VERTEX®

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December 14, 2015

Mr. John Miller, Case Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, New York 12233-7014

**Re: Final SMP**
Cornwall Plaza
19-45 Quaker Avenue
Cornwall, New York 12518
Site No. C336070
VERTEX Project No. 24803

Dear Mr. Miller:

Vertex Engineering, PC (VERTEX) is pleased to provide you with the Final SMP for the above-referenced site. This document incorporates revisions in response to the NYSDEC comments received that were outlined in the Site Management Plan Approval letter dated October 9, 2015. Changes have been made in green lettering and include changes to Table 6, Section 3.3.2, and Section 4.3.2. The signed Environmental Easement is included in Appendix A. Figure 7 has also been updated to reflect current data.

VERTEX is finalizing the Draft FER which will be submitted under separate cover.

Sincerely,

**Vertex Engineering, PC**

Richard J. Tobia, PE
Technical Director

Joseph J.C. Dultz, CHMM
Vice President

**CORNWALL PLAZA**

**ORANGE COUNTY**

**CORNWALL, NEW YORK**

# SITE MANAGEMENT PLAN

**NYSDEC Site Number: C336070**

**USEPA ID # NYD054065735**

**Prepared for:**

Cornwall Shopping, LLC

c/o Philips International Holding Corp.

295 Madison Avenue, New York, NY 10017

**Prepared by:**

Vertex Engineering, PC

4518 Court Square. Suite 602

Long Island City, NY 11101

646-553-3500

Project No. 24803

**Revisions to Final Approved Site Management Plan:**

| Revision No. | Date Submitted | Summary of Revision | NYSDEC Approval Date |
|---|---|---|---|
| 0 | 08/06/15 | DRAFT | October 9, 2015 |
| 1 | 12/14/15 | FINAL | |
| | | | |
| | | | |

**DECEMBER, 2015**

CERTIFICATION STATEMENT

I RICHARD J. TOBIA certify that I am currently a NYS registered professional engineer or Qualified Environmental Professional as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

_____ P.E.

December 14, 2015 DATE


**It is a violation of NY State Law for any person, unless acting under the direction of a licensed Professional Engineer, to alter this document in any way.**

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| | |
|---|---|
| AS | Air Sparging |
| ASP | Analytical Services Protocol |
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CAMP | Community Air Monitoring Plan |
| C/D | Construction and Demolition |
| CFR | Code of Federal Regulation |
| CLP | Contract Laboratory Program |
| COC | Certificate of Completion |
| CO2 | Carbon Dioxide |
| CP | Commissioner Policy |
| DER | Division of Environmental Remediation |
| EC | Engineering Control |
| ECL | Environmental Conservation Law |
| ELAP | Environmental Laboratory Approval Program |
| ERP | Environmental Restoration Program |
| GHG | Green House Gas |
| GWE&T | Groundwater Extraction and Treatment |
| HASP | Health and Safety Plan |
| IC | Institutional Control |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYCRR | New York Codes, Rules and Regulations |
| O&M | Operations and Maintenance |
| OM&M | Operation, Maintenance and Monitoring |
| OSHA | Occupational Safety and Health Administration |
| OU | Operable Unit |
| PID | Photoionization Detector |
| PRP | Potentially Responsible Party |
| PRR | Periodic Review Report |
| QA/QC | Quality Assurance/Quality Control |
| QAPP | Quality Assurance Project Plan |
| RAO | Remedial Action Objective |
| RAWP | Remedial Action Work Plan |
| RCRA | Resource Conservation and Recovery Act |
| RI/FS | Remedial Investigation/Feasibility Study |

| | |
|---|---|
| ROD | Record of Decision |
| RP | Remedial Party |
| RSO | Remedial System Optimization |
| SAC | State Assistance Contract |
| SCG | Standards, Criteria and Guidelines |
| SCO | Soil Cleanup Objective |
| SMP | Soil Management Plan |
| SOP | Standard Operating Procedures |
| SOW | Statement of Work |
| SPDES | State Pollutant Discharge Elimination System |
| SSD | Sub-slab Depressurization |
| SVE | Soil Vapor Extraction |
| SVI | Soil Vapor Intrusion |
| SVMS | Soil Vapor Mitigation System |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leachate Procedure |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VCA | Voluntary Cleanup Agreement |
| VCP | Voluntary Cleanup Program |

# ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP):

| | |
|---|---|
| Site Identification: | C336070 Cornwall Plaza<br>19-45 Quaker Avenue, Cornwall, NY |

| | |
|---|---|
| Institutional Controls: | 1. The property may be used for commercial or industrial use. |
| | 2. The remedial party or site owner is required to complete and submit to the New York State Department of Environmental Conservation (Department or NYSDEC) a periodic certification of institutional and engineering controls in accordance with 6 NYCRR Part 375-1.8 (h)(3) (hereinafter "Part 375"). |
| | 3. The use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g) is allowed, although land use is subject to local zoning laws. |
| | 4. The use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or Orange County Department of Health (OCDOH); to render it safe for use as drinking water or for industrial purposes is restricted, and the user must first notify and obtain written approval to do so from the Department. |
| | 5. Agriculture or vegetable gardens on the controlled property are prohibited. |
| | 6. Compliance with the Department approved SMP is required. |
| | 7. All engineering controls (ECs) must be operated and maintained as specified in this SMP. |

| | |
|---|---|
| | 8. All ECs must be inspected at a frequency and in a manner defined in the SMP. |
| | 9. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP |
| | 10. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP |
| | 11. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP |
| | 12. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP |
| | 13. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement |
| | 14. The potential for vapor intrusion must be evaluated for any buildings developed in the area within the institutional controls (IC) boundaries noted on Figures 2 and 8A and Appendix 1, and any potential impacts that are identified must be monitored or mitigated; and |
| | 15. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP |
| Engineering Controls: | 1. Cover system |
| | 2. Sub-slab Depressurization (SSD) System |

| Inspections: | Frequency |
|---|---|
| 1. Cover Inspection | Annually |

| | |
|---|---|
| 2. SSD System | Semi-annually |
| 3. Monitoring Wells | Annually |
| Monitoring: | |
| 1. SSD System<br>- Soil Gas<br>- Indoor Air | Semi-annually 2015. Annually thereafter through 2018 |
| 2. Groundwater Monitoring Wells MW-1R, MW-2R, MW-3, MW-4R, MW-6, MW-7, MW-8 | Quarterly through December 2015. Annually thereafter through 2018 |
| Maintenance: | |
| 1. Monitoring Well Maintenance | As needed |
| 2. SSD maintenance | As needed |
| 3. Cover | Annually |
| Reporting: | |
| 1. Groundwater Data | Annually through 2018 |
| 2. Periodic Review Report | Annually |

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

# 1.0 INTRODUCTION

## 1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Cornwall Plaza located in Cornwall, New York (hereinafter referred to as the "site"). See Figure 1 - Site Location Map. The site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C336070, which is administered by NYSDEC.

Cornwall Shopping LLC entered into a Brownfield Cleanup Agreement (BCA) on November 13, 2006 with the NYSDEC to remediate the site. Cornwall Shopping LLC entered the BCP as a volunteer as defined in ECL 27-1405(1)(B). A figure showing the boundaries and features of this site is provided in Figure 2. The boundaries of the site are fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix 1.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination." Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Orange County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of the ECL, 6 NYCRR Part 375 and the BCA for the site, and thereby is subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix 2 of this SMP.

This SMP was prepared by Vertex Engineering, PC (VERTEX), on behalf of Cornwall Shopping LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 3, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

## 1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

## 1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, Part 375 and/or the ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity.
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix 2.

**Table 1: Notifications***

| **Name** | **Contact Information** |
|---|---|
| NYSDEC Project Manager<br>John B. Miller, P.E. | Division of Environmental Remediation<br>625 Broadway, 11th floor<br>Albany, NY 12233-7014<br>Phone: (518) 402-9662<br>Fax: (518) 402-9679<br>John.miller@dec.ny.gov |
| NYSDEC Site Control Section Chief<br>Kelly Lewandowski | (518) 402-9553<br>Kelly.lewandowski@dec.ny.gov |
| NYSDEC HW Engineer<br>Ed Moore | (845) 256-3137<br>Edward.moore@dec.ny.gov |
| Region 3 | http://www.dec.ny.gov/about/607.html<br>(845) 256-3000 |

* Note: Notifications are subject to change and will be updated as necessary.

# 2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

## 2.1 Site Location and Description

The site is located at 19-45 Quaker Avenue in Cornwall, Orange County, New York and is identified as Section 25 Block 3 and Lot 4 on the Orange County Tax Map (see Figure 1 and 2). The site is an approximately 3.8-acre area and is bounded by Quaker Avenue to the north, Warren Court and residential dwellings to the south, Cornwall Fire Department and Angola Road to the east, and Cedar Lane and residential dwellings to the west (see Figure 2 – Overall Site Plan). The boundaries of the site are described in detail in Appendix 1–Environmental Easement. The owner(s) of the site parcel(s) at the time of issuance of this SMP is/are:

Cornwall Shopping, LLC
c/o Philips International Holding Corp.
295 Madison Avenue, New York, New York 10017

## 2.2 Physical Setting

### 2.2.1 Land Use

The site consists of the following: two slab-on-grade structures with multiple commercial tenant spaces. The remainder of the site consists of paved parking lots and driveways and a small amount of landscaped and vegetated areas. The site is zoned commercial and is currently utilized for commercial uses. Site occupants include (from west to east) the U.S. Post Office and Anytime Fitness in the western most building. The tenants in the eastern most building on the site (from west to east) are Bank of America, Leo's Pizzeria, Cornwall Wash n' Dry, Chan's Peking House (Chan's), and DeCicco's Family Market (DeCicco's) was formerly Key Foods. The site is serviced by municipal sanitary sewer and potable water by the Town of Cornwall.

The properties adjoining the site and in the neighborhood surrounding the site primarily include commercial and residential properties. The properties immediately south of the site include residential properties; the properties immediately north of the site include commercial and residential properties; the properties immediately east of the site include commercial properties; and the properties to the west of the site include commercial properties.

### 2.2.2 Geology

The site is located at an elevation of approximately 280 feet above mean sea level. Overall, the site is relatively flat. The surrounding area slopes generally downward to the north and east and upward to the south. An approximately 10-foot upward slope is located on the southern edge of the site, separating the site from the neighboring residential properties along Warren Court.

Overburden soils consist of grey to brown silt, with some sand and gravel, from ground surface to between 8.5 and 11.0 feet below ground surface (ft bgs). A dense till layer is present at the site at depths ranging from 8.5 and 15.0 ft bgs. Local bedrock, consisting of grey shale, was encountered between 16.0 and 20.0 ft bgs.

A geologic cross section is shown in Figures 3A and 3B. Site specific boring logs are provided in Appendix 3.

### 2.2.3 Hydrogeology

Ground water is encountered between 6.0 and 11.0 ft bgs in the overburden above the bedrock, and flows in the overburden to the north and northeast at a gradient of 0.005 ft/ft. Ground water is not utilized at the site, as potable water is provided by the Town of Cornwall.

Typical groundwater contour maps are depicted in Figures 3A and 4. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix 3.

## 2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

According to a Phase I Environmental Site Assessment (ESA) completed by LFR Levine Fricke (LFR) in November 2005, the site was developed with one residential dwelling from at least 1902 through 1966 when the easternmost building was developed and occupied by Grand Union (grocery store). By 1970, the site consisted of two buildings, as currently depicted.

Due to the identification of historic dry cleaning operations at the site, a subsurface investigation was conducted by LFR in August and October 2005. Soil and groundwater samples were collected around the perimeter of the eastern site building. A Phase II ESA report, prepared by LFR in November 2005, identified tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE) in soil and ground water. One soil sample location contained PCE in exceedance of the Technical and Administrative Guidance Memorandum/4046 (TAGM 4046) and 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs).

The source of these contaminants is the result of a release or releases from the site's former dry-cleaning business (Cornwall Cleaners). Identified as lease space #2, Chan's is the current lessee of the former Cornwall Cleaners leasehold space. Based on documents in the Cornwall Assessor's Office, Cornwall Cleaners operated at the Cornwall Plaza as a dry cleaner and Laundromat from approximately 1967 through 1994. Records indicate that the leasehold space was converted from a dry cleaner to a restaurant in 1994.

Between November 2007 and May 2009, Leggette, Brashears & Graham (LBG) conducted a remedial investigation at the site. The investigation included the evaluation of soil, ground water, soil gas, and indoor air samples. The LBG investigation confirmed that soil and ground water were impacted with chlorinated volatile organic compounds (CVOCs). Elevated CVOC concentrations were identified in sub-slab soil gas samples; however, corresponding low indoor air concentrations indicated the vapor intrusion pathway is incomplete and/or there is a high attenuation factor within the building. The details of the remedial investigation were included in the December 2009 *Remedial Investigation Report* (RIR).

The findings presented in the RIR were revised by ARCADIS U.S., Inc., (ARCADIS) in accordance with NYSDEC comments, and re-submitted in January 2011. Included in the revised report was an evaluation of potential vapor intrusion concerns at the site. PCE was detected at relatively high concentrations in the sub-slab soil gas beneath two leasehold spaces. Utilizing New York State Department of Health (NYSDOH) guidance, it was identified that mitigation was required in these areas. The submittal also included the results from soil characterization sampling that was conducted in August 2010. The characterization was performed to document the soil conditions in areas below the cap (asphalt and building footprint) at the site. Based on the sampling results, metals and semi-volatile organic compounds (SVOCs) were identified in exceedance of the TAGM soil cleanup objective, but below the NYCRR Part 375 Restricted Use Protection of Ground Water (RUPG) standards.

A *Remedial Work Plan* (RWP) was prepared by Arcadis, and dated April 3, 2012. The RWP outlined the remedial actions that were selected in the *Revised Alternatives Analysis Report* (Arcadis, November 29, 2011) and approved by NYSDEC on January 3, 2012. The RWP also addressed the modification from a Track 2 cleanup to a Track 4 cleanup, as requested by the NYSDEC on January 3, 2012.

On April 23, 2013, VERTEX conducted a pilot test to evaluate the design parameters for the installation of a SSDS at the Site. The pilot test was conducted at two separate locations at the site building. Based upon the results of the pilot test, a radius of influence (ROI) of approximately 30 feet at an airflow rate ranging between 4 and 9 cfm was estimated as the optimal design for the SSD system.

Between July 29, 2013 and September 20, 2013, VERTEX commenced the initial carbon substrate injection application in accordance with the RWP. The remedial activities included the injection of Emulsified Vegetable Oil (EVO), supplied by Terra Systems, Inc., (Terra Systems), into 117 vertical injection points and the three directional drilled permanent wells. The objective of the enhanced reductive dechlorination (ERD) treatment using EVO is to enhance the biological breakdown of the CVOCs through the addition of a carbon substrate. Injections were conducted by pumping a mixture of EVO and water through the Geoprobe® rods which were advanced to depth for each location. A total of 1,022 gallons of EVO was injected into 117 vertical injection points. A figure showing the injection locations is provided as Figure 5.

During the injection activities, it was observed that EVO was entering a stream via infiltration into an on-site storm water drain. VERTEX notified the NYSDEC (Dispatcher Maher, Operator No. 28) of the discharge and response actions. The NYSDEC assigned Reference No. 1305257 to the incident. The discharge was remediated by VERTEX and an environmental response team. The NYSDEC case manager gave a verbal response that the spill will not require any further reporting.

Between August 28, 2013 and September 6, 2013, VERTEX oversaw the installation of three directionally drilled horizontal wells (Well Point 10, Well Point 12, and Well Point 14). The horizontal wells were installed at the following depth intervals: 10 feet bgs (Well Point 10), 12 feet bgs (Well Point 12), and 14 feet bgs (Well Point 14).

Injection into the horizontal wells was conducted between September 17, 2013 and November 22, 2013. In order to facilitate distribution of the EVO in the subsurface, the EVO was diluted onsite using imported water stored in a frac-tank. A total of 4,894 gallons of EVO was injected into 3 horizontal injection points. A figure showing the horizontal injection locations is provided as Figure 5.

On February 20, 2014, VERTEX conducted the first round of post-remedial groundwater sampling activities at the Site. Monitoring wells MW-2, MW-2B, and MW-4 were damaged during the EVO injection activities and were subsequently abandoned; therefore, they were not sampled. It should be noted that wells MW-1B, MW-6, MW-6B, MW-8, MW-9, and MW-10 were inaccessible during the February 2014 sampling event due to large snow piles and ice.

Between March 5, 2014 and March 14, 2014, VERTEX commenced the second carbon substrate injection application in accordance with the RWP. The remedial activities included the injection of EVO into 67 vertical injection points and additional injections into the existing horizontal injection wells.

Between June 22, 2014 and June 24, 2014, a total of eight SSD system vapor points were installed through the building floor within the DeCicco leasehold. The locations were selected based upon the concentrations of CVOCs in the sub-slab soil gas, subsurface and surface obstructions, and the calculated ROI. The ROI from the northwestern system, System 1, was installed to influence the Chan's Peking House leasehold. The SSD system is described in detail in Section 3.3.2 and depicted in Figure 8B.

On June 30, 2014 and July 1, 2014, VERTEX conducted the second round of post-remedial groundwater sampling activities at the Site. Groundwater samples were collected from on-site monitoring wells MW-1R, MW-1B, MW-3, MW-3B, MW-5, MW-6, MW-6B, MW-7, MW-8, and MW-9.

On November 24, 2014, VERTEX conducted the third round of post-remedial groundwater sampling activities at the Site. Groundwater samples were collected from on-site monitoring wells MW-1R, MW-3, MW-6, MW-7, and MW-8.

In April of 2015, VERTEX reinstalled MW-2 (MW-2R) and MW-4 (MW-4R) adjacent to the prior wells with the same well construction specifications as the prior wells.

On February 19 and April 24, 2015, VERTEX conducted the fourth round of post-remedial groundwater sampling activities at the Site. Groundwater samples were collected from on-site monitoring wells MW-1R, MW-2R, MW-3, MW-3B, MW-4R, MW-5, MW-6, MW-6B, MW-7, MW-8, and MW-9.

Based upon the groundwater data collected to date, bioremediation via de-chlorination of CVOCs is occurring at the Site in areas where EVO was injected. Concentrations of CVOCs have exhibited an overall decreasing trend since the injections of EVO. However, additional sampling will be required to confirm that CVOC concentrations are continuing to be reduced, and that a rebound of CVOC concentrations does not occur. The historical groundwater sampling results are shown on Table 3.

## 2.4 Remedial Action Objectives

The RWP (ARCADIS, October 2012) was designed to follow a Track 4 cleanup at the site via in-situ groundwater remediation through Enhanced Reductive Dechlorination (ERD) and the installation of an active sub-slab depressurization system (SSD system). Site-specific soil cleanup objectives (SCOs), based upon SCOs set forth in Subpart 375-6, will be utilized for the contaminants of concern. A long-term institutional control will be implemented to address exceedances of the SCO.

The remedial strategy involves the following activities that have been or will be performed at the site:

- Completion of a subsurface geophysical survey to identify subsurface utilities within the proposed injection area;
- Installation of an active SSD system below the current tenants DeCicco's Market and adjacent to Chan's Restaurant;
- Injection of a carbon substrate to the subsurface through direct-push points and temporary well points and permanent horizontal injection wells;
- Perform quarterly groundwater monitoring events through the end of 2015 followed by annual events thereafter through the end of 2018, to evaluate the effectiveness of the ERD; and
- Perform semi-annual sub-slab soil gas and indoor air sampling through the end of 2015 and annually thereafter through the end of 2018, to monitor the effectiveness of the SSDS.

The RWP was approved by the NYSDEC and NYSDOH in a letter dated August 14, 2012.

The Remedial Action Objectives (RAOs) for the site as listed in the Decision Document dated August 10, 2012 are as follows:

**Groundwater**

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.

- Remove the source of ground or surface water contamination.

**Soil**

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

**Soil Vapor**

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

## 2.5 Remaining Contamination

### 2.5.1 Soil

Soil contamination was previously detected at concentrations exceeding the NY TAGM 4046 and 6 NYCRR Part 375 UUSCOs in 2005. Soil contamination at the site has been characterized and is currently capped with asphalt pavement and/or buildings preventing a direct contact exposure pathway. Further soil sampling is not required as proposed in the Revised RIR/RIR Addendum prepared by ARCADIS dated January 5, 2011. The proposal was accepted by the Department in a letter dated August 14, 2012.

Furthermore, residual VOC soil impacts may have been addressed during the injection events to remediate groundwater.

### 2.5.2 Groundwater

Between July 29, 2013 and September 20, 2013 and between March 5, 2014 and March 14, 2014 VERTEX injected emulsified vegetable oil (EVO) in accordance with the RWP.

Post injection concentrations of CVOCs (PCE, TCE, cis-1,2-DCE) have generally decreased in all monitoring wells (MW-1R, MW-2/2R, MW-3, MW-4/4R, MW-6, MW-8, and MW-11) that had exceedances since March 2011 except in MW-7 where PCE concentrations have remained consistent or increased slightly. All but seven of the monitoring wells did not contain concentrations of VOCs exceeding the NY Ambient Water Quality Standards (AWQS) & Guidance Values, Class GA as per Division of Water Technical & Operational Guidance Series (1.1.1) (GV) during the most recent groundwater sampling event in February-April 2015.

VOC contamination exceeding the NY AWQS and GV is limited to the overburden and the northeastern side of the site. Overburden wells with concentrations remaining above the AWQS and GV are screened between 6 and 20 ft bgs.

PCE concentrations remaining range from 0.2 J ug/L in MW-6 to 300 ug/L in MW-4R. TCE concentrations range from 0.79 ug/L in MW-7 to 50 ug/L in MW-4R. Cis-1,2-DCE concentrations range from 2.4 in MW-8 to 110 ug/L in MW-4R. Vinyl chloride was detected in MW-6 at a concentration of 3 ug/L and in MW-4 at a concentration of 8.7 ug/L. Acetone concentrations range from 1.5 ug/L in MW-1R to 73 ug/L in MW-6. The remaining groundwater exceedances following the remedial action are shown on Table 3 and Figure 6.

Monitoring wells MW-1R and MW-6 have shown highly favorable conditions for continuing reductive dechlorination: high dissolved organic carbon (DOC), high methane,

high dissolved iron, low sulfate, and a marked decreasing VOC trend. There appears to be a sufficient quantity of EVO remaining in this area for continued dechlorination.

Monitoring wells MW-7 and MW-8 have shown somewhat favorable conditions for continuing reductive dechlorination: low to mid-levels of DOC, medium methane, low dissolved iron, and high sulfate.

Monitoring well MW-3 is exhibiting less favorable conditions for continuing reductive dechlorination: mid-level DOC, low methane, low dissolved iron, high sulfate, high dissolved oxygen (DO). This well has shown a significant decreasing VOC trend but may be depleted of EVO. Levels of pH, oxidation reduction potential (ORP) and DO are favorable in most wells.

A third targeted injection of carbon substrate to address remaining contamination, in particular near MW-4R where concentrations of PCE (300 ug/L) and its daughter products (TCE, c-DCE and vinyl chloride) remain highest may be required if concentrations of carbon substrate are depleted and reductive dechlorination stalls. The need for a third injection event will be determined based on the results obtained during the proposed groundwater monitoring events outlined in the SMP.

Additional groundwater sampling events have been performed since completion of the SMP (July 2015 and November 2015). The results of these sampling events will be presented in the FER.

Table 3 and Figure 6 summarize the results of all samples of groundwater that exceed the SCGs after completion of the remedial action.

### 2.5.3 Soil Vapor

Soil vapor samples were collected from the northern and southern sides of the building in October 2007. At the time, the DeCicco leasehold was occupied by Key Foods.

PCE and vinyl chloride (VC) were detected in the sample collected from the southern side of the eastern building.

Sub-slab soil vapor samples were collected from beneath the slab of Chan's Restaurant and the former Key Foods (currently DeCicco) leasehold in October 2007 and April 2009. PCE was detected in sub-slab soil gas up to 4,700 ug/m3. Detections of TCE in sub-slab soil gas ranged from 24 ug/m3 to 54 ug/m3.

Indoor air samples were collected from Chan's, Key Foods, Leo's Pizza, and the basement and first floor of the fire department building in October 2007 and April 2009. The highest concentrations of PCE were detected in the former Key Foods leasehold (1.4 ug/m3) and the first floor of the fire department (1.52 ug/m3). TCE concentrations ranged from 0.16 ug/m3 (former Key Foods) and 1.26 ug/m3 (fire department). The TCE detected in the fire department is presumed to be from an indoor source. Despite the elevated PCE concentrations in sub-slab soil gas below the Chan's and Key Foods leaseholds, concentrations of PCE in the indoor air in the leaseholds were not detected indicating an incomplete pathway or a high attenuation factor within the leaseholds.

Soil vapor samples were collected on September 11, 2015 once the SSD system was fully operational for at least 30 days. A second round of indoor air and sub slab sampling was performed on November 20, 2015. All indoor air samples from the November Sampling were below the NYDOH Air Guideline Values.

Table 4 and Figure 7 summarize the results of the soil vapor sampling conducted in 2009.

# 3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

## 3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

## 3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to commercial uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are depicted the figure included as Appendix 1. These ICs are:

Imposition of an institutional control in the form of an environmental easement for the controlled property that:

- The remedial party or site owner is required to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- The use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.S(g) is allowed, although land use is subject to local zoning laws;
- Groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or OCDOH; to render it safe for use as drinking water or for industrial purposes is restricted, and the user must first notify and obtain written approval to do so from the Department;
- Agriculture or vegetable gardens are prohibited on the controlled property;
- Compliance with the Department approved Site Management Plan is required;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.

- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on the figure included as Appendix 1, and any potential impacts that are identified must be monitored or mitigated.

## 3.3 Engineering Controls

### 3.3.1 Cover (or Cap)

Exposure to remaining contamination at the site is prevented by a cover system placed over the site. This cover system is comprised of a minimum of 12 inches of clean soil, asphalt pavement, concrete-covered sidewalks, and concrete building slabs. Figure 8A presents the location of the cover system.

Any site redevelopment will maintain a site cover, which may consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is required it will be a minimum of one foot of soil, meeting the SCOs for cover material as set forth in Part 375-6.7(d). The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in Part 375-6.7(d).

Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) prepared for the site and provided in Appendix 4.

### 3.3.2 Sub-slab Depressurization System

An active SSD system which prevents the migration of vapors into the buildings from groundwater has been installed in the easternmost site building, within the DeCicco's leasehold. The ROI of the northwestern system extends to include the Chan's Peking

Restaurant leasehold. The system was installed in two parts on June 22 through 24, 2014 and May 18 through 22, 2015. The system has been tested and became fully operational upon the final electrical connection on August 6, 2015.

Eight extraction points and six sub-slab monitoring points were installed in the grocery store. Two of the extraction points are installed along the demising wall between the grocery store and Chan's. Four systems (one blower per system) were installed to induce a vacuum beneath the building slab. Two additional monitoring points were installed within the Chan's leasehold upon completion of the electrical connection.

Based on the results of the pilot test in 2013, a radius of influence (ROI) of approximately 30 feet at an airflow rate ranging between 4 and 9 cfm was estimated for the system. The location of the extraction points were selected based upon sub slab concentrations, subsurface and surface obstructions, and the calculated ROI.

The SSD system piping includes a vent pipe installed within a void space extending approximately 1-foot below the building concrete floor at each extraction point. The pipe was sealed to the existing floor to prevent "short circuiting" and provide the best possible subsurface vacuum from each point. The suction point riser (steel) extends vertically to the roof. On the roof, connecting piping (PVC) travels horizontally as shown on Figure 8B to one of four roof-mounted fans. The PVC vent piping running along the roof is 3-inches in diameter with the exception of the piping associated with system 2 which is 2-inches in diameter. Air flow and vacuum within each system is controlled with a valve installed on each SSD system line and through the variable speed control for each electrical fan.

Sub-slab vapors will be removed using four roof-mounted OBAR GBR76 compact radial blowers (GBR76). Each GBR76 blower is connected to four suction points. The GBR76 is a variable speed fan that is capable of providing sufficient air flow and vacuum for one to three suction points with additional capacity should additional suctions points be required in the future. A control panel with a pressure gauge and visible alarm (red light)

was installed to control and monitor the SSD system operation and notify on-site personnel if the SSD system is not functioning under normal operational parameters. Electrical service is already present at the facility. However, to separate the electrical costs associated with the operation of the SSD system from the DeCicco leasehold operation, the SSD system was connected to a separate electrical meter and breaker panel. The system became fully operational once the final electrical connection was made by the electric company.

To evaluate the initial effectiveness of the SSD system operation, VERTEX performed the following:

- Balanced the system by closing/opening valves, and/or raising or lowering fan power to extract air at the optimum flow and pressure rates indicated in the pilot test described above; and
- Conducted negative pressure tests using a differential pressure gauge to evaluate the induced vacuum below the building slab during normal operation of the SSD system.
- Conducted smoke tests to evaluate cracks or leaks in the building floor/foundation that may need to be sealed to increase SSD system efficiency; and
- Completed sub-slab and indoor air screening/testing to evaluate concentrations of CVOCs in indoor air, as detailed in the approved RAP.

Three sub-slab soil vapor samples were collected from beneath the slab of Chan's Restaurant and the former Key Foods (currently DeCicco) leasehold in September 2015. This is the first event since the installation and startup of the SSD system. The results were compared to the NYSDOH Sub-Slab Criteria. PCE was detected in sub-slab soil gas at concentrations ranging from 113 ug/$m^3$ to 3,700 ug/$m^3$. These concentrations exceeded the NYSDOH Sub-Slab Criteria of 30 ug/$m^3$. TCE concentrations ranged from 1.27 ug/m3 to 303 ug/$m^3$. The concentration of TCE detected in one sample exceeded the NYSDOH Sub-Slab of 5 ug/$m^3$.

Indoor air samples were also collected from Chan's and Key Foods in September 2015. TCE was detected in one of the three samples at a concentration of 260 ug/$m^3$ which exceeds the most stringent NYSDOH Indoor Air Criteria of 3 ug/$m^3$.

It is surmised that the high indoor air concentration in the rear of Chan's Restaurant was due to the interior negative pressure induced by the exhaust blowers used during operation of the kitchen. The installed sub slab system appears to not be imparting a vacuum great enough to overcome the vacuum imparted by the kitchen fans. A second sample of indoor air was collected on November 20, 2015 to confirm the indoor air exceedance detected in September 2015. All indoor air samples collected during this event were below the NYDOH Air Guideline Values.

Procedures for operating and maintaining the Sub-Slab Depressurization system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As built drawings, signed and sealed by a professional engineer, are included in Appendix 5 – Operations and Maintenance Manual. Figures 8A and 8B show the location of the ECs for the site.

### 3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10.

#### 3.3.3.1 - Cover (or Cap)

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

#### 3.3.3.2 - Sub-Slab Depressurization (SSD) System

The active SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH.

#### 3.3.3.3 - Monitoring Wells Associated with Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC with consultation with NYSDOH, until residual groundwater concentrations are found to be consistently below ambient water quality standards, the site SCGs, or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicates that monitoring for natural attenuation may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

# 4.0 MONITORING AND SAMPLING PLAN

## 4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix 6.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, and soil vapor);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and

- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

## 4.2 Site–Wide Inspection

Site-wide inspections will be performed at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix 7 – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and

- If site records are complete and up to date; and

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

## 4.3 Treatment System Monitoring and Sampling

### 4.3.1 Remedial System Monitoring – SSD System

Monitoring of the SSD system will be performed on a routine basis, as identified in Table 5 Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSD system components to be monitored include, but are not limited to, the components included in Table 5 below.

**Table 5 – Remedial System Monitoring Requirements and Schedule**

| Remedial System Component | Monitoring Parameter | Operating Range | Monitoring Schedule |
|---|---|---|---|
| Blowers | Flow Rate | 5 – 100 CFM | Annually |
| Blowers | Vacuum | 5 – 10 in WC | Semi-Annually |
| System Risers | Vacuum | 5 – 10 in WC | Annually |
| System Leaks | Audible, visual | NA | Annually |
| Operation | Alarm | On/Off | Annually |
| Sub-Slab | Vacuum | 0.003 – 1 in WC | Annually |

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix 7 - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

#### 4.3.2 Remedial System Sampling

Semi-annual indoor air and sub slab vapor sampling is proposed through the end of 2015. One additional round of sampling was performed on November 20, 2015, during the 2015-2016 heating season, to confirm the SSD system is operating as designed and is mitigating the potential for exposure via soil vapor intrusion. All indoor air samples were below NYDOH Air Guideline Values.

### 4.4 Post-Remediation Media Monitoring and Sampling

Samples shall be collected from the groundwater and indoor air on a routine basis as outlined above in the Executive Summary and in Section 2.4. Upon achieving the remediation criteria, quarterly groundwater samples will be collected until two consecutive rounds of samples are collected and analyzed that meet the criteria. One round of indoor

air samples will be collected after the SSD system operation is suspended based on attainment of ground water quality criteria. Sampling locations, required analytical parameters, and schedule are provided in Table 6 – Post Remediation Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

## Table 6 – Remediation and Post-Remediation Sampling Requirements and Schedule

| Sampling Location | Analytical Parameters | | | Schedule | Minimum Reporting Requirements |
|---|---|---|---|---|---|
| | VOCs (EPA Method 8260) | Field [1] / Biological [2] Parameters [1] | VOCs (Method TO-15) | | |
| **Monitoring Wells** MW-1R, 2R, 3, 4R, 6, 7, 8 | X | X | | Quarterly through end of 2015 then semiannually through end of 2018[3] | NY Ambient Water Quality Standards & Guidance Values, Class GA as per Division of Water Technical & Operational Guidance Series (1.1.1) |
| **Monitoring Wells** MW-1R, 2R, 3, 4R, 6, 7, 8 | X | | | 2 Quarters after groundwater criteria are achieved | |
| **Indoor Air & Sub Slab** Food Store, Former Dry Cleaner @ former sampling locations | | | X | Semi-annually through end of 2015 then once during 2015-2016 heating season to confirm indoor air mitigation is complete | NYSOB Indoor Air Guidance Values |
| **Indoor Air** Food Store, Former Dry Cleaner @ former sampling locations | | | X | Once 30 – 45 days after SSD system is shut down (Section 3.3.3.2) | |

[1] Field Parameters = DO, pH, ORP

[2] Biological Parameters = alkalinity, VFA, chloride, sulfate, dissolved iron, dissolved manganese, nitrate, dissolved organic carbon, dissolved gases

3. Data will be evaluated after the final semi-annual event to determine if sampling frequency can be reduced

Detailed sample collection and analytical procedures and protocols are provided in Appendix 6 – Quality Assurance Project Plan.

### 4.4.1 Soil Sampling

Soil sampling is not required to be performed and is not included in this plan.

### 4.4.2 Groundwater Sampling

Groundwater monitoring will be performed quarterly through end of 2015 then annually through end of 2018 to assess the performance of the in-situ remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, on-site and downgradient groundwater conditions at the site. Groundwater at the site generally flows to the north-northeast. The network of monitoring wells selected for post remediation monitoring has been designed based on location of the source area, groundwater flow, and previous sampling results.

Table 7 summarizes the wells identification number, as well as the purpose, location, depths, diameter and screened intervals of the wells. As part of the groundwater monitoring, four on-site plume wells and three on-site downgradient wells will be sampled to evaluate the effectiveness of the remedial system. The wells are depicted in Figure 9.

## Table 7 – Monitoring Well Construction Details

| Monitoring Well ID | Well Location | Coordinates (longitude/ latitude) [1] | Well Diameter (inches) | Elevation (above mean sea level) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Casing | Surface [1] | Screen Top | Screen Bottom |
| MW-1R | Plume | 41.433762/ -74.037919 | 2 | 49.69 | 49.45 | 39 | 29 |
| MW-2R* | Plume | 41.434073/ -74.037512 | 2 | 47.79 | 48.28 | 10 | 20 |
| MW-3 | Plume | 41.434165/ -74.037978 | 2 | 48.22 | 48.34 | 32 | 27 |
| MW-4R* | Plume | 41.434135/ -74.037631 | 2 | 48.41 | 48.76 | 10 | 20 |
| MW-6 | Down-Gradient | 41.434282/ -74.037409 | 2 | 47.20 | 47.45 | 41 | 31 |
| MW-7 | Down-Gradient | 41.434500/ -74.037506 | 2 | 47.29 | 47.66 | 37 | 27 |
| MW-8 | Side-Gradient | 41.434446/ -74.037869 | 2 | 48.24 | 48.26 | 38 | 28 |

* = Wells reinstalled to replace former wells in this area of the site
All wells were surveyed by a licensed surveyor on July 30, 2015. This table, including coordinates and elevations, will be updated accordingly.

Monitoring well construction logs are included in Appendix 3 of this document.

Samples will be collected in general accordance with *USEPA Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells*. Groundwater samples will be collected in laboratory-supplied pre-cleaned containers, preserved on ice, and submitted in coolers under strict chain of custody

procedures for laboratory analysis by a New York certified laboratory. Table 6 summarizes the analyses and minimum reporting requirements for groundwater samples.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC. The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

### 4.4.3 Soil Vapor Sampling – Sub-Slab

Sub-slab soil vapor intrusion sampling will be performed semi-annually through end of 2015 then annually through end of 2018 to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

The network of on-site soil vapor intrusion sample locations has been designed based on the prior sub-slab sampling locations. Six permanent sub-slab monitoring points have been installed in the DeCicco's leasehold area. Two additional permanent monitoring points were installed in the former Dry Cleaner leasehold. The permanent sampling probes are installed through the concrete slab to facilitate the collection of soil gas from beneath the concrete slab into stainless steel Summa canisters. Teflon tubing will be connected to the Summa canister using compression fittings.

The entire sample train will be purged of approximately three air volumes prior to sample collection at a rate that will not exceed 200 milliliters per minute. Following purging, the sample valve of the Summa canister will be opened to initiate sample collection. The sub-slab samples will be collected over an approximate 5-minute timeframe. Following sample collection, the monitoring points will be capped. Samples will be collected in laboratory-supplied pre-cleaned containers and submitted to a New York certified laboratory under strict chain of custody procedures for analysis. Table 6 summarizes the analytical parameters and minimum reporting requirements for sub-slab soil vapor samples.

Deliverables for the sub-slab soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

#### 4.4.4 Soil Vapor Intrusion Sampling – Indoor Air

Soil vapor intrusion sampling of the indoor air will be performed on semi-annually through end of 2015 then annually through end of 2018 basis to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

The network of on-site indoor air soil vapor intrusion sample locations has been designed based on previous sampling locations.

Indoor air samples will be collected over an approximate 8-hour duration using a 6-liter Summa canister. An exterior ambient sample will also be collected to evaluate

exterior background air quality in relation to the indoor air sample. Indoor and ambient weather conditions including temperature and atmospheric pressure will be collected and recorded on field sampling data sheets during the sampling program. The vapor intrusion samples will be collected into laboratory-supplied, pre-cleaned Summa canisters and be submitted to a New York certified laboratory under strict chain of custody protocol. Table 6 summarizes the analyses and minimum reporting requirements for soil vapor intrusion indoor air samples.

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

#### 4.4.5 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix 7 - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

# 5.0 OPERATION AND MAINTENANCE PLAN

## 5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. The site groundwater remedy does not rely on any mechanical systems. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSD systems;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSD systems are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSD system is provided in Appendix 5 - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

## 5.2 Remedial System Performance Criteria

Table 8 below contains the minimum operating requirements for the major components of the SDS system. The system did not require permits with the exception of standard building and electrical permits from the Town of Cornwall.

**Table 8 – Minimum Operating Requirements of SSD System**

| Remedial System Component | Monitoring Parameter | Operating Range |
|---|---|---|
| Blowers | Flow Rate | 20 – 100 CFM |
| System Risers | Vacuum | 5 – 10 in WC |
| System Leaks | Audible, visual | NA |
| Operation | Alarm | On/Off |
| Sub-Slab | Vacuum | 0.003 – 5 in WC |

## 5.3 Operation and Maintenance of SSD System

The following sections provide a description of the operations and maintenance of the SSD system. Cut-sheets and as-built drawings for the SSD system are provided in Appendix 5 - Operations and Maintenance Manual. A figure of the SSD System is provided as Figure 8B.

### 5.3.1 System Start-Up and Testing

After the system was installed, temporary power was connected to the system blowers and was checked for effectiveness by:

- Balancing the system by closing/opening valves and/or raising or lowering fan power to extract air at the optimum flow and pressure rates indicated in the pilot test described above;
- Conducting negative pressure tests using a differential pressure gauge to evaluate the induced vacuum below the building slab during normal operation the SSD system.

Upon connection of permanent power, system effectiveness will be checked again and the following additional testing will be performed:

- Conduct smoke tests to evaluate cracks or leaks in the building floor/foundation that may need to be sealed to increase SSD system efficiency;

- Completed indoor air screening/testing to evaluate concentrations of suspected CVOCs in indoor air, as detailed in the approved RAP dated April 3, 2013.

Once operational and functioning within the designed parameters, operation maintenance and monitoring of the SSDS system will be conducted annually and will include semi-annual visual inspections of the SSDS piping, and valves, recording pressure gauge values at the system control panel, and confirming that the SSD system is operating as designed. Upon loss of vacuum, the system visual alarm beacon will light.

The system testing described above will be conducted if, in the course of the SSD system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

### 5.3.2 Routine System Operation and Maintenance

The SSD systems do not require any routine maintenance or adjustments. The mechanical components require no lubrication or adjusting.

Once operational, and functioning within the designed parameters, monitoring of the SSDS system will be conducted by on-site personnel and will include periodic visual inspections of the SSDS alarm. Operational maintenance will be performed by others and include a check of the piping, valves, pressure gauge values at the system control panel, and confirming that the SSD system is operating as designed.

A copy of the SSD system Operations and Maintenance (O&M) Manual is provided in Appendix 5.

Table 5 provides a summary and schedule of routine maintenance.

### 5.3.3 Non-Routine Operation and Maintenance

Non-routine maintenance would typically entail the repair and/or replacement of system components. These components are as follows:

- Vacuum Gauge
- Blower
- Damaged piping, valves or sample ports
- Alarm

Cut sheets and/or manufacturer information and model number are provided in the O&M Manual. Non-routine repairs should be performed by qualified installation personnel.

### 5.3.4 System Monitoring Devices and Alarms

A control panel with a vacuum gauge and visible alarm (red light) was installed to monitor the SSD system operation and notify on-site personnel if the SSD system is not functioning under normal operational parameters. An alarm signal will iluminate within the grocery store warehouse area if the system experiences a loss of vacuum. In the event of a power failure, the SSD systems and alarms will not function. The system and alarms will restart upon the restoration of power.

The SSD system has warning devices to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSD system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

# 6.0 PERIODIC ASSESSMENTS/EVALUATIONS

## 6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

This assessment has identified the following potential vulnerabilities that will be assessed during periodic reviews:

- Flood Plain: No areas of the site are located in a flood plain, low-lying or low-groundwater recharge area.
- Site Drainage and Storm Water Management: In the event storm water management systems are plugged, the cover area of the site would likely experience flooding. In the event the SSD systems suction points flood, the system would return to normal operation upon the water receding.
- Erosion: No remedial systems are susceptible to erosion during periods of severe rain events.
- High Wind: The SSD blowers and associated pipe runs are situated on the roof of the site building. These blowers and piping are secured but can be susceptible to damage from very high winds that can be produced during such weather events as hurricanes or tornados.
- Electricity: The SSD system blowers and alarms are susceptible to power surges/spikes and can be damaged due to these events. In the event the system is compromised the equipment would require repair or replacement.

- Spill/Contaminant Release: No remedial systems are susceptible to a spill or other contaminant release due to storm-related damage caused by flooding, erosion, high winds, loss of power etc.

## 6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

The following Green Remediation assessment has been made and includes a discussion of items listed below, in relation to the implementation and operation and maintenance of the selected remedy. The injection of EVO, as the selected remedy for the site soil and groundwater, is considered a green remediation technology.

- Waste Generation - The site remedy included the in-situ injection of emulsified vegetable oil to biologically remediate, in-place, contaminated groundwater. This green remediation solution limits the generation of secondary waste (e.g. air, carbon) typically associated with other physical treatment methods (e.g. pump & treat, air sparging).

- Energy Usage - This green remediation solution eliminates operation of electrical systems that are typically associated with the installation and operation of above-grade groundwater treatment mechanical systems typically associated with other physical treatment methods (e.g. pump & treat, air sparging). The SSDS system blowers utilize lower wattage direct current fans versus typical higher horse power alternating current centrifugal or regenerative blowers.

- Emissions - This green remediation solution limits the generation of emissions typically associated with other physical treatment methods (e.g. pump & treat, air sparging). The elimination of mechanical systems minimizes the need for frequent routine operation and maintenance inspections.

- Water Usage - The remedy chosen required water to mix with the EVO during the injections. This water was trucked into the site. The chosen remedy does not require water for long-term remediation.

- Land and/or Ecosystems - The in-situ remedy did not add any additional buildings to the site. Disturbed land was limited to paved areas of the site. Injection of EVO into the groundwater is considered temporary and will degrade naturally.

### 6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

### 6.2.2. Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

Remedial system types and associated parameters to be evaluated include, but are not limited to:

- SSD venting systems

### 6.2.3 Building Operations

No temporary or permanent structures are required, other than existing site buildings, for the site remedy.

### 6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

Consideration has been given to:

- Reduced sampling frequencies;
- Reduced site visits and system checks;
- Installation of remote sensing/operations and telemetry;
- Coordination/consolidation of activities to maximize foreman/labor time; and
- Use of mass transit for site visits, where available.

### 6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix 7 – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits; a set of metrics has been developed.

## 6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

# 7.0. REPORTING REQUIREMENTS

## 7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix 7. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 9 and summarized in the Periodic Review Report.

**Table 9: Schedule of Interim Monitoring/Inspection Reports**

| Task/Report | Reporting Frequency* |
|---|---|
| Inspection Report | Semi-annual |
| Periodic Review Report | Annually, or as otherwise determined by the Department |

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);

- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

## 7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix 1 -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:

  – The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;

  – The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

  – Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  – Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and

  – Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.

  – The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:

  – The number of days the system operated for the reporting period;

- The average, high, and low flows per day;
- The contaminant mass removed;
- A description of breakdowns and/or repairs along with an explanation for any significant downtime;
- A description of the resolution of performance problems;
- Alarm conditions;
- Trends in equipment failure;
- A summary of the performance, effluent and/or effectiveness monitoring; and
- Comments, conclusions, and recommendations based on data evaluation.

