# FINAL
# DYNAMIC WORK PLAN

# REMEDIAL INVESTIGATION/FEASIBILITY STUDY
# COUNTRY CLEANERS
# 410 WEST MAIN STREET, HUNTINGTON, NY

**Site No. 152187**
**Work Assignment No. D004436-13**

**Prepared for:**

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# 1.0 INTRODUCTION

## 1.1 GENERAL

Earth Tech Northeast, Inc. (Earth Tech) has been issued Work Assignment # D004436-13 under the New York State Department of Environmental Conservation (NYSDEC) State Superfund Standby Program. The site under this work assignment is Country Cleaners (Site # 1-52-187) (herein identified as the "Site"). The location of the Site is shown on Figure 1.

The specific objective of this project, as defined by the NYSDEC, is to conduct a remedial investigation (RI) to develop a conceptual site model that describes the nature and extent of site related contaminants. The data generated from the RI will be used for effective identification and evaluations of remedial action alternatives, prepare a remedial action plan, and issue a Record of Decision. Once the groundwater impacts have been delineated, Soil Vapor Investigation evaluation work plan will be developed if deemed necessary and submitted to NYSDEC under Supplemental RI work plan. The RI will be performed in accordance with NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation, (NYSDOH, 2002). The soil vapor investigation will be performed in accordance with New York State Department of Health (NYSDOH), Soil Vapor Intrusion Guidance, (NYSDOH, 2006).

The Site is located at 410 West Main Street, Huntington, Suffolk County, New York. The Site is improved with a single one-story building. The Site is abutted by a residential building to the south, Hillside Avenue to the west, West Main Street to the North, and Getty Service Station to the east (Figure 2).

## 1.2 BACKGROUND

Dry-cleaning operations are conducted at the Site by Jim Dandy Cleaners (Jim Dandy). Based on the interview conducted with Nick, manager of Jim Dandy, Jim Dandy currently leases the building at the Site. Nick mentioned that Jim Dandy does not use chlorinated solvents in its dry-cleaning operations. According to Nick, Country Cleaners ceased its dry-cleaning operations at the Site about a year back.

Based on the information provided in the WA, the disposal of tetrachloroethene (PCE) at the Site has led to the contamination of on-site soil and groundwater, and off-site groundwater above the applicable NYSDEC standards. One source of contamination is located in a narrow yard at the south side of the property. PCE impacts were found in the soil beneath a condensate pipe at the southeast corner of the on-site building and in a nearby storm drain. Under the order and oversight of the Suffolk County Department of Health Services (SCDHS), the owner remediated the storm drain in December 2001. Approximately 1,000 gallons of oily water and 37 tons of contaminated soil/sediments were removed to a depth of 26 feet below grade (ft bgs). An unknown quantity of soil was also removed from the unpaved portions of the yard. Subsequent sampling confirmed that PCE contamination remains in a location near the southeast corner of the building. An old floor drain was also found in the floor of the boiler room during the course of the investigation. A thorough evaluation of the floor drain and associated piping was not possible because the new boiler was located directly over the drain. NYSDEC believes that this floor drain represents a possible point of past discharges contributing to the contaminated groundwater originating from the Site. The groundwater samples collected from the on-site and off-site monitoring wells (at the Getty Service Station) show the presence of PCE and its degradation products.

## 2.0 CONCEPTUAL SITE MODEL

The conceptual site model discussed in the following sections is developed based on Earth Tech's review of previous investigation results. This conceptual plan will be refined based on the data generated during the proposed expedited site characterization process.

## 2.1 PHYSICAL SETTING

### *2.1.1 Site Geology/Stratigraphy*

Based on the boring logs for the monitoring wells installed on the Getty Service Station and potable water wells installed on Hollywood Place, fine to medium sand, trace silt and clay underlies the top asphalt/gravel layer and extends to a depth of approximately 10 ft below ground surface (ft bgs). A layer of medium to fine sandy clay was observed from a depth of 10 to 20 ft bgs and sand layer was observed from 30 to 60 ft bgs. Bedrock was not encountered up to 370 ft bgs.

### *2.1.2 Groundwater*

The two uppermost major geologic units, the upper glacial deposits, and the older, deeper deposits of the Magothy formation, constitute the water bearing aquifers. Based on information obtained from NYSDEC, the water table ranges from 50 to 70 ft bgs. The groundwater flow direction in the vicinity of the Site is to the north-northeast(NYSDEC, Site Investigation Information letter dated September 18, 2003).

## 2.2 Summary of Previous Environmental Investigations

Several rounds of investigations have been conducted at the Site and on adjacent Getty Service Station. The summary of investigations presented below is based on the review of limited information made available to Earth Tech by the SCDHS, NYSDEC and NYSDOH. Data and sample locations from the investigations discussed below and are shown in Figure 3.

### *2.2.1 Getty Service Station – Groundwater Investigation - Berninger Environmental, Inc.*

Lou Halperin Properties, Inc. contracted Berninger Environmental, Inc. (BEI) to perform a limited subsurface investigation at the Getty Service Station property. BEI installed monitoring wells MW-1 and MW-2 on October 28, 1996 and November 5, 1996, respectively. MW-1 was dry; water was encountered in MW-2 at a depth of 52 ft bgs. MW-1 was installed along the property fence with the Country Cleaner site; strong perchloroethylene odor was observed in the well. Groundwater collected from MW-2 was found to be primarily impacted by the following volatile organic compounds (VOCs) exceeding New York State Groundwater Standards: PCE (2,170 µg/l), trichloroethene (398 µg/l), benzene (6.5 µg/l), toluene (31 µg/l), and methyl tertyl butyl ether (MTBE) (960 µg/l). BEI attributed the presence of chlorinated solvents to an upgradient source (Country Cleaners).

### *2.2.2 Suffolk County Department of Health Services – October 1997*

Four soil samples (1-WS-10-20, 2-WS-10-20, 3-WS-10-20, and 4-WS-10-20) were collected on October 30, 1997 by SCDHS. Earth Tech was able to obtain a hand sketch showing the sample collection location and the reduced data tables for some of the samples collected during this sampling event. Due to the hazardous waste disposal at the Site, shallow groundwater aquifer was found to be contaminated. The groundwater contamination appeared to move off-site. During this investigation the samples were analyzed for VOCs by USEPA Method 8260. 1-WS-10-20 was collected from the storm drain; 2-WS-10-20 was a sludge sample collected from the storm drain; 4-WS-10-20 was collected from under the condensate pipe; no information is available about the location of 3-WS-10-20. The soil sample results (in mg/kg) are summarized below (Figure 3).

| Compound | 1-WS-10-20 | 2-WS-10-20 | 4-WS-10-20 |
|---|---|---|---|
| 1,1-Dichloroethene (1,1-DCE) | ND | 0.11 | ND |
| trans-1,2-Dichloroethene (trans-1,2-DCE) | ND | 0.34 | ND |
| cis-1,2-Dichloroethene (cis-1,2-DCE) | 0.51 | 37 | ND |
| trichloroethene (TCE) | 0.17 | 0.21 | ND |
| PCE | ND | 1 | 12,000 |

No information about the soil sample results from 3-WS-10-20 was available.

### *2.2.3 Suffolk County Department of Health Services – March 1998*

Subsequent to the October 1997 investigation, SCDHS conducted a second round of investigation at the Site in March 1998. Earth Tech was able to obtain a hand sketch showing the sample collection location and the reduced data tables for some of the samples collected by SCDHS during this sampling event. Four soil samples (1-WS-3-24, 2-WS-3-24, 3-WS-3-24, and 4-WS-3-24) were collected on March 24, 1998 and one groundwater sample from monitoring well MW-2 was collected on January 14, 1998 during this investigation. The samples analyzed for VOCs by USEPA Method 8260. 1-WS-3-24 and 3-WS-3-24 were collected from 9 inches below surface; 2-WS-3-24 and 4-WS-3-24 were surficial soil samples. PCE was detected at a concentration of 0.72 mg/kg, 9.3 mg/kg, 1.6 mg/kg, and 0.44 mg/kg in the soil samples collected from 1-WS-3-24, 2-WS-3-24, 3-WS-3-24, and 4-WS-3-24, respectively. PCE was detected at a concentration of 3,500 µg/L in the groundwater sample collected from MW-2. Results for other compounds were not reported in the reduced data tables made available to Earth Tech.

### *2.2.4 Sampling Investigation by Impact Environmental – September 2000*

Impact Environmental installed one monitoring well MW-1 in the southern portion of the Site. In addition, Impact Environmental collected two soil samples and two groundwater samples (MW-1 [on-site well] and MW-2 [Getty Service Station well]). Impact Environmental reported that PCE was detected at concentration of 0.01 mg/kg and 0.031 mg/kg in the soil samples collected. No information is available to determine if the soil samples were analyzed for compounds other than PCE. The groundwater sample results (in µg/L) are summarized below.

| Compound | MW-1 | MW-2 |
|---|---|---|
| cis-1,2-DCE | 17.7 | 583 |
| TCE | 97.5 | 184 |
| PCE | 2,853 | 1,888 |

## 2.3 SITE VISIT

A site visit was conducted on November 17, 2007 by Earth Tech personnel Mr. Amit Haryani. Mr. Vivian James of NYSDEC escorted Earth Tech through the Site. Dandy operates a dry cleaning operation at the Site. During the Site visit Earth Tech was informed that country cleaners ceased its operations at the Site a year back. The Site is improved by a one story structure. An asphalt paved parking lot is located north of the building. An asphalt paved drive way is located to the south of the building. Earth Tech was unable to find the location of MW-1on the Site due to asphalt pavement in the drive. The Site is located in a mix of residential and commercial neighborhood. Huntington village, a residential apartment community is located downgradient of the Site based on the presumed groundwater flow direction.

## 2.4 SUMMARY OF DATA GAPS

Following data gaps were identified during the review of Country Cleaners documents:

- Very limited soil samples were collected during previous rounds of investigations. Chlorinated solvents contamination extent is not delineated (horizontally and vertically) at the Site. No information is available about the post excavation soil samples and the extent of contamination removal conducted at the Site.
- Limited groundwater data are available to evaluate the vertical and horizontal extent of groundwater contamination plume.

- Due to limited number of monitoring wells installed, the true groundwater flow direction at the Site is uncertain. The groundwater flow information provided in previous section is obtained from NYSDEC letter dated September 18, 2003.
- Last round of groundwater samples were collected during September 2000 investigation conducted by Impact Environmental, Inc. i.e. about 8 years ago.

## 3.0 PROJECT PLANNING

### 3.1 PLANNING AND FIELD TEAM

This section defines the organizational structure and management methodology within which quality assurance for the project has been planned and will be implemented with a clear delineation of the responsibility and authority of the personnel and organizations involved. Planning and filed teams consist of appropriate skills and regulatory authorities needed to plan and implement the proposed Triad approach. The planning team comprises of representatives of NYSDEC, NYSDOH, Earth Tech Project Manager, QA Coordinator, Health and Safety Officer (HSO), Field Team Leader (FTL), and related technical support personnel and subcontractors. The goal of project team is to identify technical objectives and goals to be accomplished. Field personnel and Earth Tech technical team members will be in regular communication with NYSDEC so that decision made in the field are in conformance with this dynamic work plan.

### 3.2 SUBCONTRACTORS

Earth Tech intends to utilize a team of experienced subcontractors, with specialties in the fields listed below.

- Geophysical Surveying Services – Enviroscan, Inc. (Lancaster, PA)
- Off-Site Analytical Laboratory - Chemtech, Inc. (Mountain Side, NJ)
- Membrane Interface Probe (MIP) Drilling Services – $S_2C_2$, Inc. (Raritan, NJ)
- Drilling Services –Land, Air and Water Environmental Services (Center Moriches, NY)
- Data Validation – Environmental Data Services, Inc. (Williamsburg, VA)
- Surveying Services - Naik Consulting Group, P.C. (Edison, NJ)

## 4.0 DYNAMIC WORK PLAN

This Dynamic Work Plan (Triad approach) uses a combination of systematic planning, dynamic work strategies and real time measurement tools to aggressively investigate the extent of impacts. The primary objective of the investigation program is to evaluate groundwater impacts, if any, from chlorinated volatile organic compounds (CVOCs), identified during previous investigations, have occurred on-site and to delineate the extent of such impacts. The program will use a combination of surface geophysics, MIP data, zone specific groundwater sampling results, and soil sampling to achieve this objective. This dynamic work plan relies on Site decisions made in the field, aided by the use of semi-quantitative data (i.e., data used to make about whether concentrations are above or below the applicable criteria) generated using MIPs. The use of data generated on-site will allow quick decision-making regarding subsequent steps.

## 4.1 PHASE I – MIPS INVESTIGATION

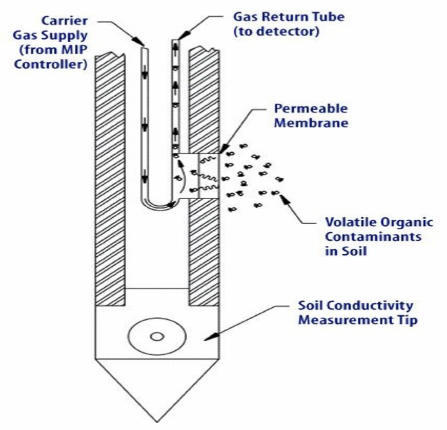
### *4.1.1 Geophysical Survey (Utility Clearance)*

Prior to the initiation of subsurface borings or penetrations, a utility mark out through the New York One Call Service will be ordered by $S_2C_2$, Inc. ($S_2C_2$), the drilling subcontractor performing the MIPs service. In addition to the utility mark-out service, Earth Tech will oversee a ground penetrating radar survey to get clearance for the MIP borings to verify that no underground utilities are impacted by the subsurface investigations. A geophysical survey will also be conducted around the area where MW-1 is suspected to be buried under the asphalt.

### *4.1.2 MIP Sampling Equipment*

$S_2C_2$ will mobilize a 6620DT track rig or equivalent with a support truck to perform direct-sensing MIP service at the Site. $S_2C_2$ will use a MP6510 or equivalent MIP probe, FC5000 field computer, MP 6500 MIP controller, coupled with a HP gas chromatograph. $S_2C_2$ will use combination photo ionization detector or electrolyte conductivity detector (PID/ELCD) during the field activity to detect the total VOCs and CVOCs at the selected borings. The ELCD detects any chlorinated compounds, if present in the subsurface. Detection limits for MIP configurations will be set between 100 and 250 parts per billion (ppb).

The MIP is approximately 1.5-inches in diameter and 12-inches in length. The probe will be driven into the subsurface at the selected locations at a rate of one-foot per minute using a 6620DT track rig or equivalent rig. The MIP will be coupled with an electrical conductivity sensor to provide continuous stratigraphic information of the soil as well as semi-quantitative concentrations of the CVOCs. A thin film membrane is impregnated into stainless steel screen on the face of the probe (see figure below). Prior to start of the field activity, the membrane is calibrated and replaced in the field between each boring. The membrane is placed in a heated block attached to the probe. This block is heated to approximately 120 $^{o}$C and is raised at the leading edge to protect the membrane. The purpose of the heating is to accelerate the diffusion of the contaminant through the membrane as diffusion occurs to a carrier gas that is swept behind the membrane at a constant flow of 35-45 mL/min. The carrier gas serves as the transport mechanism that conveys the diffused contaminants to the gas phase detectors at the surface.



MIP configuration

### *4.1.3 Pre-specified MIPs Sampling Locations*

The first phase of Triad approach program will include using MIPs to delineate the horizontal and vertical extent of CVOC impacts. The pre-selected MIP locations are shown in Figure 4. The MIP gives readings in µV (micro volts). Earth Tech proposes to advance the first few MIPs borings adjacent to the existing monitoring wells. The water from these monitoring wells will be sampled and analyzed for VOCs on a 12-hour turnaround time. The MIPs readings (in µV) will be correlated to the total concentrations (in µg/L) of CVOCs detected in these monitoring wells. At this point, the average push depth for a MIP is assumed to be 80 ft bgs. However, the MIPs borings will be advanced deeper if groundwater impacts are noted at depths beyond 80 ft bgs.

**TABLE 1**

| **No.** | **Approximate Grid Number** | **Rationale** |
|---|---|---|
| 1 | MIP-1 | To correlate MIP data with existing groundwater contamination levels from monitoring well MW-1. MW-1 may have been paved over during the improvement made at the Site. |
| 2 | MIP-2 | To correlate MIP data with existing groundwater contamination levels from monitoring well MW-2 |
| 3 | MIP-3 | Downgradient of MW-1 based on the presumed groundwater flow |
| 4 | MIP-4 | Cross-gradient of MW-1 based on the presumed groundwater flow |

### *4.1.4 Subsequent MIPs Sampling Locations*

Once a correlation has been established between the MIP results and the groundwater sampling data collected from MW-1 and MW-2, Earth Tech will begin a program of "step out" in a direction perpendicular to the assumed groundwater flow direction in order to determine the plume width and the vertical extent of groundwater contamination. After the plume width and trend has been determined by several transects, Earth Tech will begin a MIP program in the downgradient direction to determine the extent of off-site groundwater impacts. For estimating purposes, Earth Tech has assumed seven days of MIPs investigation to delineate the extent of contamination.

### *4.1.5 Borehole Abandonment*

It is anticipated that the borings will be advanced to a depth of 80 ft bgs. Each borehole will be backfilled with grout and then topped off with granular bentonite once sampling activities have been completed.

### *4.1.6 Updating the Conceptual Site Model*

After the field activities are completed, a 3-dimensional (3D) depiction of the MIP findings will be generated to refine the CSM. Based on the MIP findings, Hydropunch groundwater sampling locations and depths will be selected. Once the CSM is updated, Earth Tech will submit a letter report to NYSDEC and NYSDOH to further finalize the location and depths of confirmatory Hydropunch groundwater sampling.

## 4.2 PHASE II – GROUNDWATER INVESTIGATION

Upon completion of the MIP investigation, Earth Tech will initiate an interval-specific confirmatory groundwater grab sampling program using drive point screens. Groundwater sampling intervals will be selected based upon the MIP findings – i.e., the MIP logs and the 3D visualization of the MIP results. Earth Tech will choose intervals that represent a range of MIP signal strengths. The interval-specific groundwater samples will be collected from downgradient, upgradient, side gradient, and within the source area.

### *4.2.1 Groundwater Sampling Equipment*

Groundwater samples will be collected at specified intervals using a Hydropunch type device such as a Geoprobe S-15 sampler. The Hydropunch device will be advanced to the targeted depth and retracted to expose the stainless steel screened interval. A peristaltic pump will be used to purge groundwater from the Hydropunch with the goal of obtaining clear water prior to sampling. Field measurements are not typically recorded during Hydropunch sampling. After several minutes of purging, a groundwater sample will be collected using the peristaltic pump. The sample will be submitted to Chemtech, an ELAP (Environmental Laboratory Approval Program) certified laboratory, for analysis. Once sampling is complete, the Hydropunch will be lifted to the next interval and purged for several minutes to clear water from both the screen and the tubing. The sampling process will then be repeated.

### *4.2.2 Groundwater Sample Analysis*

Groundwater samples will be analyzed by Chemtech, (ELAP certified laboratory) for VOCs on a 24-hour turnaround time. VOC analyses will be performed by Chemtech using USEPA SW-846 GC/MS Method 8260B.

### *4.2.3 Updating the Conceptual Site Model*

Based on the Hydropunch groundwater sample data, Earth Tech will update the CSM to include information on the vertical and horizontal extent of groundwater contamination. Earth Tech will send a letter report to NYSDEC and NYSDOH to further discuss and finalize the locations for installation of permanent monitoring wells.

## 4.3 PHASE III – MONITORING WELL INSTALLATION

### *4.3.1 Monitoring Well Installation*

Upon completion of Phase I and II of the investigation, six monitoring wells will be installed for long term groundwater monitoring. The locations of proposed monitoring wells and screen intervals will be decided upon completion of Phase I and II investigations.

The monitoring well boring will be advanced using a truck mounted rig equipped hollow-stem auger (HSAs). Each well will be constructed of 2-inch inside diameter flush threaded schedule 40 polyvinyl chloride (PVC) well screen (10 ft screen length and 0.01-inch factory slotted) and casing. The PVC screen will be inserted into the HSAs to the desired depth. Sand pack, consisting of Morie No. 1 sand or equivalent, will be tremmied into the HSAs. The HSAs will be retracted as the sand is tremmied into the HSAs. The sand pack will extend from approximately 1 ft below the bottom of the screen to approximately 1 to 2 ft above the top of the screened interval. The annular space will be tremmie grouted with cement-bentonite grout. The inner casing will be marked with a permanent reference point for future well gauging and secured with a locking gripper plug. The well will be finished to grade and located within a flush mount well cover. If difficulties with running sands are encountered which hinder drilling, potable water may be introduced into the HSAs to maintain a positive hydrostatic head.

Soil cuttings generated from the boreholes will be logged and documented by an Earth Tech representative. In addition, borings for new wells will be logged by collecting split spoon samples, typically at 5-ft intervals. Notes will be kept in bound field books, boring logs, and monitoring well construction forms (Attachment 1). The Unified Soil Classification System (USCS) will be used to describe the soil. Cuttings will also be screened for VOCs using an organic vapor analyzer equipped with a PID.

### *4.3.2 Well Development*

After the grout has been allowed to set for at least eight hours, each new monitoring well will be developed to achieve hydraulic connection between the formation and the well screen. A suitable pump will be selected for development at each well. Each well will be developed until the water is clear. During development, the field supervisor will record development information on the Well Development form. Periodic readings (every five to ten minutes) will include depth to water, pumping rate, temperature, pH, conductivity and turbidity (Attachment 1). The The goal of development will be to remove at least several casing volumes of water and achieve a turbidity reading of 50 nephelometric units (NTU) or less. If these development goals have not been achieved after two hours of development, the field supervisor will contact the Earth Tech project manager for further instructions.

### *4.3.3 Groundwater Sampling*

Low flow sampling techniques will be employed to collect groundwater samples. A bladder pump (or similar submersible pump) will be used to purge the wells. The sampling procedure will follow EPA low flow sampling procedures (EPA SOP, 1998, Attachment 2). The pump intake will be set at the midpoint of the screened interval. The pump will be operated at a flow rate of 300 to 500 mL/min. Dedicated Teflon or Teflon-lined tubing will be used for all groundwater sample collection. Parameters will be recorded during purging include flow rate, depth to water, temperature, pH, conductivity, DO, ORP, and turbidity. The measurements will be recorded on the Well Sampling Forms (Attachment 1). Measurements will be collected approximately every five minutes. A flow-through cell will be used to measure most of the parameters. Purging will be considered complete when the indicator parameters have stabilized over three consecutive readings. Stabilization parameters are:

- flow rate: between 300 and 500 mL/min;
- depth to water: less than 0.3 ft drawdown during purging;
- pH: ± 0.1
- conductivity: ± 3%
- ORP: ± 10 mV
- DO: ±10% and
- Turbidity: less than 50 NTU.

An attempt will be made to achieve these criteria. However, if stabilization is not achieved after two hours of purging, the field team leader will notify the Earth Tech project manager who will contact the NYSDEC project manager for further instruction (unless default contingencies are established in advance).

During sample collection, the flow-through cell will be disconnected and the sample tubing discharge will be poured directly into the laboratory supplied sample containers. The flow rate will be decreased to approximately 100 mL/m during sample collection for VOC analysis.

The new monitoring wells and existing monitoring wells (MW-1 and MW-2) identified to be useful and viable will be purged and sampled.

### *4.3.4 Monitoring Well Survey and Groundwater Level Measurements*

Earth Tech will utilize available aerial photography to develop a site plan depicting general (existing) site features (e.g., buildings, roadways, etc.) within the vicinity of the Site. The locations of all sample points and existing monitoring wells will be surveyed by a subcontractor. The horizontal and vertical positions will be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88). The measuring point associated with the existing monitoring wells or other site reference features will be recorded to a vertical accuracy of 0.01 ft. The final survey will be supplied in a digital CAD format (i.e., .dwg or .dxf files in the cited coordinate systems).

In order to better understand the hydrogeologic conditions, one or more rounds of synoptic water level readings will be collected by Earth Tech. A groundwater elevation survey will be taken at the conclusion of a well installation program to assess factors which influence groundwater elevations and flow directions. At each well, the water level will be measured using an electronic water level meter and the water level will be recorded to the nearest 0.01 ft. The reading will then be recorded in the field notebook. Once the field crew returns to the office, the data will be converted into elevations. These elevations will be used to prepare a groundwater contour map for each synoptic event which will be included in project reports.

