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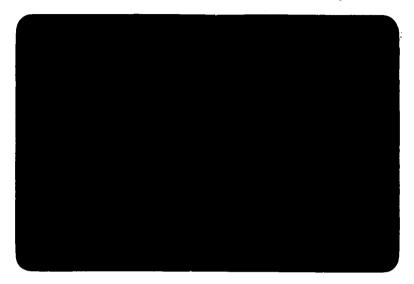
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A Unit of ENVIROGEN Remediation Services

(Rovised 4-28-84)

FINAT STANP





#### CLOSE OUT REPORT ON THE INSTALLATION AND START UP OF AN AIR SPARGING AND SOIL VAPOR EXTRACTION SYSTEM FOR THE

MACHIAS GRAVEL PIT SITE MACHIAS, NY

Feb 94 Final 4-29-94

PREPARED FOR:

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FEBRUARY 1994

operation

AS 1-13-99 SVE 12-22-93

#### REPORT PREPARATION AND REVIEW

The report was prepared and/or reviewed by the VAPEX personnel listed below. The undersigned certifies that project work described in this document complies with the Order<sup>(1)</sup> issued for Site #905013 and work plans<sup>(2)(3)</sup> approved by the New York State Department of Environmental Conservation.

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<sup>(1)</sup> Order on Consent Index No. B9-0335-90-05, New York State Department of Environmental Conservation, July 2, 1993.

<sup>(2) &</sup>quot;Final Remedial Design/Remedial Action Workplan for Machias Gravel Pit Site Cattaraugus County, New York", Site No. 905013, prepared by Simon Hydro-Search, Golden, CO May 28, 1994.

<sup>(3) &</sup>quot;Workplan for Proposed Soil Vapor Extraction and Air Sparging Pilot Study for the Machias Gravel Pit Site in Machias, New York" by VAPEX Environmental Technologies, Inc., May 27, 1993.

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The objective of VAPEX's work was to design, install, and operate an AS/SVES at the site in order to remove source volatile organic compounds (VOCs), specifically trichloroethylene (TCE) and trichlorethane (TCA), from unsaturated and saturated zone soils at the site.

Section 1.0 of this report summarizes the design, and installation of the AS/SVES. Section 2.0 summarizes the results of the start up of the AS/SVES. Section 3.0 presents *VAPEX*'s recommendations for the continued operation of the AS/SVES and Section 4.0 presents other issues to be addressed at the site.

#### 1.0 SVES DESIGN AND INSTALLATION

#### 1.1 Design

With the approval of the New York State Department of Environmental Conservation (NYSDEC), VAPEX proceeded with the design and implementation of the air sparging and soil vapor extraction system (AS/SVES). The AS/SVES design was presented to the NYSDEC in the report titled "Air Sparging Pilot Study Summary and Design Report" and dated August 1993.

During the week of June 28, 1993, VAPEX conducted a short term air sparging and soil vapor extraction (AS/SVE) parameter evaluation test (PET) at the site. VAPEX reviewed site data from the PET and examined existing site conditions to develop a full scale AS/SVES design. Based on this design process, it was determined that approximately 16 vapor extraction wells and 41 air sparging wells were required to adequately cover the target areas. Design flow rate for the soil vapor extraction wells (SVEW) was 30 standard cubic feet per minute (scfm) per well at 8 inches of mercury vacuum. Anticipated effective radius of vacuum influence in the unsaturated zone was expected to be 25 feet. Design air sparging (AS) well flow rates were in the range of 3 to 5 scfm at approximately 23 pounds per square inch (psi) pressure. Anticipated radius of sparging influence in the saturated soils was expected to be approximately 12.5 feet.

### 1.2 Air Sparging, Soil Vapor Extraction and Ground Water Monitor Well Borings

From September 28 through November 6, 1993, VAPEX installed 38 AS wells 16 SVE wells and two monitoring wells in a total of 46 borings. After laying out the proposed 41 AS wells it was determined that 2 of the proposed AS wells were not able to be installed due to space limitations in the source area. The PET air sparging well was used as well AS 20. A site plan showing the location of all AS and SVE wells is presented in Figure 1.

All borings were completed using a combination of air rotary and standard rotary auger techniques. Typically, the well was bored using air rotary techniques to several feet below the anticipated depth of the well and then threaded 4 inch steel casing was driven to depth. The casing was removed as the well was built. With the consent of the NYSDEC, auger cuttings were spread over the ground surface. Also, two ground water monitoring wells were installed (MW22 and MW22D). Well MW22D is considered a replacement for MW3D which had been damaged previously. Boring logs for all the wells are presented in Appendix A.

# 1.3 Air Sparging/Soil Vapor Extraction and Ground Water Well Installation The AS wells were constructed of 1 inch schedule 40 PVC 20 slot screen with 1 inch PVC riser. Twenty eight AS wells were set approximately 22 feet below the groundwater table.

Drilling conditions across the site were difficult due to running sands as well as unstable gravel and sand formations in the vadose zone which lead to the borehole collapsing. Ten AS wells were set at depths ranging from 17 to 37 feet below the ground water table. All of the AS wells were installed with 2 feet of 1 inch diameter screen. After the 1 inch PVC well was set, the 4 inch casing was removed while adding sand to a depth of one foot above the screen. A bentonite seal was installed above the sand pack.

AS wells were installed either individually or nested with an SVE well. In a nested well configuration, the bentonite seal was installed to 5 feet above the groundwater level and the SVE well was constructed above the bentonite seal and then backfilled with native material. In the case of individual AS wells, a 2 foot bentonite seal was

installed above the sandpack and bentonite/cement grout was added to approximately 10 feet above the ground water table. The hole was backfilled with native material to within one foot of the surface after the grout was set. Typical nested AS/SVE well and single AS well cross sections are presented in Figures 2 and 3, respectively.

The SVE wells were constructed of 2 inch schedule 40 PVC 20 slot well screen Each well was constructed with 10 feet of screen. The bottom of the screen was set approximately 5 feet above the water table and sand was added to one foot above the screen. A two foot bentonite seal was installed above the sand pack and the remainder of the borehole was backfilled with native material to within one foot of the ground surface. A typical SVE well cross section is presented in Figure 4.

Monitoring wells MW22 and MW22D were installed in accordance with specifications provided in the approved RD/RA work plan. Monitoring well MW22 was screened from 3 feet above to 7 feet below the ground water table. Ground water was measured at 47 feet below grade at the time of installation. Monitoring well MW22D was screened from 65 to 75 feet below grade. Both monitor wells were constructed of 2 inch PVC screen and riser. The wells were backfilled with a sand pack to 3 feet above the screens and 3 feet of bentonite above the sand. The remainder of the well was grouted to the surface. A 6 inch diameter protective casing was installed over each well.

#### 1.4 Wellfield Manifold System Installation

Following the installation of the wells, during the period from November 8 through December 15, 1993, VAPEX installed the AS/SVE wellfield manifold piping. VAPEX installed approximately 1,100 linear feet of 2, 3, and 4 inch schedule 40 PVC manifold lines from the SVE wells to the equipment garage. SVE manifold lines were run above ground and supported with concrete blocks to insure that all piping sloped back to the wells to induce condensate to drain back to the wells. All SVE piping was heat traced and insulated to prevent pipeline freezing. Each SVE wellhead was installed with a 2 inch operating valve and a 1/4 inch sample port. A site plan illustrating the SVE manifold lines is presented as Figure 5.

VAPEX also installed approximately 1,800 feet of 0.5 and 1.0 inch rubber pressure hose to the AS wells on site. The AS manifold lines were run on the ground surface. The AS manifold was configured to operate in three specific groups. The perimeter area includes 14 wells on the edge of the source area, the module area refers to the 20 wells within the source area, and the defensive line refers to the five wells installed to prevent additional migration of contamination across Very Road. The AS wells are grouped as follows:

Perimeter - AS 1, 2, 3, 4, 5, 6, 12, 18, 24, 30, 31, 32, 33 and 34

Defensive - AS 35, 36, 37, 38 and 39

Module Area - AS 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 25,

26, 27, 28 and 29

Within the source area, the eight movable AS lines will be used in a modular fashion to rotate between three different configurations of the 20 AS wells located within this area. These sub groups are as follows:

a - AS7, 10, 13, 14, 19, 22, 26 and 29

b - AS8, 15, 16, 17, 20, 21, 27 and 28

c - AS9, 11, 14, 20, 22, 23, 25 and 27

Each AS wellhead was installed with a 1/2 inch operating valve. A site plan illustrating all AS manifolding is presented as Figure 6.

#### 1.5 Process System Installation

The AS/SVES process system is located in the equipment garage. The SVE unit is capable of providing 480 scfm at 10 inches of mercury (Hg) vacuum. The blower unit is a 25 HP rotary lobe type, fitted with an air/water separator with a high level water shutoff switch, an in-line particulate filter, inlet and outlet silencers, and an adjustable vacuum relief valve. A schematic of the vapor extraction system is presented in Figure 7.

The air sparging unit is capable of supplying 130 cfm of air at 30 psi. The compressor unit is a 30 HP rotary screw type, fitted with particulate and coalescing filters and a dryer assembly with a holding tank to collect moisture from the dryers.

The unit is also fitted with 3 separate regulators, solenoid valves and timers that allow for the distribution of air flow to the three separate manifold lines at varying intervals. A schematic of the AS system is presented as Figure 8.

Two 1,000 pound carbon contactors were installed in series to control VOC emissions from the SVES discharge. An air to air heat exchanger was installed prior to the carbon units in order to cool the discharge from the blower to under 100 degrees Fahrenheit and subsequently increase the efficiency of the carbon. The discharge from the second carbon unit was vented to the outside of the building through a six inch diameter PVC stack in accordance with the NYSDEC air discharge permit #045800022400001.

#### 2.0 OPERATION AND MONITORING

#### 2.1 SVES Start Up and Operation

The design basis for the SVES wells is predicated on achieving uniform flow from the individual wells. Prior to the SVES start up, individual well performance characteristics were determined for wellfield optimization.

Each well was individually tested at two flowrates and wellhead vacuums were recorded. From these individual well curves (assumed to be linear), individual well flow rates were estimated from the well head vacuum readings. The required wellhead vacuum is calculated by multiplying the design flowrate (30 scfm) by the high flow test ratio of vacuum divided by flow. Individual wellhead performance data is presented in Table 1.

Each wellhead valve in the field was adjusted to meet the vacuum calculated to correspond to the design flow rate. In some cases a well may not achieve the design flow rate as its performance characteristics were below the applied manifold system vacuum (i.e., the wellhead valve was left open).

The SVES was activated on December 22, 1993. Table 2 summarizes SVES discharge data through February 3, 1994. SVES vapor samples were measured with a hand-held total organic vapor meter (OVM) which utilizes a photoionization detector equipped with an 11.7eV bulb (calibrated to benzene). VOC

concentrations from the SVES have ranged from 7 to 20 parts per million on a volume basis (ppmv) as benzene. The measurements were converted from ppmv as benzene to estimated ppmv as trichloroethylene as follows: First, a vapor sample of known concentration of TCE was analyzed using the OVM calibrated to benzene in order to determine the TCE response factor to benzene. Then this response factor is multiplied by the concentrations as benzene. The product is the converted concentration as TCE. This procedure is shown in Equation (1) below.

 $C_{known} / C_{benz} = rf_{TB}$ 

where

$$C_{known} = known concentration of TCE vapor sample, (ppmv)$$

$$C_{benz} = concentration of TCE vapor sample as read by OVM (ppmv) calibrated to benzene,

$$rf_{TB} = response factor of TCE to benzene,$$

$$C_{i} = concentration of a given vapor sample as read by$$$$

Concentrations of post carbon discharge samples have throughout the operating period remained below detection limits. Confirmatory pre- and post-carbon laboratory samples were taken at the time of start up. Laboratory results are presented in Appendix B.

