ATTACHMENT 1
INSTALLATION AND STARTUP OF SUBSLAB DEPRESSURIZATION SYSTEMS OFF-BASE RESIDENTIAL HOUSING SITE 1, NWIRP BETHPAGE

INTRODUCTION

Naval Facilities Engineering Command Mid-Atlantic (NAVFAC) is planning to install SubSlab Depressurization (SSD) systems on up to eight off-facility residential houses in an area east of Site 1 – Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York (Figures 1, 2, and 3). The SSD systems will induce a slight vacuum (0.025 to 1.0 inches water column) underneath basement slabs to prevent potential migration of volatile organic compound (VOC)-contaminated soil vapor from entering the houses. The SSD systems are anticipated to operate for a period of approximately two years, until an on-site Soil Vapor Extraction (SVE) Containment System is constructed and in operation. After the SVE Containment System has been operating for approximately one year, the SSD systems will be evaluated for removal.

Remedial Investigations conducted in the early 1990s identified VOC-contaminated soils and shallow groundwater at Site 1 that were contributing to a regional groundwater plume. To address this contamination, a 1995 Record of Decision (ROD) was prepared that included in-situ treatment of VOCs, excavation and offsite disposal of soils contaminated with polychlorinated biphenyls (PCBs), and placement of a permeable cover to address other residual contaminants including cadmium, chromium, and VOCs.

The in-situ treatment consisted of an air sparging/soil vapor extraction (AS/SVE) system that started operation in 1998. Remedial goals for this system were based on protection of groundwater and minimization of solvent emissions during a planned subsequent soil excavation to address the PCBs. In 2002, the operation of the in-situ system achieved these goals and was shutdown. Final actions to address cadmium-, chromium-, and PCB-contaminated soils, including excavation and capping are being evaluated by the Navy.

The geology in the area consists mainly of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units that in descending order are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay, and the Lloyd Formation. Groundwater is present at approximately 50 feet and soil vapor migration is limited to the Upper Glacial Formation and the upper portion of the Magothy Formation.

The Upper Glacial Formation, which is about 30 to 45 feet thick, consists chiefly of coarse sands and gravels. The Upper Magothy Formation consists chiefly of coarse sands to a depth of about 100 feet below ground surface (bgs), below which finer sands, silts, and clay predominate. The clay is fairly common but laterally discontinuous; no individual clay horizon of regional extent underlies the NWIRP.

Chlorinated solvents including trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) have been identified as the VOCs of interest in soil gas at Site 1 and the offsite area east of Site 1, see Figure 4.

February through April 2009, 18 houses in the area east of Site 1 were investigated in accordance with New York State Department of Health (NYSDOH) "*Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006"*. Based on an evaluation of site-related VOCs in subslab soil gas samples using this guidance, SSD systems were identified for 7 or 8 houses. VOCs detected in subslab soil vapor samples are presented in Table 1. These 7 or 8 houses are bordered by 10th and 11th Streets, and Maple and Sycamore Avenues.

The houses were built in the 1960s. The houses consist of a poured-concrete slab and wall basement and with single story structure above the basement. Approximate dimensions are presented in Attachment 1-1. The basement ceiling heights are approximately 7 feet. The basements are both unfinished and finished. The houses are heated with fuel oil furnaces. The basement slabs consist of 2 to 4 inches of concrete. The basement walls are approximately 8 inches of poured concrete.

OBJECTIVE

The objective of the SSD systems is to prevent intrusion of site-related VOC-contaminated soil vapors into residential houses. The SSD systems achieve this objective by creating a slight vacuum underneath the structures relative to the pressure in the structure.

SUBSLAB DEPRESSURIZATION SYSTEM

To achieve the objective, a vapor extraction point, fan, and discharge stack will be used to extract and discharge soil vapors. The system is designed and constructed in accordance with *American Society for Testing Materials (ASTM) "Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings" E2121-08*. The fan will operate to create a minimum vacuum of 0.025 inches of water column underneath the structure. The system may be modified

on a house-by-house basis to address unique conditions, including aesthetics, available space, and access.

Subslab depressurization systems will consist of the following elements:

- Vapor Extraction Well – 4-inch diameter slotted polyvinyl chloride (PVC) pipe installed in an approximate 5-inch diameter hole to a depth of 18 inches below the floor surface. The annular space will be filled with coarse-grained quartz sand and sealed at the floor surface with epoxy.
- Exhaust Fan - In-line fan that produces approximately 89 cubic feet per minute at a pressure of 1.0 inch water column. During startup, subslab vacuums will be measured. If adequate vacuum is not developed, a larger capacity fan will be used.
- System Piping – 4-inch schedule 40 PVC that extends to a minimum of 2 feet above the nearest roofline. The discharge piping will generally be anchored to the chimney. Discharge heights will be 12 feet or higher above ground surface.

Draft SSD system Layout Sketches are presented in Attachment 1-1.

AIR MODELING EVALUATION

Air modeling of the stack discharges was conducted in accordance with New York State Department of Environmental Conservation (NYSDEC) Air Guide 1 Model, also known as DAR1. Evaluation of expected off gas concentrations from the SSDs was based on measured subslab soil gas sample concentrations (Table 1). The model was run in two stages. The first stage used the preliminary conservative model. Inputs and model run results from the first stage evaluation are presented in Attachment 1-2 and indicate that there would be no short-term exceedances of New York State Air Quality Criteria from operating the SSDs. However, the results also indicated a potential exceedance of long-term New York State Air Quality Criteria for trichloroethene (3.4 $\mu g/m^3$ versus 0.5 $\mu g/m^3$).

The second stage model run was then developed based on the results from the first stage model run. In particular, the second stage model used meteorological data from Islip, New York Airport instead of default wind speed and direction assumptions. The model results for one system operating at 100 cubic feet per minute (CFM) are presented in Attachment 1-3 and indicate that a predicted annual average concentration of trichloroethene would be 0.034 $\mu g/m^3$, which is less than the New York State Air Quality Criteria of 0.5 $\mu g/m^3$. Based on a linear response between emissions and ambient air concentrations, individual or combined stack emissions can increase

by a factor of approximately 15 and remain below New York State Air Quality Criteria of 0.5 $\mu g/m^3$.

STARTUP AND MONITORING

During initial startup of the SSD systems, flow rate and photoionization detector (PID) readings will be collected on an hourly basis for a minimum of 4 hours to document initial discharge air quality. Based on subslab soil gas data, PID readings are expected to be 3 parts per million by volume (ppm-v) or less. If discrete PID readings exceed 12 ppm-v or are sustained above 6 ppm-v for more than 1 hour, the system will be shut down and the Navy will consult with NYSDEC to determine a path forward.

After approximately one month of operation, flow rates will be measured and stack discharge air samples will be collected and analyzed for the nine site-specific VOCs (see Attachment 1-4). Semi-annual stack monitoring will be conducted while the SSD systems remain in operation.

TABLE 1
SUMMARY OF SUBSLAB SOIL GAS CONCENTRATIONS
OFF-BASE RESIDENTIAL HOUSING, SITE 1
NWIRP BETHPAGE, NEW YORK

Parameter	Highest Concentration Houses (µg/m^3)	Mid-Concentration Houses (µg/m^3)	Low Concentration Houses (µg/m^3)
House Number	2, 3	4, 6	13, 14
Trichloroethene	13,000 to 15,000	740 to 1,400	230 to 300
Tetrachloroethene	130 to 310	42 to 650	11 to 670
1-1-1-Trichloroethane	10,000 to 15,000	1,600 to 2,100	420 to 970

Additional VOCs detected above screening levels and maximum concentrations include carbon tetrachloride (3.2 µg/m^3), chloroform (59 µg/m^3), 1,4-dichlorobenzene (2.3 µg/m^3), and benzene (9.7 µg/m^3).

