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Alexander B. Grannis
Commissioner

July 11, 2007

Mr. Peter Brighton
Walden Associates
16 Spring Street
Oyster Bay, NY 11771

Re: Bayville Village Cleaners #V00220
Revised Site Investigation Work Plan: May 2007

Dear Mr. Brighton,

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the referenced work plan. Based upon the information and representations given in the work plan and previous reports, the plan is hereby approved.

Please notify the NYSDEC five days prior to the initiation of field activities so that the Department can have a representative present to oversee field work and to split soil and groundwater samples. If you should have any questions, please feel free to contact me at (631) 444-0246.

Sincerely,

James Ascher
Engineering Geologist 2

cc: M. Lesser
A. Tamuno
C. Vasudevan
W. Parish
G. Bobersky
D. Miles
R. Ockerby
J. DeFranco

REVISED SITE INVESTIGATION WORK PLAN

FOR

VCP#: V00220-1;
VOLUNTARY CLEANUP AGREEMENT#: W1-0848-9903

BAYVILLE VILLAGE CLEANERS
290 BAYVILLE ROAD
BAYVILLE, NEW YORK

BVC0106

MAY 17, 2007

PREPARED FOR:

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
BUILDING 40, SUNY
STONY BROOK, NY 11790

WALDEN ENVIRONMENTAL ENGINEERING, PLLC
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1.0 Introduction

Walden Environmental Engineering, PLLC (Walden) has been retained by Mr. Thomas Ryan to develop and implement this *Site Investigation Work Plan* to define the nature and extent of the contamination at the Bayville Village Cleaners, 290 Bayville Road in the Village of Bayville, New York (Section 28, Block 20, Lot 58); hereafter referred to as the site (Refer to **Figure 1**). The procedures, methods and quality control Walden shall utilize in performing the work are defined herein.

Following several environmental investigation and sampling events at the site (refer to **Appendix A** for a summary of site history), Mr. Ryan entered into the Voluntary Cleanup Program with the New York State Department of Environmental Conservation (NYSDEC) on September 13, 1999 (VCP #:V00220-1; Voluntary Cleanup Agreement #:W1-0848-9903).

1.1 Site Description

The site is a commercial property with a small single story building (approximately 1,325 ft^2) containing the Bayville Village Cleaners dry cleaning facility and an associated parking lot. The site is abutted by Bayville Avenue to the North, Tri-County Installations, Inc, (plumbing and heating business) to the East, residential homes to the South, and 17th Street to the West.

The site is currently operating as a dry cleaning facility. A Realstar Model KM503 dry cleaning machine was installed on site in January 2002 and is currently in use. This Realstar dry cleaning machine is hydrocarbon based and does not utilize Tetrachloroethylene (PCE).

2.0 Site Investigation Work Plan Activities

This *Site Investigation Work Plan* was developed in accordance with the requirements of the NYSDEC, NYSDOH and VCP #:V00220-1; Voluntary Cleanup Agreement #:W1-0848-9903. Soil vapor/air, soil and groundwater sampling are proposed to be conducted at the site due to the potential of soil gas, soil and groundwater contamination. A sampling plan for each media is presented below.

2.1 Soil Vapor Intrusion Survey

Although the Bayville Village Cleaners no longer uses PCE in the on site dry cleaning process, concerns exist with regards to the potential for vapor intrusion from contaminated soil gas, if present, and the potential impacts on indoor air quality. A soil vapor intrusion investigation plan was developed in accordance with *NYSDEC DER-13: Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York* (issued October 18, 2006) and *NYSDOH: Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (dated October 2006). A total of eight (8) soil vapor and indoor/outdoor air samples will be collected at the site.

2.1.1 Exterior Soil Gas Sampling

Soil gas samples will be collected on site to determine whether this environmental medium is contaminated, to characterize the nature and extent of the contamination, and to identify possible sources of the contamination, if present. Soil gas surveys are used to determine if volatile organic compounds (VOC's) are present at detectable concentrations within the pore space of the soil media. The soil gas data collected will be used by the NYSDEC and NYSDOH to make a determination as to whether a vapor intrusion study is necessary in the surrounding community.

Five (5) soil gas samples will be collected around the perimeter of the on site building, through paved or concrete surfaces (surrounding surface confining layers are present). All soil gas samples collected around the perimeter of the building are proposed to be collected at a depth comparable to the depth of foundation footings (determined on a building-specific basis) or at least 1 foot above the water table in areas where the groundwater table is less than 6 feet below grade.

Two (2) sampling locations will be biased to the areas of former known soil contamination on the western side of the building and sited adjacent to the former evaporator discharge and vacuum discharge pipe locations. Another two (2) sampling locations will be sited at the northern and eastern sides of the building. The final sampling location will be sited along the south side of the property, between the cesspool and the property line, or, as near to the property line as possible.

Refer to **Figure 2** for the proposed locations of soil gas sampling points. **Figures 1 and 2** also identify surrounding land uses (i.e. homes, businesses) for the purpose of identifying other potential receptors.

2.1.2 Building Interior Inspection

If possible, a pre-sampling building inspection will be performed to identify potential vapor intrusion pathways and determine appropriate sub-slab and indoor air sampling locations. The building will be inspected to evaluate the physical layout and conditions of the building and to identify conditions or materials stored and/or used (especially historic or current storage or use of volatile chemicals in commercial processes, such as spot cleaning of clothing on site, and/or during building maintenance) that may affect or interfere with the proposed sampling or interpretation of the sampling results. Consideration will be given to factors such as access for installation/sampling purposes, interior uses of the building, foundation/floor slab installation and conditions, heating/ventilation/ mechanical system operation, and utility layout/breaches.

To reduce the potential for interference and dilution effects of samples, the client will be notified in advance of sampling to ensure that the building occupants avoid the following activities within 24 hours prior to sampling wherever possible (*Final NYSDOH CEH BEEI Soil Vapor Intrusion Guidance*, October 2006, p. 33):

- Opening any windows, fireplace dampers, openings or vents;

- Operating ventilation fans unless special arrangements are made;
- Smoking in the building;
- Painting;
- Using a wood stove, fireplace or other auxiliary heating equipment (e.g., kerosene heater);
- Operating or storing automobile in an attached garage;
- Allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
- Cleaning, waxing or polishing furniture, floors or other woodwork with petroleum or oil-based products;
- Using air fresheners, scented candles or odor eliminators;
- Engaging in any hobbies that use materials containing volatile chemicals;
- Using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Lawn mowing, paving with asphalt, or snow blowing;
- Applying pesticides;
- Using building repair or maintenance products, such as caulk or roofing tar; and
- Bringing freshly dry-cleaned clothing or furnishings into the building.

2.1.3 Sub-slab Vapor Sampling

In accordance with the NYSDOH request in the NYSDEC letter dated May 5, 2005, one (1) sub-slab soil vapor sample will be collected within the on-site building in a central location, away from the building footings (Refer to **Figure 2**). The sub-slab vapor sample will be collected from a sub-slab sampling port installed below the concrete slab of the building via Summa® canister over a 24 hour period.

Sub-slab vapor samples and indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and doors and windows are closed. In New York State, heating systems are generally expected to be operating routinely from November 15th to March 31st. During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time.

Sub-slab vapor probes will be installed at locations where the potential for ambient air infiltration from floor penetrations is minimal. Accordingly, the building floor will be inspected prior to installation of the sub-slab vapor probe, and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) observed will be noted and recorded.

2.1.4 Indoor Air Sampling

One (1) indoor air sample will be collected concurrently with the sub-slab vapor sample, as requested in the NYSDEC letter dated December 12, 2005. The indoor air sample will be sited at approximately the same location as the sub-slab vapor sample, which will be sited in a central location within the building. Since the building is single story structure and has no basement, the location of the sub-slab sampling port will also correspond to the lowest level living space. The indoor air sampling location will represent a centrally-located, high activity use area, and the indoor air sample will be secured at a height approximately three (3) feet above the floor to represent a height at which occupants normally are seated. The indoor air sample will be collected via Summa® canister over an 8 hour business operation period.

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time.

2.1.5 Ambient Air Sampling

Typically, an outdoor air sample is collected outside of each building where an indoor air sample is collected. One (1) outdoor air sample will be collected concurrently with the sub-slab and indoor air samples to obtain a sample representative of ambient (background) conditions. The outdoor air sampling location will be selected in the field and sited upwind of the other sampling locations, (dependent upon the wind direction observed at the time of sampling), away from wind obstructions (e.g., trees or bushes), and at a height approximately 3 to 5 feet above the ground to represent breathing zones. The sampling location will additionally be sited away from potential sources of VOCs, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, and additionally away from structures such as building HVAC outdoor air intakes, etc., in order to obtain a representative sample. The outdoor air sample will be collected via Summa® canister over an 8 hour period, comparable to the indoor air sampling interval.

2.1.6 Air Sampling Procedures

2.1.6.1 Soil Gas Sample Point Installation

A Geoprobe™ soil gas sampling unit equipped with a hollow stainless steel probe sampler that is slotted at the base will be utilized to sample soil gas at the specified sampling locations. The probe sampler will be positioned at the specified sampling depth, and the annulus of the pipe sections will be fitted with inert tubing (e.g., polyethylene, nylon, Teflon®, etc.) of the appropriate size (typically 1/8 inch to 1/4 inch diameter) and of laboratory or food grade quality to the surface for purging and sampling via a Summa® canister for analysis. Measures will be taken to ensure that an adequate surface seal is created to prevent outdoor air infiltration and tracer gas will be used.

2.1.6.2 Sub-slab Sampling Port Installation

A permanent recessed sampling probe will be installed at the selected sub-slab vapor sampling location. A rotary hammer drill will be utilized to drill a small diameter hole (approximately one inch) through the concrete floor slab and into sub-slab material (e.g., sand or sand and gravel) approximately 2 inches below the bottom of the floor slab to make an open cavity in the sub-slab material to prevent obstruction of probes by small pieces of gravel that may be present. Concrete and soil cuttings will be removed from the hole, and a probe that will be constructed from small-diameter threaded brass or stainless steel pipe and connectors/fittings will be installed to no greater than 2 inches into the sub-slab material. The top of the probe will be completed flush with the top of the concrete slab with recessed brass plugs. Porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) will be added to cover approximately 1 inch of the probe tip, and the implant will be sealed to the surface with cement for permanent installations. For sampling purposes, a threaded fitting connected to tubing (Teflon-lined or other inert material) will be inserted into the sampling port for connection to a Summa® canister.

2.1.6.3 Summa® Canister Sampling Procedure

A laboratory provided and certified clean 6 liter Summa® canister will be placed adjacent to each in-ground sampling port or at each sampling location. Where a soil vapor or sub-slab sample is being collected, a tee fitting will be utilized to connect the Summa® canister tubing (Teflon-lined or other inert material) to the sampling port tubing, and the third leg of the tee will be connected to a purge pump. Additionally, the weather conditions will be noted at the time of sampling (wind speed and direction, precipitation, outdoor temperature, barometric pressure, etc.).

Prior to sampling at each point, a pressure gauge will be used to check the Summa® canister for vacuum, and the pressure will be recorded. In the case of soil vapor or sub-slab vapor sampling, the ground surface will be sealed in advance to prevent ambient air infiltration during purging and collecting of soil gas samples. A regulator will be used to keep flow rates for both purging and collecting air for sample analysis at a rate not to exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.

The volume of air in each of the vapor/air sampling points (volume of sampling probe and/or tube depending on sample being secured) will be calculated, and a minimum of one to three volumes will be purged at a flow rate of 0.2 liters (or 200 mls) per minute immediately prior to sample collection. The soil gas/air samples will then be collected by opening the valve of the Summa® Canister to draw air through the regulator to collect the sample at a rate of 0.2 liters per minute for a specified time.

After the sampling is completed, the Summa® Canister valve will be closed, and the pressure gauge will again be read, and the vacuum will be recorded.

2.2 Groundwater Sampling

There are currently four (4) groundwater monitoring wells at the site (MW-1, MW-2, MW-3 and MW-4). These wells were installed in February 2000 by Anson Environmental Ltd (AEL), in accordance with VCP-W1-0848-9903, and subsequently sampled in March 2000, May 2000, and October 2002. The concentrations of PCE detected in the monitoring well groundwater samples were observed to have increased significantly between March 2000 and May 2002 (Refer to Appendix A for more details on site history). Groundwater was observed at approximately seven (7) to eight (8) feet below ground surface (bgs).

Under the scope of this work plan, a total of twelve (12) groundwater samples will be collected to determine current groundwater conditions on site. See **Figure 3** for the proposed groundwater sampling locations. The proposed groundwater sampling will be completed concurrently with the soil and soil vapor sampling.

