ANSON
ENVIRONMENTAL

# Soil and Groundwater Investigation Work Plan

## Voluntary Cleanup Program Site No. V00220

Site Location:

**Bayville Village Cleaners**
**290 Bayville Avenue**
**Bayville, New York 11709**

RECEIVED
OCT 20 2005
Hazardous Waste Remediation
NYSDEC Region 1

Date of Report:

**July 28, 2003**

**Revised February 24, 2004**

**Revised December 21, 2004**

**Revised September 29, 2005**

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Project No. 99195

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## 1.0 Introduction and Purpose of the Work Plan

During 1999, Mr. Thomas Ryan, the owner and operator of the property known as Bayville Village Cleaners and located at 290 Bayville Avenue, Bayville, New York, entered into a Voluntary Cleanup Agreement (VCA) with New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate the soil and groundwater contamination at 290 Bayville Avenue (Site ID. V00220). Mr. Ryan signed the agreement on September 13, 1999 and it is designated Index Number: W1- 0848-9903.

Prior to the signing of the VCA and during July 1996, P.W. Grosser Consulting Engineer and Hydrologist P.C. (PWGC), Sayville, New York, conducted the remediation of contaminated soils at the subject site through excavation and proper disposal of the contaminated soils. The following account of that soil remediation activity is described in the PWGC report "On-Site Groundwater Investigation Plan" dated January 1999:

> "During this remedial phase, PCE (perchloroethylene) impacted surface soils were successfully removed by excavation as documented through 17 endpoint samples. PCE was below detectable levels in 10 of the endpoint samples. Of the 7 bottom endpoint samples where PCE was detected, concentration in 5 samples were below 50 ug/kg and the remaining concentrations were well below PCE's TAGM soil cleanup objective of 1,400 ug/kg. An approximate total of 68 tons of impacted soils were excavated and properly disposed of during the remedial phase."

According to the above referenced PWGC investigation plan, the complete results of the aforementioned soil remediation activity were included in their report to Mr. Ryan titled "Continued Soil & Groundwater Investigation & Remedial Measure" dated December 1996. Figure 3 of the aforementioned report illustrates the locations where the contaminated soils were excavated (Page 1A). That figure shows that the deepest excavations were performed at the former locations of two above ground discharge pipes that exited the western side of the site building. Figure 3 also lists the laboratory results for the PCE concentrations detected in end-point samples collected from the excavations and compares them to NYSDEC soil cleanup objectives for PCE (TAGM). A total of 17 endpoint samples were collected and analyzed (8 bottom samples and 9 sidewall samples were collected).

In February 2000, four groundwater monitoring wells were installed on-site AEL. Groundwater samples were collected aperiodically from each of the four wells beginning in March 2000.

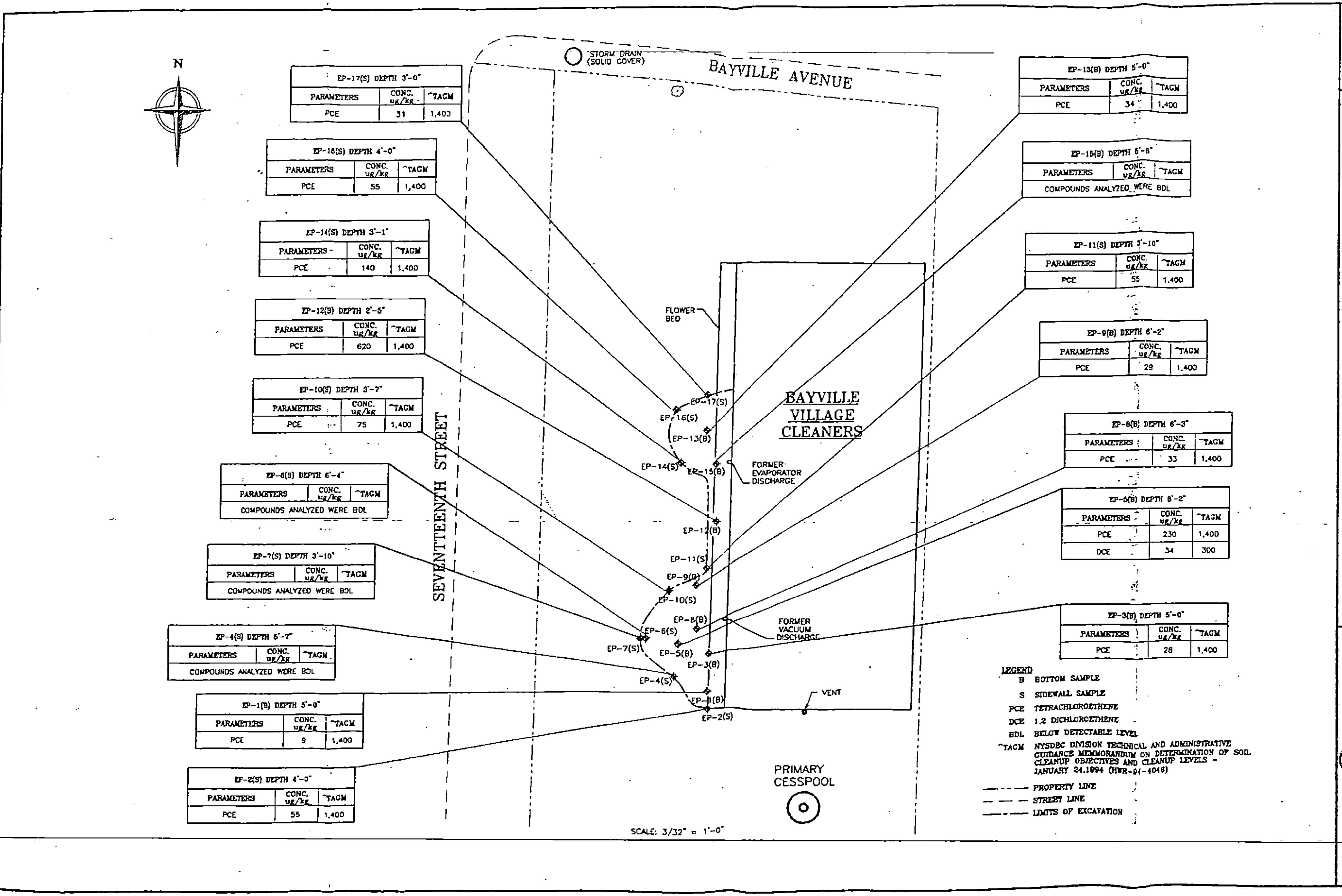
The laboratory analytical results for the latest groundwater samples collected on October 31, 2002, indicate that the detected concentrations of PCE in all four sampled monitoring wells is increasing. This Work Plan describes the investigative activities that AEL proposes to determine if a new spill has occurred that may have impacted the on-site soils and groundwater. This Work Plan will also describe an investigation to define the horizontal and vertical extent of the contamination in the groundwater.

Assuming that it is determined that the source of the on-site groundwater contamination is caused by a zone of on-site contaminated soil, AEL will design a soil vapor extraction system (SVES) to remediate that soil. Once the extent of the groundwater plume is defined, AEL will

# SITE PLAN
# ENDPOINT SAMPLING LOCATIONS AND RESULTS

290 BAYVILLE AVE.
BAYVILLE N.Y.

FIGURE No. 3



EP-17(S) DEPTH 3'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 31 | 1,400 |

EP-16(S) DEPTH 4'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 55 | 1,400 |

EP-14(S) DEPTH 3'-1"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 140 | 1,400 |

EP-12(B) DEPTH 2'-5"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 620 | 1,400 |

EP-10(S) DEPTH 3'-7"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 75 | 1,400 |

EP-6(S) DEPTH 6'-4"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| COMPOUNDS ANALYZED WERE BDL | | |

EP-7(S) DEPTH 3'-10"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| COMPOUNDS ANALYZED WERE BDL | | |

EP-4(S) DEPTH 6'-7"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| COMPOUNDS ANALYZED WERE BDL | | |

EP-1(B) DEPTH 5'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 9 | 1,400 |

EP-2(S) DEPTH 4'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 55 | 1,400 |

EP-13(B) DEPTH 5'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 34 | 1,400 |

EP-15(B) DEPTH 6'-6"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| COMPOUNDS ANALYZED WERE BDL | | |

EP-11(S) DEPTH 3'-10"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 55 | 1,400 |

EP-9(B) DEPTH 6'-2"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 29 | 1,400 |

EP-8(B) DEPTH 6'-3"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 33 | 1,400 |

EP-5(B) DEPTH 8'-2"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 230 | 1,400 |
| DCE | 34 | 300 |

EP-3(B) DEPTH 5'-0"

| PARAMETERS | CONC. ug/kg | ^TAGM |
|---|---|---|
| PCE | 28 | 1,400 |

LEGEND

| | |
|---|---|
| B | BOTTOM SAMPLE |
| S | SIDEWALL SAMPLE |
| PCE | TETRACHLOROETHENE |
| DCE | 1,2 DICHLOROETHENE |
| BDL | BELOW DETECTABLE LEVEL |
| ^TAGM | NYSDEC DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMMORANDUM ON DETERMINATION OF SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS - JANUARY 24,1994 (HWR-94-4046) |
| — - - — | PROPERTY LINE |
| — — — | STREET LINE |
| —— - —— | LIMITS OF EXCAVATION |

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FILE No. BVC961-2
Date 12/5/96

PAGE 1A

design a remediation system that will use air sparging (AS) in concert with the SVES to remediate the groundwater. AEL will also investigate the use of enhanced bioremediation processes to remediate the groundwater rather than AS.

## 2.0 Summary of Existing and Background Information

This section presents site location descriptions and background information. The background information includes site geology and a summary of previous site investigations.

### 2.1 Site Description, Location, Ownership and Access

The Bayville Village Cleaners site is located at the southeast corner of the intersection of Bayville Avenue and 17th Street, Bayville, New York (Figure 1 and Figure 2). The approximate size of the site property is 50-feet in the east/west direction and 100-feet in the north/south direction. The building on the site is located along the eastern boundary. The property is located on a narrow strip of land that connects Bayville and Center Island. This narrow land strip measures approximately 2,000 feet wide and is bounded at the north side by the waters of Long Island Sound and at the south side by the waters of Mill Neck Bay and Oyster Bay Harbor.

The site contains a small single-story building that is constructed with cinder blocks and brick. The site building measures approximately 58-feet in the north/south direction and 24-feet in the east/west direction. The primary entrance to the building is from Bayville Avenue at the northern boundary of the property.

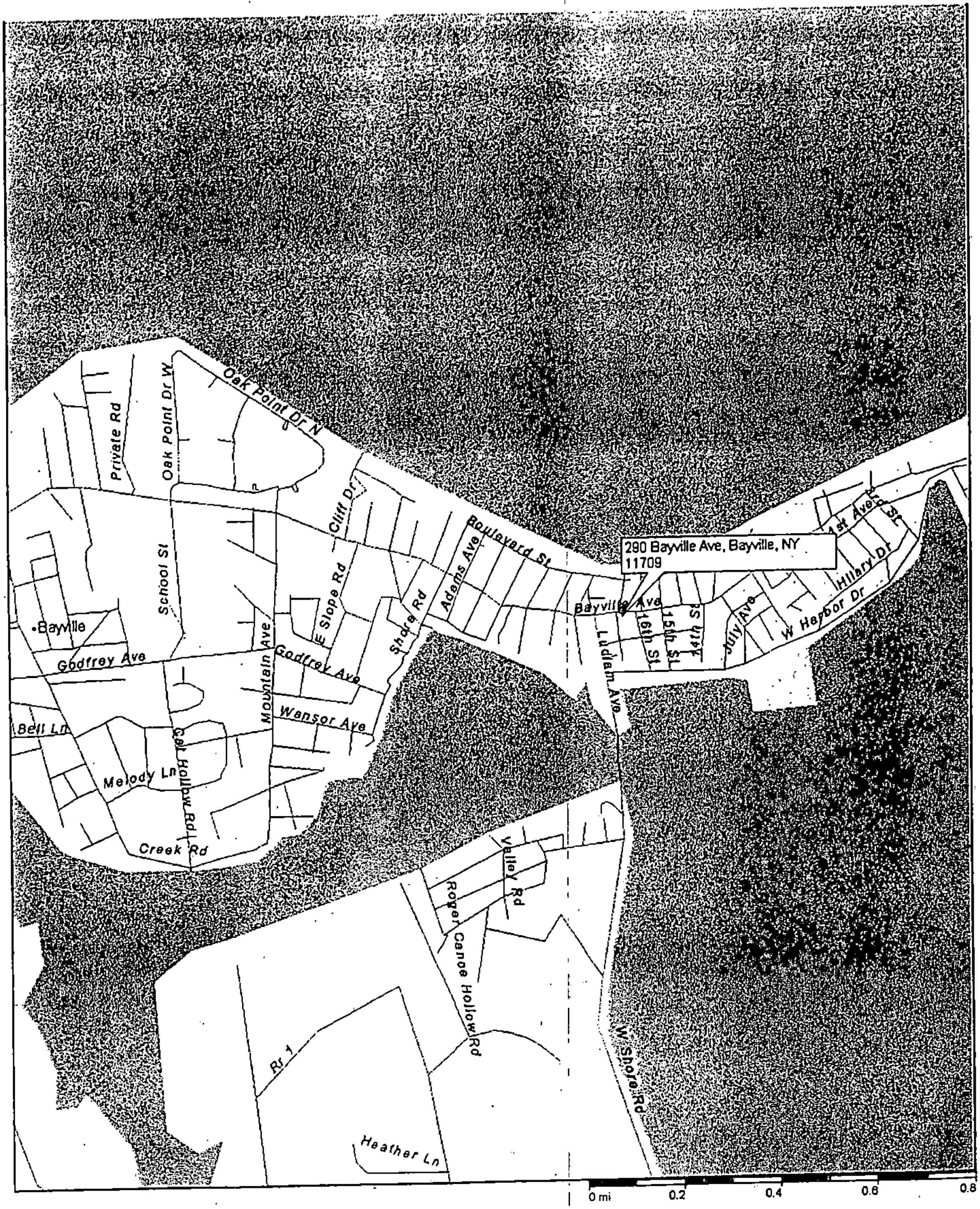
A small parking lot is located west of the building and is covered with asphalt material. Access to the site parking lot is from 17th Street at the western boundary of the property.

The owner/mortgage holder for the subject property is Mr. Thomas Ryan, 19 Todd Drive, Glen Head, New York 11545.

According to Nassau County Land and Tax Map information, the Bayville Village Cleaners property is designated as follows:

| | | |
|---|---|---|
| Section: 28 | Block: 20 | Lot: 58 |

According to Mr. Ryan, the business on the subject site was sold in July 2001 and the dry cleaning business now at that site continued to use PCE in its machines until July 2002. After July 2002 the new owner of the business at the subject site stopped using PCE and is now using a fluorocarbon dry cleaning machine.



StreetsPlus

Figure 2
*Location of Bayville Village Cleaners*

Microsoft Streets Plus

Figure 1

*Location of Bayville Village Cleaners*

### 2.2 Background Information

This section contains site geology information and a summary of previous site investigations.

#### 2.2.1 Geology

The geology of the Bayville Village Cleaners property is generally defined to a depth of 18-feet below grade surface (bgs). In February 2000, a well drilling company, Fenley & Nicol, Environmental Inc., Deer Park, New York, installed four groundwater monitoring wells at the site. Fenley & Nicol installed the monitoring wells under the direction of AEL.

The lithologic description of the soils on-site is derived from the field observations of the drill cuttings as Monitoring Well 1 (MW-1) was installed is as follows:

| Depth Below Grade (ft) | Soils Description |
|---|---|
| 0 to 2 | fine sand, orange color |
| 2 to 4 | fine sand, gray color |
| 4 to 6 | course sand, olive gray color |
| 6 to 8 | medium course sand, light brown color |
| 8 to 10 | course sand, olive gray color |
| 10 to 12 | course sand, light brown color |
| 12 to 14 | course sand, light brown color |
| 14 to 16 | course sand, color yellow |
| 16 to 18 | course sand, color yellow |

Groundwater at the Bayville Village Cleaners property has been measured at approximately 7 to 8-feet bgs. However, it is likely that the groundwater on the property is influenced by the tidal fluctuations of the Long Island Sound and Oyster Bay Harbor.

#### 2.2.2 Previous Investigations

The following is a brief chronological summary that reflects some of the events that have occurred at or near the Bayville Village Cleaners property:

1995 Nassau County Department of Health (NCDH) performed an on-site soil investigation to determine if the dry cleaning compound tetrachloroethene (PCE) had been improperly discharged. NCDH laboratory results for samples collected from the flower beds adjacent to the site building at 0 to 4-feet bgs indicated the presence of PCE in concentrations ranging from 36,000,000 parts per billion (ppb) at the surface to 24,000 ppb at 4-feet bgs. The concentration of PCE in a nearby off-site storm drain at the northwest corner of the property was 880,000 ppb.

1996 Soils and groundwater investigation by P.W. Grosser Consulting Engineer and Hydrogeologist (PWGC), Bohemia, New York indicated that the soils in the vicinity of the vacuum unit discharge pipe needed remediation because of the presence of PCE concentrations in excess of NYSDEC soil cleanup objectives.

Remedial activities consisted of the removal of PCE contaminated soils beneath the site. PCE impacted surface soils were removed by excavation and confirmed by the collection of 17 end-point samples. The laboratory analysis of the 17 samples all indicated that the remaining PCE concentrations were below the NYSDEC soil cleanup objectives.

A sediment investigation of the on-site sanitary leaching pool indicated that the detected PCE concentration in the bottom sample was below the NYSDEC guidance value and no cleanout activity was performed.

An investigation of the off-site storm drain at the northwest corner of the site determined that the bottom sediment contained PCE concentrations at 880,000 ppb. Subsequently, the storm drain was cleaned out by NCDH.

2000 In February 2000, in accordance with VCP-W1-0848-9903, AEL installed four groundwater monitoring wells on-site (Figure 4).

During March 2000, AEL collected groundwater samples from the four monitoring wells. The laboratory detected the following concentrations of PCE in the collected samples:

| | |
|---|---|
| MW-1 | 17 ug/L |
| MW-2 | not detected |
| MW-3 | 19 ug/L |
| MW-4 | 22 ug/L |

During May 2000, AEL collected groundwater samples from the four monitoring wells. The laboratory detected the following concentrations of PCE in the collected samples:

| | |
|---|---|
| MW-1 | not detected |
| MW-2 | 19 ug/L |
| MW-3 | 81 ug/L |
| MW-4 | 79 ug/L |

2002 On October 31, 2002, AEL collected groundwater samples from the four on-site monitoring wells. The laboratory detected the following concentrations of PCE in the collected samples:

| | |
|---|---|
| MW-1 | 43 ug/L |
| MW-2 | 5600 ug/L |
| MW-3 | 210 ug/L |
| MW-4 | 1300 ug/L |

## 3.0 Scope of the Proposed On-Site Investigation and Remediation Work Plan

In accordance with Voluntary Cleanup Agreement (VCA), Index No. W1-0848-9903, the volunteer is required to submit a site remediation work plan to NYSDEC for approval. The work plan described herein is submitted to comply with the VCA.

The laboratory analysis of the most recent groundwater samples collected from the on-site monitoring wells in October 2002 indicates a significant increase in concentrations of PCE in the collected samples. This increase in PCE groundwater contamination may be caused by a point source not previously detected and cleaned out, or a new discharge to the soil subsequent to the soil excavation in 1996.

Based on that opinion, AEL proposes to conduct a soil and groundwater investigation prior to finalizing the design of a remediation system that will include soil vapor extraction and air sparging methods. The soil vapor extraction subsystem (SVES) and the air sparging (AS) subsystem will be designed to operate together to remediate both the on-site groundwater and the contaminated soil that may be causing the increase in PCE groundwater contamination.

## 3.1 Approach and Objectives

The initial activity described in this Work Plan is a soil gas survey that will be performed along the entire property boundary to determine whether there are potential impacts to residential or commercial properties that border the site (Figure 4). A soil gas sample will also be collected below the slab floor of the on-site building. Although the on-site facility no longer uses tetrachloroethene (PCE) in its cleaning process, there is a possibility that vapor intrusion from contaminated soil gas below the slab could impact indoor air quality.

The site measures approximately 100-feet in the north/south direction along 17th Street and 50-feet in the east/west direction along Bayville Avenue. Temporary soil gas sampling points will be installed at approximately 25-feet apart along the perimeter of the subject property. These will be installed using a Geoprobe unit and will include a temporary sampling point at each corner of the site. Additional soil gas sampling procedures are detailed in Section 5.2.1.