### 7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

*"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

*I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Owner's/Remedial Party's Designated Site Representative for the site."*

For BCP projects, every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The Periodic Review Report may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

## 7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

## 7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3, upon completion of an RSO, an RSO report must be submitted to the Department for approval. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report, outlined in Appendix 8, will be submitted in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

# 8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

LFR, Inc., November 2005 Phase II ESA report

Leggette, Brashears & Graham, December 2009 *Remedial Investigation Report* (RIR)

Arcadis U.S., Inc., January 2011Revised RIR

Arcadis U.S., Inc., Approved Remedial Work Plan (Arcadis, October 3, 2012)

Arcadis U.S., Inc., Alternatives Analysis Report, July 8, 2011

LFR, Inc., Phase I

# REMEDIAL SYSTEM OPTIMIZATION FOR CORNWALL PLAZA

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# TABLES

**Table 2**
**GROUNDWATER ELEVATION SUMMARY**
Cornwall Plaza
Quaker Avenue, Cornwall, New York

| Well ID | Screen Interval (feet) | Date | Depth to Water (feet bgs) | Depth to Bottom (feet bgs) | TOC Elevation (feet msl) | Ground Water Elevation (feet msl) |
|---|---|---|---|---|---|---|
| **MW-1B** | 18.0-35.0 | 2/20/2014 | 5.80 | 34.80 | 49.79 | 43.99 |
| | | 6/30/2014 | 5.85 | 34.54 | | 43.94 |
| | | 11/24/2014 | 6.50 | 34.59 | | 43.29 |
| | | 2/1/2015 | --- | --- | | --- |
| | | 4/24/2015 | 4.30 | 34.59 | | 45.49 |
| **MW-1R** | 10.0-20.0 | 2/20/2014 | 4.60 | 19.10 | 49.69 | 45.09 |
| | | 6/30/2014 | 5.50 | 19.11 | | 44.19 |
| | | 11/24/2014 | 5.40 | 19.14 | | 44.29 |
| | | 2/1/2015 | --- | --- | | --- |
| | | 4/24/2015 | 3.70 | 19.14 | | 45.99 |
| **MW-2** | 15.0-20.0 | 2/20/2014 | Damaged/Abandoned | | | |
| | | 6/30/2014 | | | | |
| | | 11/24/2014 | | | | |
| | | 2/1/2015 | | | | |
| | | 4/24/2015 | | | | |
| **MW-2R** | 10.0-20.0 | 2/20/2014 | NI | NI | To be surveyed | NI |
| | | 6/30/2014 | NI | NI | | NI |
| | | 11/24/2014 | NI | NI | | NI |
| | | 2/1/2015 | NI | NI | | NI |
| | | 4/24/2015 | 10.90 | 20.00 | | #VALUE! |
| **MW-2B** | 27.0-42.0 | 2/20/2014 | Damaged/Abandoned | | | |
| | | 6/30/2014 | | | | |
| | | 11/24/2014 | | | | |
| | | 2/1/2015 | | | | |
| | | 4/24/2015 | | | | |
| **MW-3** | 16.0-21.0 | 2/20/2014 | 10.40 | 20.10 | 48.22 | 37.82 |
| | | 6/30/2014 | 12.17 | 20.12 | | 36.05 |
| | | 11/24/2014 | 11.85 | 20.05 | | 36.37 |
| | | 2/1/2015 | 11.41 | 20.05 | | 8.64 |
| | | 4/24/2015 | 10.20 | 20.05 | | 38.02 |
| **MW-3B** | 27.0-37.0 | 2/20/2014 | 11.20 | 36.00 | 48.27 | 37.07 |
| | | 6/30/2014 | 11.19 | 36.00 | | 37.08 |
| | | 11/24/2014 | 11.71 | 36.20 | | 36.56 |
| | | 2/1/2015 | 11.46 | 36.30 | | 36.81 |
| | | 4/24/2015 | 10.57 | 36.20 | | 37.70 |
| **MW-4** | 10.0-20.0 | 2/20/2014 | 11.40 | 28.00 | 48.48 | 37.08 |
| | | 6/30/2014 | Damaged/Abandoned | | | |
| | | 11/24/2014 | | | | |
| | | 2/1/2015 | | | | |
| | | 4/24/2015 | | | | |
| **MW-4R** | 10.0-12.0 | 2/20/2014 | NI | NI | To be surveyed | NI |
| | | 6/30/2014 | NI | NI | | NI |
| | | 11/24/2014 | NI | NI | | NI |
| | | 2/1/2015 | NI | NI | | NI |
| | | 4/24/2015 | 10.36 | 20.00 | | #VALUE! |
| **MW-5** | 10.0-20.0 | 2/20/2014 | 0.00 | 19.31 | 49.92 | 49.92 |
| | | 6/30/2014 | 5.58 | 19.31 | | 44.34 |
| | | 11/24/2014 | 0.00 | 19.31 | | 49.92 |
| | | 2/1/2015 | 10.17 | 19.40 | | 39.75 |
| | | 4/24/2015 | 5.70 | 19.31 | | 44.22 |
| **MW-6** | 6.0-16.0 | 2/20/2014 | --- | --- | 47.20 | --- |
| | | 6/30/2014 | 10.16 | 15.56 | | 37.04 |
| | | 11/24/2014 | 11.60 | 15.60 | | 35.60 |
| | | 2/1/2015 | 11.58 | 15.62 | | 35.62 |
| | | 4/24/2015 | 10.51 | 15.60 | | 36.69 |
| **MW-6B** | 25.0-45.0 | 2/20/2014 | --- | --- | 46.80 | --- |
| | | 6/30/2014 | 10.53 | 29.92 | | 36.27 |
| | | 11/24/2014 | --- | --- | | --- |
| | | 2/1/2015 | 10.87 | 30.05 | | 35.93 |
| | | 4/24/2015 | --- | --- | | --- |
| **MW-7** | 10.0-20.0 | 2/20/2014 | 11.20 | 19.60 | 47.29 | 36.09 |
| | | 6/30/2014 | 11.17 | 19.71 | | 36.12 |
| | | 11/24/2014 | 11.92 | 19.71 | | 35.37 |
| | | 2/1/2015 | 11.42 | 19.79 | | 35.87 |
| | | 4/24/2015 | 10.58 | 19.71 | | 36.71 |
| **MW-8** | 10.0-20.0 | 2/20/2014 | --- | --- | 48.24 | --- |
| | | 6/30/2014 | 11.41 | 18.84 | | 36.83 |
| | | 11/24/2014 | 12.29 | 18.95 | | 35.95 |
| | | 2/1/2015 | 11.65 | 18.85 | | 36.59 |
| | | 4/24/2015 | 10.89 | 18.95 | | 37.35 |
| **MW-9** | 9.0-19.0 | 2/20/2014 | --- | --- | 47.98 | --- |
| | | 6/30/2014 | 10.76 | 16.71 | | 37.22 |
| | | 11/24/2014 | 11.61 | 16.75 | | 36.37 |
| | | 2/1/2015 | --- | --- | | --- |
| | | 4/24/2015 | 10.18 | 16.75 | | 37.80 |
| **MW-10** | 10.0-20.0 | 2/20/2014 | --- | --- | 45.75 | --- |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |
| **MW-11** | 5.5-15.5 | 2/20/2014 | 7.50 | 11.20 | 44.23 | 36.73 |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |
| **MW-11B** | 22.0-37.0 | 2/20/2014 | 6.00 | 39.80 | 44.25 | 38.25 |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |
| **MW-12** | 5.0-15.0 | 2/20/2014 | 9.20 | 14.60 | 44.62 | 35.42 |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |
| **MW-12B** | 20.0-40.0 | 2/20/2014 | 5.50 | 34.25 | 44.40 | 38.90 |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |
| **MW-13** | 5.0-20.0 | 2/20/2014 | 10.70 | 19.50 | 47.68 | 36.98 |
| | | 6/30/2014 | NG | NG | | NG |
| | | 11/24/2014 | NG | NG | | NG |
| | | 2/1/2015 | NG | NG | | NG |
| | | 4/24/2015 | NG | NG | | NG |

NOTES:

| | |
|---|---|
| feet bgs | Feet below ground surface |
| feet msl | Feet above mean sea level |
| --- | Inaccessible, abandoned, destroyed, or fouled well |
| NG | Well not gauged |
| NI | Well not installed |

**Table 3**
**Ground Water Analytical Results**
Cornwall Plaza
Quaker Avenue, Cornwall, New York

| Well ID | GROUNDWATER STANDARDS | | Units | MW-1R | | | | | MW-1B | | MW-2 | MW-2R | MW-2B | MW-3 | | | | | MW-3B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | | 3/22/2011 | 2/20/2014 | 6/30/2014 | 11/24/2014 | 4/24/2015 | 3/22/2011 | 6/30/2014 | 3/22/2011 | 4/24/2015 | 3/22/2011 | 3/22/2011 | 2/20/2014 | 7/1/2014 | 11/24/2014 | 2/19/2015 | 3/22/2011 | 2/20/2014 | 7/1/2014 | 2/19/2015 |
| Lab Sample ID | | | | Arcadis | L1403838-05 | L1414661-01 | L1428576-01 | L1508572-01 | Arcadis | L1414661-02 | Arcadis | L1508572-02 | Arcadis | Arcadis | L1403838-02 | L1414661-06 | L1428576-02 | L1503206-03 | Arcadis | L1403838-03 | L141661-07 | L1503206-08 |
| Screened Interval | AWQS | NY-TOGS-GA | | 10-20 feet bgs | | | | | 18-35 feet bgs | | 15-20 feet bgs | | 27-42 feet bgs | 16-21 feet bgs | | | | | 27-37 feet bgs | | | |
| Location | | | | rear of building | | | | | rear of building | | corner of grocery store | | | front of building | | | | | front of building | | | |
| Sampling Frequency | | | | quarterly | | | | | reduced | | quarterly | | | quarterly | | | | | reduced | | | |
| Well Status | | | | Active | | | | | Active | | Fouled | Active | Fouled | Active | | | | | Active | | | |
| **Volatile Organics by GC/MS** | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 5 | 5 | ug/l | ND (0.5) | ND (1.8) | ND (0.18) | ND (0.18) | ND (0.18) | ND (0.5) | ND (0.18) | **1,000** | **13** | ND (0.5) | **1,600** | **460** | **21** | **28** | **72** | ND (0.5) | ND (1.8) | ND (0.18) | ND(0.5) |
| Benzene | 1 | 1 | ug/l | ND (0.5) | **2.4 J** | ND (0.16) | ND (0.16) | ND (0.16 | ND (0.5) | ND (0.16) | ND (10) | ND (0.16) | ND (0.5) | ND (25) | ND (1.6) | ND (0.16) | ND (0.16) | ND(0.5) | ND (0.5) | ND (1.6) | ND (0.16) | ND(0.5) |
| Vinyl chloride | 2 | 2 | ug/l | **17** | **14** | ND (0.33) | ND (0.33) | ND (0.07) | ND (0.5) | ND (0.33) | ND (20) | ND(5.6) | ND (1.0) | ND (50) | ND (3.3) | ND (0.33) | ND (0.33) | ND(1) | ND (1.0) | ND (3.3) | ND (0.33) | ND(1) |
| Trichloroethene | 5 | 5 | ug/l | 0.52 | ND (1.7) | ND (0.17) | ND (0.17) | ND (0.18) | 0.52 | ND (0.17) | **19** | **18** | ND (5.0) | **30** | **39** | 2.8 | 5 | **8.1** | ND (0.5) | ND (1.7) | ND (0.17) | ND(0.5) |
| cis-1,2-Dichloroethene | 5 | 5 | ug/l | **64** | **21 J** | ND (0.7) | ND (0.7) | ND (0.7) | ND (0.5) | ND (0.7) | **43** | **28** | ND (0.5) | ND (25) | **14 J** | 3.2 | 3.4 | **7.6** | ND (0.5) | ND (7) | ND (0.7) | ND(2.5) |
| Acetone | 50 | 50 | ug/l | ND (5.0) | ND (10) | 2.4 J | ND (1.5) | 1.5 J | ND (5.0) | ND (1) | ND (100) | 4 J | ND (5.0) | ND (250) | 27 J | 3.7 J | ND (1.5) | 3.8 J | ND (5.0) | ND (10) | ND (1) | ND(5) |
| Total VOCs | NS | NS | ug/l | 81.5 | 37.4 | 3.6 | 0.0 | | 0.0 | 0.0 | 1062.0 | | 0.0 | 1630.0 | 513.0 | 30.7 | 37.5 | 92.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| VOC TICs | NS | NS | ug/l | 16.0 | 0.0 | 29.0 | 66.7 | | 0.0 | 16.0 | 0.0 | | 4.3 | 0.0 | 0.0 | 0.0 | 5.0 | 45.0 | 0.0 | 0.0 | 6.7 | 4.8 |
| **Dissolved Gases by GC** | | | | | | | | | | | | | | | | | | | | | | |
| Methane | NS | NS | ug/l | - | 11600 | 11400 | 1120 | 2670 | - | - | - | 14400 | - | - | 17.40 | 5.73 | 1.34 | 20.8 | - | - | - | - |
| Ethene | NS | NS | ug/l | - | 13.3 | ND (0.5) | ND (0.5) | ND (0.5) | - | - | - | 4.49 | - | - | ND (0.5) | ND (0.5) | ND (0.5) | ND(0.5) | - | - | - | - |
| Ethane | NS | NS | ug/l | - | 14.6 | 6.78 | 1 | 8.13 | - | - | - | 13.8 | - | - | ND (0.5) | ND (0.5) | ND (0.5) | 0.995 | - | - | - | - |
| **Dissolved Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Iron, Dissolved | 300 | NS | ug/l | - | 21300 | 68400 | 31900 | 16300 | - | - | - | 5530 | - | - | 588 | 30.5 J | 107 | 54 | - | - | - | - |
| Manganese, Dissolved | NS | NS | ug/l | - | - | - | - | 7332 | - | - | - | 21490 | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total | NS | NS | mg/L CaCO3 | - | 263 | 379 | 384 | 384 | - | - | - | 690 | - | - | 314 | 364 | 363 | 321 | - | - | - | - |
| Chloride | NS | NS | ug/l | - | - | - | - | 1,100,000 | - | - | - | 460,000 | - | - | - | - | - | - | - | - | - | - |
| Nitrate, nitrogen | NS | NS | ug/l | - | - | - | - | ND (188) | - | - | - | ND (94) | - | - | - | - | - | - | - | - | - | - |
| Sulfate | 250000 | NS | ug/l | - | 34000 | ND (3100) | ND (3100) | 19000 | - | - | - | ND (3100) | - | - | 47000 | 49000 | 50000 | 58000 | - | - | - | - |
| Dissolved Organic Carbon | NS | NS | ug/l | - | 44000 | 160000 | 29000 | 23,000 (TOC) | - | - | - | 27,000 (TOC) | - | - | 11000 | 8600 | 14000 | 5800 | - | - | - | - |
| Volatile Fatty Acids | NS | NS | mg/l | - | - | - | - | 16 | - | - | - | 33 | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| pH | NS | NS | (s.u.) | - | - | 6.61 | 7.54 | 6.28 | - | 7.43 | - | 6.75 | - | - | - | 7.69 | 7.97 | 8.18 | - | - | 7.69 | 7.87 |
| Conductivity | NS | NS | mS/cm | - | - | 5.2 | 5.7 | 4.24 | - | 0.87 | - | 2.77 | - | - | - | 2.5 | 2.51 | 8.2 | - | - | 1.06 | 9.21 |
| ORP | NS | NS | mV | - | - | 17 | -151 | -100 | - | -23 | - | -46 | - | - | - | -51 | 116 | -69 | - | - | -39 | -58 |
| Dissolved Oxygen | NS | NS | mg/L | - | - | 0.68 | 9.92 | 10.28 | - | 2.1 | - | 0.65 | - | - | - | 2.65 | 11.5 | 13.6 | - | - | 0.1 | 3.12 |

**Notes:**
J - The compound was detected; however, the concentration is below the laboratory method detection limit. Accordingly, this concentration is estimated.
NS - No NYSDEC Standard or Screening Level established for this compound
Detected concentration exceeds either the NY AWQS or the NY-TOGS-GA

**Table 3**
**Ground Water Analytical Results**
Cornwall Plaza
Quaker Avenue, Cornwall, New York

| Well ID | GROUNDWATER STANDARDS | | | MW-4 | MW-4R | MW-5 | | | MW-6 | | | | MW-6B | | | MW-7 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | | 3/22/2011 | 4/24/2015 | 3/22/2011 | 6/30/2014 | 2/18/2015 | 3/22/2011 | 6/30/2014 | 11/24/2014 | 2/18/2015 | 3/22/2011 | 6/30/2014 | 2/18/2015 | 3/22/2011 | 2/20/2014 | 7/1/2014 | 11/24/2014 | 2/18/2015 |
| Lab Sample ID | | | | Arcadis | L1508572-03 | Arcadis | L1414661-04 | L1503206-02 | Arcadis | L1414661-05 | L1428576-03 | L1503206-01 | Arcadis | L1414661-05 | L1503206-06 | Arcadis | L1403838-04 | L1414661-08 | L1428576-04 | L1503206-07 |
| Screened Interval | AWQS | NY-TOGS-GA | Units | 10-20 feet bgs | | 10-20 feet bgs | | | 6-16 feet bgs | | | | 25-45 feet bgs | | | 10-20 feet bgs | | | | |
| Location | | | | front of grocery store | | upgradient | | | downgradient property line | | | | downgradient property line | | | downgradient property corner | | | | |
| Sampling Frequency | | | | quarterly | | reduced | | | quarterly | | | | reduced | | | quarterly | | | | |
| Well Status | | | | Fouled | Active | Active | | | Active | | | | Active | | | Active | | | | |
| **Volatile Organics by GC/MS** | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 5 | 5 | ug/l | **320** | **300** | ND (5.0) | ND (0.18) | ND(0.5) | **16** | 1.6 | 2.5 | 0.2 J | ND (0.5) | ND (0.18) | ND(0.5) | **18** | **19** | **15** | **23** | **22** |
| Benzene | 1 | 1 | ug/l | ND (5.0) | ND (0.4) | ND(0.5) | ND (0.16) | ND(0.5) | ND (5.0) | ND (0.16) | ND (0.4) | ND(0.5) | ND (0.5) | ND (0.16) | ND(0.5) | ND (0.5) | ND (0.16) | ND (0.16) | ND (0.16) | ND(0.5) |
| Vinyl chloride | 2 | 2 | ug/l | **11** | **8.7** | ND (1.0) | ND (0.33) | ND(1) | **87** | 1.7 | **43** | **3** | ND (1.0) | ND (0.33) | ND(1) | ND (1.0) | ND (0.33) | ND (0.33) | ND (0.33) | ND(1) |
| Trichloroethene | 5 | 5 | ug/l | **120** | **50** | ND (0.5) | ND (0.17) | ND(0.5) | **37** | 1.8 | 4.6 | ND(0.5) | ND (0.5) | ND (0.17) | ND(0.5) | 1 | 1.1 | 1.1 | 0.72 | 0.79 |
| cis-1,2-Dichloroethene | 5 | 5 | ug/l | **95** | **110** | ND (0.5) | ND (0.7) | ND(2.5) | **570** | **24** | **250** | **6.2** | ND (0.5) | ND (0.7) | ND(2.5) | 2.7 | 2 J | 2.8 | 2.3 J | 2.6 |
| Acetone | 50 | 50 | ug/l | **190** | **ND (3.6)** | 5.4 | 2 J | ND(5) | **220** | 23 | ND (1.5) | **73** | **9** | ND (1) | 14 | ND (5.0) | ND (1) | 3.5 J | ND (1.5) | ND(5) |
| Total VOCs | NS | NS | ug/l | 546.0 | | 9.0 | 2.0 | 0.0 | 710.0 | 69.1 | 300.1 | 102.5 | 9.2 | 0.0 | 16.3 | 25.3 | 23.3 | 23.3 | 26.0 | 25.4 |
| VOC TICs | NS | NS | ug/l | 0.0 | | 27.0 | 17.0 | 4.3 | 0.0 | 1.3 | 270.0 | 6.3 | 0.0 | 9.8 | 15.0 | 0.0 | 0.0 | | 3.0 | 0.0 |
| **Dissolved Gases by GC** | | | | | | | | | | | | | | | | | | | | |
| Methane | NS | NS | ug/l | - | 5030 | - | - | - | - | 6320 | 6150 | 7470 | - | - | - | - | 269 | 67 | 316 | 564 |
| Ethene | NS | NS | ug/l | - | 4.9 | - | - | - | - | ND (0.5) | 1.31 | ND (0.5) | - | - | - | - | ND (0.5) | ND (0.5) | ND (0.5) | ND(0.5) |
| Ethane | NS | NS | ug/l | - | 5.76 | - | - | - | - | 0.893 | 3.92 | 3.16 | - | - | - | - | ND (0.5) | ND (0.5) | ND (0.5) | ND(0.751) |
| **Dissolved Metals** | | | | | | | | | | | | | | | | | | | | |
| Iron, Dissolved | 300 | NS | ug/l | - | 1660 | - | - | - | - | 80000 | 50000 | 103000 | - | - | - | - | 625 | 133 | 38.8 J | 46 |
| Manganese, Dissolved | NS | NS | ug/l | - | 10530 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total | NS | NS | mg/L CaCO3 | - | 520 | - | - | - | - | 846 | 349 | 506 | - | - | - | - | 361 | 362 | 362 | 349 |
| Chloride | NS | NS | ug/l | - | 360,000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrate, nitrogen | NS | NS | ug/l | - | ND (94) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate | 250000 | NS | ug/l | - | 5600 J | - | - | - | - | ND (3100) | ND (3100) | ND(10000) | - | - | - | - | 32000 | 38000 | 36000 | 35000 |
| Dissolved Organic Carbon | NS | NS | ug/l | - | 6400 (TOC) | - | - | - | - | 130000 | 47000 | 100000 | - | - | - | - | 5700 | 6700 | 7800 | 1500 |
| Volatile Fatty Acids | NS | NS | mg/l | - | ND (5) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| pH | NS | NS | (s.u.) | - | 6.82 | - | 7.67 | 7.72 | - | 6.35 | 6.52 | 6.3 | - | 7.62 | 7.13 | - | - | 6.58 | 7.01 | 7.03 |
| Conductivity | NS | NS | mS/cm | - | 2.06 | - | 0.36 | 0.92 | - | 2.48 | 10.9 | 4.97 | - | 0.62 | 12.9 | - | - | 2.75 | 2.17 | 2.12 |
| ORP | NS | NS | mV | - | 2 | - | -39 | -53 | - | 36 | -124 | 26 | - | -35 | -5 | - | - | 23 | 63 | 0 |
| Dissolved Oxygen | NS | NS | mg/L | - | 8.76 | - | 0.64 | 0.58 | - | 12.7 | 1.75 | 3.16 | - | 0.9 | 2.94 | - | - | 0.6 | 3.15 | 3.14 |

**Notes:**
J - The compound was detected; however, the concentration is belo
NS - No NYSDEC Standard or Screening Level established for this
Detected concentration exceeds eitl

**Table 3**
**Ground Water Analytical Results**
Cornwall Plaza
Quaker Avenue, Cornwall, New York

| Well ID | GROUNDWATER STANDARDS | | Units | MW-8 | | | | MW-9 | | | MW-10 | MW-11 | | MW-11B | | MW-12 | | MW-12B | | MW-13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | | 3/22/2011 | 7/1/2014 | 11/24/2014 | 2/19/2015 | 3/22/2011 | 7/1/2014 | 2/19/2015 | 3/22/2011 | 3/22/2011 | 2/20/2014 | 3/22/2011 | 2/20/2014 | 3/22/2011 | 2/20/2014 | 3/22/2011 | 2/20/2014 | 3/22/2011 | 2/19/2014 |
| Lab Sample ID | | | | Arcadis | L1414661-09 | L1428576-05 | L1503206-09 | Arcadis | L1414661-10 | L1503206-10 | Arcadis | Arcadis | L1403838-08 | Arcadis | L1403838-09 | Arcadis | L1403838-06 | Arcadis | L1403838-07 | Arcadis | L1403838-01 |
| Screened Interval | | | | | | | | 9-19 feet bgs | | | 10-20 feet bgs | 5.5-15.5 feet bgs | | 22-37 feet bgs | | 5-15 feet bgs | | 20-40 feet bgs | | 5-20 feet bgs | |
| Location | AWQS | NY-TOGS-GA | | downgradient street | | | | sidegradient | | | | Fire Station | | Fire Station | | Fire Station | | Fire Station | | | |
| Sampling Frequency | | | | quarterly | | | | reduced | | | | none | | none | | none | | none | | none | |
| Well Status | | | | Active | | | | Active | | | Active | Active | | Active | | Active | | Active | | Active | |
| **Volatile Organics by GC/MS** | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 5 | 5 | ug/l | **49** | **9.3** | **15** | **20** | ND (0.5) | ND (0.18) | ND(0.5) | **49** | **27** | ND (0.18) | ND (0.5) | ND (0.18) | 1.2 | 0.27 J | 1.2 | ND (1.8) | ND (0.5) | ND (0.18) |
| Benzene | 1 | 1 | ug/l | ND (0.5) | ND (0.16) | ND (0.16) | ND(0.5) | ND (0.5) | ND (0.16) | ND(0.5) | ND (0.5) | ND (0.5) | ND (0.16) | ND (0.5) | ND (0.16) | ND (0.5) | ND (0.16) | ND (0.5) | ND (1.6) | ND (0.5) | ND (0.16) |
| Vinyl chloride | 2 | 2 | ug/l | ND (1.0) | 1.9 | 0.68 J | ND(1) | ND (1.0) | ND (0.33) | ND(1) | ND (1.0) | ND (1.0) | ND (0.33) | ND (1.0) | ND (0.33) | ND (1.0) | ND (0.33) | ND (1.0) | ND (3.3) | ND (1.0) | ND (0.33) |
| Trichloroethene | 5 | 5 | ug/l | 2.9 | 3.6 | 3.0 | 1.6 | 2.9 | ND (0.17) | ND(0.5) | **6.4** | **8.2** | ND (0.17) | ND (0.5) | ND (0.17) | ND (0.5) | 1.1 | ND (0.5) | ND (1.7) | ND (0.5) | ND (0.17) |
| cis-1,2-Dichloroethene | 5 | 5 | ug/l | **10** | 4.7 | 2.7 | 2.4 J | ND (0.5) | ND (0.7) | ND(2.5) | **26** | **14** | ND (0.7) | ND (0.5) | ND (0.7) | 0.88 | 4.4 | 0.88 | ND (7) | ND (0.5) | ND (0.7) |
| Acetone | 50 | 50 | ug/l | ND (5.0) | ND (1) | ND (1.5) | ND(5) | ND (5.0) | ND (1) | ND(5) | ND (5.0) | ND (5.0) | ND (1) | 17 | ND (1) | 17 | ND (1) | 31 | ND (10) | ND (5.0) | 13 |
| Total VOCs | NS | NS | ug/l | 61.9 | 22.1 | 21.4 | 24.0 | 0.0 | 0.0 | 0.0 | 81.4 | 49.2 | 0.0 | 17.0 | 0.0 | 2.1 | 5.8 | 31.0 | 0.0 | 0.0 | 15.2 |
| VOC TICs | NS | NS | ug/l | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Dissolved Gases by GC** | | | | | | | | | | | | | | | | | | | | | |
| Methane | NS | NS | ug/l | - | 965 | 500 | 561 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethene | NS | NS | ug/l | - | 1.35 | ND (0.5) | ND (0.5) | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethane | NS | NS | ug/l | - | 3.12 | ND (0.5) | 0.733 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Dissolved Metals** | | | | | | | | | | | | | | | | | | | | | |
| Iron, Dissolved | 300 | NS | ug/l | **-** | 2550 | 134 | 101 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese, Dissolved | NS | NS | ug/l | **-** | **-** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total | NS | NS | mg/L CaCO3 | - | 463 | 398 | 364 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride | NS | NS | ug/l | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrate, nitrogen | NS | NS | ug/l | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate | 250000 | NS | ug/l | - | 33000 | 34000 | 36000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Organic Carbon | NS | NS | ug/l | - | 17000 | 9400 J | 5700 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Volatile Fatty Acids | NS | NS | mg/l | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| pH | NS | NS | (s.u.) | - | 6.44 | 7.01 | 6.95 | - | 6.38 | 6.8 | - | - | - | - | - | - | - | - | - | - | - |
| Conductivity | NS | NS | mS/cm | - | 4.4 | 2.52 | 2.26 | - | 2.65 | 3.07 | - | - | - | - | - | - | - | - | - | - | - |
| ORP | NS | NS | mV | - | 16 | 20 | -5 | - | 20 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| Dissolved Oxygen | NS | NS | mg/L | - | 0.16 | 4.99 | 3.35 | - | 0.37 | 3.19 | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
J - The compound was detected; however, the concentration is belo
NS - No NYSDEC Standard or Screening Level established for this
Detected concentration exceeds eit

NOTE: TABLES ARE TAKEN FROM LEGGETTE, BRASHEARS & GRAHAM, INC.'S REMEDIAL INVESTIGATION REPORT DATED DECEMBER 2009

# Table 4
# Soil Vapor Results

**FORMER CORNWALL CLEANERS**
**CORNWALL PLAZA**
**QUAKER AVENUE**
**CORNWALL, NEW YORK**
**BCP SITE NO. C336070**

**Soil Vapor / Sub-slab Vapor Analytical Results, VOCs by EPA Method TO-15**
**Collected October 25, 2007**

| Compound | ug/m3 [1] | | | | | |
|---|---|---|---|---|---|---|
| | Chans Subslab 1 (CSS1) | Chans Subslab 2 (CSS2) | Key Foods Subslab 1 (KFSS1) | Leos Pizza Subslab 1 (LPSS1) | Soil Vapor Front (SVF) | Soil Vapor Rear (SVR) |
| 1,3,4-Trimethylbenzene | — | 5 | — [2] | 6.1 | — | 6.4 |
| 2-Butanone (Methyl Ethyl Ketone) | 33 | 5.3 | — | 3.5 | 47 | 56 |
| Benzene | — | — | — | — | 12 | 14 |
| Chloroform | 20 | 18 | — | — | — | — |
| Cyclohexane | — | — | — | — | — | 2.9 |
| Ethanol | 2,800 E [3] | 270 | 11 | 150 | 10 | 110 |
| Ethylbenzene | — | 3.4 | — | 4.0 | 5.3 | 3.4 |
| Freon 11 | — | — | 8.4 | — | — | — |
| Freon 12 | — | — | — | 5.6 | — | — |
| Hexane | 12 | 5.4 | — | — | 7 | — |
| m,p-Xylenes | 14 | 13 | 8.1 | 18 | 20 | 12 |
| o-Xylenes | — | 4.4 | — | 6.2 | 6.7 | 4.9 |
| Styrene | 22 | 4.1 | — | 4.6 | — | — |
| Tetrachloroethene | 4700 | 1800 | 3300 | 51 | — | 28 |
| Toluene | 44 | 12 | 15 | 12 | 16 | 12 |
| 1,3,5-Trimethylbenzene | — | — | — | — | — | — |
| 1,4-Dichlorobenzene | — | — | — | — | — | — |
| Carbon Tetrachloride | — | — | — | — | — | — |
| Chloromethane | — | — | — | — | — | — |
| Freon 113 | — | — | — | — | — | — |
| tert-Butyl alcohol | — | — | — | — | — | — |
| 1,3 Butadiene | — | — | — | — | 6.3 | — |
| 2,2,4-Trimethylpentane | — | — | — | — | — | 4 |
| 2-Propanol | — | — | — | 8.3 | 12 | — |
| 4-Ethyltoluene | — | — | — | — | — | 3.8 |
| Acetone | 500 | 49 | 24 | 21 | 230 | 350 |
| Carbon disulfide | — | 2.7 | — | — | 73 | 14 |
| Heptane | 61 | 47 | — | 8.2 | 29 | 10 |
| Tetrahydrofuran | 110 | 17 | — | 4.4 | 100 | 14 |
| Trichloroethene | 54 | 37 | 24 | — | — | — |
| Vinyl chloride | — | — | — | — | — | 7.5 |

Compounds in **BOLD** are primary Site contaminants

1 - micrograms per cubic meter

2 - not detected above the laboratory detection limit

3 - exceeds instrument calibration range

Compound detected in both ambient air and soil vapor
Compound detected in ambient air only
Compound detected in soil vapor only

LEGGETTE, BRASHEARS & GRAHAM, INC.

# Table 4
# Soil Vapor Results

**FORMER CORNWALL CLEANERS**
**CORNWALL PLAZA**
**QUAKER AVENUE**
**CORNWALL, NEW YORK**
**BCP SITE NO. C336070**

**Ambient Air Analytical Results, VOCs by EPA Method TO-15**
**Collected October 25, 2007**

| Compound | ug/m3 [1] | | | | | |
|---|---|---|---|---|---|---|
| | Chan's Indoor Air 1 (CIA1) | Key Foods Indoor Air 1 (KFIA1) | Leo's Pizza Indoor Air 1 (LPIA1) | Outdoor Air Front (OAF) | Outdoor Air Rear (OAR) | NYSDOH Indoor Air Guidance Values |
| 1,2,4-Trimethylbenzene | --- [2] | --- | --- | 3.5 | 4.1 | NE [3] |
| 2-Butanone (Methyl Ethyl Ketone) | 1.8 | 3.9 | 3.3 | 5.2 | 5.6 | NE |
| Benzene | 1.6 | 0.66 | 3.7 | 0.99 | 1.0 | NE |
| Chloroform | --- | 0.92 | --- | --- | --- | NE |
| Cyclohexane | --- | --- | 1.5 | --- | --- | NE |
| Ethanol | 240 E [4] | 350 E | 3900 E | 11 | 12 | NE |
| Ethylbenzene | --- | --- | --- | 4 | 3.6 | NE |
| Freon 11 | 1.2 | 10 | 1.2 | 1.4 | 1.2 | NE |
| Freon 12 | 2.2 | 3 | 2.8 | 2 | 2.2 | NE |
| Hexane | --- | 0.85 | 4.8 | --- | --- | NE |
| m,p-Xylenes | --- | --- | 1.1 | 22 | 17 | NE |
| o-Xylenes | --- | --- | --- | 6.3 | 5.1 | NE |
| Styrene | --- | --- | --- | 0.79 | --- | NE |
| Tetrachloroethene | --- | 1.4 | --- | --- | --- | 100 |
| Toluene | 1.6 | 5.6 | 3.4 | 18 | 12 | NE |
| 1,3,5-Trimethylbenzene | --- | --- | --- | 1.3 | 1.2 | NE |
| 1,4-Dichlorobenzene | --- | 6.4 | --- | --- | --- | NE |
| Carbon Tetrachloride | 0.81 | 0.76 | 0.6 | --- | 0.72 | NE |
| Dichloromethane | 0.94 | 0.80 | 1.5 | 0.63 | 1.0 | NE |
| Freon 113 | --- | 0.76 | --- | 0.62 | --- | NE |
| tert-Butyl alcohol | --- | 30.0 | --- | 5.0 | 6.0 | NE |
| 1,3-Butadiene | --- | --- | --- | --- | --- | NE |
| 2,2,4-Trimethylpentane | --- | --- | --- | --- | --- | NE |
| 2-Propanol | --- | --- | --- | --- | --- | NE |
| 4-Ethyltoluene | --- | --- | --- | --- | --- | NE |
| Acetone | --- | --- | --- | --- | --- | NE |
| Carbon disulfide | --- | --- | --- | --- | --- | NE |
| Heptane | --- | --- | --- | --- | --- | NE |
| Tetrahydrofuran | --- | --- | --- | --- | --- | NE |
| Trichloroethene | --- | --- | --- | --- | --- | 5 |
| Vinyl chloride | --- | --- | --- | --- | --- | NE |

Compounds on BOLD are primary Site contaminants

1. micrograms per cubic meter
2. not detected above the laboratory detection limit
3. not established
4. exceeds instrument calibration range

Compound detected in both ambient air and soil vapor
Compound detected in ambient air only
Compound detected in soil vapor only

LEGGETTE, BRASHEARS & GRAHAM, INC.

# Table 4
# Soil Vapor Results

**FORMER CORNWALL CLEANERS**
**CORNWALL PLAZA**
**QUAKER AVENUE**
**CORNWALL, NEW YORK**
**BCP SITE NO. C336070**

**Indoor Air / Soil Vapor / Sub-slab Vapor Analytical Results, VOC's by EPA Method TO-15**
**Collected October 25 2007**

| Compound | ug/m3 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chen's Subslab 1 (CSS1) | Chen's Subslab 2 (CSS2) | Chen's Indoor Air 1 (CIA1) | Key Foods Subslab 1 (KFSS1) | Key Foods Indoor Air 1 (KFIA1) | Leo Pizza Subslab 1 (LPSS1) | Leo's Pizza Indoor Air 1 (LPIA1) | Soil Vapor Front (SVF) | Outdoor Air Front (OAF) | Soil Vapor Rear (SVR) | Outdoor Air Rear (OAR) | NYSDOH Indoor Air Guidance Values |
| 1,2,4-Trimethylbenzene | --- [2] | 5 | --- | --- | --- | 6.1 | --- | --- | 3.5 | 6.4 | 4.1 | NE [3] |
| 2-Butanone (MEK) | 33 | 5.3 | 1.8 | --- | 3.9 | 3.5 | 3.3 | 47 | 5.2 | 56 | 5.6 | NE |
| Benzene | --- | --- | 1.6 | --- | 0.66 | --- | 3.7 | 12 | 0.99 | 14 | 1 | NE |
| Chloroform | 20 | 18 | --- | --- | 0.92 | --- | --- | --- | --- | --- | --- | NE |
| Cyclohexane | --- | --- | --- | --- | --- | --- | 1.5 | --- | --- | 2.9 | --- | NE |
| Ethanol | 2,800 E [4] | 270 | 240 E | 11 | 350 | 150.0 | 900 E | 10 | 11.0 | 110 | 12 | NE |
| Ethylbenzene | --- | 3.4 | --- | --- | --- | 4.0 | --- | 5.3 | 4 | 3.4 | 3.6 | NE |
| Freon 11 | --- | --- | 1.2 | 8.4 | 10 | --- | 1.2 | --- | 1.4 | --- | 1.2 | NE |
| Freon 12 | --- | --- | 2.2 | --- | 3 | 3.6 | 2.8 | --- | 2 | --- | 2.2 | NE |
| Hexane | 12 | 5.4 | --- | --- | 0.85 | --- | 4.8 | 7 | --- | --- | --- | NE |
| m,p-Xylenes | 14 | 13 | --- | 8.1 | --- | 18 | 1.1 | 20 | 22 | 12 | 17 | NE |
| o-Xylenes | --- | 4.4 | --- | --- | --- | 6.2 | --- | 6.7 | 6.3 | 4.9 | 5.1 | NE |
| Styrene | 22 | 4.1 | --- | --- | --- | 4.6 | --- | --- | 0.79 | --- | --- | NE |
| Tetrachloroethene | 4700 | 1800 | --- | 3300 | 1.4 | 53 | --- | --- | --- | 28 | --- | 100 |
| Toluene | 44 | 12 | 1.6 | 15 | 5.6 | 12 | 3.1 | 16 | 18 | 12 | 12 | NE |
| 1,3,5-Trimethylbenzene | --- | --- | --- | --- | --- | --- | --- | --- | 1.3 | --- | 1.2 | NE |
| 1,4-Dichlorobenzene | --- | --- | --- | --- | 6.4 | --- | --- | --- | --- | --- | --- | NE |
| Carbon Tetrachloride | --- | --- | 0.81 | --- | 0.76 | --- | 0.6 | --- | --- | --- | 0.72 | NE |
| Chloromethane | --- | --- | 0.94 | --- | 0.88 | --- | 1.5 | --- | 0.63 | --- | 1.0 | NE |
| Freon 113 | --- | --- | --- | --- | 0.76 | --- | --- | --- | 0.62 | --- | --- | NE |
| tert-Butyl alcohol | --- | --- | --- | --- | 30.0 | --- | --- | --- | 5.0 | --- | 6.0 | NE |
| 1,3-Butadiene | --- | --- | --- | --- | --- | --- | --- | 6.3 | --- | --- | --- | NE |
| 2,2,4-Trimethylpentane | --- | --- | --- | --- | --- | --- | --- | --- | --- | 4 | --- | NE |
| 2-Propanol | --- | --- | --- | --- | --- | 8.3 | --- | 12 | --- | --- | --- | NE |
| 4-Ethyltoluene | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.8 | --- | NE |
| Acetone | 500 | 99 | --- | 24 | --- | 21 | --- | 230 | --- | 350 | --- | NE |
| Carbon disulfide | --- | 2.7 | --- | --- | --- | --- | --- | 73 | --- | 14 | --- | NE |
| Heptane | 61 | 47 | --- | --- | --- | 8.2 | --- | 29 | --- | 10 | --- | NE |
| Tetrahydrofuran | 110 | 17 | --- | --- | --- | 1.4 | --- | 100 | --- | 14 | --- | NE |
| Trichloroethene | 54 | 37 | --- | 24 | --- | --- | --- | --- | --- | --- | --- | 5 |
| Vinyl Chloride | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.5 | --- | NE |

Compounds in **BOLD** are primarily Site contaminants
1 = micrograms per cubic meter
2 = not detected above the laboratory limit
3 = not established
4 = exceeds instrument calibration range
= compound detected in both sub-slab air and soil vapor
= compound detected in ambient air only
= compound detected in soil vapor only

LIGGETTE, BRASHEAR & GRAHAM, INC.

# Table 4
# Soil Vapor Results

FORMER CORNWALL CLEANERS
CORNWALL PLAZA
QUAKER AVENUE
CORNWALL, NEW YORK
BCP SITE NO. C336070

Soil Vapor / Sub-slab Vapor Analytical Results, VOCs by EPA Method TO-15
Collected April 30, 2009

| Compound | ug/m$^3$ [1] | |
|---|---|---|
| | Cornwall Fire Dept Subslab 1 (Basement) (CFDSS1) | Cornwall Fire Dept Soil Vapor 1 (Parking lot) (CFDSV1) |
| 1,2,4-Trimethylbenzene | 13.5 | 22.5 |
| 1,3,5-Trimethylbenzene | 15 | 25.5 |
| 2-Butanone (Methyl Ethyl Ketone) | 26.4 | 23.7 |
| 4-Ethyltoluene | 4.84 | --- [2] |
| Benzene | 390 D [3] | 9.75 |
| Ethylbenzene | 9.27 | 15.5 |
| Heptane | 7.07 | 12.9 |
| Hexane | 5.01 | 10 |
| m,p-Xylenes | 44.2 | 75.1 |
| o-Xylenes | 14.6 | 26.1 |
| **Tetrachloroethene** | 22.8 | --- |
| Toluene | 357 D | 72.8 |
| 1,1,1-Trichloroethane | --- | --- |
| 1,1-Dichloroethene | --- | --- |
| 1,2-Dichloroethane | --- | --- |
| 2,2,4-Trimethylpentane | --- | --- |
| Carbon Tetrachloride | --- | --- |
| **cis-1,2-Dichloroethene** | --- | --- |
| Methylene chloride | --- | --- |
| **Trichloroethene** | --- | --- |
| Trichlorofluoromethane | --- | --- |
| **Vinyl chloride** | --- | --- |
| Carbon disulfide | --- | 2.31 J [4] |
| Chloroform | 18.4 | --- |
| Ethyl acetate | 2,590 D | 5.62 |
| MIBK | --- | 62.5 |
| Tetrahydrofuran | 33 | 6.3 |

Compounds on **BOLD** are primary Site contaminants
1 - micrograms per cubic meter
2 - not detected above the laboratory detection limit
3 - result reported based on a diluted sample, due either to high concentration or matrix interference
4 - indicates an estimated value

Compound detected in both ambient air and soil vapor
Compound detected in ambient air only
Compound detected in soil vapor only

LEGGETTE, BRASHEARS & GRAHAM, INC.

# Table 4
# Soil Vapor Results

**FORMER CORNWALL CLEANERS**
**CORNWALL PLAZA**
**QUAKER AVENUE**
**CORNWALL, NEW YORK**
**BCP SITE NO. C336070**

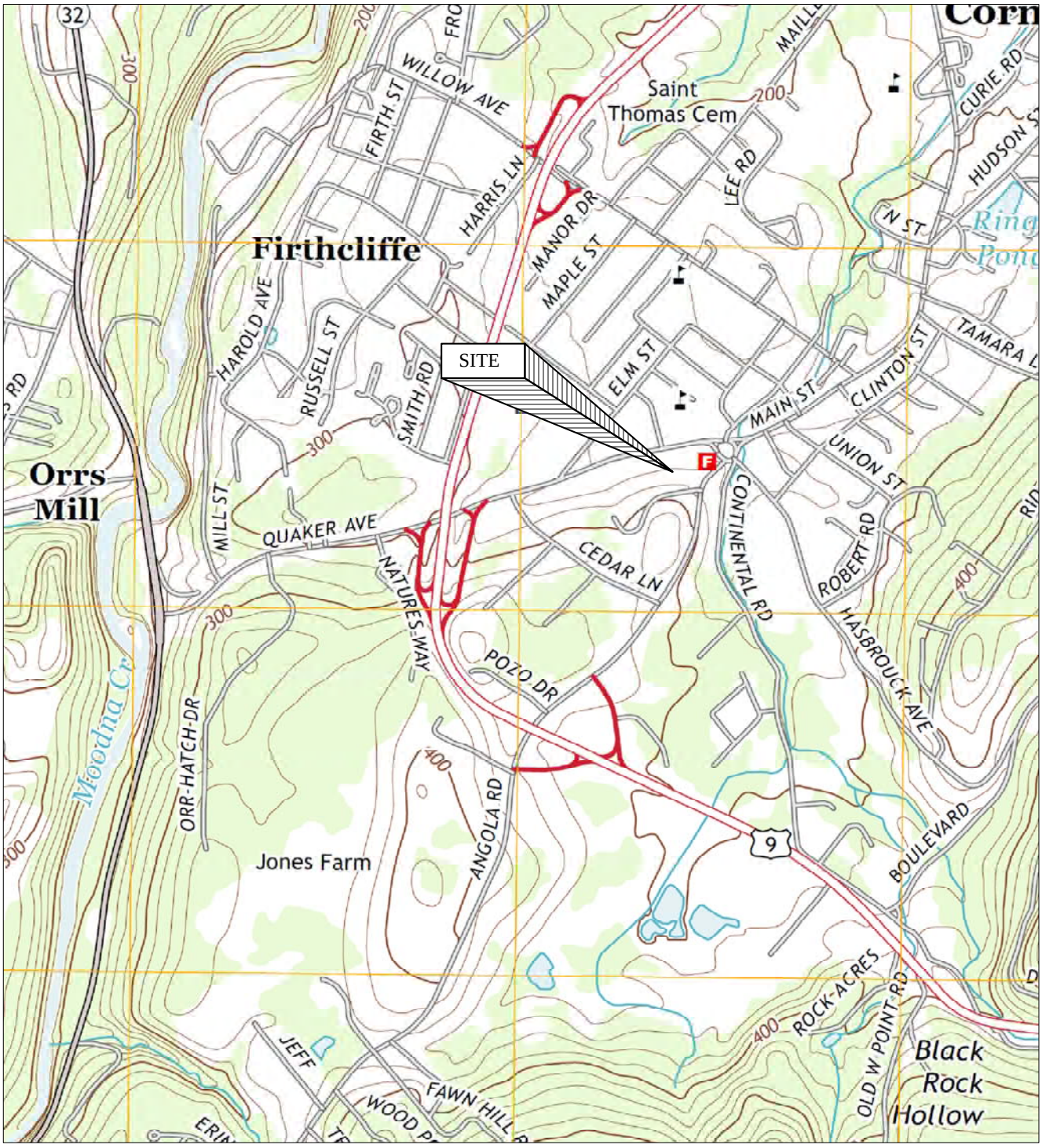
**Ambient Air Analytical Results, VOCs by EPA Method TO-15**
**Collected April 30, 2009**

| Compound | ug/m3 | | | | | |
|---|---|---|---|---|---|---|
| | Chan's Indoor Air 2 (CIA2) | Key Foods Indoor Air 2 (KFIA2) | Leo's Pizza Indoor Air 2 (LPIA2) | Cornwall Fire Dept Indoor Air 1 (Basement) (CFDIA1) | Cornwall Fire Dept Indoor Air 2 (Upstairs) (CFDIA2) | NYSDOH Indoor Air Guidance Values |
| 1,2,4-Trimethylbenzene | --- [2] | --- | --- | --- | 12.5 | NE [3] |
| 1,3,5-Trimethylbenzene | --- | --- | --- | --- | 11.5 | NE |
| 2-Butanone (Methyl Ethyl Ketone) | --- | 3.3 | 1.53 J [4] | 6.0 | 6 | NE |
| 4-Ethyltoluene | --- | --- | --- | --- | 3.69 J | NE |
| Benzene | 2.63 J | --- | --- | --- | 3.57 | NE |
| Ethylbenzene | --- | --- | --- | 2.21 J | 6.18 | NE |
| Heptane | --- | --- | 1.87 J | --- | 3.45 J | NE |
| Hexane | 2.90 J | --- | 1.93 J | 3.00 J | 5.37 | NE |
| m,p-Xylenes | --- | --- | --- | 8.83 | 24.3 | NE |
| o-Xylenes | --- | --- | --- | 3.09 J | 8.83 | NE |
| Tetrachloroethene | 1.52 (SIM) [5] | 0.90 (SIM) | 0.62 (SIM) | 1.03 (SIM) | 1.52 | 100 |
| Toluene | --- | --- | --- | 12.3 | 31.1 | NE |
| 1,1,1-Trichloroethane | 0.50 (SIM) | 0.11 J (SIM) | 0.22 J (SIM) | 1.55 (SIM) | 1.55 (SIM) | NE |
| 1,1-Dichloroethene | 0.24 (SIM) | --- | 0.12 J (SIM) | --- | --- | NE |
| 1,2-Dichloroethane | 0.45 (SIM) | 0.16 J (SIM) | 0.25 J (SIM) | 0.16 J (SIM) | 0.16 J (SIM) | NE |
| 2,2,4-Trimethylpentane | --- | --- | --- | --- | 4.13 J | NE |
| Carbon Tetrachloride | 1.22 (SIM) | 0.90 (SIM) | 0.83 (SIM) | 0.83 (SIM) | 0.77 | NE |
| cis-1,2-Dichloroethene | 0.32 (SIM) | 0.08 J (SIM) | 0.16 J (SIM) | 0.08 J (SIM) | 0.08 J (SIM) | NE |
| Methylene chloride | 4.95 | --- | --- | 4.24 | --- | NE |
| Trichloroethene | 0.60 (SIM) | 0.16 J (SIM) | 0.27 J (SIM) | 0.38 J (SIM) | 1.26 | 5 |
| Trichlorofluoromethane | --- | --- | --- | 6.29 | --- | NE |
| Vinyl chloride | 0.13 (SIM) | --- | 0.08 J (SIM) | --- | --- | NE |
| Carbon disulfide | --- | --- | --- | --- | --- | NE |
| Chloroform | --- | --- | --- | --- | --- | NE |
| Ethyl acetate | --- | --- | --- | --- | --- | NE |
| MIBK | --- | --- | --- | --- | --- | NE |
| Tetrahydrofuran | --- | --- | --- | --- | --- | NE |

Compounds on **BOLD** are primary Site contaminants
1 - micrograms per cubic meter
2 - not detected above the laboratory detection limit
3 - not established
4 - indicates an estimated value
5 - selected ion monitoring

Compound detected in both ambient air and soil vapor
Compound detected in ambient air only
Compound detected in soil vapor only

# FIGURES




USGS Topographic Map, 2013
Cornwall-On-Hudson, NY Quadrangle
Contour Interval: 20 Feet

**SITE LOCATION MAP**

Cornwall Plaza
19-45 Quaker Avenue
Cornwall, New York

SCALE: 1:24,000

August 2015

VERTEX Proj. No. 24803

VERTEX
**Environmental Services, Inc.**
**FIGURE NO. 1**


**TAX MAP REFERENCE: TOWN OF CORNWALL SECTION 23 - BLOCK 3 - LOT 4**

NOTE: SITE ENCOMPASSES ENTIRE PARCEL

## SYMBOL LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CATCHBASIN
- MANHOLE
- ROOF MOUNTED VENT FANS
- SOIL CHARACTERIZATION BORING LOCATION (AUGUST 2010)
- LFR BORING LOCATION (AUGUST/OCTOBER 2005)
- x x - ORIGINAL WALL LOCATION
- ABANDONED, DESTROYED, OR FOULED WELL

0' 60' 120' 180'

SCALE: 1" = 60'-0"
(WHEN PRINTED AT 11x17)

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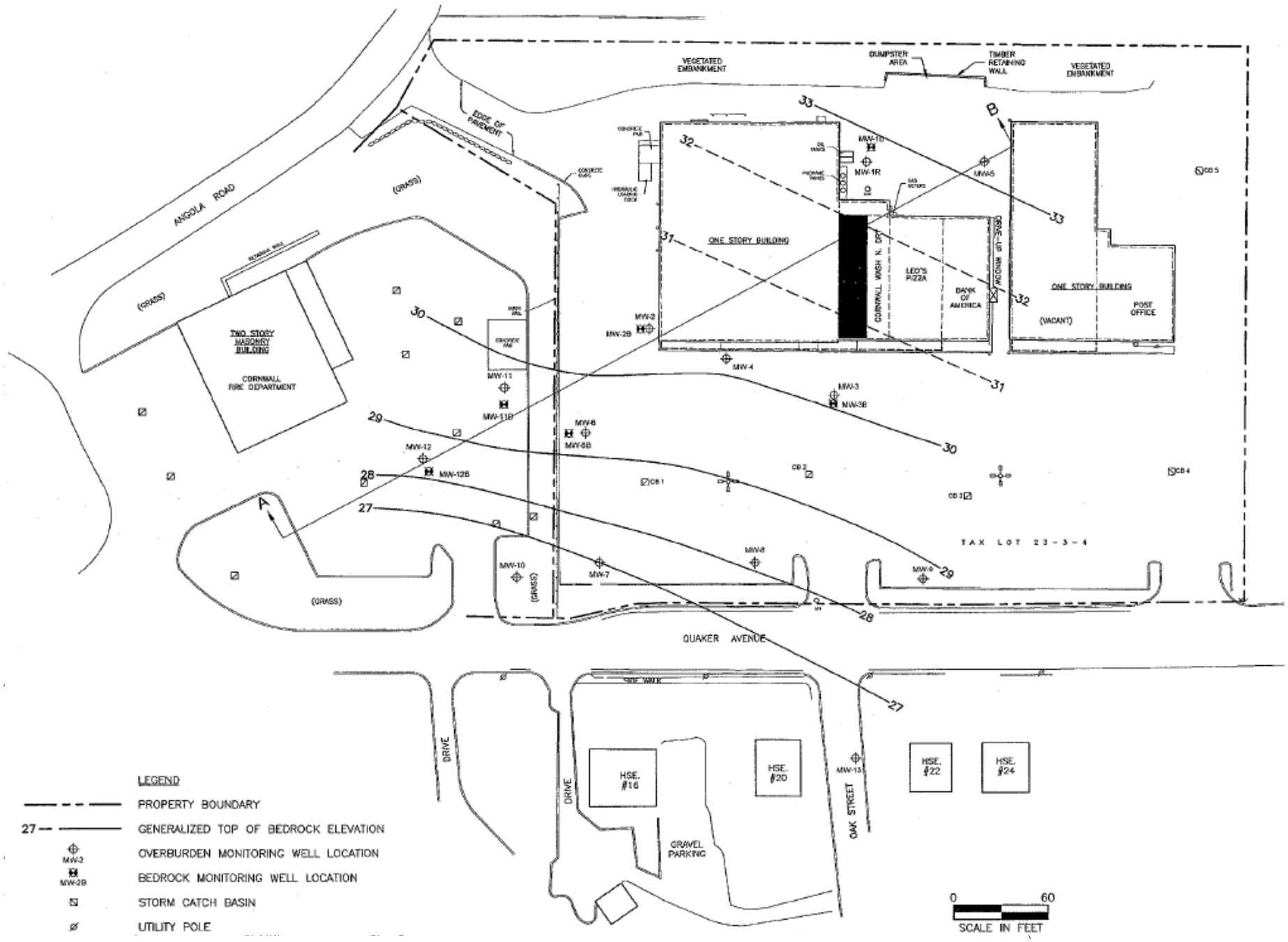
| Checked: | JMF |
| Job No.: | 24803 |

Figure 2

OVERALL SITE PLAN
CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY




LEGEND

- PROPERTY BOUNDARY
- 27 GENERALIZED TOP OF BEDROCK ELEVATION
- MW-2 OVERBURDEN MONITORING WELL LOCATION
- MW-2B BEDROCK MONITORING WELL LOCATION
- STORM CATCH BASIN
- UTILITY POLE

NOTE:
FIGURE IS FROM LEGGETTE, BRASHEARS & GRAHAM, INC.'S GENERALIZED ELEVATION CONTOURS FOR TOP OF BEDROCK DATED DECEMBER 15, 2009

