that most of the historical TCE contamination in this area is near the building wall.
- Subsurface pressure data indicate that both SVE-2 and SVE-3 have a radius of influence conservatively estimated to be 40 ft. This radius easily encompasses the area where soils appear to have been affected.
- Air permeability calculations indicate that both shallow and deep soil strata in the northeast corner of the building area exhibit relatively low air permeabilities, with shallow soils being more permeable than deep soils. This observation is confirmed by the lower air flow rates observed in deep vents when compared to shallow vents at similar operating pressures.
- Both the extracted vapor flow rate and the TCE mass removal rate increase as the operating vacuum is increased. An inflection point occurs near a vacuum of approximately -70 inches of water, where a further increase in vacuum does not cause a significant increase in flow rate or mass removal.
- Sustained operations indicate that a TCE removal rate of 1.0 to 1.5 lb/day can be expected. This, combined with VOC concentrations in soil, suggests that TCE residual remaining in the vadose zone is less than previously believed. The limited "foot print" suggests that TCE moved downward over a small area into the groundwater.
- Based on the above, remediation using existing vents SVE-2 and SVE-3 will be effective in encompassing the area beneath the northeast corner of the building and the

Figure 3-14  
TCE Cummulative Mass Removal During Sustained Operations

3-26



former TCE tank area. To enhance contaminant mass removal, an air sparging well near the former TCE tank will also be installed.

## SECTION 4

### BIOVENTING PILOT STUDY

Following the SVE operations in the Tank Farm 2 area, a bioventing study was performed to determine the potential effectiveness of bioventing as a remedial technology for subsurface soils in this area. The bioventing study was focused on remediation of subsurface soils containing petroleum hydrocarbon residue which may be less amenable to remediation by SVE than the chlorinated hydrocarbons. Further, because the cosolvency between chlorinated hydrocarbons and other heavier petroleum hydrocarbons reduces the effective volatility of the chlorinated hydrocarbons, an evaluation of bioventing was considered necessary. The effectiveness of the bioventing technology was evaluated by performing an in situ respiration (ISR) test as discussed in the following subsections.

#### **4.1 IN SITU RESPIRATION TEST**

##### **4.1.1 Overview**

Many petroleum hydrocarbons can be metabolized by microorganisms which are naturally occurring in the subsurface soil and have acclimated to the contaminants as a carbon (food) source. The ISR test is intended to provide a relative measurement of the rate of aerobic microbial degradation of contaminants in subsurface soils by measuring the oxygen uptake during the tests. Prior to measuring oxygen uptake, air containing a helium tracer was injected into the soil for a 24-hour period. Oxygen uptake and carbon dioxide production in the soil are subsequently measured over a period of up to 5 days following injection. Helium is also measured to ensure that no additional aeration of the subsurface soil is occurring. In addition, the helium tracer can be used to determine how far the injected oxygen has traveled away from the injection point. Data obtained from the ISR test can be used to determine whether or not the injection of oxygen (air containing oxygen) into the soil will enhance microbial degradation of contaminants in soil and the approximate rate at which degradation will occur.

#### 4.1.2 Test Procedures

The methods used to conduct the ISR test were based on the procedures discussed in both the U.S. Environmental Protection Agency's (EPA) manual: *Bioventing Principles and Practice* (EPA, 1995) and the U.S. Air Force document: *Test Plan and Technical Protocol for a Field Treatability Test for Bioventing* (AFCEE, 1992). The ISR test was conducted on MP-2(S). This probe was selected based on subsurface soil sampling which indicated that TPH contamination was highest at this location.

The following is a summary of the ISR test procedures implemented at the site:

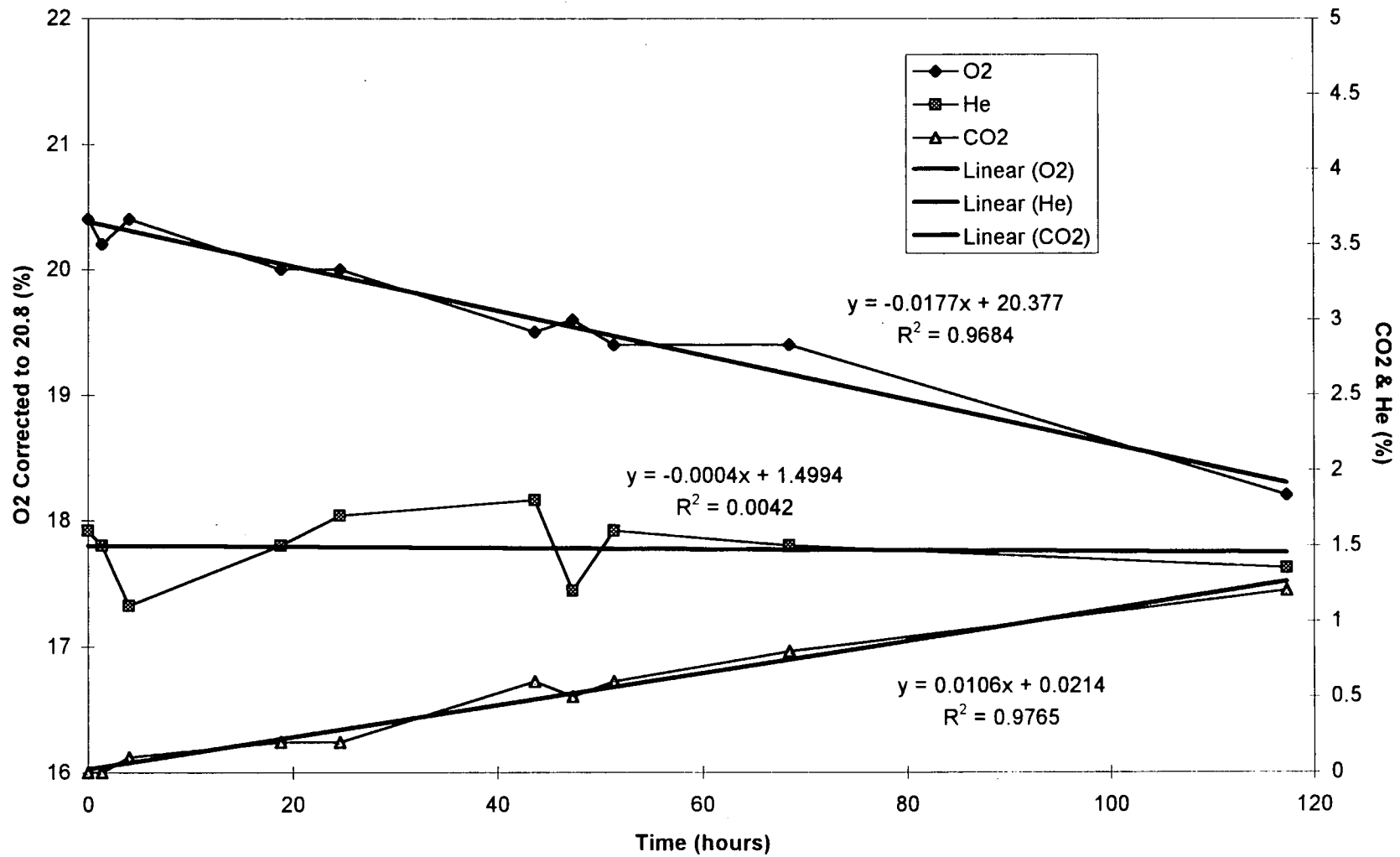
- Baseline oxygen, carbon dioxide, and FID readings were obtained following the SVE study to ensure starting conditions have been established.
- A mixture of 1-3% helium in air was injected into MP-2(S) for approximately 24 hours.
- Oxygen, carbon dioxide, helium, and FID measurements were collected during the test period by purging the monitoring probe approximately 1 minute until carbon dioxide and oxygen measurements stabilize.
- The test was conducted for approximately 5 days.

#### 4.2 In Situ Respiration Test Results

Results from the ISR test are plotted on Figure 4-1. Oxygen values plotted on the figure were corrected to account for varying background oxygen readings collected during the test. Figure 4-1 shows a steady decline for oxygen concentration and a steady increase for carbon dioxide concentration in subsurface soil vapor over the 5-day test period. The helium concentration remains relatively steady indicating that the oxygen concentration decrease is not due to diffusion. During the test, helium was also detected in all of the monitoring probes in the Tank Farm 2 area indicating that the injected air had traveled throughout the entire area. Microbial data, shown on Table 2-2, confirm that microorganisms are present in the subsurface soils tested, although at relatively low levels.



Figure 4-1  
In Situ Respiration Test Results



4-3

Nutrient data for subsurface soils are also included on Table 2-2. Nutrient data (total kjeldahl nitrogen (TKN) and total phosphate) were compared to organic carbon concentrations extrapolated from TPH data (assuming that TPH consists of approximately 80% carbon by weight). The TPH concentration used to calculate the carbon concentration was an average of the TPH concentrations detected in soil samples collected from SVE-1, MP-1, and MP-2. Average nitrogen and phosphorus concentrations were calculated by averaging the TKN and total phosphorous results from the two nutrient samples collected from SVE-1. These average carbon, nitrogen, and phosphorus concentrations were used to calculate carbon to nitrogen (C:N) and carbon to phosphorus (C:P) ratios which were used to determine if these nutrients are present in sufficient concentrations to support microbial growth. The C:N ratio calculated was approximately 110:1, which is somewhat higher than the optimal C:N ratio for balanced microbial growth of 20:1. The C:P ratio calculated was approximately 15:1, which is within the optimal C:P ratio for balanced of microbial growth of 100:1. Although the data suggest that the nitrogen concentration may be low, much of the nitrogen may be naturally recycled over the course of remediation. These nutrient concentrations should be adequate.

#### **4.3 Explanation of Results**

The results of the ISR test indicate that the subsurface soils in the Tank farm 2 area exhibited baseline oxygen concentrations of 14% to 16% prior to air injection. This is attributed to the fact that the SVE pilot study was previously conducted in this area, causing aeration of the soil, prior to conducting the ISR test. A steady uptake of oxygen during the respiration tests coupled with carbon dioxide production, clearly indicate the presence of microbial degradation. The C:P ratio indicates that there is sufficient phosphorus in the soil to support microbial degradation. The C:N ratio indicates a slightly less favorable nitrogen content of soils; however, this ratio may be skewed due to the relatively high TPH concentrations encountered in MP-2.

The rate of biodegradation potentially could be enhanced by adding a microorganism "seed" at the start of bioventing operations. Cultured microorganisms acclimated to heavy petroleum oils could be more effective degraders of the heavy oils than the naturally occurring acclimated

microorganisms due to the low concentration and variety of native microorganisms typically present in soils so far below the surface.

The amount of airflow required for bioventing in the tank farm area was estimated using the ISR oxygen uptake rate of 0.5% per day based on Figure 4-1. To maintain sufficiently aerobic oxygen levels in soil (i.e., greater than 18%), it will be necessary to turn over air within the contaminated zone every 5 days. Conservatively assuming a volume of soil to be treated is a cylinder 40 feet in diameter centered at SVE-1 with a depth of 20 feet, the volume of air within the cylinder is 7,530 ft<sup>3</sup>. Therefore, a minimum flow rate of 1.1 cfm would be required to replenish the air every 5 days.