## 5.0 DECONTAMINATION PROCEDURES AND IDW DISPOSAL

All downhole equipment contacting material to be sampled will be decontaminated to minimize the potential for sample contamination and cross-contamination. Decontamination will be accomplished using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., alconox);
- Tap water rinse or distilled/de-ionized water rinse;
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags. General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

Soil cuttings and purge water will be drummed; drums will be provided by the drilling contractors. The IDW will be tested and disposed of off-site upon completion of the RI.

## 6.0 FIELD SAMPLING RECORD

This section describes the procedures to be followed by field personnel in recording of field activities for the site investigation. Field notebooks will be initiated at the start of on-site work. The field notebook will include the following daily information for all site activities (except that information that is recorded on standard forms need not be repeated in the log book):

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (Earth Tech and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

## 6.1 PHOTOGRAPHS

Routine photographs of typical site operations will be collected to document the fieldwork by Earth Tech personnel. Photographs will be documented in the photograph log.

## 6.2 SAMPLE IDENTIFICATION (NUMBERING) SYSTEM

Each sample collected during this project will be designated by a unique sample identifier. The following system will be used to assign unique sample identification numbers. Each sample will be identified by a four -character identifier, as described below.

Groundwater samples and MIP samples will be identified by the MIP boring location number from which they are collected (e.g., MIP-3). Hydropunch groundwater samples will be identified with the Hydropunch boring location from which they are collected and a two-digit depth interval in feet, with a “HP” prefix. For example, a Hydropunch groundwater sample from the 60 ft bgs interval at the boring for HP-1 will be identified as HP-1-60.

Field duplicates will have the same number as the original sample, with 50 added. For example, the field duplicate of MW-2 will be labeled as MW-52. Trip blanks will be identified as “TB” followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on June 14, 2008 will be labeled TB061408. Field (rinsate) blanks will be identified as “FB” followed by a matrix code (“SB” for soil boring field blanks, and “GW” for groundwater field blanks) and the six-digit date code.

The selection of sample containers is based on the media sampled, the required analysis, and the requirements of the analytical laboratory. A non-removable (even when wet) label will be affixed to each sample container. Labels will be marked with waterproof indelible ink. The following information will be contained on each label.

- Project name
- Sample identifier
- Sample date and time
- Sampler’s initials
- Sample preservation (if any)
- Analysis required

## 7.0 QUALITY ASSURANCE/QUALITY CONTROL

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a pre-determined quality at the Site. Earth Tech plans to collect trip blank, field blank, duplicate, matrix spike and matrix spike duplicate samples during the Hydropunch groundwater sample and monitoring well groundwater sampling events. A site specific QAPP is attached in Appendix A.

# 8.0 HEALTH AND SAFETY PLAN

Health and Safety Plan (HASP) provides a site specific description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted at the Site. The HASP also identifies site specific chemical and physical hazards known to be associated with the work activities addressed in this document. A site specific HASP is attached as Appendix B.

## 9.0 COMMUNITY AIR MONITORING PLAN

Community Air Monitoring Plan (CAMP) is used 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. A site specific CAMP is attached as Appendix C.

## 10.0 SITE CHARACTERIZATION REPORT

Upon completion of the field work, a draft RI Report will be generated for the site. The report will include the following:

- **Summary of Analytical Data:** The RI report will summarize analytical data, using tables and maps to the extent possible. All of the analytical data collected during this and past investigations will be included.

- **Summary of Site History and Conditions:** The report will include all of the information collected during the historic records and file search. The report will also include a section detailing the geologic and hydro-geologic conditions.

- **Summary of Field Work:** The report will include an account of all of the field work performed during this investigation. This account will include figures and tables to show sample locations, parameters analyzed for, etc.

- **Evaluation of Data Collected:** The completeness of the data collected during this investigation will be evaluated. Any data gaps or other areas where additional information is desirable will be identified. Recommendations on ways to fill these data gaps will be provided.

- **Comparison to State Standards, Criteria and Guidelines (SCGs):** SCGs for each contaminant detected will be identified and compared to existing conditions.

A total of four copies of a draft report will be submitted to NYSDEC. Upon receipt of the comments, Earth Tech will revise the draft report and print the requested number of final copies indicated in the NYSDEC comment letter. One copy of the final report; text, tables, maps, photos, etc., will be submitted as a single PDF file. All electronic files will be submitted to NYSDEC on a compact disc(s).

## 11.0 REFERENCES

EPA, 1998, Low Flow Sampling Procedure.

Berninger Environmental, Inc., 1996, Getty Service Station – Groundwater Investigation

NYSDEC, December 2002 Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation,

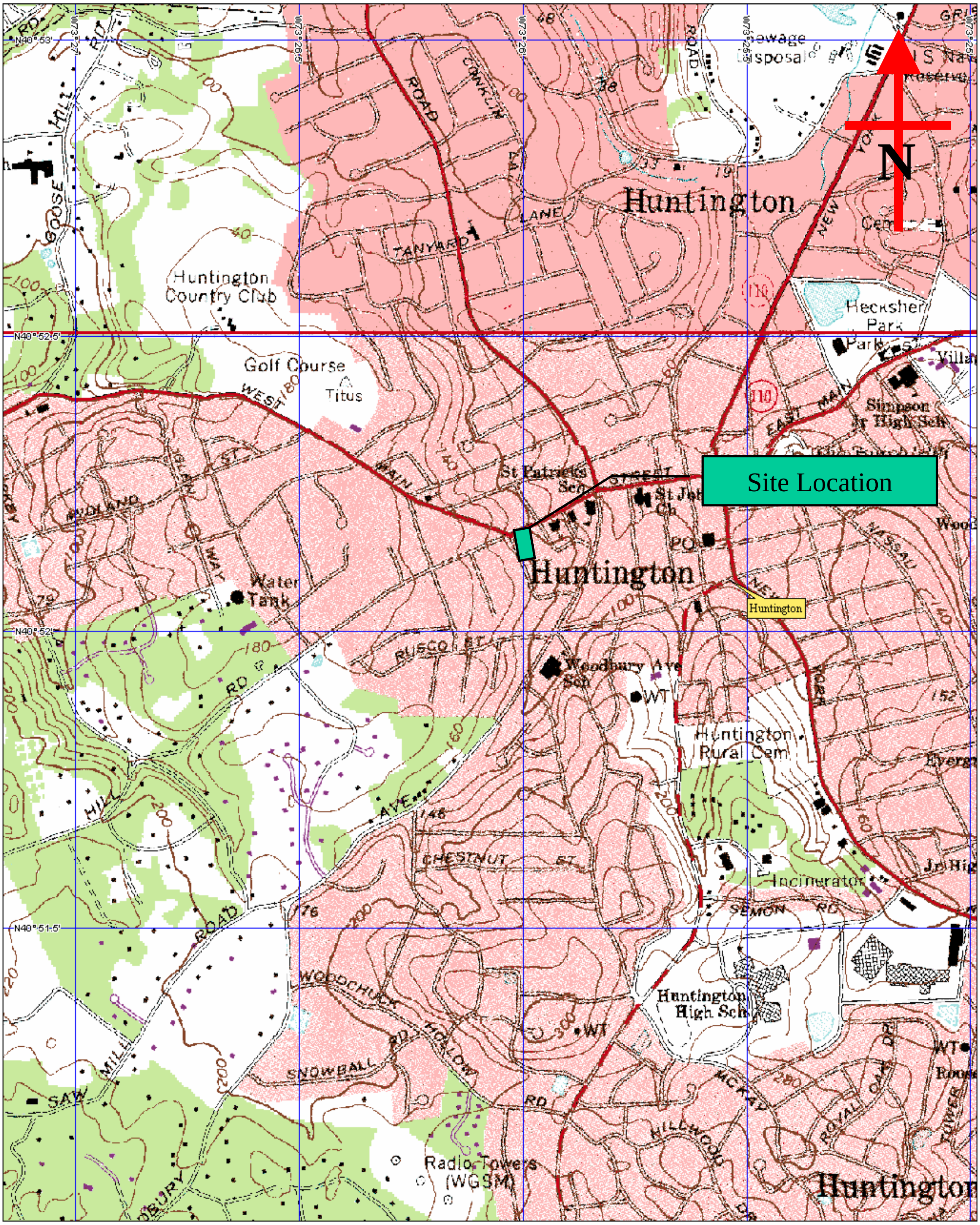
Suffolk County Department of Health Services – October 1997

Suffolk County Department of Health Services – March 1998

Impact Environmental, September 2000, Sampling Investigation

Earth Tech, January 2008, Project Management Plan.

# Figures



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

450 ft Scale: 1 : 16,000 Detail: 13-6 Datum: WGS84

300 Broadacres Drive,
Bloomfield, New Jersey 07003

ENVIRONMENTAL/CONSULTING ENGINEERS

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

PROJECT:

**REMEDIAL INVESTIGATION/FEASIBILITY STUDY**

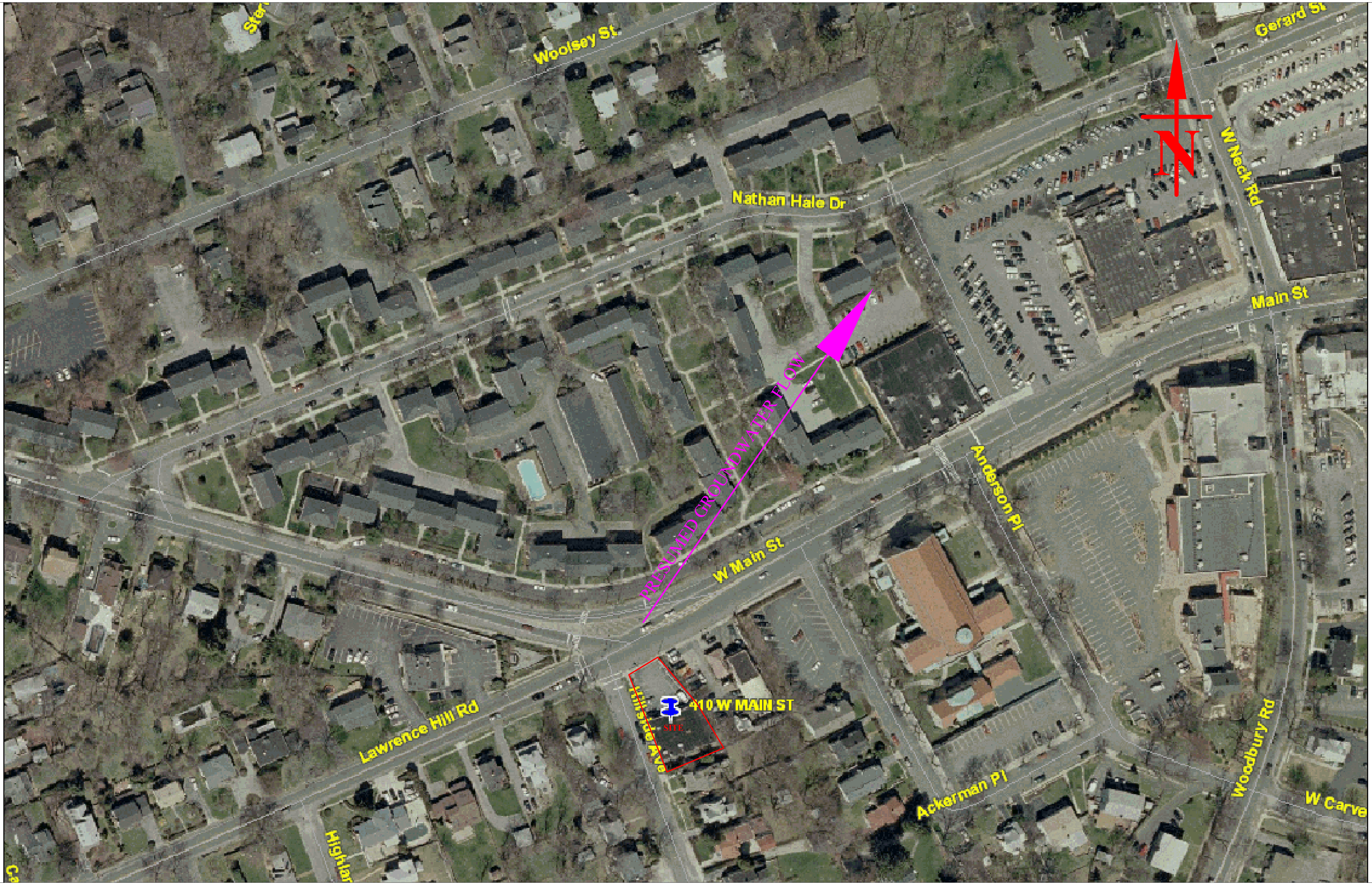
**COUNTRY CLEANERS**

410 Main Street, Huntington, New York

SITE LOCATION MAP

Project No: 102656

Figure No: 1



**LEGENDS:**

Site Boundary

Presumed Groundwater Flow Direction

**SOURCE:**

New York State Interactive Mapping Gateway

**GRAPHIC SCALE**

100 0 100 200 300

PREPARED BY:

EarthTech
A tyco International Ltd. Company
300 Broadacres Drive, Bloomfield New Jersey

PREPARED FOR:

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York

| DESIGNED BY : | DESCRIPTION : | | |
|---|---|---|---|
| MKC | SITE PLAN | | |
| CHECKED BY : | DATE : | SCALE : | DRAWING NO. : |
| AH | MAY 2008 | 1" = 140' | 2 |

**BERNINGER ENVIRONMENTAL INC., NOVEMBER 1996**

| COMPOUND | MW-2 |
|---|---|
| BENZENE | 6.5 |
| TOLUENE | 31 |
| MTBE | 960 |
| TCE | 398 |
| PCE | 2,170 |

**IMPACT ENVIRONMENTAL - SEPTEMBER 2000**

| COMPOUND | MW-1 | MW-2 |
|---|---|---|
| Cis 1,2-DCE | 17.7 | 583 |
| TCE | 97.5 | 184 |
| PCE | 2,853 | 1,888 |

**SUFFOLK COUNTY DEPARTMENT OF HEALTH - MARCH 1998**

| COMPOUND | 1-WS-3-24 | 2-WS-3-24 | 4-WS-3-24 |
|---|---|---|---|
| PCE | 720 | 9,300 | 1,600 |

**SUFFOLK COUNTY DEPARTMENT OF HEALTH - OCTOBER 1997**

| COMPOUND | 1-WS-10-20 | 2-WS-10-20 | 4-WS-10-20 |
|---|---|---|---|
| 1,1-DCE | ND | 110 | ND |
| Trans 1,2-DCE | ND | 340 | ND |
| Cis 1,2-DCE | 510 | 37,000 | ND |
| TCE | 170 | 210 | ND |
| PCE | ND | 1,000 | 12,000,000 |

**LEGENDS:**

| | |
|---|---|
| — | Site Boundary |
| — — — | Pipe |
| 1-WS-10-20 ● | Soil Boring Locations - 1997 |
| 1-WS-3-24 ● | Soil Boring Locations - 1998 |
| MW-1 ⊕ | Monitoring Well Locations |
| ⊗ | Storm Drain |
| ⊗ | Roof Leader |

**SOURCE:**

New York State Interactive Mapping Gateway

**NOTES:**

- 1-WS-10-20 was collected from the storm drain; 2-WS-10-20 was a sludge sample collected from the storm drain; 4-WS-10-20 was collected from under the condensate pipe; no information is available about the location of 3-WS-10-20. Samples collected by Suffolk County Department of Health Services - October 1997.
- 1-WS-3-24 and 3-WS-3-24 were collected from 9 inches below surface; 2-WS-3-24 and 4-WS-3-24 were surficial soil samples. Suffolk County Department of Health Services - March 1998.
- Berninger Environmental Inc., installed monitoring wells MW-1 and MW-2 on October 28, 1996 and November 5, 1996, respectively. MW-1 was dry; water was encountered in MW-2 at a depth of 52 ft bgs.
- MW-1 was installed along the property fence with the Country Cleaner site by Impact Environmental and MW-2 was installed downgradient of the existing underground storage tanks on the Getty Gas Station property.Sampling Samples collected by Impact Environmental - September 2000.
- All units for groundwater samples are in ug/L.
- All units for soil samples are in ug/kg.

GRAPHIC SCALE

25 0 25 50

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EarthTech
A tyco International Ltd. Company

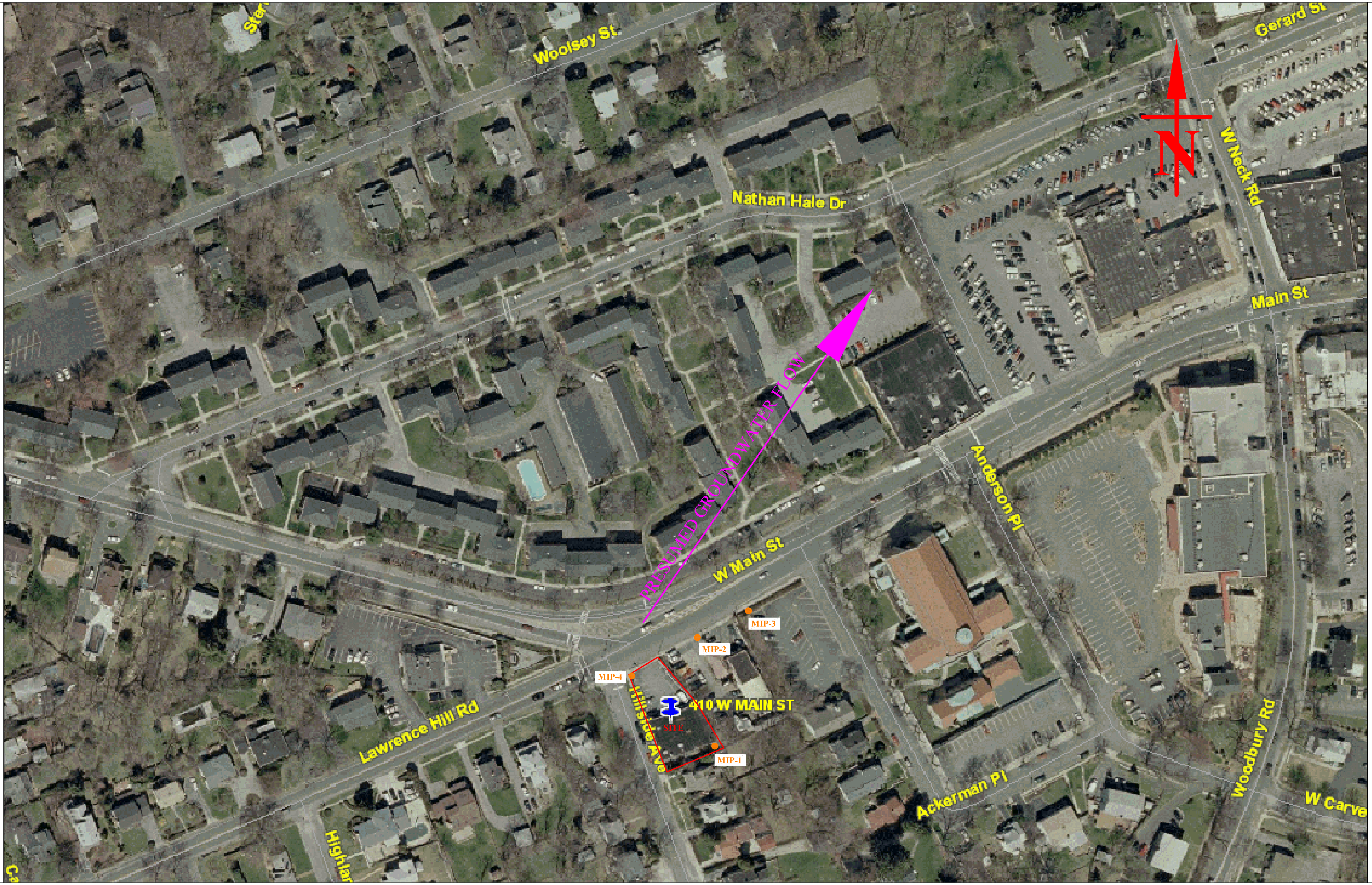
300 Broadacres Drive, Bloomfield New Jersey

PREPARED FOR:

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

625 Broadway, Albany, New York

| DESIGNED BY : | DESCRIPTION : | | |
|---|---|---|---|
| MKC | SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATIONS | | |
| CHECKED BY : | DATE : | SCALE : | DRAWING NO. : |
| AH | MAY 2008 | 1" = 25' | 3 |



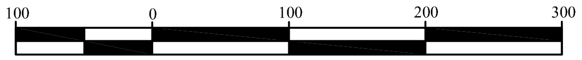
**LEGENDS:**

| | |
|---|---|
| 🟥 | Site Boundary |
| → | Presumed Groundwater Flow Direction |
| ● MIP- 1 | Pre Selected MIPs Boring Location |

**SOURCE:**

New York State Interactive Mapping Gateway

**GRAPHIC SCALE**



PREPARED BY:
EarthTech
A tyco International Ltd. Company
300 Broadacres Drive, Bloomfield New Jersey

PREPARED FOR:
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York

DESIGNED BY : MKC
DESCRIPTION : PRE–SELECTED MIPs BORING LOCATION MAP

CHECKED BY : AH
DATE : MAY 2008
SCALE : 1" = 140'
DRAWING NO. : 4

EarthTech

A tyco International Ltd. Company

**WELL NO.**

|  |  |  |  |
|---|---|---|---|
| **WELL SAMPLING FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>102656 | SHEET OF SHEETS |
| 1. LOCATION<br>Huntington, NY | 4. DATE WELL STARTED |  | 5. DATE WELL COMPLETED |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR |  |  |
| 3. DRILLING COMPANY<br>N/A | 7. SIGNATURE OF INSPECTOR |  |  |

ONE WELL VOLUME :

WELL TD:

Pump Installed:

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS |  |  |  |  |  | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) |  |
|  |  |  |  |  |  |  |  |  |  |
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Pump Type: Bladder Pump

Analytical Parameters: VOCs

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**WELL NO.**

| | | | |
|---|---|---|---|
| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>102656 | SHEET 1 OF SHEETS |
| 1. LOCATION<br>Huntington, NY | 4. DATE WELL STARTED | | 5. DATE WELL COMPLETED |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR | | |
| 3. DRILLING COMPANY | 7. SIGNATURE OF INSPECTOR | | |

ONE WELL VOLUME :

WELL TD:

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | |
| | | | | | | | | | |
| | | | | | | | | | Static |
| | | | | | | | | | Begin pumping |
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Pump Type: Whale Pump

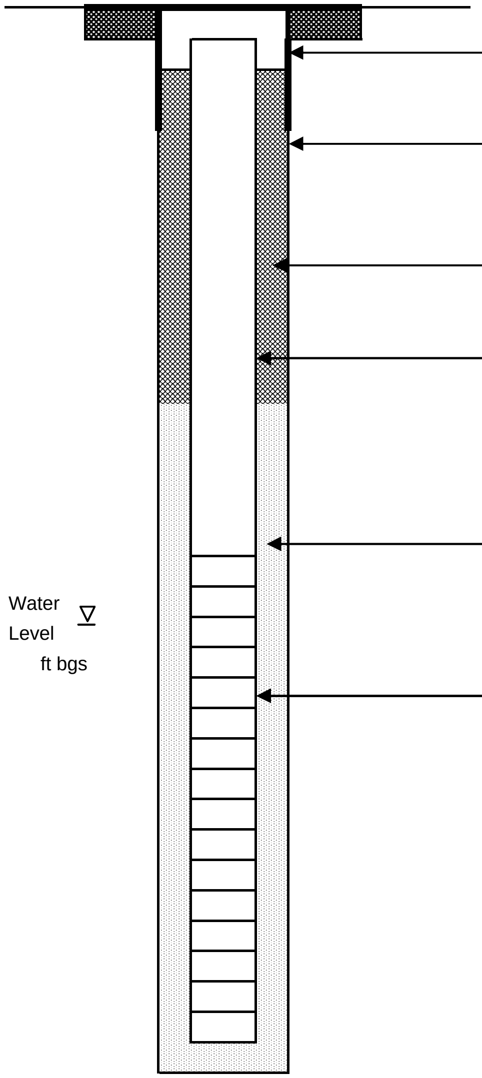
Analytical Parameters: Not Required

EarthTech
A Tyco International Ltd. Company

**Well No.**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Earth Tech Project No.: 102656 | Subcontractor: | Water Levels | | |
| Surface Elevation: Ft | Driller: | Date | Time | Depth |
| Top of PVC<br>Casing Elevation: Ft | Well Permit No.: N/A | | | |
| | Earth Tech Rep.: | | | |
| Datum: NGVD 1988 | Date of Completion: | | | |
| | | | | |

Locking protective flushmount with concrete pad



Ground Surface ____________ ft

Well casing ____________ ft bgs

Borehole diameter ____________ inches

Cement-bentonite
grout from ____________ ft to ____________ ft

Riser Pipe from ____________ ft to ____________ ft

Filter pack from ____________ ft to ____________ ft

Sand Size ____________

Well screen from ____________ ft to ____________ ft

Diameter ____________ inches
Slot size ____________ inches
Type ____________

Bottom Cap at ____________ ft

Bottom of Borehole at ____________ ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

EarthTech
A Tyco International Ltd. Company

# DIRECT PUSH BORING LOG

**Boring No.:**

| | | | | |
|---|---|---|---|---|
| PROJECT: | Country Cleaners | | | PAGE 1 OF 1 |
| PROJECT No.: | 102656 | | CONTRACTOR: | DATE: |
| LOCATION: | Huntington, NY | | DRILLERS NAME: | ET REP.: |

| WATER LEVELS | | | |
|---|---|---|---|
| | | | DESIGNATION OF DRILL RIG: |
| DATE | TIME | DEPTH | SIZE AND TYPE OF EQUIPMENT: |
| | | | REFERENCE ELEVATION: GS DEPTH OF BOREHOLE: |

LABORATORY ANALYSES:

| Depth (ft) | Sample Number &Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
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# II

United States
Environmental Protection
Agency

Office of
Research and
Development

Office of Solid Waste
and Emergency
Response

EPA/540/S-95/504
April 1996

# Ground Water Issue

## LOW-FLOW (MINIMAL DRAWDOWN) GROUND-WATER SAMPLING PROCEDURES

**by Robert W. Puls[1] and Michael J. Barcelona[2]**

### Background

The Regional Superfund Ground Water Forum is a group of ground-water scientists, representing EPA's Regional Superfund Offices, organized to exchange information related to ground-water remediation at Superfund sites. One of the major concerns of the Forum is the sampling of ground water to support site assessment and remedial performance monitoring objectives. This paper is intended to provide background information on the development of low-flow sampling procedures and its application under a variety of hydrogeologic settings. It is hoped that the paper will support the production of standard operating procedures for use by EPA Regional personnel and other environmental professionals engaged in ground-water sampling.