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GENERALIZED ELEVATION CONTOURS FOR TOP OF BEDROCK

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

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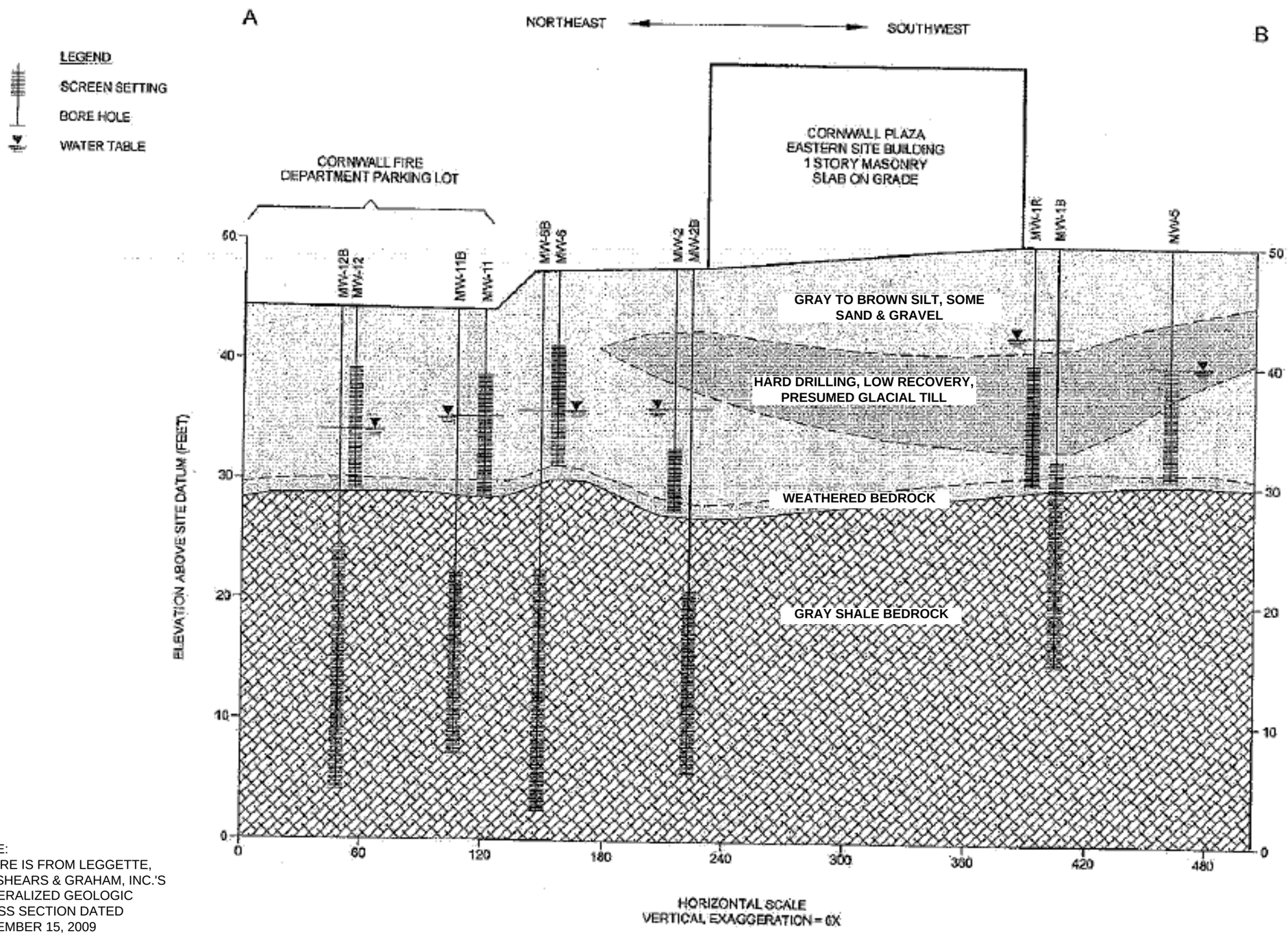
Figure 3A




NOTE:
FIGURE IS FROM LEGGETTE, BRASHEARS & GRAHAM, INC.'S GENERALIZED GEOLOGIC CROSS SECTION DATED DECEMBER 15, 2009

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GENERALIZED GEOLOGIC CROSS SECTION

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

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Figure 3B

NOTE:

1. MW-1R, MW-2R, AND MW-4R WERE NOT INCLUDED IN THE CONSTRUCTION OF THE GROUNDWATER CONTOUR

2. MW-1R, MW-2R, AND MW-4R WERE SAMPLED IN APRIL 2015


## SYMBOL LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CATCHBASIN
- MANHOLE
- ROOF MOUNTED VENT FANS
- SOIL CHARACTERIZATION BORING LOCATION (AUGUST 2010)
- LFR BORING LOCATION (AUGUST/OCTOBER 2005)
- x x - ORIGINAL WALL LOCATION
- ABANDONED, DESTROYED, OR FOULED WELL
- 36.73 GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- NG NOT GAUGED
- 92.00 GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

SCALE: 1" = 60'-0"
(WHEN PRINTED AT 11x17)


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GROUNDWATER CONTOUR MAP - FEBRUARY 2015

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

| | |
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Figure 4


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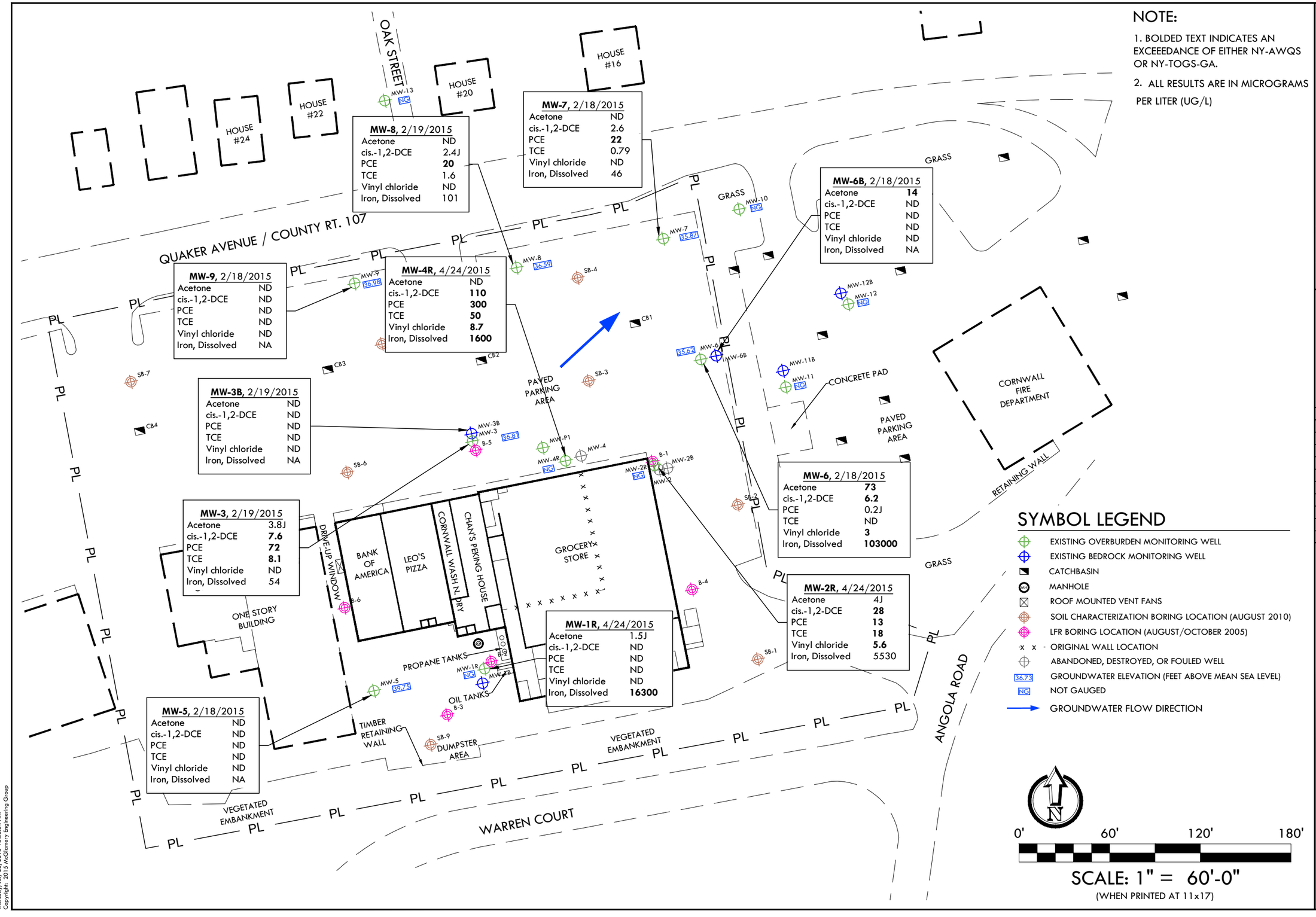
Figure 5

**INJECTION LOCATIONS**

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY




## NOTE:

1. BOLDED TEXT INDICATES AN EXCEEEDANCE OF EITHER NY-AWQS OR NY-TOGS-GA.
2. ALL RESULTS ARE IN MICROGRAMS PER LITER (UG/L)

## SYMBOL LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CATCHBASIN
- MANHOLE
- ROOF MOUNTED VENT FANS
- SOIL CHARACTERIZATION BORING LOCATION (AUGUST 2010)
- LFR BORING LOCATION (AUGUST/OCTOBER 2005)
- -x x- ORIGINAL WALL LOCATION
- ABANDONED, DESTROYED, OR FOULED WELL
- 36.73 GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- NG NOT GAUGED
- GROUNDWATER FLOW DIRECTION

N

0' 60' 120' 180'

SCALE: 1" = 60'-0"
(WHEN PRINTED AT 11x17)

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GROUNDWATER EXCEEDANCES POST REMEDIAL ACTION
CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

| | | | |
|---|---|---|---|
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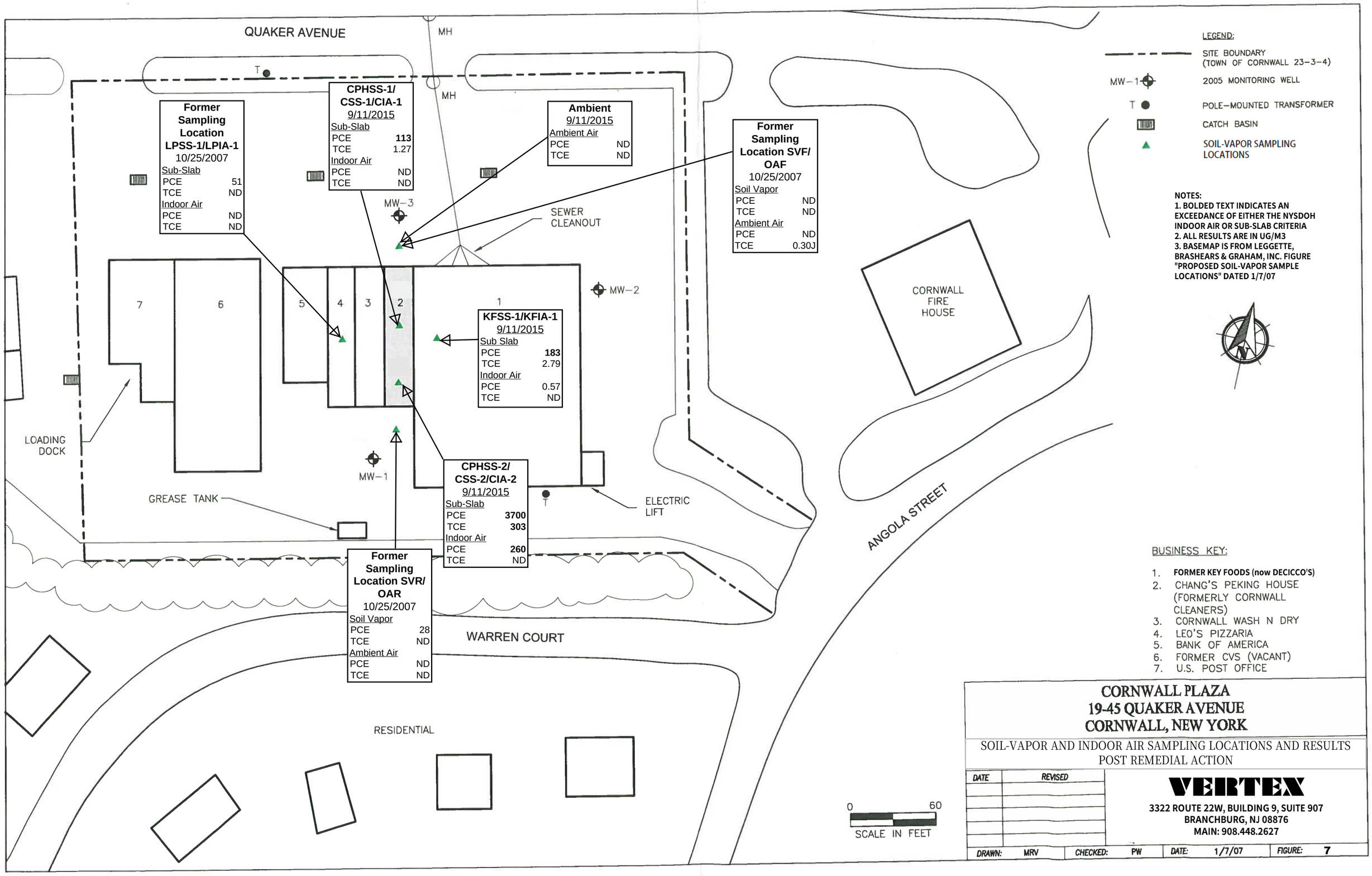
| Date: | JULY 2015 | | |
| Drawn: | SS | | |
| Checked: | JD | | |
| Job No.: | 24803 | | |




# CORNWALL PLAZA
# 19-45 QUAKER AVENUE
# CORNWALL, NEW YORK

SOIL-VAPOR AND INDOOR AIR SAMPLING LOCATIONS AND RESULTS
POST REMEDIAL ACTION

| DATE | REVISED |
|---|---|
| | |
| | |
| | |
| | |
| | |
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|---|---|---|---|---|---|---|---|


## SYMBOL LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CATCHBASIN
- MANHOLE
- ROOF MOUNTED VENT FANS
- SOIL CHARACTERIZATION BORING LOCATION (AUGUST 2010)
- LFR BORING LOCATION (AUGUST/OCTOBER 2005)
- x x - ORIGINAL WALL LOCATION
- ABANDONED, DESTROYED, OR FOULED WELL
- LANDSCAPED AREA
- CONCRETE AREA
- VEGETATED AREA
- ASPHALT PAVED AREA

N

0' 60' 120' 180'

SCALE: 1" = 60'-0"
(WHEN PRINTED AT 11x17)

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INSTITUTIONAL AND ENGINEERING CONTROLS MAP

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

| | | | |
|---|---|---|---|
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| Date: | FEB 2015 | | |
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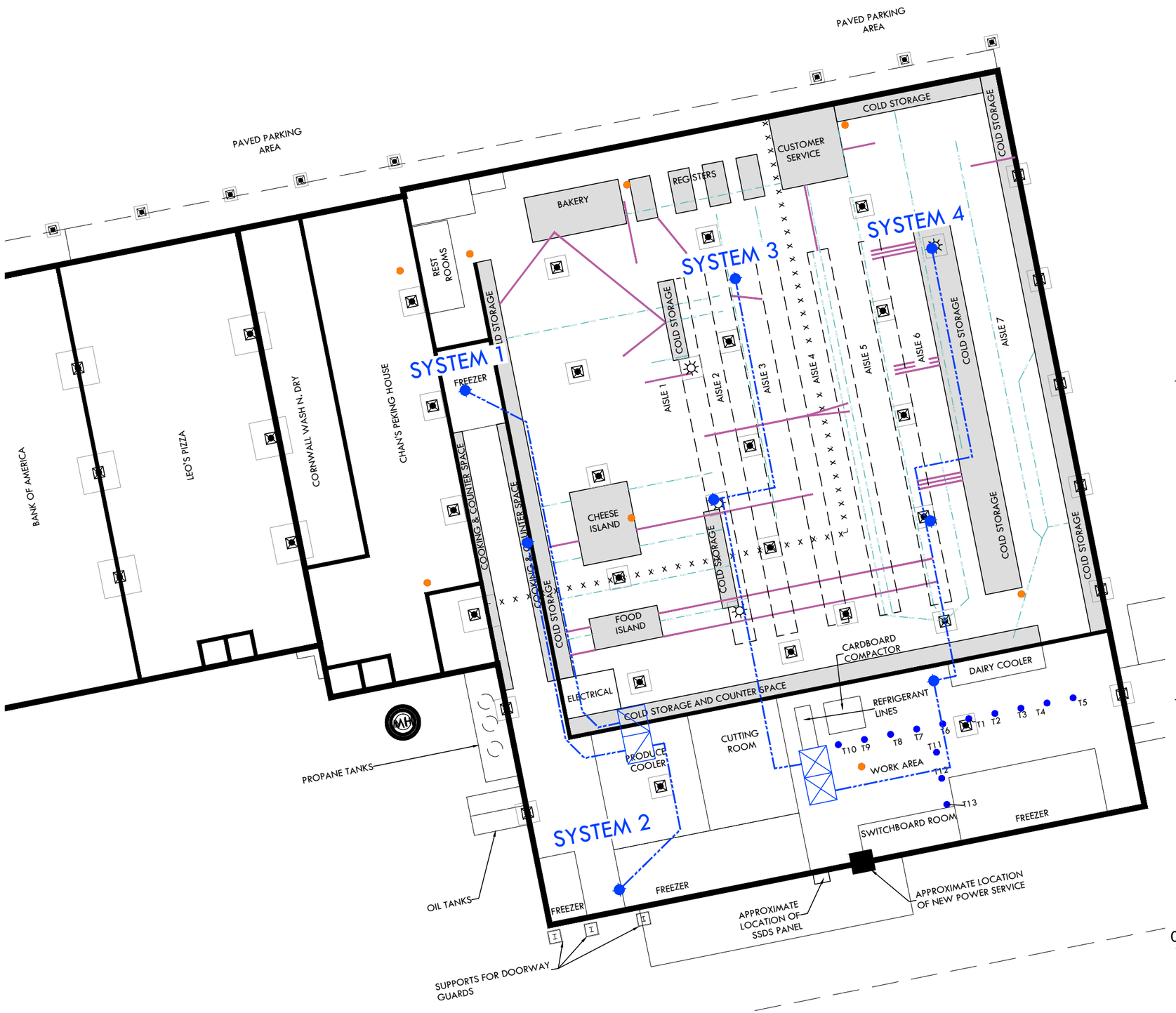


## SYMBOL LEGEND

- STRUCTURAL COLUMN
- UTILITY COLUMN
- ORIGINAL WALL LOCATION
- APPROXIMATE. LOCATION OF BURIED ELECTRICAL LINE (ESTIMATED GPR)
- APPROXIMATE LOCATION OF BURIED GPR ANOMALY
- MANHOLE
- APPROXIMATE LOCATION OF ROOF MOUNTED VENT FANS
- APPROXIMATE LOCATION OF STORE SHELVING
- SUCTION POINTS

## AS BUILT

- SSDS LOCATIONS
- SUB-SLAB VAPOR MONITORING POINTS
- SSDS PIPING (LOCATED ON ROOF)

N

0' 20' 40' 60'

SCALE: 1" = 20'-0"
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REVISIONS

SUB-SLAB DEPRESSURIZATION SYSTEM ENGINEERING CONTROLS

CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

| | |
|---|---|
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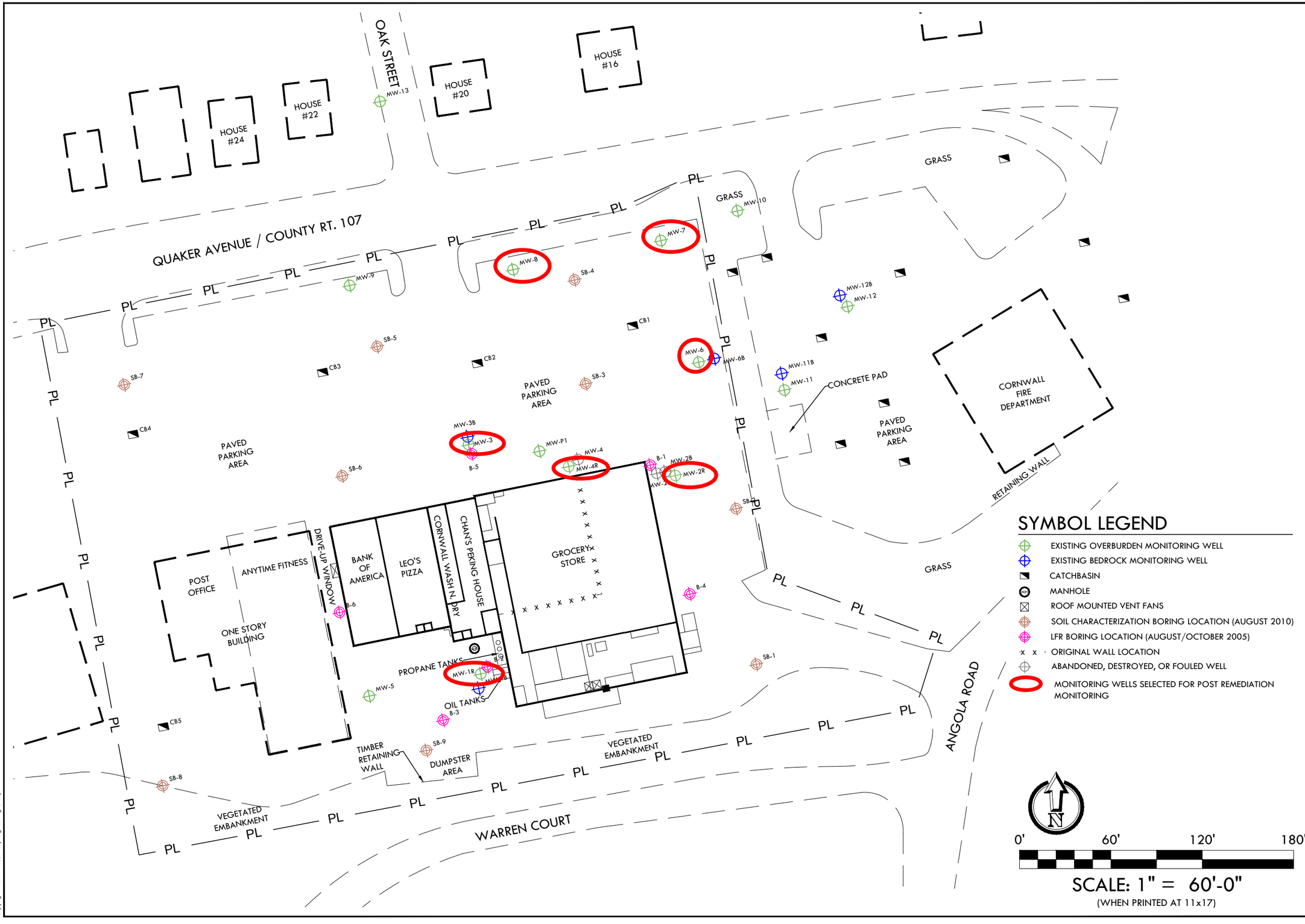
| Date: | JULY 2015 |
| Drawn: | SS |
| Checked: | JD |
| Job No.: | 24803 |

Figure 8B




## SYMBOL LEGEND

- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CATCHBASIN
- MANHOLE
- ROOF MOUNTED VENT FANS
- SOIL CHARACTERIZATION BORING LOCATION (AUGUST 2010)
- LFR BORING LOCATION (AUGUST/OCTOBER 2005)
- ORIGINAL WALL LOCATION
- ABANDONED, DESTROYED, OR FOULED WELL
- MONITORING WELLS SELECTED FOR POST REMEDIATION MONITORING

N

0' 60' 120' 180'

SCALE: 1" = 60'-0"
(WHEN PRINTED AT 11x17)

VERTEX®
3322 RTE. 22W, BUILDING 9, SUITE 907
BRANCHBURG, NJ 08876
MAIN: 908.448.2627
VERTEXENG.COM

REVISIONS

POST REMEDIATION MONITORING PLAN
CORNWALL PLAZA
19-45 QUAKER AVENUE
CORNWALL, NY

| | |
|---|---|
| File No.: | 24803 |
| Date: | JULY 2015 |
| Drawn: | KHH |
| Checked: | JMF |
| Job No.: | 24803 |

Figure 9

# APPENDIX 1 – ENVIRONMENTAL EASEMENT

# ORANGE COUNTY – STATE OF NEW YORK

ANN G. RABBITT, COUNTY CLERK
255 MAIN STREET
GOSHEN, NEW YORK 10924

## COUNTY CLERK'S RECORDING PAGE

***THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH***

BOOK/PAGE: 13930 / 703
INSTRUMENT #: 20150051805

Receipt#: 1990201
Clerk: HS
Rec Date: 08/11/2015 10:52:33 AM
Doc Grp: D
Descrip: RIGHT OF WAY (R)
Num Pgs: 10
Rec'd Frm: FIRST AMERICAN TITLE NCS - NEW YORK

Party1: CORNWALL SHOPPING LLC
Party2: PEOPLE OF STATE OF NY
Town: CORNWALL (TN)
23-3-4

Recording:

| | |
|---|---|
| Recording Fee | 70.00 |
| Cultural Ed | 14.25 |
| Records Management - Coun | 1.00 |
| Records Management - Stat | 4.75 |
| TP584 | 5.00 |
| Sub Total: | 95.00 |

Transfer Tax

| | |
|---|---|
| Transfer Tax - State | 0.00 |
| Sub Total: | 0.00 |
| Total: | 95.00 |

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: 259
Exempt
Consideration: 0.00

Total: 0.00

Payment Type:
Check ___
Cash ___
Charge ___
No Fee ___

Comment: _____

Ann G. Rabbitt
Orange County Clerk

Record and Return To:

FIRST AMERICAN TITLE NCS - NEW YORK
666 THIRD AVE-5TH FLOOR
NEW YORK, NY 10017

## ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

**THIS INDENTURE** made this 14th day of July, 2015 between Owner(s) Cornwall Shopping, LLC, having an office at c/o Philips International Holding Corp. 295 Madison Avenue, New York, NY 10017, County of New York, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

**WHEREAS,** the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

**WHEREAS,** the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

**WHEREAS,** the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

**WHEREAS,** Grantor, is the owner of real property located at the address of 19-45 Quaker Avenue in the Town of Cornwall, County of Orange and State of New York, known and designated on the tax map of the County Clerk of Orange as tax map parcel numbers: Section 23 Block 3 Lot 4, being the same as that property conveyed to Grantor by deed dated March 9, 2006 and recorded in the Orange County Clerk's Office in Liber and Page 12110/0502. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 3.793 +/- acres, and is hereinafter more fully described in the Land Title Survey dated February 16, 2006 and last revised on May 11, 2015 prepared by Leo J. Carroll, P.E., L.S. & Associates, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

**WHEREAS**, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

**NOW THEREFORE**, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: A3-0564-0906, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

**Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)**

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Orange County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining

contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

**This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation**

## Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by

Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C336070
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of

this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

**Remainder of Page Intentionally Left Blank**

**IN WITNESS WHEREOF,** Grantor has caused this instrument to be signed in its name.

Cornwall Shopping, LLC:

By: _____

Print Name: Seth Pilevsky

Title: Authorized Signatory Date: 6/29/15

**Grantor's Acknowledgment**

STATE OF NEW YORK )
) ss:
COUNTY OF New York )

On the 29 day of June, in the year 20 __, before me, the undersigned, personally appeared Seth Pilevsky, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

DOMENICA FACCIOLA
Notary Public, State Of New York
No. 01FA5058533
Qualified In Kings County
Commission Expires April 8, 20 18

**THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK**, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

**Grantee's Acknowledgment**

STATE OF NEW YORK )
) ss:
COUNTY OF ALBANY )

On the 14th day of July, in the year 2015, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2018

## SCHEDULE "A" PROPERTY DESCRIPTION

TAX LOT 23-3-4 State of New York, County of Orange, Town of Cornwall.
BEGINNING AT A POINT IN THE SOUTHERLY BOUNDS OF QUAKER AVENUE, A/K/A COUNTY HIGHWAY NO. 107, AT THE NORTHWESTERLY CORNER OF THE LANDS N/F OF THE BOARD OF FIRE COMMISSIONERS OF THE CANTERBURY FIRE DISTRICT, LIBER 1842,PAGE 775 AND THE NORTHEASTERLY CORNER OF THE HEREIN DESCRIBED PARCEL OF LAND.

FROM SAID POINT OF BEGINNING AND ALONG THE WESTERLY BOUNDS OF THE BOARD OF FIRE COMMISSIONERS OF THE CANTERBURY FIRE DISTRICT THE FOLLOWING TWO [2] COURSES AND DISTANCES:

[1] S 00-32-30 W, 265.30 FEET; THENCE,
[2] S 58-18-40 E, 117.70 FEET TO THE WESTERLY BOUNDS OF ANGOLA ROAD, A/K/A COUNTY HIGHWAY NO.9; THENCE, ALONG THE WESTERLY BOUNDS OF ANGOLA ROAD, A/K/A COUNTY HIGHWAY NO. 9, S 28-06-52 W, 49.44 FEET TO THE NORTHERLY BOUNDS OF WARREN COURT.

THENCE, ALONG THE NORTHERLY BOUNDS OF WARREN COURT AND THE NORTHERLY BOUNDS OF THE LANDS N/F OF RICHARD T. LAFERERA AND IRIS G. THOMSON, LIBER 11732, PAGE 257, N 89-27-30 W, 517.85 FEET TO A FOUND PIPE AT THE EASTERLY BOUNDS OF THE SAID LANDS N/F OF LAFERERA AND THOMSON;

THENCE, ALONG THE EASTERLY BOUNDS OF SAID LANDS N/F OF LAFERERA AND THOMSON AND THE EASTERLY BOUNDS OF PARCEL II [TAX LOT 23-3-51.2], N 00-32-30 E, PASSING OVER A FOUND PIPE AT A DISTANCE OF 45.00 FEET, FOR A TOTAL DISTANCE OF 356.25 FEET TO THE SOUTHERLY BOUNDS OF QUAKER AVENUE, A/K/A COUNTY HIGHWAY NO. 107;

THENCE, ALONG THE SOUTHERLY BOUNDS OF QUAKER AVENUE, A/K/A COUNTY HIGHWAY NO. 107, THE FOLLOWING EIGHT [8] COURSES AND DISTANCES:
[1] N 89-35-21E, 73.27 FEET; THENCE,
[2] N 89-24-45 E, 106.48 FEET; THENCE,
[3] S 89-25-35 E, 53.03 FEET; THENCE,
[4] S 89-29-55 E, 56.13 FEET, THENCE,
[5] S 89-29-00 E, 79.04 FEET; THENCE,
[6] N 87-40-00 E, 20.75 FEET; THENCE,
[7] N 77-28-00 E, 41.33 FEET; THENCE,
[8] S 89-27-02 E, 11.10 FEET TO THE PLACE OF BEGINNING.

CONTAINING 3.793 ACRES MORE OR LESS.

**LEO J. CARROLL, P.E., L.S. & ASSOCIATES**
SURVEYING ~ ENGINEERING ~ ARCHITECTURAL ~ LAND PLANNING

**DESCRIPTION OF LANDS PREPARED FOR**
**CORNWALL SHOPPING LLC**

**ALL** that certain parcel of land, with the improvements erected thereon, situate Quaker Avenue, a/k/a County Highway No. 107, Town of Cornwall, County of Orange, and State of New York. Said parcel being bounded and described as follows:

**BEGINNING** on the southerly bounds of Quaker Avenue, a/k/a County Highway No. 107 at the northwesterly corner of the Lands n/f of Board of Fire Commissioners of the Canterbury Fire District, Liber 1842 ~ Page 775 and the northeasterly corner of the herein described parcel of land.

**FROM** said point of beginning and along the westerly and southerly bounds of the Lands n/f of Board of Fire Commissioners of the Canterbury Fire District the following two [2] courses and distances:

[1] S 00-32-30 W, 265.30 feet; **THENCE,**

[2] S 58-18-40 E, 117.70 feet to the westerly bounds of Angola Road, a/k/a County Highway No. 9; **THENCE**, along the westerly bounds of Angola Road, a/k/a County Highway No. 9, S 28-06-52 W, 49.44 feet to the northerly bounds of Warren Court; **THENCE**, along the northerly bounds of Warren Court and the northerly bounds of the Lands n/f of Lawrence P. and Sandra K. Kirwan, Liber 12528 ~ Page 1700, N 89-27-30 W, 517.85 feet to a found pipe on the easterly bounds of said Lands n/f of Kirwan; **THENCE**, along the easterly bounds of the Lands n/f of Kirwan and the easterly bounds of other Lands n/f of Cornwall Shopping LLC, Liber 12110 ~ Page 502, N 00-32-30 E, passing over a found pipe at a distance of 45.00 feet, for a total distance of 356.25 feet to the southerly bounds of Quaker Avenue, a/k/a County Highway No. 107; **THENCE**, along the southerly bounds of Quaker Avenue, a/k/a County Highway No. 107 the following eight [8] courses and distances:

[1] N 89-35-21 E, 73.27 feet; **THENCE**,

[2] N 89-24-45 E, 106.48 feet; **THENCE**,

[3] S 89-25-35 E, 53.03 feet; **THENCE**,

[4] S 89-29-55 E, 56.13 feet; **THENCE**,

[5] S 89-29-00 E, 79.04 feet; **THENCE**,

[6] N 87-40-00 E, 20.75 feet; **THENCE**,

[7] N 77-28-00 E, 41.33 feet; **THENCE**,

[8] S 89-27-02 E, 11.10 feet to the place of beginning.

**CONTAINING** 3.793 acres more or less.

**BEARINGS** refer to North as per Deed Liber 12110 ~ Page 502.

**SUBJECT** to Right of Way and Easement for NY Telephone Company as per Deed Liber 4827 ~ Page 265.

**SUBJECT** to 20 foot wide Utility Easement as per Filed Map No. 6313.

**SUBJECT** to a Utility Easement as per Deed Liber 4543 ~ Page 1.

**SUBJECT** to a 30 foot wide Utility Easement to Central Hudson Gas & Electric Corp. as per Deed Liber 1760 ~ Page 334.

**SUBJECT** to a Pedestrial and Vehicular Traffic for Ingress and Egress and Vehicular Parking as per Deed Liber 4616 ~ Page 113.

**SUBJECT** to grants and easements of record, if any.

**THE** above description was prepared by Susan L. Plass, L.S. of **LEO J. CARROLL, P.E., L.S. & ASSOCIATES**, of Middletown, New York.



83 CEMETERY ROAD
MIDDLETOWN, NEW YORK 10940
PHONE [845] 343-7994
[914[ 443-4421
CARROLLASSOC@HOTMAIL.COM

ALL THAT CERTAIN PARCEL OF LAND, WITH THE IMPROVEMENTS ERECTED THEREON, SITUATE 19-45 QUAKER AVENUE, a/k/a COUNTY HIGHWAY No.107, TOWN OF CORNWALL, COUNTY OP ORANGE AND STATE OF NEW YORK. SAID PARCEL BEING BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING ON THE SOUTHERLY BOUNDS OF QUAKER AVENUE, a/k/a COUNTY HIGHWAY No.107 AT THE NORTHWESTERLY CORNER OF THE LANDS N/F OF BOARD OF FIRE COMMISSIONERS OF THE CANTERBURY FIRE DISTRICT, LIBER 1842~PAGE 775 AND THE NORTHEASTERLY CORNER OF THE HEREIN DESCRIBED PARCEL OF LAND.

FROM SAID POINT OF BEGINNING AND ALONG THE WESTERLY AND SOUTHERLY BOUNDS OF THE LANDS N/F OF BOARD OF FIRE COMMISSIONERS OF THE CANTERBURY FIRE DISTRICT THE FOLLOWING TWO [2] COURSES AND DISTANCES:

[1] S 00°-32'-30" W, 265.30 FEET; THENCE,

[2] S 58°-18'-40" E, 117.70 FEET TO THE WESTERLY BOUNDS OF ANGOLA ROAD, a/k/a COUNTY HIGHWAY No.9; THENCE, ALONG THE WESTERLY BOUNDS OF ANGOLA ROAD, a/k/a COUNTY HIGHWAY No.9, S 28°-06'-52" W, 49.44 FEET TO THE NORTHERLY BOUNDS OF WARREN COURT; THENCE, ALONG THE NORTHERLY BOUNDS OF WARREN COURT AND THE NORTHERLY BOUNDS OF THE LANDS N/F OF LAWRENCE P. and SANDRA K. KIRWAN, LIBER 12528~PAGE 1700, N 89°-27'-30" W, 517.85 FEET TO A FOUND PIPE ON THE EASTERLY BOUNDS OF SAID LANDS N/F OF KIRWAN: THENCE, ALONG THE EASTERLY BOUNDS OF THE LANDS N/F OF KIRWAN AND THE EASTERLY BOUNDS OF OTHER LANDS N/F OF CORNWALL SHOPPING LLC, LIBER 12110~PAGE 502, N 00°-32'-30" E, PASSING OVER A FOUND PIPE AT A DISTANCE OF 45.00 FEET, FOR A TOTAL DISTANCE OF 356.25 FEET TO THE SOUTHERLY BOUNDS OF QUAKER AVENUE, a/k/a COUNTY HIGHWAY No.107; THENCE, ALONG THE SOUTHERLY BOUNDS OF QUAKER AVENUE, a/k/a COUNTY HIGHWAY No.107 THE FOLLOWING EIGHT [8] COURSES AND DISTANCES:

[1] N 89°-35'-21" E, 73.27 FEET; THENCE,
[2] N 89°-24'-45" E, 106.48 FEET; THENCE,
[3] S 89°-25'-35" E, 53.03 FEET; THENCE,
[4] S 89°-29'-55" E, 56.13 FEET; THENCE,
[5] S 89°-29'-00" E, 79.04 FEET; THENCE,
[6] N 87°-40'-00" E, 20.75 FEET; THENCE,
[7] N 77°-28'-00" E 41.33 FEET; THENCE,
[8] S 89°-27'-02" E, 11.10 FEET TO THE PLACE OF BEGINNING.

CONTAINING 3.793 ACRES MORE OR LESS.

BEARINGS REFER TO NORTH AS PER DEED LIBER 12110~PAGE 502.

SUBJECT TO RIGHT OF WAY AND EASEMENT FOR NY TELEPHONE COMPANY AS PER DEED LIBER 4827~PAGE 265.

SUBJECT TO 20 FOOT WIDE UTILITY EASEMENT AS PER FILED MAP No. 6313.

SUBJECT TO A UTILITY EASEMENT AS PER DEED LIBER 4543~PAGE 1.

SUBJECT TO A 30 FOOT WIDE UTILITY EASEMENT TO CENTRAL HUDSON GAS & ELECTRIC CORP. AS PER DEED LIBER 1760~PAGE 334.

SUBJECT TO PEDESTRIAL AND VEHICULAR TRAFFIC FOR INGRESS AND EGRESS AND VEHICULAR PARKING AS PER DEED LIBER 4616~page 113.

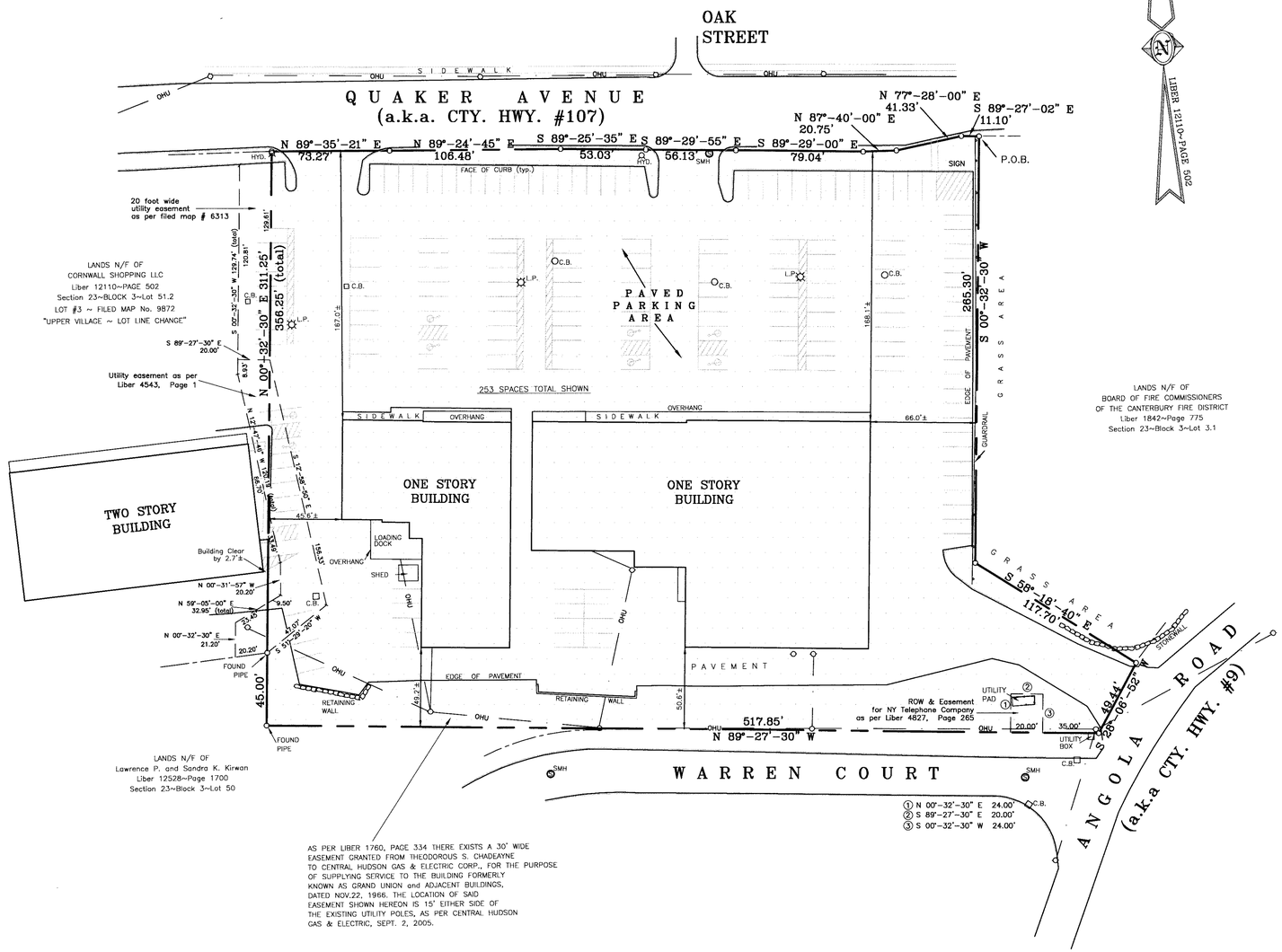
SUBJECT TO GRANTS AND EASEMENTS OF RECORD, IF ANY.

NOTES:

TAX PARCELS 4 ande 51.2 SUBJECT TO A RECIPROCAL EASEMENT FOR THE PUPRPOSES OF PEDESTRIAL and VEHICULAR TRAFFIC FOR INGRESS and EGRESS TO and FROM QUAKER AVENUE ONLY and FOR VEHICULAR PARKING, AS PER DEED LIBER 4616, PAGE 113.

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW. THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN MORE DETAIL IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT DERWEB@DEC.NY.GOV

THE ENVIRONMENTAL EASEMENT ENCOMPASSES THE ENTIRE PROPERTY: SECTION 23~BLOCK 3~LOT 4.
SITE No. C336070




SCALE 1:480

40ft 0 20ft 40ft 80ft

10m 0 5m 10m 20m

LEGEND:

- ENVIRONMENTAL EASEMENT AREA
- CONCRETE CURBING
- EDGE OF PAVEMENT
- NO PARKING AREA
- HANDICAP PARKING
- WOOD RETAINING WALL
- STONE RETAINING WALL
- OHU — OVERHEAD UTILITY LINES
- UTILITY POLE
- HYD. FIRE HYDRANT
- SMH SEWER MANHOLE
- C.B. STORM CATCH BASIN
- L.P. LIGHTPOLE

AREA:
3.793 Acres±

EASEMENT AREA:
3.793 Acres±

TAX MAP REFERENCE:
TOWN OF CORNWALL
SECTION 23~BLOCK 3~LOT 4

APRIL 17, 2015

I HEREBY CERTIFY TO CORNWALL SHOPPING LLC, STEWART TITLE INSURANCE COMPANY THAT THIS IS A TRUE AND ACCURATE SURVEY PERFORMED IN THE FIELD.

SUSAN L. PLASS, N.Y.S. Licensed Land Surveyor No. 50317

STATE OF NEW YORK SUSAN L. PLASS Licensed Land Surveyor



#2026


LEO J. CARROLL, P.E., L.S. & ASSOCIATES
83 Cemetery Rd, Middletown, NY 10940 (845) 343-7994


# PROPERTY SURVEY

CORNWALL SHOPPING LLC
19-45 QUAKER AVENUE
SITE No. C336070
TOWN OF CORNWALL
ORANGE COUNTY, NEW YORK

| REVISED: | SCALE: |
|---|---|
| 2-16-06 | 1" = 40' |
| 3-2-06 | DATE: |
| 3-11-10 | 8-30-05 |
| 10-18-11 | DRAWN: |
| 4-16-15 | J.E.S. |
| 5-11-15 | CHECKED: |
| | S.L.P. |
| | SHEET NO. |
| | 1 |

John-Patrick Curran
Direct Dial: (646) 378-7215
JPCurran@sprlaw.com

September 16, 2015

Randy Clark, Supervisor
Town of Cornwall
Town Hall
183 Main Street
Cornwall, NY 12518

Re: Environmental Easement

Dear Supervisor Clark:

Enclosed please find a copy of an environmental easement granted to the New York State Department of Environmental Conservation ("DEC") on July 14th, 2015, by Cornwall Shopping LLC, for property at 19-45 Quaker Avenue, Cornwall, Tax Map No. Section 23, Block 3, Lot 4, DEC Site No: C336070.

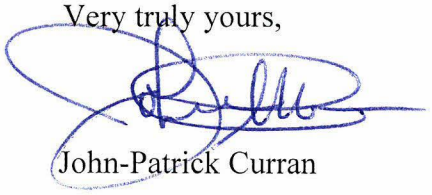
This Environmental Easement restricts future use of the above-referenced property to commercial uses. Any on-site activity must be done in accordance with the Environmental Easement and the Site Management Plan which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use.

Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

> 1. Whenever the department is granted an environmental easement, it shall provide each affected local government with a copy of such easement and shall also provide a copy of any documents modifying or terminating such environmental easement.
> 2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an environmental easement and that may relate to or impact such easement, the affected local government shall notify the department and refer such application to the department. The department shall evaluate whether the application is consistent with the environmental easement and shall notify the affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local government shall not approve the application until it receives approval from the department.