However, to maintain a radius of influence for aeration across the entire tank farm area higher air injection rate of 15 cfm or more would be needed. This is approximately 15 times the volume of air currently required for respiration and should be sufficient if the respiration rate increases with microbial enhancement.

## SECTION 5

### CONCEPTUAL FULL-SCALE DESIGN

Based on the data collected during the SVE and bioventing pilot studies previously discussed, a conceptual design for a full-scale remediation system has been prepared. This full-scale system is designed to treat subsurface soil in both the Tank Farm 2 area by bioventing and the northeast corner of the building area by SVE and air sparging.

#### 5.1 DESIGN BASIS

Based on the results of the bioventing study, a full-scale bioventing system at the Tank Farm 2 area would require at a low air injection flow rate to replenish oxygen consumed by biodegradation, but a higher air flow rate would be required to distribute the air across the entire target area. Since the equipment for air extraction is already necessary for SVE operations at the northeast corner of the building and air supply will be needed for air sparging, both air extraction and injection could be easily implemented. SVE-1 is better suited to air extraction which can broadly influence the Tank Farm 2 area. Air injection can be used directly at MP-2 to maximize air flow through the highest concentration zone.

In the northeast corner of the building area, air will be extracted from the SVE-2 and SVE-3 nested pairs. Air will be injected into a new air sparging well installed into the more productive transition zone between unconsolidated soil and bedrock. Air injection rates will be kept below one half of the extraction rates to create a defined flow path toward the extraction vents.

The design specifications for the major components of the full-scale soil remediation system are discussed in the following subsections.

## 5.2 SOIL VAPOR EXTRACTION SYSTEM DESIGN

### 5.2.1 Blower System Specifications

The specifications for the vacuum blower, and associated components, that will be used to extract soil vapor are listed below:

- Flow rate = 75 scfm (60 scfm from NE corner and 15 scfm from Tank Farm 2)
- Operating pressure at blower intake = -80 inches of water (approximately 6 inches or Hg).
- Operating pressure at blower exhaust = atmospheric pressure.
- Motor horsepower = 5 hp.

The blower motor will require a 230-volt 3-phase power supply which is readily available inside the northeast corner of the building. The blower system will also include the following accessories:

- A knock-out drum to remove entrained liquid from the extracted soil vapor.
- An air filter to remove particulates from extracted vapor.
- Pressure/vacuum gauges on the intake and outlet of the blower.

### 5.2.2 Extraction Vent Specifications

The existing extraction vents (SVE-1, SVE-2, and SVE-3) appear to be in optimal locations and have been constructed to be used for full-scale remediation. No modification of existing vents or addition of new vents is necessary.

Based on the distribution of contamination in the Tank Farm 2 area and the subsurface pressure measurements collected during the pilot study, the screened interval of 16 to 25 ft bgs at SVE-1 is adequate for treatment. A radius of influence of approximately 40 ft determined for SVE-1

indicates that it will provide treatment of contaminated subsurface soil in the Tank Farm 2 area as shown on Figure 5-1.

Subsurface soil in the unsaturated zone in the northeast corner of the building area can be treated by operating both the shallow and deep vents simultaneously. A conservative radius of influence of 40 ft calculated for both SVE-2 and SVE-3 indicates that simultaneous operation of these two vents will provide treatment of surface soil in the northeast corner of the building area as shown on Figure 5-1.

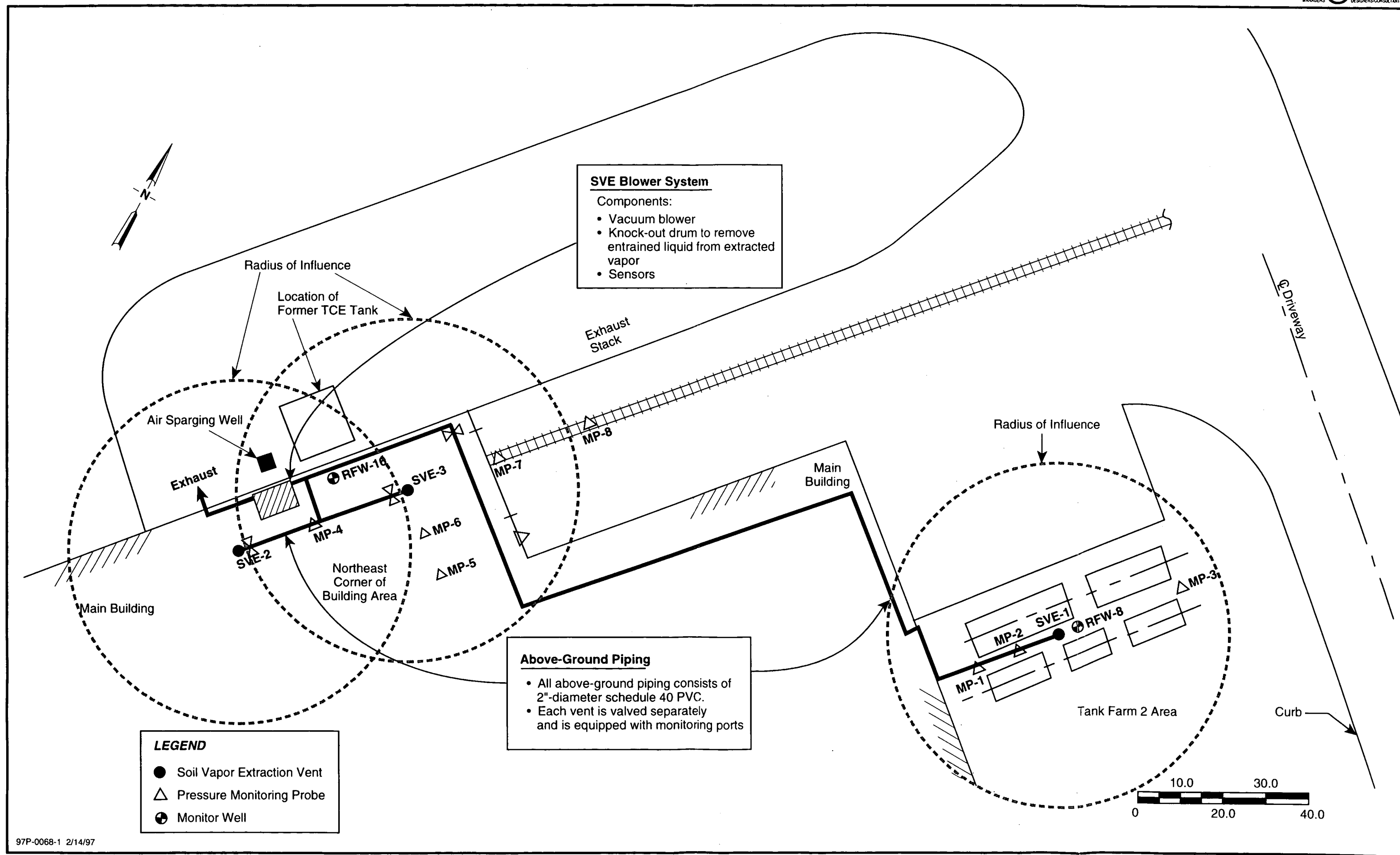
### 5.2.3 Piping Specifications

The existing manifold is constructed of 2-inch diameter Schedule 40 PVC pipe. This piping will require some minor modifications to accommodate the permanent location of the full-scale blower system. Any additional piping required will also be constructed using 2-inch diameter Schedule 40 PVC pipe.

### 5.3 AIR SPARGING DESIGN

Although the full-scale SVE system will treat soils in the vadose zone at the northeast corner of the building, it is not expected to yield a high rate of VOC recovery and will not affect contamination already in the saturated zone. Therefore, in order to further enhance performance and accelerate remediation of the saturated zone, air sparging will be conducted concurrently with the full-scale SVE system in the northeast corner of the building area. The SVE system will collect all VOCs stripped by the air sparging process.

In addition, air injection will be used at MP-2 to create a higher rate of air flow in the zone of peak hydrocarbon contamination. Concurrent operation of SVE-1 will further encourage flow and capture injected air from the soil.



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**FIGURE 5-1 FULL-SCALE SOIL VAPOR EXTRACTION SYSTEM LAYOUT**

### 5.3.1 Sparge Well Design

As previously discussed, it appears that subsurface contamination is concentrated in the vicinity of the building footer near monitor well RFW-16. Therefore, as illustrated on Figure 5-1, one sparge well will be installed in this area. The well will be constructed in the following manner:

- The borehole will be advanced until competent bedrock is encountered (approximately 50-60 ft bgs). Borehole logging, field screening of subsurface soils, and sample collection for laboratory analysis will be performed in a manner consistent with the procedures used for extraction vent installation.
- The sparge well will be constructed of 2-inch diameter Schedule 40 PVC riser pipe equipped with a 5-ft length of 0.01-inch PVC slotted well screen which will begin approximately 1 ft above the bottom of the well. The well screen will be laterally centered in a sandpack and will be equipped with a well sock to prevent silt from entering the sparge well.
- The sandpack will extend approximately 2 feet above the screened interval. The remainder of the annular space between the riser pipe and the borehole wall will be grouted to grade.

Following installation of the well, a pressurized air line will be connected to the sparge well. The air line will be equipped with a regulator to allow the air injection rate to be adjusted.

### 5.3.2 Sparge Well Operation

The sparge well will be operated during full-scale SVE operations. Sparging will be performed by injecting pressurized air (above 20 psig) into the sparge well at an initial flow rate of about 10 scfm. The injection rate will be adjusted to maximize the injection air flow rate without causing excessive mounding of groundwater around the sparge well. Since air sparging aerates the groundwater, the effectiveness of the sparger will be evaluated by measuring the downhole dissolved oxygen in the groundwater at nearby monitor well (RFW-16). In addition, concentrations of extracted soil vapor from the full-scale SVE will be measured before and during air sparging/SVE operation so results can be compared to extracted vapor concentrations measured during SVE operation only.



### 5.3.3 MP-2 Air Injection

To supplement aeration of contaminated soil in the Tank Farm 2 area, air will be injected into MP-2(S), located in the Tank Farm 2 area exhibiting the highest concentrations of TPH. Air injection at MP-2(S) will be conducted concurrently with air extraction from SVE-1. The air injection rate (approximately 5 scfm) will be adjusted so that the subsurface pressures caused by vapor extraction from SVE-1 and air injection at MP-2 are balanced. This will be determined by measuring subsurface pressure at MP-1. The air injection and air extraction systems will be considered balanced when the subsurface pressure measured at MP-1 is approximately zero.

### 5.3.4 Air Supply Requirement

Compressed air will be required for air sparging in the northeast corner of the building and for air injection at MP-2. The compressed air requirements for the full-scale system are:

- Flow rate = 15 scfm.
- Pressure = 15 psig

The compressed air will be filtered, if necessary, to remove potential lubricating oils which might be entrained in the air. In addition, the compressed air supply manifold will be equipped with regulators to prevent over-pressurization of the injection equipment.

## 5.4 PROGRESS MONITORING

Following construction of the full-scale soil remediation system, startup and long-term operation of the system will begin to remediate contaminated soils at both the northeast corner of the building area and the Tank Farm 2 area. Periodic monitoring will be will be conducted to assess the progress of the full-scale remediation system. Monitoring will consist of the collection of air samples and operational measurements.