For further information contact: Robert Puls, 405-436-8543, Subsurface Remediation and Protection Division, NRMRL, Ada, Oklahoma.

### I. Introduction

The methods and objectives of ground-water sampling to assess water quality have evolved over time. Initially the emphasis was on the assessment of water quality of aquifers as sources of drinking water. Large water-bearing units were identified and sampled in keeping with that objective. These were highly productive aquifers that supplied drinking water via private wells or through public water supply systems. Gradually, with the increasing awareness of subsurface pollution of these water resources, the understanding of complex hydrogeochemical processes which govern the fate and transport of contaminants in the subsurface increased. This increase in understanding was also due to advances in a number of scientific disciplines and improvements in tools used for site characterization and ground-water sampling. Ground-water quality investigations where pollution was detected initially borrowed ideas, methods, and materials for site characterization from the water supply field and water analysis from public health practices. This included the materials and manner in which monitoring wells were installed and the way in which water was brought to the surface, treated, preserved and analyzed. The prevailing conceptual ideas included convenient generalizations of ground-water resources in terms of large and relatively homogeneous hydrologic *units*. With time it became apparent that conventional water supply generalizations of *homogeneity* did not adequately represent field data regarding pollution of these subsurface resources. The important role of *heterogeneity* became increasingly clear not only in geologic terms, but also in terms of complex physical,

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[1] ***National Risk Management Research Laboratory, U.S. EPA***
[2] ***University of Michigan***

**Superfund Technology Support Center for Ground Water**

**National Risk Management Research Laboratory**
**Subsurface Protection and Remediation Division**
**Robert S. Kerr Environmental Research Center**
**Ada, Oklahoma**

Technology Innovation Office
Office of Solid Waste and Emergency
Response, US EPA, Washington, DC

Walter W. Kovalick, Jr., Ph.D.
Director

chemical and biological subsurface processes. With greater appreciation of the role of heterogeneity, it became evident that subsurface pollution was ubiquitous and encompassed the unsaturated zone to the deep subsurface and included unconsolidated sediments, fractured rock, and *aquitards* or low-yielding or impermeable formations. Small-scale processes and heterogeneities were shown to be important in identifying contaminant distributions and in controlling water and contaminant flow paths.

It is beyond the scope of this paper to summarize all the advances in the field of ground-water quality investigations and remediation, but two particular issues have bearing on ground-water sampling today: aquifer heterogeneity and colloidal transport. Aquifer heterogeneities affect contaminant flow paths and include variations in geology, geochemistry, hydrology and microbiology. As methods and the tools available for subsurface investigations have become increasingly sophisticated and understanding of the subsurface environment has advanced, there is an awareness that in most cases a primary concern for site investigations is characterization of contaminant flow paths rather than entire aquifers. In fact, in many cases, plume thickness can be less than well screen lengths (e.g., 3-6 m) typically installed at hazardous waste sites to detect and monitor plume movement over time. Small-scale differences have increasingly been shown to be important and there is a general trend toward smaller diameter wells and shorter screens.

The hydrogeochemical significance of colloidal-size particles in subsurface systems has been realized during the past several years (Gschwend and Reynolds, 1987; McCarthy and Zachara, 1989; Puls, 1990; Ryan and Gschwend, 1990). This realization resulted from both field and laboratory studies that showed faster contaminant migration over greater distances and at higher concentrations than flow and transport model predictions would suggest (Buddemeier and Hunt, 1988; Enfield and Bengtsson, 1988; Penrose et al., 1990). Such models typically account for interaction between the mobile aqueous and immobile solid phases, but do not allow for a mobile, reactive solid phase. It is recognition of this third *phase* as a possible means of contaminant transport that has brought increasing attention to the manner in which samples are collected and processed for analysis (Puls et al., 1990; McCarthy and Degueldre, 1993; Backhus et al., 1993; U. S. EPA, 1995). If such a phase is present in sufficient mass, possesses high sorption reactivity, large surface area, and remains stable in suspension, it can serve as an important mechanism to facilitate contaminant transport in many types of subsurface systems.

Colloids are particles that are sufficiently small so that the surface free energy of the particle dominates the bulk free energy. Typically, in ground water, this includes particles with diameters between 1 and 1000 nm. The most commonly observed mobile particles include: secondary clay minerals; hydrous iron, aluminum, and manganese oxides; dissolved and particulate organic materials, and viruses and bacteria. These reactive particles have been shown to be mobile under a variety of conditions in both field studies and laboratory column experiments, and as such need to be included in monitoring programs where identification of the *total* mobile contaminant loading (dissolved + naturally suspended particles) at a site is an objective. To that end, sampling methodologies must be used which do not artificially bias *naturally* suspended particle concentrations.

Currently the most common ground-water purging and sampling methodology is to purge a well using bailers or high speed pumps to remove 3 to 5 casing volumes followed by sample collection. This method can cause adverse impacts on sample quality through collection of samples with high levels of turbidity. This results in the inclusion of otherwise immobile artifactual particles which produce an overestimation of certain analytes of interest (e.g., metals or hydrophobic organic compounds). Numerous documented problems associated with filtration (Danielsson, 1982; Laxen and Chandler, 1982; Horowitz et al., 1992) make this an undesirable method of rectifying the turbidity problem, and include the removal of potentially mobile (contaminant-associated) particles during filtration, thus artificially biasing contaminant concentrations low. Sampling-induced turbidity problems can often be mitigated by using low-flow purging and sampling techniques.

Current subsurface conceptual models have undergone considerable refinement due to the recent development and increased use of field screening tools. So-called hydraulic *push* technologies (e.g., cone penetrometer, Geoprobe®, QED HydroPunch®) enable relatively fast screening site characterization which can then be used to design and install a monitoring well network. Indeed, alternatives to conventional monitoring wells are now being considered for some hydrogeologic settings. The ultimate design of any monitoring system should however be based upon adequate site characterization and be consistent with established monitoring objectives.

If the sampling program objectives include accurate assessment of the magnitude and extent of subsurface contamination over time and/or accurate assessment of subsequent remedial performance, then some information regarding plume delineation in three-dimensional space is necessary prior to monitoring well network design and installation. This can be accomplished with a variety of different tools and equipment ranging from hand-operated augers to screening tools mentioned above and large drilling rigs. Detailed information on ground-water flow velocity, direction, and horizontal and vertical variability are essential baseline data requirements. Detailed soil and geologic data are required prior to and during the installation of sampling points. This includes historical as well as detailed soil and geologic logs which accumulate during the site investigation. The use of borehole geophysical techniques is also recommended. With this information (together with other site characterization data) and a clear understanding of sampling objectives, then appropriate location, screen length, well diameter, slot size, etc. for the monitoring well network can be decided. This is especially critical for new in situ remedial approaches or natural attenuation assessments at hazardous waste sites.

In general, the overall goal of any ground-water sampling program is to collect water samples with no alteration in water chemistry; analytical data thus obtained may be used for a variety of specific monitoring programs depending on the regulatory requirements. The sampling methodology described in this paper assumes that the monitoring goal is to sample monitoring wells for the presence of contaminants and it is applicable whether mobile colloids are a concern or not and whether the analytes of concern are metals (and metalloids) or organic compounds.

## II. Monitoring Objectives and Design Considerations

The following issues are important to consider prior to the design and implementation of any ground-water monitoring program, including those which anticipate using low-flow purging and sampling procedures.

### *A. Data Quality Objectives (DQOs)*

Monitoring objectives include four main types: detection, assessment, corrective-action evaluation and resource evaluation, along with *hybrid* variations such as site-assessments for property transfers and water availability investigations. Monitoring objectives may change as contamination or water quality problems are discovered. However, there are a number of common components of monitoring programs which should be recognized as important regardless of initial objectives. These components include:

1) Development of a conceptual model that incorporates elements of the regional geology to the local geologic framework. The conceptual model development also includes initial site characterization efforts to identify hydrostratigraphic units and likely flow-paths using a minimum number of borings and well completions;

2) Cost-effective and well documented collection of high quality data utilizing simple, accurate, and reproducible techniques; and

3) Refinement of the conceptual model based on supplementary data collection and analysis.

These fundamental components serve many types of monitoring programs and provide a basis for future efforts that evolve in complexity and level of spatial detail as purposes and objectives expand. High quality, reproducible data collection is a common goal regardless of program objectives.

High quality data collection implies data of sufficient accuracy, precision, and completeness (i.e., ratio of valid analytical results to the minimum sample number called for by the program design) to meet the program objectives. Accuracy depends on the correct choice of monitoring tools and procedures to minimize sample and subsurface disturbance from collection to analysis. Precision depends on the repeatability of sampling and analytical protocols. It can be assured or improved by replication of sample analyses including blanks, field/lab standards and reference standards.

### *B. Sample Representativeness*

An important goal of any monitoring program is collection of data that is truly representative of conditions at the site. The term *representativeness* applies to chemical and hydrogeologic data collected via wells, borings, piezometers, geophysical and soil gas measurements, lysimeters, and temporary sampling points. It involves a recognition of the statistical variability of individual subsurface physical properties, and contaminant or major ion concentration levels, while explaining extreme values. Subsurface temporal and spatial variability are facts. Good professional practice seeks to maximize representativeness by using proven accurate and reproducible techniques to define limits on the distribution of measurements collected at a site. However, measures of representativeness are dynamic and are controlled by evolving site characterization and monitoring objectives. An evolutionary site characterization model, as shown in Figure 1, provides a systematic approach to the goal of consistent data collection.

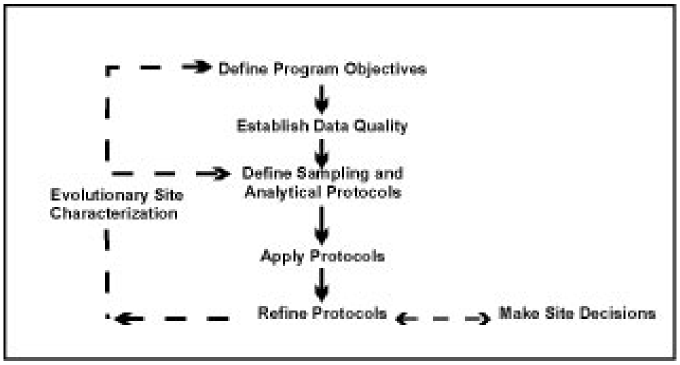

Figure 1. Evolutionary Site Characterization Model

The model emphasizes a recognition of the causes of the variability (e.g., use of inappropriate technology such as using bailers to purge wells; imprecise or operator-dependent methods) and the need to control avoidable errors.

#### 1) Questions of Scale

A sampling plan designed to collect representative samples must take into account the potential scale of changes in site conditions through space and time as well as the chemical associations and behavior of the parameters that are targeted for investigation. In subsurface systems, physical (i.e., aquifer) and chemical properties over time or space are not statistically independent. In fact, samples taken in close proximity (i.e., within distances of a few meters) or within short time periods (i.e., more frequently than monthly) are highly auto-correlated. This means that designs employing high-sampling frequency (e.g., monthly) or dense spatial monitoring designs run the risk of redundant data collection and misleading inferences regarding trends in values that aren't statistically valid. In practice, contaminant detection and assessment monitoring programs rarely suffer these *over-sampling* concerns. In corrective-action evaluation programs, it is also possible that too little data may be collected over space or time. In these cases, false interpretation of the spatial extent of contamination or underestimation of temporal concentration variability may result.

#### 2) Target Parameters

Parameter selection in monitoring program design is most often dictated by the regulatory status of the site. However, background water quality constituents, purging indicator parameters, and contaminants, all represent targets for data collection programs. The tools and procedures used in these programs should be equally rigorous and applicable to all categories of data, since all may be needed to determine or support regulatory action.

### *C. Sampling Point Design and Construction*

Detailed site characterization is central to all decision-making purposes and the basis for this characterization resides in identification of the geologic framework and major hydro-stratigraphic units. Fundamental data for sample point location include: subsurface lithology, head-differences and background geochemical conditions. Each sampling point has a proper use or uses which should be documented at a level which is appropriate for the program's data quality objectives. Individual sampling points may not always be able to fulfill multiple monitoring objectives (e.g., detection, assessment, corrective action).

#### 1) Compatibility with Monitoring Program and Data Quality Objectives

Specifics of sampling point location and design will be dictated by the complexity of subsurface lithology and variability in contaminant and/or geochemical conditions. It should be noted that, regardless of the ground-water sampling approach, few sampling points (e.g., wells, drive-points, screened augers) have zones of influence in excess of a few feet. Therefore, the spatial frequency of sampling points should be carefully selected and designed.

#### 2) Flexibility of Sampling Point Design

In most cases *well-point* diameters in excess of 1 7/8 inches will permit the use of most types of submersible pumping devices for low-flow (minimal drawdown) sampling. It is suggested that *short* (e.g., less than 1.6 m) screens be incorporated into the monitoring design where possible so that comparable results from one device to another might be expected. *Short*, of course, is relative to the degree of vertical water quality variability expected at a site.

#### 3) Equilibration of Sampling Point

Time should be allowed for equilibration of the well or sampling point with the formation after installation. Placement of well or sampling points in the subsurface produces some disturbance of ambient conditions. Drilling techniques (e.g., auger, rotary, etc.) are generally considered to cause more disturbance than *direct-push* technologies. In either case, there may be a period (i.e., days to months) during which water quality near the point may be distinctly different from that in the formation. Proper development of the sampling point and adjacent formation to remove fines created during emplacement will shorten this water quality *recovery* period.

## III. Definition of Low-Flow Purging and Sampling

It is generally accepted that water in the well casing is non-representative of the formation water and needs to be purged prior to collection of ground-water samples. However, the water in the screened interval may indeed be representative of the formation, depending upon well construction and site hydrogeology. Wells are purged to some extent for the following reasons: the presence of the air interface at the top of the water column resulting in an oxygen concentration gradient with depth, loss of volatiles up the water column, leaching from or sorption to the casing or filter pack, chemical changes due to clay seals or backfill, and surface infiltration.

Low-flow purging, whether using portable or dedicated systems, should be done using pump-intake located in the middle or slightly above the middle of the screened interval. Placement of the pump too close to the bottom of the well will cause increased entrainment of solids which have collected in the well over time. These particles are present as a result of well development, prior purging and sampling events, and natural colloidal transport and deposition. Therefore, placement of the pump in the middle or toward the top of the screened interval is suggested. Placement of the pump at the top of the water column for sampling is only recommended in unconfined aquifers, screened across the water table, where this is the desired sampling point. Low-flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval.

### *A. Low-Flow Purging and Sampling*

Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practical taking into account established site sampling objectives. Typically, flow rates on the order of 0.1 - 0.5 L/min are used, however this is dependent on site-specific hydrogeology. Some extremely coarse-textured formations have been successfully sampled in this manner at flow rates to 1 L/min. The effectiveness of using low-flow purging is intimately linked with proper screen location, screen length, and well construction and development techniques. The reestablishment of natural flow paths in both the vertical and horizontal directions is important for correct interpretation of the data. For high resolution sampling needs, screens less than 1 m should be used. Most of the need for purging has been found to be due to passing the sampling device through the overlying casing water which causes mixing of these stagnant waters and the dynamic waters within the screened interval. Additionally, there is disturbance to suspended sediment collected in the bottom of the casing and the displacement of water out into the formation immediately adjacent to the well screen. These disturbances and impacts can be avoided using dedicated sampling equipment, which precludes the need to insert the sampling device prior to purging and sampling.

Isolation of the screened interval water from the overlying stagnant casing water may be accomplished using low-flow minimal drawdown techniques. If the pump intake is located within the screened interval, most of the water pumped will be drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. However, if the wells are not constructed and developed properly, zones other than those intended may be sampled. At some sites where geologic heterogeneities are sufficiently different within the screened interval, higher conductivity zones may be preferentially sampled. This is another reason to use shorter screened intervals, especially where high spatial resolution is a sampling objective.

### *B. Water Quality Indicator Parameters*

It is recommended that water quality indicator parameters be used to determine purging needs prior to sample collection in each well. Stabilization of parameters such as pH, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature and turbidity should be used to determine when formation water is accessed during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by oxidation-reduction potential, dissolved oxygen and turbidity. Temperature and pH, while commonly used as purging indicators, are actually quite insensitive in distinguishing between formation water and stagnant casing water; nevertheless, these are important parameters for data interpretation purposes and should also be measured. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator parameters. Instruments are available which utilize in-line flow cells to continuously measure the above parameters.

It is important to establish specific well stabilization criteria and then consistently follow the same methods thereafter, particularly with respect to drawdown, flow rate and sampling device. Generally, the time or purge volume required for parameter stabilization is independent of well depth or well volumes. Dependent variables are well diameter, sampling device, hydrogeochemistry, pump flow rate, and whether the devices are used in a portable or dedicated manner. If the sampling device is already in place (i.e., dedicated sampling systems), then the time and purge volume needed for stabilization is much shorter. Other advantages of dedicated equipment include less purge water for waste disposal, much less decontamination of equipment, less time spent in preparation of sampling as well as time in the field, and more consistency in the sampling approach which probably will translate into less variability in sampling results. The use of dedicated equipment is strongly recommended at wells which will undergo routine sampling over time.

If parameter stabilization criteria are too stringent, then minor oscillations in indicator parameters may cause purging operations to become unnecessarily protracted. It should also be noted that turbidity is a very conservative parameter in terms of stabilization. Turbidity is always the last parameter to stabilize. Excessive purge times are invariably related to the establishment of too stringent turbidity stabilization criteria. It should be noted that natural turbidity levels in ground water may exceed 10 nephelometric turbidity units (NTU).

### *C. Advantages and Disadvantages of Low-Flow (Minimum Drawdown) Purging*

In general, the advantages of low-flow purging include:

- samples which are representative of the *mobile* load of contaminants present (dissolved and colloid-associated);
- minimal disturbance of the sampling point thereby minimizing sampling artifacts;
- less operator variability, greater operator control;

- reduced stress on the formation (minimal drawdown);
- less mixing of stagnant casing water with formation water;
- reduced need for filtration and, therefore, less time required for sampling;
- smaller purging volume which decreases waste disposal costs and sampling time;
- better sample consistency; reduced artificial sample variability.

Some disadvantages of low-flow purging are:

- higher initial capital costs,
- greater set-up time in the field,
- need to transport additional equipment to and from the site,
- increased training needs,
- resistance to change on the part of sampling practitioners,
- concern that new data will indicate a *change in conditions* and trigger an *action*.

## IV. Low-Flow (Minimal Drawdown) Sampling Protocols

The following ground-water sampling procedure has evolved over many years of experience in ground-water sampling for organic and inorganic compound determinations and as such summarizes the authors' (and others) experiences to date (Barcelona et al., 1984, 1994; Barcelona and Helfrich, 1986; Puls and Barcelona, 1989; Puls et. al. 1990, 1992; Puls and Powell, 1992; Puls and Paul, 1995). High-quality chemical data collection is essential in ground-water monitoring and site characterization. The primary limitations to the collection of *representative* ground-water samples include: mixing of the stagnant casing and *fresh* screen waters during insertion of the sampling device or ground-water level measurement device; disturbance and resuspension of settled solids at the bottom of the well when using high pumping rates or raising and lowering a pump or bailer; introduction of atmospheric gases or degassing from the water during sample handling and transfer, or inappropriate use of vacuum sampling device, etc.

### *A. Sampling Recommendations*

Water samples should not be taken immediately following well development. Sufficient time should be allowed for the ground-water flow regime in the vicinity of the monitoring well to stabilize and to approach chemical equilibrium with the well construction materials. This lag time will depend on site conditions and methods of installation but often exceeds one week.

Well purging is nearly always necessary to obtain samples of water flowing through the geologic formations in the screened interval. Rather than using a general but arbitrary guideline of purging three casing volumes prior to sampling, it is recommended that an in-line water quality measurement device (e.g., flow-through cell) be used to establish the stabilization time for several parameters (e.g. , pH, specific conductance, redox, dissolved oxygen, turbidity) on a well-specific basis. Data on pumping rate, drawdown, and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

The following are recommendations to be considered before, during and after sampling:

- use low-flow rates (<0.5 L/min), during both purging and sampling to maintain minimal drawdown in the well;
- maximize tubing wall thickness, minimize tubing length;
- place the sampling device intake at the desired sampling point;
- minimize disturbances of the stagnant water column above the screened interval during water level measurement and sampling device insertion;
- make proper adjustments to stabilize the flow rate as soon as possible;
- monitor water quality indicators during purging;
- collect unfiltered samples to estimate contaminant loading and transport potential in the subsurface system.

### *B. Equipment Calibration*

Prior to sampling, all sampling device and monitoring equipment should be calibrated according to manufacturer’s recommendations and the site Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). Calibration of pH should be performed with at least two buffers which bracket the expected range. Dissolved oxygen calibration must be corrected for local barometric pressure readings and elevation.

### *C. Water Level Measurement and Monitoring*

It is recommended that a device be used which will least disturb the water surface in the casing. Well depth should be obtained from the well logs. Measuring to the bottom of the well casing will only cause resuspension of settled solids from the formation and require longer purging times for turbidity equilibration. Measure well depth after sampling is completed. The water level measurement should be taken from a permanent reference point which is surveyed relative to ground elevation.

### *D. Pump Type*

The use of low-flow (e.g., 0.1-0.5 L/min) pumps is suggested for purging and sampling all types of analytes. All pumps have some limitation and these should be investigated with respect to application at a particular site. Bailers are inappropriate devices for low-flow sampling.

### 1) General Considerations

There are no unusual requirements for ground-water sampling devices when using low-flow, minimal drawdown techniques. The major concern is that the device give consistent results and minimal disturbance of the sample across a range of *low* flow rates (i.e., < 0.5 L/min). Clearly, pumping rates that cause minimal to no drawdown in one well could easily cause *significant* drawdown in another well finished in a less transmissive formation. In this sense, the pump should not cause undue pressure or temperature changes or physical disturbance on the water sample over a reasonable sampling range. Consistency in operation is critical to meet accuracy and precision goals.