Once the soil gas survey is completed the next activity described in this Work Plan will focus on determining if a new source of contamination is present in the soils located adjacent to the western side of the on-site building. A hand operated Geoprobe sampling device will be used install borings at eight locations along the western side of the on-site building (Figure 5). At

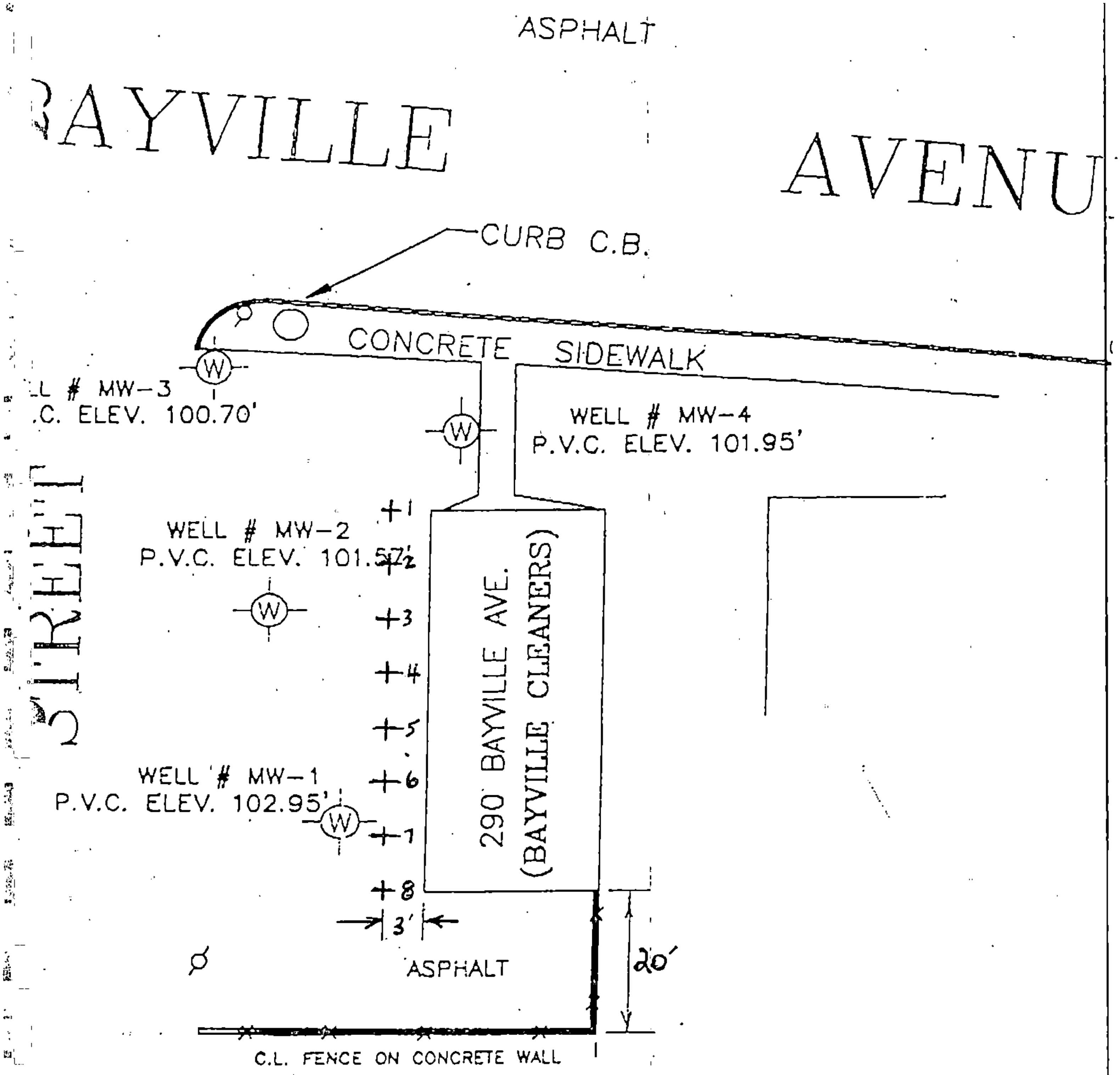


**Figure 5**

Proposed Soil Boring Locations
at
Bayville Village Cleaners

each boring soil samples will be collected from 0 to 2-feet, 2 to 4-feet, 4 to 6-feet, and 6 to 8-feet below grade surface (bgs). A photoionization detector instrument (PID) will be used to field screen each collected sample. The PID measures the concentration of total volatile organic compounds (VOCs) present in a collected sample. Based on PID measurements, selected samples will be delivered to a State certified laboratory where they will be analyzed for concentrations of VOCs using EPA Method 8260. AEL believes that the extent of any new soil contamination can be defined by the aforementioned methodology. In addition, a sediment sample will be collected from the on-site sanitary leaching chamber located south of the on-site building. Additional soil/sediment sampling procedures are detailed in Section 5.2.3.

To define the horizontal and vertical extent of the on-site groundwater contamination plume, a vehicle-mounted Geoprobe unit will be used to install borings and collect groundwater samples deep into the saturated zone. As a minimum, deep groundwater samples will be collected in the vicinity of all four on-site monitoring wells. Groundwater samples will be collected at each Geoprobe boring at 25-feet, and 50-feet bgs. The collected groundwater samples will be delivered to a State certified laboratory where they will be analyzed for concentrations of VOCs using EPA Method 8260 with Category B deliverables. The detection limits for this method must be capable of meeting NYS Drinking Water Standards. Additional groundwater sampling procedures are detailed in Section 5.2.2.

In addition to the groundwater sampling described above, deeper groundwater samples will be collected at the site in order to determine the deeper groundwater quality. Groundwater samples will be collected adjacent to MW-1 and downgradient of MW-2 using the Geoprobe sampling method. These samples will be collected at 25-feet and 50-feet below the water table and analyzed for concentrations of VOCs by a NYSDOH ELAP certified laboratory using EPA Method 8260 with Category B deliverables. Detection limits will be capable of meeting NYS groundwater standards.

Therefore, one Geoprobe boring will be installed in the vicinity of each of the four on-site monitoring wells. The borings in the vicinity of MW-1 and MW-2 will be located downgradient of these wells. Groundwater samples from the borings at MW-1 and MW-2 will be collected at 25-feet bgs, 50-feet bgs and approximately 33-feet bgs and 58-feet bgs since the depth to the water table is nominally 8-feet bgs. Groundwater samples from the remaining two borings in the vicinity of MW-3 and MW-4 will be collected at 25-feet and 50-feet bgs. A total of 12 groundwater samples will be collected from the four Geoprobe borings.

The groundwater sample at each boring will be collected using clean dedicated polyvinyl chloride (PVC) tubing for each sample. The PVC tubing will be equipped with a clean check valve and the tubing will be rapidly moved up and down as the groundwater is made to fill the tubing. Once clear groundwater flows from the tubing at the surface, a sample will be collected in a glass 40-milliliter vial that will then be delivered to the State certified laboratory.

When available, the laboratory analytical results will be used to establish a horizontal and vertical profile of the groundwater contamination plume.

To support the calculations required to determine the direction of groundwater flow at the subject site, depth to groundwater measurements will be measured and recorded at each of the surveyed monitoring wells. These measurements will be performed before purging the wells in preparation for collecting groundwater samples.

Based on the findings of the soil and groundwater investigation, AEL can design a remediation system to cleanup the on-site contamination.

### 3.2 Land Survey

The surface elevations of the four on-site monitoring wells were determined by Welsh Engineering and Land Surveying, P.C., Pleasantville, New York, a State certified land surveying and professional engineering firm. All elevations were measured within one-hundredth of a foot. During this survey, the building and other major land features were surveyed with their locations identified on the survey. The survey drawing was prepared using a scale of one-inch equals twenty feet. A copy of the survey is included in this report (Figure 4).

A new site diagram that will include adjacent properties, their uses, local roads, businesses, etc. will be prepared by Welsh Engineering.

### 3.3 Laboratory Analysis

All soil and groundwater samples and quality control blanks collected will be kept in an ice-filled cooler and delivered to a New York State certified laboratory.

Groundwater samples will be analyzed for concentrations of VOCs using EPA Method 8260 with Category B deliverables. The detection limits for this method must be capable of meeting NYS Drinking Water Standards.

The selected soil samples from each boring location will also be analyzed for concentrations of VOCs using EPA Method 8260. The information collected from the laboratory results and field screening will be used to determine the extent of soil contamination on-site and the groundwater quality beneath the site.

### 3.4 Deliverables

The following reports will be prepared using the data gathered during the above described soil and groundwater sampling investigation.

#### 3.4.1 Site History Report

The historical uses of the site will be described identifying building modifications, if any, and site changes. The operations on-site will be described. Previous environmental investigations will be summarized. The current status of the facility's dry cleaning operations will be described. The site history will be part of the Soil and Groundwater Investigation Report

### 3.4.2 Soil and Groundwater Investigation Report

This report will be submitted to NYSDEC within 30-days of AEL receiving the laboratory analytical results.

## 3.5 Pilot Testing Program

AEL plans to conduct pilot tests to determine the radius of influence (ROI) for the remediation system that we anticipate will be used to cleanup the on-site soil and groundwater contamination. Several piezometers will be installed at specific locations and depths below grade that can be used to measure ROI.

## 3.6 Operation, Maintenance and Monitoring Schedule

This schedule will be developed after the soil and groundwater investigation is completed and a remediation system has been designed.

## 4.0 Project Management

This section of the Work Plan describes the key milestones to monitor the progress of the soil and groundwater investigation, and identifies the personnel that will be supporting the investigation.

## 4.1 Project Schedule and Key Milestones

Key Milestones are identified to monitor work progress. Specific milestones for completion of tasks and subtasks are established throughout the project schedule in a manner to ensure timely completion of work. The following list of milestones is proposed for this project:

| Milestone | Description | Expected Start Date |
|---|---|---|
| 1 | Soil Gas Survey | 15-days after Work Plan approval |
| 2 | Groundwater Investigation | 15-days after Work Plan approval |
| 3 | Soil Investigation | 15-days after NYSDEC and NYSDOH Soil Gas Survey review/comment |
| 4 | Soil and Groundwater Investigation Report | 30-days after Soil Investigation is completed |

## 4.2 Project Management, Organization and Key Technical Personnel

AEL will be the prime consultant responsible for the Work Plan. Subcontractors will provide assistance in performing tasks identified in the work plan. The key AEL technical personnel will be:

| | |
|---|---|
| Project Manager | Mathew Schieferstein |
| QA/QC Officer | Fritzi Gros-Daillon |
| Professional Engineer | John V. Soderberg, P.E. |

| | |
|---|---|
| Land Surveyor | William Welsh, P.E., L.S. |

Fritzi Gros-Daillon will act as the Quality Assurance Manager and will be responsible to ensure that the data collected is precise and valid. The QA Manager will make unannounced field visits to observe data collection procedures.

The New York State licensed professional engineer on this project will be John V. Soderberg, P.E., License Number 49975.

The resumes of Mathew Schieferstein and Fritzi Gros-Daillon are presented in Appendix 1.

## 5.0 Field Operations and Investigation Plan

This section contains the Site Management Plan and the Field Activity Plan.

### 5.1 Site Management Plan

This section contains site access information and names the potential contractors that will perform work to support the Work Plan activities.

#### 5.1.1 Site Access and Security

The main access to the Bayville Village Cleaners building is from Bayville Avenue. Access to the on-site parking area is from 17th Street. Access authorization for the NYSDEC will be granted following proper notification to AEL and/or Bayville Village Cleaners.

#### 5.1.2 Organization and Responsibilities

For the purpose of undertaking technical aspects of this Work Plan, the following firms will assist in project implementation. Prior to commencing fieldwork and upon request, the qualifications of the subcontractors will be submitted to the NYSDEC for review and approval. These include:

- Anson Environmental Ltd. – AEL will be the environmental consultants with prime responsibility for completion of the Work Plan.
- H2M Laboratories, Melville, New York
- Geoprobe Services – Zebra Environmental (or other approved subcontractor)
- Drilling Services – Fenley & Nicol, Deer Park, New York (or other approved subcontractor)

#### 5.1.3 Utility Mark Out for Subsurface Investigation

After the locations for the proposed boring penetrations have been finalized, the necessary clearances for access, work, and utility mark outs will be obtained. Access and clearances to public property will be obtained by AEL. Access and clearances for private property will be obtained by the NYSDEC. Once these proposed locations have been cleared for access, a utility mark out will be conducted.

## 5.2 Field Activity Plan

The following is a description of the field activities to be conducted at the Bayville Village Cleaners site. The NYSDEC may choose to collect split soil and/or groundwater samples. Detailed descriptions of the sampling procedures are included in the Quality Assurance/Quality Control Plan (Section 6.0)

### 5.2.1 Soil Gas Sampling Plan

The site measures approximately 100-feet in the north/south direction along 17th Street and 50-feet in the east/west direction along Bayville Avenue. Temporary soil gas sampling points will be installed at approximately 25-feet apart along the perimeter of the subject property. These will be installed using a Geoprobe unit and will include a temporary sampling point at each corner of the site. The depth to groundwater at the subject property is approximately 8-feet below grade surface.

Individual soil gas samples will be collected using information and techniques that are presented in the New York State Department of Health (NYSDOH) draft document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" and dated February 2005.

Using a vehicle mounted Geoprobe unit, a soil boring will be installed at the desired soil gas sampling location. The Geoprobe unit will be positioned over the sampling location and a clean drive point adapter with a new expendable point will be driven to the desired depth. Since the sampling equipment will be used to collect multiple soil gas samples, the drive point adapters and stainless steel tubing connectors will be cleaned with Alconox and double rinsed before and between each use.

After the drive point reaches the desired depth below grade (DBG), the probe rod will be retracted approximately 3-4-inches to create a void that allows for the migration of the soil gas sample into the bottom of the drive point adaptor. After the retraction of the probe rod, a dense mixture of water and bentonite pellets/chips will be placed around the probe rods on the ground surface forming a cone to seal the probe/ground interface and prevent ambient air intrusion during sampling and purging. AEL will then place a sheet of plastic over the probe rods and seal the edges using bentonite and native soils/sand. A plastic bucket will then be placed upside down over the probe rods with a soft gasket seal placed around the open edge of the bucket. The soft seal will be formed using the aforementioned dense water and bentonite sealing technique. A tube installed through the side of the bucket will be used to introduce helium (inert tracer gas) into the immediate vicinity of the area where the probe intersects the ground surface. A second tube installed at the upended bottom of the bucket and will be connected to the purge pump. The tube holes in the bucket will be sealed with duct tape/silicon.

Next, a clean unused piece of one-quarter inch polyethylene tubing will be attached to a stainless steel adaptor. The tubing will then inserted into the probe rod and extended to the bottom of the probe rod. Using a counter-clockwise circular motion, the tubing will be threaded onto the drive point adaptor and tightened to compress the "O" ring seal (Appendix 2).

After connecting the polyethylene tubing to the "down-hole" drive point adaptor, the helium tracer gas will be released into the bucket enclosure. The tubing will then be purged at a flow rate of 0.1 and 0.2 liters per minute, purging approximately one liter of soil gas/vapor through the tubing using a vacuum/volume system mounted on the Geoprobe vehicle. To confirm the probe rod seal purged air will be screened in the field for the helium tracer gas with a field detection meter. If the meter detects a helium level greater than 20 percent, the ground/rod seal will be reworked and improved and the system will be retested. Once the seal is judged satisfactory, a purged air sample will be screened in the field for concentrations of VOCs using a ppbRAE® photoionization detector (PID) monitor. The ppbRAE® PID is capable of detecting VOCs in the parts per billion (ppb) range. If the PID readings warrant laboratory analysis, a sample will be collected in an individual Summa canister.

After field screening with the PID, the tubing connected to the drive point adaptor will then be disconnected from the vacuum system and attached directly to a regulator and Summa canister with a flow rate of 0.1 to 0.2 liters per minute. Upon collection of the soil gas sample the Summa canister will be disconnected from the regulator and subsequently delivered to Severn Trent Laboratories, Inc., Great Neck, New York, where it will be analyzed for concentrations of trichloroethene and other compounds using EPA Method TO-15.

Using the aforementioned technique, a field blank sample of ambient air will also be collected.

In an area where the PID detects high concentrations of VOCs, AEL will also collect a soil sample. This sample will be collected immediately next to the soil gas sample location with the high PID reading. A Geoprobe macrocore sampler will be driven to the desired depth and a soil sample will be collected. The soil sample will be placed into pre-cleaned laboratory glassware and delivered to a New York State certified laboratory were the sample will be analyzed for concentrations of volatile organic compounds (VOCs) using EPA Method 8260.

Concurrent with the collection of soil gas samples, groundwater samples will be collected from the four on-site monitoring wells.

### 5.2.2 Groundwater Sampling Plan

Concurrent with the soil gas sampling activity, groundwater sampling of the four monitoring wells (MW-1, MW-2, MW-3 and MW-4) will be conducted. In addition, as a minimum, borings will be installed on-site using a vehicle-mounted Geoprobe at locations adjacent to the four monitoring wells and groundwater samples will be collected at up to 58-feet bgs as described in Section 3.1.

The basic sampling protocol follows:

- At the laboratory, a trip blank will be placed with the sampling glassware and will remain with each cooler until it arrives at the laboratory, where it will be analyzed.
- Protective tarp will be placed around the groundwater monitoring well location. The monitoring well will be opened and the depth to water measured. The monitoring well

will be purged of three to five volumes of standing water using a Redi-Flo variable pump or comparable submersible pump.
- The groundwater samples will be collected using dedicated polyethylene bailers. The groundwater will be put into laboratory-cleaned 40-milliliter glass vials. The labels on the vials will be completed and the vials will be placed in a cooler on ice.
- Collecting de-ionized water, which is poured through the decontaminated field tools, will be the field blank for each day of sampling.

### 5.2.3 Soil and Sediment Sampling Plan

After NYSDEC and NYSDOH evaluate the soil gas samples analytical results, soil samples will be collected from eight borings located along the western side of the Bayville Village Cleaners building. In addition, standing water and sediment samples will be collected from the on-site sanitary system leaching pool. The depth of the soil and sediment samples will be collected at depths not to exceed the groundwater interface (approximately 8-feet bgs). The collected samples will be delivered to a NYSDOH ELAP certified laboratory where they will be analyzed for concentrations of VOCs using EPA Method 8260 with Category B deliverables.

The basic soil and sediment sampling protocol follows:
- At the laboratory, a trip blank will be placed with the sampling glassware and will remain with each cooler until it arrives at the laboratory, where it will be analyzed.
- Protective tarp will be placed around the boring location. The boring will be installed using a hand operated Geoprobe sampler that will be advanced no greater than the groundwater interface
- The soil samples will be collected using dedicated acrylic sampling tube inside the sampling probe of the Geoprobe device. The soil sample will be put into laboratory-cleaned 2-ounce glass jar. The labels on the glass jars will be completed and the jars and their soil contents will be placed in a cooler on ice.
- Collecting de-ionized water, which is poured through the decontaminated field tools, will be the field blank for each day of sampling.

The standing water sample from the leaching pool will be collected using clean dedicated polyethylene bailer. The collected water sample will be put into laboratory-cleaned 40-milliliter glass vials. The labels on the vials will be completed and the vials will be placed in a cooler on ice.

## 6.0 Quality Assurance/Quality Control Plan

It is the objective of this project to ensure that all measurements be made so that the results are representative, precise, accurate, complete and comparable. Within this section, sampling, decontamination, and field measurement procedures are described which will ensure the QA/QC of all data collected.

The aforementioned objectives apply to laboratory sample analysis as well. To meet these objectives, standard laboratory methods will be applied.

## 6.1 Sampling and Analytical Procedures and Protocol

This phase of the project, as described in the Work Plan, entails the collection of groundwater samples. Groundwater samples will be collected using dedicated polyethylene bailers. A description of the sampling method to be used for the collection of samples is addressed in the following section.

## 6.2 Groundwater Samples

A groundwater samples will be collected semi-annually from the two existing off -site monitoring wells. All groundwater sampling will follow strict USEPA QA/QC protocols. Prior to sampling the wells, a 4-foot by 4-foot plastic sheet will be placed at the foot of each well. This will be the designated work zone for the sampling event. All sampling equipment will be placed on the sheet to minimize the possibility of contaminating sampling equipment from the surrounding surfaces. Upon opening the monitoring well, the PID will be used to screen for total volatile organic contaminants in the ambient atmosphere and in the headspace of the well. Any readings will be recorded and compared to ambient background readings. Ambient air sampling for this project will be performed with a PID calibrated to manufacturer's instructions.

The following procedure will be followed for groundwater sampling:

1. Prior to the purging of the wells for sample collection, a synoptic static water level measured to the nearest 0.01 foot in each monitoring well will be taken.
2. To ensure a representative sample from the monitoring well, purging of the wells is required. The standing water will be purged from the top of the water column. In general, the groundwater standing in the well casing prior to sample collection will be similar in quality to that in the surrounding aquifer or local groundwater, but it may not be representative.
3. A volume of water equal to three to five times the volume of standing water in the well will be purged from the well before taking the sample. If the monitoring well has a low yield, standing water will be evacuated until the well is dry and a sample will be collected upon recovery. Wells with high yield can be sampled immediately after evacuation. A dedicated polyethylene bailer will be used to collect the groundwater sample. Prior to the sampling event, sampling equipment shall be decontaminated. All water removed during the evacuation process shall be placed in clearly labeled 55-gallon drums and stored on site pending analysis.
4. Dedicated, laboratory-cleaned, polyethylene disposable bailers will be attached to dedicated polypropylene rope or nylon line. The sample will be collected from the screen zone. The first bailer volume shall be placed in a pre-cleaned glass jar and used to conduct analytical field tests such as temperature, pH and specific conductivity. The measurements will be recorded in the field book. All field instruments shall be calibrated daily prior to the sampling events. And cleaned between each sampling point.