CTCE

=

OVM calibrated to benzene, and

converted concentration as TCE (ppmv).

System flow rate at the time of start up of the SVES was 287 scfm. This was increased to approximately 425 scfm on January 12, 1994 and has remained in this range since. Flow rates were measured using a pitot tube assembly. SVES flow data is presented in Table 2.

Total system flow is calculated as in Equation (2) below (Equation out of Omega High Accuracy Pitot Tube Operator's Manual M579/1091).

$$Q = 128.8 * K * Di2 * ((P * delP)/((T + 460) * Ss))1/2 (2)$$

where:

Ss

Q total flow (scfm); K flow coefficient (dependent on D;),  $D_i$ inner diameter of manifold (inches). P static manifold pressure (psia)  $(14.7 + P_{\rm m}/27.7)$ where  $P_{\rm m}$ vacuum pressure ("H<sub>2</sub>O) and is negative if under vacuum, delP differential pressure ("H2O), T temperature in degrees Fahrenheit, and

The SVES went through a debugging process until January 25. The original transformer was overloaded and replaced with a larger capacity unit. For the period from the startup through February 3, 1994 the system has operated for approximately 33 days and has removed approximately 89 pounds (lbs) of volatile organic compounds. This total discharge was calculated by multiplying the total time of operation of the SVE system by the VOC discharge rate. The VOC discharge rate is calculated using Equation (3).

specific gravity of vapor stream to air.

$$DR = Q * 3.742x10^{-5} * fp * C_v$$
 (3)

where

DR = discharge rate (lbs/hr),

Q = total flow (ft<sup>3</sup>/min),

fp = air pollution factor ((mg/m<sup>3</sup>)/ppm-v/v))

(This data is obtained from the Handbook of Environmental Data on Organic Chemicals, 2nd edition by Karel Verschueren, 1983.), and

C<sub>v</sub> = concentration of vapor stream (ppm-v/v).

Individual SVEW data from pre- and post-SVES start up is summarized in Table 3. These data indicate that individual well head VOC concentrations ranged from 1 ppmv to 92 ppmv before start up of the system. As of February 3, 1994, wellhead concentrations range from 1 ppmv to 76 ppmv. All individual SVE wellhead concentrations have decreased since start up.

Pipeline freeze ups were encountered, requiring the installation of heat trace and insulation on all SVE pipelines. The SVES has been optimized as necessary during site checks to achieve uniform SVE well flow rates at as close to design flowrates as possible. Currently the SVES is operating on all of the SVE wells.

#### 2.2 AS Start Up and Operation

At the time of start up of the AS system air flowrate and wellhead pressure were measured at each well in order to achieve a uniform flow of approximately 3 scfm per well over the wellfield. As the control valve on each AS well was adjusted, the system pressure changed slightly and subsequently the well flowrates also changed slightly. To compensate for this effect, two rounds of flowrates and pressures were taken to confirm that the well flows had remained close to the desired flow of 3 scfm. Table 4 summarizes the final individual well head pressures and flow rate measurements during the AS start up testing.

The AS system was activated on a continuous basis on January 13, 1994. A compressor overheating problem prevented the AS system from being activated at the same time as the SVES. As defined in Section 1.5, the AS system is divided into three separate groups. The perimeter system consists of 14 wells. The defensive system consists of 5 wells. The remaining 20 wells in the source area system are designed to be operated in subgroups of eight in a modular fashion. That is, only eight wells will be connected to the module group manifold at one time. The three subgroups a, b and c are defined in Section 1.5. The well configurations may be adjusted as more data is gathered on the long term effectiveness of these groupings.

Each group is controlled by an individual timer and solenoid valve. Presently the system is configured such that the perimeter wells are pulsed in one hour on, one hour off intervals on a continuous 24 hour basis. The module wells, which are

currently configured to group a, and the defensive wells are grouped together to operate opposite of the perimeter wells. This system allows for maximum usage of the compressor and provides a pulsing of the air sparging process. Pulsing allows the AS process to maximize the development of air pathways in the saturated zone soils which in turn allows for the maximum stripping of contaminant from the ground water. Table 5 presents a summary of the air sparging activities since start up as well as a description of the air sparging configurations.

#### 2.3 Monitoring

The AS/SVES will continue to be monitored by VAPEX on a biweekly basis through March 1994. The frequency of planned site checks will be on a monthly schedule starting in March through the first year of operation. The monitoring of AS/SVES physical parameters will include SVES vacuums, SVEW wellhead vacuums, SVES flow rate, AS system pressures, AS wellhead pressures and flow rates. The monitoring of AS/SVES chemical parameters will include SVES air stream pre- and post-carbon VOC concentrations, and SVEW wellhead VOC concentrations. These data will be used to determine system operating efficiencies and to optimize the AS/SVES as necessary to maximize VOC removal rates for the site. The Operating and Maintenance Plan is presented in Appendix C. The Town has been requested to check the systems daily. Motorola will check the site weekly.

#### 3.0 RECOMMENDATIONS FOR AS/SVES OPERATION

#### 3.1 AS/SVE System Performance

The system, having operated from December 22, 1993 through February 11, 1994, a total of 33 days, has removed approximately 89 pounds (the equivalent of 7 gallons of TCE) of VOCs from the soil and ground water zones. The source area AS well configuration will be varied on a quarterly basis. Future monitoring and optimization of the SVE system during site checks will be performed to ensure continued efficient operation.

#### 3.2 SVES Discharge

Monitoring of the post-carbon discharge VOC concentration verifies that the offgas treatment unit is providing an effective means of control. The post carbon discharge will continue to be monitored and the VOC emission quantities will be maintained below the acceptable state discharge limits and 97 percent reduction from inlet concentration levels.

#### 3.3 AS/SVES Reporting

Future monitoring reports will briefly describe AS/SVE system configuration and performance on a quarterly basis. The next report is scheduled to be submitted approximately three months from the date of this close out report.

#### 4.0 OTHER ISSUES

On November 9, 1993, during the plumbing of the AS/SVE system, a buried drum was encountered approximately one foot below the ground surface. The approximate location of the drum is shown on Figure 9. The drum was located essentially at the edge of the geophysical survey area investigated as part of the RI/FS.

In response to finding the buried drum, the former geophysical grid was expanded to the south and west to include areas not previously surveyed. A magnetometer survey (the gradiometer option on the instrument malfunctioned, therefore, a straight magnetometer survey was run) was performed by Simon Hydro-Search on ten-foot centers over the expanded grid area on November 16, 1993. The results of the survey are included on Figure 9. Two areas of potential buried metal anomalies were identified in addition to the initially uncovered drum.

On December 2, 1993, test pits were performed at the noted additional anomalies. Although some buried debris and metal were found, no additional drums were uncovered. The one drum that was found during the AS/SVE system installation was removed from the ground, overpacked and temporarily stored in the on-site garage until appropriate disposition is determined.

On December 8, 1993, during the installation of snow fencing around the site, a second drum was found slightly exposed in runoff rill to the northwest of the inactive gravel pit. This area was also not part of the initial geophysical survey performed as part of the RI/FS. The drum was hand excavated and determined to be intact. No other drums were found in the area. Simon Hydro-Search performed an expanded

magnetic gradiometer survey to the north and west of the gravel pit to verify that no more metal anomalies exist in the area. The results of the gradiometer survey are provided on Figure 10. Only one additional anomaly was noted. Hand excavation in the area to approximately 3 feet showed no near surface metal debris.

The noted drum found during snow fence installation was scheduled to be overpacked and sampled the week of January 17th. Due to snow storms which moved through the area, the drum was inaccessible as it was covered with 3 to 4 feet of snow. Overpacking and sampling has been rescheduled for the Spring. The NYSDEC has been notified of this delay in the Monthly Progress Report for January 1994.

# SVE WELLHEAD PERFORMANCE DATA MACHIAS GRAVEL PIT - MACHIAS, NY VAPEX JOB NO. 93-411 FEBRUARY 1994

	HIGH FLC	W TEST	LOW FLO	W TEST	HIGH	DESIGN
	VACUUM	FLOW	VACUUM	FLOW	TEST RATIO	WELL VAC
WELL	(*H2O)	(cfm)	(°H2O)	(cfm)	("H2O/cfm)	("H2O)
1	64	13 <b>1</b>	35	89	_ 0.49	15
_ 2	90	125	60	77	0.72	22
3	119	105	73	78	1.13	34
4	72	5 <b>8</b>	19	30	1.25	37
5	26	169	11.5	109	0.15	5
6	112	106	58	63	1.05	32
7	210	72	91	32	2. <b>92</b>	88
8	210	46	93	26	4.53	136
9	222.6	42	95	26	5. <b>32</b>	159
10	63	154	33	97	0.41	12
. 11	134	106	78	55	1.26	38
12	210	51	92	26	4.14	124
13	36	179	17	115	0.20	6
14	42	144	25	98	0.29	9
15	214.2	60	85	32	3.60	108
16	40	96	8	64	0.41	12
<u>1</u> 7	130	91	25	74	1.42	43

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NOTE: DESIGN WELL VAC IS THE WELLHEAD VACUUM REQUIRED TO ACHIEVE THE DESIGN FLOW RATE OF 30 SCPM.

7

### SVE SYSTEM OPERATION DATA MACHIAS GRAVEL PIT – MACHIAS, NY VAPEX JOB NO. 93-411 FEBRUARY 1994

Date,Time	Operating Time (hrs)	Total System Flow (cfm)	Influent Conc* (ppm)	Effluent Conc* (ppm)	Total TCE Discharge Rate (lbs/hr)	Total TCE Removed by SVES (lbs)	Cumulative TCE Removed by SVES (lbs)	Comments
12/22/93, 10am	0.0	287	18.9	ND	0.11	0.00	0.00	Start up.
12/29/93, 8am	164.1	0		i		18.16	18.16	System down due to ice buildup in lines.
12/29/93, 12n	167.0	285	16.8	ND	0.10	0.28	18.45	Final data after restarting.
1/10/94, 10:30am	452.7	0			l	<b>27.9</b> 7	46.41	System down due to ice buildup in lines.
1/12/94, 4pm	452.7	425	18.9	ND	0.16		46.41	Start up data winterized lines.
1/13/94,9am	469.6	405	21	ND	0.17	2.85	49.27	Site check data before optimization of SVES wells.
1/13/94,3pm	475.6	408	NM	NM	0.18	1.05	50.31	Final data after optimization of SVES wells.
1/17/94	570.7	0				1 <b>6.6</b> 6	66.98	System down due to overloaded transformer.
1/25/94,10:30am	570.7	<b>3</b> 90	NM	NM			66.98	System data with new transformer before optimization.
1/25/94,1:15pm	573.5	387	7.35	ND	0.06	0.16	67.14	System data after optimization of SVES wells.
2/3/94,11am	784.2	417	12.6	ND	0.10	21.80	88.94	System down due to low amp setting.
2/3/94,3pm	787.2	405	11.34	NM	0.10	0.29	89.23	System data after optimization of SVES wells.

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\* Concentrations measured with a Thermo 580B OVM equipped with a photoionizations detector, reported as trichloroethylene (TCE).