Monitoring will begin shortly after startup to define initial conditions. Operational measurements will be conducted throughout startup. Following startup, periodic air sampling and operational

monitoring will be conducted at the end of the first week of operation, at the end of the first month of operation, and monthly thereafter. Monitoring will continue for a period of up to 2 years, which is anticipated to be the time required to complete remediation.

#### 5.4.1 Air Sampling

Two air samples will be collected from the blower exhaust of the full-scale system and analyzed for VOCs during the first week of long-term operations to ensure that the emissions from the system do not exceed permissible emission rates, as discussed in Subsection 5.5. During the first week of operation, two air samples, one from the vapor extracted from SVE-1 located at Tank Farm 2 and one from the combined vapor extracted from vents SVE-2 and SVE-3 located at the northeast corner, will be collected and analyzed for VOCs.

Subsequent air samples will be collected on a monthly basis, starting at the completion of the first month of operation. Two air samples, one from the vapor extracted from vent SVE-1 and one from the combined vapor extracted from vents SVE-2 and SVE-3, will be collected during the monthly sampling events and will be analyzed only for those VOCs detected in preceding monitoring events (i.e., TCE and PCE).

#### 5.4.2 Operational Measurements

The operational measurements listed below will be collected from the full-scale system during each monitoring event:

- Air flow rate.
- Air temperature.
- Air pressure.
- Organic vapor concentration of extracted vapor (FID/PID reading).

The above measurements will be collected from the following monitoring locations on the remediation system:

- Each of the five extraction vents.
- Combined flow from the manifold connecting the northeast corner vents.
- Blower exhaust stack.
- Air sparging well (except FID/PID readings).

### 5.4.3 Completion of Remediation

As discussed in the Work Plan, treatment of the soil will continue until monitoring of collected vapors indicate that continued operation of the system would not result in significant reductions in the concentrations of contaminants detected. Determination of system shutdown would be made consistent with the Technical Impracticability guidance referenced in paragraph IV.N of the Consent Order.

### 5.5 AIR EMISSION CONTROL AND PERMITTING CONSIDERATIONS

Based on the pilot study, the air flow rate for full-scale implementation of SVE and bioventing extraction systems will be approximately 75 scfm which will yield approximately 1.5 lb/day of TCE, 0.3 lb/day of PCE, and 0.02 lb/day of TCA. Other contaminants detected in extracted vapor from MP-2 were SVOCs (acenaphthylene, 1-methylnaphthalene, and 2-methylnaphthalene) which, if summed and multiplied by the maximum air flow rate observed from SVE-1, yield an emission rate of 0.0001 lb/day. Since TCE and the detected semivolatile compounds are considered to be VOCs by U.S. EPA (40 CFR 51.100), while PCE and TCA are not, a VOC emission rate of 1.5 lb/day is expected for a full-scale system. However, the addition of an air sparging well could potentially, double the VOC emission rate. Therefore, a total VOC emission rate of 3 lb/day has been used when considering air permitting requirements.

Based on the above information from the pilot study, MDE regulatory requirements for continuous operation of the SVE process are as follows:

Control Requirements for Volatile Organic Compounds (VOC) - in accordance with the Code of Maryland (COMAR) 26.11.06.B, new installations located in Carroll County cannot cause VOC emissions in excess of 20 lb/day unless the emissions are abated by at least 85%. Of the contaminants emitted, only TCE and the semivolatiles are VOCs with a combined emission rate of 3 lb/day which is well below the 20 lb/day regulatory criterion for control. Therefore, no VOC emissions control would be required for full-scale implementation.

Toxic Air Pollutants (TAP) Emissions - in accordance with COMAR 26.16.15, TCE, TCA, and PCE are TAP. All three compounds are further classified as Class II (non-carcinogenic) TAP. The regulation provides for exemption from the requirements for installation of best available control technology for TAP emissions (T-BACT) and ambient impact analysis (i.e., modeling). For new sources of Class II TAP, the exemption criteria are as follows:

- Each TAP emission rate must be 0.5 lb/hr or less; and
- The screening levels (a measure of the toxicity) for each TAP must be greater than 200  $\mu\text{g}/\text{m}^3$ .

Assuming 24-hour operation, the hourly emission rates of each TAP are well below 0.5 lb/hr. The applicable screening levels of TCE, PCE, and TCA are based on threshold limit values (TLVs), and are presented in Table 5-1. As seen on Table 5-1, screening levels for all compounds present exceed the 200  $\mu\text{g}/\text{m}^3$ . Therefore, the emissions from the full-scale system are exempt from T-BACT and ambient impact analysis requirements.

Construction and Operating Permit Requirements - COMAR 26.11.02 lists specific processes requiring permits and those that are exempt from permitting requirements. Those sources that are not on either list must obtain a permit. The SVE process is not specifically required to obtain permits nor is it specifically exempted, therefore, a permit to construct will be required. To obtain this permit, an application will be submitted to MDE in accordance with the schedule provided in Subsection 5.7.

## 5.6 FAULT DETECTION

The full-scale soil remediation system will be equipped with several sensors that will detect abnormal system operations. These abnormal conditions include:

- High liquid level sensor inside knockout drum.
- High temperature sensor for the blower motor.

**Table 5-1  
Toxic Air Pollutant Screening Levels  
Black & Decker  
Hampstead, Maryland**

<b>Compound</b>	<b>TLV-TWA<sup>a</sup> (ug/m<sup>3</sup>)</b>	<b>TLV-STEL<sup>a</sup> (ug/m<sup>3</sup>)</b>	<b>8 Hour<sup>b</sup> Screening Level (ug/m<sup>3</sup>)</b>	<b>1 Hour<sup>c</sup> Screening Level (ug/m<sup>3</sup>)</b>
TCE	269,000	537,000	2,690	5,370
PCE	170,000	685,000	1,700	6,850
TCA	1,910,000	2,460,000	19,100	24,600

Notes:

TLV - Threshold Limit Value.

TWA - Time Weighted Average.

STEL - Short-Term Exposure Limit.

<sup>a</sup> - Values as published by the American Conference of Governmental Industrial Hygienists in 1996.

<sup>b</sup> - The 8 Hour Screening Level is calculated by divided the TLV-TWA by 100.

<sup>c</sup> - The 1 Hour Screening Level is calculated by divided the TLV-STEL by 100.

TCE - Trichloroethene

PCE - Tetrachloroethene

TCA - 1,1,1-Trichloroethane

These sensors will be interlocked to the blower motor starter box and will shutdown the blower if the above conditions are detected by the sensors. In addition, the blower system will be equipped with an autodialer which will dial pre-programmed phone numbers and alert responsible personnel if the system is shutdown for any reason.

### 5.7 LAYOUT

Figure 5-1 shows the layout of the major components of the full-scale soil remediation system. The blower system will be located inside the northeast corner of the building. The sparge well will be located outside the building northeast of monitor well RFW-16. The exact position of these components will be determined by the facility to ensure that plant operations are not disrupted. The off-gas from the SVE system will be exhausted outside the building.

### 5.8 SCHEDULE FOR FULL-SCALE IMPLEMENTATION

The implementation for startup of the full-scale system is shown in Table 5-2.

**Table 5-2  
Preliminary Schedule for Implementation of the Full-Scale Remedial System  
Black & Decker  
Hampstead, Maryland**

Task	1997						
	February	March	April	May	June	July	August
<i>Soil Remediation Implementation Design Report</i>							
1 Submit to MDE			▲				
2 MDE Review							
3 MDE Approval							
<i>Air Permit</i>							
4 Prepare Air Permit							
5 Submit Air Permit to MDE			▲				
6 MDE Review of Permit							
7 MDE Approval of Air Permit							
<i>Full-Scale Implementation</i>							
8 Procurement							
9 Installation/Construction of Full-Scale System							
10 Start Operation of Full-Scale System							

▲ Indicates approximate date that task is completed.

S-12

**SECTION 6**  
**REFERENCES**

AFCEE (U.S. Air Force Center for Environmental Excellence). May 1992. *Test Plan and Technical Protocol for a Field Treatability Test For Bioventing*. Washington D.C.

WESTON (Roy F. Weston, Inc.). August 1995. *Soil Remediation Plan, Black & Decker (U.S.) Inc. Hampstead, Maryland*. West Chester, PA.

EPA (U.S. Environmental Protection Agency). September 1995. *Manual for Bioventing Principles and Practice*. Volume II: Bioventing Design. Washington D.C.

EPA (U.S. Environmental Protection Agency). September 1991. *Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction (Interim Guidance)*. Washington D.C.



**APPENDIX A**  
**BOREHOLE LOGS**

**TANK FARM 2 AREA**

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : SVE-1
PROJECT : PILOT TEST BEGIN DATE : 10/31/96
SITE/AREA : TANK FARM 2 END DATE : 11/01/96
LOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : O

Total Depth : 25.00 Depth to Bedrock : 0

Borehole Diameter #1: 12.00
Interval: 0.00 ft. to 25.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Estimated Surveyed
Surface Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000
Well Permit.....(Y)es (N)o: N Permit # :
Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0
Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