The groundwater samples shall be collected in laboratory-cleaned containers on the second bail. The first round of groundwater samples will be analyzed for concentrations of VOCs using EPA Method 8260 with Category B deliverables by a NYSDOH ELAP certified laboratory following appropriate protocols for that method. The detection limits for this method must be capable of meeting NYS groundwater standards. The purpose of this analysis is to determine if there are measurable quantities of volatile organic compounds in the groundwater that were used on-site in the past.

One (1) trip and one (1) field blank QA/QC sample will accompany the groundwater sampling per sample day. A trip blank is used in order to determine if outside contamination has been introduced in the course of the transportation of the samples. The trip blank vials are filled in the laboratory using analyte-free distilled/deionized water and will accompany the glassware from the laboratory to the field and back to the laboratory. The field blank vial will be filled during the sampling by adding distilled/deionized water to one of the bailers and then filling the empty field blank vials from the bailer. The blank samples will be analyzed for the same parameters as the groundwater samples.

Field tests will include temperature, pH, salinity, and specific conductivity and will be taken immediately upon collection. The pH probe will be field calibrated with a No. 7 buffer solution. The specific conductivity probe will be calibrated in air to zero. Complete calibration procedures are included in the copies of the instrument instruction manuals in the Appendix 3. A mercury thermometer will be used to measure temperature and will be visibly inspected. The above calibration procedures will be performed each day of groundwater sampling.

The well cap shall be secured and the above process repeated at each groundwater sampling location.

### 6.3 Preparation and Preservation of Sample Containers

Groundwater samples will be placed in a cooler provided with ice packs as soon as they are collected. All samples will be delivered the same day or shipped for overnight delivery. The scope of the project necessitates that 40-milliliter vials and 2-ounce sampling containers be used. The laboratory will provide the sample containers. Each sample container will be provided with a label for sample identification purposes. The amount of information will include identification number, time, date, and initials of sample collector. A full chain-of-custody as outlined by the USEPA will accompany all sample containers.

All sample containers will be thoroughly cleaned by the laboratory prior to sampling. The 40-milliliter vials will contain hydrochloric acid (HCl). The 2-ounce soil sampling jars will be not preserved.

### 6.4 Groundwater Level Monitoring

Groundwater levels will be obtained from the four existing monitoring wells. Water levels will be taken using an electronic water level indicator. The depth to water will be measure to the nearest 0.01 foot and referenced to the top of the well casing. After use in each monitoring well, the measuring device will be cleaned to prevent cross contamination between wells. A licensed land surveyor will survey the well casings in order to determine the direction of groundwater flow.

## 6.5 Field Sampling Quality Assurance

### 6.5.1 Field QA/QC

Blanks will be used to verify the quality of the field sampling results. A field blank will be used to determine the effectiveness of the decontamination of the sampling devices (i.e. bailers and split spoon samplers). Analyte free water will be poured into the device and then transferred to sample containers before use in sampling. Dedicated disposable polyethylene bailers will be used; however, these equipment blanks will be used to ensure that the manufacturer does not introduce contamination.

### 6.5.2 Field Records

All information pertinent to any field activities will be recorded in bound, waterproof field books. Duplicates of all notes will be prepared and kept in a ringed binder. The binder will be stored in a secure place in the office of AEL. Proper documentation will consist of field personnel maintaining records of work accomplished including the items listed below:

- Date and time of work events
- Weather
- Purpose of work
- Description of methods
- Description of samples
- Number and size of samples
- Description of sampling
- Date and time of collection of sample
- Sample collector's name
- Field observations
- Any field measurements with portable instruments

Each sample collected in the field will be labeled using waterproof ink. Each bottle will be labeled with a number or location, parameter to be analyzed, sampling time and date.

Data obtained from borings shall be recorded in the field notebook and shall include the following:

- name, location and job number
- date of boring
- boring number
- surface elevation (if available)
- sample number and depth
- method of advancing sampler, penetration and recovery lengths
- type and size of sampler
- PID reading during field screening
- description of soil

- thickness of layer
- depth to water
- type of equipment used
- size of casing, depth to well
- blow counts

## 6.6 Decontamination of Field Equipment

Proper decontamination protocols will be followed during field activities in order to minimize the possibility of introducing contaminants into non-contaminated areas of the site and to ensure that samples and data collected are representative of the actual conditions.

### 6.6.1 Equipment Requiring Decontamination

The field equipment and sampling devices that require decontamination include:

1. Drilling Equipment-paying particular attention to down-hole tools, back of the drilling rig and drilling rod racks.
2. Sampling Equipment-split spoons, trowels, pumps and hoses, stainless steel bailers, temporary well screen and casing, water level measuring device, etc.
3. Personnel Protective Equipment-respiratory protection and protective clothing.

### 6.6.2 Decontamination Procedures

The water level meter, sampling rods and miscellaneous tools will be decontaminated according to the following procedure:

- non-phosphate detergent and tap water wash
- tap water rinse
- distilled/deionized water rinse
- total air dry

Field decontamination for drilling equipment, split spoons, temporary well screening and casing, and other sampling equipment will consist of steam cleaning and/or manual scrubbing to remove foreign material and steam cleaning inside and out. These items will then be stored in such a manner as to preserve their clean condition.

Field decontamination for pumps and hoses shall consist of manual scrubbing to remove foreign materials followed by a non-phosphate detergent scrub and flushing.

Field personnel protective equipment decontamination procedures shall consist of the minimum decontamination stations outlined in the Health and Safety Plan prepared for this project. The contractor will prepare a decontamination station whose perimeter is diked to prevent ground contamination from wash waters running out of the area. All drilling equipment shall be decontaminated in this zone. Wash waters from equipment requiring decontamination will be contained and stored in 55-gallon drums pending laboratory analyses.

## 6.7 Sample Custody

The purpose of sample custody procedures is to document the history of sample containers and samples from the time of preparation of sample containers through sample collection and analysis. To maintain and document sample possession, chain of custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection and identification in the field.

A sample is in custody if it is in:

1. your actual possession; or,
2. your view, after being in your physical possession; or,
3. your physical possession and then you locked it up or sealed it to prevent tampering; or,
4. a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain of custody procedures. A discussion of the various stages of sample custody, transfer of custody and laboratory custody is presented below.

## 6.8 Environmental Sample Chain of Custody

The field sampler initiates the chain of custody procedure in the field and is the first to sign the form upon collection of samples.

The field sampler is personally responsible for the care and custody of the samples until they are transferred and properly dispatched. Sample labels shall be completed for each sample using waterproof ink and packaged to preclude breakage during shipment. Every sample shall be assigned a unique identification number that is entered on the chain of custody form. Samples can be grouped for shipment using a single form.

The record shall be completed in the field so as to indicate; project number, unique sample number, sample location, sampling date and time, person obtaining the sample and method of sample preservation. The paperwork will be done and checked at an on-site location.

## 6.9 Transfer of Custody

A chain of custody record will accompany all samples. When transferring possession of samples, the individuals relinquishing and receiving will sign, date and note the time of the transfer. This record documents transfer of custody of samples whether from the sampler to another person or mobile laboratory or to a permanent laboratory.

Whenever samples are split with a facility or government agency, a separate chain of custody record will be prepared for those samples and marked to indication with which the samples were split.

## 6.10 Laboratory Custody Procedures

The laboratory utilized will follow a minimum standard operating procedure for documenting receipt, tracking and sample preparation. A full explanation of laboratory procedures is included in the laboratory documentation in Appendix 4. Sample custody is described briefly in Section 6.10.1.

### 6.10.1 Sample Custody

1. Shipping or Pickup of Cooler by Client
   a. Cooler packed at lab after contact with client.
   b. Cooler wrapped with evidence tape.
   c. Chain of custody forms filled out by lab personnel.
   d. Client supplied with evidence tape to seal cooler prior to shipment back to laboratory.

2. Delivery of Cooler to Lab
   a. Samplers check for external damage (such as leaking).
   b. Lab signs for cooler from shipper.

3. Cooler Delivery to Sample Custodian
   a. Samplers place cooler in air lock to special process lab.
   b. Sample custodian or assistant removes cooler.

4. Opening of Cooler
   a. Check condition of external seal.
   b. Open cooler.
   c. Remove chain of custody forms, fill out and sign.
   d. Check to see if any samples are broken or damaged. If the samples are broken, note manner of disposal and contact client immediately.

5. Report Sent to Client
   a. Traveler's Way Bill
   b. Final Report
   c. Log-out Sheet

6. Final Steps
   a. Raw data stored on file.

### 6.10.2 Sample Storage

Samples will be maintained in storage in the GC/MS laboratory in a locked refrigerator prior to sample preparation and analysis. The storage refrigerators will be maintained at 4 degrees Celsius. The samples will be stored no longer than the required holding time before analysis. It is the responsibility of the laboratory to properly dispose of samples beyond the holding period.

## 6.11 Field Notebook Chain of Custody

Dedicated field notebooks will be used for the duration of the project. These will be numbered and assigned to field personnel. A log of the notebook number, the personnel assigned to the notebook and the date and time signed out and signed in will be the responsibility of the field hydrogeologist. Sufficient number of notebooks will be provided.

All field notes during drilling data will be copied and stored in a ringed binder. Sample chain of custody forms will also be retained in the binder.

## 6.12 Calibration Procedures and Frequency

The in-field analytical instruments to be used in the site investigation include:

- Photoionization Air Monitor (PID)
- pH meter
- Specific conductivity meter
- Depth to water measuring tape.

The instruments will be calibrated in compliance with manufacturer's recommended schedule.

## 6.13 Documentation, Data Reduction, Validation and Reporting

### 6.13.1 Field and Technical Documentation

All information pertinent to any field activities will be recorded in bound, field books. Duplicates of all notes will be prepared each night and kept in a ring binder, at the AEL office. Proper documentation will consist of all field personnel maintaining detailed records of all work accomplished including:

1. date and time of work events
2. purpose of work
3. names and address of people relevant to the project
4. description of all methods
5. description of all samples
6. number and size of samples
7. description of sampling point
8. date and time of collection of sample
9. sample collector's name
10. reference to sit map and/or photographs
11. field observations
12. any field measurements with portable instruments

### 6.13.2 Field and Technical Reporting

During the performance of the project, field and technical data will be assembled and will be made available to those individuals who need the data. Data reported will be as follows:

1. data collected by the field manager

2. data will be reduced by the field manager
3. data will then by reviewed by the project manager

After the data in the field books are checked, the data will be reduced to tabular form and entered into data files. Objective data such as water table measurements will be compiled on a spreadsheet. Subjective data such as boring logs will be included as hard copies.

### 6.13.3 Field and Technical Data Validation

The two levels upon which the field and technical data will be validated will be:

- Validated at the time of collection
- After data reduction into tables and charts

Inconsistencies will be resolved by reviewing the original data or by discussing the inconsistencies with the field personnel or laboratory performing the analysis.

Where possible, peer review will be used to maximize consistency among field personnel.

## 6.14 Laboratory Data

### 6.14.1 Laboratory Data Documentation

A complete description of the H2M Laboratories standard operating procedures is presented in Appendix 4.

### 6.14.2 Laboratory Data Reporting

Applicable data presentation and all laboratory reports will conform to full reporting standards including:

1. Laboratory data will be reviewed and approved by laboratory manager.
2. Data presentation will include:
    - Sample identification numbers used by laboratory,
    - Chemical parameters analyzed, report values, and units of measurement,
    - Detection limits,
    - Data for chemical parameters,
    - Results of QA sample analysis, and
    - Footnotes if required.

### 6.14.3 Laboratory Data Validation

Data validation procedures performed internally by H2M Laboratories is based upon the following document as reference:

Technical Directive Document No. HQ-8410-01,
"Functional Guidelines for Evaluation of Organic Analysis".

In addition, L.A.B. Validation Corp., East Northport, New York will perform third party validation.

## 7.0 Health and Safety Plan

Described below are Anson Environmental Ltd.'s (AEL) project health and safety requirements, responsibilities, and procedures to protect workers during the Work Plan activities for the Bayville Village Cleaners site located in Bayville, Nassau County, New York.

### 7.1 Requirements

The requirements for worker health and safety area based on the following:

- The Standard Operating Safety, U.S. Environmental Protection Agency (EPA), Office of Emergency and Remedial Response.
- The Occupational Safety and Health Administration (OSHA) Regulations, 29 CFR Parts 1910.120 and 1992.
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG and EPA.
- Superfund Amendments Reauthorization Act (SARA), Title I, Section 126.

### 7.2 Applicability

The protection of AEL's workers' and subcontractors' health and safety and the environment are major concerns during the Work Plan activities at the Bayville Village Cleaners site. Personnel must be protected from the risk of incurring illness or injury during the field investigation at the site. Since each and every safety hazard associated with the site cannot be anticipated, precautions will be taken to prevent illness or injury to workers during the project. Based on these considerations, this health and safety plan will be applicable for each phase of the investigation/remediation activities at the site as described in this Work Plan. The implementation of this plan will be based on the judgment of the Project Manager as described in the Work Plan.

### 7.3 Site Specific Information

The Bayville Village Cleaners site is a commercial building located in Bayville, New York. The principal areas of concern are remediation of on-site soil contamination and on-site groundwater monitoring.

### 7.4 Hazardous Characterization/Identification

The primary concern at the site is to protect the workers from contaminated subsurface soils and groundwater beneath the site. During this portion of the investigation, exposure to a potential source of contamination is limited. Ambient air monitoring will be performed during any soil disturbance procedures (soil borings) and any field operations that warrant it. The health and safety officer and/or field project manager will discuss the chemical exposure concerns for the site with all field personnel at the beginning of each workday.

Each day that field work is to be performed, AEL personnel and subcontractors will be made aware of the chemical compounds that may be present on site. The health and safety symptoms of exposure to those chemical compounds will be discussed. Workers on site the previous day will be interviewed to see if they experience any of the symptoms of exposure.

### 7.5 Potential Exposures

Potential exposure during the Work Plan activities will be considered on a daily basis during the investigation. Therefore, disposable gloves will be worn during any contact with any medium being sampled on the property.

### 7.5.1 Level of Protection

Level of protection during the field investigations will be Level D and will be upgraded, if conditions require.

### 7.5.2 Site Personnel

The project will require the interaction of government agencies (NYSDEC), contractors, site facility operators and technical specialists. The project team will be composed of AEL and various subcontractors. The Health and Safety Plan will be implemented during all field operations performed on the property. The Field Operations Manager will be responsible for implementing safety precautions during all field activities/sampling phases.

### 7.5.3 General Work Practices

The following general health and safety requirement will apply to all persons working at the site:

1. All personnel working on the site investigation team shall read the Health and Safety Plan. A copy of the Acknowledgement Form is provided at the last page of this work plan.
2. No employee will be allowed in the active field investigation areas without the prior knowledge of the field project manager.
3. All personnel involved in the investigation at the site will notify the field operations manager of any unsafe conditions or activities.
4. Standard hygiene practices will be implemented such as no smoking, eating or drinking during site investigative work activities and requires a thorough washing of hands and face prior to smoking, eating or drinking. At all times, personnel should perform investigative activities from upwind directions.
5. Workers will avoid unnecessary contamination such as walking through, sitting on, leaning on, or kneeling in areas that are known or suspected to be hazardous.

6. All site personnel shall observe their partners for any signs of adverse effects associated with the work activity and will inform their partner or supervisor of any unusual signs or symptoms that they are experiencing themselves.

### 7.6 Orientation and Training

Each member of the field investigation team has completed the 40-hour training course required by the Occupational Safety and Health Administration for personnel working at hazardous waste sites. Each field team member is trained and experienced in the standard field sampling techniques and procedures to be utilized in this project.

Each person who may be required to use respiratory protection has been medically approved, trained and fit tested with a NIOSH approved respirator appropriate for the conditions likely to be encountered. In addition; each field team member participated in an orientation session prior to commencing work at the site. The orientation will include the following:

- Project goals and objectives
- Overview of the Health and Safety Plan
- Health and safety requirements and procedures
- Chemicals contaminating the site and their properties
- Potential health and safety hazards
- Safe sampling procedures
- First aid and emergency procedures
- Use of respiratory protection and respirator fit testing
- Use of protective clothing
- Decontamination procedures
- Waste disposal procedures

### 7.7 Monitoring Equipment

The principal forms of chemical contamination at the site are known and are generally low hazard levels if appropriate precautionary measures are used. However, routine monitoring for health and safety purposes will be performed during all site Work Plan activities.

Monitoring equipment will be operated, maintained and calibrated each working day in accordance with the manufacturer's instructions and AEL's quality assurance procedures. Organic vapor monitoring will be conducted during field activities. Should contaminant levels indicate high hazard potential, operations will be discontinued until situation is evaluated.

Organic vapor monitoring will be performed as outlined in the NYSDOH Community Air Monitoring Plan. If TOV levels exceed 5 parts per million (ppm) above established pre-work background levels, work activities will be halted and monitoring will continue under the provision of the Vapor Emission Response Plan.

### 7.8 Injuries

Injured or over-exposed person will be removed from the area immediately. Where applicable, first aid will be administered and/or emergency rescue team called. Depending on the nature of the injury/emergency, appropriate notifications will be made.

### 7.9 Levels of Protection

Four protection levels (A, B, C and D) will be used as benchmarks for selection of personal protection equipment.

Level A requires the highest degree of protection including fully encapsulating, chemical resistant suit with full face piece, SCBA or supplied air respirator. No situations are anticipated in this investigation that would require this level of protection.

Level B protection requires full chemical resistant clothing with a full-face piece SCBA or supplied air respirator. No levels of VOCs or toxic chemical expected at this site that would require this level of protection. However, provisions will be made to have this equipment available should its use to be determined to be required. Investigative activities that may result in this level of projection being required will not be implemented until the equipment has been transported to the site. Implementation of level B protection shall only be performed when sufficient trained personnel (minimum of two) are available.

Level C protection requires full-face piece, air purifying cartridge-equipped respirator (or a half-face, air purifying cartridge-equipped respirator if specifically approved), and protective coveralls, (Tyvek or full chemical resistant clothing or other protective clothing if specifically approved). Level of contaminants in the study area is not expected to require this level of protection. Activities that significantly disturb the soil or generate dust will be closely monitored to determine if upgrading to this level of protection is appropriate. Sampling and handling of highly contaminated waste or soils onsite could result in potential exposures to where this level of protection is warranted. The decision to require this level of protection will be made on a case-by-case basis. Unknown hazardous conditions suspected of containing risks that have not been identified, as part of this plan shall be investigated with Level C protection.

Level D protection requires standard work clothes, such as protective coveralls, work boots, safety glasses/goggles, and hardhat. This protection level applies to situations in which there is minimal risk of dust generation with subsequent inhalation and dermal risk to hazardous chemicals. It is currently anticipated that this level of protection will be applicable to all investigative activities both on and off site.

Should ambient air monitoring during the study indicate a need for higher protection levels that those currently in use, implementation of the appropriate level or cessation of all activities, which are generating the excessive levels, shall be performed. The level at which initial work activities would be halted is concentrations which exceed 5 ppm above established pre-work background levels.

In addition, protection and first aid will be provided for common health hazards associated with outdoor work such as poison ivy, insect bites and stings, and ticks. Since ticks are known disease vectors, affected persons are instructed to report tick bites to a physician. Poison ivy contact should be treated immediately. A medical kit for first aid will be available in the field. Any signs of rashes, inflammation, irritation, or burning sensation will be reported immediately.

### 7.10 Personal Protective Equipment

All employees at the site will be required to use appropriate equipment for protection against potential hazards at the site. Since Level D is anticipated for the field investigation, equipment listed under Level D in Section 7.9 will be required.

## 7.11 Emergency Information

### 7.11.1 Emergency Services Notification

The emergency procedure will include notifying emergency and other affected personnel and keeping their locations and emergency telephone numbers in a convenient and readily accessible area at the project site. A map showing the route from the project site to the nearest emergency medical facility will be provided at the project area.

Emergency services for the Bayville Village Cleaners site include:

Nearest Emergency Medical Facility
**North Shore University Hospital at Glen Cove**
St. Andrews Lane
Glen Cove, NY
**Emergency Department: (516) 674-7306**

**Bayville Fire Department**
**Fire/Emergency calls: (516) 742-3300 or 911**
Fire/Non-Emergency calls: (516) 628-1922

**Nassau County Police Department**
Second Precinct
7700 Jericho Turnpike
Woodbury, NY 11797
**Emergency calls: 911**
Non-emergency calls: (516) 573-6200

**Poison Control Center**
General Area Number: (516) 542-2323

**Nassau County Department of Health**
Mr. Joseph De Franco, Chief
Office of Site Assessment
240 Old Country Road
Mineola, NY 11501
Phone: (516) 571-1523

### 7.11.2 Community Air Monitoring Plan

A copy of the NYS Department of Health (DOH) Generic Community Air Monitoring Plan (CAMP) is in Appendix 5. The CAMP will be implemented during all subsurface investigation activities. During excavation, drilling and boring activities real time air monitoring of VOCs and particulate levels at the perimeter of the exclusion zone or work area will be necessary.