ND = not detected

NM = not measured

## SVE WELLHEAD DATA MACHIAS GRAVEL PIT – MACHIAS, NY VAPEX JOB NO. 93–411 FEBRUARY 1994

003 - 1.54	12/15/93		1/13/94			/25/94**	2/3/94**		
WELL	1	CONCENTRATION	The state of the s	CONCENTRATION		CONCENTRATION		CONCENTRATION	
AACTT	(°H2O)	(ppm)	(°H2O)	(ppm)	(HSO)	(ppm)	(°H2O)	(ppm)	
1	NM	40	15	10	15	7	15	9	
2	NM	52	22	33	22	22	22	26	
3	NM	20	34	9	34	6	34	6	
4	NM	6	37	9	37	5	37	9	
5	NM	18	5	3	5	5	5	4	
6	NM	21	32	10	32	9	32	7	
7	NM	92	52	80	52	52	52	76	
8	NM	9	58	4	59	4	59	1	
9	NM	42	55	21	56	18	56	27	
10	NM	8	12	7	12	6	12	5	
11	NM	15	39	21	38	14	39	23	
12	NM	20	51	13	54	6	52	6	
13	NM	24	6	11	6	7	6	7	
14	NM	4	OFF	OFF	OFF	OFF	NM	NM	
15	NM	7	58	9	60	5	58	8	
16	NM	1	12	1	12	. 3	12	1	
17	NM	45	43	24	43	16	43	19	

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NM = not measured at this time.

NOTE: WW14 off due to pipeline freezing; heat trace and insulation installed 2/3/94.

<sup>\*</sup> Concentrations are reported as trichloroethylene (TCE).

<sup>\*\*</sup> Air sparging system active.

# AS WELL OPERATION DATA MACHIAS GRAVEL PIT - MACHIAS, NY VAPEX JOB NO. 93-411 FEBRUARY 1994

		FLOW	PRESSURE
WELL	CONFIGURATION*	(cfm)	(psi)
AS1	1	3	50
AS2	1	3	60
AS3	1	3	^28 <sup>-</sup>
AS4	1	3	50
AS5	1	3	43
AS6	1	3	36
AS7	2a	4	60
AS8	2b	4	59
AS9	2c	4	60
AS10	2a	5	60
AS11	2c	3	>60
AS12	1	NM	NM
AS13	2a	4	60
AS14	2a,2c	4.5	59
AS15	2b	4.5	53
AS16	2b	5	53
AS17	2b	4.5	54
AS18	1	NM	NM
AS19	2a	6	59
AS20	2b,2c	4	60
AS21	2b	3	54
AS22	2a,2c	3	54
AS23	2c	4	54
AS24	1	3	21
AS25	2c	4	60
AS26	2a	4.5	59
AS27	2b,2c	3	54 (
AS28	2Ь	4	28
AS29	2a	3	54
AS30	1	3	20
AS31	1	3	20
AS32	1	0	20
AS33	1	3	21.5
AS34	1	0	26
AS35	3	4	49
AS36	3	3.5	49
AS37	3	5	50
AS38	3	3.5	50
AS39	3	3	50

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<sup>\*</sup>Configurations are the same as noted on Table 5.

## AS SYSTEM OPERATION DATA MACHIAS GRAVEL PIT - MACHIAS, NY VAPEX JOB NO. 93-411 FEBRUARY 1994

Date, Time	Operating Time (hrs)	Operati <del>ng</del> Well Configuration*	Total Pressure (psi)	Compressor Air Outlet Temperature (deg F)	System	System	Defense System Pressure (psi)	
1/13/94, 1pm	O	1, 2a, 3	95	NM	55	50	50	Start up of AS system.
1/17/94	110.05	1, 2a, 3						System down due to overloaded transformer.
1/25/94, 10:30am	110.05	1, 2a, 3	90	175	60	52	50	System data with new transformer.
2/3/94,11am	323.62	1, 2a, 3	90	177	50	50	50	Site check data.

G:\DATA\PROJECT\93-411\ASOPER.WK1

\* Configuration 1 consists of all Perimeter AS wells, 1,2,3,4,5,6,12,18,24,30,31,32,338.34.

Configuration 2 consists of three subgroups of the Module AS wells.

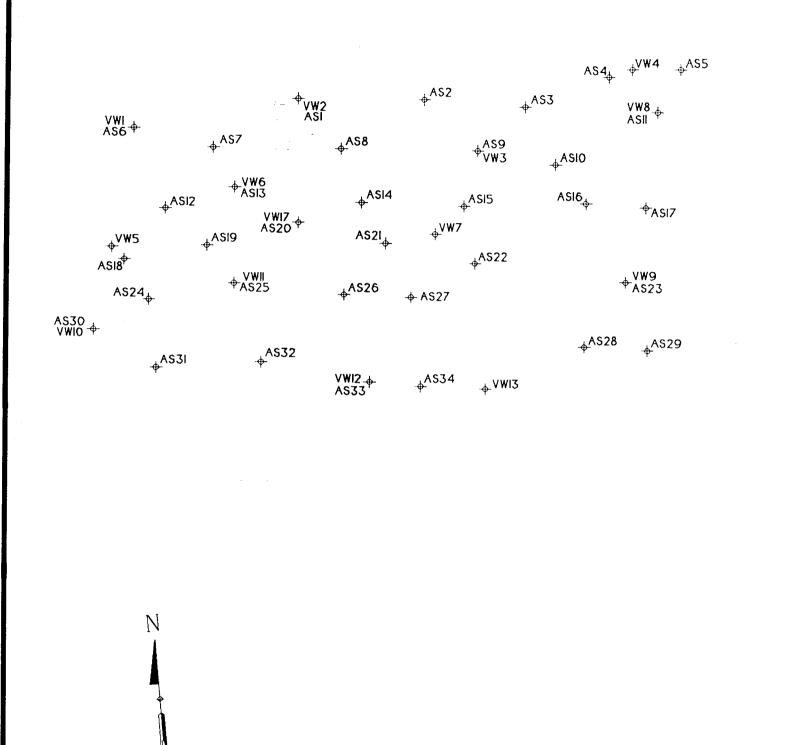
2a consists of AS7,10,13,14,19,22,26&29.

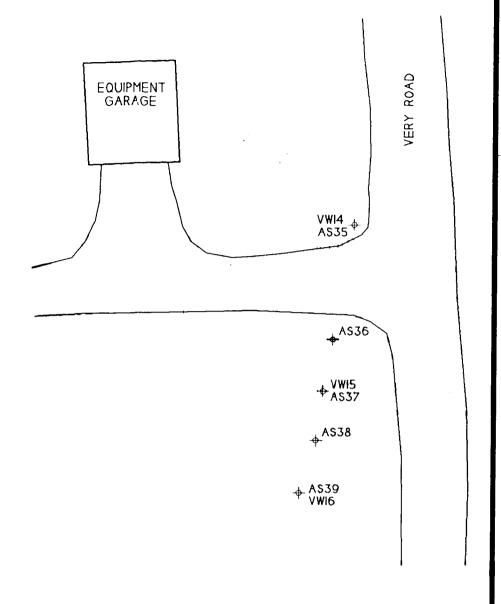
2b consists of AS8,15,16,17,20,21,27&28.

2c consists of AS9,11,14,20,22,23,25&27.

NOTE: Some of the wells in these subgroups overlap and can be reconfigured as necessary for optimization.

Configuration 3 consists of all Defense AS wells, 35,36,37,38&39.

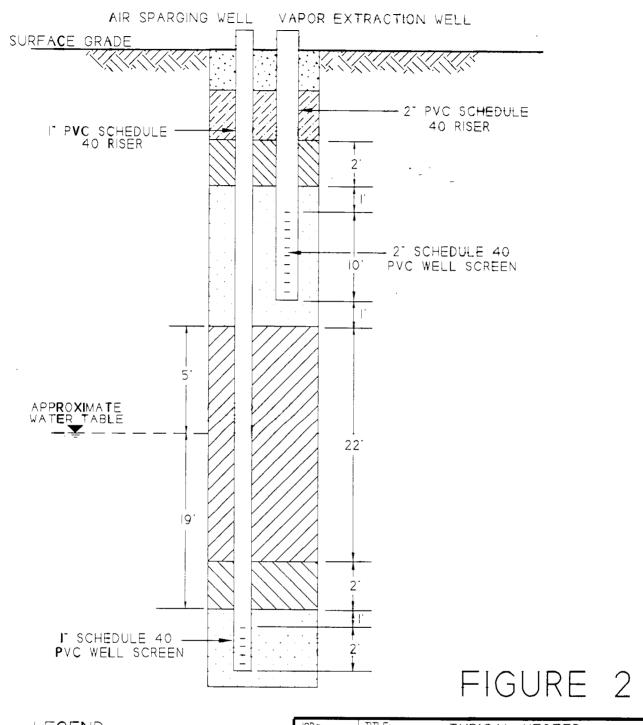




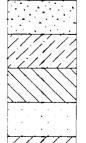
ALL INFORMATION ON THIS DRAWING IS APPROXIMATE

SITE:	MACHIAS MACH	GRAVEL IAS. N.Y.	PIT	TITLE: SITE PLAN WITH APPROXIMATE WELL LOCATIONS
JOB#:	93-411	DRAWNG#:	411-2	R
DATE:	2/11/94	DRAWN:	DAF	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
SCALE:	APPROX.	CHECKED:		Environmental Technologies

FIGURE I

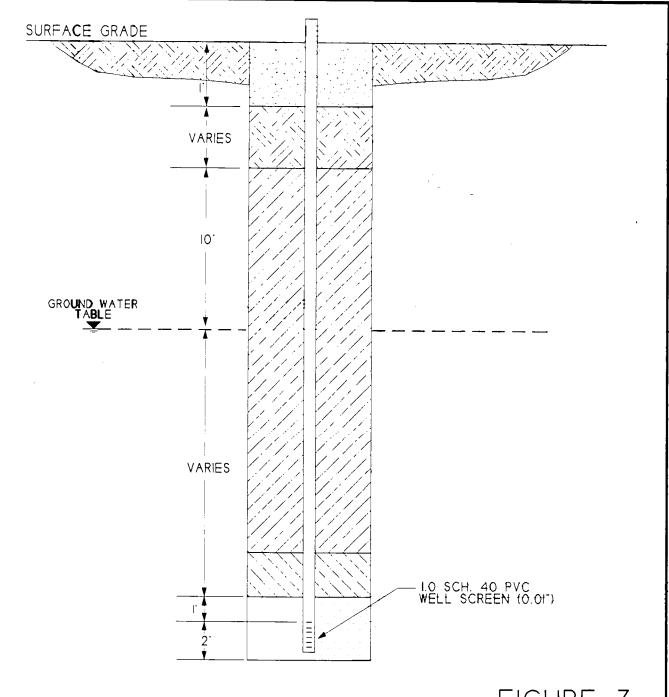


#### LEGEND



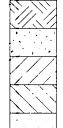
- CONCRETE
- NATIVE FILL
- BENTONITE
- \$AND
- BENTONITE OR CEMENT/ BENTONITE GROUT

JOB <b>≠</b> :	TYPICAL NESTED
93-411	SVE/AS WELL
DATE:	INSTALLATION DETAIL
	SITE: MACHIAS GRAVEL PIT
2/11/94	MACHIAS, N.Y.
SCALE:	DRAWING#: 411-5
NTS	
004401	R
DRAWN:	<b>V</b>
DAF	Y / \1 / \
CHECKED:	Environmental Technologies
	480 Neponset Street
ŀ	Canton, MA 02021
1	Tel. 617 821- <b>5</b> 560 Fax <b>617 821-496</b> 7



### FIGURE 3

#### LEGEND



- NATIVE
- CONCRETE
- BENTONITE GROUT
- BENTONITE
- SAND

100	
JOB#: 93-4	TYPICAL AIR INJECTION WELL
DATE: 2/II/94	STE: MACHIAS GRAVEL PIT MACHIAS, N.Y.
SCALE:	DRAWNG#: 411-6
DRAWN:	<b>VVIDEX</b> ®
CHECKED:	Environmental Technologies 480 Neponset Street Canton, MA 02021
	Tel. 617 821-5560 Fax 617 8 <b>21-496</b> 7