2.2.1 Monitoring Well Sampling

One (1) groundwater sample will be collected from each of the four (4) existing on-site groundwater monitoring wells. Prior to sampling the monitoring wells, the static water level and total well depth will be measured using an electric water level probe. The static water level measurements will be utilized to calculate site-specific groundwater flow direction.

A Walden field Hydrogeologist will calculate the static well volume (volume of standing water) within each of the groundwater monitoring wells based on well diameter and water column height.

$$\text{Static well volume} = \text{water column height} \times (\text{well diameter}/2)^2 \times \pi \times 7.48$$

(7.48 is the conversion factor for cubic feet to gallons)

Each of the monitoring wells will be developed by purging a minimum of three (3) static well volumes from each well utilizing a submersible pump with dedicated polyethylene tubing. The polyethylene discharge tube will be replaced and the submersible pump will be decontaminated after each well is purged. Purge water evacuated from the on site monitoring wells will be containerized for proper off-site disposal in accordance with applicable regulations.

Purging will begin from the well bottom to remove accumulated fines. The pumping rate will be adjusted to maintain a steady recovery and pumping volume. If a steady state is achieved and the silt-grained sediments have been removed from the bottom of the well, the pumping level will gradually be raised to the center of the screened interval of the well to ensure the entire standing water column is removed. If it appears that the wells may be purged dry before the required volume has been removed, then the well will be allowed to recover and then purged again to ensure that the standing water in the immediate vicinity of the screened interval has been removed.

At the start of purging, turbidity, specific conductance, pH and temperature of groundwater in each monitoring well will be measured and re-measured during the purging at intervals of 1 well volume, 2 volumes, 3 volumes, and so on, with pre-calibrated instruments. The objective of the purging and parameter-monitoring process is to ensure that representative groundwater samples with a turbidity value of 50 NTU or less are obtained. The well is considered stabilized and ready for sample collection when field parameters are measured for three consecutive readings meet the following guidance criteria: pH ±0.1, specific conductance ± 3% and turbidity ± 10%. After purging, the water level within the well will be recorded again, and the well will be allowed to recover to at least 90% of the initial water level before a sample is collected. Field data will be recorded in a dedicated field book and individual monitoring well sampling logs.

2.2.1.1 Deep Groundwater Sampling

In order to ascertain deeper groundwater quality, one (1) boring will be installed adjacent to each of the on-site monitoring wells, on the downgradient side, to define the vertical extent of the groundwater contamination previously detected in the on site monitoring wells. The groundwater boring samples will be collected utilizing Geoprobe™ direct push methods with a stainless steel Geoprobe™ Screen Point sampling setup. Groundwater will be purged until clear groundwater is obtained via a dedicated inert tubing system equipped with a bottom check valve that will be oscillated up and down to push water up into the tubing as the ball is repeatedly lifted and seated. Groundwater samples will be collected from each boring at depths of twenty five (25) feet and fifty (50) feet below the water table. Purge water evacuated from the on site monitoring wells will be containerized for proper off-site disposal in accordance with applicable regulations.

2.3 Soil Sampling

2.3.1 Septic System Leaching Pool

As per the NYSDEC's *Site Investigation Plan Response Letter* dated August 2, 2004, a grab sediment sample will be collected from the bottom sediments of the on-site septic system leaching pool located on the south side of the site utilizing a hand auger. The bottom sediments of the leaching pool will be sampled with a hand auger from approximately zero to two feet below the invert.

Additionally, if standing water is present, a grab water sample will be collected from the leaching pool utilizing a dedicated polyethylene bailer.

2.3.2 Storm Drain

A *Continued Soil and Groundwater Investigation & Remedial Measure Report* by P.W. Grosser, dated December 1996, indicated that the storm drain located on the sidewalk along Bayville Avenue, off the northwest corner of the site, was sampled as part of a previous NCDH investigation. The sample reportedly consisted of black sludge secured from the top two feet of the bottom sediment within the structure. Analytical results reportedly showed the sample to contain PCE at concentrations of 880,000 ppb.

In October 1996, under the scope of the P.W. Grosser investigation, a soil boring was installed with via Geoprobe™ direct push methods to define the vertical extent of the contamination within and below the storm drain. Discrete continuous soil samples were secured from the invert of the structure at two foot intervals and screened with a PID. A sample could not be secured from first two feet below the invert of the structure at the time of sampling (approximately 6-8 feet bgs), due to standing water, although black sludge was encountered. An approximate 2-3 inch black sludge layer was encountered at the top of the 8-10 foot bgs sampling interval, which yielded the highest PID reading, and the sample containerized from this interval consisted of mostly sludge to represent worst case conditions. P.W. Grosser reported that analytical results indicated that PCE, TCE, DCE and vinyl chloride were detected, and the contamination within the structure was primarily limited to top two feet beneath the invert of the structure. The target VOCs (PCE; TCE; 1,2 DCE and vinyl chloride) were not detected in the sample secured from the 10-12 foot sampling interval.

The P.W. Grosser report further indicated that on October 30, 1996 the NCDPW cleaned out the storm drain using an "orange peeler" device. This cleanout event was reportedly prompted due to a flood in the area in which local residents also pumped out water from their basements into the structure.

To confirm the clean-out activities that the NCDPW reportedly completed subsequent to the NCDH and P.W. Grosser sampling events and that no residual contamination exists within the storm drain, a soil sample will be collected from the bottom. The bottom sediments of the storm drain will be sampled with a hand auger at two foot intervals from below the current invert of the structure to a minimum of 8-10 feet bgs (or until groundwater is encountered) to confirm that the sludge layer was removed and, if so, obtain a soil sample representative of the sediment beneath the former sludge layer. The soil samples will be screened with a Photo-Ionization Detector (PID), and the sample with the highest PID reading, will be collected for analysis. If organic vapors or other evidence of contamination are not detected, the deepest sample representative of native soil will be collected for analysis.

2.3.3 Additional Soil Sampling

Although soil excavation activities were previously conducted to remove contaminated soil on site, additional soil sampling is required to verify that there is no residual subsurface soil contamination remaining in and/or beyond the previously excavated former source areas. Using soil gas sampling results to screen for the presence of residual subsurface soil contamination as the source of contaminants detected in soil gas, as was originally proposed, is not feasible. The shallow nature of the groundwater beneath the site will make it difficult to differentiate between whether groundwater or residual subsurface contamination is the source of contaminants detected in soil gas.

2.3.3.1 Soil Boring Installation

Walden will install eight (8) soil borings throughout the site as depicted in **Figure 4** utilizing Geoprobe™ direct push methods to define the extent of any residual contamination along the western side of the building. Continuous discrete soil sampling at two (2) foot depth intervals will be completed starting from grade to the water table (anticipated at approximately 7-8 feet bgs).

Soil samples will be field screened with a PID, and one sample per boring will be secured from the unsaturated soil according to field screening activities. The sampling interval exhibiting the highest PID reading will be collected for analysis. If organic vapors or other evidence of contamination are not detected, the deepest unsaturated soil sample will be selected.

2.4 Sample Analysis

2.4.1 Laboratory

Each of the samples will be submitted to the selected NYSDOH ELAP certified laboratory for analysis. Walden is in the process of selecting a laboratory, which will be chosen from based on factors such as availability, accessibility and price. Prior to the start of work, the selected analytical laboratory shall review the attached QAPP policies and procedures and sign an acknowledgement of the same (Refer to **Appendix B** for QAPP).

2.4.2 Soil Vapor and Air Samples

All soil vapor and air samples will be analyzed for VOCs in accordance with USEPA Method TO-15 with Category B deliverables. The analytical laboratory will achieve a minimum detection limit of 1.0 $\mu g/m^3$ for all VOCs in soil vapor. For the indoor air samples, the analytical laboratory will achieve a minimum detection limit of 0.25 $\mu g/m^3$ for tricholorethene (TCE) and 1.0 $\mu g/m^3$ for all other VOCs in the USEPA Method TO-15 analysis.

2.4.3 Groundwater and Soil Samples

All groundwater and sediment samples collected will be analyzed for VOCs in accordance with USEPA Method 8260 with Category B deliverables. Detection limits will meet NYS groundwater standards and recommended soil cleanup objectives.

2.5 Sample Handling

All soil vapor and air samples will be collected in accordance with the NYSDOH's *Guidance for Evaluating Soil Vapor Intrusion in the State of New York.*

All groundwater and sediment samples will be collected in accordance with the USEPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).

The collected samples will be containerized in laboratory provided certified clean Summa® canisters or laboratory provided single-use sampling glassware, as applicable. The sample containers will be labeled with the site name, the Walden job number, sample location and identification, date, time, sampler's initials, and the parameter(s) for analysis. All soil and groundwater samples will be packed on ice in coolers maintained at 4°C prior to transport to the analytical laboratory. Samples will be transported to the laboratory in such a manner as to avoid container breakage during transportation and to minimize the possibility of cross-contamination. The samples will be picked up by the analytical laboratory or delivered via an overnight courier under the appropriate Chain-of-Custody protocol.

2.6 Quality Assurance/Quality Control (QA/QC)

The proposed work may include method blanks, field blanks, trip blanks, duplicates, matrix spike/matrix spike duplicates (MS/MSD) and duplicates as necessary and specified in the QAPP (Refer to **Appendix B**). Any method blank, field blank or trip blank samples (properly sealed vials filled with distilled water by the laboratory) used will be carried into the field and handled and transported in the same manner as all other samples, as needed. MS/MSD and duplicate samples may be randomly collected during each sampling event, dependent upon total number of samples collected. Additional QA/QC details are described in the QAPP presented in **Appendix B.**

Schedule of Proposed Work Plan Activities

Walden has submitted this *Site Investigation Work Plan* to be approved by the NYSDEC to define the nature and extent of the suspected contamination at the site.

The following tentative schedule presented in the table below will be implemented for the investigative activities at the site.

Task	**Description**	**Start Time (Weeks)**	**End Time (Weeks)**
1	NYSDEC Approval of Work Plan	0	3
2	Scheduling of Work	3	5
3	Collect Groundwater, Soil, & Soil Vapor Intrusion Samples	5	8
4	Analysis of Samples & Receipt of Analytical Results	8	11
5	Analytical Review, Generation of Report & Submittal to NYSDEC	11	15

FIGURES

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WALDEN ASSOCIATES

JOB NO: BVC0106
DATE: 12-7-2006
FILE NAME: Gis Server\Bayville\maps\Bayville Cleaner
Aerial photos obtained from the New York State GIS Clearinghouse

0 20 40 80 120 160 Feet

SITE LOCATION PLAN

Bayville Village Cleaners
290 Bayville Ave, Bayville, NY 11079
Figure 1

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WALDEN ENVIRONMENTAL ENGINEERING, PLLC

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WALDEN ASSOCIATES

JOB NO: BVC0106
DATE: 12-7-2006, revised 05-14-2007
FILE NAME: Gis Server\Bayville\maps\Propose Soil Vapor
Aerial photos obtained from the New York State GIS Clearinghouse

Proposed Soil Vapor & Air Sampling Locations

Bayville Village Cleaners
290 Bayville Ave, Bayville, NY 11079
Figure 2

N

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JOB NO: BVC0106
DATE: 12-7-2006
FILE NAME: Gis Server\Bayville\maps\Propose Groundwater
Aerial photos obtained from the New York State GIS Clearinghouse