An electronic version of every environmental easement that has been accepted by this Department is available to the public at: http://www.dec.ny.gov/chemical/36045.html. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Very truly yours,



John-Patrick Curran

**SENDER: *COMPLETE THIS SECTION***

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Randy Clark, Supervisor
Town Hall
183 Mainstreet
Cornwall, NY 12518

***COMPLETE THIS SECTION ON DELIVERY***

A. Signature

X ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Certified Mail® ☐ Priority Mail Express™
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ Collect on Delivery

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7003 2260 0005 9588 0209

PS Form 3811, July 2013 Domestic Return Receipt

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

CERTIFIED MAIL™

7003 2260 0005 9588 0209

7003 2260 0005 9588 0209

**U.S. Postal Service™**
**CERTIFIED MAIL™ RECEIPT**
***(Domestic Mail Only; No Insurance Coverage Provided)***

For delivery information visit our website at www.usps.com®

OFFICIAL USE

| | |
|---|---|
| Postage | $ |
| Certified Fee | |
| Return Reciept Fee (Endorsement Required) | |
| Restricted Delivery Fee (Endorsement Required) | |
| Total Postage & Fees | $ |

Postmark Here

Sent To Randy Clark
Street, Apt. No.; or PO Box No. 183 Main St
City, State, ZIP+4 Cornwall, NY 12518

PS Form 3800, June 2002 See Reverse for Instructions

# APPENDIX 2 – LIST OF SITE CONTACTS

# SITE CONTACTS

| Name | Phone/Email Address |
|---|---|
| Owner & Remedial Party<br>Philips International Holding Corp. | 212-951-3828<br>sworth@pihc.com |
| Engineer<br>Vertex Engineering, PC | 646-553-3500<br>jdultz@vertexeng.com |
| Qualified Environmental Prof. or PE | 908-448-2627<br>Vertex Engineering, PC |
| Remedial Party Attorney<br>Sive Paget & Riesel, P.C. | 212-421-2150 |
| NYSDEC Project Manager<br>John B. Miller, P.E.<br>Division of Environmental Remediation<br>625 Broadway, 11th floor<br>Albany, NY 12233-7014 | Phone: (518) 402-9662<br>Fax: (518) 402-9679<br>John.miller@dec.ny.gov |
| NYSDEC Site Control Section Chief<br>Kelly Lewandowski | (518) 402-9553<br>Kelly.lewandowski@dec.ny.gov |
| Region 3 | http://www.dec.ny.gov/about/607.html<br>(845) 256-3000 |
| NYSDEC HW Engineer<br><br>Ed Moore | (845) 256-3137<br><br>Edward.moore@dec.ny.gov |

**TENANTS**

| Name | Mailing Address/Phone/Contact Person (if available) |
|---|---|
| Bank of America | 25 Quaker Avenue, Cornwall, New York<br>800-432-1000/Al Teetsel (Property Manager) |
| Chan's Peking | 19 Quaker Avenue, Cornwall, New York<br>845-534-7777/Zhao Lin |
| DeCiccio's Food Market | 15 Quaker Avenue, Cornwall, New York/845-534-9900 |
| Leo's Restaurant | 21 Quaker Avenue, Cornwall, New York/845-534-3446 |
| Cornwall Wash & Dry | 21 Quaker Avenue, Cornwall, New York/845-534-2243 |
| US Postal Service | 33 Quaker Avenue, Cornwall, New York<br>845-534-9801/Bob Donnelly (Postmaster Manager) |
| Anytime Fitness | 29 Quaker Avenue, Cornwall, New York/845-534-7016 |

## ADJACENT PROPERTIES

| Name | Mailing Address/Phone/Contact Person (if available) |
|---|---|
| CVS | 29 Quaker Avenue, Cornwall, New York 845-534-2506/ Christine (Store Manager) |
| Highland Engine Co. | 1 Quaker Avenue, Cornwall, New York 845-534-9550 |
| Woody's Burgers & Fries | 30 Quaker Avenue, Cornwall, New York 845-534-1111 |
| Subway | 55 Quaker Avenue, Suite 106, Cornwall, New York 845-534-4012 |
| Sakura | 55 Quaker Avenue, Suite 101, Cornwall, New York 845-534-3386 |
| Fashion Boutique | 55 Quaker Avenue, Cornwall, New York 845-534-1288 |
| Wasabi Sesame | 55 Quaker Avenue, Suite 101, Cornwall, New York 845-534-3488 |
| Golden Dollar | 55 Quaker Avenue, Suite 104, Cornwall, New York 845-534-0470 |
| Cornwall Wines & Spirits | 45 Quaker Avenue, Suite 102, Cornwall, New York 845-534-5140 |
| Dunkin' Donuts | 45 Quaker Avenue, Cornwall, New York 845-534-4300 |
| Main Street Cutters Salon | 45 Quaker Avenue, Suite 201, Cornwall, New York/845-534-2278/Melanie Antonelli (Owner) |
| Touch of Gold | 45 Quaker Avenue, Suite 101, Cornwall, New York/845-534-3333/Ann Palmerone |
| World Wide Travel | 45 Quaker Avenue, Suite 103, Cornwall, New York/845-534-4333/Lucy or Nancy Gillmiere |
| UFC Aerospace | 45 Quaker Avenue, Suite 203, Cornwall, New York/845-534-0530 |
| Encore Consignment Shop | 45 Quaker Avenue, Suite 10, Cornwall, New York/845-458-8313 |
| Artrip & Webber Law Firm | 45 Quaker Avenue, Suite 208, Cornwall, New York/845-534-2968 |
| Donna Cornell & Co. | 45 Quaker Avenue, Cornwall, New York 845-565-0088 |
| Horizon Family Medical Group | 45 Quaker Avenue, Suite 202, New York 845-534-9590 |

# APPENDIX 3 – BORING LOGS AND MONITORING WELL CONSTRUCTION LOGS

| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-1R (R = Replacement)<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter galvanized steel<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: November 13, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 8-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter galvanized steel<br>SETTING: 0-10 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 7-8 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 49.69 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2 by 2 concrete pad with 8-inch manhole | DURATION: N/A YIELD: N/A |
| REMARKS: * Sample sent to laboratory for analysis (1 soil sample only). | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 12-50/4 | .50 | 0.00 | SILT; trace gravel, moist, gray/brown, no odor. |
| 7 | 9 | SS | | .50 | 0.00 | SILT; fractured rocks, moist, gray, no odor. |
| 9 | 11 | SS | 9-17-26-53 | .50 | 0.00 | SILT; fractured rocks, moist, gray, no odor. |
| * Tough drilling - 11 to 15 ft bg. | | | | | | |
| 15 | 17 | SS | 50/5 | 0 | --- | No recovery. Sluff silt, rock in tip of spoon, moist, gray. |
| *18 | 20 | SS | 9-33-50/4 | 1.00 | 0.00 | SILT; some gravel, fractured rocks, black/brown, moist to saturated in tip of spoon, gray and brown, no odor. |
| | 20 | | | | | End boring. Close to auger refusal. |
| | | | | | | |
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September 4, 2008

| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-1B (bedrock well)<br>PAGE: 1 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: May 1, 2009 - casing | SAND PACK SIZE & TYPE:<br>SETTING: |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 4-inch diameter black steel |
| DRILLING METHOD: 6 1/4-inch hollow-stem auger/ roller bit | SETTING: 0 - 18 ft bg |
| SAMPLING METHOD: N/A / Cuttings | SEAL TYPE: Bentonite grout |
| OBSERVER: Michael K. De Felice | SETTING: 0 - 18 ft bg |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: |
| ELEVATION OF TOC: 49.79 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: 2 x 2 concrete pad with 8-inch manhole | DURATION: YIELD: |
| REMARKS: | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | | | | FILL; some sand, cobbles, dry, no odor. |
| 5 | 8 | | | | | AUGERS to 8 ft bg; sand; some cobbles; some silt, moist, no odor. |
| 8 | 18 | | | | | Roller bit through some hard subsurface, probably a boulder, bedrock at approximately 15 ft bg, socket to 18-2 ft socket. |
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December 17, 2009
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-1B (bedrock well)<br>PAGE: 2 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch PVC well screen<br>SLOT NO.: 20 SETTING: 18 - 35 ft bg |
| DATE COMPLETED: May 4, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 17 - 35 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: grade - 18 ft bg |
| DRILLING METHOD: Rotary air hammer ( 3 7/8") | |
| SAMPLING METHOD: N/A | SEAL TYPE: Bentonite<br>SETTING: 16 - 17 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 49.79 | STATIC WATER LEVEL: |
| STICK-UP: — | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: 4-inch steel casing 0-18 ft bg, grouted in place. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 15 | 18 | | | | | Air hammer creates rock socket for 4-inch steel casing. |
| 18 | 35 | | | | | Use air rotary to create open rock hole. |
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December 17, 2009

| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-2B (overburden portion)<br>PAGE: 1 OF 2 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: Boring/sampling<br>November 14, 2007 | SAND PACK SIZE & TYPE: |
| DRILLING COMPANY: ADT<br>Troy, New York | SETTING: |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | CASING SIZE & TYPE:<br>SETTING: |
| SAMPLING METHOD: Split spoon | SEAL TYPE: |
| OBSERVER: M. K. De Felice | SETTING: |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 47.98 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: Hole | DURATION: N/A YIELD: N/A |
| REMARKS: * Sample sent to laboratory for analysis. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 7-50/4 | .25 | 0.00 | SILT; trace gravel, dry, gray, no odor. |
| 7 | 9 | SS | 9-50/5 | <.25 | 0.00 | SILT; trace clay, trace gravel, dry, gray, no odor. |
| 9 | 11 | SS | 9-14-22-16 | 1.25 | 0.00 | SILT; trace clay, moist, gray, no odor. |
| *11 | 13 | SS | 3-9-7-11 | 1.50 | 0.00 | SILT; trace clay, saturated, ray, no odor. |
| *13 | 15 | SS | 14-5-7-9 | 1.75 | 0.00 | SAND; fine, some silt, saturated, brown, no odor. |
| | | | | | | 18 ft bg close to auger refusal. |
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September 4, 2008
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-2B (bedrock portion)<br>PAGE: 2 OF 2 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter Sch 40 PVC<br>SLOT NO.: 20 SETTING: 26-42 ft bg |
| DATE COMPLETED: November 29, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 26-42 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter Sch 40 PVC<br>SETTING: 0-27 ft bg |
| DRILLING METHOD: Rotary air hammer (3 7/8") | |
| SAMPLING METHOD: N/A | SEAL TYPE: Bentonite<br>SETTING: 25-26 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 47.98 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2-foot by 2-foot concrete pad with 8-inch manhole | DURATION: N/A YIELD: N/A |
| REMARKS: 4-inch steel casing 0-26 ft bg (8 feet into rock) grouted in place. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 18 | 22 | | | | | Augers and rotary air hammer advanced into bedrock. |
| 22 | 26 | | | | | Air hammer creates rock socket for 4-inch steel casing. |
| 26 | 42 | | | | | Used 3 7/8-inch air hammer to create open rock hole. |
| | 42 | | | | | End of boring. |
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September 4, 2008
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-3B (bedrock portion)<br>PAGE: 2 OF 2 |
|---|---|
| SITE LOCATION: Cornwall Plaza, Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter Sch 40 PVC<br>SLOT NO.: 20 SETTING: 27-37 ft bg |
| DATE COMPLETED: November 26 and 29, 2007 | SAND PACK SIZE & TYPE: #2 filter |
| DRILLING COMPANY: ADT, Troy, New York | SETTING: 26-37 ft bg |
| | CASING SIZE & TYPE: 2-inch diameter sch. 40 PVC |
| DRILLING METHOD: Air hammer (3 7/8") | SETTING: 0-27 ft bg |
| SAMPLING METHOD: N/A | SEAL TYPE: Bentonite |
| OBSERVER: M. K. De Felice | SETTING: 25-26 ft bg |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 48.27 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2-foot x 2-foot concrete pade with 8-inch manhole | DURATION: N/A YIELD: N/A |
| REMARKS: 4-inch diameter steel casing from 0-27 ft bg (10 feet into rock) grouted in place. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 17.5 | 27 | | | | | Air hammer creates rock socket for 4-inch steel casing. |
| 27 | 37 | | | | | Used 3 7/8-inch air hammer to create open rock hole. |
| | 37 | | | | | End of boring. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-3B (overburden portion)<br>PAGE: 1 OF 2 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: November 14, 2007<br>Soil boring and sampling | SAND PACK SIZE & TYPE:<br>SETTING: |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE:<br>SETTING: |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE:<br>SETTING: |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: |
| ELEVATION OF TOC: 48.27 | STATIC WATER LEVEL: |
| STICK-UP: N/A | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: 2-foot by 2-foot concrete pade with 8-inch manhole | DURATION: YIELD: |
| REMARKS: * Sample sent to laboratory for analysis (1 soil sample only). | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 3-4-50/5 | .75 | 0.00 | FILL; some silt, some gravel, dry, brown, no odor. |
| 7 | 9 | SS | 7-50/4 | .25 | 0.00 | |
| 8.5 ft bg tough drilling - grinding - auger refusal at 8 ft bg - move rig and try again - 2 feet back and redrill to 10 ft bg. | | | | | | |
| *10 | 12 | SS | 8-9-9-15 | .50 | 0.00 | SILT; trace clay, trace gravel, saturated, gray, no odor. |
| *15 | 17 | SS | 14-50/4 | .50 | 0.00 | SILT AND GRAVEL; trace clay, saturated, gray, no odor. |
| | | | | | | Auger refusal at 17.5. |
| | | | | | | |

dmd
September 4, 2008
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-4<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter galvanized steel<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: November 13, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 8-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter galvanized steel<br>SETTING: 0-10 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 7-8 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 48.48 | STATIC WATER LEVEL: |
| STICK-UP: N/A | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: 2 by 2 concrete pad with 8-inch diameter manhole | DURATION: YIELD: |
| REMARKS: *Ground-water interface • Sample to laboratory. Water at approximately 12.5 ft bg. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 8-11-13-13 | 1.25 | 0.0 | SILT; trace clay, trace fill (sand and gravel) moist, gray, no odor. |
| 7 | 9 | SS | 9-14-50/4 | .75 | 0.00 | Debris (wood); trace silt, gray, no odor, very little recovery due to presence of wood at tip of spoon. |
| 9 | 11 | SS | 11-17-31-34 | 1.00 | 0.00 | SILT; some clay, some fracturd rock, some gravel, saturation observed at tip of spoon, moist throughout, gray, no odor. |
| •*11 | 13 | SS | 11-12-18-22 | 1.25 | 5.6 | SILT; trace fractured rocks, saturated, brown/ gray, no odor. |
| •13 | 15 | SS | 6-11-12-15 | 1.50 | 2.0 | SILT; fractured rock in tip of spoon, saturated, brown, no odor. |
| 18 | 20 | SS | 14-50/3 | .50 | 0.00 | SILT and fractured rocks, saturated, brown, no odor. |
| | 20 | | | | | End boring. |

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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-5<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter galvanized steel<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: November 14, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 8-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter galvanized steel<br>SETTING: 0-10 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 7-8 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 49.92 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2-foot by 2-foot concrete pad with 8-inch diameter manhole | DURATION: N/A YIELD: N/A |
| REMARKS: * Sample to laboratory for analysis. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 8-18-32-50/3 | 1.25 | 0.00 | SILT; some gravel, trace clay, dry, brown, no odor. |
| 7 | 9 | SS | 11-17-50/4 | 0 | --- | No recovery in spoon, very little soil in tip of spoon. 0.00 on PID - silt, some gravel, moist, brown, no odor. |
| 9 | 11 | SS | 8-25-32-27 | 1.50 | 0.00 | SILT AND GRAVEL; moist, brown-gray at tip of spoon, no odor. |
| *11 | 13 | SS | 6-4-8-18 | .50 | 0.00 | SILT AND GRAVEL; trace clay, saturation observed in sections of sample, moist throughout, brown-gray, no odor. |
| *15 | 17 | SS | 8-16-23-50/4 | .50 | 0.00 | SILT AND GRAVEL; trace clay, saturated, brown-gray, no odor, tough drill at this depth - advance to 20 ft bg. |
| | 20 | | | | | End boring - auger refusal. |

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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-6<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter galvanized steel<br>SLOT NO.: 20 SETTING: 6-16 ft bg |
| DATE COMPLETED: November 15, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 4-16 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter galvanized steel<br>SETTING: 0-6 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 3-4 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 47.20 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2-foot by 2-foot concrete pad with 8-inch diameter manhole | DURATION: N/A YIELD: N/A |
| REMARKS: 10-12 and 12-14 soil sampled submitted to laboratory for analysis. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 20-10-9-14 | .75 | 0.00 | SILT; some gravel, moist, brown, no odor. |
| *10 | 12 | SS | 4-4-4-4 | .75 | 0.00 | SILT, trace clay, moist to saturated at tip of spoon, gray, no odor. |
| *12 | 14 | SS | 8-9-17-8 | | | SILT and fine sand, thick clay, saturated, gray, no odor. |
| | 16 | | | | | End of boring. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-6B<br>PAGE: 1 OF 1 | |
|---|---|---|---|
| SITE LOCATION: | Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter sch. 40 PVC<br>SLOT NO.: 20 SETTING: 25-45 ft bg | |
| DATE COMPLETED: | November 15 and 29, 2007 | SAND PACK SIZE & TYPE: #2 filter | |
| DRILLING COMPANY: | ADT<br>Troy, New York | SETTING: | 24-45 ft bg |
| | | CASING SIZE & TYPE: | 2-inch diameter sch. 40 PVC |
| DRILLING METHOD: | 6 1/4-inch hollow stem auger/<br>rotary air hammer | SETTING: | 0-25 |
| SAMPLING METHOD: | N/A | SEAL TYPE: | Bentonite |
| OBSERVER: | M. K. De Felice | SETTING: | 23-24 ft bg |
| REFERENCE POINT (RP): | Grade | BACKFILL TYPE: | Cuttings |
| ELEVATION OF TOC: | 46.80 | STATIC WATER LEVEL: | N/A |
| STICK-UP: | N/A | DEVELOPMENT METHOD: | N/A |
| SURFACE COMPLETION: | 2 by 2 concrete pad with<br>8-inch manhole | DURATION: N/A | YIELD: N/A |
| REMARKS: | 28 ft of 4-inch diameter steel casing set and grouted in rock. | | |
| ABBREVIATIONS: | SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | | |

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 20 | | | | | 6 1/4-inch hollow-stem auger and rotary air hammer. |
| 20 | 28 | | | | | 4 7/8-inch roller bit to create rock socket for 4-inch steel casing. |
| 28 | 45 | | | | | 3 7/8-inch air hammer to create open rock hole. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-7<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch sch. 40 pvc<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: November 12, 21 and 26, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 8-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch sch. 40 PVC<br>SETTING: 0-10 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 7-8 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 47.29 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 2-foot by 2-foot concrete pad with 8-inch manhole | DURATION: N/A YIELD: N/A |
| REMARKS: Note: 12.5 feet of 4-inch diameter steel casing set 0-12.5 ft bg. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 5 | 7 | SS | 4-4-4-5 | .75 | 0.00 | SILT; some clay, trace gravel, moist, gray, no odor. |
| 7 | 9 | SS | 9-12-29-50/3 | 1.00 | 0.00 | SILT; some clay, trace gravel, moist, gray, no odor. |
| | 10 | | | | | Auger refusal, set 4-inch steel casing, grouted in place |
| 10 | 13 | c | | | | run air hammer, cuttings are shale fragments, rounded coarse gravel of various geologies, silt. hole making water. hole colapsing upon withdrawl of hammer. |
| 10 | 20 | | | | | use 3-inch drive & wash casing and 2 7/8-inch roller bit to hold boring open. set 2-inch PVC well screen from 10-20 then removed 3-inch D&W casing |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-8<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter sch 40 PVC<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: November 12, 20 and 28, 2007 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 8-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch diameter galvanized steel<br>SETTING: 0-10 ft bg |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 7-8 ft bg |
| OBSERVER: M. K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 48.24 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: | DURATION: N/A YIELD: N/A |
| REMARKS: Note: 10 feet of 4-inch diameter casing from grade to 10 ft bg. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 10-12-14-16 | 1.25 | 0.00 | SILT; some clay, trace gravel (<.25 inch diameter) moist, gray, no odor. |
| 7 | 9 | SS | 23-32-50/5 | .50 | 0.00 | SILT; trace clay, fractured rocks in tip of spoon, dry, no odor. |
| 10 | 12 | SS | 17-50/3 | .75 | 0.00 | Fractured rock; dry, no sample. |
| | | | | | | Auger refusal at 12 ft bg - no ss. |
| 12 | 17 | | | | | Air hammer. |
| | 17 | | | | | Significant water entering boring, borehole collapsing. |
| 17 | 20 | | | | | Drive and wash 3-inch steel casing (later withdrawn). |
| | 20 | | | | | End of boring. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping LLC<br>WELL NO.: MW-9<br>PAGE: 1 OF 1 |
|---|---|
| SITE LOCATION: Cornwall Plaza<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch diameter sch 40 PVC<br>SLOT NO.: 20 SETTING: 9-19 ft bg |
| DATE COMPLETED: November 12, 20 and 28, 2007 | SAND PACK SIZE & TYPE: #2 filter |
| DRILLING COMPANY: ADT<br>Troy, New York | SETTING: 7-19 ft bg<br>CASING SIZE & TYPE: 2-inch diameter sch. 40 PVC |
| DRILLING METHOD: 4 1/4-inch hollow-stem auger | SETTING: 0-9 ft bg |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite |
| OBSERVER: M. K. De Felice | SETTING: 6-7 ft bg |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 47.98 | STATIC WATER LEVEL: N/A |
| STICK-UP: N/A | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: Cuttings | DURATION: N/A YIELD: N/A |
| REMARKS: 9 feet of 4-inch diameter casing. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | 7 | SS | 9-14-50/5 | .50 | 0.00 | SILT; some clay, some gravel, some fractured rock, moist, gray, no odor. |
| 7 | 9 | SS | 50/3 | .25 | 0.00 | (7.25 ft bg) fractured rock, dry, no odor, no sample. |
| | | | | | | Refusal - 7.5 ft bg. |
| 9 | 19 | C | | | | Run 3 7/8-inch air hammer. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-10 (overburden well)<br>PAGE: 1 OF 1 PAGE |
|---|---|

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|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch PVC slotted<br>SLOT NO.: 20 SETTING: 10-20 ft bg |
| DATE COMPLETED: May 8, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 9-20 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: Grade-10 ft bg |
| DRILLING METHOD: Hollow-stem auger | |
| SAMPLING METHOD: Cuttings | SEAL TYPE: Bentonite<br>SETTING: 8-9 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 45.75 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: Very tough drilling, many cobbles | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | --- | --- | 0.0 | FILL material, small cobbles, brown, moist, no odor. |
| 5 | 20 | --- | --- | --- | --- | Hammer and augers used to advance boring, very rocky and slow drilling. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: Proposed MW-10B (no well installed)<br>PAGE: 1 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: April 27, 2009 - casing / well bore | SAND PACK SIZE & TYPE:<br>SETTING: |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 4-inch diameter black steel |
| DRILLING METHOD: 6 1/4-inch hollow-stem auger | SETTING: 0 - 17 ft bg (~2' socket) |
| SAMPLING METHOD: N/A | SEAL TYPE: Grout around steel casing |
| OBSERVER: Michael K. De Felice | SETTING: 2 - 17 feet |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: --- | STATIC WATER LEVEL: N/A |
| STICK-UP: --- | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: 8-inch manhole in 2 foot by 2 foot by 6 inch concrete pad | DURATION: N/A YIELD: N/A |
| REMARKS: Hand-cleared borehole location to 5 ft bg | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | --- | --- | --- | ROCK FRAGMENTS; sand and silt, fill, rocks, boulders, gravel, dry, no odor. |
| 5 | 10 | C | --- | --- | --- | AUGER with roller bit combo through 5-10 ft bg - boulders in subsurface. Augers set at 8 ft bg will not advance unless predrilled with roller bit. |
| 10 | 15 | C | | | | Roller bit; shale fragments observed in cuttings at approximately 14 ft bg. |
| 15 | 17 | | | | | Roller bit to 17 ft bg for 2 foot socket - shale cuttings observed. Ran augers to 15 ft bg to prevent hole from collapse while setting casing. No soil sample collected. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: Proposed MW-10B (no well installed)<br>PAGE: 2 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: N/A<br>SLOT NO.: N/A SETTING: N/A |
| DATE COMPLETED: May 12, 2009 | SAND PACK SIZE & TYPE: N/A<br>SETTING: N/A |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: N/A<br>SETTING: N/A |
| DRILLING METHOD: Air rotary hammer (3 7/8") | |
| SAMPLING METHOD: --- | SEAL TYPE: N/A<br>SETTING: N/A |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: N/A |
| ELEVATION OF TOC: | STATIC WATER LEVEL: N/A |
| STICK-UP: --- | DEVELOPMENT METHOD: N/A |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: N/A YIELD: N/A |
| REMARKS: 4-inch steel casing, 0-17 ft bg, grouted in place | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 17 | | | | | Air hammer creates rock socket of 2 feet.<br>15-17 ft bg for 4-inch steel casing. |
| 17 | | | | | | Well collapsed in on itself at 17 ft bg. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-11 (overburden well)<br>PAGE: 1 OF 1 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch slotted PVC<br>SLOT NO.: 20 SETTING: 5.5-15.5 ft bg |
| DATE COMPLETED: May 6, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 4.5-15.5 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: grade-5.5 ft bg |
| DRILLING METHOD: Hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 3-4.5 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 44.23 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: Sampled 9-11 feet at 1340; water at 9-11 ft bg. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 9 | C | --- | --- | 0.0 | SILT and fine sand, moist, gray, no odor. |
| 9 | 11 | SS | --- | 1 | 0.0 | SILT and fine sand, small cobbles, gray, saturated, no odor. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-11B (bedrock well)<br>PAGE: 1 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: April 29, 2009 - casing/well | SAND PACK SIZE & TYPE:<br>SETTING: |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE:<br>SETTING: |
| DRILLING METHOD: Hollow-stem auger/roller bit | |
| SAMPLING METHOD: N/A | SEAL TYPE:<br>SETTING: |
| OBSERVER: Michael K. De Felice | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: |
| ELEVATION OF TOC: 44.25 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | --- | --- | 0.00 | BOULDERS and cobbles; some sand, dry, no odor. |
| 5 | 10 | --- | --- | --- | --- | Roller bit and augers - cuttings. Silt; some sand, some cobbles, gray, dry, no odor. |
| 10 | 22 | --- | --- | --- | --- | Roller bit; competent bedrock from 19-22; 3 foot socket, 22 foot casing. |
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December 17, 2009

| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-11B (bedrock well)<br>PAGE: 2 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch PVC well screen<br>SLOT NO.: 20 SETTING: 22-37 ft bg |
| DATE COMPLETED: May 5, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 21-27 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: 0-22 ft bg |
| DRILLING METHOD: Air rotary (3 7/8") | |
| SAMPLING METHOD: N/A | SEAL TYPE: Bentonite<br>SETTING: 20-21 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 44.25 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: 4-inch steel casing 0-22 ft bg, grouted in place. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 22 | | | | | Air hammer creates rock socket 19-22 ft bg for 4-inch steel casing. |
| 22 | 37 | | | | | Use air rotary to create open rock hole. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-12 (overburden well)<br>PAGE: 1 OF 1 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch slotted PVC well screen<br>SLOT NO.: 20 SETTING: 5-15 ft bg |
| DATE COMPLETED: May 6, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 4-15 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: grade-5 ft bg |
| DRILLING METHOD: Hollow-stem auger | |
| SAMPLING METHOD: Split spoon | SEAL TYPE: Bentonite<br>SETTING: 3-4 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Cuttings |
| ELEVATION OF TOC: 44.62 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: Sampled 9-11 feet at 0900; water at 9-11 ft bg. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | --- | --- | 0.0 | FILL, cobbles, brown to gray, moist, no odor. |
| 5 | 7 | SS | --- | 1 | 0.0 | FINE sand and silt, brown to gray, moist, no odor. |
| 7 | 9 | SS | --- | 1 | 0.0 | FINE sand and silt, gray, moist, no odor. |
| 9 | 11 | SS | --- | 2 | 0.0 | SILT and fine sand, gray, saturated, no odor. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-12B (bedrock well)<br>PAGE: 1 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE:<br>SLOT NO.: SETTING: |
| DATE COMPLETED: April 30, 2009 - casing / well | SAND PACK SIZE & TYPE:<br>SETTING: |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 4-inch diameter black steel |
| DRILLING METHOD: Hollow-stem auger/roller bit | SETTING: 0 - 22 ft bg |
| SAMPLING METHOD: N/A / Cuttings | SEAL TYPE: Bentonite grout |
| OBSERVER: Michael K. De Felice | SETTING: 0 - 22 ft bg |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: |
| ELEVATION OF TOC: 44.40 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | --- | --- | --- | FILL; some sand, some boulders/cobbles; dry, brown, no odor. |
| 5 | 10 | C | --- | --- | --- | SAND; some cobbles, some silt, augers advance to 15 ft bg - roller bit ahead of augers to approximately 20 ft bg. |
| 10 | 20 | | | | | Alternate between augers and roller bit, augers to 20 ft bg, roller bit to 22 ft bg. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-12B (bedrock well)<br>PAGE: 2 OF 2 PAGE |
|---|---|
| SITE LOCATION: Cornwall Fire Department<br>Quaker Avenue<br>Cornwall, New York | SCREEN SIZE & TYPE: 2-inch PVC well screen<br>SLOT NO.: 20 SETTING: 20-40 ft bg |
| DATE COMPLETED: May 5, 2009 | SAND PACK SIZE & TYPE: #2 filter<br>SETTING: 19-40 ft bg |
| DRILLING COMPANY: ADT<br>Troy, New York | CASING SIZE & TYPE: 2-inch PVC<br>SETTING: grade-20 ft bg |
| DRILLING METHOD: Air rotary hammer (3 7/8") | |
| SAMPLING METHOD: --- | SEAL TYPE: Bentonite<br>SETTING: 18-19 ft bg |
| OBSERVER: Brian Hawe | |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 44.40 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: 4-inch steel casing, 0-22 ft bg, grouted in place. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 22 | | | | | Air hammer creates rock socket for 4-inch steel casing. |
| 22 | 40 | | | | | Use air rotary to create open rock hole. |
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| GEOLOGIC LOG<br>LEGGETTE, BRASHEARS & GRAHAM, INC.<br>WHITE PLAINS, NEW YORK | OWNER: Cornwall Shopping, LLC<br>WELL NO.: MW-13 (overburden well)<br>PAGE: 1 OF 1 PAGE |
|---|---|
| SITE LOCATION: Intersection of Oak Street and Quaker Avenue, Cornwall, New York | SCREEN SIZE & TYPE: 2-inch PVC well screen<br>SLOT NO.: 20 SETTING: 5-20 ft bg |
| DATE COMPLETED: May 12, 2009 | SAND PACK SIZE & TYPE: #2 filter |
| DRILLING COMPANY: ADT, Troy, New York | SETTING: 4-20 ft bg |
| | CASING SIZE & TYPE: 2-inch PVC riser |
| DRILLING METHOD: Hollow-stem auger and air hammer | SETTING: grade-5 ft bg |
| SAMPLING METHOD: Cuttings | SEAL TYPE: Bentonite |
| OBSERVER: Brian Hawe | SETTING: 3-4 ft bg |
| REFERENCE POINT (RP): Grade | BACKFILL TYPE: Sand |
| ELEVATION OF TOC: 47.68 | STATIC WATER LEVEL: |
| STICK-UP: --- | DEVELOPMENT METHOD: |
| SURFACE COMPLETION: Manhole in concrete pad | DURATION: YIELD: |
| REMARKS: Water at approximately 12 feet and rising. Auger refusal at 20 feet. | |
| ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube<br>MC = Macrocore REC = Recovery PPM = parts per million | |

| DEPTH (FEET) FROM | DEPTH (FEET) TO | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0 | 5 | C | --- | --- | 0.0 | FINE sand and silt, some clay, brown to gray, moist, no odor. |
| 5 | 10 | C | --- | --- | --- | FINE sand and silt, some clay, brown to gray, moist, no odor. |
| 10 | 20 | C | --- | --- | 0.0 | Hammer/augers used to advance borings. Fine sand and silt, cobbles, gray, saturated, no odor. |
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December 17, 2009
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|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 8'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-1<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | | NA | | | | Gray/olive brown silt with some angular medium to coarse gravel | |
| 2 | | | 42" | 0 | | | |
| 3 | SB-1_3-3.5 | | | | | Gray/olive brown silt, trace gravel | |
| 4 | | | | | | Gray/olive brown silt, trace gravel, wet | |
| 5 | | | | | | | |
| 6 | | | 42" | 0 | | Brown silt with some subangular to subrounded gravel, moist | |
| 7 | | | | | | | |
| 8 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level
bgs - below ground surface
PID - photoionization detector
ppm - parts per million

Project: BB014860.0000
Date: 11/18/2010

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Data File: G:\Client\Tannenbaum\Cornwall Plaza, NY\Boring Logs

**Date Start/Finish:** 8/12/2010
**Drilling Company:** Hawk Drilling
**Driller's Name:** Andrew
**Drilling Method:** Direct Push GeoProbe

**Sampler Size:** 2 inch

**Northing:** N/A
**Easting:** N/A
**Surface Elevation:** N/A

**Boring Depth:** 8'

**Description By:** Casey Pringle

**Well/Boring ID:** SB-2

**Client:** Cornwall Shopping LLC

**Location:** Cornwall Plaza
Quaker Avenue
Cornwall, New York

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | SB-2_1-1.5 | NA | 48" | 0 | | Gray/olive brown silt with some angular gravel, brick fragments @ 1.2'-1.5' | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | Black/dark brown organic silt, moist | |
| 5 | SB-2_4.5-5 | | 42" | 0 | | Gray/brown clayey silt, low plasticity, wet | |
| 6 | | | | | | | |
| 7 | | | | | | Gray/brown clayey silt, high plasticity, wet | |
| 8 | | | | | | | |
| 9 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level
bgs - below ground surface
PID - photoionization detector
ppm - parts per million

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|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 12'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-3<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | | NA | | | | Brown/dark olive brown, silty fine sand with some angular to rounded, fine to medium gravel, moist | |
| 2 | SB-3_1.5-2 | | 48" | 0 | | Brown silt, trace gravel, dry | |
| 3 | | | | | | White/gray angular rock | |
| 4 | | | | | | Brown silt, trace gravel, dry | |
| 5 | | | | | | Brown silt, trace gravel, moist | |
| 6 | | | 36" | 0 | | | |
| 7 | | | | | | | |
| 8 | | | | | | Dark brown clayey silt, organic-like, moist | |
| 9 | SB-3_9-9.5 | | | | | Dark brown clayey silt, organic-like, medium plasticity, moist | |
| 10 | | | 48" | 0 | | Gray clayey silt, medium plasticity, moist | |
| 11 | SB-3_ 10.5-11 | | | | | Silty clay, medium plasticity, wet | |
| 12 | | | | | | | |
| 13 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

| | | |
|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 10'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-4<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | | NA | | | | Brown/Dark brown silty fine sand with fine-medium gravel | |
| 2 | | | 48" | 0 | | Gray/olive brown silt with trace medium-coarse gravel | |
| 3 | | | | | | | |
| 4 | | | | | | Gray/brown subangular, medium to coarse gravel with silt | |
| | | | | | | Gray/brown subangular, medium to coarse gravel with more silt | |
| 5 | | | | | | Light brown silt with some angular medium to coarse gravel | |
| 6 | SB-4_5.5-6 | | 48" | 0 | | Gray olive/brown silt with trace gravel<br>Orange brown silt, with some angular medium to coarse gravel | |
| 7 | | | | | | Orange brown silt, with some angular medium to coarse gravel with wood fragments (root or branch) | |
| 8 | | | | | | Dark brown clayey silt, medium plasticity | |
| | | | | | | Gray clayey silt, medium plasticity | |
| 9 | | | 24" | 0 | | Gray clayey silt, medium plasticity, moist | |
| 10 | SB-4_9.5-10 | | | | | Refusal at 10' | |
| 11 | | | | | | | |
| 12 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

Project: BB014860.0000
Date: 11/18/2010

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|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 6'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-5<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | SB-5_1-1.5 | NA | 48" | 0 | | Light brown/olive-gray silt with some medium to coarse angular gravel | |
| 2 | | | | | | | |
| 3 | | | | | | Gray/olive clayey silt, trace gravel | |
| 4 | | | | | | Light brown silt, moist | |
| 5 | | | 24" | 0 | | Refusal at 6' | |
| 6 | SB-5 5.5-6 | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

Project: BB014860.0000
Date: 11/18/2010

Template: G:/GeoScience/LOGPLOT/ARCADIS LOG TEMPLATES
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|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 12'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-6<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt/debris | |
| 1 | | NA | | | | Light brown to olive gray silt with some medium to coarse angular gravel, dry | |
| 2 | SB-6_2-2.5 | | 42" | 0 | | | |
| 3 | | | | | | Olive gray/brown silt, trace gravel, moist | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | 42" | 0 | | | |
| 7 | | | | | | Gray clayey silt, moist at 8' | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | SB-6_9.5-10 | | 48" | 0 | | | |
| 11 | | | | | | Silty clay, wet. | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
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ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level
bgs - below ground surface
PID - photoionization detector
ppm - parts per million

Project: BB014860.0000
Date: 11/18/2010

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|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 7'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-7<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | | NA | | | | Brown silty fine sand, with some medium to coarse gravel, moist | |
| 2 | SB-7_1.5-2 | | 48" | 0 | | Brown/olive gray clayey silt, trace gravel, high plasticity. | |
| 3 | | | | | | | |
| 4 | | | | | | Brown organic clayey silt, moist | |
| 5 | | | | | | | |
| 6 | SB-7_6-6.5 | | 36" | 0 | | Gray clayey silt, high plasticity, more moist. | |
| 7 | | | | | | Refusal at 7' | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
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| 20 | | | | | | | |

ARCADIS
infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

| | | |
|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 7.9'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-8<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | SB-8_0.5-1 | NA | | | | Light brown silt with some gravel, dry | |
| 2 | | | 48" | 0 | | Gray silt with some gravel, high plasticity, large gray rock @ 4 ft, wet @ bottom of boring. | |
| 3 | | | | | | Refusal at 7.9' | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | 48" | 0 | | | |
| 7 | | | | | | | |
| 8 | SB-8_7.5-8 | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
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| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

| | | |
|---|---|---|
| **Date Start/Finish:** 8/12/2010<br>**Drilling Company:** Hawk Drilling<br>**Driller's Name:** Andrew<br>**Drilling Method:** Direct Push GeoProbe<br><br>**Sampler Size:** 2 inch | **Northing:** N/A<br>**Easting:** N/A<br>**Surface Elevation:** N/A<br><br>**Boring Depth:** 4'<br><br>**Description By:** Casey Pringle | **Well/Boring ID:** SB-9<br><br>**Client:** Cornwall Shopping LLC<br><br>**Location:** Cornwall Plaza<br>Quaker Avenue<br>Cornwall, New York |

| DEPTH | Sample | Blow Counts | Recovery (inches) | PID Headspace (ppm) | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt | |
| 1 | SB-9_0.5-1 | NA | | | | Brown silty fine sand,with trace gravel | |
| 2 | | | 48" | 0 | | Gray angular - subangular rock<br>Brown silt, with medium to coarse gravel | |
| 3 | | | | | | Gray silt, with medium to coarse gravel | |
| 4 | SB-9 3.5-4 | | | | | Refusal at 4' | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
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| 13 | | | | | | | |
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| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

ARCADIS
Infrastructure, environment, buildings

**Remarks:** amsl - above mean sea level

bgs - below ground surface

PID - photoionization detector

ppm - parts per million

**BORING LOG**

LFR
LEVINE • FRICKE
ENVIRONMENTAL ENGINEERS AND CONSULTANTS
194 FORBES ROAD
BRAINTREE, MASSACHUSETTS 02184
*phone* (781) 356-7300 *fax* (781) 356-2211

Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B-1
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | |
| | S-1 | 60/50 | 0-5 | NA | 76 | Top 4" asphalt. Lt. olive brown f/SAND and Silt; some f/Gravel; trace (+) Clay. Some oxidizing. No staining/odor. | Asphalt | Temporary monitoring well |
| 5 | | | | | | | Fill | 0-10ft |
| | | | | | | Top 3-ft. Lt. olive f/SAND; trace wood fragments. Bottom 2-ft. SILT and f/GRAVEL trace Clay. No staining except wood fragments black. Strong musty odor | | Filter Sand 11-18 ft. |
| 10 | S-2 | 60/60 | 5-10 | NA | 4.7 | (naphthalene) | | |
| | | | | | | Top 2-ft. Lt. green SILT;trace Clay. Bottom 1-ft. wet olive f/m SAND and GRAVEL; trace Silt. No staining, slight odor. | Till | well screen 13-18 ft |
| ▼15 | S-3 | 60/36 | 10-15 | NA | ND | | | |
| | | | | | | Lt. brown f/SAND and SILT. Refusal no staining/odor. | | Well point 18 ft ± |
| | S-4 | 60/36 | 15-18 | NA | ND | | | |
| 20 | | | | | | Bottom of boring 18-ft.± | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed temporary 1-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 8-feet of filter sand. PVC was removed and boring was backfilled and sealed with a concrete plug and asphalt patch.

Submitted samples from 0-5ft. And 10-15-ft. interval for analysis by EPA method 8260

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**BORING LOG**

Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B2
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | |
| | S-1 | 60/36 | 0-5 | NA | ND | Top 4" asphalt and brown f/m SAND.. Bottom 32-in. Brown f/SAND and SILT; some rock fragments; little fine Gravel. No staining/odor. | Asphalt | Temporary monitoring well |
| 5 | | | | | | | Fill | 0-10ft. |
| | | | | | | Top 2-ft. brown f/SAND and SILT, seams of dk. Gray coarse Sand and Clay. Bottom 3-ft. tight f/SAND and SILT; some f/Gravel. No staining/odor. | | Filter Sand 11-18 ft. |
| 10 | S-2 | 60/60 | 5-10 | NA | ND | | | |
| | | | | | | Top 18-in. Same as above 7-10-ft. Bottom 18-in. olive/gray Clayey SILT and Rock Fragment. | | well screen 13-18 ft. |
| 15 | S-3 | 60/36 | 10-15 | NA | ND | | Till | |
| | | | | | | Lt. brown f/SAND and SILT. Refusal at 19-ft. no staining/odor. Hole collapsed with 1-in. PVC switched to 2-in. at 18-ft. 1-in water in boring at well set. | | Well point 18 ft. ± |
| ▼ | S-4 | 60/36 | 15-18 | NA | ND | | | |
| 20 | | | | | | Bottom of boring 19-ft. ± | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed temporary 2-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 8-feet of filter sand. PVC was removed and boring was backfilled and sealed with a concrete plug and asphalt patch.
Submitted sample from 10-15-ft. interval for analysis by EPA method 8260

**BORING LOG**

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Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B-3
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | Equipment Installed |
| | S-1 | 60/50 | 0-5 | NA | ND | Top 4" asphalt and brown f/m SAND.. Bottom 32-in. Brown f/SAND and SILT;some rock fragments; little fine Gravel. No staining/odor. | Asphalt | |
| 5 | | | | | | | Fill | |
| | | | | | | Top 2-ft. brown f/SAND and SILT, seams of dk. Gray coarse Sand and Clay. Bottom 3-ft. tight f/SAND and SILT;some f/Gravel. No staining/odor. | | |
| 10 | S-2 | 60/60 | 5-10 | NA | ND | | | |
| | | | | | | Top 18-in. Same as above 7-10-ft. Bottom 18-in. olive/gray Clayey SILT and Rock Fragment. | Till | |
| 15 | S-3 | 60/36 | 10-15 | NA | ND | | | |
| ▼ | | | | | | Lt. brown f/SAND and SILT. Refusal at 19-ft. no staining/odor. Dry hole. | | |
| | S-4 | 60/36 | 15-18 | NA | ND | | | |
| 20 | | | | | | Bottom of boring 19-ft. ± | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Well dry, no equipment installed, boring was backfilled and sealed with a concrete plug and asphalt patch. Submitted Sample 15-19-ft.
Submitted sample from 10-15-ft. interval for analysis by EPA method 8260

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Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B-4
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | |
| | S-1 | 60/48 | 0-5 | NA | ND | Top 4" asphalt. Yellow f/m SAND and SILT; some Rock fragment. No staining v. slight sweet odor. | Asphalt | Temporary monitoring well |
| 5 | | | | | | Lt. brown f/SAND and SILT; some Gravel. No staining/odor. | Fill | 0-10ft |
| 10 | S-2 | 60/36 | 5-10 | NA | ND | Lt. brown f/SILT and SAND;some Gravel. No staining/odor. | | Filter Sand 12-19 5 ft. |
| 15 | S-3 | 60/48 | 10-15 | NA | ND | Wet olive SILT and GRAVEL. No staining/odor. | Till | well screen 14-19 ft |
| | S-4 | 56/24 | 15-19.5 | NA | ND | | | Well point 19 5 ft. ± |
| 20 | | | | | | Bottom of Boring 19.5-ft. ± | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed temporary1-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 8-feet of filter sand. PVC was removed and boring was backfilled and sealed with a concrete plug and asphalt patch.

Submitted sample from 10-15-ft. interval for analysis by EPA method 8260

# BORING LOG

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Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B-5
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | |
| | S-1 | 60/48 | 0-5 | NA | ND | Top 4-in. asphalt. 4-14-in. Brown f/m SAND and GRAVEL;trace (+) Silt (fill). Remaining 34-in. olive brown f/Silty SAND and GRAVEL;some Rock fragment. No staining/odor. | Asphalt | Temporary monitoring well |
| 5 | | | | | | | Fill | |
| | | | | | | Top 2-ft. as above (14-48-in.) Bottom 36-in. olive Claye SILT. No staining/odor. | | |
| 10 | S-2 | 60/60 | 5-10 | NA | 4.7 ND | | | Filter Sand 13-20 ft. |
| ▼ | | | | | | Wet oilve gray SILT;some f/Sand;trace (-) Clay. No staining/odor. | | well screen 15-20 ft. |
| 15 | S-3 | 60/60 | 10-15 | NA | ND | | Till | |
| | | | | | | As above. | | Well point 20 ft ± |
| 20 | S-4 | 60/48 | 15-20 | NA | ND | | | |
| | | | | | | Bottom of Boring 20 + | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed temporary1-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 8-feet of filter sand. PVC was removed and boring was backfilled and sealed with a concrete plug and asphalt patch.

Submitted sample from 15-20-ft. interval for analysis by EPA method 8260

**BORING LOG**

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Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. B-6
Page: 1
File No 010-13344-10

Date: 29/08/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: Steven Law
Others:

Boring Equipment Description: Geoprobe 6600
3.25 ID barrel for well installation
Sampler Description: 5' x 2" Acetate Sleeve
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information | | | | PID | Sample | Stratum | Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | Field Test Data (ppmv) | Description: | | |
| | S-1 | | | | | Top 4" asphalt. Brown f/m SAND and GRAVEL; some Silt. No staining/odor. | Asphalt | Temporary monitoring well |
| 5 | | 60/48 | 0-5 | NA | ND | | Fill | |
| | | | | | | Top 8-in. as above (excluding top 4-in.) Bottom 52-in. olive f/SAND and SILT and GRAVEL; some Rock Fragment. Some oxidation. No staining/odor. | | Filter Sand 13-20 ft. |
| 10 | S-2 | 60/60 | 5-10 | NA | ND | | | |
| ▼ | | | | | | Wet brown SILT and GRAVEL; some Clay and Rock Fragment. Some oxidizing. No staining/odor. | Till | well screen 15-20 ft. |
| 15 | S-3 | 60/36 | 10-15 | NA | ND | | | |
| | | | | | | Brown SILT;trace (-) Clay. Minor gravel seams. No staining/odor. | | Well point 20 ft ± |
| | S-4 | 60/48 | 15-20 | NA | ND | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed temporary1-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 8-feet of filter sand. PVC was removed and boring was backfilled and sealed with a concrete plug and asphalt patch.

Submitted sample from 10-15-ft. interval for analysis by EPA method 8260

**BORING LOG**

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BRAINTREE, MASSACHUSETTS 02184
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Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

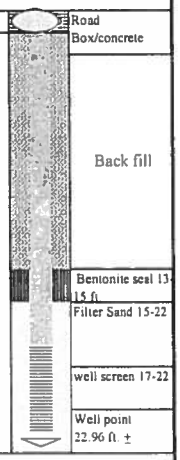
Boring No. MW-1
Page: 1
File No 010-13344-10

Date: 10/4/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: John Bedard
Others: Donnie Watson

Boring Equipment Description: Model B-59 HSA, 4.25-inch ID auger
140# hammer for 30-in fall
Sampler Description: 2-ft by 2-in. Split Spoon Sampler
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | PID Field Test Data (ppmv) | Sample Description: | Stratum |
|---|---|---|---|---|---|---|---|
| | | | | | | Med. Dense lt. brown SILT and f/GRAVEL;trace (+)f/Sand. No staining/odor | Asphalt |
| | | | | | | | FILL |
| | | | | 4-9 | | | |
| 5 | S-1 | 24/18 | 5-7 | 10-13 | ND | | |
| | | | | | | Med. Dense lt. brown and graySILT and f/GRAVEL(rock fragment);trace (+) f/Sand. No staining/odor. | |
| | | | | 5-8 | | | |
| 10 | S-2 | 24/5 | 10-12 | 12-8 | ND | | |
| | | | | | | Med. Dense lt. gray SILT and f/GRAVEL;little f/Sand;trace (+) Clay. No staining/odor. | TILL |
| ▼ | | | | | | | |
| | | | | 13-12 | | | |
| 15 | S-3 | 24/12 | 15-17 | 12-11 | ND | | |
| | | | | | | Spoon refusal, tip recovery-V. dense wet gray CLAY and SILT and Rock fragment top of bedrock. Sent 2-ft. flight to confirm. Auger refusal at 22-ft. | |
| 20 | S-4 | 11/NR | 20-22 | 25-60/5-in. | ND | | |
| | | | | | | Bottom of Boring 22-ft. ± | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |
| 40 | | | | | | | |

Permanent Equipment Installed




Remarks:
Installed 2-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 17-ft. of riser and 7-feet of filter sand and 2-ft of bentonite. Backfilled from 0.5-ft to13-ft and finished with an 6-inch road box with a concrete apron.

Submitted sample from 15-17ft. and 20-22 ft. spoon recovery interval for analysis by EPA method 8260

This well was undermined by the sewer line backup and the road box will need to be re-set, when the repair is made.

**BORING LOG**

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BRAINTREE, MASSACHUSETTS 02184
*phone* (781) 356-7300 *fax* (781) 356-2211

Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

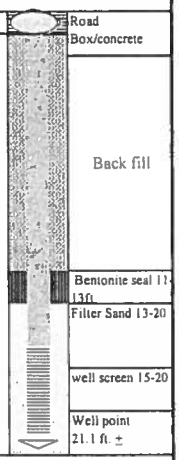
Boring No. MW-2
Page 1
File No 010-13344-10

Date: 10/4/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: John Bedard
Others: Donnie Watson

Boring Equipment Description: Model B-59 HSA, 4.25-inch ID auger
140# hammer for 30-in fall
Sampler Description: 2-ft by 2-in. Split Spoon Sampler
Field Testing Equipment: PhotoVac 20/20 with 11.7 eV lamp

| Depth | Sample Information No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | PID Field Test Data (ppmv) | Sample Description: | Stratum |
|---|---|---|---|---|---|---|---|
| | | | | | | Med. Dense lt. brown f/m SAND and GRAVEL;trace (+) Silt. No staining/odor | Asphalt / FILL |
| | | | | 7-9 | | | |
| 5 | S-1 | 24/18 | 5-7 | 12-15 | ND | | |
| | | | | | | Med. Dense lt. brown and gray green f/SAND and SILT. No staining Very slight odor. | |
| | | | | 5-7 | | | |
| 10 | S-2 | 24/12 | 10-12 | 11-5 | ND | | |
| | | | | | | wet loose olive brown SILT and CLAY. No staining/odor | TILL |
| ▼ | | | | 3-4 | | | |
| 15 | S-3 | 24/15 | 15-17 | 5-6 | ND | | |
| | | | | | | Very dense same as above with some rock fragment. Spoon refusal, auger refusal. | |
| | | | | 9-35 | | | |
| 20 | S-4 | 14/6 | 20-22 | 60/2" | ND | | |
| | | | | | | Bottom of Boring 22-ft ± | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |
| 40 | | | | | | | |

Permanent Equipment Installed




Remarks:
Installed 2-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 15-ft. of riser and 7-feet of filter sand and 2-ft of bentonite. Backfilled from 0.5-ft to 1-ft and finished with an 6-inch road box with a concrete apron.

Submitted sample from 21 ft. spoon recovery interval for analysis by EPA method 8260

**BORING LOG**

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phone (781) 356-7300 fax (781) 356-2211

Site: Cornwall Plaza
15-45 Quaker Avenue
Cornwall, New York

Boring No. MW-3
Page: 1
File No 010-13344-10

Date: 10/4/2005
Reported by: Phyllis Nelson
Boring Co: GeoSearch
Foreman: John Bedard
Others: Donnie Watson

Boring Equipment Description: Model B-59 HSA, 4 25-inch ID auger
140# hammer for 30-in fall
Sampler Description 2-ft by 2-in Split Spoon Sampler
Field Testing Equipment: PhotoVac 20/20 with 11 7eV lamp

| Depth | Sample Information No. | Penetration/ Recovery | Depth (feet) | Blows/ 6" | PID Field Test Data (ppmv) | Sample Description: | Stratum | Permanent Equipment Installed |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Med. Dense lt. brown SILT and f/GRAVEL;trace (+)f/Sand. No staining/odor | Asphalt | Road Box/concrete |
| | | | | | | | FILL | |
| | | | | 6-8 | | | | |
| 5 | S-1 | 24/18 | 5-7 | 12-14 | ND | | | |
| | | | | | | Med. Dense lt. brown and graySILT and f/GRAVEL(rock fragment);trace (+) f/Sand. No staining/odor. | | Back fill |
| | | | | 3-7 | | | | |
| 10 | S-2 | 24/24 | 10-12 | 10-9 | ND | | | |
| | | | | | | Med. Dense lt. gray SILT and f/GRAVEL;little f/Sand;trace (+) Clay. No staining/odor. | TILL | Bentonite seal 12-14 ft |
| ▼ | | | | 7-12 | | | | Filter Sand 14-21 |
| 15 | S-3 | 24/12 | 15-17 | 15-17 | ND | | | |
| | | | | | | V. dense wet gray CLAY and SILT and Rock fragment top of bedrock. Auger refusal at 21-ft. | | well screen 16-21 |
| | | | | | | | | Well point 21.6 ft. ± |
| 20 | S-4 | 12/12 | 20-22 | 25-50/0-in. | ND | | | |
| | | | | | | Bottom of Boring 21-ft ± | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Remarks:
Installed 2-inch (ID) PVC well, with 5-ft. of 10-micron slotted PVC screen and 16-ft. of riser and 7-feet of filter sand and 2-ft of bentonite. Backfilled from 0.5-ft to12-ft and finished with an 6-inch road box with a concrete apron.