### 2) Advantages and Disadvantages of Sampling Devices

A variety of sampling devices are available for low-flow (minimal drawdown) purging and sampling and include peristaltic pumps, bladder pumps, electrical submersible pumps, and gas-driven pumps. Devices which lend themselves to both dedication and consistent operation at definable low-flow rates are preferred. It is desirable that the pump be easily adjustable and operate reliably at these lower flow rates. The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and some volatiles loss. Gas-driven pumps should be of a type that does not allow the gas to be in direct contact with the sampled fluid.

Clearly, bailers and other *grab* type samplers are ill-suited for low-flow sampling since they will cause repeated disturbance and mixing of *stagnant* water in the casing and the *dynamic* water in the screened interval. Similarly, the use of inertial lift foot-valve type samplers may cause too much disturbance at the point of sampling. Use of these devices also tends to introduce uncontrolled and unacceptable operator variability.

Summaries of advantages and disadvantages of various sampling devices are listed in Herzog et al. (1991), U. S. EPA (1992), Parker (1994) and Thurnblad (1994).

## *E. Pump Installation*

Dedicated sampling devices (left in the well) capable of pumping and sampling are preferred over <u>any</u> other type of device. Any portable sampling device should be slowly and carefully lowered to the middle of the screened interval or slightly above the middle (e.g., 1-1.5 m below the top of a 3 m screen). This is to minimize excessive mixing of the stagnant water in the casing above the screen with the screened interval zone water, and to minimize resuspension of solids which will have collected at the bottom of the well. These two disturbance effects have been shown to directly affect the time required for purging. There also appears to be a direct correlation between size of portable sampling devices relative to the well bore and resulting purge volumes and times. The key is to minimize disturbance of water and solids in the well casing.

## *F. Filtration*

Decisions to filter samples should be dictated by sampling objectives rather than as a *fix* for poor sampling practices, and field-filtering of certain constituents should not be the default. Consideration should be given as to what the application of field-filtration is trying to accomplish. For assessment of truly dissolved (as opposed to operationally *dissolved* [i.e., samples filtered with 0.45 µm filters]) concentrations of major ions and trace metals, 0.1 µm filters are recommended although 0.45 µm filters are normally used for most regulatory programs. Alkalinity samples must also be filtered if significant particulate calcium carbonate is suspected, since this material is likely to impact alkalinity titration results (although filtration itself may alter the $CO_2$ composition of the sample and, therefore, affect the results).

Although filtration may be appropriate, filtration of a sample may cause a number of unintended changes to occur (e.g. oxidation, aeration) possibly leading to filtration-induced artifacts during sample analysis and uncertainty in the results. Some of these unintended changes may be unavoidable but the factors leading to them must be recognized. Deleterious effects can be minimized by consistent application of certain filtration guidelines. Guidelines should address selection of filter type, media, pore size, etc. in order to identify and minimize potential sources of uncertainty when filtering samples.

In-line filtration is recommended because it provides better consistency through less sample handling, and minimizes sample exposure to the atmosphere. In-line filters are available in both disposable (barrel filters) and non-disposable (in-line filter holder, flat membrane filters) formats and various filter pore sizes (0.1-5.0 µm). Disposable filter cartridges have the advantage of greater sediment handling capacity when compared to traditional membrane filters. Filters must be pre-rinsed following manufacturer's recommendations. If there are no recommendations for rinsing, pass through a minimum of 1 L of ground water following purging and prior to sampling. Once filtration has begun, a filter cake may develop as particles larger than the pore size accumulate on the filter membrane. The result is that the effective pore diameter of the membrane is reduced and particles smaller than the stated pore size are excluded from the filtrate. Possible corrective measures include prefiltering (with larger pore size filters), minimizing particle loads to begin with, and reducing sample volume.

## *G. Monitoring of Water Level and Water Quality Indicator Parameters*

Check water level periodically to monitor drawdown in the well as a guide to flow rate adjustment. The goal is minimal drawdown (<0.1 m) during purging. This goal may be difficult to achieve under some circumstances due to geologic heterogeneities within the screened interval, and may require adjustment based on site-specific conditions and personal experience. In-line water quality indicator parameters should be continuously monitored during purging. The water quality indicator parameters monitored can include pH, redox potential, conductivity, dissolved oxygen (DO) and turbidity. The last three parameters are often most sensitive. Pumping rate, drawdown, and the time or volume required to obtain stabilization of parameter readings can be used as a future guide to purge the well. Measurements should be taken every three to five minutes if the above suggested rates are used. Stabilization is achieved after all parameters have stabilized for three successive readings. In lieu of measuring all five parameters, a minimum subset would include pH, conductivity, and turbidity or DO. Three successive readings should be within ± 0.1 for pH, ± 3% for conductivity, ± 10 mv for redox potential, and ± 10% for turbidity and DO. Stabilized purge indicator parameter trends are generally obvious and follow either an exponential or asymptotic change to stable values during purging. Dissolved oxygen and turbidity usually require the longest time for stabilization. The above stabilization guidelines are provided for rough estimates based on experience.

### *H. Sampling, Sample Containers, Preservation and Decontamination*

Upon parameter stabilization, sampling can be initiated. If an in-line device is used to monitor water quality parameters, it should be disconnected or bypassed during sample collection. Sampling flow rate may remain at established purge rate or may be adjusted slightly to minimize aeration, bubble formation, turbulent filling of sample bottles, or loss of volatiles due to extended residence time in tubing. Typically, flow rates less than 0.5 L/min are appropriate. The same device should be used for sampling as was used for purging. Sampling should occur in a progression from least to most contaminated well, if this is known. Generally, volatile (e.g., solvents and fuel constituents) and gas sensitive (e.g., $Fe^{2+}$, $CH_4$, $H_2S/HS^-$, alkalinity) parameters should be sampled first. The sequence in which samples for most inorganic parameters are collected is immaterial unless filtered (dissolved) samples are desired. Filtering should be done last and in-line filters should be used as discussed above. During both well purging and sampling, proper protective clothing and equipment must be used based upon the type and level of contaminants present.

The appropriate sample container will be prepared in advance of actual sample collection for the analytes of interest and include sample preservative where necessary. Water samples should be collected directly into this container from the pump tubing.

Immediately after a sample bottle has been filled, it must be preserved as specified in the site (QAPP). Sample preservation requirements are based on the analyses being performed (use site QAPP, FSP, RCRA guidance document [U. S. EPA, 1992] or EPA SW-846 [U. S. EPA, 1982] ). It may be advisable to add preservatives to sample bottles in a controlled setting prior to entering the field in order to reduce the chances of improperly preserving sample bottles or introducing field contaminants into a sample bottle while adding the preservatives.

The preservatives should be transferred from the chemical bottle to the sample container using a disposable polyethylene pipet and the disposable pipet should be used only once and then discarded.

After a sample container has been filled with ground water, a Teflon™ (or tin)-lined cap is screwed on tightly to prevent the container from leaking. A sample label is filled out as specified in the FSP. The samples should be stored inverted at 4°C.

Specific decontamination protocols for sampling devices are dependent to some extent on the type of device used and the type of contaminants encountered. Refer to the site QAPP and FSP for specific requirements.

### I. Blanks

The following blanks should be collected:

(1) field blank: one field blank should be collected from each source water (distilled/deionized water) used for sampling equipment decontamination or for assisting well development procedures.

(2) equipment blank: one equipment blank should be taken prior to the commencement of field work, from each set of sampling equipment to be used for that day. Refer to site QAPP or FSP for specific requirements.

(3) trip blank: a trip blank is required to accompany each volatile sample shipment. These blanks are prepared in the laboratory by filling a 40-mL volatile organic analysis (VOA) bottle with distilled/deionized water.

## V. Low-Permeability Formations and Fractured Rock

The overall sampling program goals or sampling objectives will drive how the sampling points are located, installed, and choice of sampling device. Likewise, site-specific hydrogeologic factors will affect these decisions. Sites with very low permeability formations or fractures causing discrete flow channels may require a unique monitoring approach. Unlike water supply wells, wells installed for ground-water quality assessment and restoration programs are often installed in low water-yielding settings (e.g., clays, silts). Alternative types of sampling points and sampling methods are often needed in these types of environments, because low-permeability settings may require extremely low-flow purging (<0.1 L/min) and may be technology-limited. Where devices are not readily available to pump at such low flow rates, the primary consideration is to avoid dewatering of the well screen. This may require repeated recovery of the water during purging while leaving the pump in place within the well screen.

Use of low-flow techniques may be impractical in these settings, depending upon the water recharge rates. The sampler and the end-user of data collected from such wells need to understand the limitations of the data collected; i.e., a strong potential for underestimation of actual contaminant concentrations for volatile organics, potential false negatives for filtered metals and potential false positives for unfiltered metals. It is suggested that comparisons be made between samples recovered using low-flow purging techniques and samples recovered using passive sampling techniques (i.e., two sets of samples). Passive sample collection would essentially entail acquisition of the sample with no or very little purging using a dedicated sampling system installed within the screened interval or a passive sample collection device.

### *A. Low-Permeability Formations (<0.1 L/min recharge)*

#### 1. Low-Flow Purging and Sampling with Pumps

a. "portable or non-dedicated mode" - Lower the pump (one capable of pumping at <0.1 L/min) to mid-screen or slightly above and set in place for minimum of 48 hours (to lessen purge volume requirements). After 48 hours, use procedures listed in Part IV above regarding monitoring water quality parameters for stabilization, etc., but do not dewater the screen. If excessive drawdown and slow recovery is a problem, then alternate approaches such as those listed below may be better.

b. "dedicated mode" - Set the pump as above at least a week prior to sampling; that is, operate in a dedicated pump mode. With this approach significant reductions in purge volume should be realized. Water quality parameters should stabilize quite rapidly due to less disturbance of the sampling zone.

#### 2. Passive Sample Collection

Passive sampling collection requires insertion of the device into the screened interval for a sufficient time period to allow flow and sample equilibration before extraction for analysis. Conceptually, the extraction of water from low yielding formations seems more akin to the collection of water from the unsaturated zone and passive sampling techniques may be more appropriate in terms of obtaining "representative" samples. Satisfying usual sample volume requirements is typically a problem with this approach and some latitude will be needed on the part of regulatory entities to achieve sampling objectives.

### *B. Fractured Rock*

In fractured rock formations, a low-flow to zero purging approach using pumps in conjunction with packers to isolate the sampling zone in the borehole is suggested. Passive multi-layer sampling devices may also provide the most "representative" samples. It is imperative in these settings to identify flow paths or water-producing fractures prior to sampling using tools such as borehole flowmeters and/or other geophysical tools.

After identification of water-bearing fractures, install packer(s) and pump assembly for sample collection using low-flow sampling in "dedicated mode" or use a passive sampling device which can isolate the identified water-bearing fractures.

## VI. Documentation

The usual practices for documenting the sampling event should be used for low-flow purging and sampling techniques. This should include, at a minimum: information on the conduct of purging operations (flow-rate, drawdown, water-quality parameter values, volumes extracted and times for measurements), field instrument calibration data, water sampling forms and chain of custody forms. See Figures 2 and 3 and "Ground Water Sampling Workshop -- A Workshop Summary" (U. S. EPA, 1995) for example forms and other documentation suggestions and information. This information coupled with laboratory analytical data and validation data are needed to judge the "useability" of the sampling data.

## VII. Notice

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Figure 2. **Ground Water Sampling Log**

**Project** ________________ **Site** ________________ **Well No.** ______________ **Date** ___________________________

**Well Depth** _____________ **Screen Length** ___________ **Well Diameter** __________ **Casing Type** _____________

**Sampling Device** ________________ **Tubing type** _______________________ **Water Level** ___________________

**Measuring Point** ____________________ **Other Infor** ______________________________________________________

________________________________________________________________________________________________

**Sampling Personnel** ___________________________________________________________________________

| Time | pH | Temp | Cond. | Dis.$O_2$ | Turb. | [ ]Conc |  |  | Notes |
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**Type of Samples Collected**

________________________________________________________________________________

**Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft: $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi\ r^3$**

Figure 3. **Ground Water Sampling Log** (with automatic data logging for most water quality parameters)

**Project** ________________ **Site** ________________ **Well No.** ______________ **Date** __________________________

**Well Depth** _____________ **Screen Length** ___________ **Well Diameter** __________ **Casing Type** ____________

**Sampling Device** ________________ **Tubing type** ______________________ **Water Level** __________________

**Measuring Point** ____________________ **Other Infor** ______________________________________________________

_______________________________________________________________________________________________

**Sampling Personnel** ________________________________________________________________________________

| **Time** | **Pump Rate** | **Turbidity** | **Alkalinity** | **[ ] Conc** | **Notes** |
|---|---|---|---|---|---|
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**Type of Samples Collected**

_______________________________________________________________________________

**Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft: $\mathrm{Vol}_{cyl} = \pi r^2 h$, $\mathrm{Vol}_{sphere} = 4/3\pi\, r^3$**

# III

# ATTACHMENT 3
# Site Contact List
# Country Cleaners
# Site No. # 152187

| Name | Title/Workstation | Telephone Number | Mobile Phone |
|---|---|---|---|
| Vivian James | NYSDEC, Project Manager | (518)-402-9621 | |
| Amit Haryani | Earth Tech, Project Manager | (973)-337-4218 | |
| Mihir Chokshi | Earth Tech, Site Supervisor/SSHO | (973)-337-4222 | |
| Robert Poll | Earth Tech, Safety & Health Manager | (518)-951-2200 | (518)-817-3089 |
| Mike Thiagaram | Earth Tech, Primary Emergency Coordinator | (973)-337-4242 | |
| Nick | Jim Dandy Cleaners (Formerly Country Cleaners) | (631) 425 1919 | |

# A

# FINAL
# QUALITY ASSURANCE PROJECT PLAN

## REMEDIAL INVESTIGATION/FEASIBILITY STUDY
## COUNTRY CLEANERS
## 410 WEST MAIN STREET, HUNTINGTON, NY

**Site No. 152187**
**Work Assignment No. D004436-13**

**Prepared for:**

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Submitted By:

EarthTech
A Tyco International Ltd. Company
300 Broadacres Drive
Bloomfield, New Jersey 07003

May 2008

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**APPENDIX**

# 1.0 INTRODUCTION

## 1.1 Purpose and Objective

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a pre-determined quality at the Country Cleaners facility (hereafter referred to as the "Site") located in Huntington, Suffolk County, New York (Site # 152187). The work will be performed by Earth Tech Northeast, Inc. (Earth Tech) under Earth Tech/New York State Department of Environmental Conservation (NYSDEC) Superfund Standby Contract Work Assignment No. D004436-13. The Site location is shown in Figure 1.

The specific objectives of this project, as defined by the NYSDEC, are to conduct a remedial investigation (RI) to develop a conceptual site model that describes the nature and extent of site related contaminants. The data generated from the remedial investigation will be used for effective identification and evaluations of remedial action alternatives, prepare a remedial action plan, and issue a Record of Decision. The RI will be performed in accordance with NYSDEC Division of Environmental Remediation Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002. The soil vapor investigation will be performed in accordance with New York State Department of Health (NYSDOH), Soil Vapor Intrusion Guidance, dated October 2006.

The Site is located at 410 West Main Street, Huntington, Suffolk County, New York. The Site is improved with a single story building. The Site is abutted by a residential building to the south, Hillside Avenue to the west, West Main Street to the North, and Getty Service Station to the east.

## 1.2 Summary of Previous Investigations

The previous investigations have been summarized in detail in Sections 2.2 of the dynamic work plan (DWP); this information is not repeated here.

## 1.3 Project Description

This QAPP is a quality control basis for the scope of work which is described in the Work Plan (WP, Earth Tech, January 2008) and as summarized in the dynamic work plan. As identified in the WP, the major tasks comprising this work assignment are:

- Task 1 –Work Plan Development
    - Draft Remedial Investigation/Feasibility Study Work Plan
    - Final Remedial Investigation/Feasibility Study Work Plan
- Task 2 – Remedial Investigation
    - Proposed Triad Approach

  - Remedial Investigation Field Activities
    - Geophysical Survey
    - MIPs Investigation
    - Groundwater Grab Sampling
    - Permanent Monitoring Well Installation, Development and Sampling
    - Well Survey
  - Data Usability Summary Report
- Task 3 – Remedial Investigation Report
  - Summary of Analytical Data
  - Summary of Site History and Conditions
  - Summary of Field Work
  - Evaluation of Data Collected
  - Comparison to State Standards, Criteria and Guidelines (SCGs)
- Task 4 – Feasibility Study Report
  - Development and Screening of Alternatives
  - Treatability Investigations
  - Detailed Analysis of Alternatives/Draft Feasibility Study Report
  - Final Feasibility Study Report
  - Public Participation
- Task 5 – Document Disposition and Data
  - Remedial Investigation Reporting Requirements
  - Monthly Report
- Task 6 – Citizen Participation

## 1.4 Project Management and Organization

### *1.4.1 Personnel*

The general responsibilities of key project personnel are listed below.

| | |
|---|---|
| Program Manager | Mike Thiagaram, P.E. (Earth Tech), Program Manager will have responsibility for overall program management. |
| Project Manager | Amit Haryani (Earth Tech), Project Manager, will have responsibility for overall project management, coordination with NYSDEC and coordination of subcontractors to complete the work. |
| Field Team Leader | Mihir Chokshi will have overall responsibility of implementing and coordinating field activities specified under Task 3. |
| QA Officer | Allen Burton will serve as Quality Assurance Officer, and will be responsible for laboratory and data validation subcontractor procurement and assignment, as well as providing overall direction for the QA program (including the QAPP and the final data usability assessment). |
| H & S Officer | Robert Poll, Earth Tech Northeast Safety Manger, will oversee the health and safety aspects of this assignment. He, or his designee, will have the responsibility for approval of the project health and safety plan, and tracking its implementation. He will also verify that on-site subcontractors either have their own (acceptable) HASP; or confirm in writing that the subcontractors will abide by the provisions of the Earth Tech HASP. |

### *1.4.2 Subcontractors*

The subcontracting and M/WBE plan presented here is only for the Tasks 1 through 3. Several areas of unit price service under Task 2 are amenable to existing Earth Tech standby subcontracting:

- Geophysical Survey
- Drilling Services
- Laboratory Analysis
- Well Survey
- Data Validation

Earth Tech tentatively plans to use **Enviroscan, Inc.,** a New York Empire State Development (NY ESD)-certified WBE firm, for providing utility clearance at the sub-slab sampling locations.

Earth Tech tentatively plans to utilize **$S_2C_2$, Inc.,** for conducting MIPs investigation.

Earth Tech tentatively plans to use **Land, Air, Water Environmental Services, Inc.**, a NY ESD-certified WBE firm, for conducting HydroPunch sampling and installing monitoring wells.

Earth Tech tentatively plans to utilize **Chemtech**, a NY ESD-certified MBE firm for laboratory analysis. **Chemtech** is certified by NYSDOH Wadsworth center ELAP (Environmental Laboratory Approval Program).

Earth Tech tentatively plans to use **NAIK Consulting Group Inc.,** a NY ESD-certified MBE firm, for land survey.

Earth Tech tentatively plans to use **Environmental Data Services Inc.,** a NY ESD-certified WBE firm, for data validation and preparation of the data usability report.

## 2.0 SITE INVESTIGATION PROCEDURES

Environmental sampling and other field activities will be performed as specified by NYSDEC in the Work Assignment and detailed in the dynamic work plan and in general accordance with the appropriate techniques presented in the following guidance documents.

- Technical Guidance for Site Remediation and Investigation (Draft), DER-10, NYSDEC Division of Environmental Remediation, December 2002.

Table 1 contains a list of the expected number of samples for each matrix. Field sampling activities and rationale for determining the sampling locations are presented in the dynamic work plan.

# 3.0 SAMPLE HANDLING

## 3.1 Sample Identification/Labeling

Sample identification and labeling requirements are presented in DWP Section 5 and are not repeated here.

## 3.2 Sample Preservation And Holding Time

### *3.2.1 Sample Containers*

The sample containers for groundwater samples, trip and field blanks will be provided by the analytical laboratory.

### *3.2.2 Sample Preservation*

Groundwater samples submitted for VOC analysis will be preserved to a pH of ≤2 with hydrochloric acid (HCl). The laboratory will provide pre-preserved 40-mL VOA vials for this purpose.. All groundwater samples will be cooled to 4° C (±2° C) after collection and maintained at that temperature through shipping and receipt at the laboratory. The samples will not be subjected to extremes in temperature or temperature fluctuations.

### *3.2.3 Holding Times*

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory. Samples will be shipped from the field to arrive at the laboratory by the day after the sample is collected. Samples collected on Friday will be shipped for Saturday delivery.

For the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered.

## 3.3 Chain of Custody And Shipping

A chain-of-custody form will trace the path of sample containers from the Site to the laboratory. A sample Chain-of-Custody form is included in Appendix 1. Sample/bottle tracking sheets or the chain-of-custody will be used to document the custody of the samples within the laboratory from sample receipt though completion of analysis. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Sample shipping containers will be provided by the laboratory for shipping samples. All sample containers within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory.

In addition, each sample shipping container will be sealed with two adhesive custody seals. The custody seals will be initialed by a member of the field sampling team.

# 4.0 DATA QUALITY REQUIREMENTS

Analytical methods and data quality requirements are discussed below. Sample containers and sample analyses will be provided by Chemtech, a NY ESD-certified MBE firm.

## 4.1 Analytical Methods

Groundwater samples will be analyzed for VOCs by SW-846, Method 8260B. One sample representing the investigation-derived waste (IDW), may be analyzed for waste classification purposes; at this time, assumed to be the full suite (all analytical fractions) for toxicity characteristic leaching procedure (TCLP) analyses. Specific analyses to be performed may be modified to satisfy the requirements of the facility at which the IDW is disposed. It should be noted that the cost of IDW sample analysis was not included in work plan (Earth Tech, 2008)

## 4.2 Quality Assurance Objectives

Data quality objectives (DQOs) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

### *4.2.1 Sensitivity*

For VOCs in groundwater, a reporting limit (RL) goal of 1 µg/L has been established for the contaminants of concern (chlorinated solvents, especially TCE, PCE, and cis-1,2 DCE) to adequately assess the extent of groundwater contaminant migration and potential degradation products, and also for comparability with existing data. USEPA Method SW-846 Method 8260B with a 25 mL purge volume can meet this goal; as the low level calibration standard is set to 1 µg/L, and the method detection limits (MDLs) typically a factor of five or ten lower than the RL.

### *4.2.2 Precision*

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the “universe” is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Field duplicates will be collected at a frequency of one per 20 environmental samples of each type.

Relative Percent Difference (RPD) criteria are used to evaluate precision between duplicates, using the equation below

$$RPD = 100 \times [2(X_1 - X_2) / (X_1 + X_2)]$$

where:

$X_1$ and $X_2$ are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is $\leq$ 50% RPD for all matrices. Precision is not calculable where the analyte is not detected in one or both of the samples and duplicate. The absolute difference between the results ($X_1 - X_2$) may be a more appropriate measure of analytical precision where the reported concentrations are low (i.e., less than five times the RL).

### *4.2.3 Accuracy*

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent recovery criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP-CLP. Other method-specific laboratory QC samples (such as laboratory control samples and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\%R = (SSR-SR)/SA \times 100,$$

where

SSR = Spiked sample Result

SR = Sample Result, and

SA = Spike Added

### *4.2.4 Representativeness*

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions.

Representativeness is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

### 4.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), USEPA, or the New York State Department of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

### *4.2.6 Completeness*

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid, and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95 percent useable data (i.e., less than 5 percent rejected data). However, it is acknowledged that this goal may not be fully achievable; for example, individual analyte may be rejected within an otherwise acceptable analysis; or some sampling locations may not be accessible. The impact of rejected or unusable data will be made on a case-by-case basis. If the study can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require re-sampling or reanalysis.

## 4.3 Field Quality Assurance

Field quality assurance/quality control samples associated with the generation of environmental data typically include field (equipment rinsate) blanks; field duplicates; and trip blanks. The rationale and frequency of each of these are discussed below.