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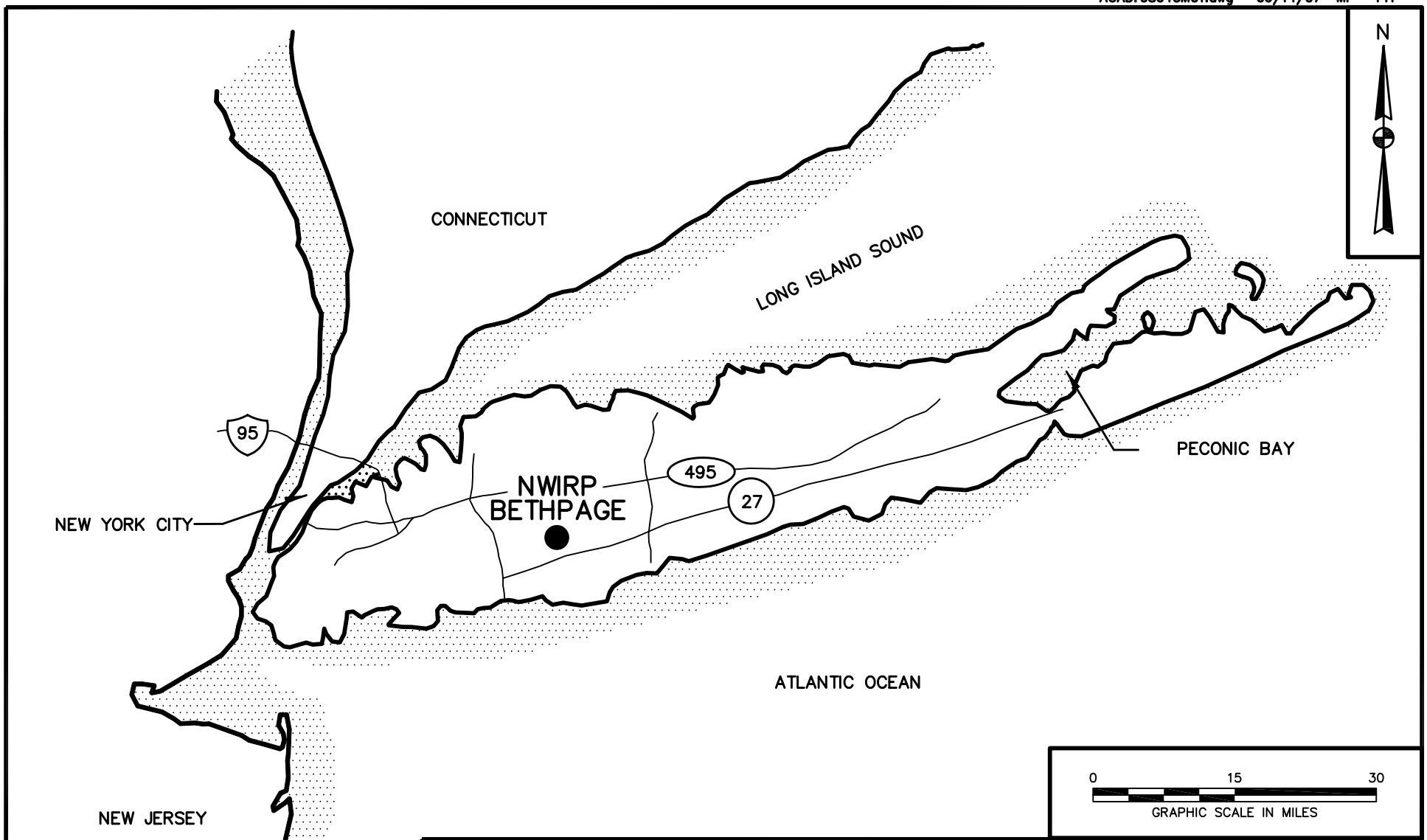

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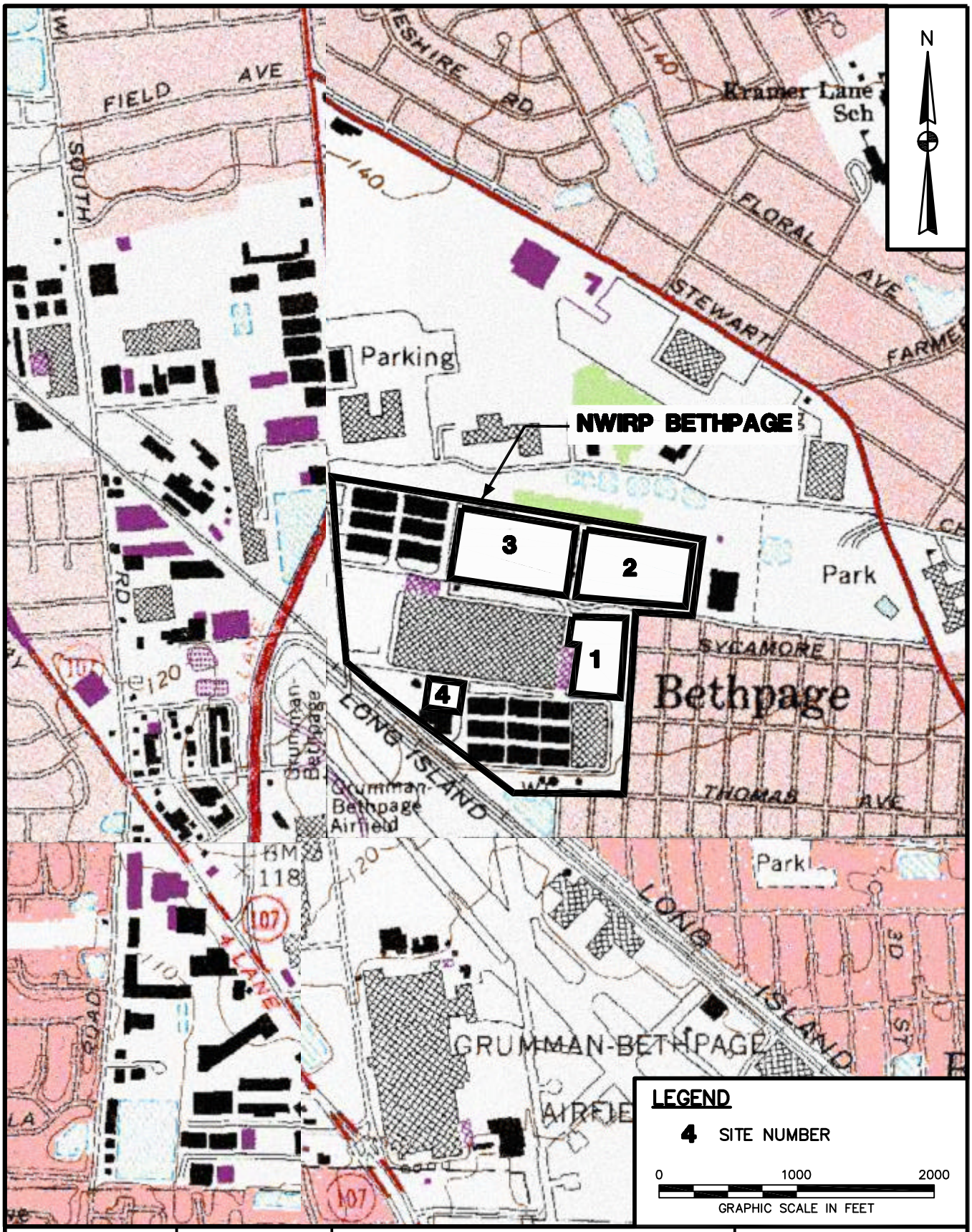
CHECKED BY	DATE		
REVISED BY	DATE		
SCALE AS NOTED			

CONTRACT NO. 0804	
OWNER NO.	
APPROVED BY	DATE
DRAWING NO. FIGURE 1	REV. 0

FORM CADD NO. TTNUS-AH.DWG - REV 1 -9/10/98

ACAD: 0804CM02.dwg 06/13/07 MF PIT



DRAWN BY MF	DATE 6/13/07	Tetra Tech NUS, Inc.	CONTRACT NO. 0804
CHECKED BY	DATE	SITE LOCATION MAP SITE 1 NWIRP BETHPAGE BETHPAGE, NEW YORK	OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2 / REV. 0

FORM CADD NO. TTNUS-AV.DWG - REV 1 -9/10/98

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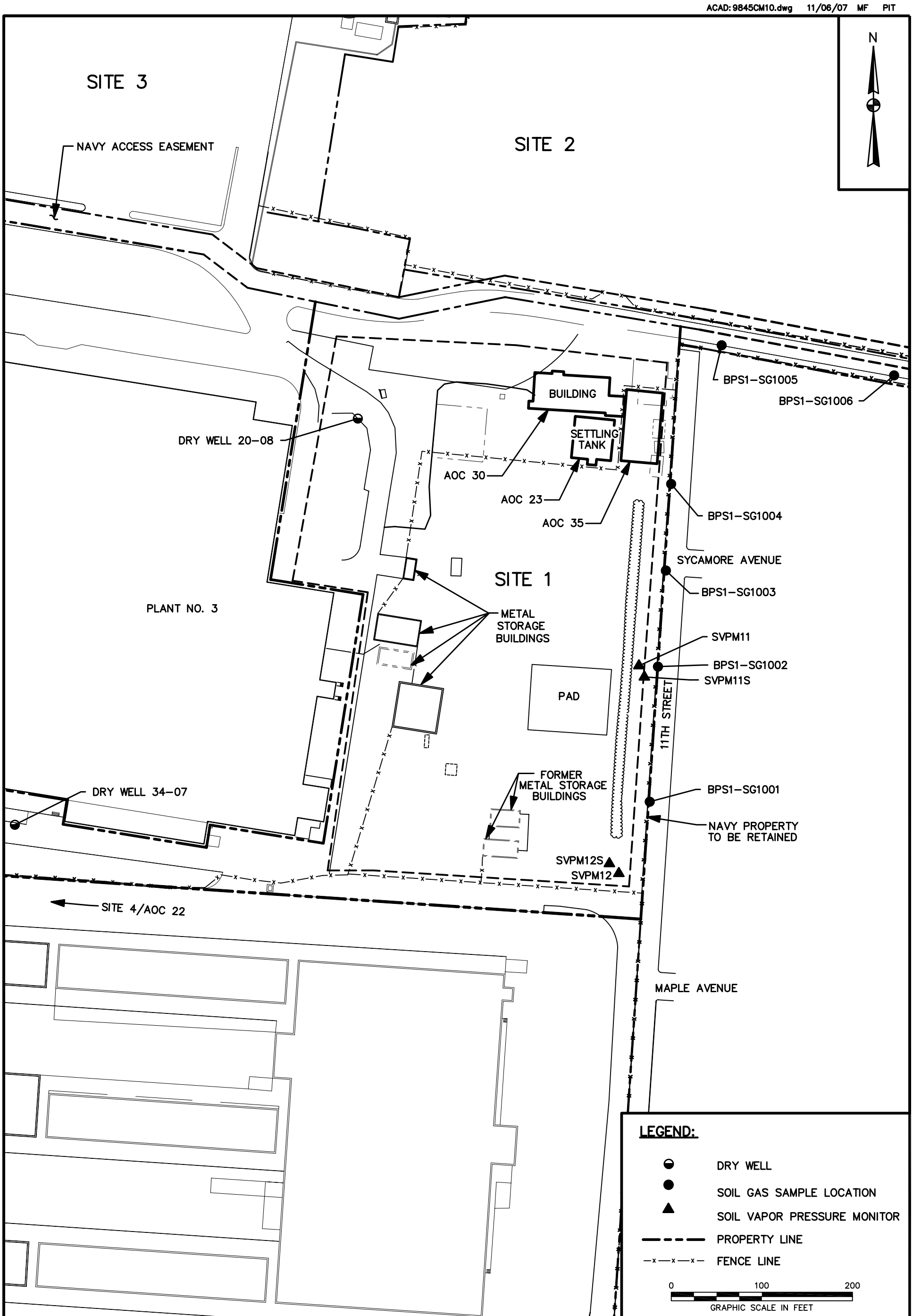