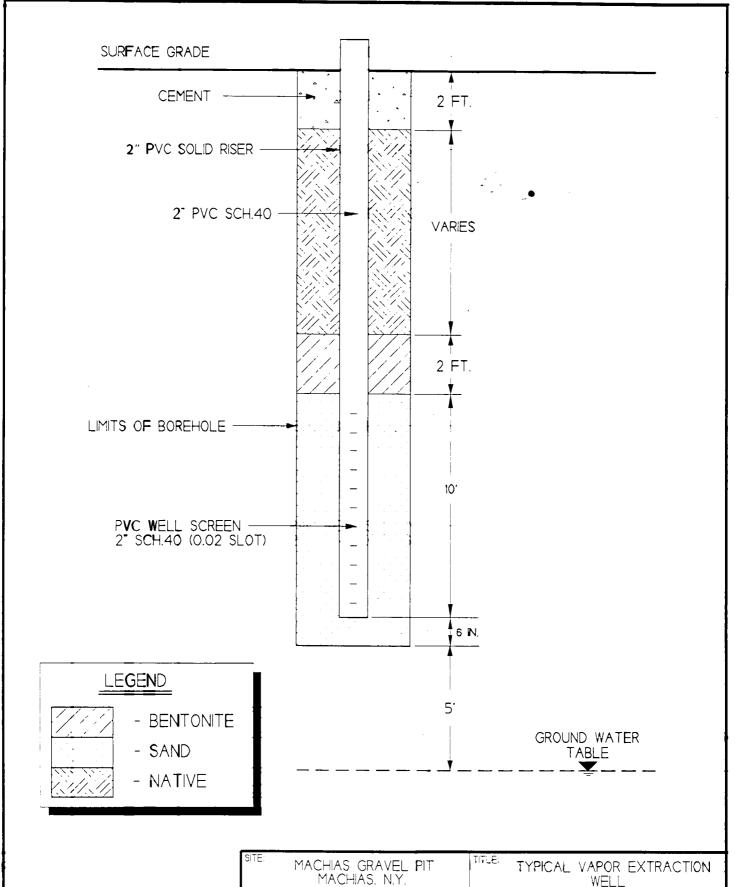
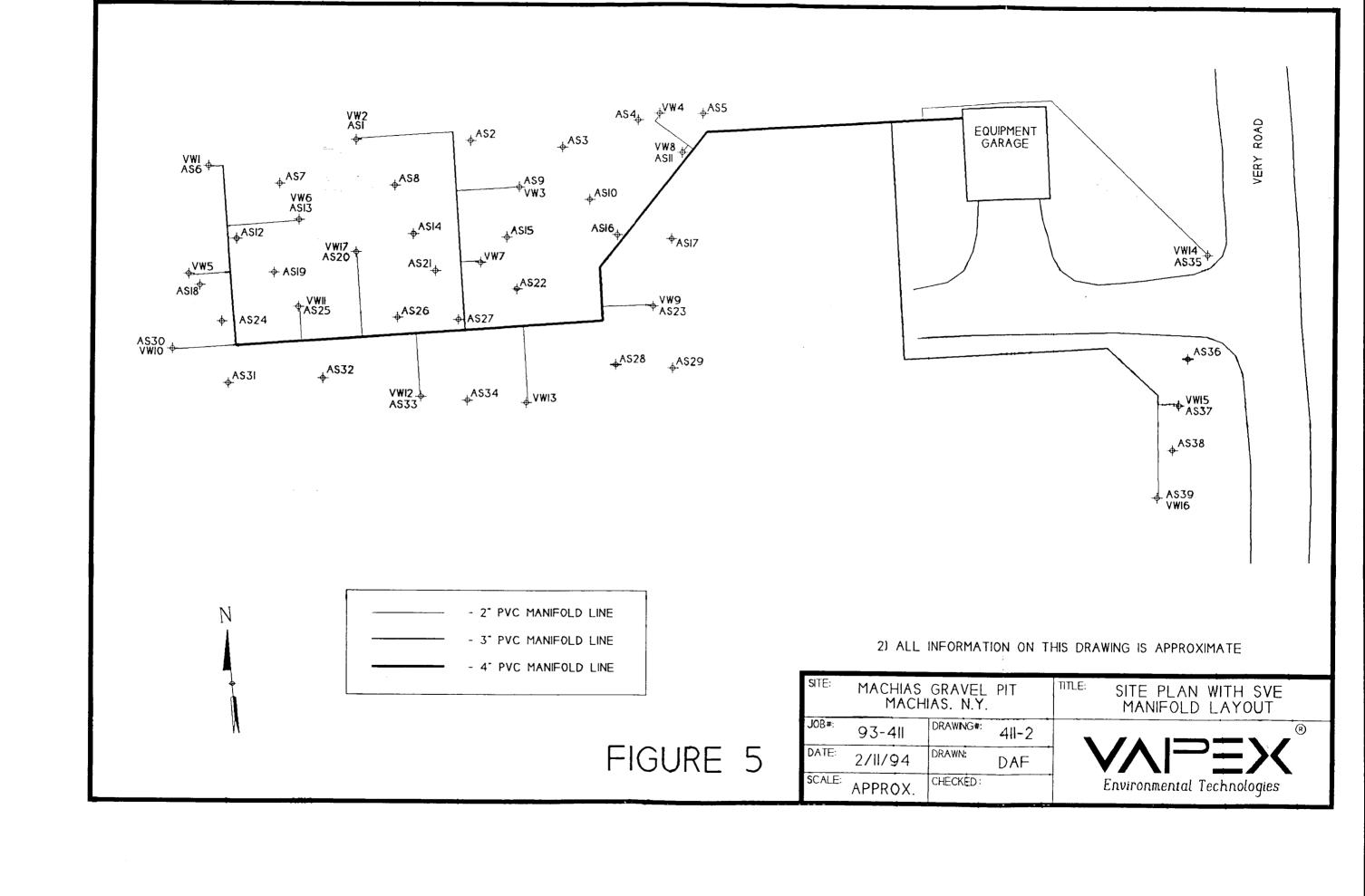
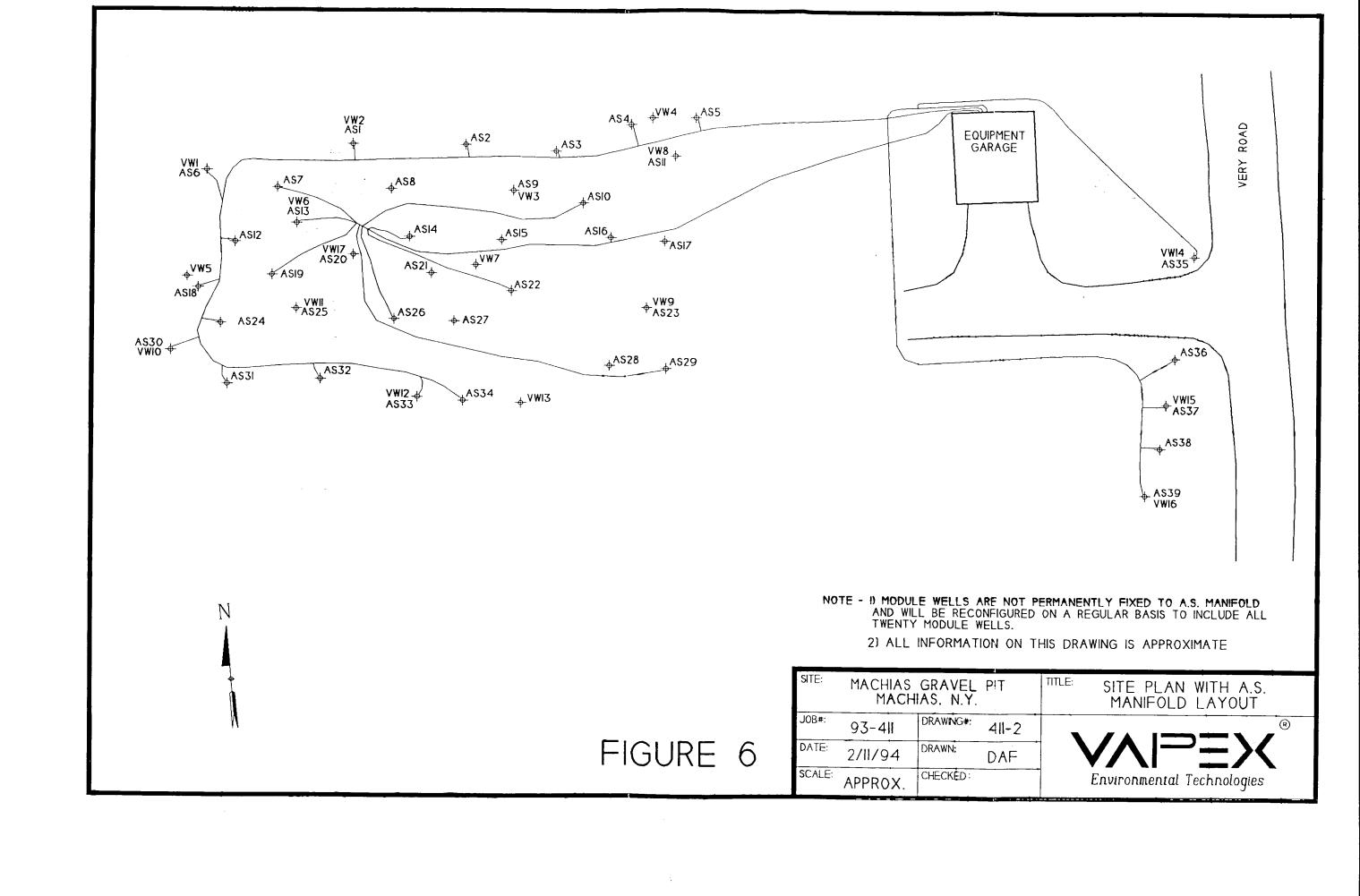
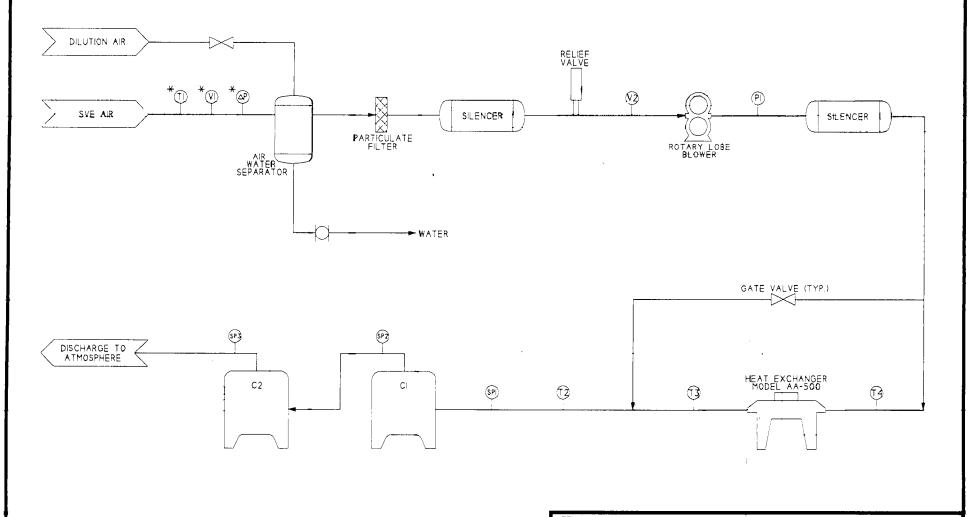