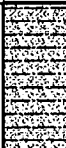




Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
SVE-1	1	1	0.00	1.10	SPS		40	40	20	0	0		NON	POR	LSE	DRY	
SVE-1	1	2	1.10	2.00	SPS		0	0	0	0	0						
SVE-1	2	1	2.00	3.00	SPS		0	40	40	20	0		NON	POR	LSE	MST	
SVE-1	2	2	3.00	4.00	SPS		0	0	0	0	0						
SVE-1	3	1	4.00	5.00	SPS		0	40	40	20	0		NON	POR	LSE	MST	
SVE-1	3	2	5.00	6.00	SPS		0	0	0	0	0						
SVE-1	4	1	6.00	7.00	NS		0	0	0	0	0						
SVE-1	5	1	7.00	9.00	STB		0	0	0	0	0						
SVE-1	6	1	9.00	10.80	SPS		0	30	45	25	0		LOW	POR	LSE	MST	
SVE-1	6	2	10.80	11.00	SPS		0	0	0	0	0						
SVE-1	7	1	11.00	12.30	SPS		0	35	45	20	0		LOW	POR	LSE	MST	
SVE-1	7	2	12.30	13.00	SPS		0	0	0	0	0						
SVE-1	8	1	13.00	15.00	STB		0	0	0	0	0						
SVE-1	9	1	15.00	16.80	SPS		0	15	60	25	0		NON	POR	FIR	DRY	
SVE-1	9	2	16.80	17.00	SPS		0	0	0	0	0						
SVE-1	10	1	17.00	18.80	SPS		0	20	55	25	0		NON	POR	FIR	MST	
SVE-1	10	2	18.80	19.00	SPS		0	0	0	0	0						
SVE-1	11	1	19.00	19.80	STB		0	0	0	0	0						
SVE-1	12	1	19.80	23.00	NS		0	0	0	0	0						
SVE-1	13	1	23.00	24.80	SPS		5	15	60	20	0		LOW	POR	FRM	DRY	
SVE-1	13	2	24.80	25.00	SPS		0	0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : SVE-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-1	1		55	Silty sand with gravel, SM	BROWN/GRAY	LSE	DRY	2 1-1 3	0.0	GRAVEL.
				No Sample Recovered						
-2	2		50	Sandy silt, ML	ORG-BRN	LSE	MST	2 2		
-3	3			No Sample Recovered						
-4	4		50	Sandy silt, ML	ORG-BRN	LSE	MST	1 1-1 2	1.5	SAMPLE SVE-1-005=VOC, TPH, AND TPC.
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED TO 7'-SAME AS ABOVE.
-7	7		100	Shelby tube sample						SHELBY TUBE COLLECTED.
-8	8									
-9	9		90	Sandy silt, ML	ORG-BRN	LSE	MST	1 1-1 2	2.2	SAMPLE SVE-1-011=TOTAL FE, MOISTURE, TKN, PH, TOTAL PHOS., ALK.
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : SVE-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Sandy silt, ML	ORG-BRN	LSE	MST	1 1 2	OVM 2.2	SAMPLE SVE-1-011=TOTAL FE, MOISTURE, TKN, PH, TOTAL PHOS., ALK.
-11	11		65	No Sample Recovered						
				Sandy silt, ML	ORG-BRN	LSE	MST	2 3 4 11	OVM 8.0	QUARTZ FRAGMENTS @-12.1'. WEATHERED MICA SCHISTS; SAMPLE SVE-1-013=VOC TPH, TOTAL PLATE COUNT.
-12	12			No Sample Recovered						
-13	13		100	Shelby tube sample						SHELBY TUBE COLLECTED.
-14	14									
-15	15		90	Silt with sand, ML	ORG-BRN	FIR	DRY	6 7 8 9	OVM 1.4.	SAMPLE SVE-1-017=VOC AND TPH.
-16	16									
-17	17		90	No Sample Recovered						
				Silt with sand, ML	ORG-BRN	FIR	MST	3 4 7 15	OVM 1.1	SAMPLE SVE-1-019=TOTAL FE, MOISTURE, TPH, PH, ALK, TOTAL PHOS.
-18	18									
-19	19			No Sample Recovered						
				Shelby tube sample						SHELBY TUBE REFUSAL (BENT); AUGER TO 23'.
-20	20			Interval Not Sampled						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : SVE-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						
-21	21									
-22	22									
-23	23		90	Silt with sand, ML	ORG-BRN/RED-BRN	FRM	DRY		OVM 5.0	VAR WEATHERED SCHIST; ROCK FRAGMENTS.
-24	24									
-25	25			No Sample Recovered						
-26	26									
-27	27									
-28	28									
-29	29									
-30	30									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-1
PROJECT : PILOT TEST BEGIN DATE : 10/30/96
SITE/AREA : TANK FARM 2 END DATE : 10/31/96
LOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0

Total Depth : 25.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 25.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000

Well Permit.....(Y)es (N)o: N Permit # :

Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0

Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

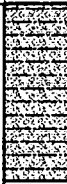
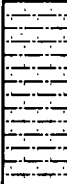
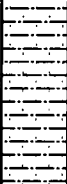
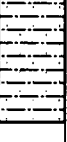


BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-1	1	1	0.00 1.30	SPS		15		50	30	5	0		NON	POR	LSE	MST	
MP-1	1	2	1.30 2.00	SPS		0		0	0	0	0						
MP-1	2	1	2.00 3.50	SPS		5		50	35	10	0		NON	POR	LSE	DRY	
MP-1	2	2	3.50 4.00	SPS		0		0	0	0	0						
MP-1	3	1	4.00 5.80	SPS		0		55	35	10	0		NON	POR	LSE	DRY	
MP-1	3	2	5.80 6.00	SPS		0		0	0	0	0						
MP-1	4	1	6.00 9.00	NS		0		0	0	0	0						
MP-1	5	1	9.00 10.60	SPS		0		50	35	15	0		NON	POR	LSE	DRY	
MP-1	5	2	10.60 11.00	SPS		0		0	0	0	0						
MP-1	6	1	11.00 14.00	NS		0		0	0	0	0						
MP-1	7	1	14.00 15.80	SPS		0		20	50	30	0		NON	POR	LSE	DRY	
MP-1	7	2	15.80 16.00	SPS		0		0	0	0	0						
MP-1	8	1	16.00 19.00	NS		0		0	0	0	0						
MP-1	9	1	19.00 20.50	SPS		0		25	50	25	0		NON	POR	LSE	MST	
MP-1	9	2	20.50 21.00	SPS		0		0	0	0	0						
MP-1	10	1	21.00 23.00	NS		0		0	0	0	0						
MP-1	11	1	23.00 24.60	SPS		0		20	50	30	0		NON	POR	LSE	MST	
MP-1	11	2	24.60 25.00	SPS		0		0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/30/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 10/31/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-1	1		65	Silty sand with gravel, SM	ORG-BRN	LSE	MST	2 2 3	OVM 0.0	
				No Sample Recovered						
-2	2		75	Silty sand, SM	ORG-BRN	LSE	DRY	3 3 5	OVM 0.0	MICACEOUS.
				No Sample Recovered						
-4	4		90	Silty sand, SM	ORG-BRN	LSE	DRY	2 4 9 8	OVM 0.0	
				No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL.
-9	9		80	Silty sand, SM	ORG-BRN	LSE	DRY	10 16 17 21	OVM 1.2	MICACEOUS; SAMPLE MP-01-011=VOC & TPH.
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/30/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 10/31/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silty sand, SM	ORG-BRN	LSE	DRY	10 16 17 21	OVM 1.2	MICACEOUS: SAMPLE MP-01-011=VOC & TPH.
-11	11			No Sample Recovered						AUGERED INTERVAL.
				Interval Not Sampled						
-12	12									
-13	13									
-14	14		90	Silt with sand, ML	ORANGE-BRN	LSE	DRY	9 15 18 24	OVM 1.6	BLACK SILT LENSES AT 14.3-14.4'.
-15	15									
-16	16			No Sample Recovered						AUGERED INTERVAL.
				Interval Not Sampled						
-17	17									
-18	18									
-19	19		75	Silt with sand, ML	ORG-BRN	LSE	MST	9 14 15 16	OVM 0.0	BLACK LAYER FROM 19.2-19.5'.
-20	20									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-1	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/30/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 10/31/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	LSE	MST	9	OVM 0.0	BLACK LAYER FROM 19.2-19.5'
				No Sample Recovered				14		
				Interval Not Sampled				15		
-21	21							16		AUGERED INTERVAL.
-22	22									
-23	23		80	Silt with sand, ML	ORG-BRN	LSE	MST	16	OVM 0.0	MICACEOUS. SAPROLITE.
								17		
								18		
								25		
-24	24									
				No Sample Recovered						
-25	25									
-26	26									
-27	27									
-28	28									
-29	29									
-30	30									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-2
PROJECT : PILOT TEST BEGIN DATE : 10/31/96
SITE/AREA : TANK FARM 2 END DATE : 11/01/96
LOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0
Total Depth : 25.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 25.00 ft. BGS
Method : HSA Fluid : NONE
Borehole Diameter #2:
Interval:
Method : Fluid :
Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000

Well Permit.....(Y)es (N)o: N Permit # :

Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0

Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-2	1	1	0.00 1.30	SPS		10		40	30	20	0		NON	POR	LSE	MST	
MP-2	1	2	1.30 2.00	SPS		0		0	0	0	0						
MP-2	2	1	2.00 3.00	SPS		0		40	40	20	0		NON	POR	LSE	MST	
MP-2	2	2	3.00 3.30	SPS		0		0	0	0	0						
MP-2	3	1	3.30 4.00	NS		0		0	0	0	0						
MP-2	4	1	4.00 5.10	SPS		0		35	45	20	0		LOW	POR	LSE	MST	
MP-2	4	2	5.10 6.00	SPS		0		0	0	0	0						
MP-2	5	1	6.00 9.00	NS		0		0	0	0	0						
MP-2	6	1	9.00 10.50	SPS		0		40	40	20	0		LOW	POR	LSE	MST	
MP-2	6	2	10.50 11.00	SPS		0		0	0	0	0						
MP-2	7	1	11.00 14.00	NS		0		0	0	0	0						
MP-2	8	1	14.00 15.80	SPS		0		20	55	25	0		NON	POR	LSE	DRY	
MP-2	8	2	15.80 16.00	SPS		0		0	0	0	0						
MP-2	9	1	16.00 19.00	NS		0		0	0	0	0						
MP-2	10	1	19.00 20.50	SPS		0		20	45	35	0		LOW	POR	LSE	DRY	
MP-2	10	2	20.50 21.00	SPS		0		0	0	0	0						
MP-2	11	1	21.00 23.00	NS		0		0	0	0	0						
MP-2	12	1	23.00 25.00	SPS		0		20	50	30	0		NON	POR	FRM	DRY	

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
			65	Silty sand, SM	ORG-BRN	LSE	MST	1	OVM 0.0	QUARTZ FRAGMENTS.
-1	1			No Sample Recovered						
-2	2		76	Sandy silt, ML	ORG-BRN	LSE	MST		OVM 1.3	REFUSAL @ 3.3'. OFFSET 1' AND REDRILL.
-3	3			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL.
-4	4		55	Sandy silt, ML	ORG-BRN	LSE	MST	1	OVM 6.0	
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL.
-7	7									
-8	8									
-9	9		75	Sandy silt, ML	ORG-BRN	LSE	MST	1	OVM 19.0	SAMPLE MP-2-011: VOC & TPH.
-10	10							3		

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-11	11			Sandy silt, ML	ORG-BRN	LSE	MST	1	OVN 19.0	SAMPLE MP-2-011: VOC & TPH.
				No Sample Recovered				5		
				Interval Not Sampled						AUGERED INTERVAL.
-12	12									
-13	13									
-14	14		90	Silt with sand, ML	ORG-BRN	LSE	DRY	5 12 17 18	OVN 1.5	
-15	15									
-16	16			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-17	17									
-18	18									
-19	19		75	Silt with sand, ML	ORG-BRN	LSE	DRY	12 15 19 20	OVN 1.3	
-20	20									



# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	LSE	DRY	12	OVM 1.3	
				No Sample Recovered				15		
				Interval Not Sampled				19		
								20		AUGERED INTERVAL-SAME AS ABOVE.
-21	21									
-22	22									
-23	23		100	Silt with sand, ML	ORG-BRN	FRM	DRY	12	OVM 0.0	WEATHERED MICACEOUS SCHIST; SAPROLITE.
								20		
								23		
								26		
-24	24									
-25	25									
-26	26									
-27	27									
-28	28									
-29	29									
-30	30									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-3
PROJECT : PILOT TEST BEGIN DATE : 10/31/96
SITE/AREA : TANK FARM 2 END DATE : 11/01/96
LOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0
Total Depth : 25.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 25.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000

Well Permit.....(Y)es (N)o: N Permit # :

Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0

Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT.. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-3	1	1	0.00	0.50	SPS	0		80	20	0	0		NON	POR	LSE	DRY	
MP-3	1	2	0.50	2.00	SPS	0		0	0	0	0						
MP-3	2	1	2.00	4.00	SPS	0		0	0	0	0						
MP-3	3	1	4.00	5.60	SPS	0		30	50	20	0		LOW	POR	LSE	DRY	
MP-3	3	2	5.60	6.00	SPS	0		0	0	0	0						
MP-3	4	1	6.00	9.00	NS	0		0	0	0	0						
MP-3	5	1	9.00	10.50	SPS	0		30	50	20	0		LOW	POR	LSE	DRY	
MP-3	5	2	10.50	11.00	SPS	0		0	0	0	0						
MP-3	6	1	11.00	14.00	NS	0		0	0	0	0						
MP-3	7	1	14.00	15.80	SPS	0		20	55	25	0		NON	POR	FIR	DRY	
MP-3	7	2	15.80	16.00	SPS	0		0	0	0	0						
MP-3	8	1	16.00	19.00	NS	0		0	0	0	0						
MP-3	9	1	19.00	20.70	SPS	0		15	60	25	0		NON	POR	FIR	DRY	
MP-3	9	2	20.70	21.00	SPS	0		0	0	0	0						
MP-3	10	1	21.00	23.00	NS	0		0	0	0	0						
MP-3	11	1	23.00	25.00	SPS	0		15	60	25	0		NON	POR	FRM	DRY	

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
			25	Silty sand, SM	BROWN/LT BROWN	LSE	DRY	2 2 5	OVM 0.0	WELL GRADED SAND (FILL).
-1	1			No Sample Recovered						
-2	2			No Sample Recovered				9 10 19		ROCK STRUCK IN SHOE OF SPOON.
-3	3									
-4	4		80	Sandy silt, ML	ORG-BRN	LSE	DRY	2 6 16	OVM 0.0	MICACEOUS, BLACK SILT LENSES THROUGHOUT.
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		75	Sandy silt, ML	ORG-BRN	LSE	DRY	2 6 10	OVM 0.0	
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Sandy silt, ML	ORG-BRN	LSE	DRY	2 6 10	OVN 0.0	
				No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-11	11									
-12	12									
-13	13									
-14	14		90	Silt with sand, ML	ORG-BRN	FIR	DRY	6 12 17 23	OVN 0.0	SAPROLITE. IRON STAINING; MICACEOUS; BLACK LENSES (AUGITE)
-15	15									
-16	16			No Sample Recovered						
-16	16			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-17	17									
-18	18									
-19	19		85	Silt with sand, ML	ORG-BRN	FIR	DRY	10 16 28 26	OVN 0.0	QUARTZ PIECES AT 20.5'. HIGHLY WEATHERED SCHIST.
-20	20									

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 25.00
SITE NAME : TANK FARM 2	LOGGER : C. HARRIS
BORING ID : MP-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 10/31/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/01/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	FIR	DRY	10 16 28 26	OVM 0.0	QUARTZ PIECES AT 20.5' HIGHLY WEATHERED SCHIST.
-21	21			No Sample Recovered						AUGERED INTERVAL-SAME AS ABOVE.
				Interval Not Sampled						
-22	22									
-23	23		100	Silt with sand, ML	ORG-BRN/RED-BRN	FRM	DRY	19 43 46 40	OVM 0.0	SAPROLITE.
-24	24									
-25	25									
-26	26									
-27	27									
-28	28									
-29	29									
-30	30									

**NORTHEAST CORNER OF THE BUILDING AREA**

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : SVE-2
PROJECT : PILOT TEST BEGIN DATE : 11/04/96
END DATE : 11/05/96
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0

Total Depth : 38.00 Depth to Bedrock : 0

Borehole Diameter #1: 12.00
Interval: 0.00 ft. to 36.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2: 2.00
Interval: 36.00 ft. to 38.00 ft. BGS
Method : SSA Fluid : NONE

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000
Well Permit.....(Y)es (N)o: N Permit # :
Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0
Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :



BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
SVE-2	1	1	0.00	1.50	NS	0	0	0	0	0	0						
SVE-2	2	1	1.50	2.50	SPS	0	20	50	30	0	0		LOW	POR	SFT	DRY	
SVE-2	2	2	2.50	3.50	SPS	0	0	0	0	0	0						
SVE-2	3	1	3.50	4.80	SPS	0	20	50	30	0	0		LOW	POR	SFT	DRY	
SVE-2	3	2	4.80	5.50	SPS	0	0	0	0	0	0						
SVE-2	4	1	5.50	8.00	NS	0	0	0	0	0	0						
SVE-2	5	1	8.00	10.00	SPS	0	15	50	35	0	0		LOW	POR	SFT	MST	
SVE-2	6	1	10.00	13.50	NS	0	0	0	0	0	0						
SVE-2	7	1	13.50	15.40	SPS	0	25	50	25	0	0		LOW	POR	SFT	MST	
SVE-2	7	2	15.40	15.50	SPS	0	0	0	0	0	0						
SVE-2	8	1	15.50	18.50	NS	0	0	0	0	0	0						
SVE-2	9	1	18.50	20.50	SPS	0	15	60	25	0	0		NON	POR	FRM	DRY	
SVE-2	10	1	20.50	23.50	NS	0	0	0	0	0	0						
SVE-2	11	1	23.50	24.80	SPS	0	15	45	40	0	0		LOW	POR	FRM	MST	
SVE-2	11	2	24.80	25.50	SPS	0	0	0	0	0	0						
SVE-2	12	1	25.50	28.50	NS	0	0	0	0	0	0						
SVE-2	13	1	28.50	30.00	SPS	0	10	50	40	0	0		NON	POR	FRM	MST	
SVE-2	13	2	30.00	30.40	SPS	0	0	0	0	0	0						
SVE-2	14	1	30.40	33.50	NS	0	0	0	0	0	0						
SVE-2	15	1	33.50	34.80	SPS	0	15	45	40	0	0		LOW	POR	FRM	MST	
SVE-2	16	1	34.80	36.00	NS	0	0	0	0	0	0						
SVE-2	17	1	36.00	38.00	SPS	0	10	50	45	0	0		NON	POR		MST	

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						AUGERED INTERVAL - 0-1.5' = CONCRETE/CRUSHED STONE. 1.0-1.5' = SOIL-DK BRN SANDY SILT W/SOME GRAV.
-1	1									
			50	Silt with sand, ML	LT ORG-BRN	SFT	DRY	3 5 7 10	OVM 19.0	MICACEOUS.
-2	2			No Sample Recovered				12 15 19 37		
-3	3									
			65	Silt with sand, ML	LT ORG-BRN	SFT	DRY	5 8 11 12	OVM 19.0	SAMPLE SVE-2-005 = VOC & TPH.
-4	4			No Sample Recovered						
-5	5									
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-6	6									
-7	7									
			100	Silt with sand, ML	LT ORG-BRN/GRAY	SFT	MST	7 9 11 12	OVM 10.0	
-8	8									
-9	9									
-10	10			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-11	11			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-12	12									
-13	13									
-14	14		95	Silt with sand, ML	LT ORG-BRN	SFT	MST	4 10 10 11	OVM 6.0	
-15	15									
-16	16			No Sample Recovered Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-17	17									
-18	18									
-19	19		100	Silt with sand, ML	ORG-BRN/GRAY	FRM	DRY	19 29 34 34	OVM 6.0	SAMPLE SVE-2-021 (VOC & TPH). HIGHLY WEATHERED SCHIST.
-20	20									

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN/GRAY	FRM	DRY	19 20 34	OVM 6.0	SAMPLE SVE-2-021 (VOC & TPH) HIGHLY WEATHERED SCHIST.
-21	21			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-22	22									
-23	23									
			65	Clayey silt with sand, ML	ORG-BRN/GRAY	FRM	MST	12 19 30 36	OVM 5.0	QUARTZITE FRAGMENTS. HIGHLY WEATHERED SCHIST.
-24	24									
-25	25			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-26	26									
-27	27									
-28	28									
			78	Clayey silt, ML	ORG-BRN/GRAY	FRM	MST	12 22 32 50	OVM 6.0	SPOON REFUSAL AT 30.4'. QUARTZ FRAGMENTS.
-29	29									
-30	30			No Sample Recovered						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				12		
				Interval Not Sampled				50		AUGERED INTERVAL-SAME AS ABOVE.
-31	31									
-32	32									
-33	33									
-34	34		100	Clayey silt with sand, ML	ORG-BRN	FRM	MST	17 51 50 0	OVM 22.0	MICACEOUS- BLACK AUGITE LENSES THROUGHOUT. SAMPLE SVE-2-035 (VOC & TPH).
-35	35			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-36	36		100	Clayey silt, ML	ORG-BRN/RED BRN		MST	12 15 19 37	OVM 58.0	SAPROLITE.
-37	37									
-38	38									
-39	39									
-40	40									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : SVE-3
PROJECT : PILOT TEST BEGIN DATE : 11/06/96
END DATE : 11/08/96
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : O
Total Depth : 36.00 Depth to Bedrock : 0

Borehole Diameter #1: 12.00
Interval: 0.00 ft. to 36.00 ft. BGS
Method : Fluid :
Borehole Diameter #2:
Interval:
Method : Fluid :
Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000
Well Permit.....(Y)es (N)o: N Permit # :
Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0
Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
SVE-3	1	1	0.00	3.50	NS		0	0	0	0	0						
SVE-3	2	1	3.50	5.00	SPS		5	25	55	15	0		NON	POR	LSE	DRY	
SVE-3	2	2	5.00	5.50	SPS		0	0	0	0	0						
SVE-3	3	1	5.50	8.50	NS		0	0	0	0	0						
SVE-3	4	1	8.50	10.40	SPS		0	15	60	25	0		NON	POR	LSE	MST	
SVE-3	4	2	10.40	10.50	SPS		0	0	0	0	0						
SVE-3	5	1	10.50	13.50	NS		0	0	0	0	0						
SVE-3	6	1	13.50	15.30	SPS		0	20	50	30	0		NON	POR	FIR	MST	
SVE-3	6	2	15.30	15.50	SPS		0	0	0	0	0						
SVE-3	7	1	15.50	18.50	NS		0	0	0	0	0						
SVE-3	8	1	18.50	20.00	SPS		0	15	65	20	0		NON	POR	LSE	MST	
SVE-3	8	2	20.00	20.50	SPS		0	0	0	0	0						
SVE-3	9	1	20.50	23.50	NS		0	0	0	0	0						
SVE-3	10	1	23.50	25.50	SPS		5	20	40	35	0		NON	POR	FIR	MST	
SVE-3	11	1	25.50	28.50	NS		0	0	0	0	0						
SVE-3	12	1	28.50	29.50	SPS		0	20	45	35	0		NON	POR	FIR	DRY	
SVE-3	12	2	29.50	29.90	SPS		0	0	0	0	0						
SVE-3	13	1	29.90	30.50	NS		0	0	0	0	0						
SVE-3	14	1	30.50	33.50	NS		0	0	0	0	0						
SVE-3	15	1	33.50	35.30	SPS		0	20	40	40	0		NON	POR	FIR	DRY	
SVE-3	15	2	35.30	35.50	SPS		0	0	0	0	0						
SVE-3	16	1	35.50	36.00	NS		0	0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