DRAWN BY	DATE			CONTRACT NO.
MF	11/5/07	Tetra Tech NUS, Inc.	SITE 1 LAYOUT MAP NWIRP BETHPAGE BETHPAGE, NEW YORK	9845
CHECKED BY	DATE			OWNER NO.
REVISED BY	DATE			APPROVED BY / DATE
SCALE AS NOTED				DRAWING NO. FIGURE 3 / REV. 0

FORM CADD NO. TTNUS-BV.DWG - REV 1 -9/11/98

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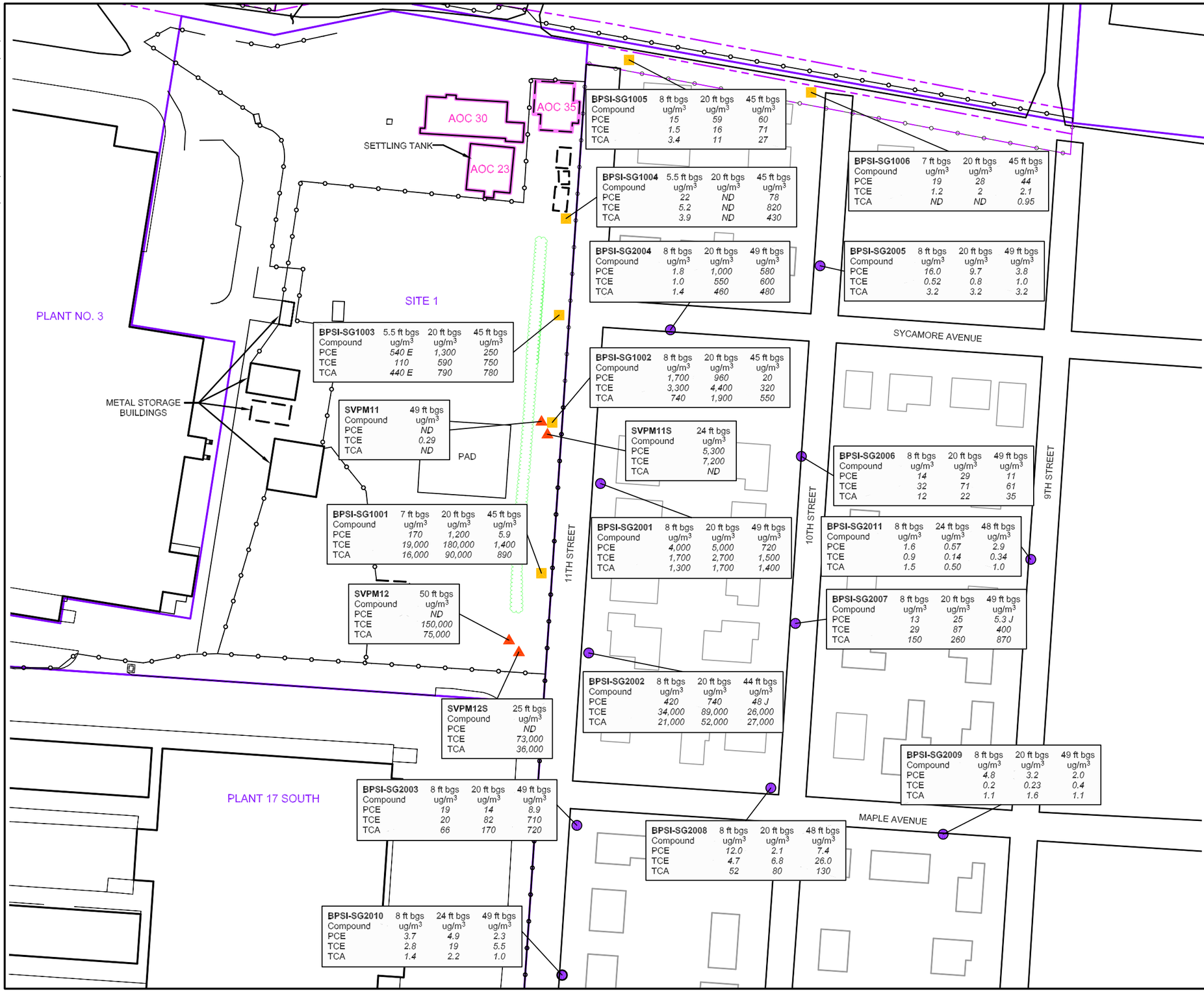


LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- *420* SOIL GAS VALUE in ug/m 3
- *J* ESTIMATED VALUE
- bgs BELOW GROUND SURFACE
- PCE TETRACHLOROETHENE
- TCE TRICHLOROETHENE
- TCA 1,1,1 - TRICHLOROETHANE
- PROPERTY LINE
- FENCE LINE
- SITE BOUNDARY

PARAMETER	NYSDOH SUBSLAB VALUE	NYSDOH INDOOR AIR VALUE
Compound	ug/m3	ug/m3
PCE	1,000	100
TCE	250	5

NOTE:
NYSDOH HAS NOT ESTABLISHED A SCREENING VALUE FOR TCA. A PROJECT-SCREENING VALUE OF 5,200 UG/M3 FOR TCA HAS BEEN ESTABLISHED.

0 100 200
SCALE IN FEET

TETRA TECH NUS, INC.

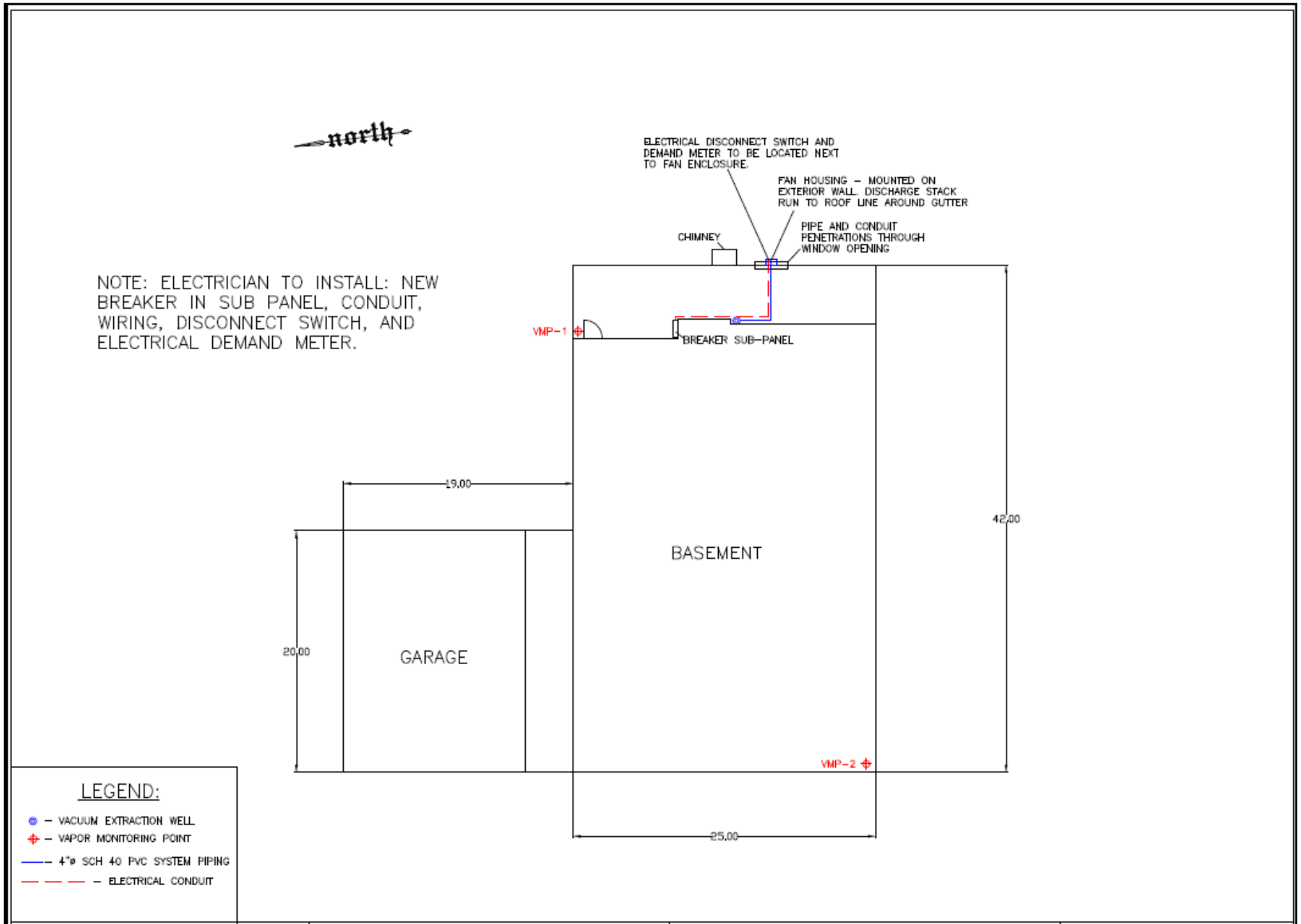
SOIL GAS SAMPLING RESULTS
JANUARY 2008 TO JANUARY 2009
SITE 1
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GM16	AS NOTED