FIGURE 4

SITE:		GRAVEL HIAS. N.Y.	PIT	TYPICAL VAPOR EXTRACTION WELL
JOB#:	93-4	DRAWING#:	411-4	3
DATE:	2/11/94	DRAWN:	DAF	
SCALE:	NTS	CHECKED		Environmental Technologies





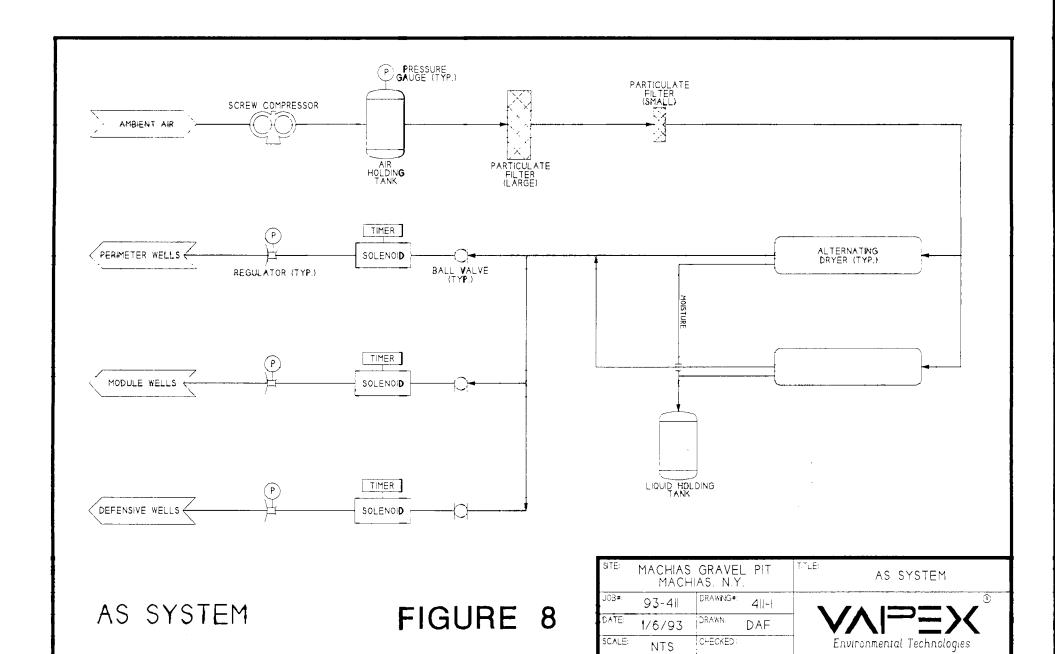


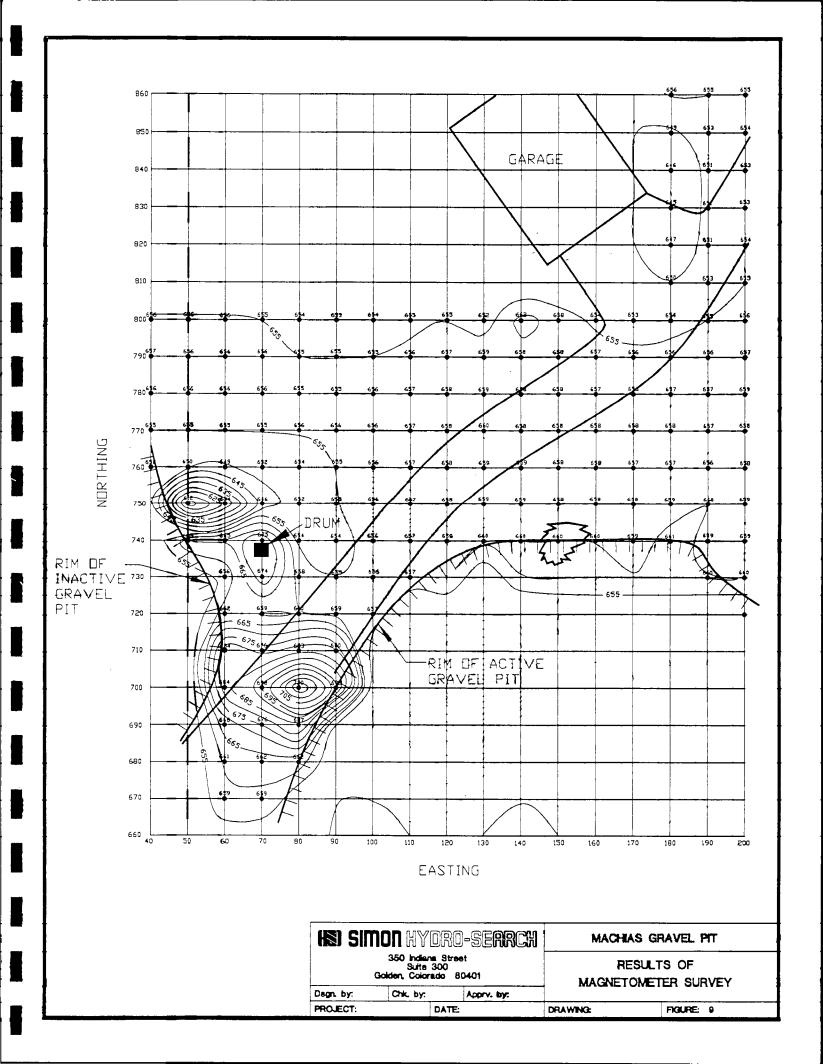
\* - MONITORING POINTS LOCATED OUTSIDE OF BUILDING.

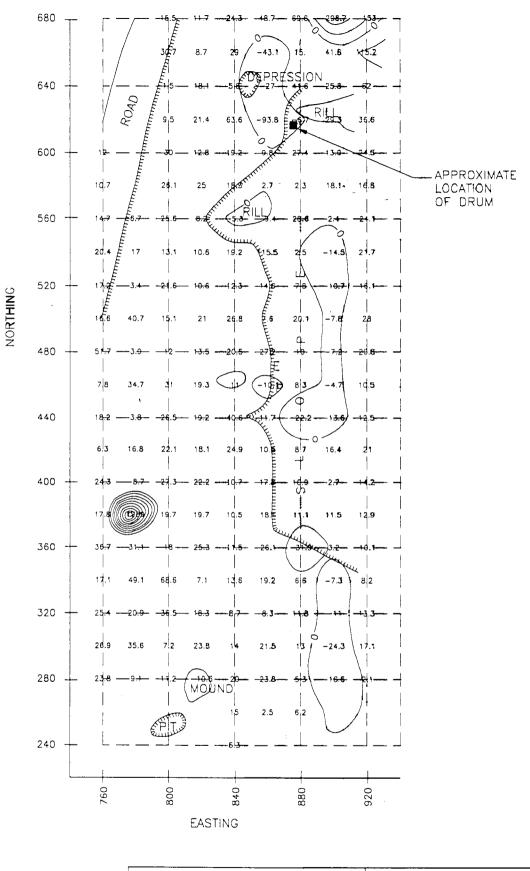
SVE SYSTEM

FIGURE 7

S.TE:		S GRAVE HIAS, N.Y		SVE SYSTEM
J08#:	93-411	DRAW <b>N</b> G#	411-3	\
DATE:	1/6/93	DRAWN:	DAF	
SCALE:	NTS	CHECKED:		Environmental Technologies









### APPENDIX A BORING LOGS

### GENERAL OVERVIEW OF SITE GEOLOGY AND WELL CONSTRUCTION

Site geology consists of intermittent strata of small to large gravel, fine sands and silty sands. Generally the sands and gravel exist to a depth of approximately 40 to 45 feet below grade and are underlain by silt and silty sands with occasional layers of courser materials. Ground water depths range from approximately 40 to 55 feet below grade across the site.

Air sparging wells were constructed with two feet of screen and one foot of sand pack above the top of the screen. Wells were installed such that the depth of the top of the sand pack was approximately 20 feet below the groundwater.

Soil vapor extraction wells were constructed with 10 feet of screen and a sand pack that extended to approximately one foot above the screen. The bottom of the screen was set approximately 5 feet above the groundwater level.

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INSPECTOR:

METHOD OF INVESTIGATION: T" AIR ROTARY WY HOLLOW STEM AUGER INSTALLATION COMMENTS: 1" PVC 20 SLOT SCREEN
FIELD ANALYSIS EQUIPMENT: NO SAMPLING S. MAGEE

STAR DATE	D:	-12 -	93	DATE	:10 <u>-1</u>	<b>2</b> .93		Eni	iron	mental	Technoiset Str	ogies.	Inc.	BORING AND LOC HOLE NO.: DEPTH:		4
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INSTALLATION COMMENTS: FIELD ANALYSIS EQUIPMENT: \_ INSPECTOR:

METHOD OF INVESTIGATION: 7" AIR ROTARY W HOLLOW STEM AUGER 1" PUC 20 SLOT SCREEN NO SAMPLING

5, MAGEE

	FINISH:
DATE: 10-12-93	DATE: 10-13-53

Environmental Technologies, Inc. 480 Neponset Street

BORING	AND	INSTALATION	
		^	

HOLE NO .: 45 4 DEPTH:

SHEET: 3 OF: CLIMATE: Canton, MA 02021 SOURCE AREA. MALILIAS 92-411

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INSPECTOR:

INSTALLATION COMMENTS: 1" PUC 30 SLOT SCREEN FIELD ANALYSIS EQUIPMENT: NO SAMPLING MASEF

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BORING AND INSTALATION VVIDEX START: \_\_\_\_\_ FINISH: \_\_ HOLE NO .: LOG A5-5 DATE: 10-12-93 DATE: 10-12-13 Environmental Technologies. Inc. 80' DEPTH: 480 Neponset Street SHEET: \_\_\_\_\_ OF: CLIMATE: Canton, MA 02021 SOURCE AREA PROJECT: MACHIAS 93-4/1 BORING LOCATION: \_\_ WELL (1") A5 DRILLER: BUFFALO DESCRIPTION: BLOWS SAMPLE 6" PENETRATION SAMPLE 9 SA BLOWS SAMPLE LAB HSP MOISTURE STRATA SAMPLE CHANGE CHANGE SOIL IDENTIFICATION INST COLOR, GRADATION, TYPE, PHYSICAL LOG OBSERVATIONS, VISUAL OBSERVATIONS ID | ppm | ELEV. | ELEV. I 50 55 60 65 NATIVE SAND BENT GROUT 70 75

METHOD OF INVESTIGATION: 4" AIR ROTARY W/ 4"4" ID INSTALLATION COMMENTS:

INSPECTOR:

FIELD ANALYSIS EQUIPMENT: \_\_

SINGLE WELL

SAMPLING NO

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STEM AUGERS

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INSPECTOR:

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Environmental Technologies, Inc. 480 Neponset Street Canton, MA 02021

BORING AND INSTALATION LOG AS 8

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SHEET: 2 OF 2 480 Neponset Street  Canton, MA 02021  PROJECT: MACHIAS 93-4// ORICES BLOWN DESCRIPTION	START: FINISH: DATE: DATE:	BORING AND INSTALATION LOG HOLE NO.: VW3	459
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SO SO SO SO SO SO SO SO SO SO SO SO SO S			FLC
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METHOD OF INVESTIGATION: 4" AIR ROTARY AND 4" ID HOLLOW STEM AUGIERS INSTALLATION COMMENTS: NESTED	75		7.5
INSTALLATION COMMENTS: NESTED	80		
INSPECTOR: S. MAGEE	INSTALLATION COMMENTS:	NESTED NO SAMPLING	·