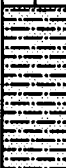
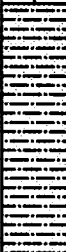
ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN/GRAY	FRM	DRY	19 20 34	OVM 6.0	SAMPLE SVE-2-021 (VOC & TPH). HIGHLY WEATHERED SCHIST.
-21	21			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-22	22									
-23	23									
-24	24		65	Clayey silt with sand, ML	ORG-BRN/GRAY	FRM	MST	12 19 30 36	OVM 5.0	QUARTZITE FRAGMENTS. HIGHLY WEATHERED SCHIST.
-25	25			No Sample Recovered						
-26	26			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-27	27									
-28	28									
-29	29		78	Clayey silt, ML	ORG-BRN/GRAY	FRM	MST	12 22 32 50	OVM 6.0	SPOON REFUSAL AT 30.4'. QUARTZ FRAGMENTS.
-30	30			No Sample Recovered						



# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 38.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-2	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/04/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/05/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				12		
				Interval Not Sampled				50		AUGERED INTERVAL-SAME AS ABOVE.
-31	31									
-32	32									
-33	33									
-34	34		100	Clayey silt with sand, ML	ORG-BRN	FRM	MST	17 51 50 0	OMV 22.0	MICACEOUS- BLACK AUGITE LENSES THROUGHOUT. SAMPLE SVE-2-035 (VOC & TPH).
-35	35			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-36	36		100	Clayey silt, ML	ORG-BRN/RED BRN		MST	12 15 19 37	OMV 58.0	SAPROLITE.
-37	37									
-38	38									
-39	39									
-40	40									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 36.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						0-0.8'=CEMENT 0.8-3'=GRAVEL (RAILROAD BED).
-1	1									
-2	2									
-3	3									
-4	4		75	Sandy silt, ML	ORG-BRN	LSE	DRY	8 10 9	OVM 7.0	
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		95	Silt with sand, ML	ORG-BRN	LSE	MST	6 12 18 20	OVM 28.0	SLIGHT ODOR ("SWEET"). SAMPLE SVE-3-011 (VOC & TPH).
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 36.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	LSE	MST	6	OVN 28.0	SLIGHT ODOR ("SHEET"). SAMPLE SVE-3-011 (VOC & TPH).  AUGERED INTERVAL-SAME AS ABOVE.
-11	11			No Sample Recovered Interval Not Sampled			13 18 20			
-12	12									
-13	13									
			90	Silt with sand, ML	ORG-BRN/GRAY	FIR	MST	6	OVN 10.0	AUGERED INTERVAL-SAME AS ABOVE.
-14	14			No Sample Recovered Interval Not Sampled			15 16			
-15	15									
-16	16									
-17	17									
-18	18									
			90	Silt with sand, ML	ORG-BRN	LSE	MST	7	OVN 20.0	BLACK AUGITE AND QUARTZ VEINS. SAMPLE SVE-3-020 (VOC & TPH).
-19	19			No Sample Recovered Interval Not Sampled			8 10 13			
-20	20									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 36.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				7		
				Interval Not Sampled				8		
-21	21							13		AUGERED INTERVAL-SAME AS ABOVE.
-22	22									
-23	23									
-24	24		100	Clayey silt with sand, ML	REDDISH/PINKISH	FIR	MST	10 14 19 23	OVM 7.0	HIGHLY WEATHERED MICACEOUS SCHIST.
-25	25									
-26	26			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-27	27									
-28	28									
-29	29		71	Clayey silt with sand, ML		FIR	DRY	16 24 50 0	OVM 17.0	MICACEOUS.
-30	30			No Sample Recovered						
				Interval Not Sampled						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 36.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : SVE-3	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-31	31									
-32	32									
-33	33									
-34	34		90	Clayey silt with sand, ML	ORG-BRN	FIR	DRY	10 18 25 43	OVM 30.0	HIGHLY WEATHERED SCHIST; SAMPLE SVE-3-036.
-35	35			No Sample Recovered						
-36	36			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-37	37									
-38	38									
-39	39									
-40	40									

**Location Identification Data**

**Roy F. Weston, Inc.**

CLIENT : B&D  
 PROJECT : PILOT TEST  
 SITE/AREA : NE CORNER OF BUILDING  
 LOCATION ID : MP-4  
 BEGIN DATE : 11/05/96  
 END DATE : 11/06/96  
 LOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : O  
 Total Depth : 33.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00  
 Interval: 0.00 ft. to 33.00 ft. BGS  
 Method : HSA Fluid : NONE

Borehole Diameter #2:  
 Interval:  
 Method : Fluid :

Borehole Diameter #3:  
 Interval:  
 Method : Fluid :

Drilling Company : WALTER CORP.  
 Driller : GARY TRUVER, SR.  
 Drill Rig Type : AUGER RIG

	Estimated	Surveyed
Surface Elevation :	0.000	
N. Coordinate :	0.0000	
E. Coordinate :	0.0000	
Well Permit.....(Y)es (N)o: N	Permit # :	
Hole Abandoned...(Y)es (N)o: N		
Well Installed...(Y)es (N)o: N		
Well Cluster.....(Y)es (N)o: N	No. of Wells : 0	
Well Nest.....(Y)es (N)o: N	No. of Wells : 0	
Pumps Installed..(Y)es (N)o: N	Type	Depth
	Purge :	0
	Sample :	0

Borehole Testing  
 Borehole Geophysics.....(Y)es (N)o: N  
 Slug Tests.....(Y)es (N)o: N  
 Packer Tests.....(Y)es (N)o: N  
 Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-4	1	1	0.00	1.50	NS	0		0	0	0	0						
MP-4	2	1	1.50	3.20	SPS	0		35	55	10	0		NON	POR	LSE	DRY	
MP-4	2	2	3.20	3.50	SPS	0		0	0	0	0						
MP-4	3	1	3.50	5.30	SPS	0		25	60	15	0		NON	POR	LSE	DRY	
MP-4	3	2	5.30	5.50	SPS	0		0	0	0	0						
MP-4	4	1	5.50	8.50	NS	0		0	0	0	0						
MP-4	5	1	8.50	10.30	SPS	0		15	60	25	0		NON	POR	LSE	DRY	
MP-4	5	2	10.30	10.50	SPS	0		0	0	0	0						
MP-4	6	1	10.50	13.50	NS	0		0	0	0	0						
MP-4	7	1	13.50	14.80	SPS	5		15	55	25	0		NON	POR	FIR	DRY	
MP-4	7	2	14.80	15.50	SPS	0		0	0	0	0						
MP-4	8	1	15.50	18.50	NS	0		0	0	0	0						
MP-4	9	1	18.50	20.30	SPS	5		20	50	25	0		NON	POR	FIR	MST	
MP-4	9	2	20.30	20.50	SPS	0		0	0	0	0						
MP-4	10	1	20.50	23.50	NS	0		0	0	0	0						
MP-4	11	1	23.50	25.00	SPS	5		10	45	40	0		NON	POR	FIR	DRY	
MP-4	11	2	25.00	25.50	SPS	0		0	0	0	0						
MP-4	12	1	25.50	28.50	NS	0		0	0	0	0						
MP-4	13	1	28.50	30.00	SPS	5		10	50	35	0		LOW	POR	FIR	MST	
MP-4	13	2	30.00	30.50	SPS	0		0	0	0	0						
MP-4	14	1	30.50	33.00	NS	0		0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-4	DRILLING COMPANY : WALTER CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/05/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/06/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-1	1			Interval Not Sampled						AUGERED INTERVAL (CONCRETE AND GRAVEL BASE).
-2	2		85	Sandy silt, ML	ORG-BRN	LSE	DRY	3 6 8	OVM 20.0	
-3	3			No Sample Recovered						
-4	4		90	Silt with sand, ML	ORG-BRN	LSE	DRY	3 8 11	OVM 32.0	
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		90	Silt with sand, ML	ORG-BRN	LSE	DRY	7 10 13 15	OVM 72.0	QUARTZ FRAGMENTS.
-10	10									



# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-4	DRILLING COMPANY : WALTER CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/05/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/06/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	LSE	DRY	7	OVM 72.0	QUARTZ FRAGMENTS.
				No Sample Recovered				10		
				Interval Not Sampled				13		AUGERED INTERVAL-SAME AS ABOVE.
-11	11									
-12	12									
-13	13									
			65	Silt with sand, ML	ORG-BRN	FIR	DRY	7	OVM 45.0	BLACK ANGITE VEINS THROUGHOUT. QUARTZ FRAGMENTS.
-14	14							13		
								20		
								21		
-15	15			No Sample Recovered						
-16	16			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-17	17									
-18	18									
			85	Silt with sand, ML	ORG-BRN	FIR	MST	13	OVM 171	QUARTZ FRAGMENTS.
-19	19							17		
								27		
								34		
-20	20									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-4	DRILLING COMPANY : WALTER CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/05/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/06/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	FIR	MST	13	OVM 171	QUARTZ FRAGMENTS.
				No Sample Recovered				17		
				Interval Not Sampled				27		
-21	21							34		AUGERED INTERVAL-SAME AS ABOVE.
-22	22									
-23	23									
			75	Clayey silt with sand, ML	ORG-BRN	FIR	DRY	16	OVM 150	MICACEOUS; BLACK VEIN (1") AT 23.9-24.0' (ANGITE); QUARTZ; SAPROLITE.
-24	24							23		
								27		
								57		
-25	25			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-26	26									
-27	27									
-28	28									
			75	Clayey silt with sand, ML	ORG-BRN	FIR	MST	15	OVM 205	QUARTZ FRAGMENTS; SAMPLE MP-4-030 (VOC & TPH).
-29	29							15		
								17		
								26		
-30	30			No Sample Recovered						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-4	DRILLING COMPANY : WALTER CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/05/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/06/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				15		
				Interval Not Sampled				15 15 26		AUGERED INTERVAL-SAME AS ABOVE.
-31	31									
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

**Location Identification Data**

**Roy F. Weston, Inc.**

CLIENT : B&D LOCATION ID : MP-5  
PROJECT : PILOT TEST BEGIN DATE : 11/06/96  
END DATE : 11/08/96  
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0

Total Depth : 33.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00  
Interval: 0.00 ft. to 33.00 ft. BGS  
Method : HSA Fluid :

Borehole Diameter #2:  
Interval:  
Method : Fluid :

Borehole Diameter #3:  
Interval:  
Method : Fluid :

Drilling Company : WALTON CORP.  
Driller : GARY TRUVER, SR.  
Drill Rig Type : AUGER RIG

	Estimated	Surveyed
Surface Elevation :	0.000	
N. Coordinate :	0.0000	
E. Coordinate :	0.0000	
Well Permit.....(Y)es (N)o: N	Permit # :	
Hole Abandoned...(Y)es (N)o: N		
Well Installed...(Y)es (N)o: N		
Well Cluster.....(Y)es (N)o: N	No. of Wells : 0	
Well Nest.....(Y)es (N)o: N	No. of Wells : 0	
Pumps Installed..(Y)es (N)o: N	Type	Depth
	Purge :	0
	Sample :	0