Proposed Groundwater Sampling Locations

Bayville Village Cleaners
290 Bayville Ave, Bayville, NY 11079
Figure 3

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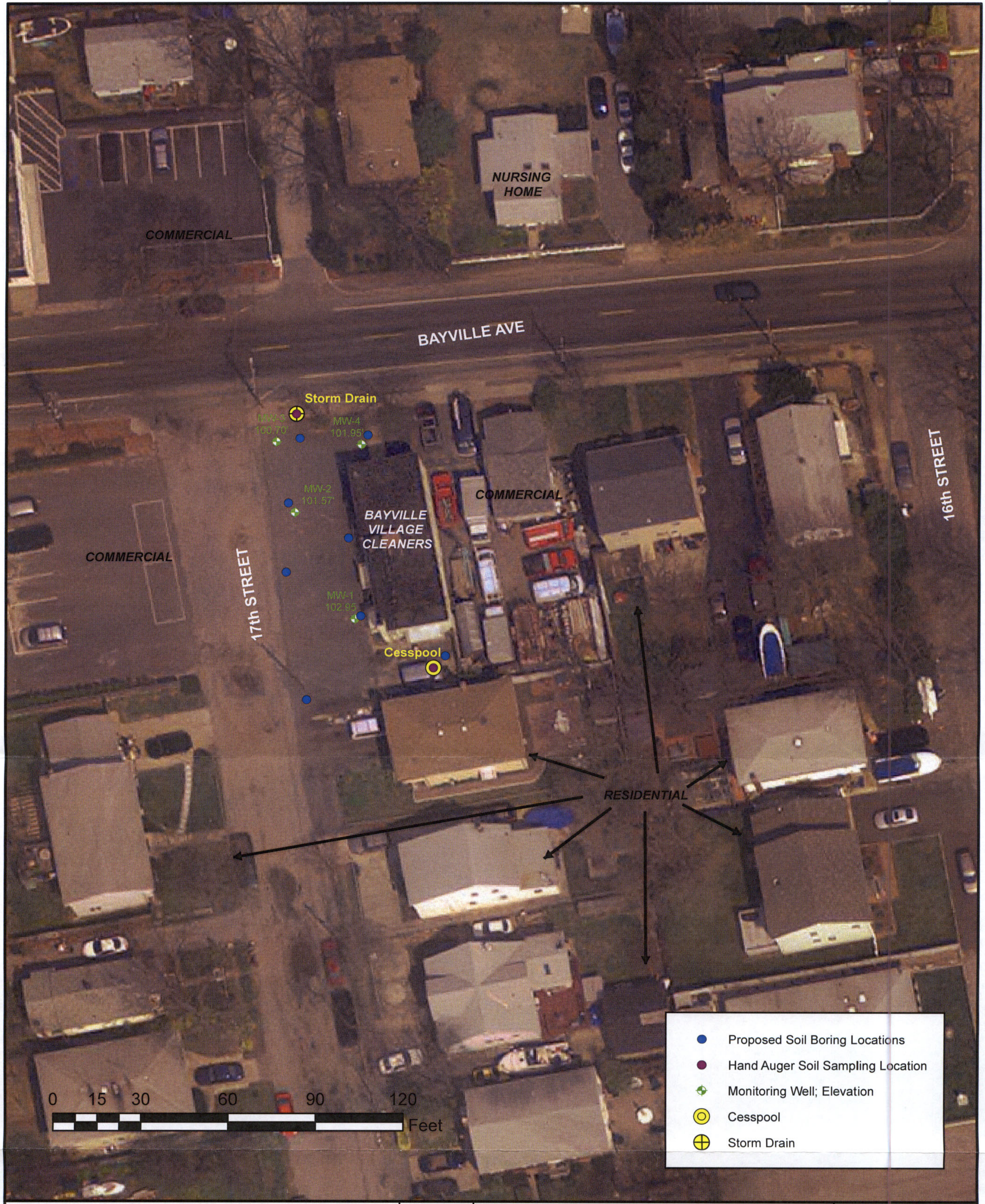

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JOB NO: BVC0106
DATE: 12-7-2006
FILE NAME: Gis Server\Bayville\maps\Proposed Soil Boring
Aerial photos obtained from the New York State GIS Clearinghouse

Proposed Soil Borings Sampling Locations

Bayville Village Cleaners
290 Bayville Ave, Bayville, NY 11079
Figure 4

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APPENDICES

APPENDIX A

SUMMARY OF SITE HISTORY

Site History

Walden received and reviewed several past completed environmental investigations, reports and letters which were performed by various environmental consultants. Past environmental investigations, reports and letters were completed from April 1996 to present. Below is a brief summary of the past environmental investigations, reports and letters.

Soil Sampling by the NCDH dated May 16, 1995

Three (3) soil samples were collected by the NCDH labeled "Near Evaporator Pipe 6' Deep", "Near Evaporator Pipe 4' Deep", "Bottom Sediment 0-6' Deep" and "At Vacuum Drain Pipe". A summary of the analytical results of the soil and sediment sampling are presented in Table 1 below.

Table 1: NCDH Soil Sample Analytical Results Summary (May 1995)

Analyte	**Compound**	**Near Evaporator Pipe 6' Deep (ppm)**	**Near Evaporator Pipe 4' Deep (ppm)**	**At Vacuum Drain Pipe (ppm)**	**Bottom Sediment 0-6' Deep (ppm)**	**NYSDEC TAGM #4046 RSCO (ppm)**
VOCs	Tetrachloroethylene	**36,000**	**24**	**11,000**	**880**	1.4
SVOCs	Anthracene	NS	NS	NS	0.13	50
	Butylbenzylphthalate	NS	NS	NS	0.19	50
	Benzo(a)anthracene	NS	NS	NS	**0.89**	0.224
	Benzo(k)floranthene	NS	NS	NS	**1.3**	0.22
	Benzo(g,h,i,)perylene	NS	NS	NS	0.5	50
	Chrysene	NS	NS	NS	**0.64**	0.4
	Diethylphthalate	NS	NS	NS	0.85	7.1
	Di-n-butylphthalate	NS	NS	NS	4.3	8.1
	Floranthene	NS	NS	NS	1.8	50
	Indeno(1,2,3-cd)pyrene	NS	NS	NS	0.59	3.2
	Phenanthrene	NS	NS	NS	0.94	50
	Pyrene	NS	NS	NS	1.4	50
Pesticides	4,4-DDD	NS	NS	NS	0.19	2.9
	Chlordane	NS	NS	NS	0.12	0.54
PCBs	Various	NS	NS	NS	ND	10

Note: ND: Non-detect; NA: Not Available; NS: Not Sampled; ppm: parts per million

Letter by the NCDH dated July 13, 1995

This letter complied by the NCDH summarized the collected soil samples from the site on May 16th, 1995. The NCDH concluded that significant contamination is present within the soil at the site.

Remedial Investigation Work Plan by CA Rich Consultants Inc. dated August 17, 1995

A *Remedial Investigation Work Plan* was complied by CA Rich Consultants, Inc. (CA Rich). CA Rich indicated that there are two (2) areas of concern at the site. These areas are the soil in and below the flower beds by the former evaporator discharge pipe and the soil in and below the flower beds by the vacuum drain discharge pipe.

CA Rich proposed to delineate the vertical and horizontal extent of the PCE within the subsurface. Eleven (11) soil borings were proposed to be installed by CA Rich to a depth of 15 feet (ft) below ground surface (bgs). Soil samples were proposed to be collected at 2 ft and 5ft intervals bgs. CA Rich also stated that based on the depth to groundwater, additional samples will be collected at 3ft intervals until groundwater is encountered. All collected soil and groundwater samples were proposed to be analyzed for Halogenated VOCs in accordance with the United States Environmental Protection Agency (USEPA) Method 8010.

Subsurface Investigation Response Letter by the NCDH dated August 25, 1995

The NCDH stated that the breakdown products of PCE must also be included in any analysis performed on soil or groundwater at the site. Additionally, the NCDH stated that there was no discussion by CA Rich of the groundwater quality and any potential impacts to the groundwater from the areas of soil contamination. Furthermore, the NCDH stated that based on the anticipated shallow groundwater depth and high levels of PCE detected on-site, that provisions be included into the work plan to sample groundwater on and off-site.

Revised Remedial Investigation Work Plan by CA Rich dated November 14, 1995

CA Rich replied to the comments listed within the NCDH's August 25, 1995 *Subsurface Investigation Response Letter* and stated that the remedial investigation will be limited to two (2) on-site sources of contamination. PCE was stated by CA Rich to be the primary contaminant of concern and that groundwater samples will be collected at the site if any PCE or breakdown products are detected above the NYSDEC's *Technical and Administrative Guidance Memorandum* (TAGM) #4046 *Recommended Soil Cleanup Objectives* (RSCOs).

Soil and Groundwater Investigation by P. W. Grosser Consulting Engineer & Hydrogeologist, P.C. dated December 15, 1995

P. W. Grosser Consulting Engineer & Hydrogeologist, P.C. (PW Grosser) prepared a proposal for soil and groundwater sampling to be conducted at the site. PW Grosser proposed that approximately eight (8) soil borings will be conducted, collecting two (2) soil samples from each boring and that if the contamination was observed to continue to the groundwater table, a groundwater sample will be collected. All samples were proposed to be analyzed for PCE, Trichloroethylene (TCE), 1,2-Dichloroethylene (DCE) and Vinyl Chloride in accordance with USEPA Methods 8010 and 601.

Soil and Groundwater Investigation Response Letter by the NCDH dated March 7, 1996

The NCDH stated that a site plan be included into the proposal indicating the proposed locations of the soil borings to be conducted; the areas to be sampled are the back door of the building, on the side of the building, flower bed and the storm drain out front. A groundwater sampling plan was also requested to be incorporated into the *Soil and Groundwater Investigation* proposal by PW Grosser.

Soil Sampling by the Nassau County Department of Health dated April 10, 1996

A soil boring was conducted by the Nassau County Department of Health (NCDH) at the site and a soil samples was collected from 2-4' below grade (no exact location is given). The sample was analyzed for Volatile Organic Compounds (VOCs) (no method given) by the NCDH's environmental laboratory. Analytical results indicated that Tetrachloroethylene (PCE) was detected at 4700ng/g (4.7ppm).

Soil and Groundwater Investigation Report by PW Grosser dated May 22, 1996

PW Grosser conducted a soil and groundwater investigation at the site whereby nine (9) soil borings were conducted and a total of nineteen (19) soil and three (3) groundwater samples were collected. Groundwater was observed by PW Grosser at approximately 8.5 ft bgs. A summary of the analytical results of the soil and groundwater sampling are presented in Table 2 below.

Table 2: PW Grosser Soil Sample Analytical Results Summary (May 1996)

Compound	S-1 (2-4') (ppm)	S-1 (6-8') (ppm)	S-2 (2-4') (ppm)	S-2 (4-6') (ppm)	S-2 (6-8') (ppm)	S-3 (0-2') (ppm)	S-3 (6-8') (ppm)	S-4 (0-4') (ppm)	S-4 (6-8') (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	**2.5**	0.042	**20**	0.11	0.06	0.5	**1.7**	**2.5**	0.019	1.4
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2

Compound	S-5 (0-4') (ppm)	S-5 (6-8') (ppm)	S-6 (0-4') (ppm)	S-6 (6-8') (ppm)	S-7 (0-4') (ppm)	S-7 (6-8') (ppm)	S-8 (0-4') (ppm)	S-8 (6-8') (ppm)	S-9 (0-4') (ppm)	S-9 (6-8') (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	**1.8**	0.036	0.78	0.08	0.2	ND	0.45	0.12	0.13	0.007	1.4
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2

Compound	W-1 (ppb)	W-2 (ppb)	W-3 (ppb)	NYSDEC TAGM #4046 Groundwater Standards (ppb)
Tetrachloroethylene	**200**	**8**	**47**	5
Trichloroethylene	ND	ND	ND	5
1,2-Dichloroethylene	ND	ND	ND	NA
Vinyl Chloride	ND	ND	ND	2

Note: ND: Non-detect; NA: Not Available; ppb: parts per billion

PW Grosser stated that PCE was detected in all groundwater samples above the NYSDEC's TAGM #4046 Groundwater Standards at the site and concluded that based on the highest concentration of PCE detected within the northern portion of the site, the groundwater contamination is likely due to bottom deposits within the nearby storm drain rather than the on-site soils. Subsequently PW Grosser stated that it is unlikely that the nearby public water supply wells will be impacted by the shallow groundwater contamination identified at the site and that it does not pose a significant threat to the environment and that no remedial action concerning the groundwater is warranted.

With regard to the noted soil contamination at the site, PW Grosser concluded that the area surrounding the former vacuum pipe be excavated to a depth of 5 to 8 ft bgs.

Continued Soil & Groundwater Investigation & Remedial Measure by PW Grosser dated December 1996

PW Grosser excavated an area in the vicinity of the former vacuum drain discharge pipe and the former evaporator discharge pipe (flower bed). The excavation was conducted to various depths of 2.5 to 8 ft bgs along this flower bed. A total of seventeen (17) endpoint soil samples, labeled EP-1 through EP-17 were collected by PW Grosser comprising of eight (8) bottom samples and nine (9) sidewall samples. All endpoint soil samples were analyzed for PCE, TCE, DCE and Vinyl Chloride. A summary of the analytical results of the endpoint soil sampling are presented in Table 3 below.