START:  DATE:  SHEET:/	DATE:	Environmental 480 Nepo	Technologies, Inc. nset Street MA 02021	BORING AND INSTALATION LOG HOLE NO.: AS 10 DEPTH: 69' CLIMATE:
	MACHIAS BUFFALO		BORING LOCATION: SOL	URCE AREA WELL
DEPTH SAMPLE NO.	BLOWS PENETRATION SAMPLE	LAB HSP MOISTURE SAMPLE CHANGE ID PPM ELEV.	CHANGE   COLOR, GR	DIL IDENTIFICATION RADATION. TYPE, PHYSICAL CONS. VISUAL OBSERVATIONS
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DATE: /0-21-13 DATE:/0:		rironmental Technologies	S Inc. HOLE NO.: AS /	5
SHEET:OF:	2	480 Neponset Street Canton, MA 02021	DEPTH: <u>6 7</u> CLIMATE:	_
PROJECT: MACI	1145 - 93-411		SOURCE AREA	
ORILLER: BUF		DESCRIPTION:	AS WELL	1
BLOWS 6" PENETRA	ATTON SAMPLE LAB SAMPLE		SOIL IDENTIFICATION COLOR, GRADATION, TYPE, PHYSICAL BSERVATIONS, VISUAL OBSERVATIONS	INST LOG
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METHOD OF INVESTIGATION COMMEN	ATION: ZAINGLE	WELL WITH	Y"4" HOLLOW STEM AUGER	2
	PMENT: NO SA	MALING		
INSPECTOR:	5. MA	SEE		

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SHEET: Z OF:			nton. MA 0202		CLIMATE:	
PROJECT: M	ACHIAS -	13 - 4/1	PORING LOCA	TION: SOURCE	AREA	
	BUFFALO		DESCRIPTION:	A5 4	FIL	]
DEPTH SAMPLE NO. 0 0 0	NETRATION SAM	SAMPLE	CHANGE   CHANGE	SOIL IDENT COLOR, GRADATION OBSERVATIONS, V.SI	, TYPE, PHYSICAL	∦NST ¦LOG
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INSTALLATION C	OMMENTS:	SINGLE	WELL	. =		
FIELD ANALYSIS	EQUIPMENT:	NO SAM S. MAG.	re 146			
INSPECTOR:		S. MAG.				

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			S 93-411 BORING LOCATION: SOURCE AREA	
			O DESCRIPTION: AS WELL (11")	-
OE P.H.	SAMPLE NO.	BLOWS " PENETRATION 12   18   24	SAMPLEI LAB HSP MOISTURE STRATAL SOIL IDENTIFICATION SAMPLE CHANGE CHANGE COLOR, GRADATION, TYPE, PHYSICAL PENIREC 10 PPM   ELEV. ELEV. OBSERVATIONS, VISUAL OBSERVATIONS	INST LOG
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	UCTUOD O	INVESTIGATE	: 4" AIR ROTARY W/ 4"4" ID HOLLOW STEM AUGERS	80
		- INVESTIGAT <b>IO</b> N ON COMMEN <b>TS</b> :	SINGLE WELL	
			NO SAMPLING	
ľ	NSPECTOR		S. MAGEE	

FINIS DEP	RT: 825 A DATE: 260493 SH: 12N DATE: 260493 PTH: 75' OF: 77' ET: 1 OF: 2	Environmental Technologies, Inc.  480 Neponset Street Canton, MA 02021  HOLE NO.:  DEPTH: CLIMATE:	ORM #1 <u>AS 17</u> 
	PROJECT: Motorola, W DRILLER: Bultalo Do	DESCRIPTION: AS 17  AS WILL  DESCRIPTION: AS WILL	<del></del>
рерзи	BLOWS 6" PENETRATION S 00 6 12 18 24	LAB HSP STRATA   WOISTURE   SCIL :DENTIFICATION   SAMPLE   SAMPLE   CHANGE   COLOR, GRADATION, TYPE, PHYSICAL   ID   ppm   ELEV.   OBSERVATIONS, VISUAL OBSERVATIONS   PENIREC	COMMENTS LOG
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35'			
40'			
	METHOD OF INVESTIGATION: INSTALLATION COMMENTS: FIELD ANALYSIS EQUIPMENT:	air Cotarn 4" Casing 1" DVC Sch 40 20 Slot	
	INSPECTOR:	Annette Lee	

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DEPTH	SAMPLE	ON	<b>6</b> "	PENE	OWS ETRA		LAB SAMPLE ID	HSP ppm		MOISTURE CHANGE ELEV.		CRADA	ENTIFICATION, TY	DE PHY	SICAL ATIONS	SAMP	COM	MENTS	INST. LOG.
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START: FINISH: DATE: DATE:					<b>∨</b> ∧ ⊃≡>⟨°								BORING AND INSTALATION LOG AS 18					
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PROJECT: MACHIAS  DRILLER: BUFFAL						IAS			3 - 4/1		BORING LOCATION: SOURCE					AREA	4	-
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SHEET:	Canton, MA 02021	CLIMATE:
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METHOD OF INVESTIGATIONS	4" AIR ROTARY WITH 4"/4" ID	HOILOU STEM
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	NO SAMPLING	
INSPECTOR:	S. MAGEE	

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INSTALLATION COMMENTS:

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Environmental Technologies, Inc. 480 Neponset Street Canton, MA 02021 DRILL FORM #2 HOLE NO.: 4523

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START: 25 DC+93DATE: 430-DRILL FORM #1 HOLE NO .: 4525 VW 11 FINISH: 250cf POATE: 1456 DEPTH: 40' OF: Environmental Technologies, Inc. DEPTH: 480 Neponset Street CLIMATE: Cooliclear SHEET: 1' OF: Canton, MA 02021 505 BORING LOCATION: AS25 VW11 PROJECT: Motorola, Machias Wy nosted SVE /AS Well DRILLER: Bullalo Drilling DESCRIPTION: BLOW\$ SAMPLE COMMENTS LOG **LAB** HSP | STRATA | MOISTURE | SOIL IDENTIFICATION 6" PENETRATION
0 6 12 18 24 6" PENETRATION SAMPLE CHANGE ! CHANGE | COLOR, GRADATION, TYPE, PHYSICAL ppm ELEV. ELEV. | OBSERVATIONS, VISUAL OBSERVATIONS | PENIREC ID bentonite Sand

INSTALLATION COMMENTS: \_ FIELD ANALYSIS EQUIPMENT: \_ INSPECTOR: \_

METHOD OF INVESTIGATION: QIF FORARY 14"CASING
INSTALLATION COMMENTS: AS 1" PVC , SVE 2" PVC 40 SCL

Annette Lee

START: 25 Det 93 PATE: 730A
FINISH 25 Det 93 DATE: 140p
DEPTH: 67' OF: 67'

SHEET: 2 OF:

INSPECTOR:

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Environmental Technologies, Inc. 480 Neponset Street Canton, MA 02021 DRILL FORM #2

HOLE NO .: AS 25 VW 11

DEPTH: 67'
CLIMATE: COOL, Clear

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INSTALLATION COMMENTS: FIELD ANALYSIS EQUIPMENT: NO SAMPLING

INSPECTOR:

METHOD OF INVESTIGATION: 4" AIR ROTARY W/ 4"4" ID HOLLOW STEM AUGERS
INSTALLATION COMMENTS: 1" PVC 20 SLOT SCREEN

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Environmental Technologies, Inc. 480 Neponset Street

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Environmental Technologies, Inc. 480 Neponset Street

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Environmental Technologies, Inc. 480 Neponset Street Canton, MA 02021

DRILL FORM #2
NO.: 4529

HOLE NO .:

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Environmental Technologies. Inc. 480 Neponset Street

BORING AND INSTALATION LOG

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DATE:	FINISH:	Environm 480	ental Technologies. Neponset Street	Inc. HOLE NO	68'
PROJEC		93-411		SOURCE AR AS WELL	
	BLOWS 6" PENETRATION 6   12   18   24		OISTURE   STRATA   HANGE   CHANGE   CO	SOIL IDENTIFICATION LOR, GRADATION, TYPE, PH SERVATIONS, VISUAL OBSER	
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INSTALL	ATION COMME <b>NTS:</b> NALYSIS EQUI <b>PM</b> ENT	Y"AIR ROTARY I" PVC 20 NO SAME S. MAGE	SLOT SCR	HOLLOW STEM	

START: FINISH: DATE: DATE:	Environmental Technologies. Inc.  BORING AND INSTALATION HOLE NO.:  AS 32
SHEET: OF:	480 Neponset Street Canton. MA 02021  CLIMATE:
PROJECT: <u>MACIFIAS</u> DRILLER: <u>BUFFAL</u>	
BLOWS STATION	AMPLE: LAB   HSP   MOISTURE   STRATA   SOIL IDENTIFICATION   HIST
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INSTALLATION COMMENTS:	Y" AIR ROTARY WITH Y" HOLLOW STEM AUGERS  SINGLE WELL  NO SAMPLING  S. MAGEE

	FINISH:	Environmental Technologies, Inc.  BORING AND INSTALA  LOG  HOLE NO.: 45	32
SHEET:	2 OF: 2	Environmental Technologies, Inc.  480 Neponset Street  Canton, MA 02021  CLIMATE:	
	MACHIAS BUFFAL	- 73 - 411 BORING LOCATION: SOURCE AREA  O DESCRIPTION: AS WELL	
DEPTH SAMPLE NO.	BLOWS 6" PENETRA <b>TIO</b> N 6   12   18   <b>2</b> 4	SAMPLE LAB HSP MOISTURE STRATA SOIL IDENTIFICATION SAMPLE CHANGE CHANGE COLOR, GRADATION, TYPE, PHYSICAL PENIREC ID PPM ELEV. ELEV. OBSERVATIONS, VISUAL OBSERVATIONS	NST LOG
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INSTALL	ATION COMMEN <b>TS</b> : Nalysis Equip <b>m</b> en1	4" AIR ROTARY WITH 4'14" ID HOLLOW STEM SINGLE WELL NO SAMPLING S. MAGEE	

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PROJECT: MAC HIAS		
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METHOD OF INVESTIGATION:	4" AIR ROTARY AND 4" TD HOLLOW STEM AUGERS	
HINSTALLATION COMMENTS:	NESTED	
FIELD ANALYSIS EQUIPMENT: .		
INSPECTOR:	S. MAGEE	

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START: DATE: SHEET:	10-19	<u>-94</u>	DATE	:10 <u>-1</u>	9-94 2		Env	ironi 480	mental Nepor nton, M	Technol uset Str	ogies. eet 21			HOLE NO. DEPTH: CLIMATE:	_6.	34_
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INSTALLATION COMMENTS: INSPECTOR:

METHOD OF INVESTIGATION: 4" AIR ROTARY W/ 414" ID HOLLOW STEM AUGERS SCREEN 1" PUC 20 SLOT FIELD ANALYSIS EQUIPMENT: NO SAMPLING S. MAGEE

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INSTALLATION COMMENTS: FIELD ANALYSIS EQUIPMENT: \_ INSPECTOR:

METHOD OF INVESTIGATION: 4" AIR ROTARY W/ 4"4" ID
INSTALLATION COMMENTS: 1" PVC 20 5LOT SCR HOLLOW STEM AUGERS SCREEN NO SAMPLING 5. MAGEE

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METHOD OF INVESTIGATION: \_
INSTALLATION COMMENTS: \_
FIELD ANALYSIS EQUIPMENT: \_
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Environmental Technologies, Inc. 480 Neponset Street DEPTH: CLIMATE: Canton, MA 02021

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METHOD OF INVESTIGATION: 4" AIR ROTARY AND Y" ID 1454 PER SIMON HYDRO-SEARCH NO SAMPLING MAGIE ٥,

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APPENDIX B

LAB DATA

P.O. BOX 5150 607-753-3403

NYS ELAP ID 10795 Page 1 of 2

#### LABORATORY REPORT

Client: VAPEX ENVIRONMENTAL

38**45 RO**UTE 1 1 SOUTH,

CORTLAND, N.Y. 13045

TECHNOLOGIES, INC.