### 7.11.3 Vapor Emission Response Plan

The CAMP will be implemented during all subsurface investigation activities performed at the Bayville Village Cleaners site. CAMP procedures for monitoring vapor emissions will be implemented.

### 7.11.4 Major Vapor Emission

The CAMP will be implemented during all subsurface investigation activities being performed at the Bayville Village Cleaners site. CAMP procedures for monitoring vapor emissions will be implemented.

### 7.11.5 Major Vapor Emission Response Plan

The CAMP will be implemented during all subsurface investigation activities. In the event that a major release of vapor occurs the Vapor Emission Response Plan will be activated and the following activities will be undertaken:

- All Emergency Response contacts as listed in Section 7.11.1 of the Health and Safety Plan will go into effect.
- The local police authorities will be contacted immediately by the Safety Officer and advised of the situation.
- Frequent air monitoring will be conducted at 30-minute intervals within the 20-Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

### 7.12 Written Directions to North Shore University Hospital at Glen Cove

The following listing is the driving directions from the Bayville Village Cleaners site at Bayville Avenue, Bayville, New York to North Shore University Hospital at Glen Cove.

From Bayville Village Cleaners drive West on Bayville Avenue

Bear left as Bayville Avenue changes name to Bayville Road and drive south

Continue South on Bayville Road and turn right at Buckram Road

Continue driving West on Buckram Road as name changes to Forest Avenue

Turn Left at Walnut Road and the Hospital should be in sight at St. Andrews Lane

# Appendix 1

## Resumes of Key Project Personnel

Fritzi Gros-Daillon

and

Mathew Schieferstein

# FRITZI MAZZOLA GROS-DAILLON
# PRINCIPAL/SENIOR ENVIRONMENTAL SCIENTIST

## Experience Summary:

Over 25 years of experience: President of Anson Environmental, Responsible for Project management, quality control and assurance, contractor coordination and administrative management. Independent Management Consultant; Vice President at Bankers Trust Company, District Manager for Consolidated Edison Company.

## Education:

B.S. Business Administration, Bloomfield College, 1979
M.S. Business Policy, Columbia University, 1981
In Situ and On-Site Bioreclamation Symposium, 1993

## Professional Licenses:

New York State Certified Asbestos Inspector; Since 2003
New York State Certified Project Monitor; Since 1998
New York State Certified Project Designer Since 1998
New York State Certified Air Sampling Technician; Since 1992
OSHA Certification 40 Hour Hazardous Waste Operations Emergency Response (HAZWOPER); Since 1997
Environmental Assessment Association (EAA) Member Since 1991
Certified Environmental Inspector
American Industrial Hygiene Association (AIHA) Member Since 2002

## Key Projects:

- Performed environmental assessments in over fifty industrial and commercial buildings on Long Island. Assessments included identification of operations out of compliance with environmental regulations, searches of regulatory databases and files, site reconnaissance, and report preparation.
- Principal in charge of asbestos surveys in 60 Suffolk County-owned buildings where over 1,500 samples were collected for laboratory analysis. Sample data were entered into a computerized database for the prioritization of abatement activities.
- Quality Assurance/Quality Control Officer, providing technical oversight and guidance on variety of environmental projects including resource allocation, hazardous material contamination, proposal, and work plan preparation.
- Coordinated the removal of over fifty (50) underground storage tanks in Nassau and Suffolk Counties.
- Project Manager for the groundwater investigation and subsequent delisting petitions for forty-two properties within the State Superfund New Cassel Industrial Area. Delisting petitions have been successful in thirty-seven cases with the balances under review by the NYSDEC.
- Project Manager of groundwater investigation at former drycleaning site. Investigation includes sampling of eleven groundwater monitoring wells located in the Upper Glacial Aquifer and delineation of contaminant plum. Alternative remediation technologies under consideration by client.

ANSON
ENVIRONMENTAL

# FRITZI MAZZOLA GROS-DAILLON
# PRINCIPAL
# SENIOR ENVIRONMENTAL SCIENTIST (CONT)

- Evaluated laboratory data for groundwater remediation project in Great Neck, Long Island. Site was contaminated by leaking underground storage tanks which discharged volatile organic compounds that have contaminated the Upper Glacial Aquifer.

- Responsible for oversight of all data validation, field schedules, laboratory analyses, and report production at Anson Environmental.

- Site Manager for Federal Superfund site during installation of monitoring wells and soil borings. Coordinated sample shipment to laboratories and correspondence with USEPA. Conducted data evaluation and assisted in preparation of Remedial Investigation Report.

- Coordinated several underground storage tank removal projects for local clients in small commercial and residential properties, including coordination with appropriate County officials.

- Conducted asbestos surveys and prepared specification documents for 23 New York City schools under auspices of the New York City School Construction Authority.

- Performed extensive indoor air quality investigations for hospitals, schools, clinics, small businesses and industrial clients.

# MATTHEW SCHIEFERSTEIN
# ENVIRONMENTAL SCIENTIST
# ENVIRONMENTAL TECHNICIAN

---

## Experience Summary:

Over 2 years of experience performing environmental site assessments, developing asbestos management plans and coordinating removal of storage tanks. Previously worked as a Second Assistant Superintendent at Engineers Country Club in Roslyn Harbor, New York. Experienced in field management and field installation.

## Education:

BS Agronomy and Environmental Science 1999 Specializing in Soils and Environmental Science
Delaware Valley College of Science and Agriculture ~ Doylestown, PA

## Professional Licenses:

New York State Certified Asbestos Inspector; Since 2001
New York State Certified Project Monitor; Since 2001
New York State Certified Air Sampling Technician; Since 2001
OSHA Certification 40 Hour Hazardous Waste Operations Emergency Response (HAZWOPER); Since 2001
National Groundwater Association Member Since 2003

## Awards:

| | |
|---|---|
| Eagle Scout | 1992 |
| Vigil Honor | 1995 |

## Key Projects:

- Installed soil vapor extraction system at New York State designated inactive hazardous waste disposal site in Westbury, New York. Conducted subsurface investigations to monitor the progress of ongoing remediation.

- Conducted Phase I environmental site assessments, Phase II site sampling and Phase III remediation activities. Performed environmental assessments in industrial and commercial buildings on Long Island. Assessments included identification of operations out of compliance with environmental regulations, searches of regulatory databases and files, site reconnaissance, and report preparation.

- Anlayzed laboratory data to evaluate remedial alternatives based on contaminant properties and developed management plans for site-specific remediation.

- Produced technical reports describing project goals and status.

- Conducted asbestos surveys of residential and commericial buildings and performed air monitoring during asbestos abatement projects. Prepared Asbestos Project Specification documents for large abatement projects.

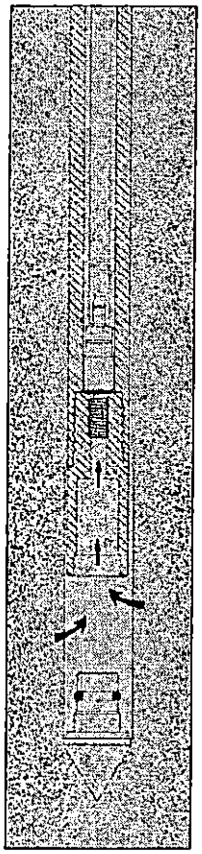
- Coordinated numerous underground storage tank abandonment and removal projects for commercial and residential properties, including coordination with appropriate County officials.

# Appendix 2

## Soil Gas Sampling – PRT System Operation

## Appendix D:

# Soil Gas Sampling — PRT System Operation



Soil Gas Sampling using the Post-Run Tubing (PRT) System.

# Soil Gas Sampling — PRT System Operation

## Basics

Using the Post-Run Tubing System, one can drive probe rods to the desired sampling depth, then insert and seal an internal tubing for soil gas sampling. The usual Geoprobe probe rods and driving accessories and the following tools are required:

- PRT Expendable Point Holder
- PRT Adapter
- Selected PRT Tubing

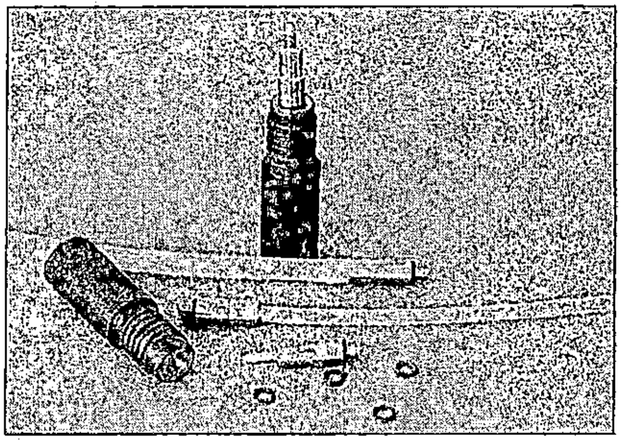
## Preparation

1. Clean all parts prior to use. Install O-rings on the PR-13B and the PRT adapter.
2. Inspect the probe rods and clear them of all obstructions.
3. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly.

   NOTE: PRT fittings are left-hand threaded.

4. Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection – especially when using Teflon tubing (Figure 1).

   **REMEMBER: The sample will not contact the outside of the tubing or adapter.**



**PRT SYSTEM PARTS**
**PRT Expendable Point Holder, PRT Adapters, Tubing, and O-rings.**

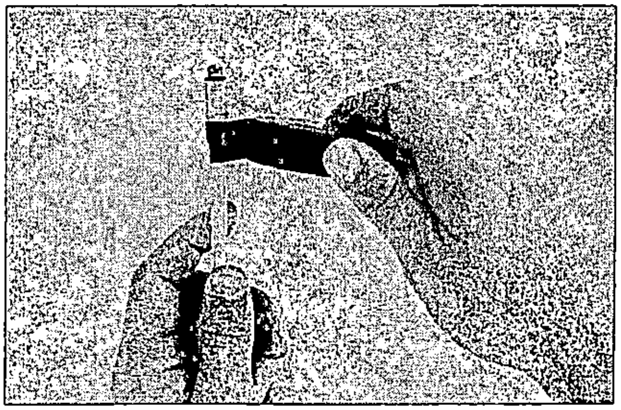


**Figure 1. Securing adapter to tubing with tape. NOTE: Tape does not contact soil gas sample.**

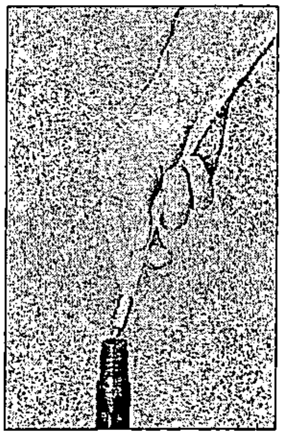


**Figure 2. Insertion of tubing and PRT adapter.**

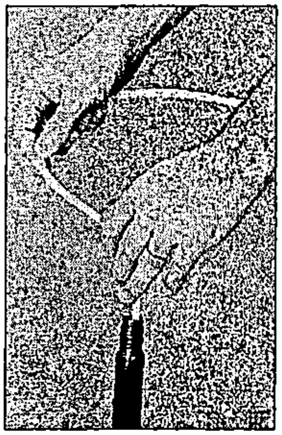
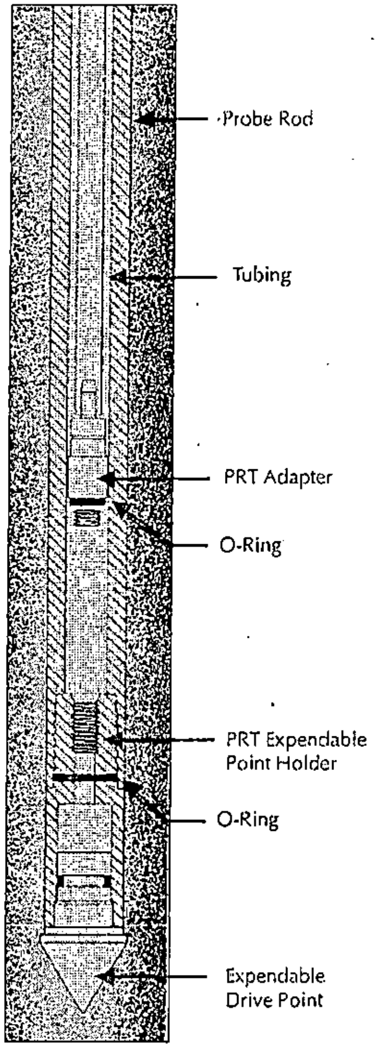


**Figure 3. Engaging threads by rotating tubing.**



**A cross section of probe rods driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.**

### Probing

Drive the PRT tip configuration into the ground. Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work.

### Connection

1. Insert the adapter end of the tubing down the inside diameter of the probe rods (**Figure 2**).

2. Feed the tubing down the rod bore until it hits bottom on the expendable point holder. Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it.

3. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder (**Figure 3**).

4. Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)

### Sampling

1. Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus).
2. Follow the appropriate sampling procedure for collecting a soil gas sample (Figure 1).

### Removal

1. After collecting a sample, disconnect the tubing from the vacuum hose or sampling system.
2. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.)
3. Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon tubing as protocol dictates.
4. Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter.
5. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter.
6. Prepare for the next sample.

**Figure 1. Taking a soil gas sample for direct injection into a GC with the PRT system.**

# Appendix 3

## Calibration Procedures for Field Instruments

Photoionization Detector (PID)

and

Horiba Water Quality Checker Model U-10

# Model 580B

Organic Vapor Meter (OVM)/Datalogger

# *Instruction Manual*

*Thermo Environmental Instruments Inc.*

# SECTION IV

## CALIBRATION

### 4.1 GENERAL

The Model 580B Organic Vapor Meter is indeed a quantitative instrument and can certainly be used as such. It makes use of the Photoionization Detection System using a lamp with an ionization energy of 10.0 eV which is standard in the Model 580B. Almost all organic materials will be ionized at this energy level. There are some organic materials, such as a few of the freons, methane, ethane and propane that are not ionized and thus will not be detected. The ionization potentials for the various organic materials will simply tell whether the material will be detected by the Photoionization Detector. It does not give any clue as to the sensitivity of the detector for that particular material. Certainly, different organic vapors will have different sensitivities. It is important to understand that the Model 580B does indeed sense most organic vapors and that its response to these different organic vapors will be different.

In this section of the manual, the aspects of calibrating the Model 580B for various vapors will be discussed. In the following section discussing applications, various ways of using the features of the Model 580B will be explained along with the various methods for calibration of the 580B. There will also be applications of the Model 580B in specific instances where the organic vapors or the mixtures of organic vapors are completely unknown. The 580B can be an extremely useful tool, even in areas such as those.

### 4.2 FACTORY CALIBRATION TEST OF THE MODEL 580B

The Model 580B has been tested for calibration and linearity tested at the factory. The particular gas chosen for this calibration is isobutylene. The Model 580B has good response for isobutylene. Isobutylene standards prepared in air are relatively stable with time, undergoing no serious adsorption or reaction problems. The test information is included in the instrument packet. In addition to the above test a benzene standard is also run. It is important to note that the instrument was not calibrated. It was tested for calibration. Therefore, it should be calibrated by the operator before use.

### 4.3 METHODS OF GENERATING CONCENTRATIONS OF VARIOUS MATERIALS IN AIR

This section is not intended to be all inclusive as far as the preparation of gas and vapor standards in air are concerned. Only those methods that have been found most practical for the calibration of the 580B are discussed here. There are basically two types of standards, cylinder and bag.

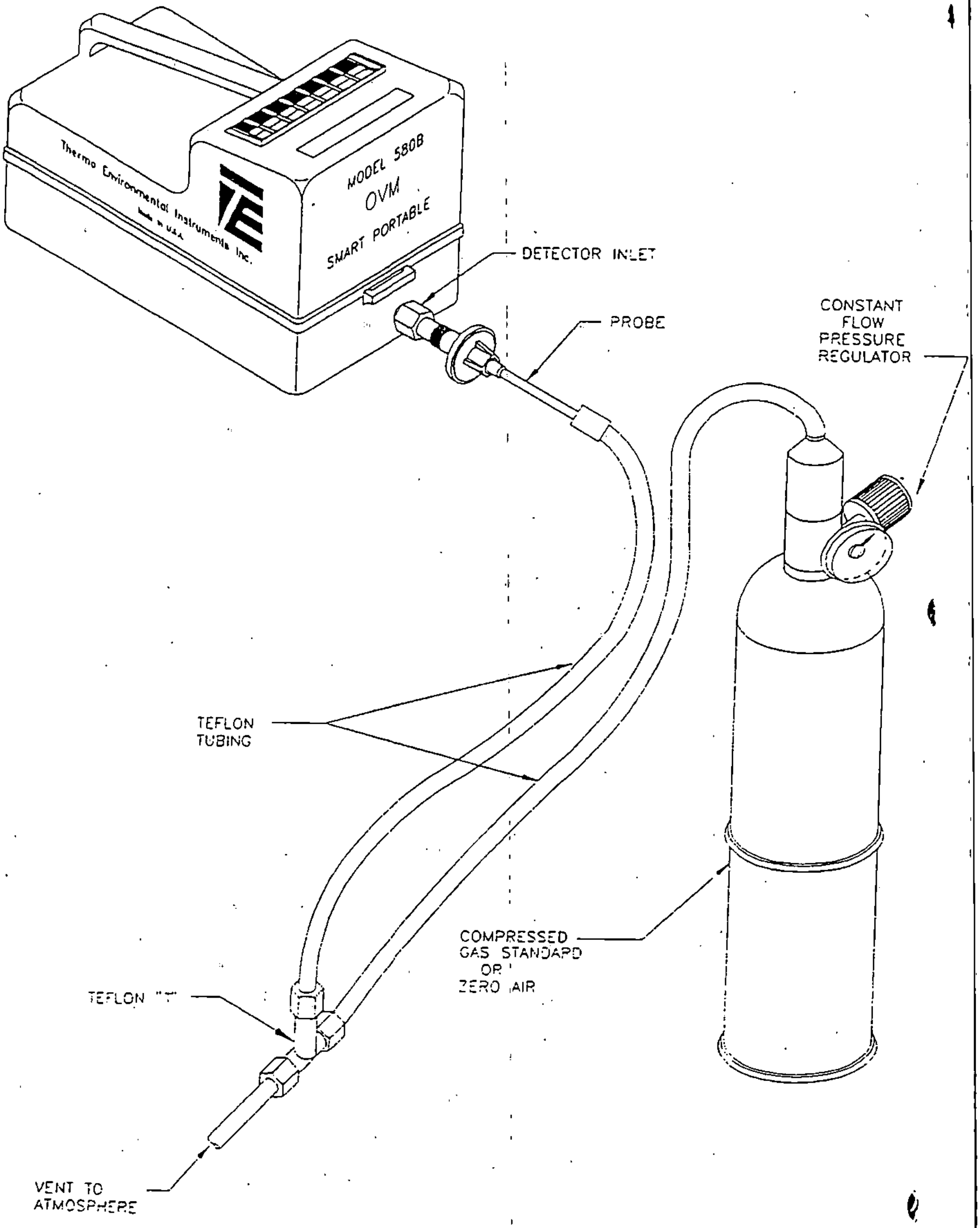


Figure 4.1
Cylinder Calibration

## 4.3.1 CYLINDER STANDARDS

Certainly commercially available standard cylinders of gaseous materials in air offer the most convenient method of calibration. However, these are static standards. Standards prepared in this fashion in air for vapors of various organic liquids often show concentration reduction with time due to adsorption problems. In general, gases when mixed with air will maintain their concentrations with time since adsorption is generally not a problem.

However, some gases are sufficiently reactive that chemical reaction of the gas will cause a reduction of it in air. These precautions must be observed when using commercially prepared standards for calibration of the Model 580B. It is for this reason that isobutylene in air was chosen as a reference standard for factory calibration. TEI offers a cylinder standard which includes both zero and isobutylene standards. A constant flow pressure regulator sets the flow needed for calibration of the 580B. Figure 4.1 illustrates the physical calibration procedure. The inlet to the 580B is connected to the "T" as shown. It is important that this connection is tangent to the gas flow. The "T" is connected to the regulator on the standard cylinder. It is important that a length of tubing is attached to the "T" location. This prevents diffusion of ambient air into sample line. The regulator and tubing assembly will have to be moved between both the zero air and standard cylinder.

## 4.3.2 BAG STANDARDS (ISOBUTYLENE)

Bag standards can be prepared in a laboratory and in general are reasonable ways of calibrating the Model 580B. However, it is important that these standards be used shortly after their preparation to reduce the significance of any adsorption problems. Static standards prepared for calibration of the Model 580B are best prepared in collapsible plastic bags. This is opposed to a fixed volume container. The sampling rate of the 580B, which is 500 ml/min, requires an appreciable amount of sample. Even one minute's sampling out of a fixed container will remove 500 ml/min from it. This should not significantly reduce the pressure inside the container. Thus, the collapsible bag provides the best means as opposed to a fixed volume. A 5 gallon polyethylene bag is a convenient size to use for the preparation of static standard.