Table 3: PW Grosser Excavation Endpoint Soil Sampling Analytical Results Summary (December 1996)

Compound	EP-1 Bottom (ppm)	EP-2 Sidewall (ppm)	EP-3 Bottom (ppm)	EP-4 Sidewall (ppm)	EP-5 Bottom (ppm)	EP-6 Sidewall (ppm)	EP-7 Sidewall (ppm)	EP-8 Bottom (ppm)	EP-9 Bottom (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	0.009	0.055	0.028	ND	0.23	ND	ND	0.033	0.029	1.4
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7
1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Vinyl Chloride	ND	ND	ND	ND	0.034	ND	ND	ND	ND	0.2

Compound	EP-10 Sidewall (ppm)	EP-11 Sidewall (ppm)	EP-12 Bottom (ppm)	EP-13 Bottom (ppm)	EP-14 Sidewall (ppm)	EP-15 Bottom (ppm)	EP-16 Sidewall (ppm)	EP-17 (0-4') (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	0.075	0.055	0.62	0.034	0.14	ND	0.055	0.031	1.4
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	0.7
1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	NA
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	0.2

Note: ND: Non-detect; NA: Not Available; ppm: parts per million

Two (2) additional areas of concern, the on-site sanitary system and the storm drain were investigated by PW Grosser. PW Grosser excavated and exposed the on-site sanitary leaching pool. PW Grosser identified the on-site sanitary system to consist of two cesspools in series, including a primary and an overflow structure. The primary leaching pool is approximately nine (9) ft bgs and PW grosser observed approximately eight (8) ft of standing water. A grab sample, labeled C-18 was collected of the bottom deposits within the primary leaching pool. This grab sample was analyzed for PCE, TCE, DCE and Vinyl Chloride. PW Grosser determined by "blind probing" that the sanitary system leaches to the subsurface because no solid bottom was detected to a depth of approximately 16 ft bgs. A summary of the analytical results of the sanitary system grab sample are presented in Table 4 below.

Table 4: PW Grosser Sanitary System Grab Sample Analytical Results Summary (December 1996)

Compound	C-18 (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	0.09	1.4
Trichloroethylene	ND	0.7
1,2-Dichloroethylene	ND	NA
Vinyl Chloride	0.027	0.2

Note: ND: Non-detect; NA: Not Available; ppm: parts per million

A storm drain was also sampled and was also determined not to have a solid bottom. Standing water was observed at a depth of five (5) ft bgs and sediments were observed at six (6) ft bgs. A soil boring, labeled B-1 was advanced within the storm drain and five (5) soil samples were collected from this boring and analyzed for PCE, TCE, DCE and Vinyl Chloride. During collection of the soil samples, a black sludge layer was observed by PW Grosser at 8-10 ft bgs, which also correlated with detected contaminates. PW Grosser stated that the impacted sediments within the storm drain are limited to the black organic sludge layer and sediments located immediately below. A summary of the analytical results of the storm drain sediment sampling are presented in Table 5 below.

Table 5: PW Grosser Storm Drain Soil Sample Analytical Results Summary (December 1996)

Compound	B-1 (8-10') (ppm)	B-1 (10-12') (ppm)	B-1 (12-14') (ppm)	B-1 (14-16') (ppm)	B-1 (16-18') (ppm)	NYSDEC TAGM #4046 RSCO (ppm)
Tetrachloroethylene	**170**	ND	ND	ND	ND	1.4
Trichloroethylene	**640**	ND	ND	ND	ND	0.7
1,2-Dichloroethylene	110	ND	ND	ND	ND	NA
Vinyl Chloride	0.09	ND	ND	ND	ND	0.2

Note: ND: Non-detect; NA: Not Available; ppm: parts per million

Five (5) additional soil borings surrounding the storm drain were conducted and soil samples from within each boring and labeled B-2 through B-6. This sampling was conducted to determine if the storm drain was contributing to the groundwater contamination detected at the site. A total of five (5) groundwater samples were collected and analyzed for PCE, TCE, DCE and Vinyl Chloride. A summary of the analytical results of the storm drain and vicinity groundwater sampling are presented in Table 6 below. PW Grosser stated that it appears that there may have been some impact of the shallow groundwater in the vicinity of the storm drain based on the analytical sampling results.

Table 6: PW Grosser Storm Drain & Vicinity Groundwater Sample Analytical Results Summary (December 1996)

Compound	**B-1 (ppb)**	**B-2 (ppb)**	**B-3 (ppb)**	**B-4 (ppb)**	**B-5 (ppb)**	**NYSDEC TAGM #4046 Groundwater Standards (ppb)**
Tetrachloroethylene	**260**	ND	2	ND	**9**	5
Trichloroethylene	7	460	ND	ND	ND	5
1,2-Dichloroethylene	32	8600	ND	ND	ND	NA
Vinyl Chloride	ND	1900	ND	ND	ND	2

Note: ND: Non-detect; NA: Not Available; ppb: parts per billion

PW Grosser stated that the storm drain was cleaned out by the NCDH on October 30, 1996 and on November 8, 1996, PW Grosser inspected the storm drain utilizing hand-auger techniques and observed that the black organic sludge layer that contained contaminates had been removed. Additionally PW Grosser stated that there were recent flooding events in the Bayville area, which occurred before the NCDH cleanout activities, whereby residents pumped-out water contained within their basements into this storm drain and that this practice had occurred in the past and could result in the documented contamination.

PW Grosser concluded that based on the results of the excavation endpoint soil sampling, that groundwater contamination was not a result of impacted on-site soils and stated that no further action is warranted in regard to the on-site soils. No further action was also concluded with regard to the on-site sanitary system based on the sampling results and that there was no significant impact to the shallow groundwater. Furthermore, PW Grosser stated that the presence of contaminates within the storm drain was due to historical discharges and that there is no direct link from the documented PCE contamination detected at the site and that no further action is warranted.

Letter by the NYSDEC dated December 27, 2001

The NYSDEC requested the sampling of groundwater within all four (4) on-site monitoring wells.

Soil and Groundwater Investigation Work Plan by Anson Environmental Ltd. (AEL) dated July 28, 2003

AEL stated that four (4) groundwater monitoring wells were installed at the site in February 2000 and that several groundwater samples had been collected from the on-site monitoring wells since. A summary of the analytical results of the groundwater monitoring well sampling is presented in Table 7, 8 and 9 below. Groundwater was observed by AEL at approximately 7-8 ft bgs and indicated that groundwater at the site may be tidally influenced by the Long Island Sound and Oyster Bay Harbor.

Table 7: AEL Groundwater Sample Analytical Results Summary (March 2000)

Compound	MW-1 Mar-00 (ppb)	MW-2 Mar-00 (ppb)	MW-3 Mar-00 (ppb)	MW-4 Mar-00 (ppb)	NYSDEC TAGM #4046 Groundwater Standards (ppm)
Tetrachloroethylene	17	ND	19	22	5

Table 8: AEL Groundwater Sample Analytical Results Summary (May 2000)

Compound	MW-1 May-00 (ppb)	MW-2 May-00 (ppb)	MW-3 May-00 (ppb)	MW-4 May-00 (ppb)	NYSDEC TAGM #4046 Groundwater Standards (ppm)
Tetrachloroethylene	ND	19	81	79	5

Table 9: AEL Groundwater Sample Analytical Results Summary (October 2002)

Compound	MW-1 Mar-00 (ppb)	MW-2 Mar-00 (ppb)	MW-3 Mar-00 (ppb)	MW-4 Mar-00 (ppb)	NYSDEC TAGM #4046 Groundwater Standards (ppm)
Tetrachloroethylene	43	5,600	210	1,300	5

Note: ND: Non-detect; ppb: parts per billion

AEL stated that based on the groundwater samples collected from the on-site monitoring well in October 2002, the PCE contamination may be caused by a point source not previously detected or from a subsequent release of contaminates to the subsurface since the soil excavation activities conducted in 1996 by PW Grosser. AEL proposed that eight (8) soil borings be conducted along the western side of the site building and subsequent soil samples collected at 0-2ft, 2-4ft, 4-6ft and 6-8ft intervals within each boring. In addition to the soil sampling listed above, AEL proposed that a sediment sample be collected from the on-site sanitary leaching pool. All collected soil and sediment samples were proposed to be analyzed for VOCs in accordance with USEPA Method 8260.

Groundwater sampling was also proposed by AEL which included the sampling of groundwater at all on-site monitoring wells and within four (4) soil borings to be conducted adjacent to the on-site monitoring wells at depths of 15, 25 and 35 ft bgs. All groundwater samples were also proposed to be analyzed for VOCs in accordance with USEPA Method 8260.

AEL stated that the work defined herein was to obtain design parameters for a proposed soil vapor extraction / air sparge remedial system.

Site Investigation Plan Response Letter by NYSDEC dated August 2, 2004

The NYSDEC requested that soil vapor samples, deep groundwater samples at 25 and 50ft intervals bgs and a leaching pool sediment sample be included into AEL's *Soil and Groundwater Investigation Work Plan.*

Soil and Groundwater Investigation Work Plan by AEL revised December 21, 2004

AEL revised the sampling intervals for the proposed groundwater sampling from the soil borings to be conducted adjacent to the existing monitoring wells to be 25 and 50 ft bgs.

Soil vapor sampling was proposed to be conducted at the site by AEL along the property perimeter at 25ft intervals. All soil vapor samples were proposed to be collected at 5ft bgs and analyzed for VOCs in accordance with USEPA Method TO-14.

Site Investigation Work Plan Response Letter by NYSDEC dated August 2, 2004

The NYSDEC requested that a sub-slab soil gas sample be incorporated into AEL's *Soil and Groundwater Investigation Work Plan* and that the NYSDEC and the New York State

Department of Health (NYSDOH) evaluate the results of the soil vapor sampling before performing any soil sampling at the site. The NYSDEC stated that a sediment sample be collected of the storm drain, if there is any suspicion that the storm drain is acting as a contaminant source.

Soil and Groundwater Investigation Work Plan by AEL revised September 29, 2005

AEL revised their work plan to include an additional sub-slab soil vapor sample to be collected inside the current on-site building.

Site Investigation Work Plan Letter by AEL dated October 18, 2005

Several NYSDEC comments were addressed by AEL including the sampling of the sub-slab soil vapor beneath the current site building; collection of groundwater samples from all on-site monitoring wells. A Freedom of Information Act. (FOIA) request was stated to have been submitted by AEL to the Nassau County Department of Public Works (NCDPW) regarding the storm drain clean-outs. AEL stated that the FOIA request indicated that the storm drain was last cleaned-out on August 8th, 2005.

Revised Site Investigation Work Plan – September 2005 Response Letter by the NYSDEC dated December 12, 2005.

The NYSDEC approved the *Soil and Groundwater Investigation Work Plan* compiled by AEL dated September 2005. Additionally the NYSDEC requested that in concurrent with the sub-slab soil vapor sample, an indoor air sample be collected and all soil vapor samples be analyzed for VOCs in accordance with USEPA Method TO-15.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN (QAPP)

QUALITY ASSURANCE PROJECT PLAN (QAPP)

FOR

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Quality Assurance Project Plan (QAPP)

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1.0 Project Organization and Responsibilities

Walden maintains company policies and procedures to ensure that all sample collection and all analyses meet a high degree of quality. These policies and procedures provide confidence that the resulting data provide an accurate representation of the matrix being sampled. Quality Assurance/Quality Control (QA/QC) starts with the design of the sampling program and ends with the summarized analytical data submitted in the final report. This Quality Assurance Project Plan (QAPP) describes all of these policies and procedures.

The project Quality Assurance Officer (QAO) is responsible for ongoing surveillance of project activities, for ensuring conformance to this QAPP, and for evaluating the effectiveness of its requirements. The QAO has access to any personnel or subcontractors, as necessary, to resolve technical problems and take corrective action as appropriate and has the authority to recommend that work be stopped when there are factors present that may jeopardize quality. The QAO will be available to respond to immediate QA/QC problems.

The primary responsibilities of the QAO are as follows:

- Monitor the correction of QC problems and alert task leaders to where similar problems might occur.
- Develop and maintain project QA files for sampling, monitoring, and field QA records.
- Participate in QA audits.
- Recommend changes to the project manager to improve the effectiveness of the project in reaching its QA objectives for field sampling and monitoring activities.
- Review proposed additions and changes to this QAPP.

The project QA will be maintained under the direction of Mr. Peter Brighton, who will be assigned as the project's QAO, in accordance with this QAPP. QC for specific tasks will be the responsibility of Walden and its subcontractors, which shall be selected at the time the work is required under the direction of Mr. Brighton.

2.0 Quality Assurance Project Plan Objectives

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative statements that specify the quality of the data required to support decisions. Data quality is measured by how well the data met the QA/QC goals of the project. In this plan, "Quality Assurance" and "Quality Control" are defined as follows:

- Quality Assurance - The total integrated program for assuring reliability of monitoring and measurement data.
- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

As stated in the Guidance for Data Quality Objectives Process (EPA QA/G-4), DQOs are derived from the outputs of each step of the DQO process that:

- Classify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision (USEPA, 1994).

A non-probabilistic (judgmental) sampling approach will be used to select the specific sampling locations for the areas of concern. A judgmental sampling design consists of directed samples at specific sampling locations to confirm the existence of contamination at these chosen locations based on visual or historical information (i.e., discoloration, staining, and deterioration).