### *4.3.1 Equipment (Rinsate) Blanks*

Equipment blanks are not required when laboratory-decontaminated, dedicated sampling equipment is used. One equipment rinsate blank will be collected for the sampling equipment used to collect groundwater samples during Phase II and Phase III.

### *4.3.2 Field Duplicate Samples*

Duplicates will be collected at a frequency of one per 20 (or fewer) samples of each type, and will be analyzed for the same parameters as the environmental sample. Based on the estimated number of field samples, the number of field duplicates is shown below. Should more samples be collected than estimated below, additional duplicate samples may be collected at the frequency stated above.

Duplicate groundwater samples will be collected by alternately filling laboratory-provided VOA vials.

| Sample Type | Est. Sample Qty | Field Duplicates |
|---|---|---|
| Groundwater (Phase II) | 50 | 3 |
| Groundwater (Phase III) | 7 | 1 |

### *4.3.3 Trip Blanks*

The purpose of a trip blank is to place a mechanism of control on sample container preparation, quality, and sample handling. The trip blank travels from the lab to the site with the empty sample container and back from the site with the collected samples. One trip blank will be submitted with each sample shipment of groundwater and analyzed for VOCs.

## 4.4 Laboratory Quality Assurance

Method-required laboratory quality assurance for Method 8260B includes an instrument performance check; calibration check; and method blank analysis for each group of 20 or fewer samples. In addition, internal standards are added to every sample (environmental samples and laboratory QA/QC samples).

### *4.4.1 Instrument Performance Check*

The instrument performance check verifies the operation of the GC/MS and verifies that it meets tuning and mass spectral abundance criteria prior to sample data acquisition. For Method SW-846 8260B, the instrument performance check standard is bromofluorobenzene (BFB), and the acceptance criteria are specified in Table 4 of the method. No samples may be analyzed without meeting the BFB acceptance criteria.

### *4.4.2 System Performance Checks*

A system performance check must be made during each 12-hour analytical shift. Each system performance check compound (SPCC) must meet the SPCC-specific response factor (as specified in the method). If the minimum response factors are not met, corrective action must be taken and no samples may be analyzed until the response factors of all SPCCs meet criteria.

### *4.4.3 Calibration Checks*

An initial five-point calibration check must be performed after the instrument performance check but prior to the analysis of blanks and samples. Concentrations of the calibration standards should be selected to span the concentration range of interest. One of the concentrations of the initial calibration must be the same as the daily calibration check.

After initial calibration and after the system performance check is met, a calibration check (consisting of six method-specified calibration check compounds [CCCs] must be analyzed. If the percent difference of drift exceeds 20 percent, corrective action must be taken prior to the analysis of samples.

### *4.4.4 Method Blanks*

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory. The method blank should not contain any target analytic at a concentration greater than its quantization level (reporting limit; typically, three times the MDL) or its action level, whichever is more stringent. Method blanks are analyzed at a frequency of one for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

### *4.4.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD)*

MS/MSD will be collected at a frequency of one per 20 (or fewer) samples of each type, and will be analyzed for the same parameters as the environmental sample. Three site-specific MS/MSD samples will be submitted for Phase II and one site-specific MS/MSD sample will be submitted for Phase III groundwater sampling events.

### *4.4.6 Internal Standards*

Internal standards (IS) are added to every sample analyzed for VOCs. Sample-specific IS recovery should be ±40 percent of the mean response in the most recent valid calibration.

# 5.0 DATA DOCUMENTATION

## 5.1 Field Notebook

Field notebooks will be utilized to record information not recorded on standard forms. The use and completion of field notebooks is described in the DWP (Section 6) and is not repeated in the QAPP.

## 5.2 Field Reporting Forms

Field reporting forms (or their equivalent) to be utilized in this investigation include the following are specified in the DWP and are provided in DWP Appendix 1.

Custody documentation will documented from time of sample collection through arrival at the laboratory with a chain Chain-of- Custody Form (example provided in Appendix 1).

These forms, when completed, will become part of the project file.

## 6.0 LABORATORY EQUIPMENT CALIBRATION AND MAINTENANCE

Laboratory equipment will be calibrated according to the requirements of the NYSDEC ASP, Superfund Contract Laboratory Program for each parameter or group of similar parameters, and maintained following professional judgment and the manufacturer's specifications.

## 7.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work. In addition, maintaining the necessary certification (e.g., ELAP; NELAC) requires that the laboratories be subject to third-party audits and also achieve acceptable results on proficiency (performance evaluation) samples.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

## 8.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the Work Plan, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

### 8.1 Laboratory Data Reporting and Reduction

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC ASP Category B deliverable requirements.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data in spreadsheet form on computer diskette. The diskette will be generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data.

The laboratory will also provide the electronic deliverable in NYSDEC "EZ-EDD" format, as described in ASP 2005 Exhibit H, Section 1.1.1.

### 8.2 Data Validation

A subcontractor to Earth Tech will review and validate the groundwater data (VOCs by 8260B data). Data validation will be performed by following guidelines established in the specific USEPA Region 2 standard operating procedures (SOPs), as indicated below.

- Volatile organic data generated by SW-846 method 8260B will be validated in accordance with HW-24, "Standard Operating Procedure for the Validation of Organic Data Acquired Using SW-846 Method 82660B" (Revision 1, January 1999).

Where necessary and appropriate, supplemental validation criteria may be derived from the USEPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, USEPA 540/R-99/008; October, 1999, and National Functional Guidelines for Inorganic Data Review, USEPA 540/R-04-004; October 2004), as appropriate.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. The results of the data validation will be presented in a Data Usability Summary Report (DUSR) prepared by the validation subcontractor.

## 8.3 Data Usability

Subsequent to review of the items evaluated in the subcontractor DUSR and accompanying tables, Earth Tech then prepares a brief data usability summary. The data usability summary, which will be provided as part of the remedial investigation report, encompasses both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality.

## 8.4 Field Data

Field data collected during the field activity will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

## 9.0 PERFORMANCE AND SYSTEM AUDITS

As part of the laboratory subcontractor procurement process under the Earth Tech/NYSDEC Contract, the laboratory assigned to this project has been verified to be certified by the NYSDOH Environmental Laboratory Approval Program for the analytical protocols to be used. Therefore, no laboratory audit specific to this study will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of Earth Tech and the NYSDEC.

Due to the short duration and scope of the field investigation, no field systems audit is planned for this project.

## 10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Quality assurance reporting for this project is limited to the DUSR (prepared by subcontract data validator) and the QA/QC summary narrative provided in the site investigation letter report.

The project manager, through task managers, will be responsible for verifying that records and files related to this project are stored appropriately and are retrievable.

The laboratory will submit any memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.

# Tables

# TABLE 1
# Analytical Methodology and QA/QC Sample Summary
# Country Cleaners
# Huntington, New York

| Matrix/Analyte | Analysis | Sample Quantity | | | | | |
|---|---|---|---|---|---|---|---|
| | | Field Samples | Field Duplicates | Field Blank | Trip Blank | Matrix Spike | MS Duplicate |
| **HrydroPunch Groundwater** | | | | | | | |
| Volatile Organics | SW-846, Method 8260B | 50 | 3 | 3 | 9 | 3 | 3 |
| **Groundwater** | | | | | | | |
| Volatile Organics | SW-846, Method 8260B | 7 | 1 | 1 | 3 | 1 | 1 |

Notes:

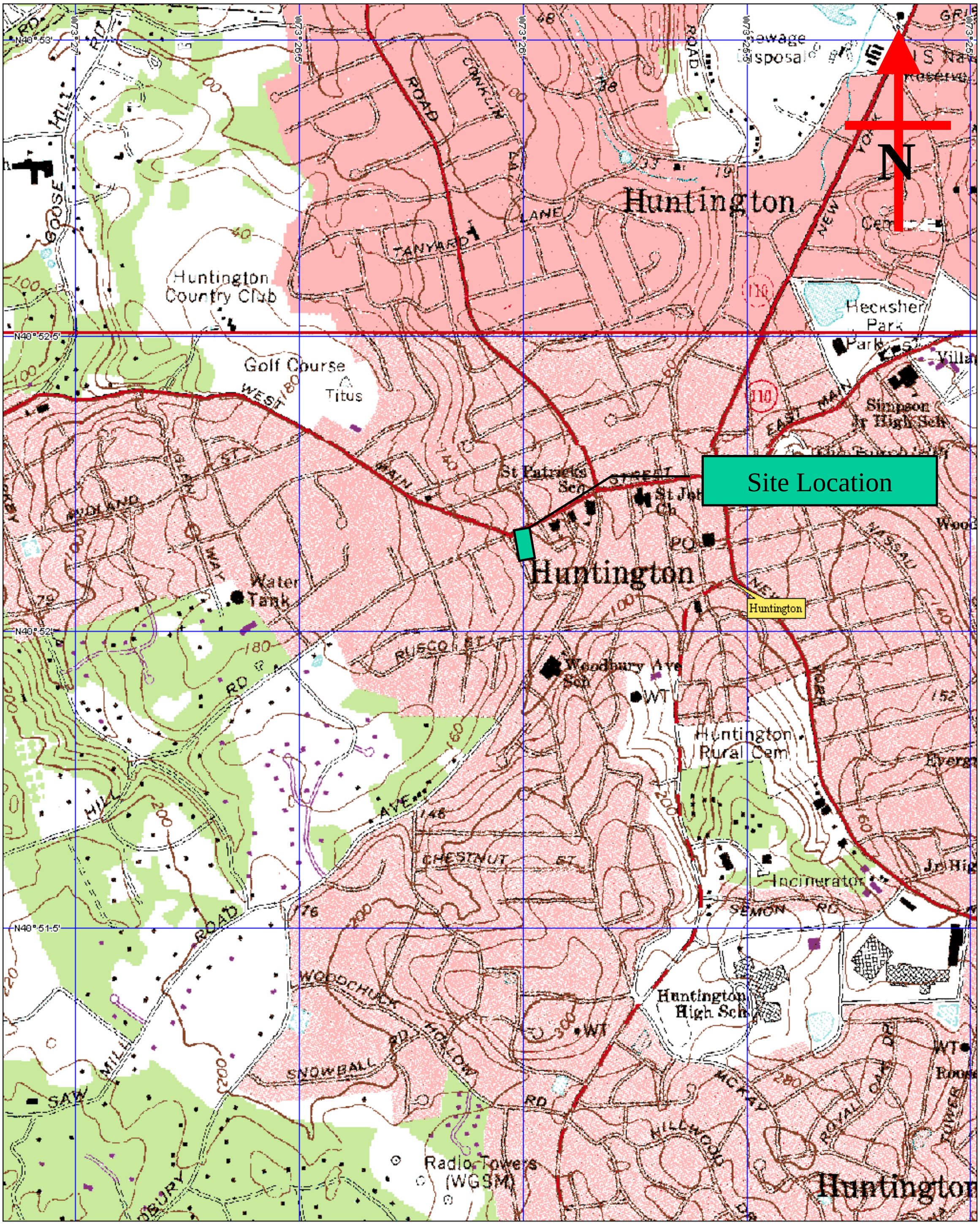
1. Trip blank quantity assumes all aqueous samples collected and shipped in one day.
2. Equipment (field) blanks taken for GW.
3. SW-846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; USEPA Office of Solid Waste and Emergency Response

# Table 2
# Draft Quality Assurance Project Plan
# Country Cleaners (Site # 152187)
# Sample Bottle, Volume, Preservation, and Holding Time Summary

| | | | Sample Bottles (3) | | | | Minimum | Preservation | Holding Time (5) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MATRIX/ANALYSIS** | Sample Prep Method [1] | Analytical Method [2] | Mat'l | Size | Qty | Source | Vol Rqd | (4) | Extraction | Analysis | Comment |
| **Aqueous** [5] | | | | | | | | | | | |
| Volatile Organic Compounds | SW-846 5030B | SW 846 8260B | G | 40 mL | 2 or 3 | Lab | 40 mL | HCl to pH ≤2 | NA | 7 days | |

(1) Laboratory may propose alternate preparation method, subject to Earth Tech and NYSDEC approval
(2) Methods listed are typical but specific methods to be selected on WA-specific basis and project DQOs.
(3) Bottles to be provided by laboratory; number of VOC vials submitted is at laboratory discretion.
(4) samples bottles will be submitted pre-preserved by laboratory; pH adjusted in field if necessary.
(5) Holding time for calculated from day of collection; contractual holding time is two days shorter (calculated from VTSR at laboratory)
G = Glass
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IIIB, November 2004.
Bottle Sources:
Lab: Bottles to be provided by laboratory performing the analysis

# Figures



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

450 ft Scale: 1 : 16,000 Detail: 13-6 Datum: WGS84

300 Broadacres Drive,
Bloomfield, New Jersey 07003

ENVIRONMENTAL/CONSULTING ENGINEERS

| | | |
|---|---|---|
| EARTH TECH<br>A tyco INTERNATIONAL LTD. COMPANY | PROJECT:<br>**REMEDIAL INVESTIGATION/FEASIBILITY STUDY**<br>**COUNTRY CLEANERS**<br>410 Main Street, Huntington, New York | SITE LOCATION MAP<br>Project No: 102656<br>Figure No: 1 |

**EarthTech**

A tyco International Ltd. Company

# Chain of Custody and Analytical Request

Page _______ of _______

**Project Name / Site Name:**

**Client Name: NYSDEC**

**Address/City/State:**

**Collected by:**

Project Number: ________

Chain of Custody Number: ___________________

Earth Tech Contact (Name/#) Allen Burton 973-338-6680

allen.burton@earthtech.com

|  |  |  |  |  | **Preservative/# Bottles** |  |  |  |  |  |  |  |  | **ANALYSIS** |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Sample ID: | Date Collected | Time Collected | Sample Depth (beginning - ending) | Sample Matrix | HCl | H2SO4 | HNO3 | NaOH | ZnAc/NaOH | Encore | None | Other | Comment | VOC 8260B - Std | VOC 8260B low | SVOC 8270C | TAL Metals | TO-15 Air VOCs |  |  |  |  | Cooler ID |
|  |  |  | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Comments

**Custody Transfers Prior to Receipt by Laboratory**

| Relinquished By (Signed) | Date | Time | Relinquished By (Signed) | Date | Time |
|---|---|---|---|---|---|
| 1.____________________________________ |  |  | 1.________________________________ |  |  |
| 2.____________________________________ |  |  | 2.________________________________ |  |  |
| 3.___________________________________ |  |  | 3.________________________________ |  |  |

**Sample Delivery Details / Laboratory Receipt**

Delivered Directly to Lab: ______________________

Shipped: Shipped:_____________________________

Method of Shipment:_____________________________

Airbill #:_____________________________

Analytical Lab:___________________________________

Location:____________________________

Lab Recipient:___________________________________

Date:_________________ Time:__________

# Reporting Limits and Quantitation Limits
# Volatile Organic Compounds by SW-846 Method 8260B
# Chemtech

| Volatile Organics by SW-846 8260B | Reporting Limit (RL) | | Practical Quantitation Limit (PQL) | |
|---|---|---|---|---|
| **Compound** | **Aqueous** | | **Aqueous** | |
| 1,1,1,2-Tetrachloroethane | 1 | ug/L | 5 | ug/L |
| 1,1,1-Trichloroethane | 1 | ug/L | 5 | ug/L |
| 1,1,2,2-Tetrachloroethane | 1 | ug/L | 5 | ug/L |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 1 | ug/L | 5 | ug/L |
| 1,1,2-Trichloroethane | 1 | ug/L | 5 | ug/L |
| 1,1-Dichloroethane | 1 | ug/L | 5 | ug/L |
| 1,1-Dichloroethene | 1 | ug/L | 5 | ug/L |
| 1,1-Dichloropropene | 1 | ug/L | 5 | ug/L |
| 1,2,3-Trichlorobenzene | 1 | ug/L | 5 | ug/L |
| 1,2,3-Trichloropropane | 1 | ug/L | 5 | ug/L |
| 1,2,4-Trichlorobenzene | 1 | ug/L | 5 | ug/L |
| 1,2,4-Trimethylbenzene | 1 | ug/L | 1 | ug/L |
| 1,2-Dibromo-3-Chloropropane | 4 | ug/L | 10 | ug/L |
| 1,2-Dibromoethane | 1 | ug/L | 5 | ug/L |
| 1,2-Dichlorobenzene | 1 | ug/L | 5 | ug/L |
| 1,2-Dichloroethane | 1 | ug/L | 5 | ug/L |
| 1,2-Dichloropropane | 1 | ug/L | 5 | ug/L |
| 1,3,5-Trimethylbenzene | 1 | ug/L | 1 | ug/L |
| 1,3-Dichlorobenzene | 1 | ug/L | 5 | ug/L |
| 1,3-Dichloropropane | 1 | ug/L | 5 | ug/L |
| 1,4-Dichlorobenzene | 1 | ug/L | 5 | ug/L |
| 1,4-Dioxane | 150 | ug/L | 250 | ug/L |
| 2,2-Dichloropropane | 1 | ug/L | 5 | ug/L |
| 2-Butanone | 2 | ug/L | 5 | ug/L |
| 2-Chloroethylvinylether | 2 | ug/L | 5 | ug/L |
| 2-Chlorotoluene | 1 | ug/L | 5 | ug/L |
| 2-Hexanone | 2 | ug/L | 5 | ug/L |
| 4-Chlorotoluene | 1 | ug/L | 5 | ug/L |
| 4-Isopropyltoluene | 1 | ug/L | 1 | ug/L |
| 4-Methyl-2-Pentanone | 1 | ug/L | 5 | ug/L |
| Acetone | 10 | ug/L | 25 | ug/L |
| Acrolein | 5 | ug/L | 25 | ug/L |
| Acrylonitrile | 2 | ug/L | 5 | ug/L |
| Benzene | 0.5 | ug/L | 5 | ug/L |
| Bromobenzene | 1 | ug/L | 5 | ug/L |
| Bromochloromethane | 1 | ug/L | 5 | ug/L |
| Bromodichloromethane | 1 | ug/L | 5 | ug/L |
| Bromoform | 1 | ug/L | 5 | ug/L |
| Bromomethane | 1 | ug/L | 5 | ug/L |
| Carbon Disulfide | 1 | ug/L | 5 | ug/L |
| Carbon Tetrachloride | 1 | ug/L | 5 | ug/L |
| Chlorobenzene | 1 | ug/L | 5 | ug/L |
| Chlorodifluoromethane | 2 | ug/L | 5 | ug/L |
| Chloroethane | 1 | ug/L | 5 | ug/L |
| Chloroform | 1 | ug/L | 5 | ug/L |
| Chloromethane | 1 | ug/L | 5 | ug/L |
| cis-1,2-Dichloroethene | 1 | ug/L | 5 | ug/L |
| cis-1,3-Dichloropropene | 1 | ug/L | 5 | ug/L |
| Cyclohexane | 2.5 | ug/L | 5 | ug/L |

Reporting Limits and Quantitation Limits
Volatile Organic Compounds by SW-846 Method 8260B
Chemtech

| Volatile Organics by SW-846 8260B | Reporting Limit (RL) | | Practical Quantitation Limit (PQL) | |
|---|---|---|---|---|
| **Compound** | **Aqueous** | | **Aqueous** | |
| Dibromochloromethane | 1 | ug/L | 5 | ug/L |
| Dibromomethane | 1 | ug/L | 5 | ug/L |
| Dichlorodifluoromethane | 1 | ug/L | 5 | ug/L |
| Di-isopropyl-ether | 1 | ug/L | 5 | ug/L |
| Ethylbenzene | 1 | ug/L | 1 | ug/L |
| Freon 113 | 2 | ug/L | 5 | ug/L |
| Hexachlorobutadiene | 2.5 | ug/L | 5 | ug/L |
| Iodomethane | 1 | ug/L | 5 | ug/L |
| Isopropylbenzene | 1 | ug/L | 1 | ug/L |
| m&p-Xylenes | 1.5 | ug/L | 1 | ug/L |
| Methyl Acetate | 1.5 | ug/L | 5 | ug/L |
| Methylcyclohexane | 1.5 | ug/L | 5 | ug/L |
| Methylene Chloride | 2.5 | ug/L | 5 | ug/L |
| Methyl-t-butyl ether | 1 | ug/L | 1 | ug/L |
| Naphthalene | 1 | ug/L | 1 | ug/L |
| n-Butylbenzene | 1 | ug/L | 5 | ug/L |
| n-Hexane | 2 | ug/L | 5 | ug/L |
| n-Propylbenzene | 1 | ug/L | 1 | ug/L |
| o-Xylene | 1 | ug/L | 1 | ug/L |
| sec-Butylbenzene | 1 | ug/L | 5 | ug/L |
| Styrene | 1 | ug/L | 5 | ug/L |
| t-Butyl Alcohol | 10 | ug/L | 25 | ug/L |
| t-Butylbenzene | 1 | ug/L | 5 | ug/L |
| Tetrachloroethene | 1 | ug/L | 5 | ug/L |
| Toluene | 1 | ug/L | 1 | ug/L |
| trans-1,2-Dichloroethene | 1 | ug/L | 5 | ug/L |
| trans-1,3-Dichloropropene | 1 | ug/L | 5 | ug/L |
| trans-1,4-Dichloro-2-butene | 5 | ug/L | 5 | ug/L |
| Trichloroethene | 1 | ug/L | 5 | ug/L |
| Trichlorofluoromethane | 1 | ug/L | 5 | ug/L |
| Vinyl Acetate | 1 | ug/L | 5 | ug/L |
| Vinyl Chloride | 1 | ug/L | 5 | ug/L |

# B

# FINAL
# HEALTH AND SAFETY PLAN

## REMEDIAL INVESTICATION/FEASIBILITY STUDY
## COUNTRY CLEANERS
## 410 WEST MAIN STREET, HUNTINGTON, NY

**Site No. 152187**
**Work Assignment No. D004436-13**

**Prepared for:**

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Submitted By:

Earth Tech
A Tyco International Ltd. Company
300 Broadacres Drive
Bloomfield, New Jersey 07003

May 2008

# HEALTH AND SAFETY PLAN SUPPLEMENT APPROVAL

This Health and Safety Plan (HASP) Supplement was prepared for Earth Tech employees performing work under the New York State Department of Environmental Conservation (NYSDEC) Superfund Standby Contract for Remedial Investigation Services (Contract No. D004436) based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP Supplement for the NYSDEC Work Assignment # D004436-13. This HASP Supplement has been written for the exclusive use of Earth Tech, Inc., its employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

**Approved by:**

Robert M. Poll, CIH, CSP — Date
ET Health and Safety Coordinator/Northeast District Safety Manager
518-951-2200

Mike Thiagaram — Date
Program Director
973-338-6680 ext # 242

Amit Haryani — Date
Project Manager
973-338-6680 ext. # 218

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| Attachment 2: | Task Hazard Analyses |
| Attachment 3: | Hazards of Environmental Contaminants |

# 1.0 INTRODUCTION

This Health and Safety Plan (HASP) (including Attachments A-C) provides a site specific description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted under the New York State Department of Environmental Conservation (NYSDEC) Superfund Standby Contract for Remedial Investigation Services (Contract No. D004436). This HASP Supplement also identifies site specific chemical and physical hazards known to be associated with the work activities addressed in this document.

Any additional safety information that may be generated to address any activities or changes in site conditions that may occur during field operations will be provided as attachments to this document. Once generated, information will be inserted in Attachment D and reviewed/acknowledged by field personnel prior to initiating the associated work.

## 1.1 GENERAL

The provisions of this HASP Supplement are mandatory for all Earth Tech personnel engaged in fieldwork associated with the environmental services being conducted for the NYSDEC assigned project. A copy of this HASP Supplement, the Standard NYSDEC HASP, and the Earth Tech Consolidated U.S. Operations Safety, Health & Environmental Manual shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this HASP Supplement and the applicable Safety, Health, and Environmental (SH&E) Procedures. In the event of a conflict between this HASP Supplement and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

## 1.2 ORGANIZATION OF THIS DOCUMENT

Work activities to be performed will consist of Geophysical Survey, Soil Sampling, Groundwater Sampling, Soil Vapor Sampling and Monitoring Wells Survey (see Section 2.0 for details). To maximize the usability of this HASP Supplement for all workers supporting the site activities, the document is organized to separately address each of these activity groups. Therefore this HASP Supplement is organized as follows:

- Section 2.0 provides an overall description of the project site, including site history and known environmental conditions. This section also provides a brief overview of the planned work operations addressed in this HASP.
- Section 3.0 provides health and safety requirements of general applicability for all on-site operations.
- Sections 4.0 addresses site specific health and safety training and requirements applicable to the overall scope of work and site operations.
- Section 5.0 includes a specific description of the work activities, personnel training/qualification requirements, assessment of work hazards and identification of applicable preventive measures, and identification of job-specific personal protective equipment requirements.
- Section 6.0 includes specific emergency response procedures and emergency contact information for the Site.