A tube is inserted into the opened end of the bag and the bag opening then sealed around the tube. The tube should have a cutoff valve or some means of closing the volume of the bag. The volume of air introduced into the bag must be measured. This is most conveniently measured by a wet test meter. However, a source of air flowing through a flow meter can be used if the flow can be held constant, then time is a measure of the volume of the air placed into the bag. All air is expelled from the bag by completely collapsing it prior to connection to the source of air.

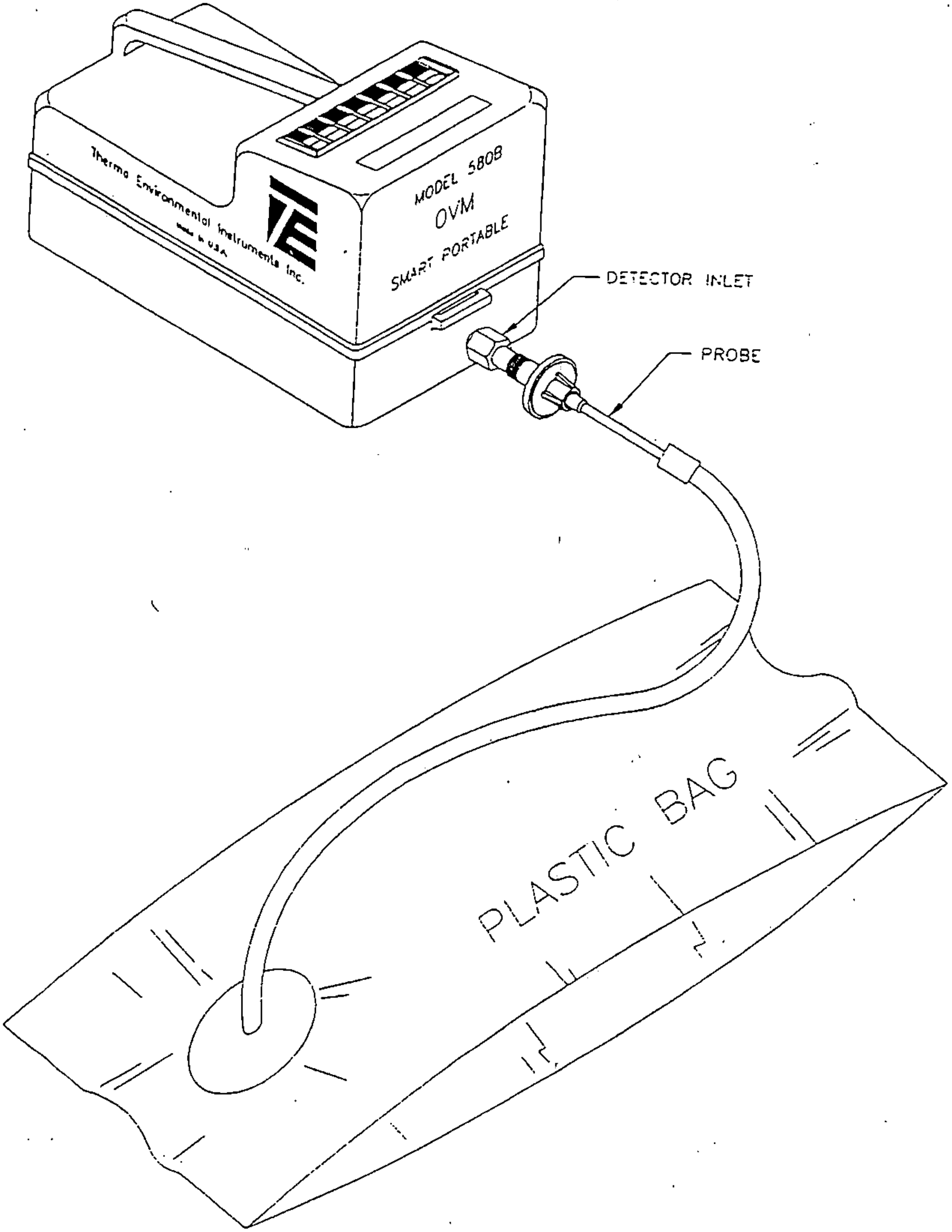


Figure 4.2
Bag Calibration

It can then be connected to a wet test meter or flow meter via a short length of rubber tubing hooked to the plastic tube of the bag. The air flow is started into the bag at a rate of approximately 5L/min. A total of 10 liters is a convenient volume for a 5 gallon bag. This would mean approximately 2 minutes for filling the bag. Figure 4.2 illustrates the physical configuration needed to develop bag standards.

For gaseous samples, the trace organic will be added via a glass hypodermic syringe. The 1 cc Tuberculin syringe is a convenient size. For an isobutylene standard, the 1 cc syringe is flushed with pure isobutylene and then filled to the 1cc mark. While the air is flowing into the plastic bag, the short piece of rubber tubing is pierced by the needle from the 1 cc syringe and the plunger slowly depressed such that the 1 cc of isobutylene is added to the air flowing into the plastic bag. When 10 liters of air have been added to the plastic bag, the flow is immediately stopped and the valve on the tube or the closing clamp is applied to contain the air and isobutylene within the plastic bag. It is best at this stage of the procedure not to rely solely on the diffusion of isobutylene to form a uniform mixture inside the plastic bag. Slight kneading of the plastic bag will hasten the mixing of the isobutylene in air. The plastic tube from the bag is then connected to the probe on the Model 580B via a short length of rubber tubing and the valve on the plastic tube immediately opened. The Model 580B withdraws a sample from the bag at the sampling rate of 500 ml/min. Thus, 10 liters of sample in the bag will provide approximately 20 minutes. Certainly the calibration of the 580B can be accomplished in a shorter period of time. The concentration of isobutylene in ppm by volume will be equal to the sample size, which was 1 cc, divided by the volume of the bag in liters, which would be 10 liters, times 1000. In this particular instance, the concentration would be:

$$\text{Conc (ppm by Vol)} = \frac{\text{1cc Isobutylene} \times 1000}{\text{10 L Air}} = \text{100 ppm}$$

### 4.3.3 BAG STANDARDS (ORGANICS)

On occasion there is the need to prepare standards other than the normal calibration standard. As mentioned previously, isobutylene was chosen as a standard because of its stability. If other standards are to be used, it is best to develop a relation of the other standard to a standard of known stability like isobutylene. If this procedure is followed, a response factor can be developed by comparing the other organic standard to isobutylene this technique will be discussed in a later section. The following is a suggested technique for preparing other standards.

For organic materials, which are normally liquids at room temperature, the procedure is essentially the same except that an extremely small liquid sample is injected into the flowing air stream rather than the gas sample. This technique works well only for relatively volatile organic materials. The flowing air stream must vaporize all of the material or the calculation will be off. If the material is not rapidly volatile in that flowing air stream, the liquid should be injected through the surface of the plastic bag. Immediately after withdrawing the needle, the hole in the plastic bag should be covered with a piece of plastic tape.

Again, significant kneading of the bag will hasten the evaporation of the sample and mixing of the vapor into the air to provide homogeneous samples. The introduction of this sample into the 580B is the same as before. The calculation of the concentration of the vapor in air is a two-step procedure whereby the small volume of liquid injected into the air stream and into the plastic bag is converted to a volume of vapor. This volume of vapor is then used in the same manner as the volume of gas in the case of isobutylene. The following equations apply:

$$\text{Volume Vapor (uL)} = \frac{\text{Liquid Volume (ul)} \times \text{Liquid Density} \times 24.45}{\text{Molecular Weight}}$$

The above equation gives the vapor volume at atmospheric pressure (760 torr) and $25^{\circ}$ C (77F).

Then:

$$\text{Concentration (ppm by Volume)} = \frac{\text{Vapor Volume (ul)} \times 1000}{\text{Air Volume (liters)}}$$

The following is a sample calculation for benzene:

Liquid Volume = 2 ul

Benzene Density = 0.879 g/cc

Molecular Weight Benzene = 78.1

Air Volume = 10 Liters

$$\text{Vapor Volume} = \frac{2 \times 0.879 \times 24.45}{78.1} = 0.55 \text{ ul Benzene Vapor}$$

$$\text{Conc} = \frac{0.55 \times 1000}{10} = 55 \text{ ppm (vol)}$$

The syringe used for the measurement of liquids in this particular instance is a small volume-type such as those manufactured by the Hamilton Company. A convenient size syringe is the 10 microliter volume.

## 4.4 580B CALIBRATION

The following procedure is applicable for both Cylinder and Bag Standards. The sequence requires both Zero gas and Span gas to be used. Span gas can be either contained as a cylinder or bag, in either case the exact concentration used must be known. This concentration will be entered to the 580 when the program provides its entry. With respect to Zero gas, there are several choices. Obviously a certified zero air standard in a cylinder presents no problem. Another choice would be to build a zero air standard in a bag. This can be simply accomplished with the set-up in Figures 4.1 and 4.2 using a charcoal scrubber to remove all the hydrocarbons present in the air. Charcoal does not absorb Methane; this does not cause a problem because the PID does not respond to it. Another approach which could be used in an emergency is to use room air unscrubbed.

This is acceptable if you know that there are no hydrocarbons present or they are exceptionally low in concentration. However, it is not recommended as a standard practice. The physical set up for cylinder calibration is illustrated in Figure 4.1; bag calibration in Figure 4.2.

### 4.4.1 CALIBRATION ROUTINE

(A) Set-up calibration assembly with zero air cylinder or bag as described in Figures 4.1 and 4.2.
(B) Model 580B set-up and zero calibration.

1. Power-up instrument using power plug.
2. Depress ON/OFF Key to ignite lamp and initiate sample pump.
3. Depress MODE/STORE Key.
4. Depress-/CRSR Key in response to LOG THIS VALUE? Prompt.
5. Depress-/CRSR Key to select Parameters Mode from the Main Menu.
6. Depress +/INC Key to advance thru the Run Mode selection parameter prompt.
7. Depress +/INC Key to advance thru the Auto Logging Mode selection parameter prompt.
8. Depress +/INC Key to advance thru the Average Time selection parameter prompt.
9. Depress +/INC Key to advance thru the Alarm Setting parameter prompt.
10. Depress +/INC Key to advance thru Lamp Selection parameter prompt.
11. Depress +/INC Key to advance thru Response Factor Setting parameter prompt.
12. Depress RESET Key to initiate calibration sequence.
13. Depress-/CRSR Key to decline restoration of the backup calibration.
14. Connect outlet of calibration tubing assembly to the Model 580B Detector Inlet as illustrated in Figure 4.2.
15. Introduce Zero Air to Model 580B by opening flow regulator.

16. Depress RESET Key to "Zero" Model 580B.
17. Close Flow Regulator.

(C) Span Calibration - assuming that the Span gas has a concentration of 250 ppm isobutylene the following procedure is followed:

18. Simultaneously Depress RESET and -/CRSR Keys to activate the movable cursor.
19. Repeat Step 18 until the cursor is at the ones place.
20. Simultaneously Depress RESET and +/INC Keys to increment the ones place value.
21. Repeat Step 20 until the ones place value reads 0.
22. Repeat Step 18 to move cursor to the tens place.
23. Repeat Step 20 until the tens place value reads 5.
24. Repeat Step 18 to move the cursor to the hundreds place.
25. Repeat Step 20 until the hundreds place value reads 2.
26. Repeat Step 18 to move the cursor to the thousands place.
27. Repeat Step 20 until the thousands place value reads 0.
28. The LCD should now read:

```
SPAN PPM = 0250
"+" TO CONTINUE
```

29. Depress +/INC to accept the span conc. value.
30. Connect isobutylene cylinder (250 ppm) to calibration tubing assembly.
31. Connect outlet of calibration tubing assembly to the Model 580B Detector Inlet.
32. Introduce isobutylene standard to Model 580B by opening flow regulator.
33. Reset key to "CALIBRATE" Model 580B.
34. Close Flow Regulator.
35. Depress +/INC. Key in response to "RESET" TO CALIBRATE message.
36. Depress MODE/STORE to return to the Run Mode.

The instrument has been calibrated and is ready to make measurements.

## 4.5 DETERMINATION OF RESPONSE FACTORS

As mentioned above, the Model 580 can be calibrated with isobutylene but be set to read correctly, the concentration of another substance. This is done by using the Response Factor that is set in the parameter routine. The default for the response factor is 1.0. The Response Factor is the number that is multiplied by the measured concentration to obtain the correct concentration of the measured component. If the chemical to be measured is less sensitive on a PID than the standard, (usually isobutylene) then the Response Factor is greater than 1.0. If it is more sensitive than the standard then the Response Factor is less than 1.0.

The reason for a Response Factor is practicality. If it is know that the sample to be measured contains only benzene and therefore the user would like to read benzene concentration directly, there are two approaches. The user could make a bag standard daily of benzene vapor in air and calibrate the 580 directly. Or the Response Factor could be used. In the latter case a bag with benzene is made only once for comparison to a cylinder of a stable standard (such as isobutylene). Then daily, the Model 580 is calibrated with the cylinder standard, a simple operation compared to the work of preparing a bag standard.

As an example, if the bag containing 55 ppm benzene in air as prepared above were measured in a 580 calibrated against isobutylene, the concentration might have been read as 91 ppm. thus the 580 is more sensitive for benzene than for isobutylene.

The Response Factor can now be calculated as:

$$\text{Response Factor (RF)} = \frac{\text{Factor STD Concentration}}{\text{580 Reading of Factor STD}}$$

$$RF = 55/91 = 0.604$$

When 0.60 is entered into the 580 as the Response Factor, the 580 will read 55 ppm for the bag.

Now the 580 need only be calibrated using an isobutylene standard and a Response Factor of 0.60 to correctly respond to benzene.

## Section 3

# Calibrating the U-10

The U-10 Water Checker may be calibrated either manually or automatically. The 4-parameter auto-calibration procedure is quite handy and should be sufficient for most measurement operations.

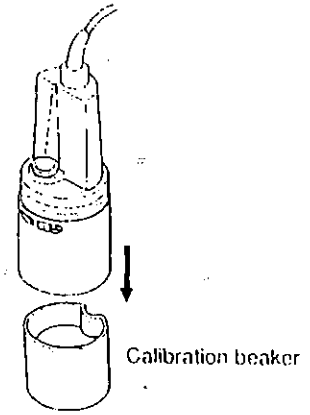
Manual calibration for each of the four parameters is more accurate but, of course, also more time-consuming. This method should be used for more precise measurement. The manual calibration procedure is explained below in detail, following the description of the auto-calibration procedure.

The auto-calibration procedure is extremely simple. The U-10 Water Checker uses just a single solution to do a simultaneous calibration of four parameters: *pH, COND, TURB,* and *DO*. Your U-10 comes with a bottle of standard phthalate pH solution and a calibration beaker for this purpose.

## Auto-calibration procedure

Fill the calibration beaker to about 2/3 with the standard solution. Note the line on the beaker.

Fit the probe over the beaker, as illustrated. Note that the beaker is specially shaped to prevent the DO sensor from being immersed in the standard solution. This is because the DO auto-calibration is done using atmospheric air.



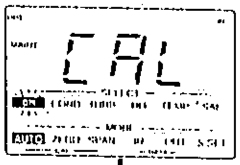
MODE

With the power on, press the MODE Key to put the unit into the MAINT mode. The lower cursor should be on the AUTO Sub-Mode; if it is not, use the MODE Key to move the lower cursor to AUTO.

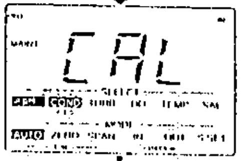
ENT

With the lower cursor on AUTO, press the ENT Key. The readout will show CAL. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one-by-one: *pH, COND, TURB,* and *DO*. When the calibration is complete, the readout will briefly show End and then will switch to the MEAS mode.

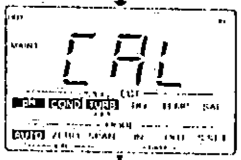
The upper cursor will blink while the auto-calibration is being made. When the auto-calibration has stabilized, the upper cursor will stop blinking.



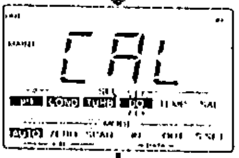
First, pH is being auto-calibrated



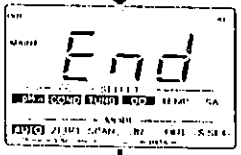
Then, COND is being auto-calibrated



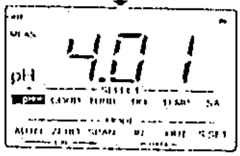
Next, TURB is being auto-calibrated



Finally, DO is being auto-calibrated



Auto-calibration now ends

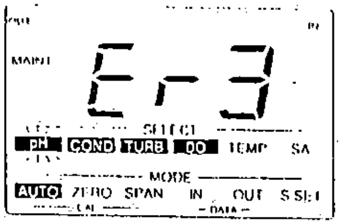


And the readout switches to the MEAS mode

Note: If you wish to abort the auto-calibration for any reason, press the CLR Key. The parameters auto-calibrated so far will be stored in memory.

## Auto-calibration error

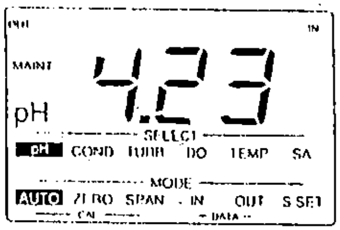
After the DO auto-calibration, if the unit does not switch to the MEAS mode as it should, and the readout shows either *Er3* or *Er4*, an auto-calibration error has occurred. Parameters will blink where an error occurred.



pH auto-calibration error

CLR

If this happens, re-do the auto-calibration. First, press the CLR Key to cancel the error code.



ENT

Then press the ENT Key to re-start the auto-calibration. Restart the auto-calibration beginning again with pH.

## Manual (2-point) calibration procedures

For normal measurements, the 4-parameter auto-calibration described above is sufficiently accurate. However, you may wish to do a parameter-by-parameter, 2-point manual calibration of one or more of the four parameters. This is recommended either for high-accuracy measurements, especially when using the expanded readout mode. It is necessary if a new probe is being used for the *first time*.

Parameters to be calibrated manually.

| | | |
|---|---|---|
| pH | • Zero | (see page 24.) |
| | • Span | (see page 25.) |
| COND | • Zero | (see page 28.) |
| | • Span | (see page 29.) |
| TURB | • Zero | (see page 31.) |
| | • Span | (see page 31.) |
| DO | • Zero | (see page 32.) |
| | • Span | (see page 33.) |

Parameters not to be calibrated.

Sample temperature
Salinity

## pH calibration

pH calibration on the U-10 is done using two commercially-available standard solutions of different pH values, one for the zero calibration, the other for the span calibration. Note that the temperature characteristics of the various standard solutions that are available may differ; therefore, before using these two solutions to make the pH calibration, carefully measure the temperature and determine the temperature characteristics of each.

### Preparation

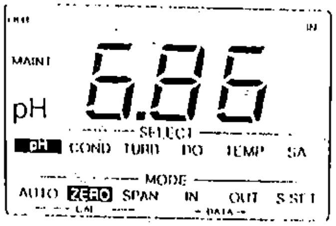
Wash the probe 2-3 times, using de-ionized or distilled water. Place it in a beaker of each standard solution.

### 1. Zero calibration

Use a pH7 standard solution for the zero calibration.

#### Operation

1. With the power on, press the MODE Key to put the unit into the MAINT mode.
2. Press the MODE Key again to move the lower cursor to ZERO.
3. Use the SELECT Key to move the upper cursor to pH.
4. When the readout has stabilized, use the UP/DOWN Keys to select the value of the pH 7 standard solution at the temperature of the sample. Refer to Table 2 for pH values of standard solutions at various temperatures.



5. Press the ENT Key to complete the zero calibration for pH.

### 2. Span calibration

Use either a pH4 or a pH9(10) standard solution for the span calibration.

#### Operation

1. Use the MODE Key to move the lower cursor to SPAN.
2. As in Step 4. above in zero calibration, when the readout has stabilized, use the UP/DOWN Keys to select the value of the standard solution (i.e., either pH4 or pH9) at the temperature of the sample. Again, refer to Table 2 for pH values of standard solutions at various temperatures.
3. Press the ENT Key to complete the span calibration for pH.