Submitted sample from 22 ft. spoon recovery interval for analysis by EPA method 8260

# SOIL BORING / MONITORING WELL CONSTRUCTION LOG

**Environmental Services, Inc.**

| | | | |
|---|---|---|---|
| PROJECT: **Cornwall Plaza** | PROJECT NO.: **24803** | BORING NO.: NA |
| LOCATION: **19-45 Quaker Avenue, Cornwall, New York** | DRILLER: Hawk Drilling, Inc. | WELL: **MW-2R** |
| Date Start: 4/13/2015 Date Finish: 4/13/2015 | INSPECTOR: Christopher Cook (VERTEX) | |

| SAMPLER | | CASING | CORE | GROUNDWATER DEPTH MEASUREMENTS | | GS Elevation Data |
|---|---|---|---|---|---|---|
| TYPE | B-59 Hollow Stem Auger | | | RISER ELEV.: | | Datum: NA |
| SIZE (ID) | 4.25" | | | DATE: | 4/13/2015 | |
| HAMMER (LB.) | N/A | | | TIME: | | Elevation (ft): NA |
| FALL (IN.) | N/A | | | DEPTH (ft): | 11.5' bgs | |

| SAMPLE INFORMATION | | | | SOIL DESCRIPTION | WELL CONST | WELL DETAILS |
|---|---|---|---|---|---|---|
| DEPTH / ELEV | INTERVAL | PEN / REC | PID (ppm) | | | Flush Mount Concrete |
| 0 | NA | NA | NA | 0.0-0.5': Asphalt and road base | | |
| 1 | | | | 0.5-2.5': Dark brown fine silt, trace small gravel | | |
| 2 | | | | | | Bentonite (0' - 8' bgs) |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | PVC Riser (0' - 10' bgs) |
| 6 | | | | | | |
| 7 | | | | 7.0-9.0': Gray fine to medium silt, trace fine sand and small to medium gravel, moist | | |
| 8 | | | | | | |
| 9 | | | | 9.0-13.0': Brown silt and fine to medium small gravel, moist, trace soft clay | | |
| 10 | | | | | | |
| 11 | ▽ | Groundwater ~ 11.5 ft bgs | | | | |
| 12 | | | | | | |
| 13 | | | | 13.0-15.0': Brown soft sandy clay, trace fine silt, moist | | Sand (8' - 20' bgs) |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | 16.0-18.5': Brown soft clay, trace fine sand and silt and small gravel, moist | | |
| 17 | | | | | | PVC Screen (10' - 20' bgs) |
| 18 | | | | | | |
| 19 | | | | 18.5-20.0': Brown soft sandy clay, trace small to medium gravel, wet | | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |
| 29 | | | | | | |

| DESCRIPTION OF SOIL CONSTITUENTS | |
|---|---|
| % | Descriptor |
| 0 - 5 % | Trace |
| 5 - 15% | Little |
| 15 - 30% | Some |
| 30 - 50% | Modifier |
| >50% | In CAPs |

| SAND AND GRAVEL (GRANULAR SOILS) | |
|---|---|
| Density | Blows (N) |
| Very Loose | 0 - 4 |
| Loose | 4 - 10 |
| Medium Dense | 10 - 30 |
| Dense | 30 - 50 |
| Very Dense | >50 |

| CLAY (COHESIVE SOILS) | |
|---|---|
| Consistency | Blows (N) |
| Very Soft | <2 |
| Soft | 2 - 4 |
| Medium Stiff | 4 - 8 |
| Stiff | 8 - 15 |
| Very Stiff | 15 - 30 |
| Hard | >30 |

| WELL CONSTRUCTION DETAILS |
|---|
| Screen |
| Riser |
| Concrete |
| Bentonite |
| Native |
| Sand |
| Grout |

**Note(s):**

| GROUNDWATER MONITORING WELL DATA | | | | | | WELL MATERIALS USED | | | |
|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FT.): | 20' | SCREEN INTERVAL: | 10' - 20' bgs | BACKFILL OVER SEAL: | | SAND: | 6 Bags | SAND SIZE: | Sand Size #1 |
| DIA. (IN.): | 2" | LENGTH OF RISER: | 0' - 10' bgs | SURFACE SEAL: | Concrete | BENTONITE: | 2 Bags | | |
| MATERIAL: | PVC | DEPTH/TYPE PACK: | Sand | ROADBOX DESC.: | Metal | CONCRETE: | 2 Bag | | |
| SLOT SIZE: | 0.020 | DEPTH/TYPE SEAL: | Bentonite | | | | | | |

# SOIL BORING / MONITORING WELL CONSTRUCTION LOG

**Environmental Services, Inc.**

| | | | |
|---|---|---|---|
| PROJECT: **Cornwall Plaza** | PROJECT NO.: **24803** | BORING NO.: NA |
| LOCATION: **19-45 Quaker Avenue, Cornwall, New York** | DRILLER: Hawk Drilling, Inc. | WELL: **MW-4R** |
| Date Start: 4/13/2015 Date Finish: 4/13/2015 | INSPECTOR: Christopher Cook (VERTEX) | |

| SAMPLER | | CASING | CORE | GROUNDWATER DEPTH MEASUREMENTS | | GS Elevation Data |
|---|---|---|---|---|---|---|
| TYPE | B-59 Hollow Stem Auger | | | RISER ELEV.: | | Datum: NA |
| SIZE (ID) | 4.25" | | | DATE: | 4/13/2015 | |
| HAMMER (LB.) | N/A | | | TIME: | | Elevation (ft): NA |
| FALL (IN.) | N/A | | | DEPTH (ft): | 11.0' bgs | |

| SAMPLE INFORMATION | | | | SOIL DESCRIPTION | WELL CONST | WELL DETAILS |
|---|---|---|---|---|---|---|
| DEPTH / ELEV | INTERVAL | PEN / REC | PID (ppm) | | | Flush Mount Concrete |
| 0 | NA | NA | NA | 0.0-0.5': Asphalt and road base | | |
| 1 | | | | 0.5-2.5': Dark brown fine silt, trace small gravel | | |
| 2 | | | | 2.5-3.0': Brown fine to medium silt, some small to medium gravel | | Bentonite (0' - 8' bgs) |
| 3 | | | | 3.0-4.0': Dark brown small to medium gravel, trace fine silt | | |
| 4 | | | | 4.0-5.0': Tan fine to medium sandy silt, trace small gravel | | |
| 5 | | | | 5.0-7.0': Gray/brown fine to medium silt, trace small gravel | | PVC Riser (0' - 10' bgs) |
| 6 | | | | | | |
| 7 | | | | 7.0-9.5': Gray/black fine to medium clayey silt, moist | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | ▽ | Groundwater ~ 11.0 ft bgs | | 9.5-12.0': Gray soft silty clay, moist | | |
| 11 | | | | | | |
| 12 | | | | 12.0-16.0': Gray/blue soft clay, trace fine silt, moist | | |
| 13 | | | | | | Sand (8' - 20' bgs) |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | 16.0-18.5': Brown soft clay, trace fine sand and silt and small gravel, moist | | |
| 17 | | | | | | PVC Screen (10' - 20' bgs) |
| 18 | | | | 18.0-18.5': Brown/gray soft silty clay, moist | | |
| 19 | | | | 18.5-20.0': Gray stiff clay, trace fine silt, moist | | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |
| 29 | | | | | | |

| DESCRIPTION OF SOIL CONSTITUENTS | |
|---|---|
| % | Descriptor |
| 0 - 5 % | Trace |
| 5 - 15% | Little |
| 15 - 30% | Some |
| 30 - 50% | Modifier |
| >50% | In CAPs |

| SAND AND GRAVEL (GRANULAR SOILS) | |
|---|---|
| Density | Blows (N) |
| Very Loose | 0 - 4 |
| Loose | 4 - 10 |
| Medium Dense | 10 - 30 |
| Dense | 30 - 50 |
| Very Dense | >50 |

| CLAY (COHESIVE SOILS) | |
|---|---|
| Consistency | Blows (N) |
| Very Soft | <2 |
| Soft | 2 - 4 |
| Medium Stiff | 4 - 8 |
| Stiff | 8 - 15 |
| Very Stiff | 15 - 30 |
| Hard | >30 |

| WELL CONSTRUCTION DETAILS |
|---|
| Screen |
| Riser |
| Concrete |
| Bentonite |
| Native |
| Sand |
| Grout |

**Note(s):**

| GROUNDWATER MONITORING WELL DATA | | | | | | WELL MATERIALS USED | | | |
|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FT.): | 20' | SCREEN INTERVAL: | 10' - 20' bgs | BACKFILL OVER SEAL: | | SAND: | 6 Bags | SAND SIZE: | Sand Size #1 |
| DIA. (IN.): | 2" | LENGTH OF RISER: | 0' - 10' bgs | SURFACE SEAL: | Concrete | BENTONITE: | 2 Bags | | |
| MATERIAL: | PVC | DEPTH/TYPE PACK: | Sand | ROADBOX DESC.: | Metal | CONCRETE: | 2 Bag | | |
| SLOT SIZE: | 0.020 | DEPTH/TYPE SEAL: | Bentonite | | | | | | |

# APPENDIX 4 – HEALTH AND SAFETY PLAN

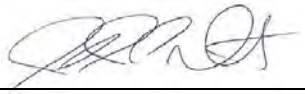
# VERTEX

## ENVIRONMENTAL SERVICES, INC.
## HEALTH AND SAFETY PLAN

Important: Please forward one copy of completed document to the Health and Safety Officer prior to project start up. Items marked with "1910.120..." are required by 29 CFR 1910.120.

| | |
|---|---|
| Project Name: | Cornwall Plaza |
| Client: | Cornwall Shopping, LLC |
| Project Number: | 24803 |
| Location: | Cornwall Plaza<br>19-45 Quaker Avenue<br>Cornwall, New York |

**Health and Safety Plan Approvals**:

| | | | |
|---|---|---|---|
| Plan Prepared By: | Christopher P. Shaw |  | 04/10/2013 |
| | Name | Signature | Date |
| In House Review: | Joseph J. Dultz |  | 04/10/2013 |
| | Name | Signature | Date |

Plan expiration date:

- Plan expiration date will be thirty (30) days after the in house review/approval date.
- If this plan is required to be used after the expiration date, then a Health and Safety review is necessary.

# 1.0 GENERAL INFORMATION

## 1.1 Introduction

This Health and Safety Plan (HASP) addresses those activities and site procedures to be followed by VERTEX personnel during work performed at sites, which contain, or are suspected to contain, hazardous substances. Compliance with this HASP is required by all persons and third parties who enter the site. The content of this HASP may change or undergo revision based upon additional information made available to health and safety (H&S) personnel, monitoring results or changes in the scope of work. Any changes proposed must be reviewed by H&S staff and are subject to approval by the HSM and Project Manager.

This site-specific Health and Safety plan has been prepared for the use of VERTEX and its contractors, and supplements the health and safety training that each employee receives. The health and safety guidelines in this plan were prepared specifically for this site. Due to the potentially hazardous nature of the site covered by this plan and the activities occurring on the site, it is not possible to discover, evaluate, and provide protection for all possible hazards, which may be encountered. This plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

VERTEX expressly disclaims any and all guarantees or warranties, expressed or implied that this plan will meet the specific needs or requirements of any contractor or its employees. VERTEX, therefore, cannot and does not assume any liability by the use or reuse of this plan by any client, contractor or their employees or agents. Any reliance on this plan will be at the sole risk and liability of such party.

## 1.2 Executive Summary

VERTEX Environmental Services, Inc. (VERTEX) is providing Active Remediation Services, Sub-Slab Depressurization System Installation and Monitoring Activities to Cornwall Shopping, LLC.

Cornwall Shopping, LLC entered into the Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in November 2006 to investigate and, as necessary, remediate the soil, soil vapor and groundwater impacts resulting from a drycleaning operation that formerly operated at the site. Subsequent soil and groundwater sampling and vapor intrusion investigation activities were completed by various consultants to characterize impacts to the site. The NYSDEC eventually approved all report submittals documenting the prior investigation activities and concluded that further soil or groundwater investigation was not required at the site. The NYSDEC also confirmed that offsite groundwater investigation or remediation was not required.

ARCADIS US, Inc. (ARCADIS) submitted an Alternatives Analysis Report (AAR) to the NYSDEC in July 2011, which concluded that in-situ remediation through the injection of a carbon substrate (i.e. Hydrogen Releasing Compound [HRC]) was the most viable remedy of the soil and groundwater impacts. Operation of a sub-slab depressurization system was selected as the most viable remedy for addressing vapor intrusion beneath the former Key Foods and Chan's Restaurant leaseholds. After receiving responses to comments, the NYSDEC indicated that the revised version of the AAR (November 2011) substantially satisfied the requirements of the Brownfields Cleanup Program (BCP). Additionally, the NYSDEC determined that a Track 4 Cleanup would be more appropriate for the site as opposed to the Track 2 Cleanup that was proposed by ARCADIS in the initial AAR. The NYSDEC stated that the Track 4 cleanup, with a long-term institutional control, was preferred due to the lack of soil data below the footprint of the building and groundwater data indicating the likely presence of a source of contamination below the building.

Based on the NYSDEC approval of the AAR, ARCADIS submitted a Remedial Work Plan (RWP) to the NYSDEC on April 3, 2012, which detailed implementation of the in-situ injection and active sub-slab depressurization system remedies for the site that were proposed in the AAR. The NYSDEC conceptually approved the RWP and issued a Fact Sheet for the site in June 2012, which opened the 45-day public

comment period. No public comments were received and the NYSDEC granted formal approval of the RWP by issuing an approval letter and Decision Document for the site dated August 14, 2012.

VERTEX shall implement the NYSDEC-approved site remedy detailed in ARCADIS' April 2012 RWP. VERTEX activities include the following:

- Installation of an active sub-slab depressurization system below the former Key Foods and the Chan's Restaurant leasehold in the area shown on Figure 12 in the RWP.
- Injection of a carbon substrate to the subsurface through direct-push points. The injections will be performed in the area shown on Figure 13 in the RWP. Up to three carbon substrate injections will be performed in both interior and exterior locations. The total duration is anticipated to be approximately 15 days per each round of injections.
- Perform quarterly groundwater monitoring following implementation of the groundwater remedy to evaluate the effectiveness of the injections.
- Performance of quarterly indoor air sampling to monitor the effectiveness of the active SSD system.
- Report submittal to the NYSDEC.

In accordance with the NYSDEC Decision Document, dated August 2012, the remedial design program shall be implemented using green remediation principles to the extent feasible in the design, implementation, and site management of the remedy as per DER-31.

### 1.3 Acknowledgment

The following personnel have read, understand, and agree to abide by the provisions of this Health and Safety Plan, which has been prepared specifically for this Project. All personnel have received training in compliance with applicable regulations.

| **NAME** (printed) | **REPRESENTING** | **SIGNATURE** | **DATE** |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## 2.0 PROJECT INFORMATION (1910.120(c)(4))

### 2.1 Site Description

The site is located at 19-45 Quaker Plaza in Cornwall, New York. The areas subject to Remediation Services include the entirety of the shopping plaza.

### 2.2 Purpose of Site Work

VERTEX shall implement the NYSDEC-approved site remedy detailed in ARCADIS' April 2012 RWP. The NYSDEC-approved remedy will successfully remediate the groundwater and vapor intrusion impacts to levels that will allow NYSDEC to grant case closure by March 2015.

## 2.3 Scope of Work

*Utility Clearance*

VERTEX's subcontractors shall contact the appropriate utility one-call system prior to initiating any intrusive activities. This scope of work also includes costs to contract a private utility locating company to ensure that no subsurface utilities are present in the drilling locations proposed to implement the site remedy. As necessary, VERTEX will also coordinate with the property owners and/or site contact, or obtain existing utility plans, in an attempt to clear all boring locations as being free of underground utilities to the greatest extent practicable.

*Sub-slab Depressurization (SSD) System Installation*

A VERTEX engineer, in coordination with the selected installation contractor, will provide design plans for the installation of an active sub-slab venting system beneath the site building in the areas specified in the NYSDEC-approval RWP. The design plans will be utilized to obtain local construction permits for the SSD system. Installation of the system will be completed by a mechanical contractor experienced in SSD system installation. At the request of legal counsel for the client, VERTEX will install a separate electric meter for the proposed SSD system. The existing power supply at the site will be used to power the SSD system. Although the electric usage will be metered separately the client will be responsible for direct payment of the electric bills for the SSD system operations.

VERTEX will design a sub-slab venting system that consists of vertical extraction piping (i.e., piping installed though the building concrete foundation). The SSD piping extending from the floor surface to the height of the interior building ceiling will be constructed with two-inch or three-inch diameter steel piping. Other piping will consist of PVC or steel as necessary. The concrete floor will be cored at each of the proposed vent pipe locations and a minimal volume of soil below the slab will be removed to a depth of approximately one foot to facilitate installation of each vent pipe. Gravel will be used to backfill to the bottom of the slab around each vent pipe. The slab around each piping penetration will be sealed with caulking. The SSD system installation activities will be performed outside of the normal operating hours of the current leasehold occupants to minimize disruptions to the businesses. Air quality will be monitored with a PID during the installation of the SSD system.

The proposed SSD system details for the former Key Foods and Chan's Restaurant leaseholds are provided in the following paragraphs. The area that will be influenced by the SSD system is shown on Figure 12 of ARCADIS' April 2012 RWP. The proposed SSD vent pipe locations are subject to change based upon tenant access agreements, tenant operations and the location of large interior features including coolers, shelving, cooking equipment, etc. within the grocery store and restaurant leaseholds.

The former Key Foods leasehold consists of the original 6,400 square foot section and an approximate 9,700 square foot addition that expanded the leasehold to the east and south. The addition was built on a separate footing; therefore, the original building section and the addition may be addressed separately. Installation of up to four SSD vent pipes connected to a common roof-mounted blower for the original 6,400 square foot section and up to seven SSD vent pipes connected to a second roof-mounted blower within the 9,700 square foot addition.

The Chan's Restaurant leasehold is approximately 2,700 square feet. Based upon the size of the leasehold, our fixed price included up to three SSD vent pipes located on the east wall of the leasehold are proposed. The vent pipes will be connected to a third roof-mounted blower. If this leasehold can be influenced by vents installed within the former Key Foods leasehold, these additional vents may be eliminated.

The three roof-mounted SSD blowers will discharge to the exterior of the building. No treatment will be performed on the SSD system effluent. Once installed, the effectiveness of the SSD system will be monitored through indoor air sampling.

*Carbon Substrate Injections*

The NYSDEC-approved remedy is in-situ treatment of chlorinated volatile organic compounds (VOCs) via enhanced reductive dechlorination (ERD). The objective of the ERD treatment is to break down the chlorinated hydrocarbons by the addition of a carbon substrate (e.g., HRC), which enhances the natural process of reductive dechlorination. The carbon substrate is initially metabolized by microbes to produce hydrogen, which is then substituted for the chlorine atoms on the chlorinated hydrocarbon molecules. The reductive dechlorination process breaks down tetrachlroethylene (PCE) to trichloroethylene (TCE); TCE to cis-dichloroethylene (DCE) cis-1,2 DCE; cis-1,2 DCE to vinyl chloride; and vinyl chloride to ethene, which is non-toxic. The presence of cis-1,2 DCE and vinyl chloride in groundwater at the Site indicates that this process is already occurring naturally.

Three separate injection areas are proposed within the area shown on Figure 13 of ARCADIS' April 2012 RWP. The first injection event will target the suspected source area, which includes the former Cornwall Cleaners leasehold (currently Chan's), upgradient and crossgradient of the leaseholds and locations of soil samples S-3 (21 feet below ground surface (bgs) at MW-2 location) and MW-3B (15-17 feet bgs). The second and third injection events will target the area downgradient of the suspected source area. The spacing of the injection points will be approximately 10 feet; however, will ultimately be determined by site conditions. The locations of interior injection points will be subject to tenant access agreements, and limited by the tenant operations and locations of equipment and permanent interior building features.

A Direct-Push Geoprobe drill rig (or equivalent) will be utilized to deliver the HRC through temporary injection points to approximate depths between 10 and 22 feet bgs. Additionally, permanent injection points may be used within the site building to facilitate additional injection events. It is estimated that up to 400 injection points will be required throughout an area comprising approximately 48,000-square feet (approximately 130 – 150 points per event). The three rounds of injections are estimated to be completed in approximately 15 days per each round of injections. The effectiveness of the injections will be monitored through quarterly groundwater sampling, as discussed below.

*Indoor Air Monitoring*

Following the installation of the active SSD system, indoor air samples will be collected on a quarterly basis for a period of two and ¼ years (Nine sampling events). The soil vapor and indoor air sampling will be completed in accordance with the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (October 2006).

During each quarterly event, indoor air samples will be collected within the former Key Foods and the Chan's Restaurant leaseholds. The indoor air samples will be collected with 6-liter Summa canisters with flow controllers calibrated to collect the sample over an 8-hour period (0.75 liters per hour – batch certified). The indoor air samples will be analyzed for VOCs by USEPA method TO-15 with selected ion monitoring (SIM) by a State of New York certified laboratory.

*Groundwater Monitoring*

Following completion of the carbon substrate injections, groundwater samples will be collected from the on-site monitoring wells on a quarterly basis for a period of two and ¼ years (nine sampling events) to evaluate the effectiveness of the ERD treatment. Based upon the results of previous groundwater sampling events, the following sampling plan is proposed:

- During the initial quarterly sampling event, and on an annual basis thereafter, all on-site groundwater monitoring wells will be sampled.
- During the remaining three quarterly groundwater sampling events, groundwater samples will be

collected from monitoring wells MW-1R, MW-2, MW-3, MW-4, MW-6, MW-7 and MW-8.

- Historically, chlorinated solvents have not been detected in monitoring wells MW-1B, MW-2B, MW-3B, MW-5, MW-6B and MW-9; therefore, a reduced sampling frequency will be performed for these monitoring wells, as described in the NYSDEC-approved RWP.

Prior to the collection of groundwater samples, depth to water measurements will be collected from all on-site and off-site monitoring wells. Groundwater samples will be collected using the low-flow sampling procedures in accordance with the USEPA Low-Flow Sampling Techniques document dated April 1996. Overburden monitoring wells will be sampled using a peristaltic pump with the tubing intake set in the center of the screened interval of each well. Bedrock monitoring wells will be sampled using a submersible pump with the pump intake set at the middle of the screened interval of each well.

The pump discharge will be directed through a flow-through cell and multi-parameter instrument. The water-quality parameters of pH, conductivity, dissolved oxygen, temperature and oxygen-reduction potential. In addition, turbidity will be measured using a separate turbidity meter and depth to water using a water level meter will be monitored during the low-flow measurement period, Parameters, and water level will be recorded every 5 minutes. Groundwater samples will be collected directly from the pump discharge when groundwater quality readings stabilize within the limits set forth in the USEPA guidance document.

Groundwater samples will be analyzed for VOCs via USEPA Method 8260 with a 10 compound library search by a State of New York certified laboratory. In addition to the VOC analysis, select wells (MW-1R, MW-2, MW-3, MW-4, MW-6, MW-7 and MW-8) in the immediate injection and downgradient areas will be analyzed for, dissolved organic carbon (DOC), dissolved iron, sulfate, alkalinity, and dissolved gases (ethene, ethane and methane). The analytical program may be modified based on the performance monitoring results. Purge water generated during the quarterly groundwater monitoring events will be passed through liquid-phase granular activated carbon (LPGAC) and discharged to the ground surface on-site. The LPGAC will be dedicated to use at the Site and will be changed after four groundwater sampling events. The spent LPGAC will be containerized and disposed as a hazardous waste by a licensed waste transportation and disposal contractor.

*Institutional Control*

Due to groundwater data suggesting that soil cleanup objectives (SCOs) are exceeded beneath the building, long-term institutional controls will be implemented to address the soils there. The long-term institutional controls will be outlined in an Environmental Easement (EE) and Site Management Plan (SMP) that will be developed to address the residual impacts remaining at the completion of the remediation activities. The EE will:

- Restrict the future use of the Site to commercial purposes. The existing commercial use will be permitted as long as the designated long-term institutional controls are employed.
- Notify future property owners of residual chlorinated solvent impacts in soil and groundwater.
- Prohibit the use of groundwater underlying the Site without treatment rendering it safe for the intended us and require the approval by the NYSDOH prior to such intended use.
- Require compliance with the approved SMP.
- Require the property owner to complete and submit to the NYSDEC an annual certification.

In addition, the SMP will also provide a detailed description of the procedures required to manage remaining impacts that may be present at the Site after the completion of the Remedial Action including:

- Identify the area below the building, including the Chan's Restaurant leasehold and the former Key Foods leasehold, as a suspected location of soil with chlorinated solvent concentrations exceeding the SCOs.
- Require the operation and maintenance of an active SSD system below Chan's Restaurant and Key Foods leaseholds, until threshold levels are achieved.

- Set forth groundwater, soil vapor and indoor air monitoring requirements.
- Address potential future intrusive subsurface activities and outline appropriate controls and measures for completing such activities, if necessary.
- Implementation and management of all Institutional Controls.
- Outline the requirements for the performance of periodic inspections, certification of results and submittal of Periodic Review Reports.
- Provisions for future injection, if warranted based upon post-injection sampling results.
- Defining the criteria for termination of the SSD system.

## 3.0 Health and Safety Hazard Analysis

At sites which, contain or are suspected to contain, hazardous substances, certain procedures will be implemented to identify, evaluate and control the substances as follows:

1. Recognition - identification of substances and the parameters which cause it to be hazardous.
2. Evaluation - the risk of impact of the substance to personnel, the public, and the environment.
3. Control - methods to prevent or minimize the impact of the substance.

**RECOGNITION**

Preliminary information about the hazardous substances which may be present at a site and the parameters which cause them to be hazardous can be obtained from an understanding of the site history. Site use, substances used at the site, disposal of substances (on or off-site), and existing status of operations provide background information on the type of materials which can be expected to be encountered. This initial step is essential to best establish how VERTEX personnel can safely obtain additional information to further recognize the hazardous substances at a site.

**EVALUATION**

The potential risks or impacts of hazardous substances suspected or known to exist at a site must be evaluated prior to entering a site. Site history is the initial source of information, which must be used to determine the level of personal protection to be worn by contractors while collecting further field information for evaluation. Levels of personal protection are summarized in the attached Site Safety Procedure outline. The minimum level of protection for contractors during a site re-grading is Level D. This level should be utilized where the atmosphere contains no known hazard and the type of work involved precludes exposure due to splashes, immersions, or the potential for unexpected inhalation of air or contact with hazardous levels of chemicals.

The next level of personal protection is Level C. Level C is not expected to be required during site re-grading activities.

In addition to appropriate levels of personnel protection required on-site, equipment identified on the safety procedure outline should be present and readily available at the site. The site safety plan should be filled out prior to entry of the site and updated as necessary.

**CONTROL**

The site safety procedures as outlined in Section 4.0, Site Safety Procedure, will be followed by VERTEX employees and subcontractors while performing work at sites which contain or are suspected to contain hazardous substances.

### 3.1 HAZARD ANALYSIS

Non-chemical hazards are associated with:

1. Hardware/Tool Operation.
2. Slip, trip and fall.
3. Noise from construction machinery.
4. Underground utilities

Chemical hazards are associated with:

1. Impacted soil, soil vapor, and groundwater with VOCs
2. Injection reagents

The overall hazard is:

_____ Low __X__ Moderate _____ High

## 4.0 Site Safety and Operating Procedures

## I. Equipment

The following is to be present and readily available at all sites where hazardous substances may be encountered:

**A. Personal Protection**

1. Level D - all equipment as described in Section II.
2. Calibrated PID meter or other suitable portable photoionization-monitoring device. This device should be selected to provide maximum sensitivity for the compounds expected to be present.

**B. Copy of Completed Site Safety Plan Containing:**

1. Emergency center telephone numbers
2. Hospital location

**C. First Aid Kit**

**D. Copy of OSHA/NIOSH Pocket guide to Chemical Hazards**

## II. Review Prior to Site Access

### A. Chemical Hazards Known or Expected to be Encountered

The following may be present in the soil and groundwater at the Site:

Potential concentrations of volatile organic compounds (VOCs).

Material Safety Data Sheets (MSDS) for the potential compounds identified on-Site are provided as Attachment C.

Health and safety information relating to the injection reagent/substrate for ERD will be included as an addendum once the ERD substrate has been chosen. MSDS for ERD under consideration (HRC) are provided.

### B. Physical Hazards Known or Expected to be Encountered

| Specific Hazard | Location |
|---|---|
| Slip, Trip, and Fall | On-site |
| Drilling Equipment | On-site |
| Loud Noise | On-site |

### C. Information Concerning Effects, Hazards, and Response/First Aid for Expected Chemical Hazards On-Site, Consult:

1. NIOSH Pocket Guide to Chemical Hazards

### D. Nearest Emergency Centers and Telephone Numbers:

1. Hospital: **845-534-7711**
2. Ambulance: **911**
3. Poison Control Center: **911**
4. Police: **845-534-8100 or 911**
5. Fire Department: **845-534-2699 or 911**
6. Gas Company: **911**
7. Electric Company: **911**

### E. Hospital Directions:

See attached (Attachment A):

Saint Lukes Cornwall Hospital
19 Laurel Avenue
Cornwall, New York
845-534-7711; http://www.stlukescornwallhospital.org/

### F. The following Level of Personal Protective Equipment will be Worn Upon Entering the Site:

1. Minimum: Level D
   a.) coveralls
   b.) gloves*
   c.) boots, shoes, chemical-resistant hard toe and shank

d.) boots, outer, chemical resistant (disposable)*
e.) safety glasses or chemical splash goggles*
f.) hardhat*
g.) escape mask *
h.) face shield*

* Optional as applicable

## III. Initial Site Entry Procedures:

### A. Have and be Familiar with Field Map

- Plan work route and work locations.
- Locate nearest telephone.
- Review and confirm subsurface utility markings.
- Review utility clearance.
- Check with site personnel for locations of underground hazards.
- Post Emergency Information - Confirm and post emergency phone numbers and hospital route.
- Designate one vehicle for emergency use.

### B. Site Specific Considerations

- Prior to completion of the SSD system installation a pilot study will be completed to aid in the design of the SSD system. A blower/fan will be utilized to draw sub-surface vapors at a specified vacuum and flow rate. The vapors will be filtered through carbon and HEPA filtration. VERTEX will monitor the blower/fan exhaust for the presence of VOC vapors. Corrective actions will be implemented if readings above background are observed.

## IV. Daily Operating Procedures:

- Hold daily tailgate safety meetings prior to work start
- Use monitoring instruments and follow designated protocol.
- Use personal protective equipment (PPE) as specified.
- Remain upwind of operations and airborne contaminants if possible.
- Establish a work/rest regime when ambient temperatures and protective clothing create a potential heat stress hazard.
- Do not carry gum, food, cigarettes, etc. into contaminated areas.
- Refer to the site Safety Supervisor for specific concerns for each individual site task.
- ALWAYS employ the Buddy System.
- Be alert to your own physical condition. Watch buddy for signs of fatigue, exposure, etc.

**Upon Accident, Physical Reaction or Excessive Exposure:**

1. leave area immediately and seek appropriate medical assistance.

2. this may include, but not be limited to, any of the following physiological reactions:

    - dizziness

- nausea
- rash
- asthmatic reactions
- abdominal pain
- distorted vision or hearing
- excessive coughing
- edema or localized swelling
- headaches

3. Exposure due to:

- spills
- splashes
- immersions
- inhalation

- **<u>All accidents</u> no matter how minor, must be reported <u>immediately</u> to the Safety Supervisor.!!**

# 5.0 EMERGENCY RESPONSE PROCEDURES

## 5.1 Emergency Incident Procedures

The nature of work at contaminated or potentially contaminated work sites make emergencies a continual possibility. Although emergencies are unlikely and occur infrequently, a contingency plan is required to assure timely and appropriate response actions. The contingency plan is reviewed at tailgate safety meetings.

Discuss client Emergency Response Plans, subcontractor's responsibilities, including site-specific requirements, in complying with the clients ER plan.

### 5.1.1 Emergency Incident Procedures

*If emergency incident occurs, take the following action.*

Step 1: Size-up the situation based in the available information.

Step 2: Notify the Site Safety Officer and/or Field Supervisor

Step 3: Only respond to an emergency if personnel are sufficiently trained and properly equipped.

Step 4: As appropriate, evacuate site personnel and notify emergency response agencies, e.g. police, fire, etc.

Step 5: As necessary, request assistance from outside sources and/or allocate personnel and equipment

Step 6: Consult the posted emergency phone list and contact key personnel.

Step 7: Prepare an incident report. Forward incident report to Project Manager /Corporate Health and Safety Manager within 24 hours

### 5.1.2 Medical Emergencies

*If a medical emergency occurs, take the following action.*

Step 1: Assess the severity of the injury and perform life-saving first aid/CPR as necessary to stabilize the injured person. Follow universal precautions to protect against exposure to blood borne pathogens.

Step 2: Get medical attention for the injured person immediately. (Call 911 or consult the Emergency Contacts list which must be posted at the site).

Step 3: Notify the Site Safety Officer and the Field Supervisor immediately. The Site Safety Officer will assume charge during a medical emergency.

Step 4: Depending on the type and severity of the injury, transport the injured employee to the nearest hospital emergency room. If the injury is not serious, then transport the injured employee to a nearby medical clinic. Consult your Health and Safety Manager for guidance, if necessary.

Step 5: Notify the injured person's personnel office, including the Regional Manager, Project Manager and Health and Safety Manager.

Step 6: Prepare an accident report. The Site Safety officer is responsible for its preparation and submittal to the Health and Safety Manager within **24 hours**.

## 5.2 Emergency Routes

Call 911/See Attached Hospital Directions.

## 5.3 Site Specific Requirements in the Event of an Emergency

### 5.3.1 Facility Notifications (if any)

**Environmental:** **VERTEX Environmental - 781-952-6000 (Corporate Headquarters)**
**Joseph J.C. Dultz, CHMM – 908-500-6678 (Project Manager)**

**Safety:** **None**

**Security:** **None**

**Facilities:** **None**

### 5.3.2 Locate Shut-Offs (in-field before start of work)

**Gas: Not Applicable**

**Power: Not Applicable**

**Fuel: Not Applicable**

### 5.3.3 Evacuation Route

*If evacuation is required, the Field Supervisor shall:*

Step 1: Activate the communications system to alert site workers of evacuation. Personnel shall be advised to remain upwind of contaminants, if possible, and proceed to the designated assembly area.

Step 2: Account for all personnel at the assembly area.

Step 3: Notify the client of the need to initiate evacuation procedures for other site personnel.

Step 4: Notify the Fire and Police Department and request their assistance for evacuating the surrounding area and residence.

**5.3.4 Spill Containment Plan *(Specify)***

*If a spill of hazardous material, occurs the following steps shall be taken to mitigate the incident:*

Step 1: Notify the Field Supervisor, and he/she shall assess the extent of the spill to determine if it can be safely mitigated with the personnel and protective equipment available at the site.

Step 2: If the release is beyond the field team's capabilities, the Field Supervisor shall evacuate the site personnel to a safe location upwind of the releases, and notify the Project Manager and the Fire Department.

Step 3: The Field Supervisor shall notify the client, Corporate Health and Safety Director, and regulatory agencies if necessary.

Step 4: If the spill can be safely mitigated using defensive actions, first don the appropriate PPE.

Step 5: Take steps to secure the area and to prevent unauthorized persons from entering the area.

Step 6: Take steps to contain the spill and to prevent it from reaching sewers, storm ditches, etc.

Step 7: Clean up the spill with absorbent, neutralizers, and soil removal as appropriate. Place waste in sealed, labeled containers for disposal.

**EMERGENCY PHONE NUMBERS**
**-POST IN FULL VIEW-**

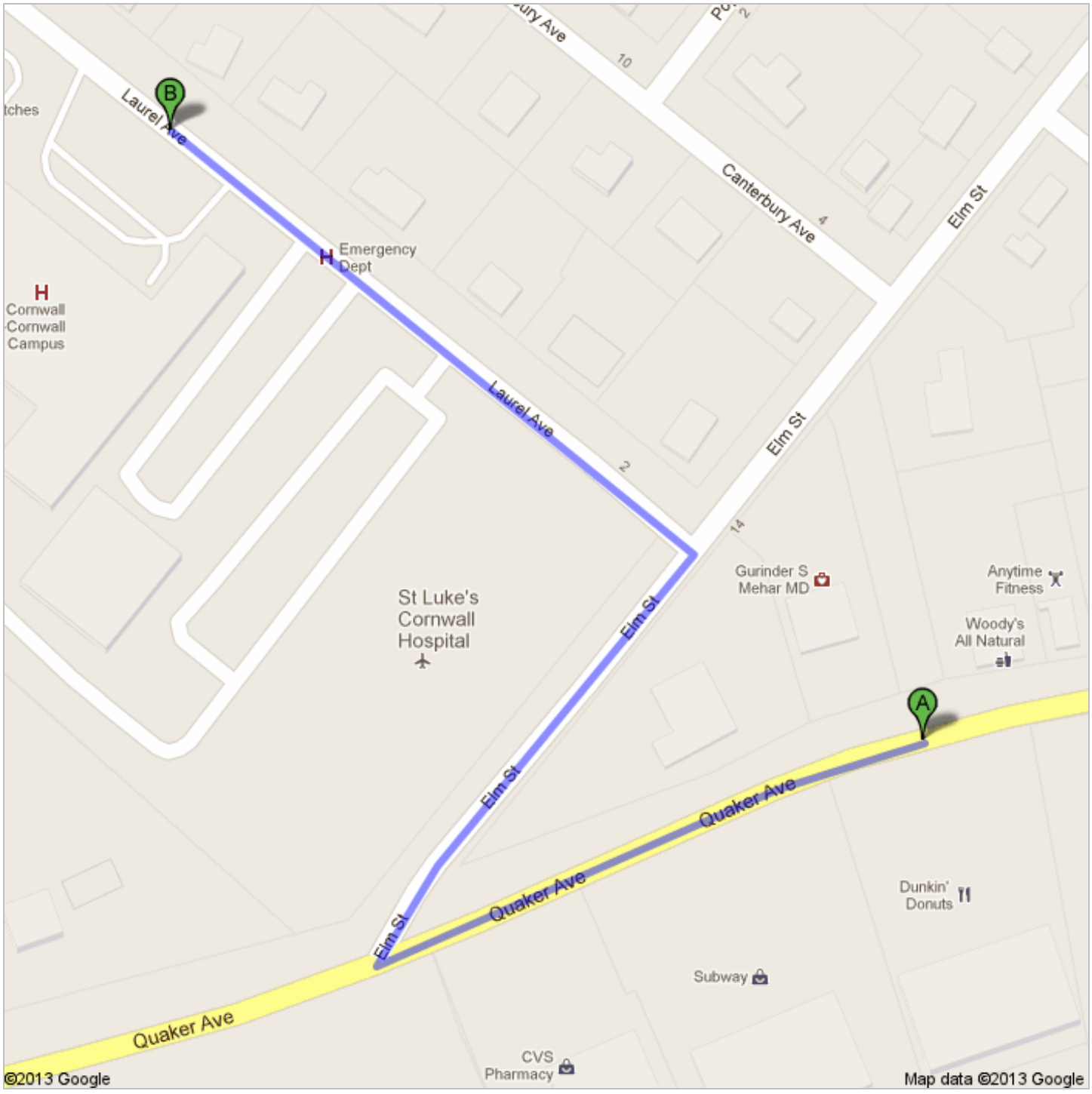
**VERTEX Corporate Office: (781) 952-6000**
**VERTEX Project Manager(s): Joseph J.C. Dultz, CHMM 908- 500-6678**
**Daniel Gardner 908-285-9067**

1. **Hospital: 845-534-7711**
2. **Ambulance: 911**
3. **Poison Control Center: 911**
4. **Police: 845-534-8100 or 911**
5. **Fire Department: 845-534-2699 or 911**
6. **Gas Company: 911**
7. **Electric Company: 911**

# Attachment A – Hospital Directions

Google

Directions to Saint Lukes Cornwall Hospital-Cornwall Campus
19 Laurel Ave, Cornwall, NY
0.3 mi – about 1 min



## 45 Quaker Ave, Cornwall, NY 12518

| | | |
|---|---|---|
| 1. | Head west on Quaker Ave toward Elm St | go 0.1 mi<br>total 0.1 mi |
| 2. | Sharp right onto Elm St | go 495 ft<br>total 0.2 mi |
| 3. | Take the 1st left onto Laurel Ave<br>Destination will be on the left | go 0.1 mi<br>total 0.3 mi |

## Saint Lukes Cornwall Hospital-Cornwall Campus
19 Laurel Ave, Cornwall, NY

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.



Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

# Appendix B – MSDS Forms

# Material Safety Data Sheet

Nonflammable Gas Mixture: 1,1 Dichlorethane / Cis-1,2-Dichloroethylene / Nitrogen / Trans-1,2-Dichloroethylene

## Section 1. Chemical product and company identification

**Product Name** : Nonflammable Gas Mixture: 1,1 Dichlorethane / Cis-1,2-Dichloroethylene / Nitrogen / Trans-1,2-Dichloroethylene

**Supplier** : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Product use** : Synthetic/Analytical chemistry.

**MSDS#** : 006533

**Date of Preparation/Revision** : **11/2/2006.**

**In case of emergency** : 1-866-734-3438

## Section 2. Hazards identification

**Physical state** : Gas.

**Emergency overview** : Warning!

CONTENTS UNDER PRESSURE.
CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, LUNGS, LIVER, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
MAY BE HARMFUL IF SWALLOWED.

Do not ingest. Do not puncture or incinerate container. Wash thoroughly after handling.

Contact with rapidly expanding gases can cause frostbite.

**Routes of entry** : Inhalation

**Potential acute health effects**

**Eyes** : Irritating to eyes.

**Skin** : Irritating to skin.

**Inhalation** : Acts as a simple asphyxiant.

**Ingestion** : Ingestion is not a normal route of exposure for gases

**Potential chronic health effects** : **CARCINOGENIC EFFECTS** Classified A4 (Not classifiable for human or animal.) by ACGIH [1,1-dichloroethane].
**MUTAGENIC EFFECTS** Not available.
**TERATOGENIC EFFECTS**: Not available.

**Medical conditions aggravated by overexposure** : Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

**See toxicological Information (section 11)**

## Section 3. Composition, Information on Ingredients

| Name | CAS number | % Volume | Exposure limits |
|---|---|---|---|
| Nitrogen | 7727-37-9 | 94 - 99 | |
| 1,2-Trans Dichloroethylene | 156-60-5 | 0.02 - 2 | **ACGIH TLV (United States, 1/2005).** TWA: 793 mg/m$^3$ 8 hour(s). Form: All forms TWA: 200 ppm 8 hour(s). Form: All forms |
| 1,2-Cis Dichloroethylene | 156-59-2 | 0.02 - 2 | **ACGIH TLV (United States, 1/2005).** TWA: 793 mg/m$^3$ 8 hour(s). Form: All forms TWA: 200 ppm 8 hour(s). Form: All forms |
| 1,1-Dichloroethane | 75-34-3 | 0.01 - 2 | **ACGIH TLV (United States, 1/2005). Notes: 1996 Adoption Refers to Appendix A -- Carcinogens.** TWA: 405 mg/m$^3$ 8 hour(s). Form: All forms TWA: 100 ppm 8 hour(s). Form: All forms |

TWA: 100 ppm 8 hour(s). Form: All forms

**NIOSH REL (United States, 12/2001). Notes: See Appendix C (Chloroethanes)**

TWA: 400 mg/m$^3$ 10 hour(s). Form: All forms

TWA: 100 ppm 10 hour(s). Form: All forms

**OSHA PEL (United States, 8/1997).**

TWA: 400 mg/m$^3$ 8 hour(s). Form: All forms

TWA: 100 ppm 8 hour(s). Form: All forms

## Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If fumes are still suspected to be present, the rescuer should wear an appropriate mask or a self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**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** : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Frostbite** : Try to warm up the frozen tissues and seek 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. Get medical attention.

## Section 5. Fire fighting measures

**Flammability of the product** : Non-flammable.

**Products of combustion** : These products are carbon oxides (CO, $CO_2$), nitrogen oxides (NO, $NO_2$...), halogenated compounds, hydrogen chloride.

**Fire fighting media and instructions** : Use an extinguishing agent suitable for surrounding fires.

If involved in fire, shut off flow immediately if it can be done without risk. Apply water from a safe distance to cool container and protect surrounding area.

No specific hazard.

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

## Section 6. Accidental release measures

**Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (Section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

**Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

## Section 7. Handling and storage

**Handling** : Do not ingest. Do not puncture or incinerate container. Wash thoroughly after handling. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Storage** : Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

## Section 8. Exposure Controls, Personal Protection

**Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

**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.

**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.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

**Hands** : Chemical-resistant, impervious gloves or gauntlets complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**Personal protection in case of a large spill** : A self-contained breathing apparatus should be used to avoid inhalation of the product.

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

## Section 9. Physical and chemical properties

**Molecular weight** : Not applicable.

**Molecular formula** : Not applicable.

**Boiling/condensation point** : Not available.

**Melting/freezing point** : -209.99°C (-346°F) based on data for: Nitrogen.

**Critical temperature** : The lowest known value is -146.9°C (-232.4°F) (Nitrogen).

**Vapor density** : The highest known value is 0.967 (Air = 1) (Nitrogen).

**Specific Volume ($ft^3/lb$)** : Not applicable.

**Gas Density ($lb/ft^3$)** : Weighted average: 0.07

## Section 10. Stability and reactivity

**Stability and reactivity** : The product is stable.

**Incompatibility with various substances** : Slightly reactive to reactive with moisture.

**Hazardous decomposition products** : These products are halogenated compounds, hydrogen chloride.

## Section 11. Toxicological information

| Ingredient name | Test | Result | Route | Species |
|---|---|---|---|---|
| 1,2-Trans Dichloroethylene | LD50 | 1235 mg/kg | Oral | Rat |
| | LD50 | 2122 mg/kg | Oral | Mouse |
| 1,1-Dichloroethane | LD50 | 725 mg/kg | Oral | Rat |

**Chronic effects on humans** : **CARCINOGENIC EFFECTS** Classified A4 (Not classifiable for human or animal.) by ACGIH [1,1-dichloroethane].
Contains material which causes damage to the following organs: kidneys, lungs, liver, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

**Other toxic effects on humans** : No specific information is available in our database regarding the other toxic effects of this material for humans.

**Specific effects**

**Carcinogenic effects** : No known significant effects or critical hazards.

**Mutagenic effects** : No known significant effects or critical hazards.

**Reproduction toxicity** : No known significant effects or critical hazards.

## Section 12. Ecological information

**Products of degradation** : These products are carbon oxides (CO, $CO_2$) and water, nitrogen oxides (NO, $NO_2$...), halogenated compounds.

**Toxicity of the products of biodegradation** : The products of degradation are as toxic as the product itself.

**Environmental fate** : Not available.

**Environmental hazards** : No known significant effects or critical hazards.

**Toxicity to the environment** : Not available.

## Section 13. Disposal considerations

**Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.**

## Section 14. Transport information

| Regulatory information | UN number | Proper shipping name | Class | Packing group | Label | Additional information |
|---|---|---|---|---|---|---|
| **DOT Classification** | UN1956 | COMPRESSED GAS, N.O.S. | 2.2 | Not applicable (gas). |  | - |
| **TDG Classification** | UN1956 | COMPRESSED GAS, N.O.S. | 2.2 | Not applicable (gas). |  | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**Passenger Carrying Road or Rail Index** 75 |
| **Mexico Classification** | UN1956 | COMPRESSED GAS, N.O.S. | 2.2 | Not applicable (gas). |  | - |

## Section 15. Regulatory information

**United States**

**U.S. Federal regulations** : TSCA 8(a) PAIR: 1,1-dichloroethane
TSCA 8(b) inventory: Nitrogen; trans-dichloroethylene; cis-dichloroethylene; 1,1-dichloroethane

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: Nitrogen; trans-dichloroethylene; cis-dichloroethylene; 1,1-dichloroethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Nitrogen: Sudden Release of Pressure; trans-dichloroethylene: Fire hazard, reactive, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; cis-dichloroethylene: Fire hazard, Delayed (Chronic) Health Hazard; 1,1-dichloroethane: Fire hazard, Delayed (Chronic) Health Hazard

Clean Water Act (CWA) 307: trans-dichloroethylene; cis-dichloroethylene; 1,1-dichloroethane

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** | : | 1,1-Dichloroethane | 75-34-3 | 0.01 - 2 |
| **Supplier notification** | : | 1,1-Dichloroethane | 75-34-3 | 0.01 - 2 |

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: Nitrogen: (generic environmental hazard); trans-dichloroethylene: (environmental hazard, generic environmental hazard); cis-dichloroethylene: (generic environmental hazard); 1,1-dichloroethane: (environmental hazard, generic environmental hazard)
Massachusetts RTK: Nitrogen; trans-dichloroethylene; cis-dichloroethylene; 1,1-dichloroethane
New Jersey: Nitrogen; trans-dichloroethylene; 1,1-dichloroethane

**California prop. 65** : **WARNING:** This product contains a chemical known to the State of California to cause cancer.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| 1,1-Dichloroethane | Yes. | No. | Yes. | No. |

**Canada**

**WHMIS (Canada)** : Class A: Compressed gas.
Class D-2A: Material causing other toxic effects (VERY TOXIC).
Class D-2B: Material causing other toxic effects (TOXIC).
CEPA DSL: Nitrogen; trans-dichloroethylene; 1,1-dichloroethane

CEPA NDSL: cis-dichloroethylene

## Section 16. Other information

**United States**

**Label Requirements** : CONTENTS UNDER PRESSURE.
CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, LUNGS, LIVER, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
MAY BE HARMFUL IF SWALLOWED.

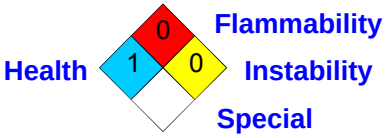
**Canada**

**Label Requirements** : Class A: Compressed gas.
Class D-2A: Material causing other toxic effects (VERY TOXIC).
Class D-2B: Material causing other toxic effects (TOXIC).

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

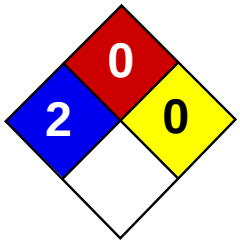
| | | |
|---|---|---|
| **Health** | * | 1 |
| **Fire hazard** | | 0 |
| **Reactivity** | | 0 |
| **Personal protection** | | C |

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



## Notice to reader

**To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**
**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**


| | |
|---|---|
| Health | 2 |
| Fire | 0 |
| Reactivity | 0 |
| Personal Protection | G |

# Material Safety Data Sheet
## Tetrachloroethylene MSDS

## Section 1: Chemical Product and Company Identification

**Product Name:** Tetrachloroethylene

**Catalog Codes:** SLT3220

**CAS#:** 127-18-4

**RTECS:** KX3850000

**TSCA:** TSCA 8(b) inventory: Tetrachloroethylene

**CI#:** Not available.

**Synonym:** Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

**Chemical Name:** Ethylene, tetrachloro-

**Chemical Formula:** C2-Cl4

**Contact Information:**

**Sciencelab.com, Inc.**
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

**CHEMTREC (24HR Emergency Telephone), call:** 1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

## Section 2: Composition and Information on Ingredients

**Composition:**

| Name | CAS # | % by Weight |
|---|---|---|
| Tetrachloroethylene | 127-18-4 | 100 |

**Toxicological Data on Ingredients:** Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50 ): Acute: 5200 ppm 4 hours [Mouse].

## Section 3: Hazards Identification

**Potential Acute Health Effects:**
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

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

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

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

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## 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 threshold limit value.

**Personal Protection:**
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Ethereal.

**Taste:** Not available.

**Molecular Weight:** 165.83 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 121.3°C (250.3°F)

**Melting Point:** -22.3°C (-8.1°F)

**Critical Temperature:** 347.1°C (656.8°F)

**Specific Gravity:** 1.6227 (Water = 1)

**Vapor Pressure:** 1.7 kPa (@ 20°C)

**Vapor Density:** 5.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 5 - 50 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, metals, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

**Special Remarks on Corrosivity:** Slowly corrodes aluminum, iron, and zinc.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

**Special Remarks on Toxicity to Animals:**
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

**Special Remarks on Chronic Effects on Humans:**
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

## Section 12: Ecological Information

**Ecotoxicity:**
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Tetrachloroethylene UNNA: 1897 PG: III

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

**Other Regulations:**
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** g

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

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:29 PM

**Last Updated:** 06/09/2012 12:00 PM

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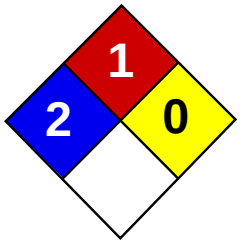



# Material Safety Data Sheet
## Trichloroethylene MSDS

## Section 1: Chemical Product and Company Identification

**Product Name:** Trichloroethylene

**Catalog Codes:** SLT3310, SLT2590

**CAS#:** 79-01-6

**RTECS:** KX4560000

**TSCA:** TSCA 8(b) inventory: Trichloroethylene

**CI#:** Not available.

**Synonym:**

**Chemical Formula:** C2HCl3

**Contact Information:**

**Sciencelab.com, Inc.**
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

**CHEMTREC (24HR Emergency Telephone), call:**
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

## Section 2: Composition and Information on Ingredients

**Composition:**

| Name | CAS # | % by Weight |
|---|---|---|
| Trichloroethylene | 79-01-6 | 100 |

**Toxicological Data on Ingredients:** Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

## Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 420°C (788°F)

**Flash Points:** Not available.

**Flammable Limits:** LOWER: 8% UPPER: 10.5%

**Products of Combustion:** These products are carbon oxides (CO, CO2), halogenated compounds.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

**Storage:**
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

## 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 threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 131.39 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 86.7°C (188.1°F)

**Melting Point:** -87.1°C (-124.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.4649 (Water = 1)

**Vapor Pressure:** 58 mm of Hg (@ 20°C)

**Vapor Density:** 4.53 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 20 ppm

**Water/Oil Dist. Coeff.:** The product is equally soluble in oil and water; log(oil/water) = 0

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol, diethyl ether, acetone.

**Solubility:**
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:**
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

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

**Toxicity to Animals:**
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Passes through the placental barrier in human. Detected in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Trichloroethylene : UN1710 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**
R36/38- Irritating to eyes and skin. R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** h

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

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:54 PM

**Last Updated:** 11/01/2010 12:00 PM

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# Material Safety Data Sheet

Vinyl Chloride (Chloroethylene)

## Section 1. Chemical product and company identification

**Product name** : Vinyl Chloride (Chloroethylene)

**Supplier** : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : Ethylene, chloro-; Chloroethene; Chloroethylene; Monochloroethylene; Vinyl chloride; Vinyl chloride monomer; Vinyl C monomer; C2H3Cl; Ethylene monochloride; Monochloroethene; Chlorethene; Chlorethylene; Chlorure de vinyle; Cloruro di vinile; Rcra waste number U043; Trovidur; UN 1086; VC; VCM; Vinile; Vinylchlorid; Vinyl chloride, inhibited; Vinyle(chlorure de); Winylu chlorek; 1-Chloroethylene

**MSDS #** : 001067

**Date of Preparation/Revision** : **4/27/2010.**

**In case of emergency** : 1-866-734-3438

## Section 2. Hazards identification

**Physical state** : Gas. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]]

**Emergency overview** : WARNING!

FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CANCER HAZARD - CAN CAUSE CANCER.
CONTENTS UNDER PRESSURE.

Keep away from heat, sparks and flame. Do not puncture or incinerate container. Do not ingest. May cause target organ damage, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed.

Contact with rapidly expanding gases can cause frostbite.