Total study error is the combination of sampling and measurement error. Total study error is directly related to decision error. These decision errors can be controlled through the use of hypothesis testing. For this sampling, the null hypothesis (baseline condition) is that the parameter of interest exceeds the cleanup levels. This decision has the smallest degree of decision error. In addition, measurement error is reduced by analyzing individual samples using more precise laboratory and sampling methods. Analyses will be performed using the Test Methods for Evaluating Solid Waste (SW-846). The soil, water and soil vapor sampling will be performed with dedicated equipment and following the appropriate standard operating procedures for sample handling.

2.2 QA/QC Requirements

QA elements to be evaluated include accuracy, precision, sensitivity, representative and completeness. Reporting of the data must be clear, concise and comprehensive. The data generated by the analytical laboratory for this project is required to be sensitive enough to achieve detection levels low enough to meet Contract Required Quantitation Limits (CRQLs) as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP) for Superfund CLP and EPA SW-846 methods performed in accordance with NYSDEC ASP protocol. The analytical results meeting the CRQLs will provide data sensitive enough to meet the objectives of this site investigation as described in the *Site Investigation Work Plan*. The QC elements that are important to this project are blank contamination, instrument calibration, completeness of field data, sample-holding times, sample preservation and sample chain of custody.

2.3 Initial Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of SW-846 and the NYSDEC's Analytical Services Protocol (ASP).

2.4 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

2.5 Method Blanks

Method blank or preparation blank is prepared from an analyze-free matrix, which includes the same reagents, internal standards and surrogate standards as the related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12-hour period during the analysis of samples for Volatile Organic Compounds (VOCs) and once for each batch or twenty (20) samples (whichever is most frequent) for Semi-Volatile Organic Compounds (SVOCs) and metals. Sample values of up to ten (10) times the quantity of Methylene Chloride, Acetone, 2-Butanone, and Phthalate Esters found in the blank must be qualified. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10% of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

2.6 Field Blanks

A field blank consists of two sets of identical, laboratory-cleaned sample containers. The first set is filled at the laboratory, with de-ionized laboratory-grade water. The water used is from the same source as that used for the laboratory method blank. In the field prior to collecting soil samples, this water will be passed through the field sampling equipment into an additional second set of containers that will then be taken back to the laboratory to be analyzed for the compounds of interest. The purpose of a field blank is to determine whether the field sampling equipment is cross-contaminating soil samples. The rinsate samples will be collected using dedicated sampling equipment provided by the laboratory; therefore, no field blanks will be collected.

2.7 Trip Blanks

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same manner as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure). A complete set of trip blanks will be provided with each shipment of groundwater samples to the certified laboratory.

2.8 Duplicates

Duplicate samples are two or more samples considered representative sub-samples of the same source. The samples are identically processed throughout the measurement system. Laboratory duplicate analyses will be performed on liquid and solid matrices at a rate of one (1) for every twenty (20) field samples in a batch or one for every batch of field samples (whichever is more frequent). Duplicate samples will be analyzed as per appropriate methodology. Duplicate analyses for Target Compound List (TCL) compounds will be associated with matrix spike and matrix spike duplicate analyses. The results of the duplicate analyses will be used to assess the precision of the measurement systems.

2.9 Surrogate Spike Analysis

Surrogate standard determinations will be performed on all samples and blanks analyzed by the analytical laboratory. All samples and blanks will be spiked with the appropriate surrogate compounds (as indicated by the methodology) before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the SW-846 protocols for samples falling within the quantitation limits without dilution.

2.10 Matrix Spike (MS)/Matrix Spike Duplicate (MSD)/Matrix Spike Blank (MSB) Analysis

MS and MSD analyses will be performed to evaluate the matrix effect of the mple upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS/MSD samples will be analyzed for each group of samples of a similar matrix, at a rate of one for every twenty (20) field samples. The Relative Percent Difference (RPD) will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

2.11 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery, and is expressed as Percent Recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike % REC is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA}$$

where:

SSR = measurement from spiked sample

SR = measurement from un-spiked sample

SA = actual data of spike added

2.12 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses. Analytical precision is expressed in terms of RPD. The RPD is calculated using the following equation:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2}$$

where:

RPD = Relative Percent Difference

D_1 = larger sample value

D_2 = smaller sample value (duplicate)

2.13 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve detection levels low enough to meet the CRQLs as specified by SW-846 methods. The Method Detection Limits (MDL) for target compounds and target analyses will be established by the analytical laboratory to be well below the remedial objectives and submit appropriate documentation to Walden as required by the QAO.

2.14 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of the site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on-site. A blind duplicate is used to accomplish this task, as well as assessing the precision of the data. Two identical groundwater samples will be collected from one (1) monitoring well and submitted as different samples. The RPD between the two samples should be less than 50%. The use of standardized techniques and statistical sampling methods influences the representativeness of an aliquot of sample to the sample at the site. The representativeness of samples is assured by adherence to sampling procedures presented in this document, therefore no specific representativeness samples are to be collected.

2.15 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers and should be between 90% and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data and raw analytical data. The laboratory will be required to submit data packages that follow SW-846 reporting format, which, at a minimum, will include the following components:

1. All sample chain-of custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analyses in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate results.
7. QC checks sample and standard recovery results.
8. Spike sample result (inorganics).
9. Blank results (field, trip, and method).
10. Internal standard area and RT summary.

2.16 Comparability

Comparability is the degree to which analytical data generated from an individual laboratory can be compared with those from another laboratory, in terms of use of standardized industry methods and equivalent instrumentation techniques. No laboratory split samples will be taken for this project.

3.0 Calibration and Maintenance Procedures of Field Equipment

Walden follows manufacturer's recommendations and guidelines with regard to filed instrument calibration procedures. The calibration of each instrument will be checked prior to each day's use. The date and time of the calibration check, serial number, model number and signature of the calibrating technician will be entered into the field logbook. If the instrument readings are incorrect, the instrument will be either recalibrated by the technician or returned to the Walden's office where it will be further evaluated and/or repaired. If field instruments require major overhauls, the instruments will be returned to the appropriate manufacturer.

Preventive maintenance of field equipment is performed routinely before each sampling event and more extensive maintenance is performed based on hours of use. The Walden equipment coordinator has overall responsibility for the preventive maintenance program. However, certain maintenance programs are overseen by the project manager. Routinely, manually operated sampling equipment is checked to ensure it operates properly and that excessive wear has not occurred. If necessary, equipment is taken out of service for repair or replacement.

4.0 Sample Custody

4.1 Overview

The handling of samples in the field and in the laboratory will conform to the sample custody procedures presented in this section. Field custody procedures involve proper sample identification, chain-of-custody forms, packaging and shipping procedures. Laboratory custody begins with the receipt of samples by the laboratory and continues through sample storage, analysis, data reporting and data archiving. This section provides the procedures that will be followed during the course of the project to ensure proper sample custody.

4.2 Field Custody Procedures for Off-Site Laboratory

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin. Each label will contain an identifying number and each number will have a suffix that identifies the site and where the sample was collected. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample and sample identification will be entered into the field logbook. A chain-of-custody form will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first "received" blank space. After each sample is collected and appropriately identified entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

- Names and signatures of persons involved in chain of possession
- Sample number
- Number of containers
- Sampling station identification
- Date and time of collection
- Type of sample and the analyses requested
- Preservatives used (if any)
- Pertinent field data i.e. pH, temperature, turbidity, etc. (if any)

After sampling has been completed, the samplers' will return/ship the samples to the laboratory. The sampler will sign and date the next "relinquished" blank space. One copy of the custody form will remain with the field personnel and the remaining copies will accompany the samples to the laboratory. The laboratory will receive all samples within 24 hours of collection. Samples will be received by laboratory personnel, who will assume custody of the samples and sign and date the next "received" blank.

4.3 Laboratory Custody Procedures

Upon receipt by the analytical laboratory, samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation. All samples will be received by the laboratory's sample control group and will be carefully checked for label identification and completed accurate chain-of-custody records. The sample will be tracked from storage through the laboratory system until the analytical process is completed and the sample is returned to the custody of the sample control group for disposal.

5.0 Sample Preparation and Analytical Procedures

Containers, preservation and holding times of environmental samples will be applied as detailed in the NYSDEC ASP. The holding time of samples for VOC analysis of all matrices will be seven (7) days and five (5) days for SVOC analyses from the Verified Time of Sample Receipt (VTSR). Analyses of environmental samples will be performed by the protocol requirements of the SW-846.

A summary of analyses and related QA/QC samples would be performed on the samples collected at the site are presented in Table 1. Organic compounds will be analyzed by the following methods:

- Soil and Groundwater Samples
    - TCL VOCs by USEPA Method 8260
- Soil Gas and Air Samples
    - TCL VOCs by USEPA Method TO-15

If any modifications or additions to the standard procedures are anticipated, and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by Walden's QAO is necessary for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of 5.

6.0 Data Reduction, Validation, Review and Reporting

6.1 Overview

The process of data reduction, review, and reporting ensures that assessments or conclusions based on the final data accurately reflect actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports and work plans are proofed and checked for technical and numerical errors prior to final submission.

6.2 Data Reduction

Data reduction is the process by which raw analytical data generated from the laboratory instrument systems are converted into usable mass concentrations. The raw data, which may take the form of summation of areas under the curve instrument responses, or observations is processed by the laboratory and converted into concentrations expressed in ug/kg for soil samples and ug/l for water samples. The analytical laboratory will be required to follow SW-846 data reduction procedures.

Data reduction also includes the process by which raw field data is summarized into tables and graphs, from which quantitative or qualitative assessments can be derived by filter integration and evaluation. Field data that is anomalous will be thrown out to create a linear interpretation of the data that depicts a more accurate trend.

Field data obtained during sampling is summarized on appropriate field forms. This information will be used to assess field conditions at the time of sampling and is summarized and analyzed along with the chemistry data in the final report. Occasionally, the reduction of actual field data requires correcting measurement data for the measurement system's baseline value. The data will be adjusted only after the raw data has been submitted to Walden's QAO and prior to preparation of the final report.

6.3 Validation

Data validation is the systematic process by which data quality is determined with respect to data quality criteria that are defined in project and laboratory QC programs and within the referenced analytical methods. The data validation process consists of an assessment of the acceptability or validity of project data with respect to the stated project goals and the requirements for data usability. Ideally, data validation establishes the data quality in terms of project DQOs. Data validation consists of data editing, screening, checking, auditing, certification, review and interpretation.

The purpose of data validation is to define and document analytical data quality and determine whether the laboratory data quality is sufficient for the intended use(s) of the data. An approved independent data evaluator will not review data prior to its use in reports prepared by Walden unless requested by the NYSDEC. Both the field and laboratory data will be subjected to a level of data validation commensurate with the required data quality level. If required, the data will be validated in accordance with the following document: "Functional Guidelines for Evaluating Inorganic Analyses" and the "Functional Guidelines for Evaluating Organic Analyses" (Technical Directive Document No. HQ-8410-01, USEPA). The validator will evaluate the analytical laboratory's ability to meet the DQOs provided in this QAPP. Noncompliant data will be flagged in accordance with the NYSDEC ASP and corrective action will be undertaken to rectify any problems.

If an independent validator is required, the data validator will review the data from compliance by performing the following tasks:

6.3.1 Task I: Determine Data Completeness

Each data package will be reviewed for completeness. A complete data package will at a minimum contain following components:

- All sample chain-of-custody forms.

- The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
- QA/QC summaries.
- All relevant calibration data summaries.
- Instrument and method performance data.
- Documentation demonstrating the laboratory's ability to attain the contract specified method detection limits for all target analyses in all required matrices.

If during the review process it is found that deficiencies exist in the data package, the analytical laboratory will be contacted and given 10 calendar days to produce the documentation necessary to remove these deficiencies.

6.3.2 Task II: Determine Data Compliance

Each data package will be reviewed to determine compliance with those portions of this QAPP that pertain to the production of laboratory data. Compliance is defined by the following criteria:

- The data package is complete as defined in Task I above.
- The data have been produced and reported in a manner consistent with the requirements of this plan and the laboratory subcontract.
- All protocol-required QA/QC criteria have been met.
- All instrument calibration requirements have been met for the time frame during
- Which the analyses were completed.
- All protocol required initial and continuing calibration summaries have been presented.
- All data reporting forms are complete for all samples submitted. This will include all requisite flags, all sample dilution/concentration factors and all pre-measurement sample cleanup procedures.

- All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.
- Verifying that calibration procedures were followed.
- Verifying that data are reported in correct units.
- Checking 10% of all field calculations.
- Verifying that samples were properly shipped with the appropriate chain-of-custody documentation.
- Verifying that QC samples were prepared and taken.

Walden's QAO will perform further review of such data prior to data integration and evaluation. All assigned data reduction or analytical procedures will be verified for accuracy and content by the QAO, who is qualified and experienced in evaluating the particular technical specialty.