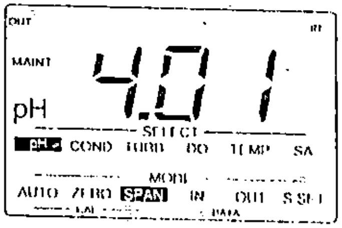


Table 2 pH values of standard solutions at various temperatures*

| Temperature ˚C / ˚F | pH2$^{a}$ | pH4$^{b}$ | pH7$^{c}$ | pH9$^{d}$ | pH10$^{e}$ | pH12$^{f}$ |
|---|---|---|---|---|---|---|
| 0 / 32 | 1.67 | 4.01 | 6.98 | 9.46 | 10.32 | 13.43 |
| 5 / 41 | 1.67 | 4.01 | 6.95 | 9.39 | 10.25 | 13.21 |
| 10 / 50 | 1.67 | 4.00 | 6.92 | 9.33 | 10.18 | 13.00 |
| 15 / 59 | 1.67 | 4.00 | 6.90 | 9.27 | 10.12 | 12.81 |
| 20 / 68 | 1.68 | 4.00 | 6.88 | 9.22 | 10.06 | 12.63 |
| 25 / 77 | 1.68 | 4.01 | 6.86 | 9.18 | 10.01 | 12.45 |
| 30 / 86 | 1.69 | 4.01 | 6.85 | 9.14 | 9.97 | 12.30 |
| 35 / 95 | 1.69 | 4.02 | 6.84 | 9.10 | 9.93 | 12.14 |
| 40 / 104 | 1.70 | 4.03 | 6.84 | 9.07 | 9.89 | 11.99 |
| 45 / 113 | 1.70 | 4.04 | 6.83 | 9.04 | 9.86 | 11.84 |
|  | 1.71 | 4.06 | 6.83 | 9.01 | 9.83 | 11.70 |

a : oxalate, b : phthalate, c : neutral phosphate, d : borax,
e : carbonate, f : Sat.calcium hydroxide solution

* These pH valves are for Japanese standard solutions. Should you prefer to use different standard solutions, be sure to make the proper adjustments in calibration

## COND calibration

The U-10 can measure conductivity in the range of 0-100 mS/cm. Depending on the sample concentration, however, the U-10 automatically selects the proper range out of its three possible ranges of 0-1 mS/cm, 1-10 mS/cm, and 10-100 mS/cm.

Therefore, if you are doing a manual calibration for COND, this must be done for each of the three ranges. However, since the zero point is common for all three ranges, only the three one-point span calibrations need be done separately.

## Preparing the standard solution for COND span calibration

This solution uses a potassium chloride as a reagent. For greater accuracy, the solution should be freshly prepared each time. If it is unavoidable to use a stored solution, be sure to keep it tightly capped in a polyethylene or hard glass bottle. The shelf life of this solution is six months. Date-stamp the bottle for reference. Never use a KCl standard solution that has been stored for more than six months: the calibration accuracy may be adversely affected.

Use potassium chloride powder of the best quality commercially available. Dry the powder for two hours at 105°C, and cool it down, in a desiccator. Weigh out an appropriate amount of dried and cooled potassium chloride powder according to the table below. Make the potassium chloride standard solution as shown.

**Table 3** Making the potassium chloride standard solution

| KCl standard solution | KCl weight g | Conductivity* mS/cm | Range to be calibrated mS/cm |
|---|---|---|---|
| 0.005N | 0.373 | 0.718 | 0-1 |
| 0.05N | 3.73 | 6.67 | 1-10 |
| 0.5N | 37.28 | 58.7 | 10-100 |

* Value at the temperature, 25°C

To prepare the standard solution, use a 1-liter volumetric flask. First, dissolve the KCl in a small amount of de-ionized or distilled water. Then fill the flask with de-ionized or distilled water up to the 1-liter line. Finally, shake the solution to mix it thoroughly.

## 1. Zero calibration

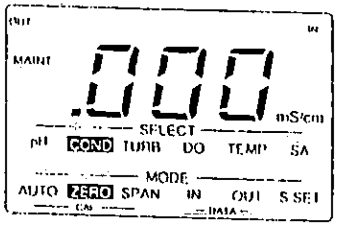
This calibration is carried out in atmospheric air; no solution is needed.

### Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Shake the probe to remove any water droplets from the COND sensor. Then allow it to dry by exposing it to fresh air.

### Operation

1. Use the MODE Key to move the lower cursor to ZERO.
2. Use the SELECT Key to move the upper cursor to COND.
3. Use the UP/DOWN Keys to set the readout to zero.



4. Press the ENT Key. This completes the zero calibration for COND.

## 2. Span calibration

This procedure uses a standard solution of potassium chloride. For best results, a fresh batch of the solution should be prepared each time. See page 27 for details.

### Preparation

Wash the probe 2-3 times using de-ionized or distilled water. Following this, wash it 2-3 times in the KCl standard solution you have prepared. Then place the probe in a beaker of the KCl solution maintained at a temperature of 25±5°C.

### Operation

1. Use the MODE Key to move the lower cursor to SPAN.
2. After the readout stabilizes, as you did for the pH calibration, use the UP/DOWN Keys to select set the value of the KCl standard solution, referring to the KCl table.
3. Press the ENT Key to complete the span calibration for this COND range.
4. Repeat this procedure for the three ranges, using each of three values of KCl standard solutions.

## TURB calibration

Use good-quality de-ionized water, which may be considered as having a turbidity of zero. If that is not readily available, distilled water may be used instead. When doing the turbidity zero calibration, it is particularly crucial that you clean the probe thoroughly. Never use a dirty probe; otherwise the calibration will be unreliable.

### Preparing the standard solution for TURB span calibration

1. Weigh out 5.0 g of hydrazine sulfate.
2. Dissolve this in 400 ml of de-ionized or distilled water.
3. Then weigh out 50 g of hexamethylenetetramine, and dissolve it in 400 ml of de-ionized or distilled water.
4. Mix these two solutions, add enough de-ionized or distilled water to make 1,000 ml, and stir the mixed solution thoroughly.
5. Allow this solution to stand for 24 hours at a temperature of 25 ± 3°C.

   The turbidity of this solution is equivalent to 4000 NTUs. The shelf-life of this solution is six months; i.e., this 4,000-NTU value will remain accurate for a maximum of six months.

   Each time you carry out this calibration, it is necessary to dilute the 4,000-NTU standard solution to prepare an 800-NTU standard solution for calibration. To do this, measure out 50 ml of the 4,000-NTU solution into a 250-ml measuring flask.

   It is recommended that you use a rubber pipette aspirator for this. Then add de-ionized or distilled water up to the 250-ml line.

   The standard solution used here for the turbidity calibration will precipitate easily. Therefore, be sure to stir the solution thoroughly before use.

### 1. Zero calibration

#### Preparation

Wash the probe thoroughly 2-3 times using de-ionized or distilled water. Shake off excess water droplets, and then place it in a beaker of de-ionized or distilled water.

#### Operation

1. Use the MODE Key to move the lower cursor to ZERO.
2. Use the SELECT Key to move the upper cursor to TURB.
3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.
4. Press the ENT Key to complete the zero calibration for TURB.

### 2. Span calibration

#### Preparation

Wash the probe thoroughly, using de-ionized or distilled water. Shake off excess water droplets. Then place it in a beaker of the 800-NTU solution you have prepared for this purpose.

#### Operation

1. Stir this 800-NTU span standard solution thoroughly.
2. Use the MODE Key to move the lower cursor to SPAN.
3. After readout has stabilized, i.e., about 60 to 90 seconds, set the readout to "800" NTU, which is the value for this standard solution.
4. Press the ENT Key to complete the span calibration for TURB.

## DO calibration

Unlike the other calibration procedures, the solution for the DO calibration cannot be stored for use; because the amount of dissolved oxygen in the solution is crucial, a fresh batch must be prepared each time, just before it is used in the DO calibration.

### 1. Zero calibration

Use a solution of sodium sulfite dissolved in either de-ionized water or tap water.

**Preparation**

1. Add about 50g of sodium sulfite to 1,000 ml of water (either de-ionized water or tap water will do). Stir this mixtuer to dissolve.
2. Wash the probe 2-3 times in tap water, and place it in the zero standard solution.

**Operation**

MODE

1. Use the MODE Key to move the lower cursor to ZERO.

SELECT

2. Use the SELECT Key to move the upper cursor to DO.

▲ ▼

3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.

ENT

4. Press the ENT Key. This completes the zero calibration for DO.

### 2. Span calibration

Use either de-ionized water or tap water that has been saturated with oxygen in air.

**Preparation**

1. Put 1 or 2 liters of water in a container (either de-ionized water or tap water will do). Use an air pump to bubble air through the solution until it is oxygen-saturated.
2. Wash the probe 2-3 times in tap water, and put it in the span calibration solution.

**Operation**

1. First, be sure the U-10 is set for fresh water readings. To do this, set the S.SET Sub-Mode to 0.0%.

MODE

2. Then, use the MODE Key to move the lower cursor to SPAN.
3. After the readout has stabilized, while slowly moving the probe up and down in the solution, set the readout value to the appropriate DO value for the temperature of this solution. For DO values at various temperatures, refer to Table 4.

ENT

4. Press the ENT Key to complete the span calibration for DO.

**Table 4** Amounts of saturated dissolved oxygen in water at various temperatures, salinity = 0.0%

| Temperature | DO | Temperature | DO |
|---|---|---|---|
| 0 °C | 14.16 mg/l | 21 °C | 8.68 mg |
| 1 | 13.77 | 22 | 8.53 |
| 2 | 13.40 | 23 | 8.39 |
| 3 | 13.04 | 24 | 8.25 |
| 4 | 12.70 | 25 | 8.11 |
| 5 | 12.37 | 26 | 7.99 |
| 6 | 12.06 | 27 | 7.87 |
| 7 | 11.75 | 28 | 7.75 |
| 8 | 11.47 | 29 | 7.64 |
| 9 | 11.19 | 30 | 7.53 |
| 10 | 10.92 | 31 | 7.42 |
| 11 | 10.67 | 32 | 7.32 |
| 12 | 10.43 | 33 | 7.22 |
| 13 | 10.20 | 34 | 7.13 |
| 14 | 9.97 | 35 | 7.04 |
| 15 | 9.76 | 36 | 6.94 |
| 16 | 9.56 | 37 | 6.86 |
| 17 | 9.37 | 38 | 6.76 |
| 18 | 9.18 | 39 | 6.68 |
| 19 | 9.01 | 40 | 6.59 |
| 20 | 8.84 | | |

# Appendix 4

H2M Labs, Inc., Standard Operating Procedure

for

Sample Preparation and Analysis of Volatile Organics by GC/MS in Air

Date: April 24, 2002

**H2M LABS, INC.**

# STANDARD OPERATING PROCEDURE

## METHOD 18 AND METHOD 106

SAMPLE PREPARATION AND ANALYSIS OF
VOLATILE ORGANICS BY GC/MS IN AIR

Prepared by: ______________________ Date: 1/6/04

Approved by: ______________________ Date: 1/6/04
Quality Assurance Manager

Approved by: ______________________ Date: 1/6/04
Laboratory Manager

| | |
|---|---|
| *SOP No.* | Meth18 |
| *Revision No.:* | 0 |
| *Revision Date* | 4/24/02 |
| *Page* | 1 of 35 |

## TABLE OF CONTENTS

## INTRODUCTION

The procedure described is based on Method 18 in Appendix A of 40 CFR, Part 60 for stationary sources and Method 106 in Appendix B of 40 CFR, Part 61 for emission testing.

The work can only be performed by analysts trained in the procedure who are qualified according to the standards set forth in ASP CLP analyses.
In addition to the requirements of this SOP, the guidelines in the H2M "Quality Assurance, Quality Control Manual" have to be observed:

- "Training"
- "Instrument Maintenance"
- "Health and Safety"
- "Waste Generation, Storage, Disposal"
- "Progression of Samples"
- "Validation and Reporting"

For data assessment and acceptance criteria for QC measures and corrective action for out of control data and handling of unacceptable data. refer to section 7 in this SOP and section "Analytical Methodology- Organic" in the QC manual.

Refer to "Waste Generation, Storage, Disposal" for pollution prevention, and to "Health and Safety" for lab policy in safety precautions.

Definitions of specific terminology utilized in this SOP and method references are summarized in the separate document "Definitions of SOP Terminology and References of Official Protocols", which applies to all SOPs.

## 1.0 SCOPE AND APPLICATION

This protocol covers analysis of medium to high levels of volatile compound collected as "whole air" in Tedlar bags or on sorbent tubes according to NIOSH methods.

1.1 Applicable Methods

1.1.1 Method 18, which incorporates both sampling procedures, is intended for the measurement of gaseous organic compound emissions by gas chromatography. GC/MS analysis is recommended, if compounds cannot be identified with certainty. To avoid duplicate analysis and due to frequently encountered interferences, analysis by this SOP are performed by GC/MS.

1.1.2 Vinyl chloride by the stack gas method 106 is collected in Tedlar bags.

1.1.3 In method 18, the Tedlar bag analysis is performed for presurvey sampling. In general, the Tedlar bag method is suitable for prescreening, and if high levels of compounds are expected. The injection size can be varied to keep compound concentration in the linear range.

1.1.4 Instead of Tedlar bags, gas sampling bottles (or "valves") are suitable if only small sample volumes need to be injected due to high concentrations.

1.1.5 For analysis (after the Tedlar bag "prescreening"), method 18 specifies "direct sampling" for in-situ analysis for the analysis, which requires portable instrumentation. As an alternative, method 18 provides for testing by NIOSH methods, covered by this protocol.

1.2 List of Analytes

1.2.1 Compounds that can be analyzed with the Tedlar bag procedure comprise compounds with boiling points below 200°C that are not or only slightly soluble in water and can be analyzed by the purge and trap procedure.

1.2.2 Tables 1A/B represent a list of targeted analytes (TCL), which can be included in this scan. The list can be expanded to other volatile analytes.

1.2.3 The NIOSH methods are generally specific for one analyte or a small group of analytes. If only a selected number of compounds are targeted, these methods are suitable. However, if a broad spectrum of analytes are to be tested, either the Tedlar bag method should be used, or for lower concentration ranges heat-desorption tubes need to be employed. (Refer to 1.3.3 below.)

1.2.4 The following NIOSH methods include the targeted compounds in Table 1B:

| Analyte | NIOSH Method . | Category |
|---|---|---|
| 1,2,4-Trichlorobenzene | 5517 | Polychlorobenzenes |
| Naphthalene | 1501 | Aromatic Hydrocarbons |
| Hexachloroethane | 1003 | Halogenated Hydrocarbons |
| Hexachlorobutadiene | 2543 | (Only Targeted Analyte) |
| Benzyl Chloride | 1003 | Halogenated Hydrocarbons |

1.2.5 The protocol described below for the NISHO methods applies to method numbers 1501 and 1003. Separate protocols apply for the analysis by method 2543 and 5517 for hexachlorobutadiene and 1,2,4-trichlorobenzene. If analyses for all compound are to be performed, the Tedlar bag method should be used.

1.3 Reporting Limits

1.3.1 In Table 1A the practical quantification limits (PQL) are listed for an injection volume of 50 mL of air for the Tedlar bag method and Table 1B lists the amount quantified per volume collected for the NIOSH methods. Note that the concentrations are given as weight per volume. If ppm concentrations as v/v are required, conversion factors, using the molecular weight per 22.4 L, are used.

1.3.2 Even though the volume collected for the NIOSH method is much larger than the injection size for the "whole air" method with Tedlar bags, the sensitivity for the NIOSH method is also only in the parts per million range (v/v), because the tubes are extracted with solvent, and only a small aliquot of the extract is injected.

1.3.3 If parts per billion sensitivities are required, either the VOST method or method TO-17 for ambient air need to be used, where the tubes are heat desorbed and the entire amount of volatiles collected is analyzed. (If samples were collected in Tedlar bags, it is possible to transfer the content of the bag in the laboratory to TO-17 tubes for analysis to achieve high sensitivities.).

## 2.0 SUMMARY OF PROCEDURE

### 2.1 Tedlar Bag Preparation

2.1.1 For "whole air" collection, an air sample is brought to the laboratory in Tedlar bags.

2.1.2 A volume up to 50 mL of the bag is withdrawn with a syringe and injected into the purge vessel of a purge and trap (P&T) autosampler.

2.1.3 The compounds are collected on the trap of the P&T concentrator and consequently back flushed at elevated trap temperature onto the analytical column.

2.2 GC/MS Analysis

2.2.1 The compounds are eluted from the column with a temperature program to achieve separation.

2.2.2 The eluting compounds are detected on a electron impact mass spectrometer and integrated on a data system capable of collecting spectral data.

2.2.3 The targeted compounds are evaluated and reported.

2.3 NIOSH Tube Collection and Preparation

2.3.1 For sorbent tube collection by NIOSH method, a predetermined volume of air is pulled through sorbent tubes, and the analytes are concentrated on the sorbent..

2.3.2 The tubes are leached with carbon disulfide, and an aliquot of the extract is injected onto the instrument for analysis.

## 3.0 SAMPLE PRESERVATION, STORAGE AND HOLDING TIMES

3.1 The samples have to be held at 4°C± 2°C from time of collection until delivered to the laboratory.

3.2 At arrival at the lab, the samples are stored refrigerated at 4°C ± 2°C protected from light. The refrigerator has to be located in an area free of volatile contaminants in the atmosphere and cannot be used for storage of standards or extracts. Samples suspected to contain medium or high concentration levels are sealed in cans or bags containing carbon granules to prevent cross contamination.

3.3 Tedlar bag samples should be analyzed as quickly as possible, preferably within 24 h due to some permeability of the bags. They should not be held more than 72 h from collection.

3.4 Holding times for sorbent tubes have not been determined. The samples should be analyzed within 2-3 weeks.

## 4.0 INTERFERENCES AND SAFTY

4.1 Interferences

4.1.1 Interferences can be compounds in the sample "interfering" with the analysis or secondary contaminations from the instrument or introduced during sample storage.

4.1.2 If other analytes are interfering (co-eluting), identification of the targeted analytes is generally still possible, by comparison with the standard spectra.

4.1.3 To avoid secondary contaminations, the samples have to be stored in an area free of volatile contaminants, which might permeate through the septa, namely freons and methylene chloride, which might be present in the lab atmosphere. Vials containing Nanopure water are stored together with the samples to serve as holding blanks.

4.1.4 After analyzing highly concentrated samples, instrument blanks need to be interspersed to demonstrate that no contamination is carried over into the next run. If samples were run with the autosampler, any positives, above the quantification level that are also present, in the sample are reanalyzed. The position of the autosampler needs to be determined (note in run-log), in which a high sample was run and the sample subsequently analyzed in that position also needs to be examined for potential false positives.

4.1.5 Even though the purge efficiency is poor for contaminants with higher molecular weights than the targeted analytes, enough may be purged out to cause interferences in the next run. To elute higher boiling compounds from the column, hold the GC at least for 3 min. at the highest temperature of the program after the retention time of the last analyte. For oily samples, extended baking times may be required to clean the instrument between runs.

4.1.6 Method blanks are required before samples are analyzed in each 12 h period to demonstrate that the instrument is free from interferences.

### 4.2 Safety

4.2.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest level possible.

4.2.2 The reference file of material safety data sheets (MSDS) should be consulted for properties of the chemicals used, to determine handling precautions.

## 5.0 SAMPLE PREPARATION

### 5.1 Equipment and Supplies

- ORBO tubes, specified for the particular NIOSH method in the vendors catalog from SKC, Supelco or equivalent
- Tedlar bags, 1 L or 500 mL
- Gas sampling valves, 250 or 500 mL, optional
- Syringe - 10 mL, gastight with Luerlok tip
- Syringe - 50 mL, gastight with Luerlok tip
- Microsyringes

- Syringe valve - with male and female Luerlok connections
- Balance - capable of weighing 100 g ± 0.001 g
- Volumetric flasks - 10 mL, 50 mL
- Vial - 15 mL with Teflon lined cap
- Spatula - narrow, stainless steel.
- Vial - 2 mL or larger
- Weighing pan - aluminum
- Oven - capable of maintaining 105°C
- Autosampler - 16 positions with purge vessels for five mL sample volumes programmable in conjunction with concentrator, ALS 2016 from Tekmar or equivalent.
- Sample Concentrator - programmable with trap heater, gas controls, and multipoint valve for directing purge and desorb flows, with moisture control module. LSC - 2000 from Tekmar or equivalent.

5.2 Reagents and Standards

- Reagent water - water free from contaminants from Nanopure or equivalent systems
- Methanol - pesticide grade
- System monitoring compounds solution in methanol

| Analyte | ug/mL |
|---|---|
| Toluene-d8 | 25 |
| 4-Bromofluorobenzene | 25 |
| 1,2-Dichloroethane-d4 | 25 |

- QC spiking solution

  All targeted analytes in methanol at a concentration of 25μg/mL

- Internal standard solution in methanol

| Analyte | ug/mL |
|---|---|
| Bromochloromethane | 25 |
| Chlorobenzene-d5 | 25 |
| 1,4-Difluorobenzene | 25 |

5.2.1 Purchase intermediate solutions for each mix at higher concentrations. Prepare the working standards at the required levels by diluting with methanol. Retain the certification of the purchased solution.

5.2.2 As long as ampules are not opened, they can be kept in the freezer up to two years or until the expiration date.

5.2.3 After opening, unused portions of the intermediate solutions should be transferred to small vials with minimal headspace, closed with Teflon lined caps and sealed with Teflon tape. These are stored at -10°C to 20°C and checked for integrity before being used again for standard preparation.

5.2.4 The working standards are opened frequently and therefore should be replaced after one week. To prolong stability, distribute the solution into several smaller vials with minimal headspace and seal and store as in 5.2.3.