**Target organs** : May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Routes of entry** : Inhalation

**Potential acute health effects**

**Eyes** : Irritating to eyes.

**Skin** : Irritating to skin.

**Inhalation** : Acts as a simple asphyxiant.

**Ingestion** : Ingestion is not a normal route of exposure for gases

**Potential chronic health effects** : **CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union.
**MUTAGENIC EFFECTS**: Not available.
**TERATOGENIC EFFECTS**: Not available.

**Medical conditions aggravated by over-exposure** : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

**See toxicological information (section 11)**

## Section 3. Composition, Information on Ingredients

| Name | CAS number | % Volume | Exposure limits |
|---|---|---|---|
| Vinyl Chloride (Chloroethylene) | 75-01-4 | 100 | **ACGIH TLV (United States, 1/2009).**<br>TWA: 1 ppm 8 hour(s).<br>**OSHA PEL (United States, 11/2006).**<br>STEL: 5 ppm 15 minute(s).<br>TWA: 1 ppm 8 hour(s).<br>**OSHA PEL 1989 (United States, 3/1989).**<br>STEL: 5 ppm 15 minute(s).<br>TWA: 1 ppm 8 hour(s). |

## Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

**Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Ingestion** : As this product is a gas, refer to the inhalation section.

## Section 5. Fire-fighting measures

**Flammability of the product** : Flammable.

**Auto-ignition temperature** : 471.85°C (881.3°F)

**Flash point** : Open cup: -79.15°C (-110.5°F).

**Flammable limits** : Lower: 4% Upper: 22%

**Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds

**Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

**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.

## Section 6. Accidental release measures

**Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

**Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

**Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

## Section 7. Handling and storage

**Handling** : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not ingest. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

## Section 8. Exposure controls/personal protection

**Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**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.

**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.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

**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 protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

**Product name**

vinyl chloride

**ACGIH TLV (United States, 1/2009).**
TWA: 1 ppm 8 hour(s).
**OSHA PEL (United States, 11/2006).**
STEL: 5 ppm 15 minute(s).
TWA: 1 ppm 8 hour(s).
**OSHA PEL 1989 (United States, 3/1989).**
STEL: 5 ppm 15 minute(s).
TWA: 1 ppm 8 hour(s).

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

## Section 9. Physical and chemical properties

**Molecular weight** : 62.5 g/mole

**Molecular formula** : C2-H3-Cl

**Boiling/condensation point** : -13.8°C (7.2°F)

**Melting/freezing point** : -160°C (-256°F)

**Critical temperature** : 158.5°C (317.3°F)

**Vapor density** : 2.21 (Air = 1)

**Specific Volume ($ft^3/lb$)** : 6.25

**Gas Density ($lb/ft^3$)** : 0.16

## Section 10. Stability and reactivity

**Stability and reactivity** : The product is stable.

**Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

**Toxicity data**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| vinyl chloride | LD50 Oral | Rat | 500 mg/kg | - |
| | LC50 Inhalation Gas. | Rat | 18 pph | 15 minutes |
| | LC50 Inhalation Gas. | Rat | 5000 ppm | 1 hours |

**Chronic effects on humans** : **CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Other toxic effects on humans** : No specific information is available in our database regarding the other toxic effects of this material to humans.

**Specific effects**

**Carcinogenic effects** : Can cause cancer. Risk of cancer depends on duration and level of exposure.

**Mutagenic effects** : No known significant effects or critical hazards.

**Reproduction toxicity** : No known significant effects or critical hazards.

## Section 12. Ecological information

**Aquatic ecotoxicity**

Not available.

**Products of degradation** : Products of degradation: carbon oxides (CO, $CO_2$) and water, halogenated compounds.

**Environmental fate** : Not available.

**Environmental hazards** : No known significant effects or critical hazards.

**Toxicity to the environment** : Not available.

## Section 13. Disposal considerations

**Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.**

## Section 14. Transport information

| Regulatory information | UN number | Proper shipping name | Class | Packing group | Label | Additional information |
|---|---|---|---|---|---|---|
| **DOT Classification** | UN1086 | VINYL CHLORIDE, STABILIZED | 2.1 | Not applicable (gas). |   | **Reportable quantity** 1 lb. (0.454 kg)<br><br>**Limited quantity** Yes.<br><br>**Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden.<br><br>**Cargo aircraft** Quantity limitation: 150 kg<br><br>**Special provisions** 21, B44, T50 |
| **TDG Classification** | UN1086 | VINYL CHLORIDE, STABILIZED | 2.1 | Not applicable (gas). |   | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**ERAP Index** 3000<br><br>**Passenger Carrying Road or Rail Index** Forbidden |
| **Mexico Classification** | UN1086 | VINYL CHLORIDE, STABILIZED | 2.1 | Not applicable (gas). |   | - |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**

# Section 15. Regulatory information

## United States

**U.S. Federal regulations** :

**United States inventory (TSCA 8b):** This material is listed or exempted.

**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**: vinyl chloride
**SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: vinyl chloride: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

**Clean Water Act (CWA) 307**: vinyl chloride

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

**Clean Air Act (CAA) 112 accidental release prevention**: vinyl chloride

**Clean Air Act (CAA) 112 regulated flammable substances**: vinyl chloride

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

### SARA 313

| | | Product name | CAS number | Concentration |
|---|---|---|---|---|
| **Form R - Reporting requirements** | : | Vinyl Chloride (Chloroethylene) | 75-01-4 | 100 |
| **Supplier notification** | : | Vinyl Chloride (Chloroethylene) | 75-01-4 | 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** :

**Connecticut Carcinogen Reporting:** This material is not listed.
**Connecticut Hazardous Material Survey:** This material is not listed.
**Florida substances:** This material is not listed.
**Illinois Chemical Safety Act:** This material is not listed.
**Illinois Toxic Substances Disclosure to Employee Act:** This material is not listed.
**Louisiana Reporting:** This material is not listed.
**Louisiana Spill:** This material is not listed.
**Massachusetts Spill:** This material is not listed.
**Massachusetts Substances:** This material is listed.
**Michigan Critical Material:** This material is not listed.
**Minnesota Hazardous Substances:** This material is not listed.
**New Jersey Hazardous Substances:** This material is listed.
**New Jersey Spill:** This material is not listed.
**New Jersey Toxic Catastrophe Prevention Act:** This material is not listed.
**New York Acutely Hazardous Substances:** This material is listed.
**New York Toxic Chemical Release Reporting:** This material is not listed.
**Pennsylvania RTK Hazardous Substances:** This material is listed.
**Rhode Island Hazardous Substances:** This material is not listed.

**California Prop. 65** :

**WARNING:** This product contains a chemical known to the State of California to cause cancer.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| Vinyl Chloride (Chloroethylene) | Yes. | No. | Yes. | No. |

## Canada

**WHMIS (Canada)** :

Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

**CEPA Toxic substances:** This material is listed.
**Canadian ARET:** This material is not listed.
**Canadian NPRI:** This material is listed.
**Alberta Designated Substances:** This material is not listed.
**Ontario Designated Substances:** This material is not listed.
**Quebec Designated Substances:** This material is not listed.

## Section 16. Other information

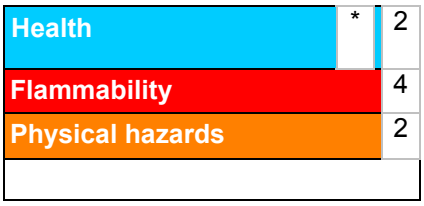
**United States**

**Label requirements** : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CANCER HAZARD - CAN CAUSE CANCER.
CONTENTS UNDER PRESSURE.

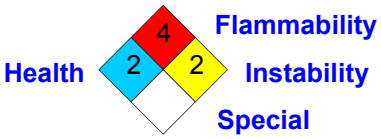
**Canada**

**Label requirements** : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

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




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




**Notice to reader**

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**
**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**

**Hydrogen Release Compound Primer (HRC Primer™)**
**MATERIAL SAFETY DATA SHEET (MSDS)**

**Last Revised:** **August 17, 2005**

## Section 1 - Material Identification

**Supplier:**


**REGENESIS**

**1011 Calle Sombra**
**San Clemente, CA 92673**
**Phone:** **949.366.8000**
**Fax:** **949.366.8090**
**E-mail:** **info@regenesis.com**


| | |
|---|---|
| **Chemical Name:** | **Propanoic acid, 2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxy]-1-oxopropoxy]-1,2,3-propanetriyl ester** |
| **Chemical Family:** | **Organic Chemical** |
| **Trade Name:** | **HRC, Glycerol Polylactate Primer** |

## Section 2 – Chemical Identification

| CAS# | Chemical |
|---|---|
| **201167-72-8** | **Glycerol Polylactate** |
| **50-21-5** | **Lactic Acid** |

## Section 3 - Physical Data

| | |
|---|---|
| **Melting Point:** | **NA** |
| **Boiling Point:** | **ND** |
| **Flash Point:** | **ND** |
| **Density:** | **1.10 g/cc** |
| **Solubility:** | **Water, Acetone and DMSO** |
| **Appearance:** | **Yellow Liquid** |
| **Odor:** | **Not detectable** |

## Section 4 - Fire and Explosion Hazard Data

**Extinguishing Media:** **Carbon Dioxide, Dry Chemical Powder or Appropriate Foam.**

**Water may be used to keep exposed containers cool.**

**For large quantities involved in a fire, one should wear full protective clothing and a NIOSH approved self contained breathing apparatus with full face piece operated in the pressure demand or positive pressure mode as for a situation where lack of oxygen and excess heat are present.**

## Section 5 - Toxicological Information

**Acute Effects:**

**May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the glycerol tripolylactate have not been investigated. Listed below are the toxicological information for glycerol and lactic acid.**

**RTECS#:**

**MA8050000**
**Glycerol**

**Irritation data:**

| | |
|---|---|
| **SKN-RBT 500 MG/24H MLD** | **BIOFX* 9-4/1970** |
| **85JCAE-,207,1986** | **85JCAE-,207,1986** |
| **EYE-RBT 126 MG MLD** | |
| **EYE-RBT 500 MG/24H MLD** | |

**Toxicity data:**

| | |
|---|---|
| **ORL-MUS LD50:4090 MG/KG** | |
| **FRZKAP (6),56,1977** | |
| **SCU-RBT LD50:100 MG/KG** | **NIIRDN 6,215,1982** |
| **ORL-RAT LD50:12600 MG/KG** | **FEPRA7 4,142,1945** |
| **IHL-** | |
| **RATLC50:>570MG/M3/1HBIOFX*9-** | **RCOCB8 56,125,1987** |
| **4/1970 IPR-RAT LD50: 4420 MG/KG** | **ARZNAD** |
| **IVN-RAT LD50:5566 MG/KG** | **26,1581,1976** |
| **IPR-MUS LD50: 8700 MG/KG** | **ARZNAD** |
| **SCU-MUS LD50: 91 MG/KG** | **26,1579,1978** |
| **IVN-MUS LD50: 4250 MG/KG** | **NIIRDN 6,215,1982** |
| **ORL-RBT LD50: 27 GM/KG** | **JAPMA8 39,583,1950** |
| **SKN-RBT LD50:>10GM/KG** | **DMDJAP 31,276,1959** |
| | **BIOFX* 9-4/1970** |
| **IVN-RBT LD50: 53 GM/KG** | **NIIRDN 6,215,1982** |
| | **JIHTAB 23,259,1941** |
| **ORL-GPG LD50: 7750 MG/KG** | |

## Section 5 - Toxicological Information (cont)

| | |
|---|---|
| **Target Organ data:** | **Behavioral (headache), gastrointestinal (nausea or vomiting), Paternal effects (spermatogenesis, testes, epididymis, sperm duct), effects of fertility (male fertility index, post-implantation mortality).** |
| **Acute Effects:** | **May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the glycerol tripolylactate have not been investigated. Listed below are the toxicological information for glycerol and lactic acid.** |
| **RTECS#:** | **OD2800000**<br>**Lactic acid** |
| **Irritation data:** | **SKN-RBT 5MG/24H SEV 85JCAE -,656,86**<br>**EYE-RBT 750 UG SEV AJOPAA 29,1363,46** |
| **Toxicity data:** | **ORL-RAT LD50:3543 MG/KG FMCHA2-,C252,91**<br>**SKN-RBT LD50:>2 GM/KG FMCHA2-,C252,91**<br>**ORL-MUS LD50: 4875 MG/KG FAONAU 40,144,67 JIHTAB 23,259,41**<br>**ORL-GPG LD50: 1810 MG/KG FMCHA2-,C252,91**<br>**ORL-QAL LD50: >2250 MG/KG** |

**Only selected registry of toxic effects of chemical substances (RTECS) data is presented here. See actual entry in RTECS for complete information on lactic acid and glycerol.**

## Section 6 - Health Hazard Data

| | |
|---|---|
| **Handling:** | **Avoid continued contact with skin. Avoid contact with eyes.** |

**In any case of any exposure which elicits a response, a physician should be consulted immediately.**

**First Aid Procedures**

| | |
|---|---|
| **Inhalation:** | **Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.** |
| **Ingestion:** | **No effects expected. Do not give anything to an unconscious person. Call a physician immediately.** |

## Section 6 - Health Hazard Data (cont)

| | |
|---|---|
| **Skin Contact:** | **Flush with plenty of water. Contaminated clothing may be washed or dry cleaned normally.** |
| **Eye contact:** | **Wash eyes with plenty of water for at least 15 minutes lifting both upper and lower lids. Call a physician.** |

## Section 7 - Reactivity Data

| | |
|---|---|
| **Conditions to Avoid:** | **Strong oxidizing agents, bases and acids** |
| **Hazardous Polymerization:** | **None known** |
| **Further Information:** | **Hydrolyses in water to form Lactic Acid and Glycerol.** |

## Section 8 - Spill, Leak or Accident Procedures

| | |
|---|---|
| **After Spillage or Leakage:** | **Neutralization is not required. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber.** |
| **Disposal:** | **Laws and regulations for disposal vary widely by locality. Observe all applicable regulations and laws. This material, may be disposed of in solid waste. Material is readily degradable and hydrolyses in several hours.** |

**No requirement for a reportable quantity (CERCLA) of a spill is known.**

## Section 9 - Special Protection or Handling

**Should be stored in plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass containers.**

| | |
|---|---|
| **Protective Gloves:** | **Vinyl or Rubber** |
| **Eyes:** | **Splash Goggles or Full Face Shield**<br>**Area should have approved means of washing eyes.** |
| **Ventilation:** | **General exhaust.** |
| **Storage:** | **Store in cool, dry, ventilated area. Protect from imcompatible materials.** |

## Section 10 - Other Information

**This material will degrade in the environment by hydrolysis to lactic acid and glycerol. Materials containing reactive chemicals should be used only by personnel with appropriate chemical training.**

**The information contained in this document is the best available to the supplier as of the time of writing. Some possible hazards have been determined by analogy to similar classes of material. No separate tests have been performed on the toxicity of this material. The items in this document are subject to change and clarification as more information becomes available.**

**Hydrogen Release Compound (HRC®)**
**MATERIAL SAFETY DATA SHEET (MSDS)**

**Last Revised:** **October 9, 2007**

## Section 1 - Material Identification

**Supplier:**


**REGENESIS**
**1011 Calle Sombra**
**San Clemente, CA 92673**
**Phone:** **949.366.8000**
**Fax:** **949.366.8090**
**E-mail:** **info@regenesis.com**


| | |
|---|---|
| **Chemical Name:** | **Propanoic acid, 2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxy]-1-oxopropoxy]-1,2,3-propanetriyl ester** |
| **Chemical Family:** | **Organic Chemical** |
| **Trade Name:** | **Hydrogen Release Compound® (HRC®)**<br>**Glycerol tripolylactate and Glycerol** |
| **Product Use:** | **Used to remediate contaminated soil and groundwater (environmental applications)** |

## Section 2 – Chemical Identification

| CAS# | Chemical |
|---|---|
| **201167-72-8** | **Glycerol Tripolylactate** |
| **56-81-5** | **Glycerol** |
| **50-21-5** | **Lactic Acid** |

## Section 3 - Physical Data

| | |
|---|---|
| **Melting Point:** | **Not Available (NA)** |
| **Boiling Point:** | **Not Determined (ND)** |
| **Flash Point:** | **ND** |
| **Density:** | **1.3 g/cc** |

## Section 3 – Physical Data (cont)

| | |
|---|---|
| **Solubility:** | **Acetone and DMSO** |
| **Appearance:** | **Viscous amber gel/liquid** |
| **Odor:** | **Not detectable** |
| **Vapor Pressure:** | **None** |

## Section 4 - Fire and Explosion Hazard Data

**Extinguishing Media:** **Use Water Spray, Carbon Dioxide, Dry Chemical Powder or Appropriate Foam.**

**Water may be used to keep exposed containers cool.**

**For large quantities involved in a fire, one should wear full protective clothing and a NIOSH approved self contained breathing apparatus with full face piece operated in the pressure demand or positive pressure mode as for a situation where lack of oxygen and excess heat are present.**

## Section 5 - Toxicological Information

**Acute Effects:** **May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the glycerol tripolylactate have not been investigated. Listed below are the toxicological information for glycerol and lactic acid.**

**RTECS#:** **MA8050000**
**Glycerol**

**Irritation data:**

| | |
|---|---|
| **SKN-RBT 500 MG/24H MLD** | **BIOFX* 9-4/1970** |
| **85JCAE-,207,1986** | **85JCAE-,207,1986** |
| **EYE-RBT 126 MG MLD** | **85JCAE -,656,86** |
| **EYE-RBT 500 MG/24H MLD** | **AJOPAA 29,1363,46** |
| **SKN-RBT 5MG/24H SEV** | |
| **EYE-RBT 750 UG SEV** | |

## Section 5 – Toxicological Information (cont)

| | | |
|---|---|---|
| **Toxicity data:** | **ORL-MUS LD50:4090 MG/KG** | **NIIRDN 6,215,1982** |
| | **FRZKAP (6),56,1977** | **FEPRA7 4,142,1945** |
| | **SCU-RBT LD50:100 MG/KG** | **RCOCB8 56,125,1987** |
| | **ORL-RAT LD50:12600 MG/KG** | **ARZNAD 26,1581,1976** |
| | **IHL-** | **ARZNAD 26,1579,1978** |
| | **RATLC50:>570MG/M3/1HBIO** | **NIIRDN 6,215,1982** |
| | **FX*9-4/1970 IPR-RAT LD50:** | **JAPMA8 39,583,1950** |
| | **4420 MG/KG** | **DMDJAP 31,276,1959** |
| | **IVN-RAT LD50: 5566 MG/KG** | **BIOFX* 9-4/1970** |
| | **IPR-MUS LD50: 8700 MG/KG** | **NIIRDN 6,215,1982** |
| | **SCU-MUS LD50: 91 MG/KG** | **FMCHA2-,C252,91** |
| | **IVN-MUS LD50: 4250 MG/KG** | **FMCHA2-,C252,91** |
| | **ORL-RBT LD50: 27 GM/KG** | **FAONAU 40,144,67** |
| | **SKN-RBT LD50:>10GM/KG** | **JIHTAB 23,259,41** |
| | **IVN-RBT LD50: 53 GM/KG** | **FMCHA2-,C252,91** |
| | **ORL-GPG LD50: 7750 MG/KG** | **JIHTAB 23,259,1941** |
| | **ORL-RAT LD50:3543 MG/KG** | |
| | **SKN-RBT LD50:>2 GM/KG** | |
| | **ORL-MUS LD50: 4875 MG/KG** | |
| | **ORL-GPG LD50: 1810 MG/KG** | |
| | **ORL-QAL LD50: >2250 MG/KG** | |
| **Target Organ data:** | **Behavioral (headache), gastrointestinal (nausea or vomiting), Paternal effects (spermatogenesis, testes, epididymis, sperm duct), effects of fertility (male fertility index, post-implantation mortality).** | |
| **RTECS#:** | **OD2800000**<br>**Lactic acid** | |

**Only selected registry of toxic effects of chemical substances (RTECS) data is presented here. See actual entry in RTECS for complete information on lactic acid and glycerol.**

## Section 6 - Health Hazard Data

| | |
|---|---|
| **Handling:** | **Avoid continued contact with skin. Avoid contact with eyes.** |

**In any case of any exposure which elicits a response, a physician should be consulted immediately.**

**First Aid Procedures**

| | |
|---|---|
| **Inhalation:** | **Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.** |
| **Ingestion:** | **No effects expected. Do not give anything to an unconscious person. Call a physician immediately.** |
| **Skin Contact:** | **Flush with plenty of water. Contaminated clothing may be washed or dry cleaned normally.** |
| **Eye contact:** | **Wash eyes with plenty of water for at least 15 minutes lifting both upper and lower lids. Call a physician.** |

## Section 7 - Reactivity Data

| | |
|---|---|
| **Conditions to Avoid:** | **Strong oxidizing agents, bases and acids** |
| **Hazardous Polymerization:** | **None known** |
| **Further Information:** | **Hydrolyses in water to form Lactic Acid and Glycerol.** |

## Section 8 - Spill, Leak or Accident Procedures

| | |
|---|---|
| **After Spillage or Leakage:** | **Neutralization is not required. This material may be burned in a chemical incinerator equipped with an afterburner and scrubber.** |
| **Disposal:** | **Laws and regulations for disposal vary widely by locality. Observe all applicable regulations and laws. This material, may be disposed of in solid waste. Material is readily degradable and hydrolyses in several hours.** |

**No requirement for a reportable quantity (CERCLA) of a spill is known.**

## Section 9 - Special Protection or Handling

**Should be stored in plastic lined, steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass containers.**

| | |
|---|---|
| **Protective Gloves:** | **Vinyl or Rubber** |
| **Eyes:** | **Splash Goggles or Full Face Shield**<br>**Area should have approved means of washing eyes.** |
| **Ventilation:** | **General exhaust.** |
| **Storage:** | **Store in cool, dry, ventilated area. Protect from incompatible materials.** |

## Section 10 - Other Information

**This material will degrade in the environment by hydrolysis to lactic acid and glycerol. Materials containing reactive chemicals should be used only by personnel with appropriate chemical training.**

**The information contained in this document is the best available to the supplier as of the time of writing. Some possible hazards have been determined by analogy to similar classes of material. No separate tests have been performed on the toxicity of this material. The items in this document are subject to change and clarification as more information becomes available.**

# *eXtended release formula* Hydrogen Release Compound (HRC-X™)
# MATERIAL SAFETY DATA SHEET (MSDS)

**Last Revised:** **August 31, 2007**

## Section 1 - Material Identification

**Supplier:**


**REGENESIS**

**1011 Calle Sombra**
**San Clemente, CA 92673**

**Phone:** **949.366.8000**

**Fax:** **949.366.8090**

**E-mail:** **info@regenesis.com**


| | |
|---|---|
| **Chemical Name:** | **Propanoic acid, 2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxy]-1-oxopropoxy]-1,2,3-propanetriyl ester** |
| **Chemical Family:** | **Organic Chemical** |
| **Trade Name:** | ***eXtended release formula* Hydrogen Release Compound (HRC-X™), Glycerol tripolylactate and Glycerol** |
| **Product Use:** | **Used to remediate contaminated soil and groundwater (environmental applications)** |

## Section 2 – Chemical Identification

| CAS# | Chemical |
|---|---|
| **201167-72-8** | **Glycerol Tripolylactate** |
| **56-81-5** | **Glycerol** |
| **50-21-5** | **Lactic Acid** |

## Section 3 - Physical Data

| | |
|---|---|
| **Melting Point:** | **Not Available (NA)** |
| **Boiling Point:** | **Not Determined (ND)** |
| **Flash Point:** | **ND** |
| **Density:** | **1.3 g/cc** |
| **Solubility:** | **Acetone and DMSO** |
| **Appearance:** | **Viscous amber gel/liquid** |
| **Odor:** | **Not detectable** |
| **Vapor Pressure:** | **None** |

## Section 4 - Fire and Explosion Hazard Data

**Extinguishing Media:** **Use Water Spray, Carbon Dioxide, Dry Chemical Powder or Appropriate Foam.**

**Water may be used to keep exposed containers cool.**

**For large quantities involved in a fire, one should wear full protective clothing and a NIOSH approved self contained breathing apparatus with full face piece operated in the pressure demand or positive pressure mode as for a situation where lack of oxygen and excess heat are present.**

## Section 5 - Toxicological Information

**Acute Effects:** **May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the glycerol tripolylactate have not been investigated. Listed below are the toxicological information for glycerol and lactic acid.**

**RTECS#:** **MA8050000**
**Glycerol**

## Section 5 - Toxicological Information (cont)

| | | |
|---|---|---|
| **Irritation data:** | **SKN-RBT 500 MG/24H MLD**<br>**85JCAE-,207,1986** | **BIOFX* 9-4/1970**<br>**85JCAE-,207,1986** |

| | | |
|---|---|---|
| **Toxicity data:** | **EYE-RBT 126 MG MLD**<br>**EYE-RBT 500 MG/24H MLD**<br>**SKN-RBT 5MG/24H SEV**<br>**EYE-RBT 750 UG SEV** | **85JCAE -,656,86**<br>**AJOPAA 29,1363,46** |
| | **ORL-MUS LD50:4090 MG/KG**<br>**FRZKAP (6),56,1977**<br>**SCU-RBT LD50:100 MG/KG**<br>**ORL-RAT LD50:12600 MG/KG**<br>**IHL-RATLC50:>570MG/M3/1HBIOFX*9-4/1970**<br>**IPR-RAT LD50: 4420 MG/KG**<br>**IVN-RAT LD50: 5566 MG/KG**<br>**SCU-MUS LD50: 91 MG/KG**<br>**IPR-MUS LD50: 8700 MG/KG**<br>**IVN-MUS LD50: 4250 MG/KG**<br>**ORL-RBT LD50: 27 GM/KG**<br>**SKN-RBT LD50:>10GM/KG**<br>**IVN-RBT LD50: 53 GM/KG**<br>**ORL-GPG LD50: 7750 MG/KG**<br>**ORL-RAT LD50:3543 MG/KG**<br>**SKN-RBT LD50:>2 GM/KG**<br>**ORL-MUS LD50: 4875 MG/KG**<br>**ORL-GPG LD50: 1810 MG/KG**<br>**ORL-QAL LD50: >2250 MG/KG** | **NIIRDN 6,215,1982**<br>**FEPRA7 4,142,1945**<br>**RCOCB8 56,125,1987**<br>**ARZNAD 26,1581,1976**<br>**NIIRDN 6,215,1982**<br>**ARZNAD 26,1579,1978**<br>**JAPMA8 39,583,1950**<br>**DMDJAP 31,276,1959**<br>**BIOFX* 9-4/1970**<br>**NIIRDN 6,215,1982**<br>**JIHTAB 23,259,1941**<br>**FMCHA2-,C252,91**<br>**FMCHA2-,C252,91**<br>**FAONAU 40,144,67**<br>**JIHTAB 23,259,41**<br>**FMCHA2-,C252,91** |
| **Target Organ data:** | **Behavioral (headache), gastrointestinal (nausea or vomiting), Paternal effects (spermatogenesis, testes, epididymis, sperm duct), effects of fertility (male fertility index, post-implantation mortality).** | |
| **RTECS#:** | **OD2800000**<br>**Lactic acid** | |

**Only selected registry of toxic effects of chemical substances (RTECS) data is presented here. See actual entry in RTECS for complete information on lactic acid and glycerol.**

## Section 6 - Health Hazard Data

**Handling:** **Avoid continued contact with skin. Avoid contact with eyes.**

**In any case of any exposure which elicits a response, a physician should be consulted**

**immediately.**

**First Aid Procedures**

| | |
|---|---|
| **Inhalation:** | **Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.** |
| **Ingestion:** | **No effects expected. Do not give anything to an unconscious person. Call a physician immediately.** |
| **Skin Contact:** | **Flush with plenty of water. Contaminated clothing may be washed or dry cleaned normally.** |
| **Eye contact:** | **Wash eyes with plenty of water for at least 15 minutes lifting both upper and lower lids. Call a physician.** |

## Section 7 - Reactivity Data

| | |
|---|---|
| **Conditions to Avoid:** | **Strong oxidizing agents, bases and acids** |
| **Hazardous Polymerization:** | **None known** |
| **Further Information:** | **Hydrolyses in water to form Lactic Acid and Glycerol.** |

## Section 8 - Spill, Leak or Accident Procedures

| | |
|---|---|
| **After Spillage or Leakage:** | **Neutralization is not required. This material may be burned in a chemical incinerator equipped with an afterburner and scrubber.** |
| **Disposal:** | **Laws and regulations for disposal vary widely by locality. Observe all applicable regulations and laws. This material, may be disposed of in solid waste. Material is readily degradable and hydrolyses in several hours.** |

**No requirement for a reportable quantity (CERCLA) of a spill is known.**

## Section 9 - Special Protection or Handling

**Should be stored in plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass containers.**

**Protective Gloves:** **Vinyl or Rubber**

| | |
|---|---|
| **Eyes:** | **Splash Goggles or Full Face Shield<br>Area should have approved means of washing eyes.** |
| **Ventilation:** | **General exhaust.** |
| **Storage:** | **Store in cool, dry, ventilated area. Protect from incompatible materials.** |

## Section 10 - Other Information

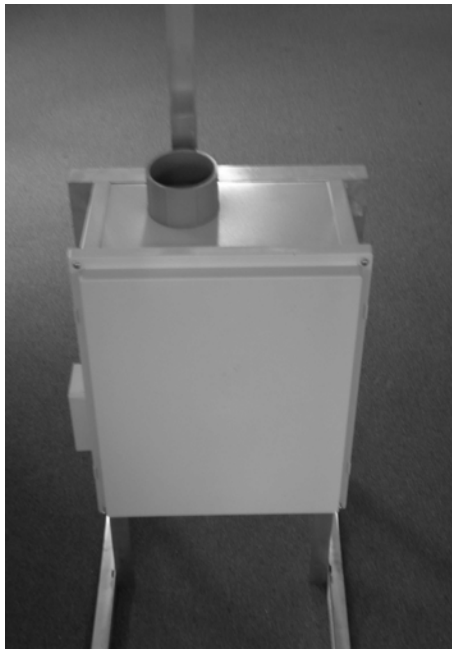
**This material will degrade in the environment by hydrolysis to lactic acid and glycerol. Materials containing reactive chemicals should be used only by personnel with appropriate chemical training.**

**The information contained in this document is the best available to the supplier as of the time of writing. Some possible hazards have been determined by analogy to similar classes of material. No separate tests have been performed on the toxicity of this material. The items in this document are subject to change and clarification as more information becomes available.**

# APPENDIX 5 - O&M MANUAL (SSDS)

# THE OBAR GBR76
## COMPACT RADIAL BLOWER

Based on 25 years of experience and 2 years of research and development, the patent pending GBR series of compact radial blowers provide the perfect combination of performance and design.



*GBR76 WITH ROOF MOUNT*

PERFORMANCE

- GBR76 SOE 16" WC @ 0  Max flow 155 cfm.
- GBR76 HO 41" WC @ 0 Max flow 160 cfm.
- Built in speed control to customize performance.
- Condensate bypass built in.
- 18 month warranty 40,000 hr sealed bearings.

### DESIGN

- Our modular design means the blower and manifold assembly can be removed and replaced as a unit. This makes repairs cost effective and easy and allows contractors to upgrade systems simply by swapping assemblies.
- The GBR series is based on a  bypass blower designed to handle combustible materials.
- The housing is not required to be air tight so you can add gauges and alarms without compromising the system.
- Built in condensate bypass.
- Built in speed control.
- Quick disconnect electrical harness.
- All UL listed components including UL listed enclosure for outside use.
- Wall fastening lugs included.
- GBR series roof and wall mounts available to quickly configure the blowers for your installation while providing a custom built look.
- Compact design  16"x 14"x 8" weighing only 18 lbs.
- 3"  schedule 40 inlet and exhaust.

| COST | GBR76 SOE | GBR76 HO |
|---|---|---|
| **COMPLETE UNIT** | **$939.00** | **$1039.00** |
| **3 YEAR WARRANTY** | **$395.00** | **$450.00** |

**OBAR SYSTEMS INC 117 POCANTECS ROAD HIGHLAND LAKES NJ 07422  800 949 6227**

| GBR76 SOE | 0” | 2” | 4” | 6” | 8” | 10” | 12” | 16” | Wattage |
|---|---|---|---|---|---|---|---|---|---|
| SOE 16 | 150 | 140 | 129 | 118 | 105 | 90 | 75 | 35 | 150-320 |
| SOE 12 | 125 | 115 | 100 | 83 | 62 | 39 | 0 | | 110-200 |
| SOE 8 | 105 | 90 | 70 | 42 | 0 | | | | 60-120 |
| SOE 4 | 75 | 50 | 0 | | | | | | 37-50 |

**GBR SOE** performance using built in potentiometer set at sealed vacuums of 16, 12, 8, and 4” WC

| GBR76 HO | 0” | 10” | 20” | 30” | 40” | Wattage |
|---|---|---|---|---|---|---|
| HO 40 | 155 | 110 | 72 | 40 | 10 | 400-575 |
| HO 30 | 150 | 108 | 70 | 22 | 0 | 375-415 |
| HO 20 | 141 | 99 | 20 | 0 | | 200-350 |

GBR76 HO performance using built in potentiometer set at sealed vacuums of 40, 30, and 20” WC

## Blower Specifications

**Notes:**

- **Input Voltage Range:** 108-132 Volts AC RMS, 50/60 Hz, single phase.
- **Input Current:** 6 amps AC RMS
- **Operating Temperature (Ambient Air and Working Air):** 0°C to 50°C
- **Storage Temperature:** -40°C to 85°C
- **Dielectric Testing:** 1500 Volts AC RMS 60 Hz applied for one second between input pins and ground, 3mA leakage maximum.
- **Speed Control Methods:** PWM (Pulse Width Modulation) (1 kHz to 10 kHz)
  0 to 10 VDC speed control.
  Mechanical: A potentiometer is available for speed control of the blower. The potentiometer can be preset for a specific speed. Access for speed adjustment located in motor housing.
- **Approximate Weight:** 4.8 Lbs. / 2.2 Kg
- **Regulatory Agency Certification:** Underwriters Laboratories Inc. UL507 Recognized under File E94403 and compliant under the CE Low Voltage Directive 2006/95/EC.
- **Design Features:** Designed to provide variable airflow for low NOx & CO emission in high efficiency gas fired combustion systems. Built with non-sparking materials. Blower housing assembly constructed of die cast aluminum. Impeller constructed from hardened aluminum. Rubber isolation mounts built into blower construction to dampen vibration within the motor. Two piece blower housing assembly sealed with O-ring gasket for combustion applications. Customer is responsible to check for any leakage once the blower is installed into the final application.
- **Miscellaneous:** Blower inlet, discharge, and all motor cooling inlet and discharge vents must not be obstructed. Motor ventilation air to be free of oils and other foreign particles, (i.e. breathing quality air). Blower is to be mounted so ventilation air cannot be re-circulated.
  **POWER CONNECTION:** Blower connector, AMP Universal MATE-N-LOK, part no. 1-350943-0.
  **SPEED CONNECTION:** Blower connector, Molex Mini-Fit Jr., part no. 39-30-3056.
  Mating harnesses available upon request.

## **Enclosure S**pecifications

**Rating:**

Ingress Protection (EN 60529): 66/67

Electrical insulation: Totally insulated

Halogen free (DIN/VDE 0472, Part 815): yes

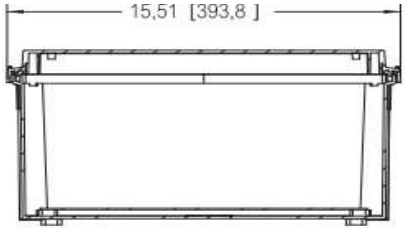
UV resistance: UL 508

Flammability Rating (UL 746 C 5): complies with UL 508

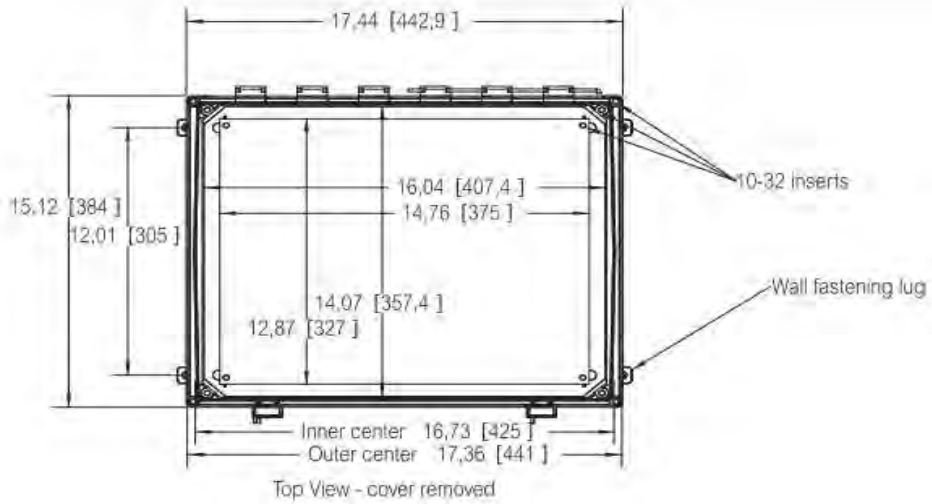
Glow Wire Test (IEC 695-2-1) °C: 960

NEMA Class: UL Type 4, 4X, 6, 6P, 12 and 13

Certificates: Underwriters Laboratories



Screw cover



Top View - cover removed

# GBR ROOF MOUNT

**The GBR Roof Mount is designed for the GBR series fans but can be adapted to accept other fans such as the Fantech HP series. Constructed of 3/16 x 1 ½ welded aluminum with stainless hardware the mount is ready for installation and does not require painting. . The mount measures 36" high, 17" wide and has a base of 40" x 17". There is an additional 12" extension to secure the discharge. The mount can be used with Pipe Pier mounts or fastened directly to curbing or other common supports.**

**Cost $169.00**

*GBR FAN MOUNT WITH GBR76 FAN*

*GBR FAN MOUNT WITH FANTECH ADAPTER*

*GBR FAN MOUNT WITH FANTECH FAN*

RECTORSEAL

# PETE™ 602L
## Low VOC PVC Solvent Cement

Description | Characteristics | Applications | Packaging | Instructions | Precautions | Specifications | Limited Warranty

**DESCRIPTION:**

Pete™ 602L is a polyvinyl chloride (PVC) solvent cement used for joining PVC pipe and socket-type fittings.

Pete™ 602L is our most popular and best selling solvent cement. It is a clear, medium body cement. Max VOC per SCAQMD 1168/316A or BAAQMD Method 40: 510 g/l.

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**CHARACTERISTICS:**

- NSF approved for potable water
- UPC (IAPMO) listed
- Exceeds ASTM D 2564 specifications
- LEED Compliant
- Pete™ 602L is a thicker formula, so it reduces product run-off and has excellent gap filling characteristics

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**APPLICATIONS:**

Pete™ 602L is specifically formulated for all PVC pipe applications such as potable water, pressure pipe, gas, conduit, sewers, and drain, waste and vent (DWV).

It is for use on PVC pipe up to and including 6" for Schedule 40 and 1 1/4" for Schedule 80.

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**PACKAGING:**

| Code | Size | Qty. Per Case | Lbs. per Case | Cu. Ft Per Case |
|---|---|---|---|---|
| 55992 | 1/4 pint dauber top (118 ml)) | 24 cans | 9 | .18 |
| 55924 | 1/2 pint dauber top (237 ml) | 24 cans | 16 | .45 |
| 55926 | Pint dauber top (473 ml) | 12 cans | 15 | .43 |
| 55928 | Quart dauber top (946 ml) | 12 cans | 27 | .78 |
| 55916 | Gallon can (3.8 L) | 4 cans | 34 | .80 |

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**INSTRUCTIONS:**

1. Store and apply between 40 degree F and 120 degree F. Protect from freezing. Do not use if cement has become curdled, lumpy, thickened or is beyond two years from date stamped on container. Do not thin.
2. **Wear non-permeable gloves during application to avoid skin contact.**
3. Clean fitting socket and pipe and check for proper fit. Apply PRIMER to all PVC surfaces. While still wet, quickly begin solvent cement application.
4. Shake well before using and stir frequently while using. Apply with supplied dauber applicator. For pipe greater than 2" diameter, use natural bristle brush sized1/2 of the pipe diameter.
5. Apply thin coat evenly to socket. Avoid puddling. Quickly apply heavy coat to pipe end. While wet,quickly insert pipe into fitting with slight twisting movement until it bottoms out.
6. Hold pipe into fitting for at least 30 seconds to prevent pipe from backing out.
7. Wipe excess cement from joint with rag. Allow 15 minutes before handling. Avoid full-line pressure for 24 hours. Cure time varies with size, fit, temperature and humidity.

For additional technical information, call Toll Free 1-800-231-3345.

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**PRECAUTIONS:**

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT,

CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

**D A N G E R!**

EXTREMELY FLAMMABLE • HARMFUL OR FATAL IF SWALLOWED
VAPOR HARMFUL • EYE AND SKIN IRRITANT • MAY BE ABSORBED THROUGH SKIN
VAPORS MAY CAUSE FLASH FIRES

**CONTAINS:**Tetrahydrofuran, Methyl Ethyl Ketone, Cyclohexanone and Acetone. **PRECAUTIONS:** Vapors are heavier than air and can collect in low areas.Keep away from heat, sparks, and flames until vapors are gone. Use only with good cross-ventilation. Wear adequate protective gear and clothing. Avoid breathing vapors and contact with skin, eyes and clothing. Long term repeated overexposure to solvents may cause damage to the brain, nervous system, reproductive system, respiratory system, mucous membranes, liver, and kidneys. Wash after handling. **FIRST AID:** For any overexposure, get immediate medical attention after first aid is given. **Eyes** - Flush 15 minutes with clean water. **Skin** - Wash with soap and water. **Inhalation** - Remove to fresh air. **Ingestion** - DO NOT INDUCE VOMITING. Only if conscious, give large amounts of water. Do not reuse empty container. **KEEP OUT OF REACH OF CHILDREN.**

For additional information, refer to Material Safety Data Sheet.

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SPECIFICATIONS:

| | |
|---|---|
| Wt/Gal @ 77 degree F | 7.6 +- .2 lbs/gal. |
| Flash Point SETA CC | 4.1 degree F |
| Color | Clear |
| Shelf Life | 2 years, Subject to inspection |

Suggestions and recommendations covering the use of our products are based on our past experience and laboratory findings. However, as we have no control as to the methods and conditions of application, we only assume responsibility for the uniformity of our products within manufacturing tolerances.

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LIMITED WARRANTY:

RectorSeal® makes the Limited Express Warranty that when the instructions for storage and handling of our products are followed we warrant our products to be free from defects. THIS LIMITED EXPRESS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION ON THE PART OF RECTORSEAL®. The sole remedy for breach of the Limited Express Warranty shall be the refund of the purchase price. All other liability is negated and disclaimed, and RectorSeal® shall not be liable for incidental or consequential damages.

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RectorSeal®
**2601 Spenwick Drive • Houston, TX 77055 USA**
**713-263-8001 • Fax 713-263-7577**
**Toll-free 800-231-3345 • Fax 800-441-0051**
G-10

Back to Solvent Cements

RECTORSEAL

# JIM™ PR1L& CLEAR PR2L
## Low VOC Hi-Etch PVC and CPVC Primers

Description | Characteristics | Applications | Packaging | Instructions | Precautions | Specifications | Limited Warranty

DESCRIPTION:

Jim™ PR1L and Clear PR2L are hi-etch primers for use on both PVC and CPVC pipe, tubing and socket-type fittings.

These two hi-etch primers are the same except for the color - Jim™ PR1L is purple and Clear PR2L is clear. Max VOC per SCAQMD 1168/316A or BAAQMD Method 40: 550 g/l.

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CHARACTERISTICS:

- NSF approved for potable water systems
- UPC (IAPMO) listed under File No. 4585 (Jim™ PR1 only)
- Meets ASTM F 656 specifications
- Fast acting, hi-etch primer prepares the surfaces for superior bonding strength
- Jim™ PR1L's purple color ensures easy visual check for complete coverage
- LEED Compliant

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APPLICATIONS:

Jim™ PR1L and Clear PR2L are specifically formulated for all PVC and CPVC pipe applications such as potable water, pressure pipe, gas, conduit, sewers and drain, waste and vent (DWV).

They are for use on all sizes and classes in both Schedule 40 and Schedule 80.

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PACKAGING:

| Jim(TM) PR1L Code | Clear PR2L Code | Size | Qty. Per Case | Lbs. per Case | Cu. Ft Per Case |
|---|---|---|---|---|---|
| 55910 | ------ | 1/4 pint dauber top (118 ml) | 24 cans | 9 | .18 |
| 55912 | ------ | 1/2 pint dauber top (237 ml) | 24 cans | 15 | .45 |
| 55914 | 55972 | Pint dauber top (473 ml) | 12 cans | 14 | .43 |
| 55918 | 55981 | Quart dauber top (946 ml) | 12 cans | 26 | .78 |
| 55920 | 55982 | Gallon can (3.8 L) | 4 cans | 32 | .80 |

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INSTRUCTIONS:

1. Store and apply between 40 degree F and 120 degree F. Use below 40 degree F only with proper solvent cement and with extreme care.
2. Cut pipe end square and remove ragged edges and burrs. Clean fitting socket and pipe of dirt, grease, and moisture, and check for proper fit. Apply PRIMER as noted below. While still wet, quickly begin solvent cement application.
3. Wear non-permeable gloves during application to avoid skin contact.
4. Apply PRIMER evenly and freely to socket and then to pipe end for length of socket depth using supplied dauber applicator. Then apply again to socket. For pipe greater than 2" diameter, use natural-bristle brush sized to 1/2 pipe diameter. During each application step, keep dauber or brush wet and moving about 10 seconds.
5. Temperature and humidity conditions may require repeated applications to one or both surfaces to avoid drying. While still wet, quickly apply proper solvent cement and make up pipe joint in accordance with cement's instructions.

For additional technical information, call Toll Free 1-800-231-3345.

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PRECAUTIONS:

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT,

CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

**D A N G E R!**

VAPORS EXTREMELY FLAMMABLE
VAPORS ARE HEAVIER THAN AIR AND CAN COLLECT IN LOW AREAS

VAPORS MAY CAUSE FLASH FIRE

**CONTAINS: Tetrahydrofuran, Methyl Ethyl Ketone, Acetone and Cyclohexanone. PRECAUTIONS:** Vapors extremely flammable. Harmful if swallowed or inhaled. Causes eye and skin irritation. Keep away from heat, sparks, and flames until vapors are gone. Use only with good cross-ventilation. Wear adequate protective gear and clothing. Avoid breathing vapors and contact with skin, eyes and clothing. Long term repeated overexposure to solvents may cause damage to the brain, nervous system, reproductive system, respiratory system, mucous membranes, liver, and kidneys.Wash after handling. **FIRST AID:** For any overexposure, get immediate medical attention after first aid is given. **Eyes** - Flush 15 minutes with clean water. **Skin** - Wash with soap and water. **Inhalation** - Remove to fresh air. **Ingestion** - DO NOT INDUCE VOMITING. Only if conscious, give large amounts of water. **FIRE AND SPILLS:** For fire, use water fog, CO2, foam, or dry chemicals. Clean up spills immediately with inert absorbents. **STORAGE AND HANDLING:** Store in cool, well-ventilated area. Keep container upright and tightly closed. Do not reuse empty container. **KEEP OUT OF REACH OF CHILDREN.**

For additional information, refer to Material Safety Data Sheet.

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SPECIFICATIONS:

| | |
|---|---|
| Wt/Gal @ 77 degree F | 6.9+-.2 lbs/gal. |
| Flash Point SETA CC | 17 degree F |
| Color | |
| Jim(TM) PR1 | Purple |
| Jim(TM) PR2 | Clear |
| Shelf Life | 2 years minimum |

For Jim(TM) PR1L only File No. 4585

Suggestions and recommendations covering the use of our products are based on our past experience and laboratory findings. However, as we have no control as to the methods and conditions of application, we only assume responsibility for the uniformity of our products within manufacturing tolerances.

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LIMITED WARRANTY:

RectorSeal® makes the Limited Express Warranty that when the instructions for storage and handling of our products are followed we warrant our products to be free from defects. THIS LIMITED EXPRESS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION ON THE PART OF RECTORSEAL®. The sole remedy for breach of the Limited Express Warranty shall be the refund of the purchase price. All other liability is negated and disclaimed, and RectorSeal® shall not be liable for incidental or consequential damages.

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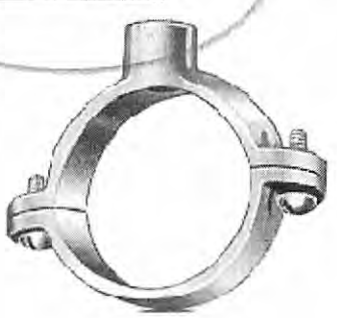
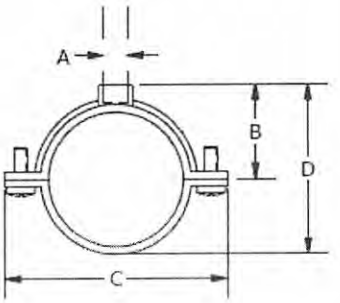
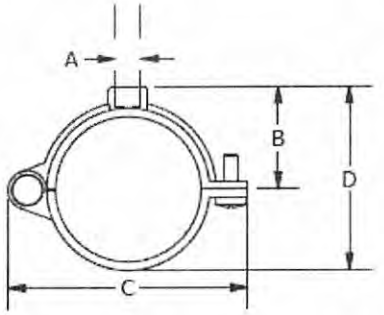
FIG. 100

# SPLIT RING EXTENSION HANGER





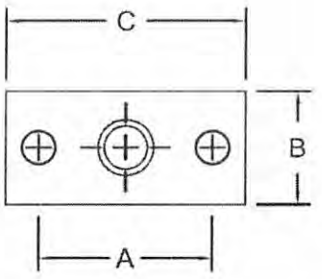

**MATERIAL:** Malleable iron, stainless steel.
**FINISH:** Black or electro galvanized.
**SERVICE:** For suspension of non-insulated stationary pipe lines.
**ORDERING:** Specify pipe size, figure number and finish.
**APPROVALS:** Complies with Federal Specification WW-H-171E Type 25 and Manufacturers' Standardization Society SP-58 & SP-69 Type 12.

| PIPE SIZE | A | B | WEIGHT/C APPROX. | MAX REC. LOAD, LB. |
|---|---|---|---|---|
| 3/8* | 3/8 | 11/16 | 16 | 180 |
| 1/2 | 3/8 | 13/16 | 17 | 180 |
| 3/4 | 3/8 | 15/16 | 20 | 180 |
| 1 | 3/8 | 1 1/16 | 21 | 180 |
| 1 1/4 | 3/8 | 1 1/4 | 29 | 180 |
| 1 1/2 | 3/8 | 1 5/16 | 31 | 180 |
| 2 | 3/8 | 1 5/8 | 35 | 180 |
| 2 1/2* | 1/2 | 1 15/16 | 57 | 300 |
| 3* | 1/2 | 2 3/8 | 72 | 300 |
| 4* | 1/2 | 2 7/8 | 116 | 300 |

*Sizes 3/8, 2 1/2, 3 and 4 are hinged style

FIG. 105

# HANGER FLANGE



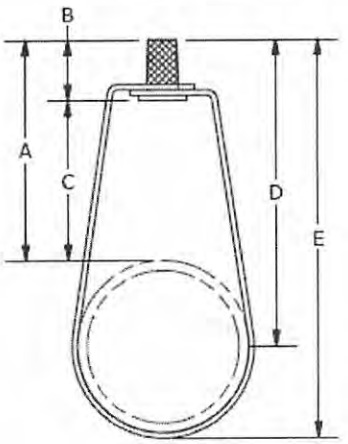

**MATERIAL:** Malleable iron, stainless steel.
**FINISH:** Black or electro-galvanized.
**SERVICE:** For attachment to wood beams, ceilings or floors.
**ORDERING:** Specify tap size, figure number and finish.

| BOLT TAP | A | B | C | WEIGHT (APPROX.) PER 100 |
|---|---|---|---|---|
| 3/8 | 1 15/16 | 1 15/16 | 2 3/4 | 18 |
| 1/2 | 1 15/16 | 1 15/16 | 2 3/4 | 17 |

## FIG. 110

# ADJUSTABLE SWIVEL RING HANGER, STD. & NFPA

**MATERIAL:** Carbon steel.
**FINISH:** Electro-galvanized.
**SERVICE:** Recommended for suspension of non-insulated, stationary pipe lines and conduit. Approved for use without additional locking nuts normally required with pipe hangers.
**ORDERING:** Specify pipe size and figure number.
**APPROVALS:** Underwriter's Laboratories Listed for ¾"-2" and Factory Mutual Approved for ¾"-4". Complies with Federal Specification WW-H-171E Type 10 and Manufacturers' Standardization Society SP-58 & SP-69 Type 10.