6.4 Walden Data Review

6.4.1 Laboratory Data

The QAO or a designee under the project manager's supervision, will review each analytical data package for completeness (i.e., Have all the analyses requested been performed?) and general protocol compliance, such as holding times, detection limits, spike recoveries and surrogate recoveries. The results of this review will be summarized and submitted to the independent validator with the data package. If information is found to be missing from the data package the analytical laboratory will be contacted and requested to submit any missing information.

6.4.2 Usability Report

Upon completion of data validation, Walden's QAO will perform a data usability analysis on all analytical laboratory data. Taking into account protocols for sampling, transport, analysis, reduction, reporting and the data validation report, the QAO will use this information and his/her own experience to establish whether the results of each analysis can be used for the purpose intended. It will be determined whether the final results can be used as reported, qualified to indicate limitations, or rejected outright.

6.5 Reporting

6.5.1 Field Data Reporting

All field real-time measurements and observations will be recorded in project logbooks or field data records. Field measurements may include pH, temperature, specific conductance and FID/PID, if applicable. All data will be recorded directly and legibly into field logbooks. If entries are changed, the change will not obscure the original entry and the correction will be signed. Field data records will be organized into standard formats whenever possible and retained in permanent files.

6.5.2 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the SW-846 deliverable requirements as applicable to the method utilized.

6.6 Data Usage

The data will be used to define the nature and extent of the suspected contamination at the subject site.

7.0 Internal Quality Control

7.1 Overview

QC checks will be performed to ensure the collection of representative and valid data. Internal QC refers to all data compilation and contaminant measurements. QC checks will be used to monitor project activities to determine whether QA objectives are being met. All specific internal QC checks to be used are identified in this section.

7.2 Laboratory Quality Control

The analytical laboratory is required to exercise internal control in a manner consistent with the requirements of this QAPP. Control checks and internal QC audits are required by the NYSDEC ASP methods. These include reference material analysis, blank analysis, MS/MSD analysis, cleanups, instrument adjustments and calibrations, standards and internal audits. One qualified professional will proof and check all final reports for transcription and/or calculation errors. Twenty percent of all final reports will be subsequently checked again by a qualified professional. All data tables will be checked to ensure no transcription errors have occurred. Data tables will also be checked to see that any criteria cited for comparison purposes is appropriate and correctly referenced. All calculations will be checked to ensure that they will be properly presented and that resulting values are achievable. If any results cannot be duplicated the calculations will be independently checked for accuracy.

8.0 Performance and System Audits

Performance audits, when performed, will be used to monitor project activities to assure compliance with project DQOs. The following text summarizes the field audits that are conducted periodically.

8.1 Field Audits

Walden periodically conducts internal audits of field activities. Walden's on-site project manager will routinely monitor all field activities to ensure that work is done correctly. All sampling and analytical work will be reviewed routinely by the project manager. All data sheets obtained in the field will be initialed and dated by project manager after review and acceptance of the services performed. A field audit will include monitoring and evaluation of sample collection, sample holding times, preservation techniques, field QC and equipment calibration. These audit forms will be kept on file with the Walden project manager for a period of at least one (1) year after completion of the project, then will be transferred to storage and held for an additional five (5) years.

9.0 Analytical Corrective Action

9.1 Laboratory Corrective Action

Corrective actions will be implemented if unsatisfactory performance and/or system audit results indicate that problems exist. Corrective action may also be implemented if the result of a data assessment or internal QC check warrants such action.

APPENDIX C

HEALTH AND SAFETY PLAN (HASP)

HEALTH AND SAFETY PLAN (HASP)

FOR

BAYVILLE VILLAGE CLEANERS
290 BAYVILLE ROAD
BAYVILLE, NEW YORK

WALDEN ASSOCIATES
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Oyster Bay, New York 11771
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Site Specific Health and Safety Plan

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Figure 1: Hospital Location Map, North Shore University Hospital, Glen Cove

Appendices

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1.0 Statement of Commitment to Worker Health and Safety

Walden Environmental Engineering, PLLC (Walden) employees may be exposed to risks from site-related hazardous conditions while performing field activities at the Bayville Village Cleaners. Walden's policy is to minimize the possibility of work-related injury through aware and qualified supervision, health and safety training, medical monitoring and the use of appropriate Personal Protective Equipment (PPE). Walden has established a guidance program to implement this corporate policy in a manner that protects personnel to the maximum reasonable extent.

This site-specific Health and Safety Plan (HASP) applies to all Walden personnel, owners' representatives, subcontractors, and the New York State Department of Environmental Conservation (NYSDEC) personnel and/or its representatives on the job site where operations involve actual or potential physical and chemical hazards that have been identified by Walden or others. This HASP is also intended to inform and guide all personnel (Walden employees and/or owner representatives and/or NYSDEC representatives and/or subcontractors) entering the exclusion zone, ensuring that each person sign and acknowledge the site hazards on the acknowledgement form provided in Appendix I. Walden and/or the owner's subcontractors are retained as independent contractors and, as such, are responsible for ensuring the safety of their employees.

Walden may require that on-site personnel take certain precautions in accordance with this HASP, and Walden may request that others protect their personnel in a manner that they deem necessary or sufficient.

2.0 General

2.1 Site Information

Site Name: Bayville Village Cleaners
Location: 290 Bayville Avenue, Bayville, New York 11709
Walden Job #: BVC0106

2.2 Project Personnel

Primary Consultant: Walden Environmental Engineering, PLLC
16 Spring Street, Oyster Bay, New York 11771
(516) 624-7200 (phone)
(516) 624-3219 (fax)

On-Site Safety Coordinator: Peter Brighton
On-Site Health and Safety Officer: Peter Brighton

2.3 Training

All site-related workers entering the exclusion zone must be trained in accordance with 29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3.

Documentation of Walden personnel training is maintained on files and each Walden employee will have copies of his/her applicable 40-Hour OSHA Training, 8-Hour Refresher and Supervision Training Certificates on-site (maintained by the job health and safety officer or designee).

Each subcontractor working on the job must provide the site safety officer with training documentation for its personnel.

2.4 Affidavit

All Walden personnel and subcontractors who enter site-related exclusion zones must sign the attached Safety Plan Acknowledgment form (**Appendix I**). Walden personnel and site-related subcontractors must also read and comply with Walden's generic HASP.

2.5 Alternative Work Practices

Underground utilities must be identified before commencing any subsurface work. Blowers may be employed to reduce and disperse any releases of toxic gases. If items proposed within the work plan are modified based on changes in field conditions, they would be evaluated and an addendum would be prepared to cover these alternative work practices.

3.0 Hazardous Substances

Hazardous substances are defined as the suspected or known hazardous substance stored, within any media (contaminated), etc.

In soils: Volatile Organic Compounds (VOCs) identified as being contained in soils are Tetrachloroethylene (PCE) and Trichloroethylene (TCE).

In groundwater: VOCs identified as being contained in groundwater are PCE and TCE.

In soil vapor: VOCs identified as being contained in soil vapor are PCE and TCE.

3.1 Hazard Assessment

Defined as toxic effects, including Threshold Limit Values (TLVs), Immediately Dangerous to Life or Health's (IDLHs), reactivity, stability, flammability and operational hazards with sampling, decontaminating, etc.

The major route of exposure to potential contaminants will be respiratory; however, dermal exposure may also be possible. Inhalation of vapors and contaminated dusts would provide the mechanism for respiratory exposure. Skin contact with soils and groundwater would result in dermal exposure. PCE is the compound of highest concern both due to its suspected carcinogenicity and its high vapor pressure. TCE has also been identified as a compound of concern because of past presence in soil and groundwater. The International Agency for Research on Cancer (IRAC) has classified PCE and TCE as probable human carcinogens. The program will use engineering controls and Personal Protective Equipment (PPE) to reduce the amount of potential exposure. Continuous air monitoring and personal protection devices will serve to prevent exposure to chemicals.

Other site hazards include those that exist on all sites where heavy equipment, industrial and construction type operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions.

In general, backhoes, drill rigs, and other heavy machinery used during field activities present a hazard with their moving parts and overhead equipment. All field personnel, except for the equipment operator, must remain away from the machinery while work is taking place. All field personnel, including the operator, must wear steel-toe boots. Hard hats and safety glasses are required by all personnel not operating any heavy machinery. All the persons unrelated to the project must remain outside the exclusion zone while work is taking place. If persons have business in the exclusion area, other than Walden personnel or associated contractors, they must remain at a safe distance away from the machinery as determined by the site health and safety officer.

During typical work activities, surfaces can be expected to become uneven and slippery, causing unsure footing and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated soils, vessels and equipment.

4.0 Site Work Zones

Defined as designated exclusion zone, contaminant reduction zone and support zone. The work zone will be divided into three areas: a support zone, a contaminant reduction zone and an exclusion zone based on the degree of danger present. To the extent possible, the support and contaminant reduction zones will be established outside of the exclusion zone.

4.1 Support Zone

The support zone will be located outside the of the exclusion zone. Personnel allowed in this area include all site personnel, visitors and representatives of regulatory agencies and observers. No particular training or PPE equipment are needed in the support zone/clean area.

4.2 Contaminant Reduction Zone

The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as needed in the exclusion zone. When exiting the contaminant reduction zone, personnel will remove contaminated PPE.

4.3 Exclusion Zone

The exclusion zone is in the immediate work area and that adjacent area as defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources. Fans or blowers will be used, if necessary, to disperse gases released during site-related activities.

4.4 Task Specific Level of Protection

See **Table 1** for levels of personal protective equipment (PPE) requirements.

4.5 Communications

In the event that either Level C or Level B respiratory protection is used, hand signals will be developed for communication. At this point, all proposed site-related work would be conducted in level D PPE.

BAYVILLE VILLAGE CLEANERS

BAYVILLE, NEW YORK

TABLE 1

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

LOCATION	LEVEL OF PROTECTION/TASKS	DESCRIPTION
Support Zone	D	Steel toe boots and work clothes
Exclusion Zone and Contamination Reduction Zone	To be determined by the site safety officer based on contamination present	
	D (modified)	Steel toe boots, nitrile or latex gloves, hard hat, safety glasses
	C	Full face respirator fitted with organic vapor cartridge and Level D
	B	Positive pressure, pressure demand self-contained breathing apparatus or positive pressure, pressure demand supplied air and Level C.

5.0 Site Access

The topography of the site is relatively flat. The area is developed with a single story building with an associated paved parking lot. In the event of an emergency, the project personnel and subcontractors should assemble at the predetermined assembly area, designated by the site safety officer.

The predetermined assembly area for this site or task is the southwestern corner of Bayville Avenue and 17th Street, Bayville, New York. The project manager or on-site health and safety officer may relocate this area, if necessary.

6.0 Monitoring Procedures

Monitoring the site for the identity of contaminants and contaminant concentrations in all media:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as indicate the need for increased monitoring frequency at the edge of the exclusion zone.

A Photo Ionization Detector (PID), which will be calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern, will be used to monitor the air on a continuous basis while air, soil and/or groundwater sampling activities are performed.

6.1 Task Specific Air Monitoring Action Levels

See **Table 2** for air monitoring action levels.

TABLE 2

AIR MONITORING ACTION LEVELS

INSTRUMENT	HAZARD MONITORED	INSTRUMENT READING	ACTION REQUIRED
PID	Organic Vapors	0.5 ppm or greater above background in the breathing zone for 1 minute and the source of the reading is unknown.	PPE will be upgraded to Level C.
		5 ppm or greater above background in the breathing zone for 30 continuous seconds	Stop work. Evaluate the source and upgrade Level C to Level B.
Combustible Gas Indicator	Explosive Vapors	>10% LEL	Explosion hazard! Withdraw from the area immediately until LEL <10%.
Oxygen Meter	Oxygen	$<19.5\%0_2$	Stop work and withdraw from area until oxygen levels increase.

7.0 Decontamination and Disposal

Decontamination procedures apply to all contaminated personnel, surfaces, materials, instruments, equipment, etc. PPE will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with Alconox detergent and water, then followed by a DI rinse and/or air-drying.

Disposal procedures also apply to all contaminated equipment, supplies, disposable items and wash water. Any PPE will be bagged and contained in a drum designated for PPE disposal. All decontamination water and materials will also be drummed and disposed of off-site.

8.0 Emergency Procedures

The topography of the site is relatively flat and open. Rapid escape from the work areas may be restricted by buildings and other barriers, particularly fences and buildings located in the proposed work area. Free and clear secondary egress is to be provided.

Preparatory meetings will be held to ensure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

8.1 Personnel Exposure

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

- Skin Contact - Wash with soap and water.
- Inhalation - Remove to fresh air, monitor for ABCs (Airway, Breathing and Circulation).
- Ingestion - Call Poison Control Center and monitor ABCs.
- Eye Exposure - Repeated eye flush, monitor ABCs and transport to hospital.