# 2.0 SITE INFORMATION AND GENERAL SCOPE OF WORK

Earth Tech will conduct a remedial investigation/feasibility study the Country Cleaners located in Huntington, New York. Work will be performed in accordance with the applicable Dynamic Work Plan (DWP) and the Quality Assurance Project Plan (QAPP) developed for the work assignment. Deviations from the listed work plans will require that a Safety Professional review any changes made to this HASP Supplement, to ensure adequate protection of personnel and other property.

## 2.1 SITE INFORMATION

### *2.1.1 General Description*

The Country Cleaners (herein identified as the "Site") is located at 410 West Main Street, Huntington, New York. The Site location map and the Site plan is included in Appendix A. Based on information obtained from the Nassau County website (http://www.nassaucountyny.gov), the Site covers approximately 6.88 acres and is identified on the Nassau county tax map as Section 11, Block 329, and Lot 369. The Site is improved with single story buildings.

The Site is abutted by residential building to the south, Hillside Avenue to the west, West main street to the North, and Getty Service Station to the east.

### *2.1.2 Site Background/History*

Several rounds of investigations have been conducted at the Site and on adjacent Getty Service Station. The summary of investigations is provided in DWP Section 2.2 and is not repeated here.

## 2.2 GENERAL SCOPE OF WORK

Earth Tech will conduct the Site Characterization field activities in accordance with DER-10, section 3. To accomplish this objective, the subtasks discussed below are proposed. Additional methodology information for field activities is provided in the DWP. Unless otherwise noted, it is assumed that all field work will be completed in United States Environmental Protection Agency (USEPA) Level D protection in accordance with the HASP. It is assumed that all field activities will be monitored by one or more Earth Tech representatives. The principal components of the field investigation include:

- Geophysical Survey
- MIPs
- Groundwater Grab Sampling
- Monitoring Well Installation, Development and Groundwater Sampling
- Monitoring Well Survey

Earth Tech and its subcontractors will list as additionally insured NYSDEC for all the type of insurance required by the Standby Contract. The procedures for implementing these investigative components are detailed in DWP Section 4.0.

## 3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

In exercising its responsibility for site safety management, Earth Tech will appoint personnel to fill the following safety-related positions.

### 3.1 HEALTH AND SAFETY COORDINATOR – ROBERT M. POLL, CIH, CSP

The Safety Professional is the member of the Earth Tech Safety, Health and Environmental Department assigned to oversee health and safety requirements for the project and provide any needed technical support. The Safety Professional will be the first point-of-contact for all of the project's health and safety matters. He, or his designee, will have the responsibility for approval of the project health and safety plan, and tracking of its implementation. He will also verify that on-site subcontractors either have their own (acceptable) HASP; or confirm in writing that the subcontractors will abide by the provisions of the Earth Tech HASP.

### 3.2 PROJECT MANAGER – AMIT HARYANI, P.E

The Project Manager (PM) has overall management authority and responsibility for all Site operations, including safety. The specific safety responsibilities for the PM are listed in Section 2.2 of SH&E 002, Operational SH&E Structure and Responsibilities. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

### 3.3 SITE MANAGER – TBD

The site supervisor has the overall responsibility and authority to direct work operations at the job Site according to the provided work plans. The PM may act as the site supervisor while on-site.

### 3.4 RESPONSIBILITIES

The site supervisor is responsible to:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, SSO, and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HASP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SOPs.

### 3.5 AUTHORITY

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the Safety Professional, and the PM.

## 3.6 QUALIFICATIONS

In addition to being HAZWOPER-qualified, the SSHO has completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4), has several years experience with health and safety at HAZWOPER sites, has participated in personal and work zone air monitoring programs at HAZWOPER sites.

## 4.0 SITE SPECIFIC SAFETY REQUIREMENTS

The following site specific requirements pertain to all work activities to be conducted at the project site, irrespective of specific work tasks or operations.

## 4.1 SITE-SPECIFIC SAFETY TRAINING

All personnel performing field activities at the site will be trained in accordance with **SH&E 114, Safety Training Programs**. For this project, training will also include the requirements specified in the following:

- ***SH&E 112Respiratory Protection Program***
- ***SH&E 115Hazard Communication Program***
- ***SH&E 202Safety Meetings***

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this HASP and any supplemental health and safety information developed for the tasks to be performed.
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety.
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task or handling the impacted materials and on an as-needed basis thereafter.

At the start of each work day the Site Manager or designated alternate will conduct a tailgate safety meeting at the start of each work day. The tailgate safety meeting will include all Earth Tech personnel and subcontractors, NYSDEC personnel and or their designate, and any other approved project oversight. This meeting will include a discussion of the work activities planned for that day, discussion of previous experiences/problems performing this work, and other safety requirements pertinent to the work activities (e.g., special PPE requirements). This meeting can also be used for discussion of previous safety difficulties and corrective measures, as well as training on general safety topics. All personnel assigned to work at the site each day are required to attend the tailgate safety meeting. Documentation of each meeting will be provided using Earth Tech's Tailgate Safety Meeting form. The SSO will maintain copies of this documentation on site for the duration of the project.

## 4.2 HAZWOPER TRAINING

Personnel performing work at the job site must be qualified as HAZWOPER workers unless otherwise noted in specific THAs, and must meet the medical monitoring and training requirements specified in the following safety procedures:

- ***SH&E 108 Medical Monitoring and Surveillance***

- ***SH&E 109 Hearing Conservation Program***
- ***SH&E 111 Employee Exposure Monitoring Program***
- ***SH&E 112 Respiratory Protection Program***
- ***SH&E 113 Personal Protective Equipment (PPE)***
- ***SH&E 115 Hazard Communication Program***
- ***SH&E 301 Hazardous Waste Operations (HAZWOPER)***

Personnel must have successfully completed training meeting the provisions established in 29 CFR 1910.120 (e) (2) and (e) (3) (40-hour initial training). As appropriate, personnel must also have completed annual refresher training in accordance with 29 CFR 1910.120 (e) (8); each person’s most recent training course must have been completed within the previous 365 days. Personnel must also have completed a physical exam in accordance with the requirements of 29 CFR 1910.120 (f), where the medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. These requirements are further discussed in **SH&E 301, Hazardous Waste Operations (HAZWOPER)**.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA (Occupational Safety and Health Administration) permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document specific to the particular materials present (**SH&E 108, Medical Monitoring and Surveillance**).

## 4.3 OVERALL SITE CONTROL AND SECURITY

### *4.3.1 General*

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made.

### *4.3.2 Controlled Work Areas*

Each HAZWOPER controlled work area will consist of the following zone:

Exclusion Zone: Contaminated work area.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Exclusion Zone and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

### *4.3.3 Site Access Documentation*

If implemented by the PM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

### *4.3.4 Visitor Access*

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

- A written confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
- Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
- All visitors must be escorted by an Earth Tech employee.
- If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended. Until these requirements have been met, entry will not be permitted.

### *4.3.5 Site Security*

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

- Maintain security in the Support Zone and at access control points.
- Establish an identification system to identify authorized persons and limitations to their approved activities.
- Assign responsibility for enforcing authority for entry and exit requirements.
- The existing property fencing will act as a physical barrier around the site.
- Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

- No off-duty hour site security will be provided for this project. If any equipment is left on site overnight, then the subcontractor will be asked to secure the equipment.

## 4.4 CONFINED SPACE ENTRY

No confined space entry is expected for this project. Should confined space entry be required, the following information will apply: The SSO/site supervisor shall identify all potential confined spaces in accordance with SH&E 118, **Confined Space Entry Program**. In addition, the SSO/site supervisor will inform all employees of the location of confined spaces. Confined space entry procedures and training requirements are listed in SH&E 118.

## 4.5 HAZARDOUS, SOLID, OR MUNICIPAL WASTE

If hazardous, solid and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations and **SH&E 601**, **Hazmat Shipping**.

## 4.6 GENERAL SITE MAINTENANCE

The site will be maintained in a professional manner at all times during construction.

## 4.7 CLIENT SPECIFIC SAFETY REQUIREMENTS

Earth Tech has prepared this site specific health and safety plan in accordance with federal regulations and its corporate standards and policies. It is the intent of Earth Tech to perform the contracted scope of work according to the Standard NYSDEC HASP and this HASP Supplement. The client has not specified any additional health and safety requirements for this Site.

# 5.0 SITE ACTIVITIES

## 5.1 TASK IDENTIFICATION AND HAZARD ASSESSMENT

### *5.1.1 Task Identification*

The following tasks are associated with the above activities:

- Mobilization/Demobilization
- MIPs Investigation
- Hydropunch Groundwater Grab Sampling
- Permanent Monitoring Well
- Groundwater Sampling
- Handling of Investigative Derived Waste

A task hazard analysis (THA) has been prepared for each of these tasks, and can be found in Attachment 2. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures) specific to the work being performed.

### *5.1.2 Hazard Assessment*

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

#### *5.1.2.1 Exposure to Environmental Contaminants*

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical hazards known or suspected to be present on site. Hazards associated with chemical products brought to the site during work operations are addressed separately, under the Hazard Communication process described in Section 4.3.

Exposure symptoms and applicable first aid information for each suspected site contaminant are listed in the MSDS sheets in Appendix C.

**Benzene**

Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, with an action level of 0.5 ppm and a short-term exposure limit of 5.0 ppm. The ACGIH TLV is 0.5 ppm.

**Tetrachloroethylene (PCE)**

PCE affects the central nervous system (CNS), causing loss of coordination, headache, vertigo (loss of balance), light narcosis, dizziness, and unconsciousness. Death may occur if exposed to extremely high concentrations of PCE. Various irritable effects have been attributed to PCE exposure, including eye, nose, and throat irritation, indications of nausea and intestinal gas, and possible changes to the liver and kidneys. PCE is not known to produce harmful effects in cases of skin exposure where the PCE was allowed to evaporate immediately after contact. However, in cases where skin was exposed to PCE frequently and for prolonged periods without evaporating, symptoms of dermatitis by defatting of the skin was evident. The National Toxicology Program (NTP) lists PCE as an anticipated human carcinogen. The OSHA PEL and the ACGIH (American Conference of Governmental Industrial Hygienists) TLV (Threshold Limit Value) are 25 part per million (ppm) with an ACGIH short-term exposure limit (STEL) of 100 ppm.

**Trichloroethylene (TCE)**

Moderate exposures to TCE cause symptoms similar to those of alcohol inebriation. Higher concentrations cause narcotic effects. Ventricular fibrillation has been cited as the cause of death following heavy exposures. TCE induced hepatocellular carcinomas which have been detected in mice during tests conducted by the National Cancer Institute. Organ systems affected by overexposure to TCE are the CNS (euphoria, analgesia, and anesthesia), degeneration of the liver and kidneys, the lungs (tachypnea), heart (arrhythmia) and skin (irritation, vesication, and paralysis of fingers when immersed in liquid TCE). Contact with the liquid defats the skin, causing topical dermatitis. Certain people appear to experience synergistic effects from TCE exposure concomitant with exposure to caffeine, alcohol, and other drugs. Other reported symptoms of TCE exposure include abnormal fatigue, headache, irritability, gastric disturbances, and intolerance to alcohol. Both the OSHA PEL and the ACGIH STEL are 100 ppm, and the ACGIH TLV is 50 ppm.

**CIS 1, 2-Dichloroethene (CIS 1, 2-DCE)**

Exposure to CIS 1, 2-DCE can occur through inhalation, ingestion and eye or skin contact. CIS 1, 2-DCE vapor is a central nervous system depressant and a mild irritant of the mucous membranes in animals. The major effect of CIS 1, 2-DCE on human is narcosis; it has been used in a combination with ether as an anesthetic in at least 2000 cases. No evidence of eye toxicity was seen in these cases. Acute exposure to the vapor of CIS 1, 2-DCE may cause burning of the eyes. Other symptoms of acute exposure are nausea, vomiting, and epigastric distress. Symptoms of exposure-related narcosis including drowsiness, tremor, incoordination, dizziness, and weakness; these symptoms clear quickly after exposure is terminated. In the chronic exposure of CIS 1, 2-DCE works as a defatting agent. This exposure can cause irritation and dermatitis. OSHA PEL and the ACGIH STEL are 200 ppm for CIS 1, 2-DCE.

#### *5.1.2.2 Exposure to Physical Hazards*

The work activities above present the following physical hazards. Heat or cold stress environments, which may be associated with site-specific work activities, PPE usage and geographical project locations. Site work may include: heavy lifting (49 pounds or heavier weight). Additional hazards involve slips/trips falls, protruding objects, hazardous noise, poor lighting in basements, severe weather, flying debris from drilling/hammering, and possibly confined spaces.

Protective measures for the hazards associated with each work task are described in the individual THAs.

#### *5.1.2.3 Biological Hazards*

Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies).

Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). If bitten by insects, see a doctor if there is any question of an allergic reaction.

Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

## 5.2 TASK-SPECIFIC OPERATIONAL SAFETY PROCEDURES

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA. Task hazard analysis (THA) is a technique used to identify hazards and hazard controls associated with a specific job function. THAs focus on the relationship between the workers, the task, resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level. Guidelines for developing THAs are located in SH&E 204, Task Hazard Analyses.

Section 2.2 describes the work activities anticipated to be performed during this project. Individual THAs for the tasks associated with this work can be found in Attachment 1.

### *5.2.1 Earth Tech Safety Procedures*

All personnel performing field activities at the site will be trained in accordance with SH&E 114, **Safety Training Programs**. For this project, training will include the requirements specified in the following:

- ***SH&E 202, Safety Meetings***
- ***SH&E 204, Task Hazard Analyses***
- ***SH&E 115, Hazard Communication Program***
- ***SH&E 109, Hearing Conservation***
- ***SH&E 113, Personal Protective Equipment***
- ***SH&E 116, Driver and Vehicle Safety***
- ***SH&E 205, Emergency Action Planning and Prevention***

For this project, the training required to perform work includes:

- HAZWOPER 40-hour and current 8-hour refresher,
- Hearing Conservation,
- First Aid/CPR training (at least one person on site).

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this HASP and any supplemental health and safety information developed for the tasks to be performed.
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety.
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task or handling the impacted materials and on an as-needed basis thereafter. Training will be conducted by the SSO (or his/her designee) and will be documented on the form attached to SH&E 202, **Safety Meetings**.

### *5.2.2 Supplemental Safety Procedures*

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, radiological, and biological hazards resulting from task- or equipment-specific activities. The requirements for the control of many of these hazards are discussed in SOPs found in the 400 and 500 Series of the Consolidated Safety, Health, and Environmental Manual.

Specific procedures applicable to this project include:

- SH&E 403 – Hammer Drilling
- SH&E 404 - Manual Lifting
- SH&E 506 - Manual Hand Tools

In addition, the following supplemental procedures have been developed to address requirements not covered within the established Earth Tech SOPs (SH&E 400/500-series). SOPs and supplemental procedures are specified on a task-specific basis in the individual THAs found in Attachment 2.

#### *5.2.2.1 Hazardous Noise Environments*

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

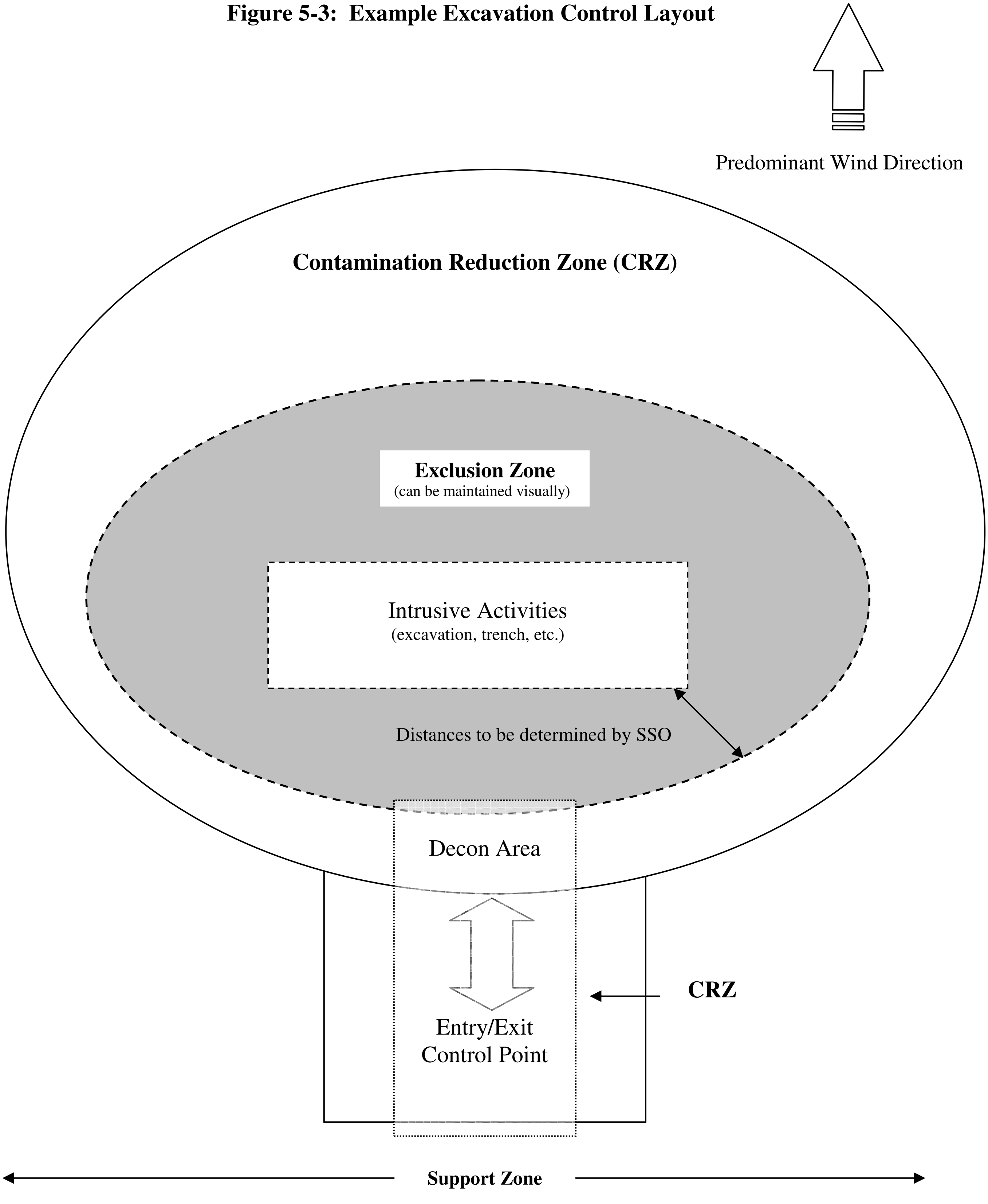
## 5.3 WORK AREA CONTROL

In addition to the general controls specified in Section 4.3, each HAZWOPER controlled work area will consist of the following zone:

Exclusion Zone: Contaminated work area where primary activities occur, such as sampling, and cleanup work. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA and Sections 4.1 and 4.2, will be allowed in an Exclusion Zone.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities.

**Figure 5-3: Example Excavation Control Layout**



## 5.4 PERSONAL PROTECTIVE EQUIPMENT

All work activities associated with the scope of activities addressed in this Section can be performed using Level D, consisting of:

**Table 1 Personal Protective Equipment**

| TYPE | MATERIAL | ADDITIONAL INFORMATION |
|---|---|---|
| ***Minimum PPE:*** | | |
| **Safety Vest** | High-visibility | Must have reflective tape and be visible from all sides |
| **Boots** | Leather | ANSI approved safety toe |
| **Safety Glasses** | | ANSI Approved |
| **Hard Hat** | | ANSI Approved |
| **Work Uniform** | | No shorts/cutoff jeans or sleeveless shirts |
| ***Additional PPE:*** | | |
| **Hearing Protection** | Ear plugs and/ or muffs | In hazardous noise areas |
| **Leather Gloves** | | If working with sharp objects or powered equipment. |
| **Protective Chemical Boots** | | Required for any potential exposure to free product. |

## 5.5 DECONTAMINATION

Personal decontamination stations will be erected at the designated entry/exit points of each HAZWOPER Exclusion Zone. Requirements for these decontamination stations are specified in SH&E 604, **Decontamination**.

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto it. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.

- Have a “buddy” check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

All heavy equipment exiting any HAZWOPER Exclusion Zone will be properly decontaminated on the main decontamination pad using a high-pressure washer and other proper equipment, (i.e. brushes, detergent). Should equipment become heavily soiled, then the use of a water sprayer and/or scrapers and brushes shall be used before being decontaminated. In general, the high pressure washer will be used for cleaning equipment: every effort will be made to remove adhering material with brushes and the sprayer. This decontamination of heavy soils will be performed over contaminated soil areas and the water will collected on poly sheeting. The pressure washer will be high pressure low volume washer to minimize the amount of waste water generated.

All equipment will be inspected prior to being demobilized from the project site.

## 5.6 OCCUPATIONAL EXPOSURE MONITORING

Monitoring shall be performed within each HAZWOPER work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA as work is performed.

### *5.6.1 Health and Safety Action Levels*

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions, the concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area. Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.
- Monitoring information
- Reasons to downgrade:
- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.
- Monitoring information

**Table 2 Action Levels during Environmental Services**

| Parameter | Location and Interval | Response Level (meter units/ppm above background) | Response |
|---|---|---|---|
| **Hydrocarbons**<br>(Total by PID) | Workers breathing zone immediately after drilling the hole for sub-slab sampling. | ≤ 10 ppm | Continue Level D or Modified Level D work and continue monitoring. |
| | | >10 ppm – 100 ppm | Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring. |
| | | ≥ 100 ppm | Cease work, exit the area, contact the SSO or SH&E Manager for guidance. |

### *5.6.2 Monitoring Equipment Calibration*

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

### *5.6.3 Personal Sampling*

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by Earth Tech employees, the PM and an Earth Tech Safety Professional (CIH) will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files. Any personal sampling will be performed according to **SH&E 111, Employee Exposure Monitoring Program.**

Should site activities warrant, Earth Tech subcontractor(s) may also need to implement employee exposure monitoring measure per their own monitoring program requirements. The subcontractor is to notify Earth Tech that personal sampling is needed prior to commencing sampling.

## 6.0 EMERGENCY RESPONSE PLANNING

### 6.1 EMERGENCY ACTION PLAN

The potential for an emergency to occur is remote however; basic emergency actions are necessary should such critical situations arise. Site specific emergency action procedures will be provided within this HASP Supplement.

Prior to the start of site operations or if daily operations dictate, the PM or the Site Manager shall notify all personnel working on the site any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

All visitors and site personnel will be briefed on daily operations and safety policies and procedures prior to entering work areas.

Earth Tech will immediately contact local emergency services by calling 911 in the event of an emergency.

**The following types of events are considered by Earth Tech to be site specific emergencies:**

- Significant physical injury or illness (requiring local EMS response)
- Large fire (can not extinguish with nearby fire extinguisher)
- Excavation collapse
- Chemical spill or release
- Heavy equipment accident
- Vehicular or traffic accident

**The following actions should be taken in response to physical injury or illness emergencies:**

- Remain calm. Proceed to office trailer/muster location if capable. Notify Site Manager or PM immediately. If not capable, remain in place and notify Site Manager or co workers of your location via mobile phone or hand held radio.
- Site Manager or appropriate field personnel will visually and verbally assess the situation. If local EMS response is needed, Site Manager or field personnel will coordinate and contact. If only First Aid is needed, certified site personnel will perform. (**Reference SH&E 205 Emergency Action Planning and Prevention)**
- If necessary, the Site Manager or field personnel will immediately contact site representation other than Earth Tech regarding emergency. If emergency affects existing site operations, Earth Tech will coordinate with site representation and proceed with response actions. If emergency does not affect existing site operations, Earth Tech will continue to elicit emergency services assistance and provide notification after the emergency is under control.
- Once the emergency is under control, Earth Tech Accident/Incident reporting procedures per **SH&E 101 Injury, Illness, and Near Miss Reporting** will be initiated.