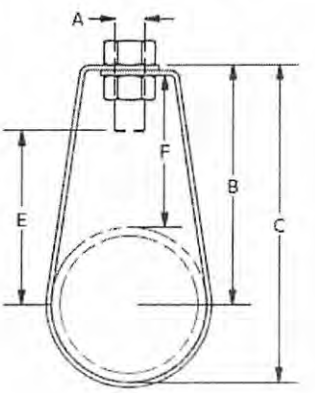



| PIPE SIZE | WEIGHT PER 100 | MAX. REC. LOAD LB. | DIMENSIONS | | | | | MATERIAL SIZE | ROD SIZE | NFPA ROD SIZE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | | | |
| ½ | 11 | 400 | 2¼ | ⅞ | 1½ | 2⅝ | 3 3/16 | 16ga x ⅝ | ⅜ | ⅜ |
| ¾ | 11 | 400 | 2 1/16 | ⅞ | 1¼ | 2½ | 3 3/16 | 16ga x ⅝ | ⅜ | ⅜ |
| 1 | 12 | 600 | 2 | ⅞ | 1⅜ | 2⅝ | 3⅜ | 16ga x ⅝ | ⅜ | ⅜ |
| 1¼ | 13 | 600 | 2 | ⅞ | 1⅜ | 2¾ | 3¾ | 16ga x ⅝ | ⅜ | ⅜ |
| 1½ | 14 | 600 | 1⅞ | ⅞ | 1⅜ | 2⅞ | 4 | 16ga x ⅝ | ⅜ | ⅜ |
| 2 | 15 | 600 | 2⅛ | ⅞ | 1¼ | 3¼ | 4⅝ | 16ga x ⅝ | ⅜ | ⅜ |
| 2½ | 32 | 600 | 2½ | 1⅛ | 1⅜ | 3¾ | 5⅝ | 13ga x ¾ | ½ | ⅜ |
| 3 | 34 | 600 | 2⅞ | 1⅛ | 2⅞ | 4½ | 6¼ | 13ga x ¾ | ½ | ⅜ |
| 3½ | 37 | 600 | 3 | 1⅛ | 1¾ | 5 | 7 | 13ga x ¾ | ½ | ⅜ |
| 4 | 78 | 1250 | 2¾ | 1⅛ | 1¾ | 5 | 7⅜ | 11ga x 1 | ⅝ | ⅜ |
| 5 | 94 | 1250 | 3¼ | 1⅛ | 1⅞ | 6 | 9⅛ | 11ga x 1 | ⅝ | ½ |
| 6 | 120 | 1250 | 3¾ | 1½ | 2½ | 7¼ | 10⅝ | 11ga x 1 | ¾ | ½ |
| 8 | 145 | 1250 | 4½ | 1½ | 3⅛ | 8⅞ | 13⅛ | 11ga x 1 | ¾ | ½ |

## FIG. 115

# ADJUSTABLE BAND HANGER

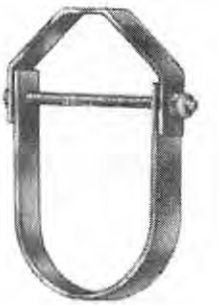
**MATERIAL:** Carbon steel.
**FINISH:** Black, electro-galvanized.
**SERVICE:** For suspension of non-insulated, stationary pipe lines and conduit.
**ORDERING:** Specify pipe size, figure number and finish.
**APPROVALS:** Complies with Federal Specification WW-H-171E Type 7 and Manufacturers' Standardization Society SP-58 & SP-69 Type 7.



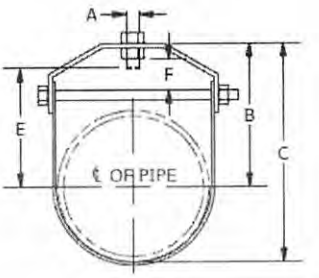

| PIPE SIZE | MATERIAL SIZE | MAX. REC. LOAD LB. | A | B | C | E | F | WEIGHT PER 100 |
|---|---|---|---|---|---|---|---|---|
| ⅜ | 16ga x ⅞ | 610 | ⅜ | 2 5/16 | 2⅝ | 1 9/16 | 1⅜ | 11 |
| ½ | 16ga x ⅞ | 610 | ⅜ | 2 3/16 | 2⅝ | 1 7/16 | 1¼ | 11 |
| ¾ | 16ga x ⅞ | 610 | ⅜ | 2 1/16 | 2⅝ | 1 5/16 | 1 | 12 |
| 1 | 16ga x ⅞ | 610 | ⅜ | 2 1/16 | 2 11/16 | 1 5/16 | 1 5/16 | 12 |
| 1¼ | 16ga x ⅞ | 610 | ⅜ | 2 9/16 | 3 7/16 | 1 13/16 | 1¼ | 14 |
| 1½ | 16ga x ⅞ | 610 | ⅜ | 2¾ | 3 11/16 | 2 | 1 3/16 | 16 |
| 2 | 16ga x ⅞ | 610 | ⅜ | 3 | 4 3/16 | 2¼ | 1 3/16 | 23 |
| 2½ | 14ga x 1 | 970 | ½ | 3 3/16 | 4⅞ | 2 7/16 | 1¼ | 28 |
| 3 | 13ga x 1 | 970 | ½ | 4¼ | 6 | 3¼ | 1⅝ | 41 |
| 3½ | 13ga x 1 | 970 | ½ | 4⅛ | 6⅛ | 3⅛ | 1⅜ | 44 |
| 4 | 11ga x 1 | 1250 | ½ | 4½ | 6¾ | 3¼ | 1⅜ | 87 |
| 5 | 11ga x 1 | 1250 | ½ | 5 | 7¾ | 4¾ | 1¼ | 100 |
| 6 | 11ga x 1½ | 1600 | ¾ | 6 11/16 | 10 | 5 3/16 | 2⅛ | 160 |
| 8 | 11ga x 1½ | 1800 | ¾ | 7 9/16 | 11⅞ | 6 13/16 | 2 | 260 |

## FIG. 200

# ADJUSTABLE CLEVIS HANGER



**MATERIAL:** Carbon steel and 304/316 stainless steel.
**FINISH:** Black, electro or hot-dipped galvanized.
**SERVICE:** For the suspension of non-insulated, stationary pipe lines.
**ORDERING:** Specify pipe size, figure number and finish.
**APPROVALS:** Underwriters Laboratories Listed and Factory Mutual Approve ¾"-8". Complies with Federal Specification WW-H-171E Type 1 and Manufacturers' Standardization Society SP-58 & SP-69 Type 1.



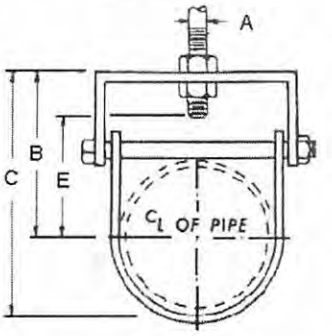

| PIPE SIZE | SIZE OF STEEL | | A | B | C | E | F | WGT. PER 100 | MAX. REC. LOAD, LBS. |
|---|---|---|---|---|---|---|---|---|---|
| | UPPER | LOWER | | | | | | | |
| ½ | 13ga x ⅞ | 13ga x ⅞ | ⅜ | 1 11/16 | 2 1/16 | 1 5/16 | 7/16 | 18 | 610 |
| ¾ | 13ga x ⅞ | 13ga x ⅞ | ⅜ | 1 11/16 | 2 9/16 | 1 5/16 | 7/16 | 18 | 610 |
| 1 | 13ga x ⅞ | 13ga x ⅞ | ⅜ | 2 1/16 | 2 11/16 | 1 5/8 | 5/8 | 22 | 610 |
| 1¼ | 13ga x ⅞ | 13ga x ⅞ | ⅜ | 2½ | 3 3/16 | 2 1/16 | ⅞ | 26 | 610 |
| 1½ | 12ga x ⅞ | 12ga x ⅞ | ⅜ | 2⅞ | 3 11/16 | 2 7/16 | 1 1/16 | 34 | 610 |
| 2 | 12ga x ⅞ | 12ga x ⅞ | ⅜ | 3 5/16 | 4 7/16 | 2 7/8 | 1 1/4 | 38 | 610 |
| 2½ | 9ga x 1 3/16 | 10ga x 1 3/16 | ½ | 4½ | 5 7/8 | 3 7/8 | 1 15/16 | 86 | 1130 |
| 3 | 9ga x 1 3/16 | 10ga x 1 3/16 | ½ | 4¾ | 6½ | 4 3/16 | 1¾ | 96 | 1130 |
| 3½ | 8ga x 1 3/16 | 10ga x 1 3/16 | ½ | 5⅞ | 7 15/16 | 5 5/16 | 2 9/16 | 114 | 1130 |
| 4 | 8ga x 1 3/16 | 10ga x 1 3/16 | ⅝ | 5 15/16 | 8 3/16 | 5 3/16 | 2⅛ | 126 | 1430 |
| 5 | 4ga x 1¼ | 8ga x 1¼ | ⅝ | 5 11/16 | 8 7/16 | 4 15/16 | 1 7/16 | 220 | 1430 |
| 6 | 3ga x 1½ | 8ga x 1½ | ¾ | 6 13/16 | 10⅛ | 5 15/16 | 1¾ | 300 | 1940 |
| 7 | 3ga x 1½ | 8ga x 1½ | ¾ | 7 13/16 | 11⅝ | 6 15/16 | 2 | 420 | 2000 |
| 8 | 3ga x 1¾ | 8ga x 1¾ | ¾ | 8 1/16 | 12 7/16 | 7⅛ | 1⅞ | 450 | 2000 |
| 10 | ⅜ x 1¾ | 3ga x 1¾ | ⅞ | 10 | 15 7/16 | 8⅞ | 2¼ | 806 | 3600 |
| 12 | ⅜ x 2 | 3ga x 2 | ⅞ | 11 9/16 | 18 | 10 7/16 | 2 13/16 | 1100 | 3800 |
| 14 | ½ x 2 | ¼ x 2 | 1 | 12 9/16 | 19 9/16 | 10 9/16 | 2 9/16 | 1480 | 4200 |
| 16 | ½ x 2½ | ¼ x 2½ | 1 | 13 15/16 | 21 15/16 | 11 15/16 | 2 13/16 | 2100 | 4600 |
| 18 | ½ x 2½ | ¼ x 2½ | 1 | 16 | 25 | 13⅞ | 3¾ | 2440 | 4800 |
| 20 | ⅝ x 3 | ⅜ x 3 | 1¼ | 17½ | 27½ | 15⅛ | 3¾ | 4700 | 4800 |
| 24 | ⅝ x 3 | ⅜ x 3 | 1¼ | 19¾ | 31¾ | 17⅜ | 4 | 5400 | 4800 |
| 30 | ¾ x 3 | ⅜ x 3 | 1¼ | 24⅛ | 39⅛ | 21½ | 4¾ | 6950 | 6000 |

NOTE: CLEVIS HANGERS FOR 20" PIPE AND LARGER ARE FURNISHED WITH PIPE SPACER ON CROSS BOLTS

## FIG. 205

# FLAT TOP CLEVIS HANGER

**MATERIAL:** Carbon steel.
**FINISH:** Black, electro or hot-dipped galvanized.
**SERVICE:** General piping, where space does not permit installation of standard figure 200 clevis hanger.
**ORDERING:** Specify pipe size, figure number and finish.




| PIPE SIZE | SIZE OF STEEL | | A | B | C | E | MAX. REC. LOAD, LBS. | WGT. PER 100 |
|---|---|---|---|---|---|---|---|---|
| | UPPER YOKE | LOWER STRAP | | | | | | |
| 2 | 8ga x 1 | 12ga x ⅞ | ⅜ | 2½ | 3 11/16 | 2 1/16 | 300 | 46 |
| 2½ | 8ga x 1¼ | 10ga x 1 3/16 | ½ | 2⅞ | 4 3/16 | 2 5/16 | 500 | 78 |
| 3 | 8ga x 1¼ | 10ga x 1 3/16 | ½ | 3⅝ | 5 3/8 | 3 1/16 | 500 | 98 |
| 3½ | 8ga x 1¼ | 10ga x 1 3/16 | ½ | 4 1/16 | 6 1/16 | 3 7/16 | 500 | 136 |
| 4 | 4ga x 1¼ | 10ga x 1 3/16 | ⅝ | 4 1/16 | 6 5/16 | 3 5/16 | 700 | 138 |
| 5 | 4ga x 1¼ | 8ga x 1¼ | ⅝ | 4⅞ | 7⅝ | 4⅛ | 700 | 208 |
| 6 | 3ga x 1½ | 8ga x 1½ | ¾ | 5½ | 8⅞ | 4⅝ | 900 | 282 |
| 8 | 3ga x 1¾ | 8ga x 1¾ | ⅞ | 6⅜ | 10⅞ | 5½ | 1000 | 434 |

CHARLOTTE
PIPE AND FOUNDRY COMPANY

## Suggested Specification

**System:** PVC Cellular Core (Foam Core) Pipe and PVC DWV Fitting System

**Scope:** This specification covers PVC cellular core (foam core) pipe and PVC DWV fittings used in sanitary drain, waste, and vent (DWV), sewer, and storm drainage applications. This system is intended for use in non-pressure applications where the operating temperature will not exceed 140°F.

**Specification:** Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 11432 as identified in ASTM D 4396. Fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454 as identified in ASTM D 1784.

PVC cellular core pipe shall be Iron Pipe Size (IPS) conforming to ASTM F 891. PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. All systems shall utilize a separate waste and vent system. Pipe and fittings shall conform to NSF International Standard 14.

Installation shall comply with the latest installation instructions published by Charlotte Pipe and Foundry and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products or other aggressive chemical agents not compatible with PVC compounds. Systems shall be hydrostatically tested after installation. **WARNING!** Never test with or transport/store compressed air or gas in PVC pipe or fittings.

**Referenced Standards:**

| | |
|---|---|
| ASTM D 4396 | Compounds for Cellular Core |
| ASTM F 891 | Co-extruded PVC Pipe with Cellular Core |
| ASTM D 2665 | PVC Drain, Waste, and Vent Fittings |
| ASTM D 2564 | Solvent Cements for PVC Pipe and Fittings |
| ASTM D 2321 | Underground Installation of Thermoplastic Pipe (non-pressure applications) |
| ASTM F 1668 | Procedures for Buried Plastic Pipe |
| ASTM F 1866 | Fabricated PVC DWV Fittings |
| NSF Standard 14 | Plastic Piping Components and Related Materials |

(811) Note: Latest revision of each standard applies.

**PO Box 35430 Charlotte, NC 28235 USA 704/372-5030 800/438-6091 FAX 800/553-1605**
**www.charlottepipe.com**

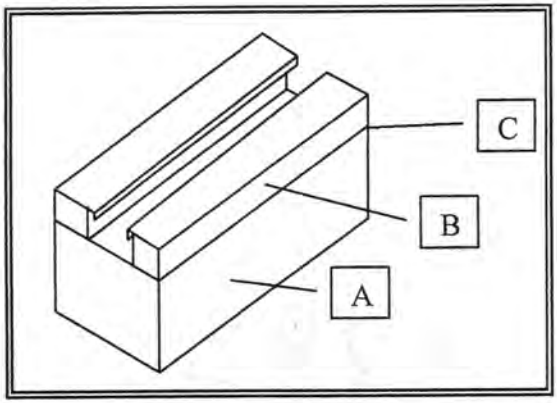
# PIPE PIER® Elite Submittal Sheet

PIPE PIER® support blocks have been designed and engineered specifically for rooftop and raised floor applications. The PIPE PIER® Elite series is offered in the following dimensions:

- ☐ PP50ELH4 – 4"H x 4"W x 10-1/2"L with 50 lbs max load.
- ☐ PP50ELH6 – 6"H x 4"W x 10-1/2"L with 50 lbs max load.
- ☐ PP30ELH4 – 4"H x 4"W x 5"L with 30 lbs max load.

**Components**

A. Closed-cell, medium density, black expanded polypropylene foam
B. High density molded polyethylene cap with integrated strut design.
C. Hot melt adhesive-bonded HDP to foam block – American Chemical




**Arplank 1.9# EPP** foam offers excellent strength, resistance to creep under loadings up to 5.0psi, vibration & shock absorbency and water resistance characteristics. It has successfully passed MVSS 302 flammability testing and meets or exceeds the requirements for U.S. Federal Standard CID AA-59136 Type IV.

| Physical Properties | Test Method | Direction | Value |
|---|---|---|---|
| Density | D3575, Suffix W, Method B | N/A | 3.9 pcf |
| Compression Set | ASTM D 3575, Suffix B | Vertical | 12% |
| Compression Creep @ 5.0 psi (1000 hr/72 F) | ASTM D 3575, Suffix BB | Vertical | <10% |
| Thermal Stability | ASTM D 3575, Suffix S | N/A | <1% |
| Water Absorption | ASTM D 3575, Suffix L | N/A | <1.0% |

RECYCLE

PIPE PIER® Elite
The Support You Can Count On.



**American Chemical** is a sprayable heat & moisture-resistant hot melt adhesive. It has a 400 degree flash point and is applied by a nozzle applicator during the manufacturing process.

U.S. Patent No. 5855342, U.S. Patent No. 6305650, U.S. Patent No. 6679461, Other patents pending

PIPE PIER® Support Systems, P: 763.745.4223 F: 763.745.4222 **www.pipepier.com**

# APPENDIX 6 – QUALITY ASSURANCE PROJECT PLAN

QAPP – Cornwall Plaza

**Quality Assurance Project Plan (QAPP)**

A QAPP was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (DER-10) for the proposed investigation activities and is outlined below.

The objective of the QAPP is to ensure that data collected will meet Quality Analysis and Quality Control standards.

3.2.1 Principal Personnel

Provided in the table below are the individuals to be involved in the completion of this RI/RA listed by specific task.

| Name | Company | Responsibility | Contact Information |
|---|---|---|---|
| Joseph Dultz, CHMM | VERTEX | Project Manager/Health and Safety Coordinator | (908) 333-4312 |
| Richard Tobia, P.E. | VERTEX | Technical Support | (908) 458-9604 |
| John Miller | New York State Department of Environmental Conservation | NYSDEC Project Manager | (518) 402-9662 |
| Ethan Leighton | Alpha Analytical | Laboratory Contact / Project Manager | (201) 847-9100 |

3.2.2 Analytical Method/Quality Assurance

As part of this investigation, groundwater and vapor samples will be collected. The sampling requirements, including matrix, frequency of collection, analytical parameter, analytical method, sample preservation, sample container volume and type, and holding time are provided in the summary tables below. Groundwater samples collected will be analyzed for volatile organic compounds plus ten tentatively identified compounds (VOCs + TICs), alkalinity, volatile fatty acids, chloride, sulfate, dissolved iron, dissolved manganese, nitrate, dissolved organic carbon,

and dissolved gases. Indoor air and soil vapor samples will be analyzed for VOCs by USEPA method TO-15 with selected ion monitoring (SIM).

Prior to commencement of the project, the ability of the laboratory and the analytical method to achieve the detection limits required to meet the applicable NYSDEC standards will be verified.

| **SAMPLING SUMMARY** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Matrix Type** | **No. of Samples** | **Sampling Frequency** | **Analytical Parameter** | **Analytical Method** | **Sample Preservation** | **Sample Container** | **Sample Holding Time** |
| Groundwater | 8 | Quarterly | TCL VOC+TICs | 8260C | Ice, HCL | 3 X 40 ml VOA vials | 14 days |
| Groundwater | 8 | Quarterly | Dissolved gases | RSK-175 | Ice, HCL | 2 X 20 ml vials | 14 days |
| Groundwater | 8 | Quarterly | Dissolved iron, dissolved manganese | 6020A | Ice, $HNO_3$ | 1 X 500 ml plastic bottle | 180 days |
| Groundwater | 8 | Quarterly | Chloride | 9251 | Ice | 1 x 250 ml plastic bottle | 28 days |
| Groundwater | 8 | Quarterly | Alkalinity, Total | 2320B | Ice | 1 x 250 ml plastic bottle (no headspace) | 14 days |
| Groundwater | 8 | Quarterly | Dissolved Organic Carbon | 9060A | H2SO4 | 2 x 40 ml vials | 28 days |
| Groundwater | 8 | Quarterly | Nitrogen, Nitrate | 4500NO3-F | Ice | 1 x 250 ml plastic bottle | 48 hours |
| Groundwater | 8 | Quarterly | Sulfate | 9038 | Ice | 1 x 250 ml plastic bottle | 28 days |
| Air-Indoor Air | Up to 8 | Semi-annual | VOCs | TO-15 | None | 6 L Summa Canisters, Eight Hour Flow Controller | 30 days |

| SAMPLING SUMMARY | | | | | | | |
|---|---|---|---|---|---|---|---|
| Air- Soil vapor | Up to 8 | Semi-annual | VOCs | TO-15 | None | 6 L Summa Canisters, One Hour Flow Controller | 30 days |

*Field and trip blanks will be collected during each groundwater sampling event

*Ambient air samples will be collected during each air sampling event

### 3.2.3 Sampling Methodology

All sampling will be conducted in accordance with the NYSDEC Sampling Guidelines and Protocols (March 1991). Samples will be collected with dedicated nitrile gloves and dedicated disposable equipment for each sample location. Samples will be collected in dedicated laboratory-provided glassware/containers, pre-preserved as appropriate for the analysis being performed. Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.

Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.

Once collected, all samples will be placed in a storage/transportation cooler and cooled to four degree Celsius with ice. Field samples will be then transported by field courier to the laboratory following proper chain of custody procedures. The courier will relinquish custody to the log-in sample custodian upon arrival at the laboratory. Sample holding times will be maintained in accordance with the NYSDEC ASP requirements.

### 3.2.4 Equipment Summary

The following mechanical equipment will be utilized during the field work associated with the remediation: photo-ionization detector (PID), a water level meter, a peristaltic and/or variable speed submersible pump or equivalent, a water quality meter, and associated sampling apparatus. All downhole equipment will be decontaminated between sampling locations. Equipment will be operated in accordance with the manufacturer's specifications, including calibration of all field instruments, which will be performed prior to the initiation of field work and on a schedule indicated by the manufacturer.

All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.

### 3.2.5 Laboratory Summary

All samples collected during this investigation will be submitted under proper chain of custody protocols to Alpha Analytical (Alpha) in Westborough, Massachusetts (New York Certification Number 11148). Alpha Analytical is a State of New York certified laboratory.

The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.

The laboratory will prepare a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

# Quality Systems Manual

## Alpha Analytical, Inc.

D/B/A

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Laboratory Technical Manager (Director) Air-Mansfield: Andy Rezendes, 508-844-4181

# 1 Mission Statement

The mission of Alpha Analytical is quite simply to provide our customers with the greatest value in analytical service available. For the 'greatest value' is not only found in the data that is delivered, it is also found in the services provided.

- Data must be of the highest integrity, accuracy and precision.
- Consultation and educational services must be provided to support the customer in establishing data quality objectives and interpretation of the final data package.
- Support services such as sample containers, courier service and electronic data deliverables must be available to the customer.

Alpha's mission continues with an established commitment to our community and environment. We must ensure that we do not produce any additional contamination to our environment or harm our neighbors and community in any way.

The value of Alpha's product is in the honesty and integrity with which each chemist, courier, login staff member, or office staff member performs their tasks. The customer or employee must always feel satisfied that they received the greatest value in their lab experience at Alpha.

Alpha Analytical will vigorously pursue its mission into the next millennium.

*Mark Woelfel*

*President*

## 2 Table of Contents

Section Description .....Page

# 3 Introduction

The Quality Systems Manual, referred to as Corporate Quality Systems Manual (CQSM) of Alpha Analytical describes the quality program in use at the laboratory for both Westboro and Mansfield facilities. This Quality Systems Manual provides employees, customers and accrediting agencies with the necessary information to become familiar with how the quality system operates within Alpha Analytical. The quality program includes quality assurance, quality control, and the laboratory systems including feedback mechanisms for the automated continuous improvement of the laboratory operations to meet customer needs.

Implementation of the laboratory operations is by documenting procedures, training personnel and reviewing operations for improvement. Written procedures are maintained as Standard Operating Procedures (SOPs). The SOPs are available to the staff as an uncontrolled, electronic, secure copy. The provisions of the QSM are binding on all temporary and permanent personnel assigned responsibilities. All laboratory personnel must adhere strictly to the QSM and SOPs.

All policies and procedures have been structured in accordance with the National Environmental Laboratory Accreditation Conference (NELAC) 2009 TNI standards, applicable EPA requirements, and applicable Department of Defense (DOD) Quality Systems Manual, standards.

Twenty-five (25) sections comprise the QSM. Related quality documentation including the listing of SOPs, forms, floor plan, equipment, personnel and laboratory qualifications are available. The QSM sections provide overview descriptions of objectives, policies, services and operations.

## 3.1 Scope

The QSM describes the requirements of the Laboratory to demonstrate competency in the operations for performing environmental tests for inorganic, organic, air and microbiological testing. The basis for the environmental tests is the methods found in documents published by the United States Environmental Protection Agency (EPA), ASTM, AOAC, APHA/AWWA/WEF, Standard Methods, DOD-QSM, and other procedures and techniques supplied by customers.

The QSM includes requirements and information for assessing competence and determining compliance by the laboratory to the quality system. When more stringent standards or requirements are included in a mandated test method, by regulation, or specified in a project plan the laboratory demonstrates achievement of the customer specified requirements through its documented processes.

The QSM is for use by Alpha Analytical for developing and implementing the quality system. Accrediting authorities and customers use the QSM for assessing the competence of Alpha Analytical. Alpha Analytical is committed to continually improving the quality system. Meeting customer needs, operating within regulatory requirements and adhering to Alpha's Data Integrity and Ethics policy are several of the mechanism used to continually improve the quality system.

## 3.2 Policy Statement

This Quality Systems Manual summarizes the policies, responsibilities and operational procedures associated with Alpha Analytical. This manual applies to all associates of the laboratory and is intended for use in the on-going operations at Alpha Analytical. Specific protocols for sample handling and storage, chain-of-custody, laboratory analyses, data reduction, corrective action, and reporting are described. All policies and procedures have been structured in accordance with the National Environmental Laboratory Accreditation Conference (NELAC) TNI 2009 standards, applicable EPA requirements, regulations, guidance, and technical standards and current DOD QSM standards. This Quality Systems Manual, laboratory Standard

Operating Procedures (SOPs), and related documentation describe the quality systems, policies and procedures for Alpha Analytical.

Alpha Analytical performs chemical analyses for inorganic and organic constituents in water, seawater, soil, sediment, oil, tissue and air matrices. Alpha Analytical's goal is to produce data that is scientifically valid, technically defensible, and of known and documented quality in accordance with standards developed by NELAC and any applicable state or EPA regulations or requirements. It is the commitment of the President, Operations Director, Laboratory Technical Manager and Quality Assurance Officer to work towards continuous improvement of the operation, and towards meeting our customer's needs, requirements, and intended data usage. This continued commitment is built into every activity of the laboratory. It is the responsibility of Senior Management and the Department Managers to ensure that all associates familiarize themselves with, and comply at all times with, the quality systems, procedures and policies set forth in this manual, laboratory SOPs, and related documentation.

Alpha Analytical analyzes Proficiency Test (PT) samples, in accordance with NELAC and other regulatory programs, from a National Institute of Standards and Technology (NIST)-approved PT provider for the analytes established by EPA for water samples, and for other analytes and matrices. The specific analytes and matrices analyzed are based on the current scope of the laboratory services as documented in the laboratory SOPs and state certifications.

The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. This includes a review of facilities and instrumentation, staffing, and any special QC or reporting requirements to ensure that analyses can be performed correctly and within the expected schedule. All measurements are made using published reference methods or methods developed by Alpha Analytical. Competence with all methods is demonstrated according to the procedure described in SOP/ 1739 prior to use.

Alpha Analytical has developed a proactive program for prevention and detection of improper, unethical or illegal actions. Components of this program include: internal proficiency testing, electronic data audits and post-analysis data review by the QA Officer; a program to improve employee vigilance and co-monitoring; and Ethics Training program identifying appropriate and inappropriate laboratory practices, instrument manipulation practices and consequences. Additionally, all associates are required to sign the Alpha Analytical *Ethics Agreement* form upon commencement of employment and each year following. This form clearly outlines the possible consequences of unethical or improper behavior, or data misrepresentation. All staff are required to report any suspected unethical conduct to management. Management will then investigate and determine if the situation was considered unethical and will take appropriate action as described in the Alpha Ethics policy.

It is the policy of the laboratory to discourage and reject all influence or inducements (whether commercial, financial or personal) offered either by customers or suppliers, which might adversely affect results or otherwise compromise the judgment or impartiality of the staff. It is the responsibility of the Operations Director and Laboratory Technical Manager to inform customers and suppliers of this policy when necessary.

In the event that any such influences or inducements are encountered, the staff is instructed to inform management immediately. It is the responsibility of the Operations Director and the Laboratory Technical Manager to take appropriate action to prevent recurrence.

### 3.3 References

External reference documents are available electronically in the Qualtrax system for staff to access the latest edition or version of the reference methods, regulations or national standards. The Quality Assurance Department maintains the electronic files in the Qualtrax system. Management purchases automated update services, where available, to provide the laboratory with the latest hardcopy edition, where electronic means is not available.

### 3.4 Definitions

Appendix A lists the definitions as adopted by the laboratory. The definitions are from the 2009 TNI and DoD QSM standards.

# 4 Organization and Management

## 4.1 Legal Definition of Laboratory

Alpha Analytical is a full service analytical laboratory. Testing services include Drinking Water, Waste Water, Ground Water, Waste material and Air. Alpha Analytical is a privately held corporation incorporated in the state of Massachusetts. Alpha Analytical, Inc. does business as (D/B/A) Alpha Analytical.

Alpha Analytical has been in business since 1985. The types of businesses served include:

Consulting firms,
Engineering firms,
Waste Management Companies,
Industrial sites,
Municipal agencies
Department of Defense projects.

## 4.2 Organization

The laboratory operates a quality system approach to management in order to produce data of known quality. The laboratory organization provides effective communication and lines of authority to produce analytical data meeting customer specifications. The organizational design provides open communication while ensuring that pressures and day to day operating circumstances do not compromise the integrity of the reporting of the final data. See Appendix B for Organizational Chart.

The President is responsible for directing all areas of the company. The following job functions report to the President:

Operations Manager
Quality Assurance Officer
Customer Services Manager
Marketing / Business Development / Sales
Financial Services
Human Resources

The Operations Manager is responsible for directing all laboratory operational areas of the company. The following job functions report to the Operations Manager:

- Laboratory Technical Manager(s)
- Department Managers

The Laboratory Technical Manager(s) is(are) responsible for the laboratory data generated by the organics testing, inorganics testing and metals testing areas and the Air Technical Director is responsible for laboratory data generated by air analyses.

The Departmental Managers (Supervisors) have the following responsibilities:

The organics managers direct personnel in the organics extraction and instrumental laboratories.

The wet chemistry manager directs personnel and team leaders in the wet chemistry and/or microbiological testing areas.

The metals manager directs personnel and team leaders in the metals sample preparation and instrumental laboratories.

The Quality Assurance Officer is a member of the staff and reports directly to the President and has defined responsibility and authority for ensuring that the quality system is implemented and adhered to at all times. The Quality Assurance (QA) Officer is responsible for interacting and communicating certification requirements, implementing the Quality Systems Manual and reporting to the Laboratory Technical Manager and Senior Management the status of the quality program. The QAO oversees the Quality Systems Specialists and is responsible for oversight and/or review of quality control data and function independently from laboratory operations.

The Customer Services Manager is responsible for customer interactions, project coordination and laboratory personnel notification of project requirements.

The Marketing, Business Development and Sales personnel are responsible for increasing the volume of work from current customers and adding new customers to the base business of Alpha Analytical. The Marketing and Business Development personnel review all new work with the Laboratory Technical Manager, Operations Manager, President and/or Quality Assurance Officer before contractual commitment.

The Controller is responsible for maintaining and reporting on the financial status of the company. The Controller directs financial personnel on proper accounting procedures and maintaining the list of approved suppliers and subcontractors. The Controller reports directly to the President.

The Human Resource Director is responsible for personnel recruitment, hiring, performance reviews.

Personnel job descriptions define the operational function duties and responsibilities. Administration and Laboratory personnel assignments may include cross-functional training and work performance in multiple areas of the operations. Multiple function training ensures laboratory back up personnel during peak workloads.

During the absence of any staff member, assignment of alternative personnel occurs by memo or e-mail. The Manager or Supervisor authorizes the assignment. The naming of alternative personnel assures the continuing performance of critical tasks during the primary person's absence and ensures that lines of communication remain open for continued decision making. The deputy for the Laboratory Technical Manager is the Quality Assurance (QA) Officer. The deputies for the Quality Assurance (QA) Officer are the Quality Systems Specialists.

For the purposes of NELAC and DoD QSM Accreditation, the Lead Laboratory Technical Manager is the Laboratory Technical Manager. The deputies for the Lead Technical Manager are the Quality Assurance (QA) Officer, and the Departmental Managers. The Laboratory Technical Manager meets the requirements specified in the Section 4.1.7.2 Volume 1, Module 2 of the 2009 TNI standards. If the Laboratory Technical Manager is absent for a period of time exceeding 15 consecutive calendar days, a full-time staff member meeting the qualifications of Laboratory Technical Manager will be designated to temporarily perform this function. The primary Accrediting Body shall be notified in writing if the Technical Manager's absence exceeds 35 consecutive calendar days.

### 4.3 Business Practices

Alpha maintains certification for the programs and analytes required by regulatory programs. The listing of qualifications from the various certifications, registrations and accreditation programs are available upon request. Alpha Analytical operates Monday to Friday from 7:30 a.m. to 5:30 p.m. Management prepares and posts the holiday schedule for the year indicating closed operations. Sample delivery occurs during normal operating hours unless arranged in advance.

Alpha's reputation depends upon timely reporting and quality data. The standard turnaround time for engineering and consulting firms is five business days from time of sample receipt. Standard turnaround for all other customers is ten business days from time of sample receipt. The time of sample receipt is when the verification of the chain of custody and samples meets the laboratory sample acceptance policy. Laboratory management must approve any special arrangements for rush or expedited turnaround time. The basis for data quality depends on customer, regulation and method performance criteria. Accuracy, precision, sensitivity and comparability are expressions of method performance criteria.

All work is performed in the strictest confidence. New and contract employees must review corporate policy and practice requirements for protecting customer confidentiality and proprietary rights. The review occurs during orientation and ethics training. It is the policy of the laboratory to release data to the customer authorized contact. Personnel assigned the duties of interacting with customers review project files and discuss data related only to the project. Personnel whose duties do not include routine customer contact must check with the customer service manager before discussing data with regulators or third parties

# 5 Quality System

*Establishment, Audits, Essential Quality Controls and Data Verification*

## 5.1 Establishment

The Mission Statement presents the policy and objectives for Alpha Analytical. The Quality Systems Manual provides the framework for the processes and operations to implement the Mission. The Quality Systems Manual and documentation controlled by the laboratory system detail the management authorized operations for achieving the objectives of the company.

The laboratory operates a quality system approach to management in order to produce data of known quality. Alpha Analytical is a full service laboratory designed to provide its customers with accurate, precise and reliable data within the best turn-around time and at the most reasonable prices. Alpha employs chemists of the highest training, ethics and caliber in the field of analytical chemistry. This and state-of-the-art instrumentation and automation combine to insure data of known and documented quality.

## 5.2 Quality Systems Manual

The QA Officer is responsible for the publication and distribution of the Quality Systems Manual. Management reviews and authorizes the manual. Implementation of major changes in the quality system occurs after revision of the appropriate Quality Systems Manual section and authorization by management.

The authorization of the Quality Systems Manual is documented electronically in Qualtrax. Updates of this manual occur at any time throughout the year. Document control procedures (SOP1729) apply to the distribution of the Quality Systems Manual. Controlled copies of the manual are maintained electronically within Qualtrax. Persons or organizations outside of Alpha Analytical may receive uncontrolled copies. Copies are distinctly indicated “Uncontrolled Documents” within the footer of each page.

## 5.3 Audits

Laboratory audits, both internal and external, review and examine the operations performed in the laboratory. Internal audits are conducted by qualified QA Specialists and external audits are reviews by external organizations to evaluate the ability of the laboratory to meet regulatory or project requirements.

A QA designee schedules internal process audits to ensure the completion of the annual audit of each operational area. The process audits are a more detailed review of the operations. Personnel from areas other than the one audited perform process audits.

The internal system audit is a review of the implementation of the documented quality system. The system audit includes sample tracking from receipt to disposal, a data audit of a completed report, and all operations not audited during the process audit.

The purpose of the internal system audit is:

Verification that adequate written instructions are available for use;

Analytical practices performed in the laboratory are consistent with SOPs;

The quality control practices are applied during production;

Corrective actions are applied as necessary;

Deviations from approved protocols are occurring only with proper authorization and documentation;

Reported data is correct and acceptable for reporting;

SOPs, quality records, analytical records, electronic data files are maintained properly; and

Personnel training files and records are satisfactory and current.

Before a scheduled internal audit, the assigned auditor reviews checklists, if used, and/or the SOP specific to the area. The checklist may be from an external source or prepared by the auditor. . After the audit, the auditor submits a summary or notes from the audit to the Laboratory Technical Manager or QAO as part of the audit report. The summary identifies discrepancies found during the audit. Technical personnel are responsible for the inspection and monitoring of in-process and final data. Personnel independent of those having direct responsibility for the work performed audit the quality system and processes.

Representatives sent by customers and government or accrediting agencies often perform external audits. These audits are most often announced inspections, but sometimes are not announced. The Quality Assurance Officer, Laboratory Technical Manager or assigned deputy, and/or appropriate Department Manager accompany the external audit team through the laboratory. The auditors receive a brief overview of company objectives, activities, and facilities. Interviews with essential supervisory staff and technical staff are arranged, along with retrieval of any documentation pertinent to the audit. Auditors usually provide a report on their findings shortly after the audit. The QA Officer receives the audit report and copies are provided to laboratory personnel for review. Corrective actions are identified and distributed to responsible parties for implementation in response to any cited deficiencies.

### 5.4 Audit Review

Management reviews internal and external audit reports to evaluate system effectiveness at the annual management review meeting. Tracking of the audit findings occurs through the nonconformance action process. The management and staff work together to establish a time line for resolving the audit findings. The Quality Assurance team tracks the time line and reports to the Laboratory Technical Manager on any outstanding audit findings.

### 5.5 Performance Audits

Alpha Analytical participates in inter-laboratory comparisons and proficiency test programs required by customers and certifying agencies. The performance audits provide information on the data comparability of results generated by the laboratory. Test samples received by the laboratory are handled following routine laboratory procedures. Proficiency test samples are unpacked, checked against the packing slip and examined for damage. Reporting requirements and deviations to routine practices are noted as would be required for any project.

Analysts demonstrate proficiency by analyzing either an external proficiency test sample, an internally prepared blind test sample or Initial Demonstration of Capability (IDC) before independent operation of a test method. The results of performance audits serve several purposes. The QA Officer may use performance audits for evaluating analyst proficiency, laboratory performance in a specified area to facilitate laboratory improvement efforts, and/or to provide information to an accrediting agency on correction of past performance of an external performance audit.

### 5.6 Corrective Actions/Preventative Actions (CAPA)

The corrective action process at Alpha Analytical is detailed in SOP 1736. The corrective action program at Alpha Analytical uses the Nonconformance workflow in Qualtrax to document and follow through the corrective action/preventative action process for three main areas: nonconformance's within the laboratory, customer complaints and failed PT studies. The process ensures continuous improvement of company performance by preventing the recurrence of quality problems.

Nonconformance reports are tracked for closure date and the type. Reports to management include the listing of open nonconformance reports and the frequency of the type of nonconformance occurring. A QA designee monitors the completeness of the forms, as well as verifies the actions are complete and acceptable.

Customers will be notified within 5 days of any question(s) regarding validity of results.

### 5.7 Managerial Review

The management review occurs at least once per year as part of the strategic planning process. Documentation of the management review meeting is by recording the meeting minutes and listing the attendees. The focus of the quality management review is the frequency of the type of nonconformance, closure status, audit progress and other quality assurance actions. Meetings include discussion and progress on quality system initiatives since the last meeting.

Prior to the meeting, an agenda is distributed to all personnel expected to be in attendance. The meeting is chaired by the President. Minutes are taken and distributed at the conclusion of the meeting by a QA designee. If action is necessary on any issue, a Summary Report is generated and distributed to responsible parties for implementation. Actions are monitored by the QAO or designee until completion.

### 5.8 Essential Quality Control Procedures

The following general quality control principles apply to all tests. The manner implemented is dependent on the type of test performed. The laboratory SOP presents the specific quality control checks undertaken to ensure precision, accuracy and sensitivity of each test method. Deviations from the existing SOP are allowed only upon approval of the deviation by the department manager and Quality Assurance Officer. This documentation must be either in form of written notice or email.

Alpha Analytical uses quality control samples to evaluate the following:

1. Adequate positive and negative controls to monitor blanks, spikes, reference toxicants, zero blanks;
2. Adequate tests to define the variability and/or reproducibility of laboratory results;
3. Measures to ensure the accuracy of the test data including sufficient calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples;
4. Measures to evaluate test performance, such as detection limits and quantitation limits or range of applicability such as linearity;
5. Selection of appropriate formulae to reduce raw data to final results such as linear regression, internal standards, or statistical packages;
6. Selection and use of reagents and standards of appropriate quality;

7. Measures to assure the selectivity of the test for its intended purpose;
8. Measures to assure constant and consistent test conditions for the method such as temperature, humidity, light, or specific instrument conditions.

   Note: All quality control samples are treated in the same manner as field samples.

All quality control measures are assessed and evaluated on an on-going basis, and quality control acceptance limits are used to determine the usability of the data. Control charts and/or calculated control limits monitor the long-term method performance by analyte, by instrument for water matrices. Routine evaluation and reporting of the control chart performance provides supervisors and management with additional performance measures to ensure data comparability. Control limits are recalculated when trends are observed.

Where no reference method or regulatory criteria exist, the laboratory specifies the acceptance/rejection criteria in the SOP. The test SOP specifies the QC samples performed per batch of samples. The quality control samples are categorized into the following, as appropriate to the method

- Method Blank
- Laboratory Duplicate
- Laboratory Control Sample (LCS)
- Laboratory Control Sample Duplicate (LCSD)
- Matrix Spike (MS)
- Matrix Spike Duplicate (MSD)

Selection of samples for Duplicate, Matrix Spike (MS) & Matrix Spike Duplicate (MSD)

2. Duplicate samples
   a. Samples will be selected if identified and requested by customer
   b. If no samples are identified by the customer then random samples will be analyzed within the batch as defined by the method, program or at a minimum batch of 20 samples.

3. Matrix Spike (MS) / Matrix Spike Duplicate (MSD) samples
   a. Samples will be selected if identified and requested by customer
   b. If no samples are identified by the customer then random samples will be selected and analyzed within the batch as defined by the method, program or at a minimum batch of 20 samples.
   c. If MS/MSD is not required, LCS/LCSD may be substituted for precision and accuracy evaluation.

The frequency is dependent on the reference method and test protocol. The following is the default requirement for quality control checks in lieu of any other guidance. The frequency for each quality control sample is generally one (1) per every 20 samples.

### 5.9 Data Reduction

After completion of the test procedure, the data reduction process begins.

Chromatography data may require the manual integration of peak areas or heights before reporting of results. The analyst must perform manual integration when software does not properly integrate or identify the peak. Manual integration must not occur for the purpose of achieving acceptable quality control or calibration. The analyst and reviewer sign and date the hardcopy of all manual integration. The analyst notes the rationale for performing the manual integration on the hardcopy printout and ensures the "TIC" marks from the software represent the integration area used for reporting the results. The analyst must minimize and avoid manual integration. The establishment of the proper integration parameters in the software reduces the number of manual integration occurrences.

The SOP for each test presents the formulas used for the specific test method. The formulas for the data calculations used throughout the laboratory are the following:

% Recovery (LCS)

$$\frac{MV}{TV} * 100 = \%R_{LCS}$$

where: *MV* = Measured Value
*TV* = True Value

% Recovery (MS or MSD)

$$\frac{MV - SV}{TV} * 100 = \%R_{MS}$$

where: *MV* = Measured Value
*TV* = True Value
*SV* = Amount found in sample

Average ( $\overline{X}$ )

$$\sum_{i-1}^{n} X_i \Big/ n = \bar{X}$$

where: $\overline{X}$ = Average of all values
*X* = Result of each measurement
*n* = Number of values

Relative Percent Difference (% RPD)

$$\frac{R_1 - R_2}{(R_1 + R_2)/2} * 100 = \% RPD$$

where: $R_1$ = Larger of two observed values
$R_2$ = Smaller of two observed values

% Difference (%D)

$$\frac{X - \overline{X}}{\overline{X}} * 100 = \%D$$

where: $X$ = Average of all values
$X$ = Result of measurement

Standard Deviation of the sample ($S_x$)

$$\sqrt{\frac{\sum \left(X - \overline{X}\right)^2}{n-1}} = S_x$$

where: $\overline{X}$ = Average of all values
X = Result of each measurement
n = Number of values

Relative Standard Deviation (%RSD)

$$\frac{S_x}{\overline{X}} * 100 = \%RSD$$

where: $\overline{X}$ = Average of all values
Sx = Standard Deviation (n - 1)

Range of Logs (for microbiological enumeration analysis)

10% of routine samples are analyzed in duplicate and the range of logs is determined.

MDL (See 40CFR Part 136 for details)

where: *MDL* = The method detection limit

$$\left[\sqrt{\frac{\sum_{i=1}^{n} x_i^2 - \left(\sum_{i=1}^{n} x_i\right)^2 / n}{n-1}}\right] * t_{0.99} = MDL$$

*X* = Result of each measurement
*n* = Number of values
t(n-1,1 = .99) = The students' T value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom. (See Students t Test Table)

Reporting Limit (RL)

Lowest calibration standard or greater

Control Limits

Upper Control Limit: $\overline{X} + 3 * S_x = UCL$
Lower Control Limit: $\overline{X} - 3 * S_x = LCL$

Warning Limits

Upper Warning Limit: $\overline{X} + 2 * S_x = UWL$
Lower Warning Limit: $\overline{X} - 2 * S_x = UWL$

Method of Standard Additions (MSA): (See EPA 7000A for details)

The simplest version of this technique is the single-addition method, in which two identical aliquots of the sample solution, each of volume Vx, are taken. To the first (labeled A) is added a known volume Vs of a standard analyte solution of concentration Cs. To the second aliquot (labeled B) is added the same volume Vs of the solvent. The analytical signals of A and B are measured and corrected for non-analyte signals. The unknown sample concentration Cx is calculated:

$$C_x = \frac{SB\ V_S\ C_s}{(SA - SB)\ V_X}$$

where SA and SB are the analytical signals (corrected for the blank) of solutions A and B, respectively. $V_S$ and $C_s$ should be chosen so that SA is roughly twice SB on the average, avoiding excess dilution of the sample. If a separation or concentration step is used, the additions are best made first and carried through the entire procedure.

Improved results can be obtained by employing a series of standard additions. To equal volumes of the sample are added a series of standard solutions containing different known quantities of the analyte, and all solutions are diluted to the same final volume.

For example, addition 1 should be prepared so that the resulting concentration is approximately 50 percent of the expected absorbance from the endogenous analyte in the sample. Additions 2 and 3 should be prepared so that the concentrations are approximately 100 and 150 percent of the expected endogenous sample absorbance.

The absorbance of each solution is determined and then plotted on the vertical axis of a graph, with the concentrations of the known standards plotted on the horizontal axis. When the resulting line is extrapolated to zero absorbance, the point of interception of the abscissa is the endogenous concentration of the analyte in the sample. The abscissa on the left of the ordinate is scaled the same as on the right side, but in the opposite direction from the ordinate. A linear regression program may be used to obtain the intercept concentration.

### 5.10 Document Control

The Document Control Procedure (SOP/1729) describes the process for controlled and uncontrolled documents. The use of the revision number allows for the retention of a previous document for historical information purposes.

Every document is assigned a unique identification number, which is present on each page of the document. A master list of documents includes the unique identification. Each controlled copy includes the revision number, published date and page number.

Full document control includes the status of each document: active, inactive or superseded/archived. Inactive documents are procedures not currently requested, but may be in the future. Archived documents are procedures replaced with a later revision. Authorized personnel must review and approve each document and any subsequent revisions before use in the laboratory. Personnel authorized to review and approve a document have access to all necessary information on which to base their review and approval. The history section of the document in Qualtrax includes a description of the nature of the document change.

Standard Operating Procedures (SOPs) are instructions for repetitive or standard operations performed by the laboratory. The SOP author is the person familiar with the topic. The standard format for writing SOPs is set-up as a template for administration and technical SOPs. Each SOP is peer reviewed, authorized by management, and QA before final publication and implementation. Authorized signatories for controlled documentation include one or more of the following personnel: Company President, Quality Assurance Officer, Laboratory Technical Manager, Department Manager, Department Team Leader. Personnel acknowledge approved documents as read, understood and agreed to through electronic attestation forms associated with each document as SOP Attestation Tests which reside in Qualtrax.

SOPs must receive evaluation and input by laboratory supervisors and key technical personnel. The content of each SOP must conform to applicable requirements of analytical methods and certification agencies. Within these constraints, the content of a SOP meets the needs of a particular area of the laboratory. A new or revised SOP is needed when regulatory programs update or add methods, the scope of the existing method is extended, or when activities are being performed without adequate documentation.

Updating, modifying and changing SOPs, forms and the contents of this QSM are prompt and part of the routine practices. The prompt modification of these documents ensures the documents reflect the current practices and operations of the laboratory. During annual review of a document, (including but not limited to: SOPs, Ethics Policy, Quality Systems Manual), requested changes are reviewed and the document reissued using the information and a new revision number is assigned and published in Qualtrax.

The laboratory maintains control over the possession and distribution of all documents that directly affect the quality of data. This includes, but is not limited to, documents such as the Quality Systems Manual, Standard Operating Procedures, customer instructions, Laboratory Work Instructions, data sheets, check lists and forms.

### 5.11 Detection Limits

Detection Limits (DLs), previously referred to as Method Detection Limits (MDLs), are determined for all analytes as specified in the NELAC TNI 2009 standards and DoD QSM standards. DLs are determined for all new instrumentation, whenever there is a change in the test method or instrumentation that affects performance or sensitivity of the analysis. From these, detection limits, Reporting Limits (RLs), are established. The RL is the minimum concentration of an analyte that can be identified and quantified within specified limits of precision and bias during routine and analytical operating conditions.

Laboratory reporting limits lie within the calibration range, at or above the RL. For methods that require only one standard, the reporting limit is no lower than the low-level check standard, which is designed to verify the integrity of the curve at lower levels. If reporting limits are required below the lower level of the calibration curve, RL, or low-level check standard, method modifications are required. Refer to DL/LOD/LOQ SOP/1732. Note: ”J” Estimated value: Upon customer request, the Target analyte concentration can be reported below the quantitation limit (RL), but above the Detection Limit (DL) with a “J” qualifier as long as there is a LOD study on file.

### 5.12 LOD/LOQ Studies

**A. LOD (Limit of Detection) Verification**

1. LOD (Limit of Detection) verification is required annually for each target analyte in which test results are to be reported below the lowest calibration standard (“J” values) for each instrument, matrix and prep procedure.
    a. Quarterly LOD Verification is required for DOD projects unless option of analyzing an LOD with a DoD project batch is employed. In this case, quarterly verification is not necessary.

2. All sample-processing steps of the analytical method shall be included in the determination of the LOD.

3. The validity of the LOD shall be confirmed by ***qualitative*** identification of the analyte(s) in a QC sample in each quality system matrix containing the analyte at no more than 2-3X the LOD for single analyte tests, and >1 up to 4X the LOD for multiple analyte tests. This verification must be performed on every instrument that is to be used for analysis of samples and reporting of data.