Report Date: Sampling By: Client

01/31/94

Site: Machias, NY

Sample: Air - Influent

Analysis Date: 01/06/94
Lab Log No: 9312382

Date Received: 12/23/93

#### NYSDOH 311-2 Air Sample Analysis (Instrument Tuning Conforming with EPA 8240 Criteria)

		<b></b>	
CAS No.	Compound	DL	RESULT
75 <b>-27-4</b>	bromodichloromethane	730	ND
75 <b>-25-</b> 2	bromoform	730	ND
74-83-9	bromomethane	1460	ND
56 <b>-23-5</b>	carbon tetrachloride	730	ND
108-90-7	chlorobenzene	730	ND
75 <b>-00-</b> 3	chloroethane	1460	ND
100 <b>-75-</b> 8	2-chloroethylvinylether	1460	ND
67 <b>-66-3</b>	chloroform	730	ND
74 <b>-87-</b> 3	chloromethane	1460	ND
124-38-1	dibromochloromethane	730	ND
95 <b>-50-1</b>	1,2-dichlorobenzene	730	ND
541 <b>-7</b> 3-1	1,3-dichlorobenzene	730	ND
106-46-7	1,4-dichlorobenzene	730	ND
75 <b>-71-8</b>	dichlorodifluoromethane	730	ND
75 <b>-34-3</b>	1,1-dichloroethane	730	ND
75 <b>-35-</b> 4	1,1-dichloroethene	730	ND
107 <b>-06-</b> 2	1,2-dichloroethane	730	ND
156 <b>-60-</b> 5	trans-1,2-dichloroethene	730	ND
78 <b>-87-</b> 5	1,2-dichloropropane	730	ND
100 <b>61-0</b> 1-5	cis-1,3-dichloropropene	730	ND
1006 <b>1-0</b> 2-6	trans-1,3-dichloropropene	730	ND
75 <b>-09-2</b>	methylene chloride	730	ND
79 <b>-34-</b> 5	1,1,2,2-tetrachloroethane	730	ND
127 <b>-1</b> 8 <b>-</b> 4	tetrachloroethene	730	ND
71 <b>-55-6</b>	1,1,1-trichloroethane	730	27,800
79 <b>-</b> 0 <b>0-</b> 5	1,1,2-trichloroethane	730	ND
79 <b>-</b> 0 <b>1-6</b>	trichloroethene	730	70,000
75 <b>-69-4</b>	trichlorofluoromethane	730	ND
75 <b>-</b> 0 <b>1</b> -4	vinyl chloride	1460	ND :

NYS ELAP ID 10795 Page 2 of 2

38**45 RO**UTE 11 SOUTH, CORTLAND, N.Y. 13045

P.O. BOX 5150 607-753-3403

#### LABORATORY REPORT

Client: VAPEX ENVIRONMENTAL

Report Date:

01/31/94

TECHNOLOGIES, INC.

Sampling By:

Client

Site:

Machias, NY

Date Received: 12/23/93 Analysis Date: 01/06/94

Sample: Air - Influent

Lab Log No:

931**238**2

#### NYSDOH 311-2 Air Sample Analysis (Instrument Tuning Conforming with EPA 8240 Criteria)

CAS No.	Compound	DL	RESULT
71-43-2	benzene ethylbenzene toluene xylenes (m, o, & p)	730	ND
100-41-1		730	ND
108-88-3		730	ND
1330-20-7		730	ND

All concentrations are reported as ug/m3. ND indicates that no amount greater than the detection limit (DL) was detected.

These analyses are certified as conforming to generally accepted laboratory practices, the analytical method cited, requirements of the New York State Health Department ELAP program, and the New York State Department of Environmental Conservation.

> ঠohn H. Buck, P.E. /Laboratory Director

## ACCREDITED ENVIRONMENTAL ANA

384**5** R**O**UTE 11 SOUTH, CORTLAND, N.Y. 13045

P.O. BOX 5150 607-753-3403

NYS ELAP ID 10795 Page 1 of 2

#### LABORATORY REPORT

Client: VAPEX ENVIRONMENTAL

TECHNOLOGIES, INC.

Site: Machias, NY

Sample: Air - Effluent

Report Date: 01/31/94

Sampling By: Client Date Received: 12/23/93 Analysis Date: 01/06/94

Lab Log No: 9312382

#### NYSDOH 311-2 Air Sample Analysis (Instrument Tuning Conforming with EPA 8240 Criteria)

		<del></del>	
CAS No.	Compound	DL	RESULT
75 <b>-27-4</b>	bromodichloromethane	775	ND
.75 <b>-25-</b> 2	bromoform	775	ND
74 <b>-83-9</b>	bromomethane	1550	ND
56 <b>-23-5</b>	carbon tetrachloride	775	ND
108 <b>-9</b> 0-7	chlorobenzene	775	ND
75 <b>-</b> 0 <b>0-</b> 3	chloroethane	1550	ND
100 <b>-7</b> 5 <b>-</b> 8	2-chloroethylvinylether	1550	ND
67 <b>−6<b>6−3</b></b>	chloroform	775	ND
74-8 <b>7</b> -3	chloromethane	1550	ND
124 <b>-3</b> 8 <b>-</b> 1	dibromochloromethane	775	ND
95 <b>-</b> 5 <b>0-1</b>	1,2-dichlorobenzene	775	ND
541 <b>-7</b> 3 <b>-</b> 1	1,3-dichlorobenzene	775	ND
106 <b>-4</b> 6-7	1,4-dichlorobenzene	775	ND
75 <b>-</b> 7 <b>1-8</b>	dichlorodifluoromethane	775	ND
75 <b>-</b> 3 <b>4-3</b>	1,1-dichloroethane	775	ND
75 <b>-</b> 3 <b>5-</b> 4	1,1-dichloroethene	775	ND
107 <b>-0</b> 6 <b>-</b> 2	1,2-dichloroethane	775	ND
156 <b>-6</b> 0 <b>-</b> 5	trans-1,2-dichloroethene	775	ND
78 <b>-</b> 8 <b>7-</b> 5	1,2-dichloropropane	775	ND
1006 <b>1-0</b> 1-5	cis-1,3-dichloropropene	775	ND
1006 <b>1-0</b> 2 <b>-</b> 6	trans-1,3-dichloropropene	775	ND
75-0 <b>9-</b> 2	methylene chloride	775	ND
79-3 <b>4-</b> 5	1,1,2,2-tetrachloroethane	775	ND
127- <b>1</b> 8-4	tetrachloroethene	775	ND
71 <b>-</b> 5 <b>5-6</b>	1,1,1-trichloroethane	775	ND
79 <b>-</b> 0 <b>0-</b> 5	1,1,2-trichloroethane	775	ND
79 <b>-</b> 0 <b>1-6</b>	trichloroethene	775	ND
75 <b>-</b> 6 <b>9-4</b>	trichlorofluoromethane	775	ND
75 <b>-</b> 0 <b>1</b> -4	vinyl chloride	1550	ND

P.O. BOX 5150 607-753-3403 NYS ELAP ID 10795 Page 2 of 2

#### LABORATORY REPORT

Client: VAPEX ENVIRONMENTAL

TECHNOLOGIES, INC.

Report Date:

01/31/94

Sampling By:

Client

Site: Machias, NY Analysis Date: 01/06/94

Date Received: 12/23/93

Sample: Air - Effluent

38**45 RO**UTE 11 SOUTH,

CORTLAND, N.Y. 13045

Lab Log No:

9312382

#### NYSDOH 311-2 Air Sample Analysis (Instrument Tuning Conforming with EPA 8240 Criteria)

CAS No.	Compound	DL	RESULT
71-43-2	benzene ethylbenzene toluene xylenes (m, o, & p)	775	ND
100-41-1		775	ND
108-88-3		775	ND
1330-20-7		775	ND

All concentrations are reported as ug/m3. ND indicates that no amount greater than the detection limit (DL) was detected.

These analyses are certified as conforming to generally accepted laboratory practices, the analytical method cited, requirements of the New York State Health Department ELAP program, and the New York State Department of Environmental Conservation.

> John H. Buck, P.E. Laboratory Director

# APPENDIX C OPERATION AND MAINTENANCE PLAN

#### OPERATION AND MAINTENANCE PLAN MACHIAS, NY

#### 1.0 OPERATION

#### 1.1 The Soil Vapor Extraction System

The objective of the SVE system is to extract available VOCs from the unsaturated zone. A blower system supplies a vacuum atmosphere to the vapor extraction wells delivering the vapors through manifold to a carbon bed.

A general optimization of the SVE system will be performed throughout the life of the project to maintain a uniform venting across the site as defined by the design parameters specified in the close-out report. In addition, optimization of specific SVE wells associated with the current configuration of sparging AS wells will be conducted for efficient VOC removal.

#### 1.2 The Air Sparging System

The objective of the AS system is to remove VOCs from the saturated zone. A compressor system supplies air through sparging lines to the AS wells to provide a vehicle for VOCs from the saturated zone to the unsaturated zone.

The air is supplied to the site through three distinct lines, the perimeter, the defensive, and the module, as defined in the close-out report. Optimization or reconfiguration occurs every three months of the operational year providing remediation in a modular fashion with consistent flows to individual AS wells. The perimeter and defensive groups will operate throughout the year while the module group will alternate between subgroups as defined in the close-out report on a quarterly basis. For optimization in the final quarter, in addition to the operation of the perimeter and defensive groups, data from the previous quarters will be analyzed in order to reconfigure, if necessary, the module subgroups to provide remediation where most effective.

#### 2.0 MONITORING

#### 2.1 The Soil Vapor Extraction System

Total SVE system flow measurements, elapsed time, temperature data, load on the blower, and total VOC concentrations will be recorded on every site visit as well as vapor extraction wellhead measurements including wellhead vacuums and wellhead VOC concentrations.

Flow measurements are taken on the main 4" PVC manifold line located just outside of the building where a temperature gauge, a vacuum port and a Pitot tube port are mounted. The vacuum is measured using a 0-150 "H<sub>2</sub>O Magnehelic pressure gauge. The differential pressure is measured using an Omega High Accuracy Pitot Tube connected to a 0-5 "H<sub>2</sub>O Magnehelic differential pressure gauge.

Temperature data is recorded for the air temperatures entering and exiting the heat exchanger, and entering the carbon beds using mounted temperature gauges. A 0-30 "Hg vacuum gauge is mounted directly before and a 0-6 psi pressure gauge is mounted directly after the blower to measure its load.

Total system VOC concentrations are measured in three locations on SVE system, the inlet to the first carbon bed, between the first and second carbon beds, and after the second carbon bed. The measurements are taken with an organic vapor meter (OVM) equipped with a photoionization detector which utilizes a 10.6 eV bulb.

Each of the SVE wells is equipped with a sample port at which the well vacuum and VOC concentration is measured using the same equipment as described above for the total system vacuum and the VOC concentrations, respectively. A listing of all the SVE wells and sampling frequency is attached in Table C1.

#### 2.2 The Air Sparging System

The AS system monitoring includes data collection of the compressor air temperature, elapsed time, perimeter system pressure, module system pressure, defensive system pressure and AS well measurements including well pressure and well flow rates.