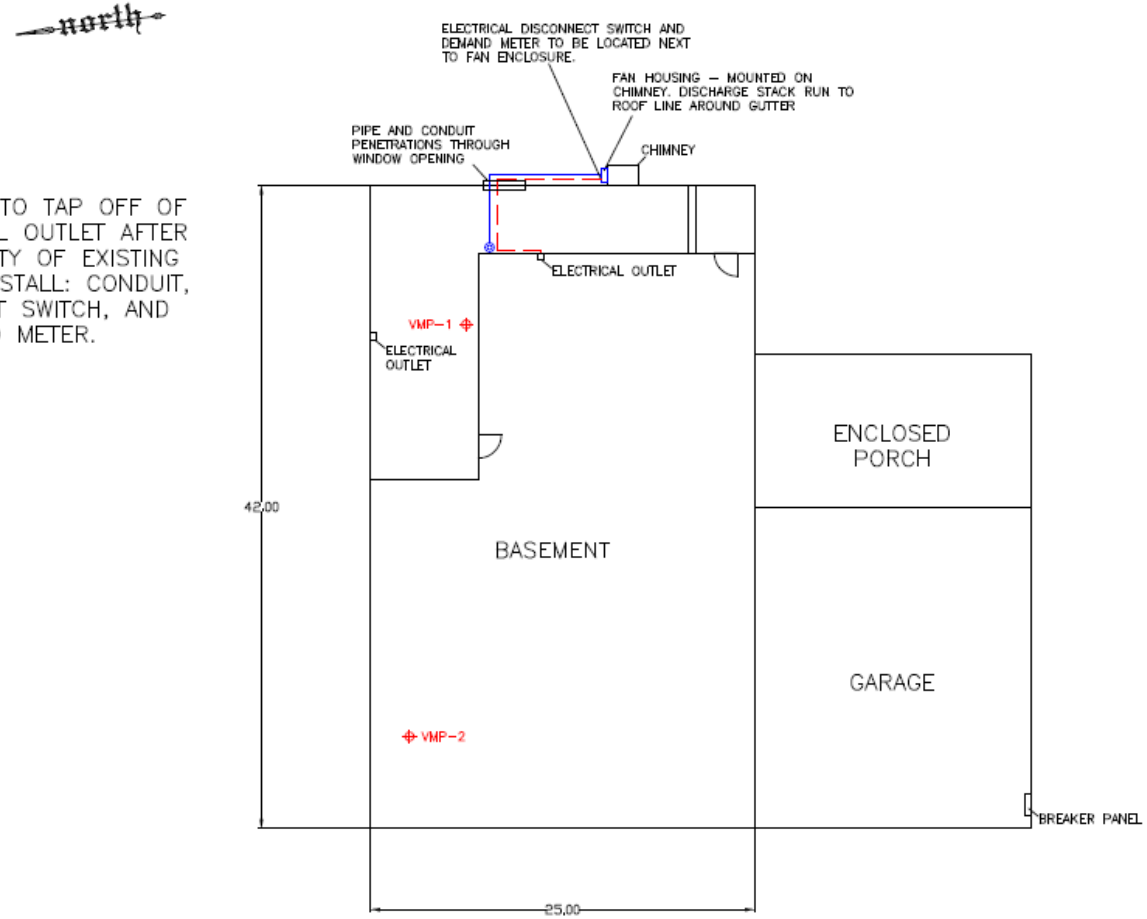
FIGURE NUMBER	REV	DATE
FIGURE 4	0	03/22/09

ATTACHMENT 1-1

SSD SYSTEM LAYOUT SKETCHES


north
ELECTRICAL DISCONNECT SWITCH AND DEMAND METER TO BE LOCATED NEXT TO FAN ENCLOSURE.
FAN HOUSING – MOUNTED ON EXTERIOR WALL. DISCHARGE STACK RUN TO ROOF LINE AROUND GUTTER
PIPE AND CONDUIT PENETRATIONS THROUGH WINDOW OPENING
CHIMNEY
NOTE: ELECTRICIAN TO INSTALL: NEW BREAKER IN SUB PANEL, CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.
VMP-1
BREAKER SUB-PANEL
19.00
42.00
BASEMENT
20.00
GARAGE
VMP-2
25.00
LEGEND:
– VACUUM EXTRACTION WELL
– VAPOR MONITORING POINT
– 4"ø SCH 40 PVC SYSTEM PIPING
– ELECTRICAL CONDUIT
5 0 5 10
APPROXIMATE SCALE
FIGURE #
1
SSD SYSTEM LAYOUT
REVISED BY: J.W.
DATE: MAY 1, 2009
APPROX. SCALE: 1" = 10'
DRAWN BY: J.W.
MAY 1, 2009
House 2
EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-3001 Fax: (631) 924-5001

NOTE: ELECTRICIAN TO TAP OFF OF EXISTING ELECTRICAL OUTLET AFTER CONFIRMING CAPACITY OF EXISTING CIRCUIT, AND TO INSTALL: CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.



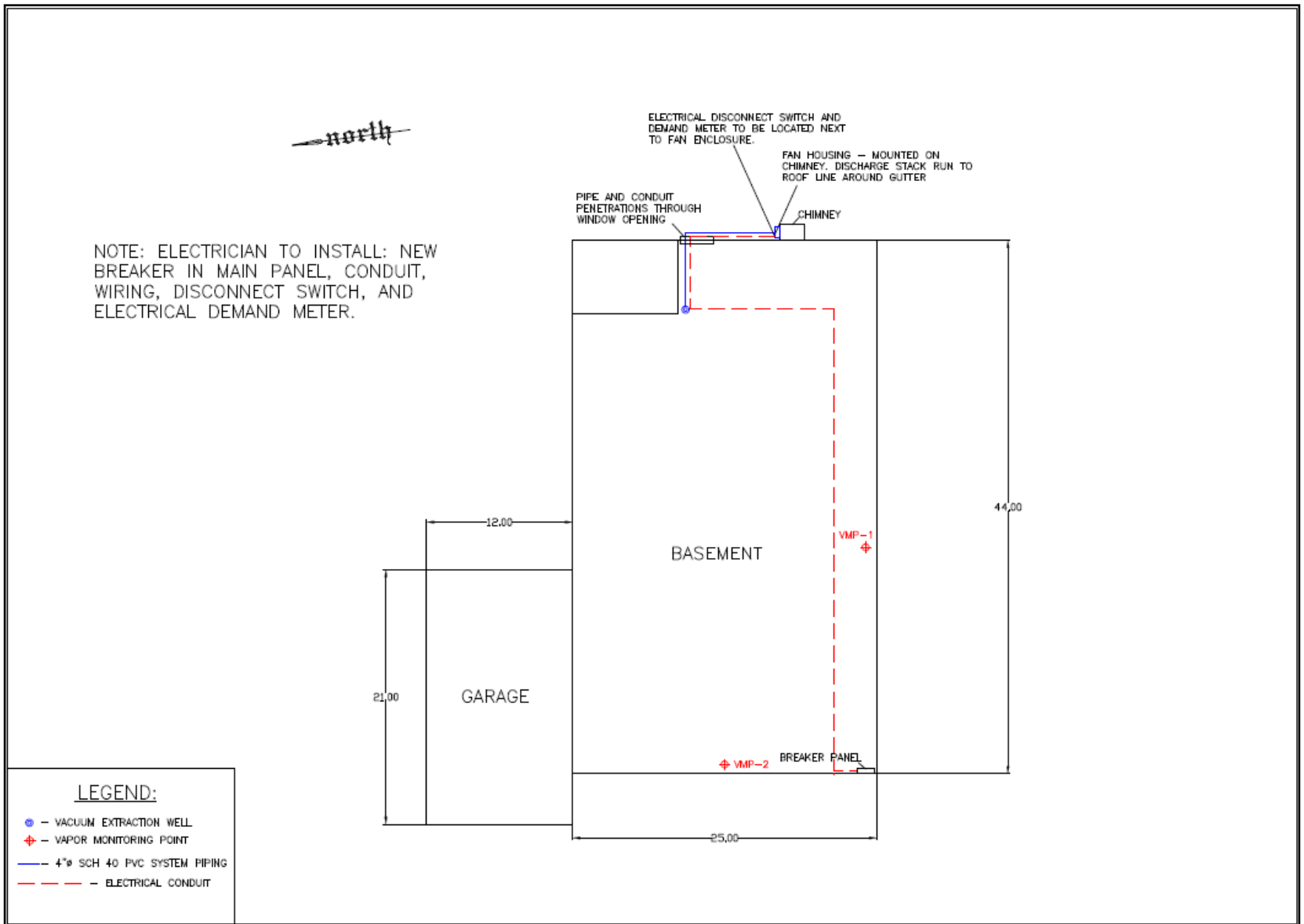
LEGEND:

- ⊗ – VACUUM EXTRACTION WELL
- ⌖ – VAPOR MONITORING POINT
- —— – 4"ø SCH 40 PVC SYSTEM PIPING
- — — — – ELECTRICAL CONDUIT

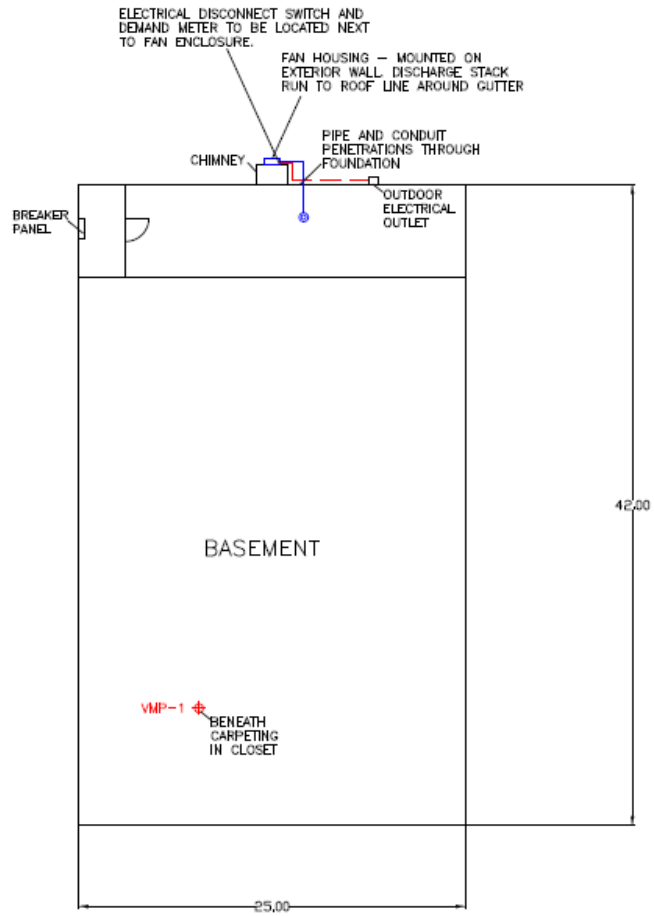
5 0 5 10
APPROXIMATE SCALE

FIGURE #	SSD SYSTEM LAYOUT			House 6
2	REVISED BY: J.W. DATE: MAY 4, 2009	APPROX. SCALE: 1" = 10'	DRAWN BY: J.W. MAY 1, 2009	

EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-3001 Fax: (631) 924-5001


north
ELECTRICAL DISCONNECT SWITCH AND DEMAND METER TO BE LOCATED NEXT TO FAN ENCLOSURE.
FAN HOUSING – MOUNTED ON CHIMNEY. DISCHARGE STACK RUN TO ROOF LINE AROUND GUTTER
PIPE AND CONDUIT PENETRATIONS THROUGH WINDOW OPENING
CHIMNEY
NOTE: ELECTRICIAN TO INSTALL: NEW BREAKER IN MAIN PANEL, CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.
12.00
44.00
BASEMENT
VMP-1
GARAGE
21.00
VMP-2
BREAKER PANEL
25.00
LEGEND:
– VACUUM EXTRACTION WELL
– VAPOR MONITORING POINT
– 4"ø SCH 40 PVC SYSTEM PIPING
– ELECTRICAL CONDUIT
5 0 5 10
APPROXIMATE SCALE
FIGURE #
3
SSD SYSTEM LAYOUT
REVISED BY: J.W.
DATE: MAY 1, 2009
APPROX. SCALE:
1" = 10'
DRAWN BY: J.W.
MAY 1, 2009
House 3
EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-3001 Fax: (631) 924-5001

NOTE: ELECTRICIAN TO TAP OFF OF EXISTING ELECTRICAL OUTLET AFTER CONFIRMING CIRCUIT CAPACITY, AND TO INSTALL: CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.



LEGEND:

- ⊗ – VACUUM EXTRACTION WELL
- ⊕ – VAPOR MONITORING POINT
- —— – 4"ø SCH 40 PVC SYSTEM PIPING
- — — — – ELECTRICAL CONDUIT

5 0 5 10
APPROXIMATE SCALE

FIGURE # 4

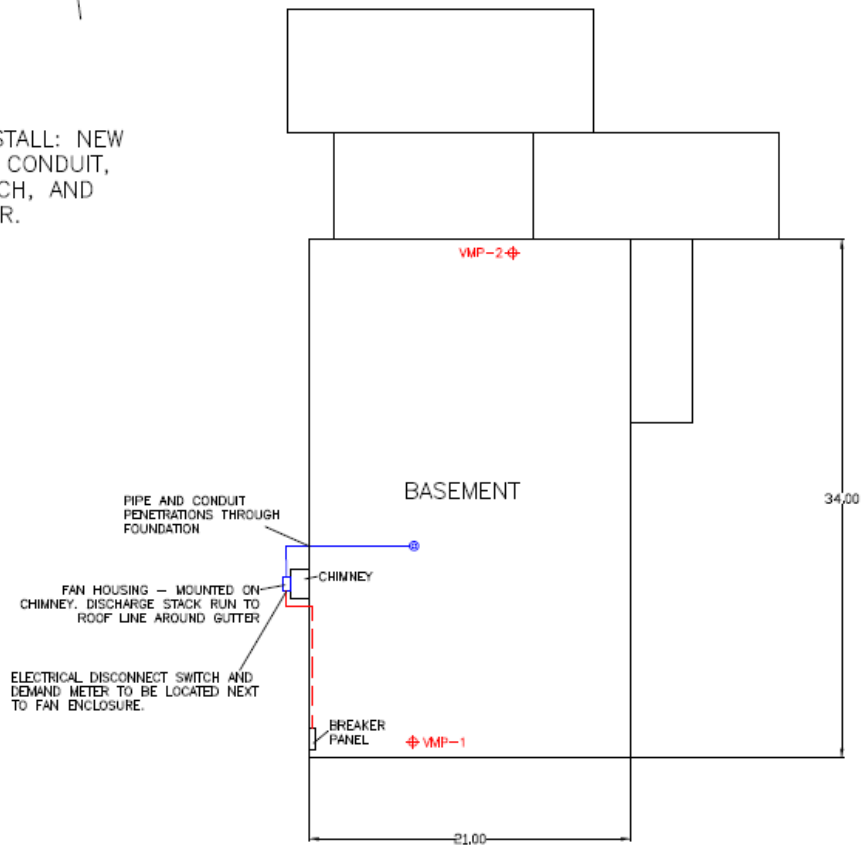
SSD SYSTEM LAYOUT

REVISED BY: J.W.	APPROX. SCALE:	DRAWN BY: J.W.
DATE: MAY 1, 2009	1" = 10'	MAY 1, 2009

House 4

EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-3001 Fax: (631) 924-5001

NOTE: ELECTRICIAN TO INSTALL: NEW BREAKER IN MAIN PANEL, CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.



LEGEND:

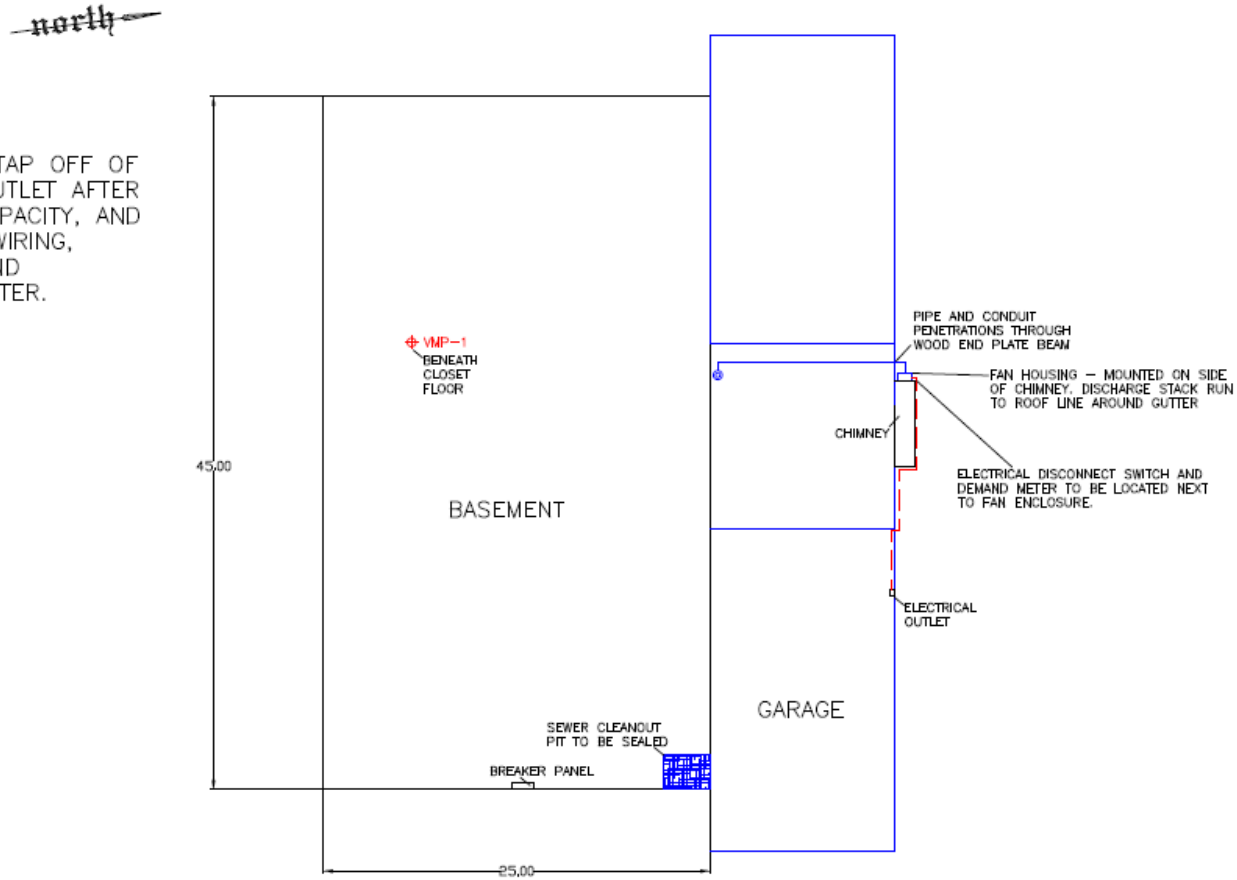
- ⊗ – VACUUM EXTRACTION WELL
- ⌖ – VAPOR MONITORING POINT
- —— – 4"ø SCH 40 PVC SYSTEM PIPING
- — — — – ELECTRICAL CONDUIT

5 0 5 10
APPROXIMATE SCALE

FIGURE #	SSD SYSTEM LAYOUT			House 13
5	REVISED BY: J.W. DATE: MAY 1, 2009	APPROX. SCALE: 1" = 10'	DRAWN BY: J.W. MAY 1, 2009	

EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-3001 Fax: (631) 924-5001

NOTE: ELECTRICIAN TO TAP OFF OF EXISTING ELECTRICAL OUTLET AFTER CONFIRMING CIRCUIT CAPACITY, AND TO INSTALL: CONDUIT, WIRING, DISCONNECT SWITCH, AND ELECTRICAL DEMAND METER.



LEGEND:

- VACUUM EXTRACTION WELL
- VAPOR MONITORING POINT
- 4"ø SCH 40 PVC SYSTEM PIPING
- ELECTRICAL CONDUIT

5 0 5 10
APPROXIMATE SCALE

FIGURE # 6

SSD SYSTEM LAYOUT

REVISED BY: J.W. DATE: MAY 1, 2009	APPROX. SCALE: 1" = 10'	DRAWN BY: J.W. MAY 1, 2009

House 14

EnviroTrac
5 OLD DOCK ROAD YAPHANK, NY 11980
Phone: (631) 924-5001 Fax: (631) 924-5001

ATTACHMENT 1-2

STAGE 1 – PRELIMINARY AIR DISPERSION MODELING RESULTS

Run	Scenario	Home Numbers	Combined Flow Rate (CFM)	Trichloroethene AGC: 0.5 ug/m^3 00079-01-6				Tetrachloroethene AGC: 1.0 ug/m^3 00127-18-4				1,1,1-Trichloroethane AGC: 1,000 ug/m^3 00071-55-6			
				Est. Loading (lb/hr)	Est. Loading (lb/yr)	Est Stack Conc. (ug/m^3)	Pred. Annual Conc (ug/m^3)	Est. Loading (lb/hr)	Est. Loading (lb/yr)	Est Stack Conc. (ug/m^3)	Pred. Annual Conc (ug/m^3)	Est. Loading (lb/hr)	Est. Loading (lb/yr)	Est Stack Conc. (ug/m^3)	Pred. Annual Conc (ug/m^3)
1	Two highest houses, 50 CFM each, with SSB concentration	2 and 3	100	0.0052	45.9	14,000	1.0	0.00008	0.7	220	0.00	0.00468	41.0	12,500	0.9
2	Two highest houses, 100 CFM each, with SSB concentration	2 and 3	200	0.0105	91.8	14,000	2.1	0.00016	1.4	220	0.03	0.00936	82.0	12,500	1.8
3	Two highest houses, 150 CFM each, with SSB concentration	2 and 3	300	0.0157	137.7	14,000	3.1	0.00025	2.2	220	0.05	0.01404	123.0	12,500	2.7
5	Seven Systems, 50 CFM each, with SSB concentration	2, 3, 4, 6, 10, 13, and 14	350	0.0058	50.8	4,423	1.1	0.00034	3.0	261	0.07	0.00574	50.3	4,383	1.1
6	Seven Systems, 100 CFM each, with SSB concentration	2, 3, 4, 6, 10, 13, and 14	700	0.0116	101.5	4,423	2.3	0.00068	6.0	261	0.13	0.01149	100.6	4,383	2.3
7	Seven Systems, 150 CFM each, with SSB concentration	2, 3, 4, 6, 10, 13, and 14	1050	0.0174	152.3	4,423	3.4	0.00103	9.0	261	0.20	0.01723	150.9	4,383	3.4

Preliminary Air Calculations for Subslab Depressurization Units at NWIRP Bethpage using DAR-1.

BPS1SSD1

EMISSION POINT = CAS NUMBER = 00079-01-6 SIC = 0

AGC = 0.500000000 ug/m3 SGC = 14000.000000 ug/m3

STACK: HA= 2., SH= 12., D= 6., T= 60., V= 9.60, q= 100.00
BUILDING: Dpl= 10., BW= 25., BL= 40., %CONTROL= 0.0000

** Reported Hourly Emission Rate (Q) is equal to 0.000520000 lbs/hour.

** Reported Annual Emission Rate (Qa) is equal to 45.000000 lbs/year.

II.B. REFINED CAVITY IMPACT METHOD (DAR-1, APPENDIX B).

II.B.1. Shortest Distance from building to Property Line (10. feet) is less than or equal to the cavity length, or 3 building heights (30. feet). Therefore, this building will have cavity impacts (if they occur) at receptors off plant property.

II.B.2. The largest building dimension (40. feet) is greater than or equal to the building height (10. feet). Therefore, the computer will NOT redefine the cavity length.

II.B.3. Stack height (12. feet) is less than cavity height (15. feet). Therefore, this source may contribute to the buildings cavity impact.

II.B.4.a. Redefining cavity height using the SCREEN2 model formula. Stack height (12. feet) is now greater than cavity height (11. feet). Therefore, no cavity impact occurs.

Computer will assume the CAVITY Annual Impact equals
0.00 ug/m3.

II.C. CAVITY Annual Impact (0.000 ug/m3) is less than AGC
(0.500 ug/m3).

III.A. STANDARD POINT SOURCE METHOD (DAR-1, APPENDIX B).

III.A.1.a. Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

III.A.2. STANDARD POINT SOURCE Actual Annual Impact is equal
to 1.007 ug/m3 for 86538. hours/year of operation.

III.A.3. STANDARD POINT SOURCE Potential Annual Impact is equal
to 0.102 ug/m3 assuming 8,760 hours/year of operation.

III.A.4. Stack height to building height ratio is less than
1.5. Computer will not reduce impacts.

III.A.5. STANDARD POINT SOURCE Short-Term Impact is calculated below
using the DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.

III.D. STANDARD POINT SOURCE Actual Annual Impact (1.007 ug/m3) is
greater than AGC (0.500 ug/m3).

**** Refer to DAR-1 Section III.D.1. A refined site ****
**** specific modeling analyis may be required. ****

III.D. STANDARD POINT SOURCE Potential Annual Impact (0.102 ug/m3)
is less than AGC (0.500 ug/m3).

**** Potential Annual Impact is based upon 8760 hours/year ****
**** operation instead of reported ***** hours/year. ****

2.0 DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.
See "Technical Reference for the Screening Procedures of the
DAR-1 Software Program, Wade/Sedefian,' 1/11/94.

2.2 CAVITY Short-Term Impact is equal to 0.00 ug/m3 as the plume
escaped the cavity region: hs(12. feet) > hc(11. feet).

II.C. CAVITY Short-Term Impact (0.000 ug/m3) is less
than SGC (14000.000 ug/m3).

2.3 Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

2.4 Maximum non-downwash GEP stack Short-Term Impact (CSTP) is equal
to 1.047 ug/m3, for hs/hb = 1.20

2.5 Maximum downwash Short-Term Impact (CSTD) is equal
to 4.009 ug/m3, for: hs/hb = 1.20 and ESH = 12. feet.

2.6 Stack height to building height ratio is less than
or equal to 1.2. Computer will not reduce downwash impact.

III.D. Maximum non-cavity Short-Term Impact (CST: 4.009 ug/m3) is
less than the SGC (14000.000 ug/m3) for the point source.