5.2.5 All solutions have to be properly labeled and entered into the standard log book.

5.2.6 Before it can be used, each new solution has to be tested for composition.

5.2.7 Equilibrate the spiking solution at room temperature for one hour before using.

5.3 Preparation of Tedlar Bag Samples

5.3.1 Fill clean 10 mL syringes with Nanopure water, without including bubbles. Adjust the volume to 5 mL.

5.3.2 Spike all syringes with 10 uL of surrogate solution and additionally spike one syringe for a lab fortified blank with 10 uL of the QC spiking solution. Also add 10 uL of internal standard spiking solution into all syringes.

5.3.2 For calibrations, spike appropriate volume of calibration solution as indicated in 6.4.2 and 6.4.4.

5.3.3 Load the purge vessel of the autosampler with the 5-mL solutions through the Hamilton valves in run order, loading clean water with internal and surrogate for each sample.

5.3.4 Start autosampler sequence.

5.3.5 Just before the first "sample" starts the purge process, withdraw 50 mL of air from the first sample Tedlar bag.

5.3.6 As soon as the nitrogen flow commences, gradually introduce the 50 mL through the Hamilton valve, careful not to apply too much pressure, which will cause leakage. Any compounds contained in the air will be collected on the trap together with purged internal and surrogate standards.

5.4 Preparation of NIOSH Tubes

5.4.1 Crack ORBO tubes and empty contents into 12 mL vials.

5.4.2 Add 9 mL of toluene. (If the extract requires further concentration, replace toluene with hexane, because of quicker evaporation rates.)

5.4.3 Soak for 30 minutes and occasionally agitate.

5.4.4 Leach blank cartridge in the same manner as samples for method blank.

5.4.5 Directly inject 2 μL of the extracts into the GC/MS.

## 6.0 INSTRUMENT ANALYSIS

### 6.1 Equipment and Supplies

- 
- Trap - to be used in LSC-2000 or PTA-30 W/S, Type K Vocarb 3000 or equivalent.
- Gas Chromatograph - with programmable temperature control, carrier gas control.
- Widebore capillary column - fused silica 105 m x 0.53 mm, 3.0 micron film thickness, RTX-502.2 from Restek or equivalent
- Quadropole mass spectrometer - benchtop, with electron impact ionization and electron multiplier, scanning from 35 to 300 amu
- Data system
- Computer
- Graphics display terminal
- Printer
- Chemstation/Enviroquant software from HP, Target from Thruput, Omega from Khemia or equivalent
- Mass Spectral library - NIST/EPA/MSDC

### 6.2 Reagents and Standards

- Performance check solution - 4-bromofluorobenzene at 25 ug/mL
- Calibration spiking solution (intermediate)- mix containing all targeted analytes in Table 1 and the system monitoring compounds at a recommended concentration of 100 ug/mL in methanol.
- Internal standard solution - in methanol as in 5.2.
- Matrix spike solution – in methanol as in 5.2
- System monitoring compounds - in methanol as in 5.2.
- Initial and continuing calibration standards (working) - water solutions prepared with the above methanol solutions to contain 50

ng/mL of internal standard and the system monitoring compounds, and targeted analytes at the following concentrations: 10, 20, 50, 100, and 200 ug/L.

6.2.1 Intermediate Solution - For preparation and storage of the methanol solutions refer to 5.2.1 to 5.2.5..

6.2.2 Working Solution - The aqueous calibration solutions can be prepared in volumetric flasks or directly in the loading syringe for a volume of 5 mL. Water solutions can only be kept for one hour, unless refrigerated at 4°C ± 2°C and protected from light.

6.3 Setup and Parameters

6.3.1 Typical operating parameters of the analytical system are presented in Table 2.

6.3.2 Carrier flow velocities and temperature programs depend on the individual column used and have to be optimized for the specific column. Equally, the parameters for the mass spectrometer have to be adjusted depending on the particular conditions.

6.3.3 Parameters have to be optimized to achieve sharp peaks for the gases that have to be separated from the solvent peak and are resolved from each other at 90% or greater.

6.4 Calibration

6.4.1 Tuning and Performance Check

6.4.1.1 After major changes of parameters or instrument maintenance that effects the source of the MS, the source has to be tuned. Adjust all voltages, obtain ion ratios for the tuning compound FC43, as established for the specific instrument, to achieve the required BFB ion ratios.

6.4.1.2 Before running calibrations or analyses, check the correct mass calibration with the analysis of 50 ng of the performance check compound BFB.

6.4.1.3 Compare ion ratios found against the DEC acceptance criteria, which are listed in Table 6. If the abundances do not meet the criteria, retune or adjust voltages based on experience before repeating the BFB check.

6.4.1.4 Documentation of acceptable mass calibration must be provided by the mass listing and bar graph plot for the BFB spectrum.

6.4.2 Initial Calibration

In the calibration, the relative response is determined for the major ion of each analyte relative to the major ion of an internal standard. The primary and secondary ions of the analytes are listed in Table 3.

6.4.2.1 Perform a multipoint calibration to establish linearity for all targeted analytes and system monitoring compounds at the following levels: 50, 100, 250, 500 and 1000 ng.For an injection volume of 50 mL of air this translates into air concentrations of 1, 2, 5,10, and 20 μg/L.

6.4.2.2 These amounts are entered with the 5 mL of calibration solutions in water as prepared in 5.3.2. The water concentrations are listed in 5.2.

6.4.2.2 Since relative responses by internal standard method are to be determined, each calibration mix must also contain the internal standards at 50 ug/L.

6.4.2.3 Equally, all sample extracts are to be spiked with 10 uL of the internal standard mix to achieve the same concentration of 50 ug/L.

6.4.2.4 Calculate relative response factors for all analytes utilizing the appropriate internal standard as found in the grouping in Table 5.

6.4.2.5 Compute the responses with the following formula:

Relative Response Factor (RRF)

RRF =

Where:

$A_x$ = Area of characteristic ion for compound measured
$C_{is}$ = Concentration of internal standard (ug/mL)
$A_{is}$ = Area of the characteristic ion for the specific internal standard
$C_x$ = Concentration of compound to be measured (ug/uL) 6.4.2.6 Determine the average response factor by summing factors and from all five concentration levels dividing the sum by the number of results. Since m- and p-xylene coelute, utilize the response factor of o-xylene for all xylenes.

6.4.2.7 Evaluate the multipoint calibration for relative standard deviation with the following computation:

Relative Standard Deviation (RSD)

% RSD

Where:

$RF_i$ = Response factor from the ith calibration run

$RF_{avg}$ = Average response factor for the analyte

n = Number of calibration points for the analyte

6.4.2.8 Compare the factors and RSDs with the acceptance criteria for minimum average response factors and maximum acceptable standard deviations summarized in Table 7.

Allowance is made for two analytes which however must meet the minimum requirement for the RRF of 0.01 with an RSD of less than or equal to 40%.

6.4.2.9 If a particular injection appears to be an outlier, reinject that level. If the criteria still cannot be met, determine the cause and take remedial action in regard to instrument maintenance or replacement of standard solutions.

6.4.2.10 Perform a new multipoint calibration.

6.4.3 Verification of Mass Calibration

6.4.3.1 To check that the tune parameters provide ion ratios that are comparable, make an injection of the performance check substance BFB at the beginning of every 12 hour period of analyses.

6.4.3.2 Check that the obtained ratios meet the acceptance criteria of Table 6. If the ion ratios are outside the limits, adjust the tune parameters until satisfactory ratios are obtained.

6.4.4 Continuous Calibration

6.4.4.1 Once correct tuning is verified, instrument calibration for relative response factors is checked with an injection of a calibration standard containing 50 ug/L of each analyte, system monitoring compound and internal standard.

6.4.4.2 Calculate the RRF (compare 6.4.2.5) and compute the relative percent difference with the following equation:

<u>Percent Difference (% D)</u>

% D =

Where:

$RRF_{avg}$ = Average RRF of initial calibration

$RRF_c$ = RRF of continuous calibration

6.4.4.3 Compare the RRFs and %Ds with the requirements tabulated in Table 7. Allowance is made for two analytes, which must meet the minimum requirements (greater than 0.01 and less than 40%), however.

6.4.4.4 If the results are acceptable, proceed with the analyses. Otherwise repeat the analysis, either with a different continuous calibration standard if a problem with the solution is suspected, or after minor remedial action is performed.

6.4.4.5 If the instrument performance and the initial calibration cannot meet criteria, a new multipoint calibration needs to be analyzed.

6.4.5 Internal Standard Area Checks

6.4.5.1 To assure stability of instrument performance and injections, the internal standard (IS) areas of all injections are monitored.

6.4.5.2 Tabulate all IS areas for a 12 hour period starting with the continuous calibration.

6.4.5.3 Compare areas and retention times with those of the continuous calibration (or medium level standard in a multipoint calibration). Areas must be between -50 and +100 percent and retention times within 0.5 minutes.

6.4.5.4 Samples with noncompliant areas must be reanalyzed to demonstrate matrix interference.

6.5 Sample Analysis

6.5.1 The method blank, QC extracts and samples are sequentially processed with the autosampler with the same instrument parameters (see 6.3) as the calibration standard(s).

6.5.2 Data of all injections are collected on the data system with the the Chemstation and processed with the Enviroquant software or Target.

6.6 Evaluation of Analyses

6.6.1 Identification of Targeted Analytes

6.6.1.1 Compound identification is performed by "reverse library search" based on the computer algorithms for matching of the sample spectra with the library spectra developed in-house from standard injections.

6.6.1.2 All ions in the standard mass spectrum of a relative intensity greater than 10 percent of the most abundant ion must be present, and the relative intensities of the ions must agree within ± 20 percent. The ions greater than 10 percent in the sample but not in the standard spectrum must be accounted for.

6.6.1.3 Another means of identifying compounds is by comparison of the relative retention time of the sample peak with that in the standard analysis. The relative retention times (RRT) should not deviate by more than ± 0.06 RRT units. This serves as a confirmation of the spectra identification and provides a means to distinguish compounds with the same spectra but with different elution times.

### 6.6.2 Quantification of Targeted Analytes

6.6.2.1 If the computer search establishes a positive, the concentration of the analyte is computed by the software program with the RRFs of the calibration established by internal standard method and reported in the "quant report".

6.6.2.2 The RRF used is either from the mid level of the multipoint calibration for those samples analyzed subsequently, or the daily RRF of the continuous calibration for samples analyzed on other days.

6.6.2.3 The data system is capable of computing the reportable sample concentration, if the appropriate parameters are entered according to the following computation:

<u>Sample Concentration · Conc. (water), Conc. (soil)</u>

Conc. water =

Conc. soil =

Where:

Conc. (water) = Concentration of analyte in water (ug/L)

Conc. (soil) = Concentration of analyte in soil (ug/kg)

$A_x$ = Area of characteristic ion of analyte

$A_{is}$ = Area of characteristic ion of internal standard

IS = Amount of internal standard (ng)

RRF = Relative response factor of analyte

$V_o$ = Volume of sample purged (mL)

DF = Dilution factor

$W_s$ = Weight of sample purged (g)

D = factor for solids content =

6.6.2.4 The total xylene is reported for the summed area of the two peaks utilizing the response factor o-xylene. The values for the cis- and trans- isomers of 1,2-dichloroethene are also summed and reported as total.

## 7.0 QUALITY CONTROL

### 7.1 System Monitoring Compound

7.1.1 To monitor method efficiency, add a mix of surrogate standards ("system monitoring compounds") to all samples, blanks and QC samples as described in 5.3.

7.1.2 Calculate the recovery for all surrogates as:

Percent Recovery (% Rec)

% Rec = x 100%

Where: X = Concentration found (ug/L or ug/kg)
T = "Targeted" concentration spiked (ug/L or ug/kg)

7.1.3 Compare the recoveries with the QC limits in Table 8. Investigate noncompliant recoveries and take corrective action as e.g.:

- Recalculate data
- Reanalyze sample
- Verify volume or concentration of spike
- Perform instrument maintenance

7.1.4 Reanalyze samples after corrective action.

7.1.5 If the reanalysis meet the acceptance criteria, only report the second analysis, otherwise present both sets of data.

### 7.2 Accuracy

7.2.1 One lab fortified blank (LFB) is spiked with the targeted analytes and prepared and analyzed with the sample batch to monitor accuracy. (Compare 5.2, 5.3.2)

7.2.2 Calculate the accuracy (% recovery) and reproducibility (relative percent difference) according to the following equations:

Recovery (% Rec)

% Rec = x 100%

Where:

% Rec = Recovery of spike in percent

X = Measured result (ug/L or ug/kg)

B = "Background" concentration of unspiked sample (ug/L or ug/kg). This value is 0 for surrogate recovery calculations.

T = Targeted value of concentration spiked (ug/L or ug/kg)

Relative Percent Difference (RPD)

RPD =
Where:
RPD = Relative percent difference (%)
MSR = Matrix spike recovery (%)
MSDR = Matrix spike duplicate recovery (%)

## 7.3 Blanks

### 7.3.1 Method Blank

7.3.1.1 A method blank is five mL of Nanopure water or equivalent or five g of a purified solid matrix spiked with the system monitoring compounds and internal standards that is analyzed prior to samples to ensure the analytical system is free of interferences. The blank must be analyzed immediately following the standard to ensure that there is no carryover. A method blank is analyzed for each 12 hours of analysis at the same conditions as the standard and samples.

7.3.1.2 The interferences seen in the method blank must be less than the PQL except for methylene chloride, acetone, and 2-butanone. These compounds must be less than five times the PQL.

7.3.1.3 If the method blank exceeds the above criteria, the source of the contamination must be found and the problem eliminated prior to continuing with analysis. All samples analyzed with a blank, that do not meet the above criteria, must be reanalyzed.

### 7.3.2 Instrument Blank

7.3.3.2 7.3.2.1 After analyzing highly concentrated samples, instrument blanks need to be interspersed to demonstrate that no contamination is carried over into the next run. If samples were run with the autosampler, any positive results, above the PQL that are also present, in the sample are reanalyzed. The position of the autosampler needs to be determined (note in runbook), in which a high sample was run and the sample subsequently analyzed in that position also needs to be examined for potential false positives.

### 7.4 Method Detection Limit (MDL)

7.4.1 The MDLs define the lowest levels, where positives will be found with 99 percent confidence with the particular analytical method in clean media. An example of a detection limit study for this procedure is presented in Table 9. Updated MDLs can be found in the Laboratory Information Management System (LIMS).

7.4.2 Determine the method detection limit by analyzing seven replicate lab fortified blanks containing each targeted analyte at or under the practical quantification limit.

7.4.3 Calculate the standard deviation according to the equation:

Standard Deviation (S)

S =

Where:

$X_i$= Individual result

n = Number of replicates

= Average results

7.4.4 From the obtained S calculate the MDL as follows:

Method Detection Limit (MDL)

MDL = $t_{n-1}$ x S

Where:

S = Standard deviation

$t_{n-1}$ = Students t-test value (for seven replicates $t_{n-1}$ = 3.14)

7.4.5 The MDL studies are submitted in the data package

7.4.6 Update the MDLs in the testcode of the LIMS annually. This is done by entering the MDLs into an excel spread sheet and transferring the data into the method "testcode".

## 8.0 REPORTING

### 8.1 Evaluation of Analytical Data

8.1.1 Check that acceptance criteria are met for QC data, BFB, calibrations and internal standards.

8.1.2 Make sure that the correct RRFs are used for positive targeted compounds.

8.1.3 Examine whether the internal standard coelutes with interferences causing incorrect TIC computations. To assess whether the internal standard areas are reasonable, compare them with the standard and blank. Areas should not deviate more than about -50% or +100%. Manually correct data as necessary, using the nearest internal standard free of interferences.

8.1.4 Visually compare the spectra of positives with the standard spectra to verify the identifications.

8.1.5 Confirm correct peak integration and edit as necessary. Manual integrations have to be signed. Provide an extracted ion profile for the major mass of the reintegrated peak.

8.1.6 Perform final quantifications with appropriate dilution factors.

8.1.7 The finalized data are entered into the LIMS software and reported as described in the Quality Assurance Manual.

8.2 Generating of the Data Package

8.2.1 After evaluating the analyses, compile all analytical data in "data packages" in the reporting format and with all deliverables of 95-1 of the NYSDEC ASP.

8.2.2 Arrange data in five report sections:

QC Summary

Sample Data

Standard Data

Raw QC Data

Documentation

8.2.3 The package includes report forms I - VIII from the ASP for summarizing sample results, calibrations and QC data. With the exception of certain sample information data in the headers, all results calculated by the data system are automatically entered by the software into the form templates.

8.2.4 Print all completed ASP forms and add printouts of all chromatograms, quant reports, library searches and spectra and arrange them in the sequence specified in the protocol.

8.2.5 Sign the $H_2M$ report release form and include at the end of the package.

8.3 Review

8.3.1 The package is submitted for review by the supervisor, QA Manager or equivalent.

8.3.2 If needed, the package is returned to the analyst for clarifications or corrections.

8.3.3 Uncorrectable deviations or non-compliances are noted in the SDG narrative upon review.

## TABLE 1A

## PRACTICAL QUANTIFICATION LIMITS (PQL) FOR TARGETED VOLATILE ORGANICS BY TEDLAR METHOD

| Analyte | CAS No. | PQL (ug/L) |
|---|---|---|
| Chloromethane | 74-87-2 | 1 |
| Vinyl chloride | 75-01-4 | 1 |
| Bromomethane | 74-83-9 | 1 |
| Chloroethane | 75-00-3 | 1 |
| 2-Butanone | 78-93-3 | 1 |
| Carbon disulfide | 75-15-0 | 1 |
| 1,1-Dichloroethene | 75-35-3 | 1 |
| Methylene chloride | 75-09-2 | 1 |
| 1,2-Dichloroethene (total) | 540-59-0 | 1 |
| 1,1-Dichloroethane | 75-34-4 | 1 |
| Chloroform | 67-66-3 | 1 |
| 1,2-Dichloroethane | 107-06-2 | 1 |
| 2-Butanone | 78-93-3 | 1 |
| 1,1,1-Trichloroethane | 71-55-6 | 1 |
| Carbon tetrachloride | 56-23-5 | 1 |
| Benzene | 71-43-2 | 1 |
| Trichloroethene | 79-01-6 | 1 |
| 1,2-Dichloropropane | 78-87-5 | 1 |
| Bromodichloromethane | 75-27-4 | 1 |
| cis-1,3-Dichloropropene | 10061-01-5 | 1 |
| Toluene | 108-88-3 | 1 |
| trans-1,3-Dichloropropene | 10061-02-6 | 1 |
| 1,1,2-Trichloroethane | 79-00-5 | 1 |
| 4-Methyl-2-pentanone | 108-10-1 | 1 |
| Chlorobenzene | 108-90-7 | 1 |
| Tetrachloroethene | 127-18-4 | 1 |
| Dibromochloromethane | 124-48-1 | 1 |
| 2-Hexanone | 591-78-6 | 1 |
| Ethylbenzene | 100-41-4 | 1 |
| Xylenes(total) | 1330-20-7 | 1 |
| Styrene | 100-42-5 | 1 |
| Bromoform | 75-25-2 | 1 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 1 |
| 1,2,4-Trichlorobenzene | 120-82-1 | 1 |
| Naphthalene | 91-20-3 | 1 |
| Hexachloroethane | 67-72-1 | 1 |
| Hexachlorobutadiene | 87-68-3 | 1 |
| Benzyl Chloride | 100-44-7 | 1 |

## TABLE 1B

## PRACTICAL QUANTIFICATION LIMITS (PQL) FOR TARGETED VOLATILE ORGANICS BY NIOSH METHODS

| Analyte | CAS No. | PQL 1) µg/Volume sampled |
|---|---|---|
| 1,2,4-Trichlorobenzene | 120-82-1 | |
| Naphthalene | 91-20-3 | 25 |
| Hexachloroethane | 67-72-1 | 25 |
| Hexachlorobutadiene | 87-68-3 | |
| Benzyl Chloride | 100-44-7 | 25 |

1) These values are based on an extract volume of 1mL and an injection size of 2µL.