Borehole Testing  
Borehole Geophysics.....(Y)es (N)o: N  
Slug Tests.....(Y)es (N)o: N  
Packer Tests.....(Y)es (N)o: N  
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-5	1	1	0.00	1.50	NS	0		0	0	0	0						
MP-5	2	1	1.50	3.10	SPS	0		30	50	20	0		NON	POR	LSE	DRY	
MP-5	2	2	3.10	3.50	SPS	0		0	0	0	0						
MP-5	3	1	3.50	4.90	SPS	5		25	50	20	0		NON	POR	LSE	DRY	
MP-5	3	2	4.90	5.50	SPS	0		0	0	0	0						
MP-5	4	1	5.50	8.50	NS	0		0	0	0	0						
MP-5	5	1	8.50	10.10	SPS	0		20	55	25	0		NON	POR	LSE	DRY	
MP-5	5	2	10.10	10.50	SPS	0		0	0	0	0						
MP-5	6	1	10.50	13.50	NS	0		0	0	0	0						
MP-5	7	1	13.50	15.00	SPS	0		15	55	30	0		NON	POR	FIR	DRY	
MP-5	7	2	15.00	15.50	SPS	0		0	0	0	0						
MP-5	8	1	15.50	18.50	NS	0		0	0	0	0						
MP-5	9	1	18.50	20.50	SPS	0		15	60	25	0		NON	POR	FIR	DRY	
MP-5	10	1	20.50	23.50	NS	0		0	0	0	0						
MP-5	11	1	23.50	25.10	SPS	0		15	45	40	0		NON	POR	FIR	DRY	
MP-5	11	2	25.10	25.50	SPS	0		0	0	0	0						
MP-5	12	1	25.50	28.50	NS	0		0	0	0	0						
MP-5	13	1	28.50	30.10	SPS	0		10	45	45	0		LOW	POR	FIR	DRY	
MP-5	13	2	30.10	30.50	SPS	0		0	0	0	0						
MP-5	14	1	30.50	33.00	NS	0		0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-5	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						0-0.8'=CONCRETE. 0.8-1.5'=GRAVEL BASE.
-1	1		80	Sandy silt, ML	ORG-BRN	LSE	DRY	3 6 8	OVM 3.0	
-2	2			No Sample Recovered						
-3	3		70	Sandy silt, ML	ORG-BRN	LSE	DRY	5 8 10 10	OVM 5.0	QUARTZ FRAGMENTS.
-4	4			No Sample Recovered						
-5	5			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-6	6									
-7	7									
-8	8		80	Silt with sand, ML	ORG-BRN	LSE	DRY	5 7 10 11	OVM 7.0	MICACEOUS; BLACK AUGITE VEINS.
-9	9									
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-5	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-11	11			Silt with sand, ML	ORG-BRN	LSE	DRY	5	OVN 7.0	MICACEOUS; BLACK AUGITE VEINS.
				No Sample Recovered				7		
				Interval Not Sampled				10		AUGERED INTERVAL-SAME AS ABOVE.
								11		
-12	12									
-13	13									
-14	14		75	Silt with sand, ML	ORG-BRN	FIR	DRY	7	OVN 7.0	MICA- BLACK VEINS THROUGHOUT; IRON STAINING.
								13		
								14		
								15		
-15	15			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-16	16									
-17	17									
-18	18									
-19	19		100	Silt with sand, ML	ORG-BRN	FIR	DRY	10	OVN 9.0	MICACEOUS; HIGHLY WEATHERED; SCHIST. SAPROLITE; TRACE GRAVEL FRAGMENT.
								15		
								20		
								25		
-20	20									

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-5	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	ORG-BRN	FIR	DRY	10 15 20 25	OVM 9.0	MICACEOUS; HIGHLY WEATHERED SCHIST. SAPROLITE; TRACE GRAVEL FRAGMENT. AUGERED INTERVAL-SAME AS ABOVE.
-21	21			Interval Not Sampled						
-22	22									
-23	23									
			80	Silt with sand, ML	ORG-BRN	FIR	DRY	5 17 18 17	OVM 0.7	AUGERED INTERVAL-SAME AS ABOVE.
-24	24									
-25	25			No Sample Recovered						
				Interval Not Sampled						
-26	26									
-27	27									
-28	28									
			80	Clayey silt, ML	ORG-BRN/PINKISH	FIR	DRY	5 10 11 24	OVM 0.5	MICACEOUS; HIGHLY WEATHERED SCHIST.
-29	29									
-30	30									



# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-5	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Clayey silt; ML	ORG-BRN/PINKISH	FIR	DRY	5	OVM 0.5	MICACEOUS; HIGHLY WEATHERED SCHIST.  AUGERED INTERVAL-SAME AS ABOVE.
				No Sample Recovered				10		
				Interval Not Sampled				11		
-31	31							24		
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-6
PROJECT : PILOT TEST BEGIN DATE : 11/06/96
END DATE : 11/08/96
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0

Total Depth : 33.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 33.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000

Well Permit.....(Y)es (N)o: N Permit # :

Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0

Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-6	1	1	0.00	1.50	NS		0	0	0	0	0						
MP-6	2	1	1.50	3.30	SPS		5	35	50	10	0		NON	POR	LSE	DRY	
MP-6	2	2	3.30	3.50	SPS		0	0	0	0	0						
MP-6	3	1	3.50	5.00	SPS		0	35	50	15	0		NON	POR	FIR	DRY	
MP-6	3	2	5.00	5.50	SPS		0	0	0	0	0						
MP-6	4	1	5.50	8.50	NS		0	0	0	0	0						
MP-6	5	1	8.50	10.00	SPS		0	25	55	20	0		NON	POR	LSE	DRY	
MP-6	5	2	10.00	10.50	SPS		0	0	0	0	0						
MP-6	6	1	10.50	13.50	NS		0	0	0	0	0						
MP-6	7	1	13.50	15.10	SPS		0	20	60	20	0		NON	POR	FIR	DRY	
MP-6	7	2	15.10	15.50	SPS		0	0	0	0	0						
MP-6	8	1	15.50	18.50	NS		0	0	0	0	0						
MP-6	9	1	18.50	20.00	SPS		0	15	60	25	0		NON	POR	LSE	DRY	
MP-6	9	2	20.00	20.50	SPS		0	0	0	0	0						
MP-6	10	1	20.50	23.50	NS		0	0	0	0	0						
MP-6	11	1	23.50	25.20	SPS		5	10	45	40	0		NON	POR	FIR	DRY	
MP-6	11	2	25.20	25.50	SPS		0	0	0	0	0						
MP-6	12	1	25.50	28.50	NS		0	0	0	0	0						
MP-6	13	1	28.50	29.80	SPS		0	10	50	40	0		NON	POR	DEN	DRY	
MP-6	14	1	29.80	30.50	NS		0	0	0	0	0						
MP-6	15	1	30.50	33.00	NS		0	0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-6	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						0-0.8'=CONCRETE 0.8-1.5'=GRAVEL
-1	1									
-2	2		90	Sandy silt, ML	LT BRN	LSE	DRY	3 9 11	OVM 6.0	
-3	3									
-4	4		75	No Sample Recovered Sandy silt, ML	ORG-BRN	FIR	DRY	3 19 22	OVM 15.0	SAMPLE MP-6-005 (VOC & TPH).
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		75	Silt with sand, ML	LT ORG-BRN	LSE	DRY	5 7 10	OVM 5.0	MICACEOUS; BLACK VEINS THROUGHOUT.
-10	10			No Sample Recovered						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-6	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				5		
				Interval Not Sampled				10		AUGERED INTERVAL-SAME AS ABOVE.
-11	11									
-12	12									
-13	13									
			80	Silt with sand, ML	LT ORG-BRN	FIR	DRY	12	OVM 5.0	HIGHLY WEATHERED SCHIST.
-14	14							20		
								24		
								32		
-15	15			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-16	16									
-17	17									
-18	18									
			75	Silt with sand, ML	ORG-BRN	LSE	DRY	9	OVM 5.0	HIGHLY WEATHERED SCHIST; BLACK VEINS THROUGHOUT.
-19	19							10		
								11		
								12		
-20	20			No Sample Recovered						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-6	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				No Sample Recovered				9		
				Interval Not Sampled				10		
								11		AUGERED INTERVAL-SAME AS ABOVE.
								12		
-21	21									
-22	22									
-23	23									
-24	24		85	Clayey silt with sand, ML	PINKISH/ORG-BRN	FIR	DRY	9	0VM 5.0	WEATHERED SCHIST; MICACEOUS; BLACK VEINS.
-25	25							11		
-26	26			No Sample Recovered						
-27	27			Interval Not Sampled						
-28	28									AUGERED INTERVAL-SAME AS ABOVE.
-29	29		100	Clayey silt, ML	PINKISH/ORG-BRN	DEN	DRY	20	0VM 3.0	
-30	30							50		
				Interval Not Sampled				0		

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-6	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/06/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Interval Not Sampled						
				Interval Not Sampled						
-31	31									
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

AUGERED INTERVAL-SAME AS ABOVE.

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-7
PROJECT : PILOT TEST BEGIN DATE : 11/07/96
END DATE : 11/07/96
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : 0

Total Depth : 33.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 33.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000

Well Permit.....(Y)es (N)o: N Permit # :

Hole Abandoned...(Y)es (N)o: N

Well Installed...(Y)es (N)o: N

Well Cluster.....(Y)es (N)o: N No. of Wells : 0

Well Nest.....(Y)es (N)o: N No. of Wells : 0

Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing

Borehole Geophysics.....(Y)es (N)o: N

Slug Tests.....(Y)es (N)o: N

Packer Tests.....(Y)es (N)o: N

Pumping Tests.....(Y)es (N)o: N

Comments :



BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-7	1	1	0.00 3.50	NS		0		0	0	0	0						
MP-7	2	1	3.50 4.80	SPS		5		30	50	15	0		NON	POR	FIR	DRY	
MP-7	2	2	4.80 5.50	SPS		0		0	0	0	0						
MP-7	3	1	5.50 8.50	NS		0		0	0	0	0						
MP-7	4	1	8.50 10.30	SPS		0		20	55	25	0		LOW	POR	SFT	MST	
MP-7	4	2	10.30 10.50	SPS		0		0	0	0	0						
MP-7	5	1	10.50 13.50	NS		0		0	0	0	0						
MP-7	6	1	13.50 15.30	SPS		0		25	60	15	0		NON	POR	LSE	MST	
MP-7	6	2	15.30 15.50	SPS		0		0	0	0	0						
MP-7	7	1	15.50 18.50	NS		0		0	0	0	0						
MP-7	8	1	18.50 20.20	SPS		10		15	50	25	0		NON	POR	FIR	MST	
MP-7	8	2	20.20 20.40	SPS		0		0	0	0	0						
MP-7	9	1	20.40 23.50	NS		0		0	0	0	0						
MP-7	10	1	23.50 23.90	SPS		5		10	50	35	0		NON	POR	DEN	DRY	
MP-7	11	1	23.90 28.50	NS		0		0	0	0	0						
MP-7	12	1	28.50 30.30	SPS		0		10	50	40	0		NON	POR	FIR	MST	
MP-7	12	2	30.30 30.50	SPS		0		0	0	0	0						
MP-7	13	1	30.50 33.00	NS		0		0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-7	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/07/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-1	1			Interval Not Sampled						AUGERED INTERVAL: 0-1' = CONCRETE 1-2.5' = GRAVEL
-2	2									
-3	3									
-4	4		65	Sandy silt, ML	ORG-BRN	FIR	DRY	4 7 13 22	OVM 0.0	
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		90	Silt with sand, ML	ORG-BRN	SFT	MST	7 8 6 7	OVM 0.0	WHITE CLAY LENSE; BLACK/RED VEINS.
-10	10									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-7	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/07/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-11	11			Silt with sand, ML No Sample Recovered Interval Not Sampled	ORG-BRN	SFT	MST	7 8 8	OVM 0.0	WHITE CLAY LENSE; BLACK/ RED VEINS.  AUGERED INTERVAL-SAME AS ABOVE.
-12	12									
-13	13									
-14	14		90	Silt with sand, ML No Sample Recovered Interval Not Sampled	ORG-BRN/PINKISH	LSE	MST	5 7 8 14	OVM 0.0	    AUGERED INTERVAL-SAME AS ABOVE.
-15	15									
-16	16									
-17	17									
-18	18									
-19	19		89	Silt with sand, ML	ORG-BRN	FIR	MST	7 13 22 50	OVM 0.0	QUARTZ VEIN (FRAGMENTED) AT 19.5' MICACEOUS; HIGHLY WEATHERED.
-20	20									