2.7 Maximum Short-Term cavity, point, or area source impact
(SHORT-TERM MAXIMUM, (Cav,Pt,Area)) equals 4.009 ug/m3
and is reported in the ANALYSIS MENU. This value is less than
the SGC (14000.000 ug/m3).

****

EMISSION POINT = CAS NUMBER = 00127-18-4 SIC = 0

AGC = 1.000000000 ug/m3 SGC = 1000.000000 ug/m3

STACK: HA= 2., SH= 12., D= 6., T= 60., V= 9.60, q= 100.00
BUILDING: Dpl= 10., BW= 25., BL= 40., %CONTROL= 0.0000

** Reported Hourly Emission Rate (Q) is equal to 0.000080000 lbs/hour.

** Reported Annual Emission Rate (Qa) is equal to 0.030000 lbs/year.

II.B. REFINED CAVITY IMPACT METHOD (DAR-1, APPENDIX B).

II.B.1. Shortest Distance from building to Property Line (10. feet) is less than or equal to the cavity length, or 3 building heights (30. feet). Therefore, this building will have cavity impacts (if they occur) at receptors off plant property.

II.B.2. The largest building dimension (40. feet) is greater than or equal to the building height (10. feet). Therefore, the computer will NOT redefine the cavity length.

II.B.3. Stack height (12. feet) is less than cavity height (15. feet). Therefore, this source may contribute to the buildings cavity impact.

II.B.4.a. Redefining cavity height using the SCREEN2 model formula. Stack height (12. feet) is now greater than cavity height (11. feet). Therefore, no cavity impact occurs. Computer will assume the CAVITY Annual Impact equals 0.00 ug/m3.

II.C. CAVITY Annual Impact (0.000 ug/m3) is less than AGC (1.000 ug/m3).

III.A. STANDARD POINT SOURCE METHOD (DAR-1, APPENDIX B).

III.A.1.a. Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

III.A.2. STANDARD POINT SOURCE Actual Annual Impact is equal to 0.001 ug/m3 for 375. hours/year of operation.

III.A.3. STANDARD POINT SOURCE Potential Annual Impact is equal to 0.016 ug/m3 assuming 8,760 hours/year of operation.

III.A.4. Stack height to building height ratio is less than 1.5. Computer will not reduce impacts.

III.A.5. STANDARD POINT SOURCE Short-Term Impact is calculated below using the DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.

III.D. STANDARD POINT SOURCE Actual Annual Impact (0.001 ug/m3) is less than AGC (1.000 ug/m3).

III.D. STANDARD POINT SOURCE Potential Annual Impact (0.016 ug/m3) is less than AGC (1.000 ug/m3).

**** Potential Annual Impact is based upon 8760 hours/year ****
**** operation instead of reported 375. hours/year. ****

2.0 DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.
See "Technical Reference for the Screening Procedures of the DAR-1 Software Program, Wade/Sedefian,' 1/11/94.

2.2 CAVITY Short-Term Impact is equal to 0.00 ug/m3 as the plume escaped the cavity region: hs(12. feet) > hc(11. feet).

II.C. CAVITY Short-Term Impact (0.000 ug/m3) is less than SGC (1000.000 ug/m3).

2.3 Plume rise should not be considered (hs/hb < 1.5). Computer will assume: he = hs.

2.4 Maximum non-downwash GEP stack Short-Term Impact (CSTP) is equal to 0.161 ug/m3, for hs/hb = 1.20

2.5 Maximum downwash Short-Term Impact (CSTD) is equal to 0.617 ug/m3, for: hs/hb = 1.20 and ESH = 12. feet.

2.6 Stack height to building height ratio is less than or equal to 1.2. Computer will not reduce downwash impact.

III.D. Maximum non-cavity Short-Term Impact (CST: 0.617 ug/m3) is less than the SGC (1000.000 ug/m3) for the point source.

2.7 Maximum Short-Term cavity, point, or area source impact (SHORT-TERM MAXIMUM, (Cav,Pt,Area)) equals 0.617 ug/m3 and is reported in the ANALYSIS MENU. This value is less than the SGC (1000.000 ug/m3).

****

EMISSION POINT = CAS NUMBER = 00071-55-6 SIC = 0

AGC = 1000.000000000 ug/m3 SGC = 68000.000000 ug/m3

STACK: HA= 2., SH= 12., D= 6., T= 60., V= 9.60, q= 100.00
BUILDING: Dpl= 10., BW= 25., BL= 40., %CONTROL= 0.0000

** Reported Hourly Emission Rate (Q) is equal to 0.004700000 lbs/hour.

** Reported Annual Emission Rate (Qa) is equal to 41.000000 lbs/year.

II.B. REFINED CAVITY IMPACT METHOD (DAR-1, APPENDIX B).

II.B.1. Shortest Distance from building to Property Line (10. feet) is less than or equal to the cavity length, or 3 building heights (30. feet). Therefore, this building will have cavity impacts (if they occur) at receptors off plant property.

II.B.2. The largest building dimension (40. feet) is greater than or equal to the building height (10. feet). Therefore, the computer will NOT redefine the cavity length.

II.B.3. Stack height (12. feet) is less than cavity height (15. feet). Therefore, this source may contribute to the buildings cavity impact.

II.B.4.a. Redefining cavity height using the SCREEN2 model formula. Stack height (12. feet) is now greater than cavity height (11. feet). Therefore, no cavity impact occurs. Computer will assume the CAVITY Annual Impact equals 0.00 ug/m3.

II.C. CAVITY Annual Impact (0.000 ug/m3) is less than AGC (1000.000 ug/m3).

III.A. STANDARD POINT SOURCE METHOD (DAR-1, APPENDIX B).

III.A.1.a. Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

III.A.2. STANDARD POINT SOURCE Actual Annual Impact is equal to 0.918 ug/m3 for 8723. hours/year of operation.

III.A.3. STANDARD POINT SOURCE Potential Annual Impact is equal to 0.921 ug/m3 assuming 8,760 hours/year of operation.

III.A.4. Stack height to building height ratio is less than 1.5. Computer will not reduce impacts.

III.A.5. STANDARD POINT SOURCE Short-Term Impact is calculated below using the DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.

III.D. STANDARD POINT SOURCE Actual Annual Impact (0.918 ug/m3) is less than AGC (1000.000 ug/m3).

III.D. STANDARD POINT SOURCE Potential Annual Impact (0.921 ug/m3) is less than AGC (1000.000 ug/m3).

**** Potential Annual Impact is based upon 8760 hours/year ****
**** operation instead of reported 8723. hours/year. ****

2.0 DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.
See "Technical Reference for the Screening Procedures of the DAR-1 Software Program, Wade/Sedefian,' 1/11/94.

2.2 CAVITY Short-Term Impact is equal to 0.00 ug/m3 as the plume escaped the cavity region: hs(12. feet) > hc(11. feet).

II.C. CAVITY Short-Term Impact (0.000 ug/m3) is less than SGC (68000.000 ug/m3).

2.3 Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

2.4 Maximum non-downwash GEP stack Short-Term Impact (CSTP) is equal
to 9.465 ug/m3, for hs/hb = 1.20

2.5 Maximum downwash Short-Term Impact (CSTD) is equal
to 36.234 ug/m3, for: hs/hb = 1.20 and ESH = 12. feet.

2.6 Stack height to building height ratio is less than
or equal to 1.2. Computer will not reduce downwash impact.

III.D. Maximum non-cavity Short-Term Impact (CST: 36.234 ug/m3) is
less than the SGC (68000.000 ug/m3) for the point source.

2.7 Maximum Short-Term cavity, point, or area source impact
(SHORT-TERM MAXIMUM, (Cav,Pt,Area)) equals 36.234 ug/m3
and is reported in the ANALYSIS MENU. This value is less than

III.D. Maximum non-cavity Short-Term Impact (CST: 36.234 ug/m3) is
less than the SGC (68000.000 ug/m3) for the point source.

2.7 Maximum Short-Term cavity, point, or area source impact
(SHORT-TERM MAXIMUM, (Cav,Pt,Area)) equals 36.234 ug/m3
and is reported in the ANALYSIS MENU. This value is less than
the SGC (68000.000 ug/m3).