## TABLE 2
## EXAMPLE OF
## INSTRUMENT OPERATING PARAMETERS FOR VOLATILE ORGANICS

### Purge Process

| | |
|---|---|
| Sample Size | 5 mL |
| Purge Time | 11 min |
| Purge Flow | 40 mL/min |
| Purge Temp. | Ambient for water and medium level soil, 40°C for low level soil |
| Desorption Flow | 15 mL/min |
| Desorption Time | 2.0 ± 0.1 min |
| Desorption Temp. | 180°C |

### GC Conditions

| | |
|---|---|
| Column | 105 m long x 0.53 mm ID, 3.0 um film thickness, fused silica widebore capillary column, RTX-502.2 Restek or equivalent |
| Carrier | Helium |
| Flow Rate | 15 mL/min |
| Temperature Program: | Initial temp: 45°C<br>Initial hold: 0 min<br>Ramp 1: 70°C/min to 30°C<br>Hold 1: 5.5 min<br>Ramp 2: 70°C/min to 120°C<br>Hold 2: 7.5 min<br>Ramp 3: 40°C/min to 220°C<br>Final Hold: 8 min |

## TABLE 2 (Continued)

## INSTRUMENT OPERATING PARAMETERS FOR VOLATILE ORGANICS

## MS Conditions (Hewlett Packard 5890)

| | |
|---|---|
| Separator Temp: | 220°C |
| Manifold Temp: | 250°C |
| Mass Range: | 35 to 300 |
| Scan Time: | 0.38 sec |
| Number of scans: | 3220 |
| Threshold: | 50 |
| Minimum peak area: | 500 |

## TABLE 3

## CHARACTERISTIC IONS FOR VOLATILE TARGETED COMPOUNDS

| Parameter | Primary Ion* | Secondary Ions |
|---|---|---|
| chloromethane | 50 | 52 |
| vinyl chloride | 62 | 64 |
| bromomethane | 94 | 96 |
| chloroethane | 64 | 66 |
| acetone | 43 | 58 |
| 2-butanone | 43*** | 72 |
| carbon disulfide | 76 | 78 |
| 1,1-dichloroethene | 96 | 61, 63 |
| methylene chloride | 84 | 49, 86 |
| 1,2-dichloroethene | 96 | 61, 98 |
| 1,1-dichloroethane | 63 | 65, 83 |
| chloroform | 83 | 85, 47 |
| 1,2-dichloroethane | 62 | 98, 64 |
| 1,1,1-trichloroethane | 97 | 61, 99 |
| 1,2-dichloroethane-$d_4$ | 65 | 102 |
| carbon tetrachloride | 117 | 119 |
| benzene | 78 | 77 |
| trichloroethene | 95 | 130, 132 |
| bromodichloromethane | 83 | 85, 127 |
| cis-1,3-dichloropropene | 75 | 77, 110 |
| toluene | 91 | 92*** |
| trans-1,3-dichloropropene | 75 | 77, 110 |
| 1,1,2-trichloroethane | 83 | 85, 97 |
| 4-methyl-2-pentanone | 43 | 57, 58 |
| toluene-$d_8$ | 98 | 100 |
| 4-bromofluorobenzene | 95 | 176 |
| chlorobenzene | 112 | 77, 114 |
| 1,3-dichloropropane | 76 | 41, 78 |
| tetrachloroethene | 164 | 129, 166 |
| dibromochloromethane | 129 | 127, 131 |

## TABLE 3 (Continued)

## CHARACTERISTIC IONS FOR VOLATILE TARGETED COMPOUNDS

| Parameter | Primary Ion* | Secondary Ions |
|---|---|---|
| 2-hexanone | 43 | 58, 57 |
| ethylbenzene | 106 | 91, 105 |
| xylenes (ortho) | 106 | 91, 105 |
| styrene | 104 | 78, 103 |
| bromoform | 173 | 175, 254 |
| 1,1,2,2-tetrachloroethane | 83 | 85, 131, 133, 166 |
| m\p-xylenes | 106 | 91, 105 |
| 1,2,4-trichlorobenzene | 180 | 182, 145 |
| naphthalene | 128 | |
| hexachloroethane | 117 | 223, 227 |
| hexachlorobutadiene | 225 | 223,227 |
| benzyl Chloride | 91 | 126 |

* The primary ion should be used unless interferences are present, in which case, a second ion may be used.

** m/z 43 is used for quantification of 2-Butanone, but m/z 72 must be present for positive identification.

*** Quantitation ion differs from primary ion.

## TABLE 4

## CHARACTERISTIC IONS FOR SYSTEM MONITORINGCOMPOUNDS AND INTERNAL STANDARDS FOR VOLATILE ORGANIC COMPOUNDS

| Compound | Primary Ion | Secondary Ion(s) | CAS No.: |
|---|---|---|---|
| System Monitoring Compounds | | | |
| 4-Bromofluorobenzene | 95 | 174, 176 | 460-00-4 |
| 1,2-Dichloroethane-$d_5$ | 65 | 102 | 17060-07-0 |
| Toluene-$d_8$ | 98 | 70, 100 | 2037-26-5 |
| Internal Standards | | | |
| 1,4-Difluorobenzene | 114 | 63, 88 | 540-36-3 |
| Chlorobenzene-$d_5$ | 117 | 82***, 119 | 3114-55-4 |
| Bromochloromethane | 128 | 49,130,51 | 74-97-5 |

*** Quantitation ion differs from primary ion.

## TABLE 5

## VOLATILE INTERNAL STANDARDS ASSIGNED FOR QUANTITATION OF TARGETED COMPOUNDS AND SYSTEM MONITORING COMPOUNDS

| Bromochloromethane (IS) | 1,4-difluorobenzene (IS$_2$) | Chlorobenzene-d5 (IS$_3$) |
|---|---|---|
| chloromethane | 1,1,1 trichloroethane | 2 hexanone |
| bromomethane | carbon tetrachloride | 4 methyl 2 pentanone |
| vinyl chloride | bromodichloromethane | tetrachloroethene |
| chloroethane | 1,2 dichloropropane | 1,1,2,2 tetrachloroethane |
| methylene chloride | trans 1,3 dichloropropene | toluene |
| acetone | trichloroethene | chlorobenzene |
| carbon disulfide | dibromochloromethane | ethylbenzene |
| 1,1 dichloroethene | 1,1,2 trichloroethane | xylenes(total) |
| 1,1 dichloroethane | benzene | styrene |
| 1,2 dichloroethane | cis 1,3 dichloropropene | bromofluorobenzene |
| 2 butanone | bromoform | toluened8 |
| 1,2 dichloroethane-d-4 | | 1,2-dibromoethane |
| chloroform | | 1,4-dichlorobenzene |
| 1,2 dichloroethene total | | 1,2,4-trichlorobenzene |
| benzyl chloride | | naphthalene |
| | | hexachloroethane |
| | | hexachlorobutadiene |

## TABLE 6

## BFB KEY IONS AND ION ABUNDANCE CRITERIA

| Mass | Ion Abundance Criteria |
|---|---|
| 50 | 15 - 40 percent of mass 95 |
| 75 | 30 - 60 percent of mass 95 |
| 95 | Base peak, 100 percent relative abundance |
| 96 | 5.0 - 9.0 percent of mass 95 |
| 173 | Less than 2.0 percent of mass 174 |
| 174 | 50 - 120 percent of mass 95 |
| 175 | 5.0 - 9.0 percent of 174 |
| 176 | 95 - 101 percent of 174 |
| 177 | 5.0 - 9.0 percent of 176 |

NOTE: All ion abundances must be normalized to m/z 95, the nominal base peak, even though the ion abundance of m/z 174 may be up to 120 percent that of m/z 95.

## TABLE 7

## RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION OF VOLATILE ORGANIC COMPOUNDS

| Volatile Compound | Minimum RRF | Maximum % RSD | Maximum % Diff |
|---|---|---|---|
| chloromethane | 0.010 | 100 | ±100 |
| vinyl chloride | 0.100 | 20.5 | ±25.0 |
| bromomethane | 0.100 | 20.5 | ±25.0 |
| chloroethane | 0.010 | 100 | ±100 |
| acetone | 0.010 | 100 | ±100 |
| 2-butanone | 0.010 | 100 | ±100 |
| carbon disulfide | 0.010 | 100 | ±100 |
| 1,1-dichloroethene | 0.100 | 20.5 | ±25.0 |
| methylene chloride | 0.010 | 100 | ±100 |
| total-1,2-dichloroethene | 0.010 | 100 | ±100 |
| 1,1-dichloroethane | 0.200 | 20.5 | ±25.0 |
| Chloroform | 0.200 | 20.5 | ±25.0 |
| 1,2-dichloroethane | 0.100 | 20.5 | ±25.0 |
| 1,1,1-trichloroethane | 0.100 | 20.5 | ±25.0 |
| 1,2-dichloroethane-$d_4$ | 0.010 | 100 | ±100 |
| 1,1-dichloropropene | 0.010 | 100 | ±100 |
| carbon tetrachloride | 0.100 | 20.5 | ±25.0 |
| benzene | 0.500 | 20.5 | ±25.0 |
| trichloroethene | 0.300 | 20.5 | ±25.0 |
| 1,2-dichloropropane | 0.010 | 100 | ±100 |
| bromodichloromethane | 0.200 | 20.5 | ±25.0 |
| cis-1,3-dichloropropene | 0.200 | 20.5 | ±25.0 |
| toluene | 0.400 | 20.5 | ±25.0 |

TABLE 7 (Continued)

RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION

OF VOLATILE ORGANIC COMPOUNDS

| Volatile Compound | Minimum RRF | Maximum % RSD | Maximum % Diff |
|---|---|---|---|
| trans-1,3-dichloropropene | 0.100 | 20.5 | ±25.0 |
| 1,1,2-trichloroethane | 0.100 | 20.5 | ±25.0 |
| 4-methyl-2-pentanone | 0.010 | 100 | ±100 |
| toluene-$d_8$ | 0.010 | 100 | ±100 |
| bromofluorobenzene | 0.200 | 20.5 | ±25.0 |
| chlorobenzene | 0.500 | 20.5 | ±25.0 |
| 1,3-dichloropropane | 0.010 | 100 | ±100 |
| tetrachloroethene | 0.200 | 20.5 | ±25.0 |
| dibromochloromethane | 0.100 | 20.5 | ±25.0 |
| 2-hexanone | 0.010 | 100 | ±100 |
| ethylbenzene | 0.100 | 20.5 | ±25.0 |
| xylenes(total) | 0.300 | 20.5 | ±25.0 |
| styrene | 0.300 | 20.5 | ±25.0 |
| bromoform | 0.100 | 20.5 | ±25.0 |
| trans-1,4-dichloro-2-butene | 0.010 | 100 | ±100 |
| 1,1,2,2-tetrachloroethane | 0.300 | 20.5 | ±25.0 |
| 1,2,4-trichlorobenzene | 0.010 | 100 | ±100 |
| naphthalene | 0.010 | 100 | ±100 |
| hexachloroethane | 0.010 | 100 | ±100 |
| hexachlorobutadiene | 0.010 | 100 | ±100 |
| benzyl Chloride | 0.010 | 100 | ±100 |

### TABLE 7 (Continued)
### RELATIVE RESPONSE FACTOR CRITERIA FOR INITIAL AND CONTINUING CALIBRATION
### OF VOLATILE ORGANIC COMPOUNDS

SYSTEM MONITORING COMPOUNDS

| | | | |
|---|---|---|---|
| Bromofluorobenzene | 0.200 | 20.5 | ±25.0 |
| Toluene-$d_8$ | 0.010 | 100. | ±100. |
| 1,2-Dichloroethane-$d_4$ | 0.010 | 100. | ±100. |

## TABLE 8

## SYSTEM MONITORING COMPOUND RECOVERY LIMITS

| Compound | % Recovery |
|---|---|
| Toluene-$d_8$ | 60-140 |
| Bromofluorobenzene | 60-140 |
| 1,2-Dichloroethane-$d_4$ | 60-140 |

## TABLE 9

## METHOD DETECTION LIMITS

(NOT DETERMINED)

## TABLE 9

## METHOD DETECTION LIMITS

## (NOT DETERMINED)

# Appendix 5

## Community Air Monitoring Program

# New York State Department of Health
# Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

## Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

## VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

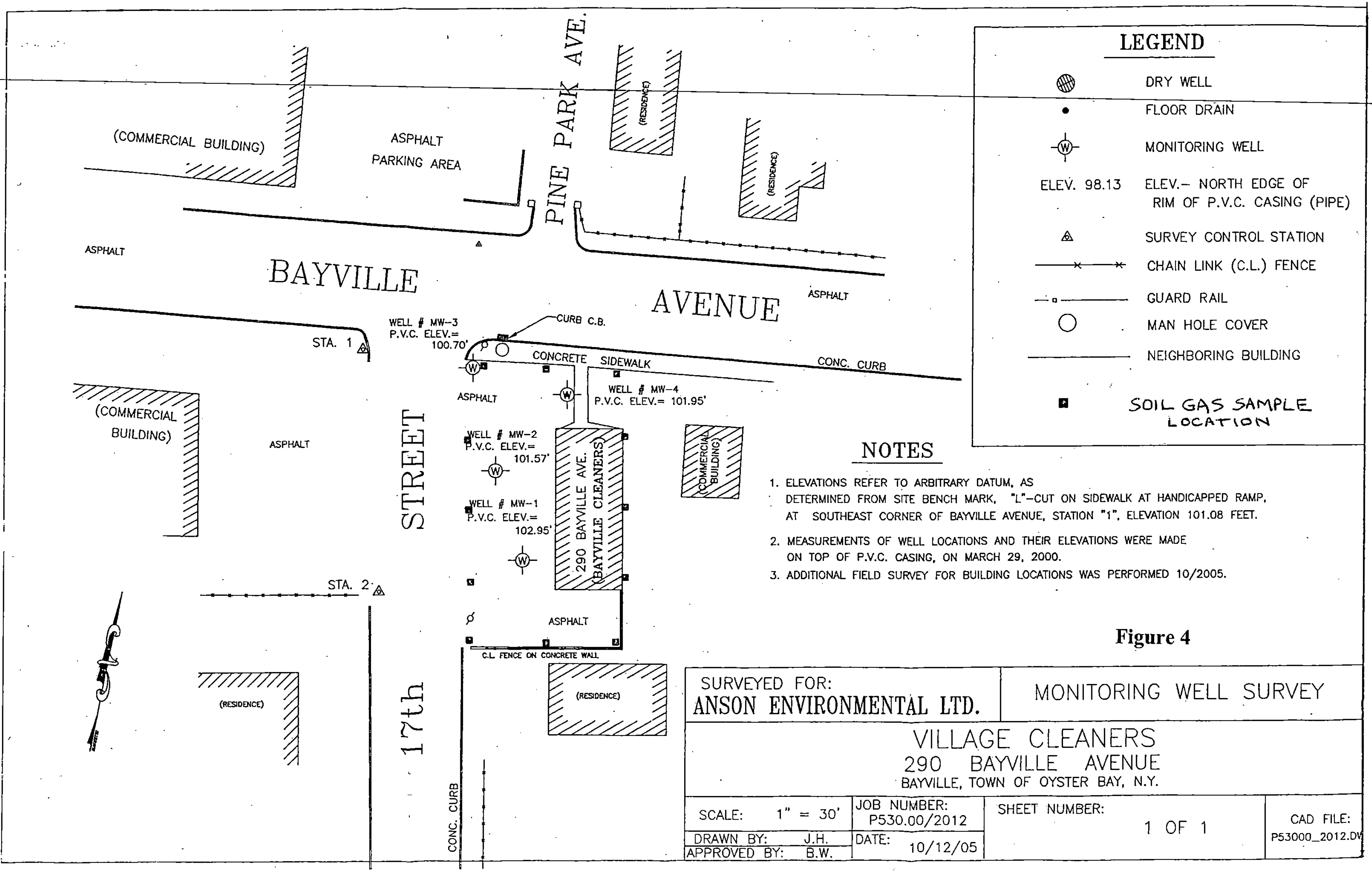
## Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/$m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/$m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/$m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/$m^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.



## LEGEND

| | |
|---|---|
| ▨ | DRY WELL |
| ● | FLOOR DRAIN |
| Ⓦ | MONITORING WELL |
| ELEV. 98.13 | ELEV.– NORTH EDGE OF RIM OF P.V.C. CASING (PIPE) |
| △ | SURVEY CONTROL STATION |
| —×—×— | CHAIN LINK (C.L.) FENCE |
| —▫— | GUARD RAIL |
| ○ | MAN HOLE COVER |
| —— | NEIGHBORING BUILDING |
| ■ | SOIL GAS SAMPLE LOCATION |

## NOTES

1. ELEVATIONS REFER TO ARBITRARY DATUM, AS DETERMINED FROM SITE BENCH MARK, "L"–CUT ON SIDEWALK AT HANDICAPPED RAMP, AT SOUTHEAST CORNER OF BAYVILLE AVENUE, STATION "1", ELEVATION 101.08 FEET.
2. MEASUREMENTS OF WELL LOCATIONS AND THEIR ELEVATIONS WERE MADE ON TOP OF P.V.C. CASING, ON MARCH 29, 2000.
3. ADDITIONAL FIELD SURVEY FOR BUILDING LOCATIONS WAS PERFORMED 10/2005.

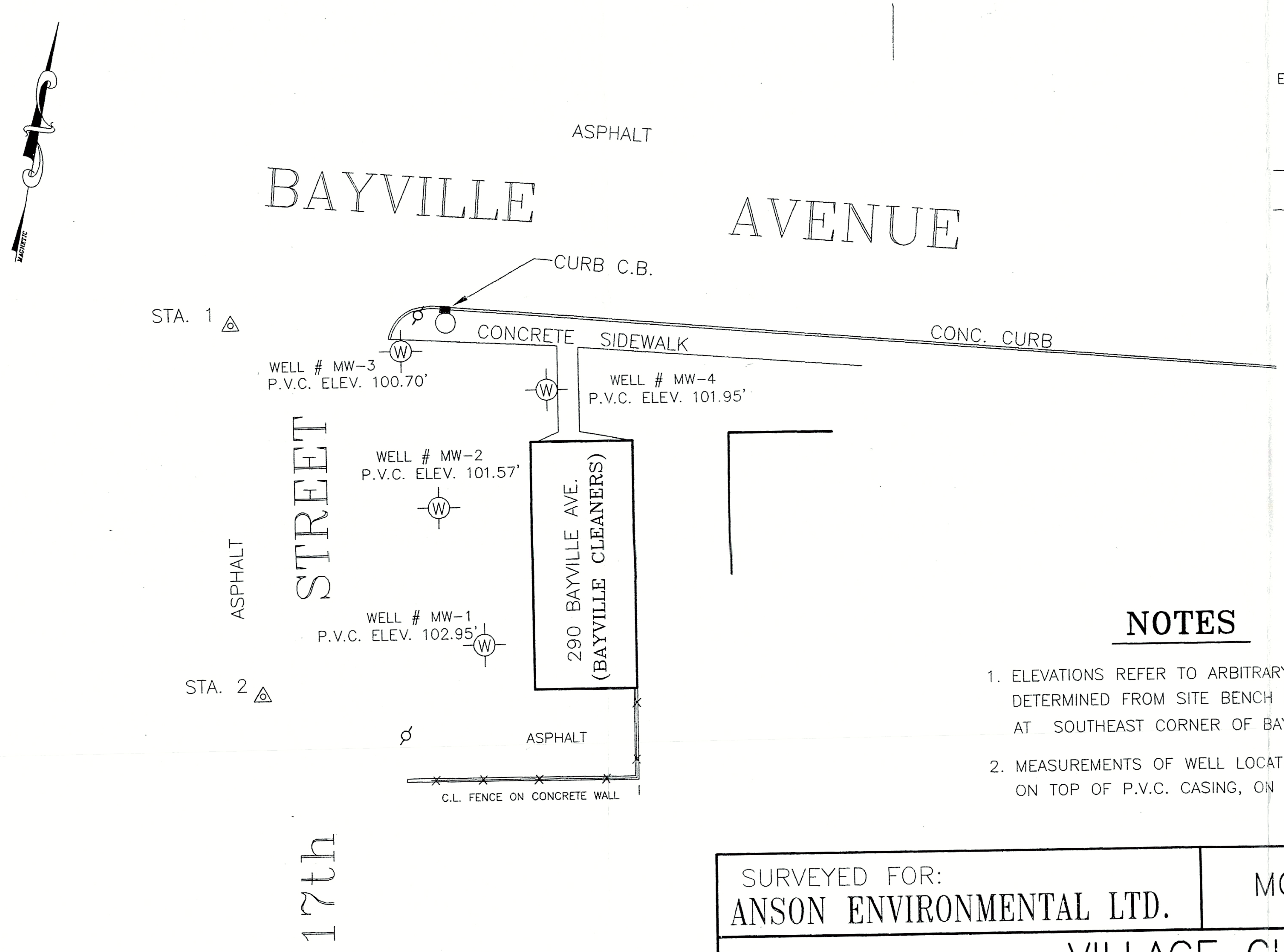
**Figure 4**

SURVEYED FOR:
ANSON ENVIRONMENTAL LTD.

MONITORING WELL SURVEY

VILLAGE CLEANERS
290 BAYVILLE AVENUE
BAYVILLE, TOWN OF OYSTER BAY, N.Y.

SCALE: 1" = 30'
DRAWN BY: J.H.
APPROVED BY: B.W.
JOB NUMBER: P530.00/2012
DATE: 10/12/05
SHEET NUMBER: 1 OF 1
CAD FILE: P53000_2012.DW



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MONITORING WELL SURVEY

VILLAGE CLEANERS
290 BAYVILLE AVENUE
BAYVILLE, TOWN OF OYSTER BAY, N.Y.

SCALE: 1" = 20'
DRAWN BY: J.H.
APPROVED BY: B.W.
JOB NUMBER: 2012
DATE: 4/7/00
SHEET NUMBER: 1 OF 1
CAD FILE: 2012.DWG

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