**The following actions should be taken in response to all other site specific emergencies:**

- Evacuate area if necessary and capable to muster location near Earth Tech office/support trailer
- Assess yourself and co-workers for injury
- Notify Site Manager or PM immediately. If not capable, remain in place and notify Site Manager or co workers of your location via mobile phone or hand held radio.
- Site Manager or appropriate field personnel will visually and verbally assess the situation. If local EMS response is needed, Site Manager or field personnel will coordinate and contact. If only First Aid is needed, certified site personnel will perform. (**Reference SH&E 205 Emergency Action Planning and Prevention**)
- If necessary, the Site Manager or field personnel will immediately contact site representation other than Earth Tech regarding emergency. If emergency affects existing site operations, Earth Tech will coordinate with site representation and proceed with response actions. If emergency does not affect existing site operations, Earth Tech will continue to elicit emergency services assistance and provide notification after the emergency is under control.
- Once the emergency is under control, Earth Tech Accident/Incident reporting procedures per **SH&E 101 Injury, Illness, and Near Miss Reporting** will be initiated.

**Table 3 Emergency Planning (To be completed by SSO prior to start of site operations)**

| Emergency | Evacuation Route | Muster Location |
|---|---|---|
| **Fire/Explosion** | • TBD | 1. TBD |
| **Tornado** | • TBD | 2. TBD |
| **Lightning** | • TBD | 3. Vehicle |
| **Additional Information** | | |
| **Communication Procedures** | Verbal: cell phones as necessary | |
| **CPR/First Aid Trained Personnel** | TBD | |

## 6.2 ACCIDENT/INCIDENT REPORTING

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSO and the PM in accordance with Earth Tech Safety Procedure SH&E 101, **Injury, Illness, and Near-Miss Reporting**. Earth Tech will also report any accidents and/or incidents to ROCHESTER GAS & ELECTRIC CORPORATION.

If any Earth Tech employee is injured and requires medical treatment, the PM will contact **Earth Tech's Incident Reporting Line at (800) 348-5046 immediately**. The PM will initiate a written report, using the **Supervisor's Report of Incident** form (see SH&E 101) and instructions.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

## 6.3 EMERGENCY CONTACTS

Earth Tech will utilize the following Emergency Contact List provided below to contact other parties regarding site specific emergencies and non-emergencies when necessary. This Emergency Contact List will be posted in all field trailers near telephone locations and hard copies will also be provided to all field personnel and subcontractors working on site.

Also provided is a Hospital Route Map and directions to the closest hospital with emergency facilities. In the event of a serious injury, do not transport the victim to the hospital. Allow EMS to provide first response and proper transport to the closest medical facility. If first aid is administered on site by qualified site personnel and the injury has been controlled, but it is determined that the injury needs further medical attention the victim can be transported by site personnel to the hospital identified in this HASP Supplement.

## Table 4 Emergency Contacts

| ***Emergency Coordinators/Key Personnel*** | | | |
|---|---|---|---|
| **Name** | **Title/Workstation** | **Telephone Number** | **Cellular Phone** |
| Amit Haryani | ET Project Manager | 973-337-4218 | |
| Mihir Chokshi | ET Site Supervisor | 973-338-4222 | |
| Robert Poll | ET District Safety Mgr/HSC | 518-951-2200 ext 242 | 518-817-3089 |
| Vivian James | NYSDEC Project Manager | 518-402-9621 | |
| Incident Reporting | Earth Tech Corporate Safety Administrator | 800-348-5046 | |
| Nick | Nick Dandy Cleaners (Former Country Cleaners Site) | (631) 425 1919 | |
| | | | |

| ***Organization / Agency*** | |
|---|---|
| **Name** | **Telephone Number** |
| Site Emergency | 911 |
| Fire Department | 911 |
| Police Department | 911 |
| Hospital ***(Use by site personnel is only for non-emergency cases)*** | |
| **Huntington Hospital**<br>270 Park Avenue, Huntington, NY | 631-351-2000 |
| Poison Control Center (WNY Poison Control) | 800-222-1222 |
| Pollution Emergency | 800-292-4706 |
| National Response Center | 800-424-8802 |
| Chem-Trec | 800-424-9300 |
| Title 3 Hotline | 800-535-0202 |
| ***Public Utilities*** | |
| Dig Safe | 1-800-dig-safe |
| ***Government Agencies*** | |
| | |
| | |
| | |

## 6.4 HOSPITAL ROUTE

| **Directions** | | | **Distance** |
|---|---|---|---|
| **Total Est. Time:** 3 minutes **Total Est. Distance:** 1.3 miles | | | |
| | **1:** | Head **northeast** on **W Main St/RT-25A** toward **Scudder Pl** | 0.4 miles |
| | **2:** | Turn **left** at **New York Ave/RT-110**. | 0.6 miles |
| | **3:** | Turn **right** at **Mill Ln** | 0.2 miles |
| | **4:** | Turn **right** at **Park Ave** | 125 ft |
| | **5:** | End at 270 Park Ave Huntington, NY 11743 | |
| **Total Est. Time:** 3 minutes **Total Est. Distance:** 1.3 miles | | | |

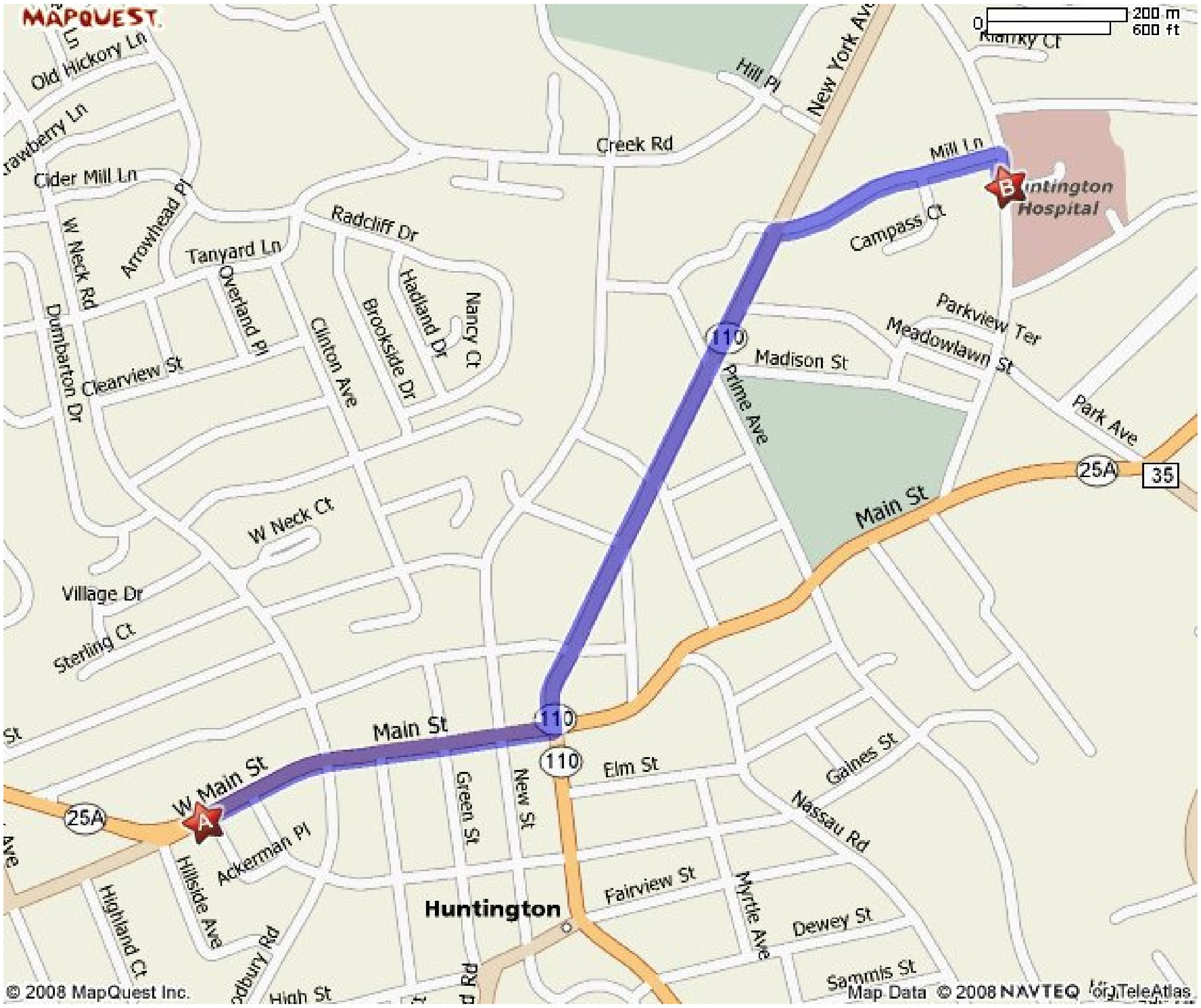


Figure 6-1: Hospital Route/Detail Map

*Note prior to the commencement of site work, Earth Tech will perform the following;

- Local emergency services will be notified of proposed site activities.
- Hospital route will be verified.

## 7.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the Earth Tech Health and Safety Plan Supplement for the NYSDEC (Work Assignment Number D004436). The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

| PRINT NAME | SIGNATURE | ORGANIZATION | DATE |
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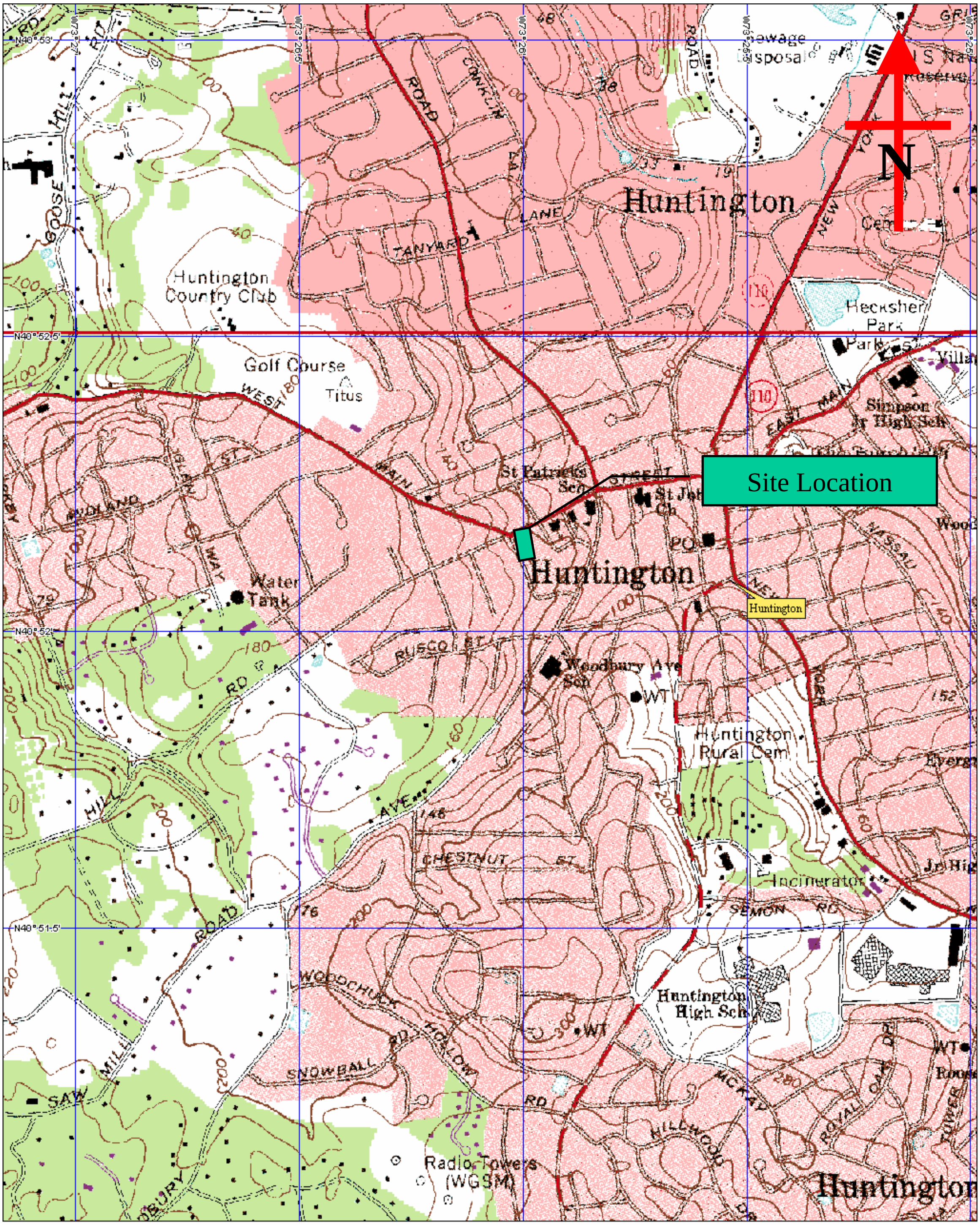
# Figures



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

Scale: 1 : 16,000 Detail: 13-6 Datum: WGS84

300 Broadacres Drive,
Bloomfield, New Jersey 07003

ENVIRONMENTAL/CONSULTING ENGINEERS

| | | |
|---|---|---|
| EARTH TECH<br>A tyco INTERNATIONAL LTD. COMPANY | PROJECT:<br>**REMEDIAL INVESTIGATION/FEASIBILITY STUDY**<br>**COUNTRY CLEANERS**<br>410 Main Street, Huntington, New York | SITE LOCATION MAP<br>Project No: 102656<br>Figure No: 1 |

**Prepared by**: Mihir Chokshi **Date**: May 2008

## TASK NAME

## INVESTIGATIVE-DERIVED WASTE

| TASK DESCRIPTION | CHEMICAL EXPOSURE HAZARDS |
|---|---|
| This task involves characterization, management and disposal of waste. Investigative-derived waste (IDW) is also known as "legacy waste". All the IDW will be collected in 55- gallon drums and stored on-site for disposal. | • TCE<br>• PCE<br>• CIS 1,2-DCE |

| PPE | OTHER SAFETY EQUIPMENT | PHYSICAL HAZARDS |
|---|---|---|
| **Level D (see Table 1 for upgrade/downgrade criteria)**<br>• Protective chemical gloves<br>• High-visibility reflective safety vest<br>• ANSI approved hardhat<br>• ANSI approved safety glasses<br>• ANSI approved steel toe safety boots | • Face shield/chemical goggles if splash is anticipated<br>• Leather gloves while handling sharp edges or operating powered tools/machinery<br>• SPF 15 sunblock when working outdoors<br>• Equipment decontamination supplies<br>• First aid kit (located in vehicle)<br>• Fire extinguisher (located in vehicle)<br>• Ear plugs/muffs if necessary | • Flying debris<br>• Dust<br>• Slip, trip, and falls<br>• Heat stress<br>• Severe weather/sunburn<br>• Biological<br>• Heavy equipment<br>• Hazardous noise<br>• Overhead hazards<br>• Pinch points<br>• Push/pull |

| APPLICABLE OPERATIONAL SAFETY PROCEDURES | ADDITIONAL SAFETY CONSIDERATIONS |
|---|---|
| • SH&E 201, General Safety Rules<br>• SH&E 404, Manual Lifting | • Evaluate surrounding work area for additional hazards that may be present.<br>• All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.<br>• Always ensure the driver of excavation equipment can see you at all time times. Never assume he can see you. Always yield to heavy equipment. |

## MONITORING PROCEDURES

Monitor with PID according to HASP requirements in Section 6.

EarthTech
A Tyco International Ltd. Company

**TASK HAZARD ANALYSIS (THA)**
**EARTH TECH NORTHEAST INC.**
**BLOOMFIELD, NJ**

**Prepared by**: Mihir Chokshi **Date**: May 2008

## TASK NAME

## MIPS, HYDROPUNCH GROUNDWATER SAMPLING AND PERMANENT MONITORING WELLS

## TASK DESCRIPTION

Earth Tech will assess groundwater at the Site to evaluate the vertical and horizontal extent of groundwater contamination. Geoprobe® direct-push technology (DPT) will be used to advance the borings. Permanent wells will be advanced using Hollow Stem Auger (HSA).

## CHEMICAL EXPOSURE HAZARDS

- TCE
- PCE
- CIS 1,2-DCE

## PPE

**Level D (see Table 1 for upgrade/downgrade criteria)**

- Protective chemical gloves
- High-visibility reflective safety vest
- ANSI approved hardhat
- ANSI approved safety glasses
- ANSI approved steel toe safety boots

## OTHER SAFETY EQUIPMENT

- Face shield/chemical goggles if splash is anticipated
- Leather gloves while handling sharp edges or operating powered tools/machinery
- SPF 15 sunblock when working outdoors
- Equipment decontamination supplies
- First aid kit (located in vehicle)
- Fire extinguisher (located in vehicle)
- Ear plugs/muffs if necessary

## PHYSICAL HAZARDS

- Flying debris
- Dust
- Slip, trip, and falls
- Heat stress
- Severe weather/sunburn
- Biological
- Heavy equipment
- Hazardous noise
- Overhead hazards
- Pinch points
- Push/pull

## APPLICABLE OPERATIONAL SAFETY PROCEDURES

- SH&E 201, General Safety Rules
- SH&E 404, Manual Lifting

## ADDITIONAL SAFETY CONSIDERATIONS

- Evaluate surrounding work area for additional hazards that may be present.
- All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
- Always ensure the driver of excavation equipment can see you at all time times. Never assume he can see you. Always yield to heavy equipment.

## MONITORING PROCEDURES

Monitor with PID according to HASP requirements in Section 5.

# TASK HAZARD ANALYSIS (THA)
EARTH TECH NORTHEAST INC.
BLOOMFIELD, NJ

**Prepared by**: Mihir Chokshi  **Date**: May 2008

## TASK NAME

## MOBILIZATION/DEMOBILIZATION

| TASK DESCRIPTION | CHEMICAL EXPOSURE HAZARDS |
|---|---|
| Mobilization/demobilization activities typically present limited hazards as compared to the majority of site tasks. However, the potential still exists for exposures to a variety of hazards, typically physical in nature. | • None anticipated |

| PPE | OTHER SAFETY EQUIPMENT | PHYSICAL HAZARDS |
|---|---|---|
| **Level D (see Table 1 for upgrade/downgrade criteria)**<br>• Protective chemical gloves<br>• High-visibility reflective safety vest<br>• ANSI approved hardhat<br>• ANSI approved safety glasses<br>• ANSI approved steel toe safety boots | • Leather gloves while handling sharp edges or operating powered tools/machinery<br>• First aid kit (located in vehicle)<br>• Fire extinguisher (located in vehicle) | • Geoprobe rig movement and operation<br>• Manual lifting, overexertion<br>• Slip, trip, and falls<br>• Heat stress<br>• Severe weather/sunburn<br>• Biological<br>• Heavy equipment<br>• Hazardous noise<br>• Overhead hazards<br>• Pinch points<br>• Push/pull |

| APPLICABLE OPERATIONAL SAFETY PROCEDURES | ADDITIONAL SAFETY CONSIDERATIONS |
|---|---|
| • SH&E 201, General Safety Rules<br>• SH&E 404, Manual Lifting<br>• SH&E 505, Powered Hand Tools<br>• SH&E 506, Manual Hand Tools<br>• SH&E 604, Decontamination | • Evaluate surrounding work area for additional hazards that may be present and modify work activities accordingly.<br>• Keep areas surrounding work areas free of obstructions during mobilization/demobilization activities.<br>• Probe areas with standing water before walking into puddles during site-walk.<br>• All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.<br>• Use Deet® containing product in areas of possible exposure to ticks, mosquitoes, etc. |

## MONITORING PROCEDURES

Monitoring is not needed for the specific task.

EarthTech
A Tyco International Ltd. Company

# TASK HAZARD ANALYSIS (THA)
EARTH TECH NORTHEAST INC.
BLOOMFIELD, NJ

**Prepared by**: Mihir Chokshi **Date**: May 2008

## TASK NAME

## GROUNDWATER SAMPLING

## TASK DESCRIPTION

Earth Tech will assess on-site groundwater at the Site to evaluate the areas of concern identify during the preliminary assessment. Each groundwater samples will be collected from temporary and permanent well point for laboratory analysis.

## CHEMICAL EXPOSURE HAZARDS

- TCE
- PCE
- CIS 1,2-DCE

## PPE

**Level D (see Table 1 for upgrade/downgrade criteria)**

- Two pair of nitrile inner gloves
- High-visibility reflective safety vest
- ANSI approved hardhat.
- ANSI approved safety glasses.
- ANSI approved steel toe safety boots.

## OTHER SAFETY EQUIPMENT

- Tyvek® if potential exists for contact with impacted materials.
- Face shield/chemical goggles if splash is anticipated
- Leather gloves while handling sharp edges or operating powered tools/machinery
- SPF 15 sunblock when working outdoors
- Equipment decontamination supplies
- First aid kit (located in vehicle)
- Fire extinguisher (located in vehicle)
- Ear plugs/muffs if necessary

## PHYSICAL HAZARDS

- Flying debris
- Dust
- Slip, trip, and falls
- Heat stress
- Severe weather/sunburn
- Biological
- Heavy equipment
- Hazardous noise
- Overhead hazards
- Pinch points
- Push/pull

## APPLICABLE OPERATIONAL SAFETY PROCEDURES

- SH&E 201, General Safety Rules
- SH&E 404, Manual Lifting

## ADDITIONAL SAFETY CONSIDERATIONS

- Always ensure the driver of excavation equipment can see you at all time times. Never assume he can see you.
- Evaluate surrounding work area for additional hazards that may be present.
- Keep areas surrounding work areas free of obstructions.
- Use Deet® containing product in areas of possible exposure to ticks, mosquitoes, etc.
- Use sunscreen lotion 15 SPF or higher on exposed skin as necessary.

## MONITORING PROCEDURES

Monitor with PID according to HASP requirements in Section 6.

# II

## 1,2-Dichloroethylene

**CAS**

540-59-0

**$ClCH=CHCl$**

**RTECS**

KV9360000

**Synonyms & Trade Names**

Acetylene dichloride, dioform, 1,2-dichloroethylene, sym-dichloroethylene, 1,2-dichloroethene, 1,2-dichloroethene, 1,2-DCE, Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene

**DOT ID & Guide**

1150 130P

**Exposure Limits**

**NIOSH REL**: TWA 200 ppm (790 mg/m$^3$)

**OSHA PEL**: TWA 200 ppm (790 mg/m$^3$)

**IDLH**

1000 ppm See: 540590

**Conversion**

1 ppm = 3.97 mg/m$^3$

**Physical Description**

Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

| | | | |
|---|---|---|---|
| MW: 97.0 | BP: 118-140°F | FRZ: -57 to -115°F | Sol: 0.4% |
| VP: 180-265 mmHg | IP: 9.65 eV | | Sp.Gr(77°F): 1.27 |
| Fl.P: 36-39°F | UEL: 12.8% | LEL: 5.6% | |

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities**

Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

**Measurement Methods**

NIOSH 1003; OSHA 7
See: NMAM or OSHA Methods

**Personal Protection & Sanitation**

(See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

**First Aid**

(See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

## Respirator Recommendations

NIOSH/OSHA
**Up to 2000 ppm**:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
**Emergency or planned entry into unknown concentrations or IDLH conditions**:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
**Escape**:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

## Exposure Routes

inhalation, ingestion, skin and/or eye contact

## Symptoms

Irritation eyes, respiratory system; central nervous system depression

## Target Organs

Eyes, respiratory system, central nervous system

See also: INTRODUCTION  See ICSC CARD: 0436

## Tetrachloroethylene

**CAS**

127-18-4

**$Cl_2C{=}CCl_2$**

**RTECS**

KX3850000

**Synonyms & Trade Names**

Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

**DOT ID & Guide**

1897 160

**Exposure Limits**

**NIOSH REL**: Ca Minimize workplace exposure concentrations. See Appendix A

**OSHA PEL**†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)

**IDLH**

Ca [150 ppm] See: 127184

**Conversion**

1 ppm = 6.78 $mg/m^3$

**Physical Description**

Colorless liquid with a mild, chloroform-like odor.

| | | | |
|---|---|---|---|
| MW: 165.8 | BP: 250°F | FRZ: -2°F | Sol: 0.02% |
| VP: 14 mmHg | IP: 9.32 eV | | Sp.Gr: 1.62 |
| Fl.P: NA | UEL: NA | LEL: NA | |

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

**Incompatibilities & Reactivities**

Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

**Measurement Methods**

NIOSH 1003; OSHA 1001
See: NMAM or OSHA Methods

**Personal Protection & Sanitation**

(See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

**First Aid**

(See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

## Respirator Recommendations

NIOSH
**At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration**:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
**Escape**:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

## Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

## Symptoms

Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

## Target Organs

Eyes, skin, respiratory system, liver, kidneys, central nervous system

## Cancer Site

[in animals: liver tumors]

## Trichloroethylene

**CAS**

79-01-6

**$ClCH{=}CCl_2$**

**RTECS**

KX4550000

**Synonyms & Trade Names**

Ethylene trichloride, TCE, Trichloroethene, Trilene

**DOT ID & Guide**

1710 160

**Exposure Limits**

**NIOSH REL**: Ca See Appendix A See Appendix C

**OSHA PEL**†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

**IDLH**

Ca [1000 ppm] See: 79016

**Conversion**

1 ppm = 5.37 mg/$m^3$

**Physical Description**

Colorless liquid (unless dyed blue) with a chloroform-like odor.

| | | | |
|---|---|---|---|
| MW: 131.4 | BP: 189°F | FRZ: -99°F | Sol(77°F): 0.1% |
| VP: 58 mmHg | IP: 9.45 eV | | Sp.Gr: 1.46 |
| Fl.P: ? | UEL(77°F): 10.5% | LEL(77°F): 8% | |

Combustible Liquid, but burns with difficulty.