8.2 Personnel Injury

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform first aid, if required. Contact local ambulance if professional help is needed.

8.3 Potential or Actual Fire or Explosion

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team (i.e. fire or police).

8.4 Environmental Accident

In event of environmental accident (spread of contamination outside site):

Stop spread of chemical as best as possible and notify Walden, NYSDEC, associated contractors and Nassau County Health Department at first opportunity.

8.5 Emergency Services

Emergency Medical Facility:	North Shore University Hospital, Glen Cove
Location:	101 St Andrews Lane, Glen Cove, New York 11542
Telephone:	(516) 674-7852

Directions to hospital from site (See **Figure 1**): Start from Bayville Village Cleaners, go west along Bayville Ave, continue on Horse Hollow Road, turn left at Lattingtown Road, turn left at Ford Street, bear right at Titus Road, turn right at St. Andrews Lane, arrive at 101 St Andrews Lane (North Shore University Hospital).

Ambulance Service:	911
National Response Center:	(800) 424-8802
Fire Department:	(516) 628-1922
NCMC (Non-emergency):	(516) 572-0123
Police Department:	911 or (516) 628-2320
Poison Control Center -	(516) 542-2323
NYSDEC Spills Hotline-	(800) 457-7362

Appendix I: Site Safety Plan Acknowledgement Form

I have read and understand the procedures set forth in this Health and Safety Plan for the Bayville Village Cleaners.

Printed Name	Signature	Representing	Date

Appendix II: Heat Stress

Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period. If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

Heat Stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102^0F. One of the following cooling measures should be taken:

a) Sponge the bare skin with cool water;
b) Apply cold packs continuously;
c) Wrap the victim in a sheet soaked with water;
d) Immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

Prior to site activity, the Site Safety Officer may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, the Site Safety Officer would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat sickness and have been adequately trained in first aid procedures. As Site Safety Officer, one should also make sure that sufficient personnel are on-site, so as to rotate work assignments, schedule work during hours of reduced temperatures, and ensure personnel do not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

The worker could be experiencing a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decon procedures or scratch where it itches on-site and risk cross contamination.

Keeping the skin clean and dry will reduce the incidence of heat rash. This can be accomplished by wearing cotton garments (or other materials that absorb perspiration) underneath protective clothing. Upon removing the protective clothing, the worker should wash and dry his skin thoroughly.

The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every ½ pound of water loss, 8 ounces of water should be ingested. Water should be replaced by drinking 2 to 4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink diluted 50/50 with water.

Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as whether or not an individual smokes, one's dietary habits, body weight, as well as predisposing physical conditions such as high blood pressure, heart conditions, diabetes, or one's medication, that may influence an individual's ability to tolerate excessive heat.

Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. Heat cramps most often afflict people in good physical condition who overwork in conditions of high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress directly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and give sips of salted water (1 teaspoon of salt to 1 quart of water) - 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade, may be used if diluted 50/50 with water.

Salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

Required Frequency of Heat Stress Monitoring for workers in Impermeable Clothing

Adjusted [2] Temperature (^{0}F)	**Work Time Allowed Before Monitoring Break (min.)**
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Super Activities. September 26, 1984, pp. 8-75.

(2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$\text{Ta adj } ^0\text{F} = \text{Ta } ^0\text{F} + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

Heat Stress Signs and Symptoms

Heat Stress Indicator	**When to Measure**	**If Exceeds . . .**	**Action**
Heart rate (pulse)	Beginning of rest period	110 beats per minute	Shorten next work period by 33%
Oral temperature	Beginning of rest period	99^{0}F (after thermometer is under tongue for 3 minutes) or	Shorten next work period by 33%
		100.6 ^{0}F or greater	Prohibit work in impermeable clothing and shorten next work period by 33%
Body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)	Decreases more than 5%	Increase fluid intake

Appendix III: Cold Stress (Hypothermia)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8^{0}F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.
2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20^{0}F) workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.
3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gases or vapors. Care must be taken to keep any heat source away from flammable substances.
6. Using a wind chill chart such as the one attached, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT or 20^{0}F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -35 ^{0}F.

7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6^0F or below.
8. Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go the warm shelter:

- Heavy, uncontrollable shivering;
- Excessive fatigue or drowsiness;
- Loss of coordination;
- Difficulty in speaking;
- Frostbite (see below).

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

- Frostbite or incipient frostbite: sudden blanching or whitening of the skin.
- Superficial frostbite: waxy or white skin which is firm to the touch (tissue underneath is still resilient).
- Deep frostbite: tissues are cold, pale and solid.

Wind-chill Chart

Wind Speed (mph)	Actual thermometer Reading (^{0}F)									
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**
	Equivalent Temperature (^{0}F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
>40	Little Danger				Increasing Danger			Great Danger		
(Little added effect)	(for properly clothed person)				(Danger from freezing of exposed flesh)					

Appendix IV: Chemical Hazards

1.0 Tetrachloroethylene (PCE)

Introduction

Tetrachloroethylene (PCE), also know as Perchloroethylene, is a man-made substance widely used for metal-degreasing operations, dry cleaning fabrics and textiles. It is also used as a starting material (building block) in producing other man-made chemicals. Other names that may be used for PCE include perc, perclene and perchlor. Although PCE is a liquid at room temperature, some of the liquid can be expected to evaporate into the air producing an ether-like odor; evaporation increases as temperature increases.

Exposure Pathways

Humans can be exposed to PCE from environmental, consumer product, and occupational sources. Common environmental levels of PCE (often called background levels) are usually several thousand times lower than levels found in some workplaces. Background levels found in the air we breathe and in the food and water we consume probably result from evaporation from industrial or dry-cleaning operations or from releases from areas where chemical wastes are stored. PCE has been found in at least 330 of the 1117 National Priorities List (NPL) hazardous waste sites.

In general, PCE levels in air are higher in urban and industrialized areas than in more rural or remote areas. Higher-than-background concentrations of PCE have occasionally been measured in air close to chemical waste sites and in water taken from nearby wells.

Exposure to PCE may also occur from some consumer products. Products that may contain PCE include auto brake quieters and cleaners, suede protectors, water repellents, silicone lubricants, belt lubricants, dressings, specialized aerosol cleaners, ignition wire driers, fabric finishers, spot removers, adhesives, and wood cleaners. Although uncommon, small amounts of PCE have been found in food.

The levels of PCE in air in dry-cleaning shops, textile and chemical processing operations, and degreasing operations can result in exposures that are much higher than those found in the outside environment. Levels of PCE in the workplace are usually measured in parts of PCE per million parts of air (ppm), while common environmental levels are usually measured in parts per billion (ppb) or parts per trillion (ppt).

Metabolism

Because PCE evaporates quickly, the most common exposure to PCE comes from breathing air containing it. This is certainly true for individuals who work with the chemical, but it is probably also true for those who live in industrial and commercial areas where large amounts of the compound are used or disposed of. PCE may also enter the body through drinking contaminated water or eating contaminated food. Because PCE does not pass through the skin to any significant extent, entry into the body by this path is of minimal concern, although skin irritation may result from repeated or prolonged contact with the undiluted liquid. Scientific reports indicate that PCE is present (and may in fact be concentrated) in the breast milk of mothers who have been exposed to the chemical.

Health Effects

In high concentrations in air, particularly in closed, poorly ventilated areas, single exposures to PCE can cause Central Nervous System (CNS) effects leading to dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, and possibly unconsciousness and death. As might be expected, these symptoms occur almost entirely in work (or hobby) environments. The potential long-term health effects that might occur in humans from breathing lower levels of PCE than those that produce CNS effects or from ingesting very low levels of the chemical found in some water supplies have not been identified. The effects of exposing infants to PCE through breast milk are unknown.

Animal studies, conducted with amounts much higher than typical environmental levels, have shown that PCE can cause liver and kidney damage, liver and kidney cancers, and leukemia (cancer of the tissues that form the white blood cells). Developmental effects in fetuses have been observed but only at PCE exposure levels that also produce toxicity in the maternal animal.

The U.S. Department of Health and Human Services has determined that PCE may reasonably be anticipated to be a carcinogen. Based on evidence from animal studies, PCE is thought to be capable of causing cancer in humans. It should be emphasized, however, that currently available information is not sufficient to determine whether PCE causes cancer in humans.

Short-term exposures to air containing more than 100 ppm of PCE have produced harmful effects in both humans and animals, and more prolonged exposures to approximately 9 ppm caused harmful liver effects in mice. It should be pointed out that some of the highest environmental levels of PCE ever recorded (at waste disposal sites, for example) were still 150 times smaller than the concentrations shown to produce symptoms of toxicity in animals after repeated exposure. Drinking (or eating) the equivalent of approximately 60 to 80 mg (less than a spoonful) of undiluted PCE per kg of body weight (1 kg = 2.2 pounds) has produced effects similar to drinking alcohol. PCE was used in the past as a medicine to eliminate worms in humans, but safer and more effective drugs are now available. More prolonged exposures in animals have produced harm to the liver at doses of approximately 100 mg/kg/day. These levels of exposure are more than 1,000 times higher than would be expected even if humans ingested the most contaminated drinking water ever reported.

Cancer: From data in animals, EPA has estimated that if people breathe air containing 1 ppm PCE all day every day for 70 years, there would be an added risk of 66 additional cases of cancer in a population of 10,000 people (or 65,500 additional cases in a population of 10,000,000) over the number of cases that would be observed in a population not exposed to PCE. If people consume 1.0 mg PCE/kg/day in food and water every day for 70 years, there would be at the most a risk of 510 additional cases of cancer in a population of 10,000, or 510,000 additional cases in a population of 10,000,000. It should be noted that these risk values are plausible upper-limit estimates. Actual risk levels are unlikely to be higher and may be lower.

Regulations

The government has made recommendations to limit the exposure of the general public to PCE in drinking water and the exposure of workers to PCE in the workplace.

The United States Environmental Protection Agency (USEPA) has developed the following health advisories to describe concentrations of PCE in drinking water at which no adverse effects are anticipated to occur: 2.0 milligrams per liter of water (mg/L) for short-term exposure of children, 1.4 mg/L for longer term exposure of children, and 5.0 mg/L for long-term exposure of adults. In addition, a drinking water equivalent level (DWEL) of 0.5 mg/L has been established.

The Occupational Safety and Health Administration (OSHA) has a legally enforceable exposure limit of 25 ppm PCE in air for an 8-hour workday, 40-hour workweek based on non-cancer health considerations. The National Institute for Occupational Safety and Health (NIOSH) has classified PCE as a potential occupational carcinogen and recommends that workplace exposure be limited to the lowest possible level.

TETRACHLOROETHENE or PERCHLOROETHENE (PCE)

Chemical name, structure / formula, CAS and RTECS Nos.. and DOT 10 and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical Properties MW, SP, SOL FLIP, IP, Sp, Gr, flammability	VP, FRZ UEL, LEL	Incompatibilities and reactivity	Measurement method (See Table 1)
Tetrachoroethylene Cl2C=CCl2 127-18-4 [#1C03 KX3850000 carbons) 1897 74	Perchlorethyene. Perchloroethylene. Perk. Tetracrioretrylene 1 ppm = 6.89 mg/m^3	NIOSH Ca See Appendix A Minimize workplace exposure concentrations limit number of workers exposed OSHAI 100PPM C 200 ppm 300 ppm (5-min max peak in any 3 hri)	Ca [150 ppm)	Colorless quid with a mild chloroform-like odor	MW 165 8 BP 250°F Sol: 0.02% FIP NA IP 9. 32 eV Sp Gr 1 62 Noncombustible liquid but decomposes in a fire to hydrogen chloride and phosgene.	VP 14mm FRZ -2°F UEL NA LEL NA	Strong oxidizers chemically-active metals such as lithium beryllium & barium, caustic soda sodium hydroxide potash	Char CS GC/FID III Halogenated Hydro-

Personal protection And sanitation Target organs		Recommendations for respirator selection-maximum concentration for use (MLIC)	Route	Symptoms	Health hazards First aid		
Skin:	Prevent skin contact	NIOSH	Inh	Jmt eyes nose :threal	Eye	irrimmed	
eyes, skin							
Eyes	Prevent eye contact	SCBAF PD,PPISAF PID,PP ASCBA	Abs	nau, flush face, necx.	Skin	Soap wash prompt	
liver, kidneys, CNS							
Washskin:	When contain	Escape GMFOVISCBAE	Ing	verti. dizz. inco head	breath	Resp support	(in
animals:							
Remove:	When wet or contain		Con	som, skin eryl. liver	Swallow	Medical attention	
liver tumors]							
Change:	N.R.			damage, (carc]		immed	
Provide:	Eyewash, Quick drench						

Perchloroethylene. (Tetrachloroethylene). CAS: 127-18-4. C12C:CC12.