BPS1SSD1

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	0.0533	0.0000	0.0921	0.0918
00079-01-6	0.50000000	0.0286	0.0000	20.3721	201.4819
00127-18-4	1.00000000	0.0617	0.0000	1.5671	0.0672
SUMMARY TOTALS		0.1436	0.0000	22.0312	201.6408

CONTAMINANT IMPACT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) ug/m3	ACTUAL ANNUAL ug/m3	POTENTIAL ANNUAL ug/m3	ACTUAL ANNUAL ug/m3
00071-55-6	1000.00000000	36.233585400	0.000000000	0.920660198	0.917861839
00079-01-6	0.50000000	4.008821960	0.000000000	0.101860277	1.007409333
00127-18-4	1.00000000	0.616741896	0.000000000	0.015670812	0.000671606

BPS1SSD2

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	0.1061	0.0000	0.1833	0.1836
00079-01-6	0.50000000	0.5782	0.0000	411.3588	411.9185
00127-18-4	1.00000000	0.1233	0.0000	3.1342	3.1342
SUMMARY TOTALS		0.8077	0.0000	414.6763	415.2362

BPS1SSD3

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	0.1587	0.0000	0.2742	0.2754
00079-01-6	0.50000000	0.8645	0.0000	615.0794	617.8777
00127-18-4	1.00000000	0.1927	0.0000	4.8971	4.9251
SUMMARY TOTALS		1.2160	0.0000	620.2507	623.0782

BPS1SSD5

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	0.0646	0.0000	0.1117	0.1126
00079-01-6	0.50000000	0.3194	0.0000	227.2268	228.3461
00127-18-4	1.00000000	0.2621	0.0000	6.6601	6.7161
SUMMARY TOTALS		0.6461	0.0000	233.9985	235.1748

BPS1SSD6

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9
Page 1
SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	0.1304	0.0000	0.2253	0.2261
00079-01-6	0.50000000	0.6388	0.0000	454.4535	454.4535
00127-18-4	1.00000000	0.5242	0.0000	13.3202	13.4321
SUMMARY TOTALS		1.2934	0.0000	467.9990	468.1117

BPS1SSD7

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS 3/28/ 9

Page 1

SHORT-TERM CAVITY POINT or AREA SOURCE

CAS NUMBER	AGC ug/m3	MAXIMUM (Cav,Pt,Area) % OF SGC	ACTUAL ANNUAL % OF AGC	POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00071-55-6	1000.00000000	1.9273	0.0000	3.3300	0.3358
00079-01-6	0.50000000	0.9582	0.0000	681.6803	680.5610
00127-18-4	1.00000000	0.7709	0.0000	19.5885	20.1482
SUMMARY TOTALS		3.6564	0.0000	704.5989	701.0449

ATTACHMENT 1-3

STAGE 2 – REFINED AIR DISPERSION MODELING RESULTS

BETHPAGE
DAR-1 MODEL OUTPUT
DOES NOT INCLUDE ISCLT MODEL RESULTS

****

BETHPAGE

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EMISSION POINT =           TOTAL     CAS NUMBER = 00079-01-6     SIC =    0

AGC =            0.500000000 ug/m3        SGC =       14000.000000 ug/m3

STACK: HA=     2., SH=   12., D=    6., T=    60., V=    9.60, q=    100.00
BUILDING: Dpl=     10., BW=   25., BL=   40., %CONTROL=   0.0000

**  Reported Hourly Emission Rate (Q) is equal to        0.000520000 lbs/hour.

**  Reported Annual Emission Rate (Qa) is equal to       45.000000 lbs/year.
```

II.B. REFINED CAVITY IMPACT METHOD (DAR-1, APPENDIX B).

II.B.1. Shortest Distance from building to Property Line (10. feet) is less than or equal to the cavity length, or 3 building heights (30. feet). Therefore, this building will have cavity impacts (if they occur) at receptors off plant property.

II.B.2. The largest building dimension (40. feet) is greater than or equal to the building height (10. feet). Therefore, the computer will NOT redefine the cavity length.

II.B.3. Stack height (12. feet) is less than cavity height (15. feet). Therefore, this source may contribute to the buildings cavity impact.

II.B.4.a. Redefining cavity height using the SCREEN2 model formula. Stack height (12. feet) is now greater than cavity height (11. feet). Therefore, no cavity impact occurs. Computer will assume the CAVITY Annual Impact equals 0.00 ug/m3.

II.C. CAVITY Annual Impact (0.000 ug/m3) is less than AGC (0.500 ug/m3).

III.A. STANDARD POINT SOURCE METHOD (DAR-1, APPENDIX B).

III.A.1.a. Plume rise should not be considered (hs/hb < 1.5). Computer will assume: he = hs.

III.A.2. STANDARD POINT SOURCE Actual Annual Impact is equal to 1.007 ug/m3 for 86538. hours/year of operation.

III.A.3. STANDARD POINT SOURCE Potential Annual Impact is equal to 0.102 ug/m3 assuming 8,760 hours/year of operation.

III.A.4. Stack height to building height ratio is less than 1.5. Computer will not reduce impacts.

III.A.5. STANDARD POINT SOURCE Short-Term Impact is calculated below using the DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.

III.D. **STANDARD POINT SOURCE Actual Annual Impact (1.007 ug/m3) is greater than AGC (0.500 ug/m3).**

****** Refer to DAR-1 Section III.D.1. A refined site ******
****** specific modeling analyis may be required. ******

III.D. STANDARD POINT SOURCE Potential Annual Impact (0.102 ug/m3) is less than AGC (0.500 ug/m3).

**** Potential Annual Impact is based upon 8760 hours/year ****
**** operation instead of reported ***** hours/year. ****

2.0 DAR-1 SOFTWARE PROGRAM SHORT-TERM METHOD.
See "Technical Reference for the Screening Procedures of the DAR-1 Software Program, Wade/Sedefian,' 1/11/94.

2.2 CAVITY Short-Term Impact is equal to 0.00 ug/m3 as the plume escaped the cavity region: hs(12. feet) > hc(11. feet).

II.C. CAVITY Short-Term Impact (0.000 ug/m3) is less than SGC (14000.000 ug/m3).

2.3 Plume rise should not be considered (hs/hb < 1.5).
Computer will assume: he = hs.

2.4 Maximum non-downwash GEP stack Short-Term Impact (CSTP) is equal to 1.047 ug/m3, for hs/hb = 1.20

2.5 Maximum downwash Short-Term Impact (CSTD) is equal to 4.009 ug/m3, for: hs/hb = 1.20 and ESH = 12. feet.

2.6 Stack height to building height ratio is less than or equal to 1.2. Computer will not reduce downwash impact.

III.D. Maximum non-cavity Short-Term Impact (CST: 4.009 ug/m3) is less than the SGC (14000.000 ug/m3) for the point source.

2.7 Maximum Short-Term cavity, point, or area source impact (SHORT-TERM MAXIMUM, (Cav,Pt,Area)) equals 4.009 ug/m3 and is reported in the ANALYSIS MENU. This value is less than the SGC (14000.000 ug/m3).

BPSR1 ISCLT MODELING SUMMARY

1 METER GRID MODELING RESULTS FOR MAXIMUM ANNUAL CONCENTRATION

04/24/09
CONCENTRATIONS x 10-2 (ug/m3) for 00079-01-6 09:37:00
AGC = 0.500000000 ug/m3

UTME UTMN	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
11.	1.91	2.10	2.30	2.50	2.66	2.77	2.88	2.99	3.09	3.19	3.27	3.07	2.88
10.	1.94	2.16	2.38	2.60	2.73	2.86	2.99	3.11	3.22	3.32	3.11	2.91	2.73
9.	0.00	2.22	2.47	2.68	2.82	2.97	3.11	3.25	3.37	3.13	2.92	2.73	2.56
8.	0.00	0.00	0.00	0.00	2.93	3.10	3.26	3.41	3.14	2.91	2.71	2.53	2.37
7.	0.00	0.00	0.00	0.00	0.00	3.26	**3.44**	3.14	2.88	2.67	2.48	2.31	2.17
6.	0.00	0.00	0.00	0.00	0.00	0.00	3.12	2.84	2.60	2.40	2.23	2.09	1.97
5.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	2.29	2.12	1.98	1.86	1.84
4.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.98	1.88	1.87	1.85	1.83

04/24/09
TOP 100 CONTRIBUTORS TO MAXIMUM CONCENTRATION FOR 00079-01-6 09:37:00
@ UTME: 7. UTMN: 7.

Emission Point	Facility Name (shortened)	EP DIR	Distance to Max.(m)	CONC. ug/m3	Percent of Max.
**********	**********	***	**********	*********	*******
TOTAL		SW	10.	0.344E-01	100.000
TOTAL OF ALL 1 CONTRIBUTORS				0.344E-01	100.000

04/24/09
ISCLT MODEL RUN INFORMATION 09:37:00

1. Current GRID SPACING equals 1. meters.
2. Maximum Concentration (flashing) equals 0.0343648195 ug/m3
   @ UTME: 7. UTMN: 7.
3. RUN FILE: BPS1.RUN
4. METEOROLOGICAL FILE: ISP.MET
5. RUN MODE: RURAL
6. HALF-LIVES: not used to account for pollutant removal from air.
7. BLD. WAKE EFFECTS: AG-1 METHOD, All data KNOWN (hb,bw,bl,orientation)
8. EMISSIONS: POTENTIAL ANNUAL EMISSIONS
9. SOURCES: All sources within 25. meters of
   UTME: 0., UTMN: 0.
10. CONTAMINANT CAS NUMBER(s): 00079-01-6
11. EMISSION POINT - CONTAMINANT(s) found by computer: 1
12. No data is being copied to DUMP file.

ATTACHMENT 1-4

LIMITED VOC ANALYTE LIST

Method : Modified TO-15-LL (Sh)/SpRLs-Tetra Tech (CTO WE06)

CAS Number	Compound	Rpt. Limit (ppbv)
71-55-6	1,1,1-Trichloroethane	0.050
79-01-6	Trichloroethene	0.050
127-18-4	Tetrachloroethene	0.050
75-01-4	Vinyl Chloride	0.10
75-35-4	1,1-Dichloroethene	0.10
75-34-3	1,1-Dichloroethane	0.10
156-59-2	cis-1,2-Dichloroethene	0.10
107-06-2	1,2-Dichloroethane	0.10
156-60-5	trans-1,2-Dichloroethene	0.10

	Surrogate	Method Limits
460-00-4	4-Bromofluorobenzene	70-130
17060-07-0	1,2-Dichloroethane-d4	70-130
2037-26-5	Toluene-d8	70-130