**Incompatibilities & Reactivities**

Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

**Measurement Methods**

NIOSH 1022, 3800; OSHA 1001
See: NMAM or OSHA Methods

**Personal Protection & Sanitation**

(See protection)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

**First Aid**

(See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

## Respirator Recommendations

NIOSH
**At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration**:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
**Escape**:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

## Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

## Symptoms

Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

## Target Organs

Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system

## Cancer Site

[in animals: liver & kidney cancer]

## MATERIAL SAFETY DATA SHEET

# Methyl Tertiary Butyl Ether (MTBE)

**VALERO MARKETING & SUPPLY COMPANY**
**and Affiliates**
**P.O. Box 696000**
**San Antonio, TX 78269-6000**

**Emergency Phone Numbers**
24 Hour Emergency: 866-565-5220
Chemtrec Emergency: 800-424-9300

**General Assistance**
General Assistance: 210-345-4593

**BRAND NAMES:** Valero, Diamond Shamrock, Shamrock, Ultramar, Beacon, Total

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## Section 1. Chemical Product and Company Identification

**Common / Trade name** : Methyl Tertiary Butyl Ether (MTBE)

**Synonym** : tert-butyl methyl ether

SYNONYMS/COMMON NAMES: This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product and are not reflected in this document. Consult specification sheets for technical information. This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Material uses** : MTBE is used as an oxygenate additive in gasoline blends. This product is intended for use as a refinery feedstock, fuel, or for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

**MSDS #** : 405

**CAS #** : 1634-04-4

## Section 2. Composition, information on ingredients

| Name | CAS number | Concentration ( % ) |
|---|---|---|
| Methyl Tertiary Butyl Ether (MTBE) | 1634-04-4 | 95 - 100 |
| Tertiary Amyl Methyl Ether (TAME) | 994-05-8 | 0 - 1 |
| Methanol | 67-56-1 | 0 - 0.5 |
| tert-Butyl Alcohol | 75-65-0 | 0 - 0.2 |

## Section 3. Hazards Identification

May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard, can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Flammable liquid. Vapors may explode.

**Physical state** : Liquid.

**Emergency overview** : Warning!

*Continued on next page*

EXTREMELY FLAMMABLE LIQUID AND VAPOR.
CAUSES SKIN IRRITATION.
CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: SKIN, EYES.
VAPOR MAY CAUSE FLASH FIRE.
POSSIBLE CANCER HAZARD
CONTAINS MATERIAL WHICH CAN CAUSE CANCER

Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Risk of cancer depends on duration and level of exposure.

**Routes of entry** : Dermal contact. Eye contact. Inhalation. Ingestion.

**Potential acute health effects**

**Eyes** : May cause severe irritation, redness, tearing, blurred vision and conjunctivitis.

**Skin** : Prolonged or repeated contact may cause moderate irritation, defatting (cracking), redness, itching, inflammation, dermatitis and possible secondary infection. High pressure skin injections are SERIOUS MEDICAL EMERGENCIES. Injury may not appear serious at first. Within a few hours, tissues will become swollen, discolored and extremely painful.

**Inhalation** : Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest and sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm. Repeated or prolonged exposure may cause behavioral changes.

**Ingestion** : This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. DO NOT INDUCE VOMITING. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".

**Medical conditions aggravated by over-exposure** : Preexisting eye, skin, heart, central nervous system and respiratory disorders may be aggravated by exposure to this product. Impaired kidney, liver and blood disorders may be aggravated by exposure to this product.

**Over-exposure signs/symptoms** : Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest or sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause irregular heart rhythm.

**See toxicological information (section 11)**

## Section 4. First Aid Measures

**Eye contact** : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin contact** : Wash exposed area thoroughly with soap and water. Remove contaminated clothing promptly and launder before reuse. Contaminated leather goods should be discarded. If irritation persists or symptoms described in the MSDS develop, seek medical attention. High pressure skin injections are SERIOUS MEDICAL EMERGENCIES. Get immediate medical attention.

**Inhalation** : If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

**Ingestion** : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.

*Continued on next page*

**Notes to physician** : In case of ingestion, gastric lavage with activated charcoal can be used promptly to prevent absorption. Consideration should be given to the use of an intratracheal tube, to prevent aspiration. Irregular heart beat may occur, use of adrenalin is not advisable. Individuals intoxicated by the product should be hospitalized immediately, with acute and continuing attention to neurological and cardiopulmonary function. Positive pressure ventilation may be necessary. After the initial episode, individuals should be followed for the delayed appearance of pulmonary edema and chemical pneumonitis. Individuals with chronic pulmonary disease will be more seriously impaired, and recovery from inhalation exposure may be complicated. In case of skin injection, prompt debridement of the wound is necessary to minimize necrosis and tissue loss.

## Section 5. Fire Fighting Measures

**Flammability of the product** : Flammable.

**Auto-ignition temperature** : 435°C (815°F)

**Flash point** : Closed cup: -10.15°C (13.7°F).

**Flammable limits** : Lower: 1.6% Upper: 15.1%

**Products of combustion** : Combustion may produce carbon monoxide, carbon dioxide and reactive hydrocarbons (aldehydes, aromatics, etc.).

**Fire hazards in the presence of various substances** : Highly flammable.

**Fire-fighting media and instructions** : Flammable Liquid. Use dry chemical, foam or carbon dioxide to extinguish the fire. Consult foam manufacturer for appropriate media, application rates and water/foam ratio. Subsurface application is only recommended where it is known that the fuel contains less than 3% oxygenated blending components. Water can be used to cool fire- exposed containers, structures and to protect personnel. If a leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers.

Collect contaminated fire-fighting water separately. It must not enter the sewage system. Dike area of fire to prevent runoff. Decontaminate emergency personnel and equipment with soap and water.

Highly flammable liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

**Special remarks on fire hazards** : Dangerous when exposed to heat or flame. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources (pilot lights, welding equipment, electrical equipment, etc.) and flash back. Vapors may accumulate in low areas. Vapors may concentrate in confined areas. Flowing product can be ignited by self generated static electricity. Use adequate bonding and grounding to prevent static buildup. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Irritating or toxic substances may be emitted upon thermal decomposition. For fires involving this material, do not enter any enclosed or confined space without proper protective equipment, which may include NIOSH approved self-contained breathing apparatus with full face mask. Clothing, rags or similar organic material contaminated with this product and stored in a closed space may undergo spontaneous combustion. Transfer to and from commonly bonded and grounded containers.

**Special remarks on explosion hazards** : No additional remark.

*Continued on next page*

## Section 6. Accidental Release Measures

**Personal precautions** : Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Do not touch or walk through spilled material. Tanks, vessels or other confined spaces which have contained product should be freed of vapors before entering. The container should be checked to ensure a safe atmosphere before entry. Empty containers may contain toxic,flammable/combustible or explosive residues or vapors. Do not cut, grind, drill, weld or reuse empty containers that contained this product. Do not transfer this product to another container unless the container receiving the product is labeled with proper DOT shipping name, hazard class and other information that describes the product and its hazards.

**Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. MTBE, TAME, Methanol, and Tertiary Butyl Alcohol are soluble in water and therefore precautions should be taken to protect surface and groundwater sources from contamination. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Fire and Explosion Hazard Data before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g., by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 800-424- 8802. For highway or railway spills, contact Chemtrec at 800-424-9300.

**Methods for cleaning up** : If emergency personnel are unavailable, contain spilled material. For small spills, add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion-proof means to transfer material to a sealable, appropriate container for disposal. For large spills, dike spilled material or otherwise contain it to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal.

## Section 7. Handling and Storage

**Handling** : Do not ingest. Avoid prolonged contact with eyes, skin and clothing. Keep container closed. Wash thoroughly after handling. Use only in well ventilated locations. Keep away from heat, spark and flames. In case of fire, use water spray, foam, dry chemical or carbon dioxide as described in the Fire and Explosion Hazard Data section of the MSDS. Do not pressurize, cut, weld, braze, solder, drill on or near this container. "Empty" container contains residue (liquid and/or vapor) and may explode in heat of a fire.

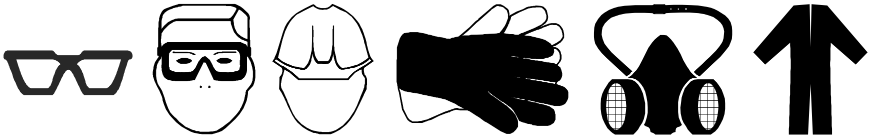
Keep out of reach of children. Failure to use caution may cause serious injury or illness. Never siphon by mouth. For use as a motor fuel only. Do not use as a cleaning solvent or for other non-motor fuel uses. To prevent ingestion and exposure - Do not siphon by mouth to transfer product between containers. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, or using toilet facilities.

**Storage** : Store in tightly closed containers in cool, dry, isolated and well ventilated area away from heat, sources of ignition and incompatible materials. Use non-sparking tools and explosion proof equipment. Ground lines, containers, and other equipment used during product transfer to reduce the possibility of a static induced spark. Do not "switch load" because of possible accumulation of a static charge resulting in a source of ignition. Use good personal hygiene practices.

*Continued on next page*

## Section 8. Exposure controls, personal protection

| | |
|---|---|
| **Engineering controls** | : Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are close to the workstation location. |
| **Personal protection** | |
| **Eyes** | : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. |
| **Skin** | : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Keep away from skin. Skin contact can be minimized by wearing protective gloves such as neoprene, nitrile-butadiene rubber, etc. and, where necessary, impervious clothing and boots. Leather goods contaminated with this product should be discarded. A source of clean water should be available in the work area for flushing eyes and skin. Flame Retardant Clothing is recommended. |
| **Respiratory** | : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary.Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. |
| **Hands** | : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. |
| **Personal protective equipment (Pictograms)** | : Consult your Supervisor or S.O.P. for special handling directions. |



| | |
|---|---|
| **Personal protection in case of a large spill** | : Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be adequate. Consult a specialist before handling this product. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. |

| Component | Exposure limits |
|---|---|
| Methyl Tertiary Butyl Ether (MTBE) | **ACGIH TLV (United States, 1/2004). Notes: 2002 Adoption.**<br>TWA: 50 ppm 8 hour/hours. Form: All forms |
| Tertiary Amyl Methyl Ether (TAME) | **ACGIH TLV (United States, 1/2004). Notes: 2002 Adoption.**<br>TWA: 20 ppm 8 hour/hours. Form: All forms |
| Methanol | **ACGIH TLV (United States, 9/2004). Skin**<br>STEL: 250 ppm 15 minute/minutes. Form: All forms<br>TWA: 200 ppm 8 hour/hours. Form: All forms<br>**NIOSH REL (United States, 6/2001). Skin**<br>STEL: 250 ppm 15 minute/minutes. Form: All forms<br>TWA: 200 ppm 10 hour/hours. Form: All forms<br>**OSHA PEL (United States, 6/1993).**<br>TWA: 200 ppm 8 hour/hours. Form: All forms |
| tert-Butyl Alcohol | **ACGIH TLV (United States, 5/2004). Notes: 1995-1996 Adoption. See Notice of Intended changes.**<br>TWA: 100 ppm 8 hour/hours. Form: All forms<br>**NIOSH REL (United States, 6/2001).**<br>STEL: 150 ppm 15 minute/minutes. Form: All forms<br>TWA: 100 ppm 10 hour/hours. Form: All forms<br>**OSHA PEL (United States, 6/1993).**<br>TWA: 100 ppm 8 hour/hours. Form: All forms |

**Consult local authorities for acceptable exposure limits.**

*Continued on next page*

# Section 9. Physical and Chemical Properties

| | | |
|---|---|---|
| **Physical state** | : | Liquid. |
| **Color** | : | Colorless. |
| **Odor** | : | Ethereal. Minty. |
| **Molecular formula** | : | C5-H12-O |
| **Boiling point** | : | 52.85°C (127.1°F) |
| **Melting/freezing point** | : | -185°C (-301°F) |
| **Specific gravity** | : | 0.758 (Water = 1) |
| **Volatility** | : | 100% (v/v). |
| **Evaporation rate** | : | 8.14 compared with Butyl acetate. |
| **VOC** | : | 100 (%) |
| **Solubility** | : | Partially soluble in cold water. |

# Section 10. Stability and reactivity data

| | | |
|---|---|---|
| **Stability and reactivity** | : | The product is stable. |
| **Incompatibility with various substances** | : | Highly reactive with oxidizing agents, reducing agents, acids, alkalis. |
| **Hazardous decomposition products** | : | Combustion may produce carbon monoxide, carbon dioxide and reactive hydrocarbons (aldehydes, aromatics, etc.). |
| **Hazardous polymerization** | : | Will not occur. |

# Section 11. Toxicological Information

**Toxicity data**

**MTBE** is a mild irritant to the eye. An increase in anesthesia with increasing concentrations was observed during a rat exposure study. Controlled human exposure to MTBE in air under relatively temperate conditions does not cause increased symptoms or measurable responses (irritation, behavioral changes) in healthy adult subjects. Although MTBE and TBA were detectable in the blood of subjects in clinical studies, no increase in symptoms occurred. A tentative review of the carcinogenicity (i.e., a tentative C classification). A sensitivity analysis of cancer risk indices also suggests that, if MTBE is carcinogenic, its potency is not likely to be greater than that already assigned to gasoline itself, which currently has a hazard classification of "probable" human carcinogen.

| Ingredient name | Test | Result | Route | Species |
|---|---|---|---|---|
| Tertiary Amyl Methyl Ether (TAME) | LD50 | 1602 mg/kg | Oral | Rat |
| Methanol | LD50 | 5628 mg/kg | Oral | Rat |
| | LD50 | 14200 mg/kg | Oral | Rabbit |
| | LD50 | 7300 mg/kg | Oral | Mouse |
| | LD50 | 15800 mg/kg | Dermal | Rabbit |
| | LDLo | 143 mg/kg | Oral | human |
| | LDLo | 428 mg/kg | Oral | human |
| | LDLo | 6422 mg/kg | Oral | man |
| | LDLo | 393 mg/kg | Dermal | Monkey. |
| tert-Butyl Alcohol | LD50 | 2743 mg/kg | Oral | Rat |
| | LD50 | 3559 mg/kg | Oral | Rabbit |

| | | |
|---|---|---|
| **Chronic effects on humans** | : | **CARCINOGENIC EFFECTS**: Classified A3 (Proven for animals.) by ACGIH [Methyl Tertiary Butyl Ether (MTBE)]. Classified 3 (Not classifiable for humans.) by IARC [Methyl Tertiary Butyl Ether (MTBE)]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [tert-Butyl Alcohol].<br>Contains material which causes damage to the following organs: skin, eyes. |
| **Other toxic effects on humans** | : | Very hazardous in case of eye contact (irritant).<br>Hazardous in case of skin contact (irritant). |

**Specific effects**

*Continued on next page*

**Carcinogenic effects** : Contains material which may cause cancer, based on animal data. Risk of cancer depends on duration and level of exposure.

**Target organs** : Contains material which causes damage to the following organs: skin, eyes.

# Section 12. Ecological Information

**Ecotoxicity data**

| Ingredient name | Species | Period | Result |
|---|---|---|---|
| Methyl Tertiary Butyl Ether (MTBE) | Pimephales promelas (LC50) | 96 hour/hours | 672 mg/l |
| Methanol | Daphnia magna (EC50) | 48 hour/hours | >10000 mg/l |
| | Oncorhynchus mykiss (EC50) | 48 hour/hours | 13200 mg/l |
| | Lepomis macrochirus (EC50) | 48 hour/hours | 16000 mg/l |
| | Pimephales promelas (LC50) | 96 hour/hours | >100 mg/l |
| | Daphnia magna (LC50) | 96 hour/hours | >100 mg/l |
| | Lepomis macrochirus (LC50) | 96 hour/hours | 15400 mg/l |
| tert-Butyl Alcohol | Daphnia magna (EC50) | 48 hour/hours | 5504 mg/l |
| | Pimephales promelas (LC50) | 96 hour/hours | 6410 mg/l |

**Products of degradation** : These products are carbon oxides (CO, $CO_2$) and water.

**Toxicity of the products of biodegradation** : The product itself and its products of degradation are not toxic.

# Section 13. Disposal Considerations

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

**Consult your local or regional authorities.**

# Section 14. Transport Information

| Regulatory information | UN number | Proper shipping name | Class | Packing group | Label | Additional information |
|---|---|---|---|---|---|---|
| **DOT Classification** | UN2398 | METHYL TERT-BUTYL ETHER | 3 | II |  | **Reportable quantity**<br>**1000 lbs. (453.6 kg)**<br>**Limited quantity**<br>**Yes.**<br>**Packaging instruction**<br>**Passenger aircraft Quantity limitation: 5 L**<br>**Cargo aircraft Quantity limitation: 60 L** |

*Continued on next page*

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | **Special provisions**<br>**IB2, T7, TP1** |
| **TDG Classification** | UN2398 | METHYL TERT-BUTYL ETHER | 3 | II |  | Not available. |

## Section 15. Regulatory Information

**United States**

**U.S. Federal regulations** : TSCA 8(a) PAIR: Tertiary Amyl Methyl Ether (TAME); tert-Butyl Alcohol
TSCA 8(b) inventory: Methyl Tertiary Butyl Ether (MTBE); Tertiary Amyl Methyl Ether (TAME); Methanol; tert-Butyl Alcohol

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Methyl Tertiary Butyl Ether (MTBE)
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Methyl Tertiary Butyl Ether (MTBE): Fire hazard

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

**SARA 313**

| | Product name | CAS number | Concentration |
|---|---|---|---|
| **Form R - Reporting requirements** : | Methyl Tertiary Butyl Ether (MTBE) | 1634-04-4 | 95 - 100 |
| **Supplier notification** : | Methyl Tertiary Butyl Ether (MTBE) | 1634-04-4 | 95 - 100 |

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

**State regulations** : Pennsylvania RTK: Methyl Tertiary Butyl Ether (MTBE): (environmental hazard, generic environmental hazard); Methanol: (environmental hazard, generic environmental hazard) ; tert-Butyl Alcohol: (environmental hazard, generic environmental hazard)
Massachusetts RTK: Methyl Tertiary Butyl Ether (MTBE); Methanol; tert-Butyl Alcohol
New Jersey: Methyl Tertiary Butyl Ether (MTBE); Methanol; tert-Butyl Alcohol

California Prop. 65: No products were found.

**Canada**

**WHMIS (Canada)** : Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
Class D-2B: Material causing other toxic effects (Toxic).

CEPA DSL: Methyl Tertiary Butyl Ether (MTBE); Tertiary Amyl Methyl Ether (TAME); Methanol; tert-Butyl Alcohol

## Section 16. Other Information

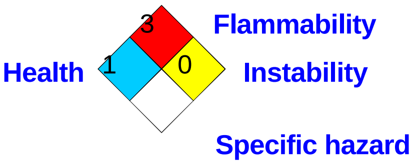
**Label requirements** : EXTREMELY FLAMMABLE LIQUID AND VAPOR.
CAUSES SKIN IRRITATION.
CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: SKIN, EYES.
VAPOR MAY CAUSE FLASH FIRE.
POSSIBLE CANCER HAZARD
CONTAINS MATERIAL WHICH CAN CAUSE CANCER

*Continued on next page*

**Hazardous Material Information System (U.S.A.)** :

| | |
|---|---|
| **Health** | 1 |
| **Fire hazard** | 3 |
| **Physical Hazard** | 0 |
| **Personal protection** | |

**National Fire Protection Association (U.S.A.)** :



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# Definitions of Material Safety Data Sheet Terminology

## GOVERNMENT AGENCIES AND PRIVATE ASSOCIATIONS

**ACGIH** - American Conference of Governmental Industrial Hygienists, (private association)
**DOT** - United States Department of Transportation
**EPA** - United States Environmental Protection Agency
**IARC** - International Agency for Research on Cancer, (private association)
**NFPA** - National Fire Protection Association, (private association)
**MSHA** - Mine Safety and Health Administration, U.S. Department of Labor
**NIOSH** - National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services
**NTP** - National Toxicology Program, (private association)
**OSHA** - Occupational Safety and Health Administration, U.S. Department of Labor
**WHMIS**- Workplace Hazardous Material Information System
**CSA**- Canadian Standards Association

## HAZARD AND EXPOSURE INFORMATION

**Acute Hazard** - An adverse health effect which occurs rapidly as a result of short term exposure.
**CAS #** - American Chemical Society's Chemical Abstract service registry number which identifies the product and/or ingredients.
**Ceiling** - The concentration that should not be exceeded during any part of the working exposure
**Chronic Hazard** - An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration
**Fire Hazard** - A material that poses a physical hazard by being flammable, combustible, phyrophoric or an oxidizer as defined by 29 CFR 1910.1200
**Hazard Class** - DOT hazard classification
**Hazardous Ingredients** - Names of ingredients which have been identified as health hazards

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**IDLH**- Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitating or irreversible health effects. Established by NIOSH.
**mg/m3** - Milligrams of contaminant per cubic meter of air, a mass to volume ratio
**N/A** - Not available or no relevant information found
**NA** - Not applicable
**PEL** - OSHA permissible exposure limit; an action level of one half this value may be applicable
**ppm** - Part per million (one volume of vapor or gas in one million volumes of air)
**Pressure Hazard** - A material that poses a physical hazard due to the potential of a sudden release of pressure such as explosive or a compressed gas as defined by 29 CFR 1910.1200
**Reactive Hazard** - A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200.
**STEL** - The ACGIH Short-Term Exposure Limit, a 15-minute Time-Weighted Average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV.
**TLV** - ACGIH Threshold Limit Value, represented herein as an 8-hour TWA concentration.
**8-hour TWA** - The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
**LD50** – Single dose of a substance that, when administered by a defined route in an animal assay, is expected to the cause the death of 50% of the defined animal population.
**LC50** - The concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay, is expected to cause the death of 50% of a defined animal population.

# C

# FINAL
# COMMUNITY AIR MONITORING PLAN

## REMEDIAL INVESTIGATION/FEASIBILITY STUDY
## COUNTRY CLEANERS
## 410 WEST MAIN STREET, HUNTINGTON, NY

**Site No. 152187**
**Work Assignment No. D004436-13**

**Prepared for:**

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May 2008

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## 1.0 INTRODUCTION

A Community Air Monitoring Plan (CAMP) is used 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.

A 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. 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.

## 2.0 MONITORING

No significant airborne concentration of contaminants is expected at the site. Real-time air monitoring for volatile organic compounds (VOCs) in the work area will be limited to periodic instantaneous measurements.

## 2.1 PERIODIC MONITORING

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.

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) periodically. Upwind concentrations will be measured at the start of each workday to establish background conditions. The monitoring work will be performed using a photo-ionization detector (PID).

- 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 a 15-minute average calculated based on instantaneous measurements, work activities will 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 will 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 (calculated based on instantaneous measurements).
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.
- Instantaneous readings used for decision purposes will be recorded.