Properties:

Colorless liquid, ether-like odor, extremely stable, resists hydrolysis, d 1.625 (20/20C), bp 121C, fp -22AC, bulk d 13.46 lb/gal (26C), refr index 1.5029 (25C), flash p none. Miscible with alcohol, ether, and oils; insoluble in water. Non-flammable.

Derivation:

(1) By chlorination of hydrocarbons and pyrolysis of the carbon tetrachloride also formed,
(2) from acetylene and chlorine via trichloroethylene.

Method of purification: Distillation.

Grade: Purified, technical, USP, as tetrachloroethylene, spectrophotometric.

Hazard: Irritant to eyes and skin. TLV: 50 ppm in air.

Use: Dry-cleaning solvent, vapor-degreasing solvent, drying agent for metals and certain other solids, vermifuge, heat transfer medium, manufacture of fluorocarbons.

2.0 Trichloroethylene (TCE)

Introduction

Trichloroethylene (TCE) is also known as Triclene, Vitran and by other trade names in industry. TCE is a nonflammable, colorless liquid at room temperature with a somewhat sweet odor and a sweet, burning taste. This manmade chemical does not occur naturally in the environment. TCE is now mainly used as a solvent to remove grease from metal parts. It is also used as a solvent in other ways and is used to make other chemicals. TCE can also be found in some household products, including typewriter correction fluid, paint removers, adhesives, and spot removers. Most people begin to smell TCE in air when there are around 100 parts of TCE per one million parts of air (ppm).

Fate & Transport

By far, the biggest source of TCE in the environment is evaporation from factories that use it to remove grease from metals. It can also enter the air and water when it is disposed of at chemical waste sites. TCE evaporates easily but can stay in the soil and in groundwater. Once it is in the air, about half will be broken down within a week. When TCE is broken down in the air, Phosgene, a lung irritant, can be formed. Under certain conditions found in the workplace, TCE can break down into chemicals such as Dichloroacetylene and Phosgene. In the body, TCE may break down into Dichloroacetic acid (DCA), Trichloroacetic acid (TCA), Chloral Hydrate, and 2-Chloroacetaldehyde. These chemical products have been shown to be toxic to animals and are probably toxic to humans. Once TCE is in water, much will evaporate into the air; again, about half will break down within a week. It will take days to weeks to break down in surface water; in groundwater the breakdown is much slower because of the much slower evaporation rate. Very little TCE breaks down in the soil and it can pass through the soil into underground water. It is found in some foods; TCE found in foods is believed to come from contamination of the water used in food processing, or from food processing equipment cleaned with TCE. It does not build up in fish, but it has been found at low levels in them. TCE is not likely to build up in the human body.

Exposure Pathways

TCE is found in the outdoor air at levels far less than 1 ppm. When measured several years ago, some of the water supplies in the United States were found to have TCE. The most recent monitoring study found mean levels in surface water ranging from 0.0001 to 0.001 parts of TCE per million parts (ppm) of water and a mean level of 0.007 ppm in groundwater. About 400,000 workers are exposed to TCE in the United States on a full-time (i.e., a 40-hour workweek) basis. The chemical can also get into the air or water in many ways, for example, at waste treatment facilities; by evaporation from paints, glues, and other products; or by release from factories where it is made. Another exposure route is breathing the air around factories that use TCE. People living near hazardous waste sites may be exposed to TCE in the air or in drinking water, or in the water used for bathing or cooking. Products that may contain TCE are some types of typewriter correction fluids, paints and paint removers, glues, spot removers, rug cleaning fluids, and metal cleaners.

Metabolism

TCE can enter the body by breathing air or drinking water containing it. TCE can also enter the body if it gets on the skin. A person could be exposed to contaminated water or air if they live near or work in a factory that uses TCE or if they live near a waste disposal site that contains TCE. If TCE is inhaled, about half the amount breathed in will get into the bloodstream and organs; the rest will be exhaled. If TCE is ingested, most of it will be absorbed into the blood. If TCE comes in contact with skin, some of it can enter the body, although not as easily as when it is breathed or swallowed.

Once in the blood, the liver changes much of the TCE into other chemicals. The majority of these breakdown products leave the body in the urine within a day. Much of the trichloroethylene that is in your bloodstream will be quickly breathed out. Some of the TCE or its breakdown products can be stored in body fat for a brief period, and thus may build up in the body if exposure continues.

Health Effects

TCE was once used as an anesthetic for surgery. People who are exposed to large amounts of TCE can become dizzy or sleepy and may become unconscious when exposed to very high levels. Death may occur from inhalation of large amounts. Many people have jobs where they work with TCE and can breathe it or get it on their skin. Some people who get concentrated solutions of TCE on their skin develop rashes. People who breathe moderate levels of TCE may have headaches or dizziness. Some people who breathe high levels of TCE may develop damage to some of the nerves in the face. Humans have reported health effects when exposed to the level of TCE at which its odor is noticeable. Effects have also occurred at much higher levels. Animals that were exposed to moderate levels of TCE had enlarged livers, and high-level exposure caused liver and kidney damage. However, it is unknown if these changes would occur in humans.

It is uncertain whether people who breathe air or drink water containing TCE are at higher risk of cancer or if their children have more birth defects. People who used water for several years from two wells that had high levels of TCE may have had a higher incidence of childhood leukemia than others. Increased numbers of children were reported to be born with cardiac abnormalities, a finding which is supported by data from some animal studies showing developmental effects of TCE on the heart. However, other chemicals were also in the water from this well. There is no clear evidence that TCE alone can cause leukemia or any other type of cancer in humans. As part of the National Exposure Registry, the Agency for Toxic Substances and Disease Registry (ATSDR) compiled data on 4,280 residents of three states (Michigan, Illinois, and Indiana) who had environmental exposure to TCE. This study found no definitive evidence for an excess of cancers from TCE exposure. In studies using high doses of TCE in rats and mice, tumors in the lung, liver, and testes were found, providing some evidence that high doses of TCE can cause cancer in experimental animals. It is unknown if TCE affects human reproduction.

TRICHLOROETHYLENE (TCE)

Chemical name. structurelfomm"la. CAS and RTIECS Nos., and DOT id and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limit (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL Fl.P. IP Sp. Gr flammability	VP. FRZ UEL LEL		
1 1.2-Tnchloroethane CHCl.CH.Cl 79-00-5 KJ3150000 2831 74	Ethane Inctdonde. 11-Trichicroettuirie Vinyl incrilande 1 ppm 5,55 mglml	NIOSH Ca See Appendix A **SeeAppendixC** (Chloroathanes) 10 ppm (45 mg/m~) Iskinj OSHA 10 ppm (45 mgW) [skin] Recommendations s	Ca [100ppm]	Colorless liquid with a sweet, chloroform-like odor.	MW, 133 4 BP.237*F Sol 0.4% FIY ? IP. 11 00 eV Sp.Gr 1.44 Combustible Liquid, forms dense soot	VP 19mm FR.7 .3.4'F UEL 11151% LEL 6%	Strong oxidizers a caustics: critemically-actrve metals(such as aluminum, magnesium powders. sodium & potassium)	char. CS, **Ci~ID,** [:f 101003. Haloge nated Hydro carbons)

Personal protection and:anitat! n organs		for respirator selection-maximum concentration for use (MLIC)	Health hazards Route	 Symptoms	 First aid		 Target
Skin:	Prevent skin contact	NIOSH	Inn	Ina eyes nc5e CNS	Eye	trimmed	Eyes,
resp sys. CNS,							
Eyes:	Prevent eye contact	V SCBAF PD.PPISAF PD.PP ASC3A	Abs	depres liver, kidney	skin	Soap wash prompt	liver,
kidneys							
Washskin:	Whencontam	Escape GMFOVISCBAE	Ing	damage. derm;	Breath	Resp support	(in
animals:							
Remmie:	Whanwetorcontzm		Con		Swallow~	Medical attention	liver
cancer)							
Change:	N.R.					immed	
Provide:	Eyewash Quick drench						

[1,1.2-Trirhloroethanel

1,1,2-trichloroethane. (vinyl trichloride; β-trichloroethane). CAS: 79-00-5. CHC12CH2CI.

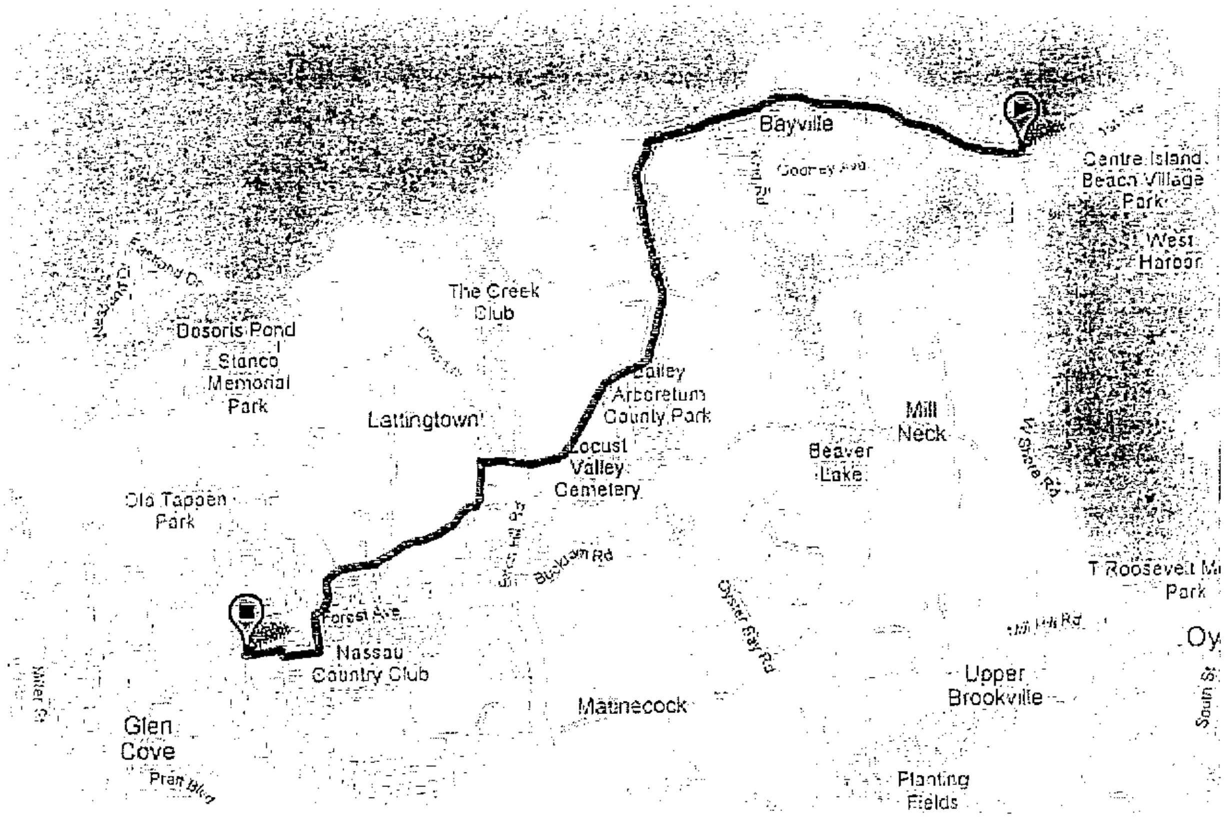
Properties: Clear, colorless liquid, characteristic sweet odor, bp 113.7C, d 1.4432 (20C/4C), refr index 1.4458, vap press 16.7 mm Hg (20C), bulk d 12.0 lb/gal (20C), fp -36.4C, flash p none. Miscible with alcohols, ethers, esters and ketones; insoluble in water. Non-flammable.

Grade: Technical.

Hazard: Irritant, absorbed by skin. TLV: 10 ppm in air.

Use: Solvent for fats, oils, waxes, resins, other products; organic synthesis.

Appendix V: Directions to Nearest Hospital



Directions

1. Head **west** from **Bayville Ave**	**3.2 mi** 7 mins
2. Continue on **Horse Hollow Rd**	**0.9 mi** 2 mins
← 3. Turn **left** at **Lattingtown Rd**	**1.2 mi** 2 mins
← 4. Turn **left** at **Ford St**	**0.2 mi**
→ 5. Bear **right** at **Titus Rd**	**0.2 mi**
→ 6. Turn **right** at **St Andrews Ln**	**308 ft**
7. Continue on **St Andrews Ln Ext**	**0.2 mi**

8. Arrive at **Community Hospital at Glen Cove: Call North Shore University Hospital at Glen Cove**
101 Saint Andrews LN, Glen Cove, NY 11542

APPENDIX D

COMMUNITY AIR MONITORING PLAN (CAMP)

APPENDIX 1A

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.