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-7	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/07/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-21	21			Silt with sand, ML No Sample Recovered Interval Not Sampled	ORG-BRN	FIR	MST	7 13 23 50	OVM 0.0	QUARTZ VEIN (FRAGMENTED) AT 19.5'; MICACEOUS; HIGHLY WEATHERED. AUGERED INTERVAL-SAME AS ABOVE.
-22	22									
-23	23									
-24	24		100	Silt with sand, ML Interval Not Sampled	PINKISH/REDDISH	DEN	DRY	50 00 0	OVM 0.0	HIGHLY WEATHERED. AUGERED INTERVAL-SAME AS ABOVE.
-25	25									
-26	26									
-27	27									
-28	28									
-29	29		90	Clayey silt, ML	ORG-BRN	FIR	MST	18 13 12 35	OVM 2.0	MICACEOUS; SAMPLE MP-7-031 (VOC & TPH).
-30	30									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-7	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/07/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-31	31			Clayey silt, ML	ORG-BRN	FIR	MST	18	OVM 2.0	MICACEOUS; SAMPLE MP-7-031 (VOC & TPH).
				No Sample Recovered						
				Interval Not Sampled						
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

Location Identification Data

Roy F. Weston, Inc.

CLIENT : B&D LOCATION ID : MP-8
PROJECT : PILOT TEST BEGIN DATE : 11/07/96
END DATE : 11/08/96
SITE/AREA : NE CORNER OF BUILDINGLOGGER : C. HARRIS

Borehole Completed In (<O>verburden <B>edrock) : O

Total Depth : 33.00 Depth to Bedrock : 0

Borehole Diameter #1: 10.00
Interval: 0.00 ft. to 33.00 ft. BGS
Method : HSA Fluid : NONE

Borehole Diameter #2:
Interval:
Method : Fluid :

Borehole Diameter #3:
Interval:
Method : Fluid :

Drilling Company : WALTON CORP.
Driller : GARY TRUVER, SR.
Drill Rig Type : AUGER RIG

Surface Estimated Surveyed
Elevation : 0.000
N. Coordinate : 0.0000
E. Coordinate : 0.0000
Well Permit.....(Y)es (N)o: N Permit # :
Hole Abandoned...(Y)es (N)o: N
Well Installed...(Y)es (N)o: N
Well Cluster.....(Y)es (N)o: N No. of Wells : 0
Well Nest.....(Y)es (N)o: N No. of Wells : 0
Pumps Installed..(Y)es (N)o: N Type Depth
Purge : 0
Sample : 0

Borehole Testing
Borehole Geophysics.....(Y)es (N)o: N
Slug Tests.....(Y)es (N)o: N
Packer Tests.....(Y)es (N)o: N
Pumping Tests.....(Y)es (N)o: N

Comments :

BOREHOLE /WELL ID	SMP NUM	LTH NUM	LITHOLOGY INT. (FT BGS)	SAMPLING METHOD	SIZE GRAVEL	GRAVEL PCT.	SIZE SAND	SAND PCT	SILT PCT	CLAY PCT	ORGANIC PCT	ROCK TYPE	PLAST	SORT	STRENGTH	MOISTURE	STRAT UNIT
MP-8	1	1	0.00 3.50	NS		0		0	0	0	0						
MP-8	2	1	3.50 5.40	SPS		0		40	50	10	0		NON	POR	LSE	MST	
MP-8	2	2	5.40 5.50	SPS		0		0	0	0	0						
MP-8	3	1	5.50 8.50	NS		0		0	0	0	0						
MP-8	4	1	8.50 10.20	SPS		5		20	55	20	0		LOW	POR	LSE	MST	
MP-8	4	2	10.20 10.50	SPS		0		0	0	0	0						
MP-8	5	1	10.50 13.50	NS		0		0	0	0	0						
MP-8	6	1	13.50 15.40	SPS		15		25	30	30	0		LOW	POR	FIR	MST	
MP-8	6	2	15.40 15.50	SPS		0		0	0	0	0						
MP-8	7	1	15.50 18.50	NS		0		0	0	0	0						
MP-8	8	1	18.50 20.50	SPS		0		20	50	30	0		NON	POR	FIR	DRY	
MP-8	9	1	20.50 23.50	NS		0		0	0	0	0						
MP-8	10	1	23.50 25.10	SPS		0		10	50	40	0		NON	POR	FIR	DRY	
MP-8	10	2	25.10 25.50	SPS		0		0	0	0	0						
MP-8	11	1	25.50 28.50	NS		0		0	0	0	0						
MP-8	12	1	28.50 30.50	SPS		0		15	45	40	0		NON	POR	FIR	DRY	
MP-8	13	1	30.50 33.00	NS		0		0	0	0	0						

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
SITE NAME : NE CORNER OF BUILDING	LOGGER : C. HARRIS
BORING ID : MP-8	DRILLING COMPANY : WALTON CORP.
NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-1	1			Interval Not Sampled						AUGERED INTERVAL: 0-2.5' = GRAVEL (RAILROAD BED) 2.5-3.5' = SOIL/GRAVEL
-2	2									
-3	3									
-4	4		95	Sandy silt, ML	PINKISH/ORG-BRN	LSE	MST	4	OVM 1.2	
-5	5			No Sample Recovered						
-6	6			Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-7	7									
-8	8									
-9	9		85	Silt with sand, ML	ORG-BRN/PINKISH	LSE	MST	3 5 10 17	OVM 2.1	QUARTZ FRAGMENTS AT 8.8'.
-10	10									



# Borehole Log

Roy F. Weston, Inc.

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ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
-11	11			Silt with sand, ML No Sample Recovered Interval Not Sampled	ORG-BRN/PINKISH	LSE	MST	3 10 17	OVM 2.1	QUARTZ FRAGMENTS AT 8.8'.  AUGERED INTERVAL-SAME AS ABOVE.
-14	14		95	Sandy silt with gravel, ML  No Sample Recovered Interval Not Sampled	ORG-BRN	FIR	MST	9 20 15 10	OVM 0.8	QUARTZ VEIN FROM 14.4-14.9'. RED/WHITE CLAY BELOW.  AUGERED INTERVAL-SAME AS ABOVE.
-19	19		100	Silt with sand, ML	PINKISH/ORANGIS	FIR	DRY	17 24 22 23	OVM 0.0	MICACEOUS; HIGHLY WEATHERED SCHIST.

**Borehole Log**

**Roy F. Weston, Inc.**

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
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NORTHING : 0.0000 estimated	DRILLING RIG : AUGER RIG
EASTING : 0.0000 estimated	DATE STARTED : 11/07/96
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ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Silt with sand, ML	PINKISH/ORANGIS	FIR	DRY	17	OVM 0.0	MICACEOUS; HIGHLY WEATHERED SCHIST.
				Interval Not Sampled				24 25 25		AUGERED INTERVAL-SAME AS ABOVE.
-21	21									
-22	22									
-23	23									
			80	Clayey silt, ML	PINKISH BRN	FIR	DRY	20	OVM 0.0	MICACEOUS; HIGHLY WEATHERED SCHIST.
-24	24							30 38 29		
-25	25			No Sample Recovered						
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-26	26									
-27	27									
-28	28									
			100	Clayey silt with sand, ML	PINKISH/REDDISH	FIR	DRY	18	OVM 0.0	WEATHERED SCHIST.
-29	29							24 39 39		
-30	30									

# Borehole Log

Roy F. Weston, Inc.

PROJECT : PILOT TEST	TOTAL DEPTH : 33.00
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ELEVATION : 0.000 estimated	DATE COMPLETED : 11/08/96

ELEVATION	DEPTH	MATERIAL	% RECOVERY	CLASSIFICATION	COLOR	STRENGTH	MOISTURE	BLOW COUNT	FIELD INSTRUMENT READING	COMMENTS
				Clayey silt with sand, ML	PINKISH/REDDISH	FIR	DRY	18 24 30 39	OMV 0.0	WEATHERED SCHIST.
				Interval Not Sampled						AUGERED INTERVAL-SAME AS ABOVE.
-31	31									
-32	32									
-33	33									
-34	34									
-35	35									
-36	36									
-37	37									
-38	38									
-39	39									
-40	40									

**APPENDIX B**  
**LABORATORY DATA SUMMARY SHEETS**

**SOIL ANALYTICAL DATA PACKAGES**



Roy F. Weston, Inc.  
208 Welsh Pool Road  
Lionville, Pennsylvania 19341-1333  
610-701-6100 • Fax 610-701-6140

**LIONVILLE LABORATORY  
ANALYTICAL REPORT**

**Client : BLACK & DECKER-HAMPSTEAD**  
**RFW# : 9611L037**

**W.O. #: 02501-004-001-0300-00**  
**Date Received: 11-01-96**

**INORGANIC CASE NARRATIVE**

1. This narrative covers the analyses of 7 soil samples.
2. The samples were prepared and analyzed in accordance with the methods indicated on the attached glossary.
3. Sample holding times as required by the method and/or contract were met.
4. The cooler temperature is recorded on the chain-of-custody.
5. The method blanks were within method criteria with the exception of sample 96LHC126-MB1 for Petroleum Hydrocarbons (PHC) which was above the reporting limit.
6. The Laboratory Control Samples (LCS) were within the laboratory control limits. The duplicate LCS for Alkalinity, Total Kjeldahl Nitrogen (TKN) and Total Phosphate were within the 20% Relative Percent Difference (RPD) control limit.
7. The matrix spike recoveries for TKN sample SVE-1-011 and Alkalinity sample SVE-1-019 were within the 75-125% control limits. The matrix spike duplicate for TKN was within the 20% RPD control limit.
8. The replicate analysis for TKN was within the 20% RPD control limit, however the replicate analysis for Alkalinity was outside the control limit. The poor reproducibility for the Alkalinity replicate analysis may be attributed to the variable rate of reactivity of the soil and the sulfuric acid used in the potentiometric titration.
9. Results for solid samples are reported on a dry weight basis.

*J. Michael Taylor*  
J. Michael Taylor  
Vice President and Laboratory Manager  
Lionville Analytical Laboratory

11.22.96  
Date

njp/11-037

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of 11 pages.