Compressor air temperature is read directly off of the gauge located on the compressor control panel. The perimeter, module, and defensive system pressures are read from the mounted pressure gauges located just before the solenoid valve on each line.

Individual well pressure and flow rates are measured and adjusted using a 0-60 psi pressure gauge and a 0-10 cfm in-line flowmeter at the time of each reconfiguration. This equipment is assembled with the same quick-connect connections as the air sparging manifold and therefore can be connected in line with each of the wells. A listing of all AS wells is attached in Table C1.

Representatives of either the Town or Motorola will also check on the site between VAPEX site visits. A logbook is located on the compressor unit in which the representative will log the date and time of the visit. The operation hours of both systems, the blower vacuum and pressure, and the temperature of the air entering the first carbon bed will also be recorded. A site check form and a system log sheet is attached to this plan.

#### 2.3 Groundwater Monitoring Wells

Wells selected for groundwater monitoring, analytical parameters, EPA test methods, frequency of sampling and target cleanup levels for the Machias Gravel Pit groundwater monitoring wells are provided in the report entitled "Final Remedial Design/Remedial Action Work Plan For Machias Gravel Pit Site" by Simon-Hydrosearch, 1993.

#### 3.0 MAINTENANCE

#### 3.1 The Soil Vapor Extraction System

In addition to regular monitoring, the SVE system is shut down on each visit in order to check the oil level in the blower. After each 1000 hours of operation the oil must be changed. The liquid level in the water knockout tank is checked. Should the knockout tank require draining, the liquid will be drummed, analyzed and disposed of property. The belts are checked for significant wear and deterioration also at this time.

SVE and AS manifold lines will be inspected for any leaks or stresses during each site check. Heat tape, insulation, and pipe supports will also be inspected and repaired as necessary to maintain operational integrity as well as physical appearance.

#### 3.2 The Air Sparging System

The AS system is also shut down on each visit in order to check the oil level in the compressor. After each 1000 hours of operation a sample of the oil must be analyzed for decomposition, and the air filter and the oil filter must be changed. The liquid level in the liquid holding tank is also checked. Should the holding tank require draining, the water will be disposed of as a non-hazardous substance.

#### 3.3 Groundwater Monitoring Wells

As part of the ongoing monitoring program, the physical condition of each well (i.e., the integrity of locks, PVC casing, protective casing, and concrete collars) will be noted in the designated field notebook. Any wells identified as needing repair will be scheduled and repaired by a local drilling contractor. Any wells damaged beyond repair will be abandoned in accordance with the NYSDEC protocol for well abandonment.

In addition to noting the physical condition of each well, the total depth of each well will be recorded during each sampling event. This will help to monitor silting levels at the bottom of the well over time.

#### 4.0 SITE CHECKS AND REPORTING

VAPEX will monitor the AS/SVE system on a regular basis, biweekly through March 1994 and then monthly through the first year of operation. A list of emergency contacts and phone numbers immediately follows. Future monitoring reports will be submitted on a quarterly basis.

#### **EMERGENCY CONTACTS AND PHONE NUMBERS**

COMPANY	CONTACT	PHONE NUMBER
VAPEX	STEVE MAGEE ANNETTE LEE BRUCE CLIFF	(617) 821-5560
SIMO <b>N/HSI</b>	RICH GNAT PHIL MOYER	(800) 544-5528
TOWN <b>OF</b> MACHIAS	DICK DASH	(716) 353-8851

## TABLE C1 WELL SAMPLING INFORMATION

WELL	PURPOSE	SAMPL	ING FREQU	ENCY	PARAMETER	METHOD	
-		weeks 1-4	5-8	9-52	h	·	
<b>VW</b> 1	SVE	Weekiy	Biweekly	Monthly	Total VOCs	OVM	
<b>VW</b> 2	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
<b>∨W</b> 3	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
<b>VW</b> 4	SVE	. Weekly <sup>1</sup>	Biweekly	Monthly	Total VOCs		
<b>VW</b> 5	SVE	Weekly	Biweekiy	Monthly	Total VOCs	OVM	
VW6	SVE	Weekiy	Biweekly	Monthly	Total VOCs	OVM	
<b>VW</b> 7	SVE	Weekiy	Biweekly	Monthly	Total VOCs	OVM	
<b>₩</b> 8	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
V <b>W</b> 9	SVE	Weekly	y Biweekly Monthly Total VOCs		1	OVM	
VW10	SVE	Weekiy			Total VOCs	OVM	
V <b>W</b> 11	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
∨ <b>W</b> 12	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
∨ <b>W</b> 13	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
V <b>W</b> 14	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
V <b>W</b> 15	SVE	Weekly	Biweekly	Monthly			
∨ <b>W</b> 16	SVE	Weekly	_ ,		Total VOCs	OVM	
∨ <b>W</b> 17	SVE	Weekly	Biweekly	Monthly	Total VOCs	OVM	
AS1	AS	NA NA	Biweekly	Monthly	Total VOCs	OVM	
AS2	AS	NA NA	NA	NA	NA	NA	
AS3	AS	NA I	NA	NA	NA )	NA	
AS4	AS		NA .	NA	NA I	NA	
AS5		NA 1	NA	NA	NA I	NA	
AS6	AS	NA I	NA	NA	NA I	NA	
	AS	NA I	NA	NA	NA NA	NA	
AS7	AS	NA	NA	NA	NA 1	NA	
A <b>S</b> 8	AS	NA .	NA	NA	NA I	NA	
A <b>S</b> 9	AS	NA I	NA	NA	NA I	NA	
A <b>S1</b> 0	AS	NA -	NA	NA NA	NA I	NA	
A <b>S1</b> 1	AS	NA {	NA	NA NA	NA NA	NA	
A <b>S</b> 12	AS	NA	NA	NA	NA 1	NA	
A <b>S1</b> 3	AS	NA	NA	NA	NA I	NA	
AS14	AS	NA :	NA	NA	NA I	NA	
A <b>S1</b> 5	AS	NA	NA	NA	NA I	NA	
A <b>S</b> 16	AS	NA }	NA	NA	NA I	NA	
A <b>S</b> 17	AS	NA I	NA	NA NA	NA I	NA	
A <b>S1</b> 8	AS	NA I	NA	NA	NA I	NA	
A <b>S1</b> 9	AS	NA I	NA	NA NA	NA 1	NA	
A <b>S2</b> 0	AS	NA I	NA .	NA	NA I	NA	
AS21	AS	NA }	NA	NA	NA I	NA	
A <b>S2</b> 2	AS	NA I	NA	NA	NA I	NA	
A <b>S2</b> 3	AS	NA I	NA	NA	NA I	NA	
AS24	AS	NA	NA .	NA	NA I	NA	
A <b>S2</b> 5	AS	NA	NA	NA	NA I	NA	
A <b>S2</b> 6	AS	NA	NA	NA	NA I	NA	
AS27	AS	NA .	NA	NA	NA I	NA	
A <b>S2</b> 8	AS	NA	NA	NA	NA I	NA	
A <b>S2</b> 9	AS	NA .	NA	NA	NA I	NA	
A <b>S3</b> 0	AS	NA	NA .	NA .	NA I	NA	
AS31	AS	NA .	NA	NA	NA I	NA	
A <b>S3</b> 2	AS	NA	NA .	NA	NA I	NA	
4 <b>S3</b> 3	AS	NA .	NA I	NA I	NA I	NA	
A <b>S3</b> 4	AS	NA -	NA .	NA	NA I	NA	
A <b>S3</b> 5	AS	NA I	NA	NA	NA I	NA	
A <b>S3</b> 6	AS	NA .	NA .	NA	NA I	NA	
A <b>S3</b> 7	AS	NA .	NA	NA	NA I	NA	
	AS	NIA -					
A <b>S3</b> 8 A <b>S3</b> 9	AS	NA I	NA I	NA I	NA I	NA	

SVE

Soil vapor extraction well

AS NA Air sparging well not applicable

Total VOCs OVM Total volatile organic compounds as measured by the OVM Organic vapor meter, equipped with a photoionization detector

which utilizes a 10.6 eV bulb.

NOTES:

- (1) The air sparging wells inject ambient air into the saturated zone. Therefore, no sampling is involved. On a quarterty basis, the wells are monitored for flows.
- (2) All groundwater monitoring, analytical parameters, EPA test methods, frequency of sampling and target cleanup levels for the Machias Gravet Pit groundwater monitoring wells are provided in the report entitled "Final Remedial Design/Remedial Action Work Plan For Machias Gravet Pit Site" by Simon—Hydrosearch, 1993.

#### VAPEX FIELD DATA SHEET, MACHIAS, NY PAGE 1 OF 2 DATE INSPECTOR SYSTEM STATUS: Total Operation Hours of Blower (hours) Pressure after Blower (psi) Vacuum @ Blower Inlet ("Hg) Temperature @ Carbon Inlet (degrees F) Temperature prior to Xchanger (degrees F) Temperature after Xchanger (degrees F) Ambient Temperature (degrees F) FLOW MEASUREMENTS: Temperature Static Vacuum Delta P Calc Flow Time (degrees F) ("H2O or "Hg) ("H2O) (cfm) Initial Final PID DATA: (ppm) Between Effluent Influent Carbon VAPOR EXTRACTION WELLHEAD MEASUREMENTS: INITIAL FINAL WELLHEAD VACUUM VACUUM CONC (" H2O) WELL (" H2O) (ppm) **VW1** VW2 **VW3 VW4 VW5 VW6 VW7 VW8 ∀₩9** VW10 V**W1**1 VW12 VW13 VW14 VW15

OIL CHECK:

VW16 VW17

	Level OK	Oil Added	Amt. Added	Oil Changed
Blower				
Comp <b>re</b> ssor				

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### VAPEX FIELD DATA SHEET, MACHIAS, NY

PAGE 2 OF 2

					DATE	
				IN	SPECTOR	
Total Operation						
Compressor A	Air Te <b>m</b> p <b>e</b> i	rature ( <mark>degr</mark> e	es F)			
Perimeter Sys	tem Press	sure (psi)	<del>-</del>			
Module Syste						
Defensive Sys			·			
		 	PRESSURE	FLOW		
WELL	OPE <b>N</b>	CLOSED	(psi)	(cfm)	COMMENTS	
AS1			•			
AS2				!	-	
AS3	:					
AS4						
AS5						
AS6						
AS4 AS5 AS6 AS7						
AS8						
AS9 AS10						
AS10						
AS11						
AS12						
AS13						
AS14						
AS15						
AS16						
AS17		-				
AS18	_			<del> </del>		
AS19	1		-	·		
AS20	<del></del>			-		
AS21 AS22						
AS23		<del> </del>				
AS24						
AS25		-			<del>-                                    </del>	
AS26						
AS27	<del></del>			<del></del>		
AS28				<del>-</del>		
AS29	<del></del>					
AS30	_			<del></del>		
AS31				<del></del>		
AS32		-		:		
AS33						
AS34					-	
AS35						
AS36						
AS37				Ţ - <del></del>		
AS38						
AS39						

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#### SYSTEM LOG MOTOROLA SITE – MACHIAS, NY VAPEX JOB NO. 93-411

INITIALS	DATE		IS THE BLOWER RUNNING?	BLOWER OPERATION HOURS	GAGE #1 VAC@BLOWER ("Hg)	GAGE #2 PRES@BLOWER (gage is located under table) (psi)	thermometer is located on PVC pipe) (degrees F)	IS THE COMPRESSOR RUNNING?	COMPRESSOR OPERATION HOURS
					-				
	<u>, , , , , , , , , , , , , , , , , , , </u>								·- <del></del>
		·							
								, , , , , , , , , , , , , , , , , , ,	