4. An LOD study is not required for any component for which spiking solutions or quality control samples are not available such as temperature. Where an LOD study is not performed, the laboratory may not report a value below the limit of quantitation.

**B. LOQ (Limit of Quantitation) Verification**

1. LOQ (Limit of Quantitation) verification is required annually for each target analyte that is not reported below the lowest calibration standard for each matrix and prep

procedure. LOQ is not required if an annual LOD verification is performed. LOQ is required quarterly for all DoD projects unless option of analyzing an LOQ with a DoD project batch is employed. In this case quarterly verification is not necessary.

2. The validity of the LOQ shall be confirmed by successful analysis of a QC sample containing the analytes of concern in each quality system matrix 1-2 times the claimed LOQ. A successful analysis is one where the recovery of each analyte is within the established test method acceptance criteria for accuracy.

The LOQ study is not required for any component or property for which spiking solutions or quality control samples are not commercially available or otherwise inappropriate (e.g., pH).

The LOQ acceptance criteria are based on the established acceptance criteria for Laboratory Control Samples.

Refer to DL/LOD/LOQ SOP/1732

### 5.13 Range of Logs – Precision of Quantitative Methods - Microbiology

A. Precision of duplicate analyses is calculated for samples examined by enumerative microbiological methods according to the following procedure:

   a. Perform duplicate analyses on first 15 positive samples.

   b. Record duplicate analyses as D1 and D2 and calculate the logarithm of each result.

   c. If either of a set of duplicate results is <1, add 1 to both values before calculating the logarithms.

   d. Calculate the range (R) for each pair of transformed duplicates as the mean of these ranges.

# 6 Personnel

## 6.1 Laboratory Management Responsibilities

Management is responsible for communicating the requirements of the quality system, customer specifications and regulatory needs to all personnel. Management job descriptions detail the responsibilities of each position.

The H.R. Director has job descriptions for all positions in the laboratory defining the level of qualifications, training, and experience and laboratory skills. During initial training, management provides access to documented operations procedures, observes personnel performance, and evaluates personnel proficiency. Management documents technical laboratory staff's proficiency initially and on a continuing basis through use of laboratory control samples and purchased proficiency evaluation standards.

Management is responsible for verification of proper sample management and all aspects of data reporting. The communication of the operating practices of the laboratory is through the document control and attestation process.

Either the Quality Assurance Officer, Operations Director and/or Technical Managers have the authority to stop work due to non-conformances and have the authority to resume work after it has been stopped.

## 6.2 Laboratory Staff Requirements

Recruitment is the responsibility of the Operations Manager and HR Department, with input from other personnel as required. The Training Program procedure SOP/1565 details the process for completing requirements and training to ensure personnel have adequate skills and competence for the job function. Initial training includes ethics training, Qualtrax Training, QA Basics, IT/LIMs including computer security.

A job description details the necessary requirements for each job and includes position title, minimum educational requirements, skills, responsibilities and reporting relationships and any supervisory responsibility.

Initial training of new employees and contract staff includes laboratory ethics and quality policies, as well as execution of an Ethics Agreement. Any employee found to knowingly violate the Ethics Policy Agreement, report data values, that are not actual values obtained or improperly manipulated, or intentionally report dates and times of data analyses that are not the actual dates and times of analysis, will lead to disciplinary action, including termination, as outlined in Section K of the Employee Handbook. Each employee must report personally or anonymously to the Laboratory Technical Manager, QA Officer and/or Ethics Team Member any accidental or suspected intentional reporting of non-authentic data by others for follow up action. The review of the laboratory ethics and ethics training occurs annually with all personnel.

The Ethics program consists of the following key components:

- Ethics Policy /Agreement (Appendix F)
- Initial and annual ethics training
- Internal audits conducted annually
- Adherence to Manual Integration SOP/1731

- Ethical or Data Integrity issues reported to Lab Managers, QAO or HR Director
- Anonymous reporting to HR Director - This is accomplished by writing a detailed description of the suspected ethics breach and submitting the information, anonymously, to the Human Resource Director.
- "No-fault" policy encouraging reporting of incidences without fear of retribution
- Electronic tracking and audit trails through LIMs and instruments enable where available.

### 6.3 Training

The Quality Systems Manual and related documentation is available to all employees. Cross training, supervisory training and other related training takes place on a scheduled and as-needed basis. Training ensures the communication and understanding of all personnel in the laboratory-documented procedures and practices.

All personnel undertake orientation-training sessions upon initial employment. Orientation training includes laboratory business practices, employment specifications, Ethics Policy, Quality Systems Manual, Chemical Hygiene Plan, and all SOPs required for the job function.

Managers ensure the training for new employees and review the continuing training for current employees. Training includes on-site and off-site programs presented by staff members, contractors, equipment manufacturers, and institutions of higher learning.

Training of new personnel to any job assignment takes place on-site according to the Training Program procedure. Laboratory personnel may perform their assigned methods/protocols without supervision only after documentation of acceptable proficiency. Training records lists the current training status.

On-the-job training includes demonstration of skills during job performance, initial demonstration of proficiency, and review of SOPs. Health and Safety training takes place on an annual basis with careful introduction to new principles. Personnel have access to the Chemical Hygiene Plan and Material Safety Data Sheets. On-site training includes side-by-side hands-on training, formal classroom type instruction on the SOP or a meeting to discuss procedural changes or to address questions related to the laboratory operation. All training is documented via the Training Attestation Form, which is signed by all in attendance that they understood and will implement what was presented to them.

Training is an on-going opportunity to evaluate the laboratory operations. The updating of SOPs, Quality Systems Manual and other related information documents all changes to the quality system. Training is documented via the Training Attestation Form or in Qualtrax with training test records.

Off-site training takes place on an as-needed basis. Recommendations and suggestions regarding educational programs come from all levels of staff. It is the employee's responsibility to present a copy of any certificates or attendance information to the HR Director. The information is added to the individual's training record.

### 6.4 Records

The QA Department is responsible for maintaining training records. Certificates, demonstration of capability forms and other records of training are placed in the individual's training file.

Appropriate personnel are notified through email and/or Qualtrax or by the QA department when a revision is complete for the controlled version of a document. The manager of the area determines when a change is significant to require training.

Job descriptions are included in the training record files. The Human Resources Department reviews the job descriptions, Resumes and/or biosketches are kept on file with the Human Resources Department and the QA Department.

# 7 Physical Facilities – Accommodation and Environment

This laboratory facility has a total area of 25,000 square feet for each of the Westboro and Mansfield Facilities

The laboratory functional areas include:

Administration and offices
Sample receiving
Sample management
Air analysis (Mansfield Facility only)
Microbiological (Westboro Facility only)
General analytical chemistry
Metals sample preparation
Organic sample preparation
Metals analysis
Volatiles gas chromatography (GC)
Volatiles gas chromatography/mass spectrometry (GC/MS)
Volatiles air analysis (Mansfield Facility only)
Semivolatiles gas chromatography/mass spectrometry (GC/MS)
Semivolatiles gas chromatography (GC)
Miscellaneous facility mechanical and storage areas.

All chemicals are stored in appropriate cabinets and properly disposed of as required. All flammable solvents are stored in OSHA and NFPA approved cabinets. Acids are stored in OSHA acid cabinets. Separate waste areas houses the sample and chemical waste before pickup by a licensed waste hauler.

## 7.1 Environment

Lighting, noise, humidity, heating, ventilation and air conditioning satisfy the needs of the testing performed on the premises. The laboratory building design ensures regulated temperature control for analytical equipment. Air-handling systems minimize airborne contaminants that may jeopardize sample integrity or analytical performance.

The analytical instrumentation is in separate rooms from laboratory activities that involve the use of large quantities of organic solvents or inorganic acids. A separate room, in the Westboro facility, provides the facilities for the microbiological testing.

Standards and other materials requiring below 0°C storage temperatures are placed in freezers and separated from samples or potential contaminating materials. Refrigerators provide cooling needs for samples and materials with temperature requirements of below room temperature and greater than freezing. Sample and standard storage areas are monitored and controlled for temperature and recorded in the data logger system. Sample storage areas for volatiles are separated from other samples and monitored for any effects due to cross contamination.

Bulk hazardous waste containers are located away from the testing activities. Waste disposal uses lab pack procedures and those designated by the regulatory authorities. The Chemical Hygiene Plan and the Waste Management and Disposal SOPs (Westboro: SOP/1728 and Mansfield SOP/1797)) include the procedures for handling and disposing of chemicals used in the laboratory.

The working and storage environments are maintained in a safe and appropriate manner. A Chemical Hygiene Plan details the requirements for safety and chemical handling. Safety measures that protect property and personnel from injury or illness include: fume hoods, fire extinguishers, fire blankets, alarm systems, safety training, protective clothing, emergency showers, eyewashes, and spill control kits.

### 7.2 Work Areas

Good housekeeping is the responsibility of all personnel. Each person is responsible for assuring clean and uncluttered work areas. The job descriptions list specific housekeeping duties. Records, samples and waste materials are the common cause for clutter in the laboratory.

. Removal of administration and laboratory records to the record storage area occurs to reduce clutter and ensure traceability. The individual filling the laboratory record box, labels the box with a number, the contents, date and laboratory area. Authorized personnel assign and record into a permanent record the box number, discard date and box contents. Authorized personnel review the box label for number, discard date and contents. Boxes are stored onsite and off-site for the record retention period identified in the NELAC and EPA regulations, whichever is more stringent.

Sample management personnel remove samples to the sample storage area after all data is correct and complete. Sample coolers are removed to a designated storage area for recycling. Samples are stored in the designated process storage areas until testing is complete. Sample removal from the process storage occurs after mailing of the final report. The sample management staff places the samples in the archive storage area for thirty days after report release. The archive sample storage area is not controlled or monitored. Based on customer specifications, samples are properly disposed or returned to the customer.

Waste materials, expired reagents, expired standards and materials are disposed of and not stored in the laboratory. Hazardous waste labeled accumulation containers in the laboratory collect designated waste streams for later bulk disposal. Laboratory personnel remove the less than five-gallon accumulation containers when full from the laboratory and place the containers in the bulk hazardous waste area. Refer to the Waste Management and Disposal SOPS for Westboro: SOP/1728 and Mansfield SOP/1797. Personnel identifying out of date reagents and standards remove the materials to the proper disposal area.

### 7.3 Security

Alpha Analytical provides a secure environment for our employees, guests, customers, samples and analytical data. Security procedures require that all exterior doors remain locked unless manned. Access to the laboratory is limited to employees and contractors. Visitors not under signed contract are required to sign the Visitors Log and must be accompanied by a laboratory employee at all times within the testing areas.

The defined high security area is the sample management area. Identification card locks on the internal doors control entry into the laboratory area.

All doors are locked after hours and require a key for entry. The security alarm continuously monitors for smoke and fire related heat. When the alarm is activated, the appropriate emergency response officers are notified. The local emergency offices have the emergency contact list for the laboratory.

# 8 Equipment and Reference Materials

## 8.1 Maintenance

The laboratory has a proactive equipment maintenance program. The laboratory maintains service contracts for most major equipment, which include routine preventative maintenance visits by the service provider. Technical personnel perform manufacturer's specified maintenance on a routine basis to ensure equipment operates at peak performance.

A brief summary of some common preventive maintenance procedures is provided in Appendix E. All instrument preventative and corrective maintenance is recorded in the maintenance logbook assigned to the equipment. After maintenance or repair, the instrument must successfully calibrate following the method SOP. Laboratory personnel must demonstrate quality control performance before sample analysis.

The laboratory maintains a stock of spare parts and consumables for analytical equipment. Backup instrumentation for some analytical equipment is available on site for use in case of major equipment failure. The person discovering or suspecting an equipment maintenance problem or failure tags the equipment with 'out of service' tag. If routine maintenance measures do not eliminate the problem, the Laboratory Technical Manager or Operations Director is notified and the appropriate equipment service provider is contacted.

All major laboratory equipment has individual and traceable maintenance logbooks in which to document manufacturer's recommended maintenance procedures, specific cleaning procedures, comments on calibration, replacement of small worn or damaged parts, and any work by outside contractors. The person performing routine or non-routine maintenance signs and dates the maintenance logbook. If an instrument is down for maintenance, a complete record of all steps taken to put it back into service is recorded including reference to the new calibration and quality control checks. Any equipment service providers working on the equipment are recorded in the logbook.

Record repetitive or on-going equipment problems other than normal maintenance requirements on nonconformance action forms. The nonconformance action form notifies management and the Quality Assurance Officer of a problem affecting the performance and data quality.

The laboratory groups some equipment into a single laboratory equipment maintenance logbook. Examples include: autopipets, thermometer calibration. The identity of each item is by serial number or a laboratory-designated item number. The same data recorded for major equipment applies to this documentation.

The maintenance records shall include:

Equipment name;

Manufacturer's name, type identification, serial number or other unique identification;

Date received, date put into service, condition when received;

Current location;

Details of past maintenance and future schedule;

A history of any damage, malfunction, modification or repair;

Dates and results of calibration or verification.

The maintenance logbook may include the reference to the location of the equipment operational and maintenance manuals. The logbook may include the reference to laboratory run logbook or data files for the calibration and quality checks of daily or frequent calibrations.

The Courier Supervisor ensures that maintenance and records for transportation vehicles are complete. The purchasing process is used for ordering garage maintenance, the garage work order is reviewed, and the vehicle checked for condition. The Controller receives all paperwork for completion of the maintenance process.

#### 8.1.1 Microbiology General Equipment Maintenance

Optics of the Quebec colony counter and microscope are cleaned prior to each use. The stage of the microscope is also cleaned and the microscope is kept covered when not in use.

Glassware is checked for residual alkaline or acid residue utilizing bromthymol blue (BTB) on each day of media preparation.

### 8.2 Equipment Listing

A listing of the major equipment used for testing is available upon request. The equipment list details the unique identification number, equipment location, serial number, model number, and purchase date. The unique identification number is attached to the piece of equipment.

The laboratory performs analyses using state of the art equipment. In addition to the major equipment, the most common equipment used in the laboratory are: thermometers, balances, autopipets, water baths, hot plates, autoclaves, pH meters, conductivity meters and a variety of labware. The SOPs list the calibration and verification requirements for all laboratory equipment used in measurements.

### 8.3 Laboratory Water

Laboratory water is purified from central DI water systems and piped to all laboratory areas. In Westboro, the QA Department samples the laboratory grade water and submits the samples for analysis by the lab to document the water meets the drinking water certification criteria. The Laboratory Water Logbook lists the daily conductivity checks and acceptance criteria for the laboratory water. The laboratory documents the daily, monthly and annual water quality checks. Please refer to Table 8-1 for tested parameters, monitoring frequency and control limits for each parameter (SOP/1738). Additional parameters may be tested for at the laboratory's discretion.

When additional treatment occurs in the test area, that test area records the water quality checks from the most frequently used tap. At a minimum the quality of the laboratory grade water is monitored daily by conductivity measurements. Records of the daily checks are found in the Laboratory Water Logbook. If out of specification results occur, a nonconformance action form is submitted.

TABLE 8-1

| Parameter | Monitoring Frequency | Control Limits |
|---|---|---|
| Conductivity | Daily | <2 µmhos/cm @ 25°C |
| pH | Daily | 5.5 - 7.5 |
| Total Organic Carbon (Westboro only) | Monthly | < 1.0 mg/L |
| Total Residual Chlorine | Monthly | < detection limit |
| Ammonia Nitrogen (Westboro only) | Monthly | < 0.1 mg/L |
| Metals: Cd, Cr, Cu, Pb, Ni and Zn (Westboro only) | Monthly (Required Annually) | < 0.05 mg/L |
| Total Metals (Westboro only) | Monthly (Required Annually) | < 0.1 mg/L |

| | | |
|---|---|---|
| Heterotrophic Plate Count (Westboro only) | Monthly | < 500 CFU/mL |
| Water Quality Test (Biosuitability) (Westboro only) | Annually | 0.8 – 3.0 ratio |

### 8.4 Reference Materials

Reference materials include: Class 1 weights, NIST thermometers and reference standards. Logbooks record the reference materials used for calibration and verification. The Department Manager or QA Department maintains any certificates received with the reference materials. Laboratory personnel record in the standards logbook the reference standards date received, unique identification number, expiration date and number of containers. Each laboratory area records the unique identifier on the reference standard certificate and the Department Manager maintains the certificate. The identifier allows traceability from the certificate to the analytical data.

# 9 Measurement Traceability and Calibration

## 9.1 General Requirements

All measuring operations and testing equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before put into service and on a continuing basis. The results are recorded in the instrument specific logbook. The laboratory has a program for the calibration and verification of its measuring and test equipment. The program includes all major equipment and minor equipment such as balances, thermometers and control standards. The Quality Systems Manual and method SOP describe the calibration records, frequency and personnel responsibilities.

## 9.2 Traceability of Calibration

The program of calibration and/or verification and validation of equipment is such that measurements are traceable to national standards, where available. Calibration certificates indicate the traceability to national standards, provide the results, and associated uncertainty of measurement and/or a statement of compliance with identified metrological specifications. A body that provides traceability to a national standard calibrates reference standards. The laboratory maintains a permanent file of all such certifications.

## 9.3 Reference Standards and Materials

Alpha Analytical has a program for calibration and verification of reference standards. The results and program are recorded in the appropriate instrument logbook. Required in-service checks between calibrations and verifications are described in method SOPs and are recorded in the appropriate instrument logbook.

Calibration standards are maintained within the area of consumption. A logbook of use is maintained and use is limited strictly to method required calibrations. Each calibration standard is identified as to test method used, date received, date opened, and expiration date. Calibrations are verified by using a second source or lot number of the calibration standard. Calibration check procedures are stated in applicable test method SOPs.

Preparation of standards must be performed using Class A glassware. Class A glassware must be used for all processes involving quantitative analyses.

Reference standards of measurement in the laboratory's possession (such as calibration weights or traceable thermometers) are used for calibration only and for no other purpose.

Standards and reagents are uniquely identified as outlined in Westboro SOP 1745 and Mansfield SOP 1816.

## 9.4 Calibration General Requirements

Each calibration record is dated and labeled with method, instrument, analysis date, analyst(s) and each analyte name, concentration and response. For electronic processing systems that compute the calibration curve, the equation for the curve and the correlation coefficient are recorded in the appropriate instrument logbook. This is also true for manually prepared curves. Calibrations are tagged to the specific instrument through use of the instrument logbook and or sequence file documentation.

Initial calibration requires a standard curve that brackets the expected sample concentration. Initial calibration generally uses three to five standards depending on the equipment and reference method specifications. Before the start of each analytical sequence, initial calibration is

verified by using a continuing calibration standard. Calibration verification or continuing calibration uses the same standard as the ICAL unless method specifies otherwise. The ICV is from a second source or lot number than that used for initial calibration. The acceptance criteria for the continuing calibration standard must meet acceptance criteria before analysis of any samples. When the acceptance criteria is not within limits, review maintenance protocols and perform any necessary maintenance before starting the initial calibration sequence.

### 9.5 Equipment Calibration

The SOP used for the analysis defines the instrument and equipment calibration required. The following defines the general practices for equipment calibration of selected equipment.

#### 9.5.1 Gas Chromatography/Mass Spectrometry (GC/MS)

The GC/MS is hardware tuned before performing the initial and continuing calibrations. Results must meet the peak ratio specifications of the analytical methods. For volatiles analyses, bromofluorobenzene (BFB) is used, and for semivolatiles analyses, decafluorotriphenylphosphine (DFTPP) is used for instrument tuning.

The mass spectrometer response is calibrated by analyzing a set of five or more initial calibration solutions, as appropriate, for each GC/MS method. Each solution is analyzed once, unless the method or the customer requires multiple analyses. The relative response factor for each analyte is calculated for internal standard calibration. The calibration factor for external standard calibration is calculated using the expressions found in the laboratory method SOP. Calibration is acceptable when all acceptance criteria are within control limits.

The initial calibration is verified through the analysis of a continuing calibration standard every 12 hours. The concentration of the continuing calibration standard is dependent on the requirements of the specific method. The relative response factors for all analytes of interest are calculated and verified against the initial calibration mean relative response factors. The percent difference (%D) for each analyte is calculated and must be less than the acceptance criteria stated in the method.

An acceptable continuing calibration run must have measured percent differences for the analytes within method specified ranges. If any criteria for an acceptable calibration are not met, either instrument maintenance must be performed until the continuing calibration analysis meets all criteria or a new initial calibration is established before any samples are analyzed. No samples may be analyzed unless the acceptance criteria are met for the initial and continuing calibration.

Additional quality control samples are part of the GC/MS analysis. These include internal standards, surrogates, method blanks, instrument blanks, laboratory control samples, matrix spikes and matrix spike duplicates. The frequency and control criteria are defined in the laboratory SOP.

#### 9.5.2 Gas Chromatography (GC)

Internal standard calibration or external standard calibration is utilized for analysis by GC. The method-specified number of calibration standards is used. Each solution is analyzed once and the analyte relative response factors or calibration factors are calculated. The mean relative response factor for each analyte is then obtained by using the expression in the formula listed in the SOP. Integrated areas are utilized for these expressions.

For multiple response pesticides, PCBs or hydrocarbons the quantitation consists of the average of selected peaks or the integration of the area defined by a reference standard. The SOP details the integration criteria for each compound.

The initial calibration is verified through the analysis of a continuing calibration standard every 12 hours or 20 samples. The concentration of the continuing calibration standard is dependent on

the requirements of the specific method. The relative response factors for all analytes of interest are calculated and verified against the initial calibration mean relative response factors. The percent difference (%D) for each analyte is calculated. The percent drift (%d) may be calculated when calibration factors are used for quantitation.

An acceptable continuing calibration must have measured percent differences or percent drift for the analytes within method specified ranges. Should any criteria for an acceptable calibration not be met, either instrument maintenance is performed until the continuing calibration analysis meets all criteria, or a new calibration is established before any samples are analyzed. No samples may be analyzed unless the acceptance criteria are met for the initial and continuing calibration.

Other standard checks may be required for a specified reference method. Instrument performance checks specified in the reference method must be performed and be within the acceptance limits stated in the reference method. Additional quality control samples are part of the GC analysis. These include internal standards, surrogates, method blanks, instrument blanks, laboratory control samples, matrix spikes and matrix spike duplicates. The frequency and control criteria are defined in the laboratory SOP.

#### 9.5.3 Cold Vapor Atomic Absorption Spectrophotometry (CVAA)

An initial calibration is performed daily with freshly prepared working standards that bracket the expected concentration range of the sample. A minimum of a three-point calibration curve is acquired which must have a correlation coefficient of 0.995 or better. The initial calibration is verified every 10 samples. The continuing calibration is required to be within method-defined criteria, depending on the analytical method employed. Continuing calibration blanks are run at the same frequency. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within ± 10% of the true value.

#### 9.5.4 Inductively Coupled Plasma Emission Spectrophotometry-Mass Spectrometry (ICP-MS)

Initial calibration and instrument tune is performed daily, not to exceed 24 hours, and continuing calibrations are performed every 10 samples. Initial calibration consists of a minimum of three standards and a Blank that bracket the expected concentration range of the samples. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within method-defined criteria. The continuing calibration is required to be within method-defined criteria. Interference check standards are performed at the beginning of the sequence. Acceptance criteria are stated in the SOP.

#### 9.5.5 Inductively Coupled Plasma Emission Spectrophotometry (ICP)

Initial calibration is performed daily, not to exceed 24 hours, and continuing calibrations are performed every 10 samples. Initial calibration consists of one standard and a Blank that bracket the expected concentration range of the samples. Analysis of samples cannot begin until an initial calibration verification has been performed and is found to be within 5% of the true value for EPA Method 200.7 and 10% for SW846 6010 methods. The continuing calibration is required to be within 10% of the true value. Interference check standards are performed at the beginning and end of the sequence. Acceptance criteria are stated in the SOP.

#### 9.5.6 Thermometers

Laboratory thermometers are checked annually for accuracy against certified, NIST traceable thermometers. Correction factors derived from the annual calibrations are applied to temperature readings where applicable. The analyst records the corrected temperature for all observations.

NIST traceable thermometers are calibrated professionally and re-certified every year. Records of thermometer calibrations are retained by the QA Department. All thermometers are tagged with the ID number, correction factor to be applied and the expiration of the calibration check.

**NOTE:** Electronic-based thermometers are calibrated on an annual basis and quarterly if associated with DoD projects. Thermometers are tagged with calibration information by the vendor, including the ID number, correction factor to be applied and the expiration of the calibration check. Certificates are kept on file in the QA Department.

Thermometers are not used past the calibration expiration date or if the thermometer is not reading properly. Replacement thermometers are calibrated and the maintenance logbook is updated when a change in the thermometer is required due to breakage, damage or expired calibration.

#### 9.5.7 Balances

Calibration checks are performed for each day of use, for each balance. The calibration consists of a minimum of two weights, which bracket the weight to be measured. Additional calibration check procedures are performed on balances utilized in Microbiology laboratory. This additional procedure consists of a deflection test, which is performed to ensure that 100mg is detectable at a weight of 150 grams.

The balance logbook lists the acceptance criteria and performance criteria for the various balances used in the laboratory. Calibration weight measurements must meet the acceptance criteria listed on the record form.

Each balance is serviced and calibrated by a professional semi-annually. Balances are labeled with the balance number, date of service and the expiration date for the annual service check. The balance number used for any measurements requiring traceability is recorded with measurement data. Balances are not used past the expiration date or when the weight check is not within acceptable criteria. The accuracy of the calibration weights used by Alpha Analytical is verified annually by an accredited calibration service.

#### 9.5.8 Mechanical volumetric pipettes

Delivery volumes for the mechanical volumetric pipettes (i.e. Eppendorf) are checked and recorded gravimetrically before use and on a quarterly basis. The verification is performed at the volume of use or bracketing the volume range of use. The check must be within the criteria stated in the laboratory logbook. If used for DoD projects, then these pipettes are checked by comparing 10 measurements. For future DoD projects using QSM 5.0, these pipettes will be checked daily using 3 measurements.

Pipettes failing acceptance criteria are tagged and removed from service until repaired and the criteria are met, or discarded and replaced. Automatic pipettes are labeled with a unique ID number, volumes verified and expiration date.

#### 9.5.9 Ion Chromatography

The ion chromatograph calibration is by analyzing a set of five or more initial calibration solutions, with concentrations of analytes appropriate to the analytical methods. The concentrations must bracket the expected concentration range of the samples analyzed. Procedures for verifying the calibration curve are method specific. The initial calibration is performed at the start of each day. The calibration curve is verified at least after every 20 samples.

### 9.5.10 pH Meters

pH meters are calibrated prior to use for each day of use. The meter is calibrated following the procedure for pH analysis. The records of the calibration are recorded in an instrument logbook or in the raw data for the analysis being performed. At least two buffer solutions that bracket the measurement range for the analysis are used for calibration. A second source check standard is used at the end of a run to verify meter stability. Buffer solutions used for calibration are NIST certified. Standard buffer solutions are not retained or re-used. The lot number of the buffer solutions is recorded in the data record to ensure traceability of the measurement to NIST.

### 9.5.11 Conductivity Meters

Three calibration standards of potassium chloride (KCL) solutions are analyzed annually on each instrument range. The calibration standards are used to verify instrument performance. The acceptance criteria are defined in the test SOP. If unacceptable performance is found, the cell is cleaned and rechecked. The cell is not used until satisfactory performance is achieved.

A single KCL standard solution is used to calibrate each range of the instrument. A second standard is used to check the calibration each day the meter is used. The check standard is near the measurement range for the samples to be analyzed. The acceptance criterion is $\pm$ 20% of the true value. The meter is labeled with expiration date for the annual calibration. A check standard that is NIST traceable is used to allow traceability. The check standard is performed at the end of the analysis run or at least after every 20 samples.

### 9.5.12 Autoclave

The date, contents, sterilization time and temperature, total cycle time and analyst's initials are recorded each time the autoclave is used. Autoclave cycles must be completed within 45 minutes when a 15 minute sterilization time is used. Autoclave timing mechanisms are checked quarterly with a stopwatch to verify timing controls. A maximum temperature thermometer is used with each cycle to ensure the sterilization temperature is reached.

Spore strips or ampoules are used weekly to confirm sterilization. BTSure ampoules are utilized as follows: An indicator ampoule is placed in most challenging area of sterilizer. Load is processed according to standard operating instructions. Remove from sterilizer and allow to cool for a minimum of 10 minutes. (Chemical indicator on label changes from green to black when processed.) Place the autoclaved indicator and un-autoclaved control indicator in an upright position in the plastic crusher provided. Gently squeeze crusher to break glass ampoules. Incubate both indicators at 55-60$^{o}$C for 24 hours. Examine appearance for color change. Yellow color indicates bacterial growth. No color change indicates adequate sterilization.

Calibration is conducted and certified annually by an outside service provider and recorded. Certificates are kept on file. Routine maintenance includes cleaning the autoclave seal to ensure freedom of caramelized media and cleaning drain screens to remove any debris buildup. For the efficient operation of the unit, overcrowding is avoided.

# 10 Test Methods and Standard Operating Procedures

## 10.1 Methods Documentation

Analysis consists of setting up proper instrument operating conditions, executing acceptable calibrations, monitoring instrument performance tests, analyzing prepared samples, and collecting data from the analyses. The test method SOP describes the instrumental analysis procedures, quality control frequencies and acceptance criteria. EPA accepted methods, national recognized methods or customer-specified methods are the basis for performance criteria, instrument conditions and the steps of the procedure. The method performance requirements of the published methods are followed unless otherwise specified by the customer.

The reference methods define the instrument operating conditions. In many of the reference methods, a range or general guidance on the operating conditions is defined. Documented modifications to the operating conditions clarify the reference methods or improve the quality of the results. In all cases where the method modifications are adopted, the performance criteria from the reference method must be met. Modifications to the operating conditions are stated in the SOP. Changes in the operating conditions made at the time of the analysis are documented in the appropriate laboratory or sequence log. A revision to the SOP takes place, when a day to day change in the operating condition improves performance for all matrices.

The laboratory SOPs include the operation of measurement equipment. The SOPs contain the - following information, as applicable:

- The equipment used in the procedure, including equipment type
- Equipment calibration and process for obtaining the measurement from the calibration
- The step by step instructions to perform the measurement
- Acceptance criteria for the calibrations
- Corrective action for failed acceptance criteria, including assessment of previous calibration results
- The basis used for the calibration standards such as traceability to NIST or EPA or demonstration of comparability
- Frequency at which the equipment will be calibrated, adjusted and checked
- The records maintained to document the calibration and use of measurement equipment
- The calibration status for the equipment
- The environmental conditions necessary before measurement equipment may be calibrated or used for measurement
- Allowed adjustments to measurement equipment, including software, which will not invalidate the laboratory analysis
- Maintenance of the equipment and record keeping to track performance before and after maintenance is completed
- Define the standards, reagents and sample handling, interferences, preservation, and storage in order to assure measurement performance

### 10.2 Standard Operating Procedures (SOPs)

Alpha Analytical maintains SOPs that accurately reflect all phases of current laboratory activities such as assessing data integrity, nonconformance actions, handling customer complaints, sample receipt and storage, purchasing of all materials, and all test methods. These documents include equipment manuals provided by the manufacturer, internally written documents, and published methods with documented changes or modifications.

Copies of all SOPs are accessible to all personnel in electronic form through Qualtrax. Each SOP clearly indicates the published date of the document and the revision number.

### 10.3 Laboratory Method Manual (s)

All SOPs are posted as secure documents in the Alpha Qualtrax system. Directories are available for each laboratory area and administrative area in appropriate subfolders. Each SOP includes or references where applicable:

1) identification of the test method and where applicable;
2) applicable matrix or matrices;
3) method detection limit;
4) scope and application;
5) summary of method;
6) definitions;
7) interferences;
8) safety;
9) equipment and supplies
10) reagents and standards
11) sample collection, preservation, shipment and storage;
12) quality control;
13) calibration and standardization;
14) procedure;
15) calculations;
16) method performance;
17) pollution prevention;
18) data assessment and acceptance criteria for quality control measurements;
19) corrective actions for out-of-control data;
20) contingencies for handling out-of-control or unacceptable data;
21) waste management;
22) references; and
23) any tables, diagrams, flowcharts and validation data.

In cases where modifications to the published method have been made by the laboratory or where the referenced method is ambiguous or provides insufficient detail, these changes or clarifications are clearly described in the SOP.

### 10.4 Test Methods

The laboratory uses appropriate methods and procedures for all tests and related activities within its responsibility (including sampling, handling, transport and storage, preparation of items, estimation of uncertainty of measurement and analysis of test data). The method and procedures are consistent with the accuracy required, and with any standard specification relevant to the calibrations or tests concerned. When the use of mandated methods for a sample matrix is required, only those methods are used. Where methods are employed that are not required, the methods are fully documented and validated and are available to the customer and other recipients of the relevant reports.

The customer requests the reference method for sample analysis usually based on the regulatory program. The customer services staff may assist the customer with method selection when the customer specifies the regulatory program, but is unsure of the correct method required. The Laboratory Technical Manager or Quality Assurance Officer recommends methods for non-regulatory programs. In all cases, recommendation of methods is based on customer-defined method performance criteria. Customer services may recommend a procedure that meets the customer method performance criteria.

### 10.5 Method Validation/Initial Demonstration of Method Performance

Before acceptance and use of any method, satisfactory initial demonstration of method performance is required. In all cases, appropriate forms are completed and retained by the laboratory and made available upon request. All associated supporting data necessary to reproduce the analytical results is retained. Initial demonstration of method performance is completed each time there is a significant change in instrument type, personnel or method.

### 10.6 Sample Aliquots

The aliquot sampling process from a submitted sample is part of a test method. The laboratory uses documented and appropriate procedures and techniques to obtain representative sub-samples. Sample aliquots removed for analysis are homogenized and representative portions removed from the sample container. Personnel record observations made during aliquot sampling in the test method logbooks.

### 10.7 Data Verification

Calculations and data transfers are subject to appropriate checks. A second person recalculates all manual calculations. An independent qualified analyst also reviews the data. A Customer Services representative reviews data for project and method performance requirements where applicable. A QA representative reviews data for project and method performance requirements when requested by a Customer. Final report review is performed by an authorized company signatory.

For drinking water suppliers, every effort is made to notify the Customer within 24-hours of obtaining valid data of any results that exceed any established maximum contaminant level or reportable concentration. Analyst or Department Supervisor notifies the Customer Services Department of the sample number(s), Customer name, analysis and sample results (preliminary or confirmed). The Customer Services Department notifies the customer.

The laboratory Report Generation and Approval SOP describes the practices to ensure that the reported data is free of transcription errors and calculation errors. Manually entered data into the LIMS is dual entered and checked by the LIMS to minimize transcription errors. The laboratory test method SOP describes the quality control measures used to assure method performance before reporting data.

### 10.8 Labeling of Standards and Reagents

The purchase, receipt and storage of consumable materials used for the technical operations of the laboratory include the following:

a) The laboratory retains records of manufacturer's statement of purity, of the origin, purity and traceability of all chemical and physical standards.
b) Original reagent containers are labeled with the date opened and the expiration date.
c) Detailed records are maintained on reagent and standards preparation. These records indicate traceability to purchased stocks or neat compounds and include the date of preparation and preparer's initials.

d) Where calibrations do not include the generation of a calibration curve, records show the calibration date and type of calibration standard used.
e) All prepared reagents and standards are uniquely identified and the contents are clearly identified with preparation date, concentration and preparer's initials. These procedures are outlined in Westboro SOP/1745 and Mansfield SOP/1816.

### 10.9 Computers and Electronic Data Related Requirements

Computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of test data. The laboratory ensures that computer software is documented and adequate. The goals of the software development methodology, existing system validations and the change control system are to ensure that:

the software systems perform the required functions accurately,

the users understand how to use the system, and

auditors can assure themselves of the validity of the analytical data.

The computer systems used at Alpha Analytical are purchased. A coordinated effort is made with the supplier to assure the computer operations meet the laboratory requirements for data integrity. Alpha Analytical has a formal validation program of its computer systems. The validation program is a comprehensive program to ensure data transmitted, reported or manipulated by electronic means is correct and free of errors. The validation and verification approach is separated into three areas.

1. New software is developed and validated using test data. Records of validation include the test data report, date and initials. Where formulas are part of the program, documentation includes manual verification of the final calculated values. New software includes the development of macros for spreadsheets and other tools using commercial software packages.
2. Reasons for changes to software are identified through flaws in existing documentation or the need to improve system processes and are documented on the Nonconformance Report. Final implementation of the change is documented on the nonconformance action form. The tracking and timelines of making the change is readily available. This process also provides the complete documentation of all software and electronic data reporting problems.

Verification of system integrity is through routine maintenance, protection from unauthorized access and electronic verification programs. Routine maintenance including system backups are performed on a scheduled basis. The backup process and password and access protections are defined in the Computer System Backup Control SOP/1562 and Computer Security SOP/1563. Electronic verification may be used to assure the commercially purchased software is performing at its original specifications. This includes virus checking of all network operation at least once per week. Documentation of all verification and maintenance operations is retained.

# 11 Sample Handling, Sample Acceptance Policy and Sample Receipt

The Sample Login and Custody procedures define the process for sample management from sample receipt through analysis and to disposal. These procedures detail the process for sample receipt, records and storage pending analysis.

Customers or Alpha's Couriers deliver samples to the laboratory during normal business hours. Sample receiving occurs in the sample management area.

Customer service personnel place bottle orders. The orders are filled following the bottle order instruction form. Blanks are prepared as needed with minimal storage. All glass containers are packed to minimize or prevent breakage. The containers are placed in plastic coolers or shipping packages and Chain-of Custody forms, seals (if requested) and labels enclosed. The bottle order is shipped by third party, picked up by the customer or customer representative or delivered by Alpha courier to the customer.

## 11.1 Sampling Supplies

### 11.1.1 Sample Containers

Sample containers provided by Alpha Analytical include labels, preservatives and a blank chain of custody form. Preservatives and containers are lot controlled and verified as appropriate for the indicated type of analysis.

Each lot of containers used for the collection of samples for microbiological analysis is checked for sterility prior to distribution. Sterility checks are performed by Microbiology staff and results recorded in Microbiology Sample Container Sterility Log.

### 11.1.2 Chain of Custody

Chain of custody forms must accompany all samples received by Alpha personnel. The chain of custody form indicates the sample origin and arrival at the laboratory and identifies the analyses requested.

### 11.1.3 Reagent Water

Alpha Analytical supplies laboratory pure water for field QC blanks. Water used for volatile organics must be free of volatile compounds below the method detection limit. The quality of the laboratory water is monitored for conductivity once per day. Additional water quality criteria may be monitored based on customer specific requests. The water quality in the laboratory is monitored for chemical parameters as required by the EPA certification manual for drinking water (Water Quality Monitoring SOP/1738).

## 11.2 Sample Tracking

Alpha Analytical uses an internal chain-of-custody in LIMs for sample tracking control purposes. When requested or required by regulation a legal custody program is used in addition to the routine laboratory practices. Legal custody practices must be arranged at the time of contractual commitment.

For legal custody the process must include complete and continuous records of the physical possession, storage, and disposal of sample containers, collected samples, sample aliquots, and sample extracts or digestates. For legal custody a sample is in someone's custody if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;

3. It is in one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

The routine sample handling and tracking process includes unique identification of all sample containers, initials of the person removing the sample from the sample management area and documentation of the date of sample removal for disposal.

Samples are assigned a unique identification number from the LIMS program. Each sample container label includes a unique identifier for the container. The person handling the sample is recorded along with the unique identifier in the container tracking records in LIMS.

ALPHA ANALYTICAL utilizes a custom designed Laboratory Information Management System (LIMS) to uniquely identify and track samples and analytical data throughout the facility. The LIMS log-in, is initiated by the Sample Custodian when the following information is entered into the computer:

- Quote number (unique to the project if requested)
- Project name or description
- Analyses requested (per matrices received)
- Sample number (unique to this sample)
- Sample descriptions (customer ID, including number of received containers)
- Date received
- Date(s) and time(s) collected
- Date analytical results are due

11.2.1 Chain of Custody

Chain of custody forms must accompany all samples received by Alpha personnel. The chain of custody form indicates the sample origin and arrival at the laboratory and identifies the analyses requested.

- Customer's name and address
- Notation of special handling instructions
- Additional comments or instruction for the laboratory
- Purchase order number(s), if applicable

**Alpha Job Numbers (Process for assigning numbers)**

Alpha Job Numbers are unique #'s automatically designated by our LIMS computer system for every individual customer project.

There are 3 parts to this number:

- All numbers start with the letter "L"
- The next two numbers are the last two numbers of the current year.
- The last five numbers are pulled sequentially by the LIMS as each Login personnel requests a new number for a job.

  For example.. L0904165 ---- Year 2009 and 4,165$^{th}$ job to be logged in this year.

  The Alpha Job Number then may contain as many extensions as there are individual samples in a job. L0904165-01 is the first sample, L0904165-02

is the second and so on. Each sample may contain as many as 26 containers as the containers are designated with the letters of the Alphabet, and each container receives its own bar-coded label. For example, L0904165-09A is the first container of the 9th sample listed on a customer's Chain of Custody.

Each container is labeled with a unique identifier, a label with a unique identifier number is placed on each sample container. Once labeled, the sample containers are placed in the appropriate storage area.

### 11.3 Sample Acceptance Policy

The sample management personnel check for proper sample labeling, preservation and handling at the time of arrival at the laboratory. The customer and customer services manager specifies the proper sample preservation, containers, cooling and other criteria on the project review form and in the LIMS. Sample management staff record all observations and immediate notify customer services of any discrepancies or questions arising during sample receipt.

It is possible for samples or sample containers to be lost, damaged, or determined to be unsuitable, for whatever reason, after initial receipt at Alpha Analytical. The problem is brought to the attention of a customer services manager who reports it to the customer. Plans for disposition of the affected samples or container are agreed upon with the customer, carried out, and recorded in the project records. Sample hold times and preservations are listed on the Alpha website (www.alphalab.com) under Support Services "Sampling Reference Guide".

### 11.4 Sample Receipt Protocols

The sample management staff receives all samples. A unique job number is assigned to each shipment of samples received from a customer. The in-house records for the incoming job, including the internal Chain-of -Custody, are initiated with a Sample Delivery Group (SDG) form. The customer, and Alpha courier and/or the sample management personnel sign the sample custody form at the time of receipt at the laboratory. Samples received via overnight courier are signed on the bill of lading. The bill of lading, SDG form and the sample custody form are completed for external courier delivered samples.

The sample management staff examines the shipping containers, their contents, and accompanying customer documentation. Information about the sample identification, the location, date and time of collection, collector's name, preservation type, sample type, presence and condition of custody seals, the state of preservation of the samples and other required information is noted on the SDG form. Any discrepancies in documentation or problems with sample condition such as appropriate sample containers, thermal preservation variation, holding times and adequate sample volumes are noted and brought to the attention of the customer via the nonconformance action form, The login staff or project manager contacts the client via email or or by phone. The Customer Services Manager provides clarification or further instruction to the sample management staff on the processing of the samples that are incomplete or missing required information.

The sample management staff logs the samples in the LIMs and a durable label for each container is printed. The custodian attaches each label to the appropriate sample container. The following information is recorded for tracking internal custody: laboratory sample ID, customer sample ID, sample matrix and storage location. Sample receipt and log-in specifically requires: date and time of laboratory receipt of sample(s); sample collection date; unique laboratory ID code; field ID code supplied by sample submitter; requested analyses; signature or initials of data

logger; comments from inspection for sample acceptance or rejection and in some cases, sample bottle codes.

### 11.5 Storage Conditions

Alpha Analytical stores samples under proper environmental conditions to ensure their integrity and security. Samples are stored at temperatures that meet specifications of the methodology, regulatory agencies and customer directives. Refrigerators are monitored and controlled to be within 4 ± 2°C. Chemical, temperature, holding times and container storage requirements are listed in the LIMS project database.

Customer Quality Assurance Project Plans may list preservation requirements differing from the laboratory. The sample management staff reviews project information for projects specific handling. Addition of chemical preservative to sample containers normally is done in the field at the time of sampling. Chemical preservation and temperature preservation checks at the time of receipt are recorded except for volatile organic compounds, bacteria, sulfite, and dissolved oxygen preservation. Any differences from laboratory or customer specific requirements are recorded on nonconformance action forms and contact made with the customer by the Customer Services Manager or designee.

Sample storage facilities are located within the sample management area or in designated sample storage areas within the analytical departments. Internal chain-of-custody procedures and documentation pertaining to sample possession, removal from storage, and transfer are outlined in the sample custody procedure. Samples are returned to the sample storage area after the sample portion is removed for analysis. Extracts and digestates are tracked and follow the same internal custody operation. Extracts and digestates are removed to the waste disposal area after analysis for proper disposal.

Sample storage precautions are used to ensure that cross contamination does not occur during sample storage. Refrigerator storage blanks are monitored bi-weekly for volatile compounds.. The storage blank information allows the assessment of potential cross contamination in the sample storage refrigerator.

Temperatures of cold storage areas are recorded continuously in the data logger system. Corrective action is done as necessary when temperatures are not within the control criteria. In both the Westboro and Mansfield facilities, Automated Data loggers are linked to thermocouples in custody refrigerators and freezers in the Sample Storage areas as well as department standards/storage refrigerators and freezers. The Data logger is calibrated and certified by an outside vendor on a quarterly basis. Refrigerators and/or freezers not connected to the Data Logger system have temperatures measured with NIST traceable thermometers. Temperature records indicate the thermometer or sensor (Data logger) used for obtaining the measurement.

### 11.6 Sample Disposal

Samples are held for 21 calendar days after the report is released to the customer. Upon written customer request samples may be held longer in an uncontrolled area. Requests for controlled sample storage must be arranged at the time of contractual commitment. Air canister samples are held for 3 days after the report is released to the customer.

An authorized waste carrier is contracted to pick up waste as needed and dispose of it, in accordance with all regulatory requirements. Post-analysis disposition of samples is dependent upon project specific requests. Remaining sample material may be returned to the customer, safely discarded, or archived for a specific time prior to disposal. The waste disposal SOP 1797 defines the specific requirements for sample disposal and other waste disposal operations.

The sample management staff are responsible for the archival and disposal of raw samples, extracts and digestates. Raw and prepared samples may not be archived or disposed until all of

the designated analyses are complete and resultant analytical data is sent to customers. Samples in storage are retained a minimum of 21 calendar days after reporting the results to the customer. Any samples requiring more than 21 calendar days are archived. Air canister samples requiring storage more than 3 business days require prior approval.

When a customer has requested the return of samples, the sample management staff prepares and ships the samples according to the same custody procedures in which the samples were received and following any customer specified requirements. Protection of the samples during delivery is ensured by the implementation of special packaging procedures. Packages are delivered by a commercial carrier whose procedures for protecting the samples are not within the control of this laboratory. Customers are informed that a commercial carrier will deliver their samples if required.

# 12 Records

Alpha Analytical has a record system that produces accurate records, which document all laboratory activities. The laboratory retains records of all original observations, calculations and derived data, calibration records and a copy of the test for ten years minimum. The system retains records longer than the minimum upon the request of authorized customers, agencies or another regulator.

## 12.1 Record Keeping System and Design

The record keeping system allows reconstruction of laboratory processes that produced the analytical data of the sample.

a) The records include the names of personnel involved in sampling, preparation, calibration or testing.

b) Information relating to laboratory facilities equipment, analytical methods, and activities such as sample receipt, preparation, or data verification are documented.

c) The record keeping system provides retrieval of working files and archived records for inspection and verification purposes.

d) Documentation entries are signed or initialed by responsible staff.

e) Generated data requiring operator logging on appropriate logsheets or logbooks are recorded directly and legibly in permanent ink

f) Entries in records are not obliterated by any method. Corrections to errors are made by one line marked through the error. The person making the correction signs and dates the correction.

g) Data entry is minimized by electronic data transfer and ensuring the number of manual data transcriptions is reduced.

## 12.2 Records Management and Storage

1. Records including calibration and test equipment, certificates and reports are safely stored, held secure and in confidence to the customer.
2. The laboratory maintains hardware and software necessary for reconstruction of data.
3. Records that are stored or generated by computers have hard copy or write-protected backup copies.
4. Alpha Analytical has established a record management system, for control of hard copy laboratory notebooks.
5. Access to archived information is carefully controlled and is limited to authorized personnel. These records are protected against fire, theft, loss, environmental deterioration, vermin, and in the case of electronic records, electronic or magnetic sources.
6. In the event that Alpha Analytical transfers ownership or goes out of business, there is a plan to ensure that the records are maintained or transferred according to the customer's instructions. A plan will be

developed to maintain continuity of our record keeping systems as requested and/or required by both state and federal laws.

Alpha Analytical retains all original hard copy or electronic raw data for calibrations, samples, and quality control measures for ten years, including:

1. Analysts work sheets and data output records,
2. Reference to the specific method,
3. Calculation steps including definition of symbols to reduce observations to a reportable value,
4. Copies of all final reports
5. Archived SOPs,
6. Correspondence relating to laboratory activities for a specific project,
7. All nonconformance action reports, audits and audit responses,
8. Proficiency test results and raw data,
9. Data review and cross checking.

The basic information to tie together analysis and peripherals such as strip charts, printouts, computer files, analytical notebooks and run logs for Alpha Analytical includes:

1. Unique ID code for each Laboratory sample or QC sample;
2. Date of analysis;
3. Instrument identification and operating conditions;
4. SOP reference and version;
5. Calculations;
6. Analyst or operator's initials/signature.

In addition, Alpha Analytical maintains records of:

1. Personnel qualifications, experience and training
2. Initial and continuing demonstration of proficiency for each analyst
3. A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory records. Use of electronic signatures has been approved by regulatory agencies.

### 12.3 Laboratory Sample Tracking

A record of all procedures to which a sample is subjected while in the possession of the laboratory is maintained. These include but are not limited to records pertaining to:

a) Sample preservation including appropriate sample container and compliance with holding time requirement; If the time of the sample collection is not provided, the laboratory must assume the most conservative time of day (i.e., earliest).

b) Sample identification, receipt, acceptance or rejection and log-in;

c) Sample storage and tracking including shipping receipts, transmittal forms, and internal routing and assignment records; this includes inter-laboratory transfers of samples, extracts and digestates.

d) Sample preparation including cleanup and separation protocols, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;

e) Sample analysis;

f) Standard and reagent origin, receipt, preparation, and use;

g) Equipment receipt, use, specification, operating conditions and preventative maintenance;

h) Calibration criteria, frequency and acceptance criteria;

i) Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;

j) Method performance criteria including expected quality control requirements;

k) Quality control protocols and assessment;

l) Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries;

m) Automated sample handling systems;

n) Records storage and retention; and

o) Disposal of hazardous samples including the date of sample or sub-sample disposal and the name of the responsible person.

p) The COC records account for all time periods associated with the samples.

q) The COC records include signatures of all individuals who had access to individual samples. Signatures (written or electronic) of all personnel who physically handle the samples. Time of day and calendar date of each transfer or handling procedure.

r) Common carrier documents.

## 13 Laboratory Report Format and Contents

The Process Planning and Control Procedure details the recording and reporting of data as required by the customer and in accordance with relevant environmental regulations.

Customers specify the report delivery and deliverables required for the work submitted. Report delivery includes standard turnaround and rush turnaround. Customers specify the delivery address or multiple addresses and method of delivery such as U.S. Mail, facsimile or electronic at the start of the project. Alpha Analytical provides data deliverables in hardcopy or electronic format. At the start of any project, the electronic deliverable formats required must be received before sample arrival.

Reporting packages are available for routine regulatory reporting requirements. Regulatory reporting packages include only the information requested by the regulatory agency. In addition to regulatory report packages, Alpha Analytical prepares a standard report format. The standard report format includes:

1. Title: “Certification of Analysis”
2. Name and address of the laboratory
3. Laboratory Job Number, page number and total number of pages included in the report.
4. Name and address of the customer
5. Alpha sample number, Customer identification, Sample location
6. Samples identified that do not meet the sample acceptance requirements for project.
7. Date of sample receipt, sample collection, analysis date and time, report date and analyst
8. Identification of data reported by subcontractors
9. Test name and EPA reference method number
10. Delivery method and sampling procedures when collected by lab personnel
11. Deviations or modifications that affect data quality and/or data integrity. These deviations or modifications are included in narrative statements and/or data merger files.
12. Statement that results relate only to the sample tested
13. Statement that report must be copied in full unless the laboratory provides written permission for partial copies
14. Glossary, References and limits of liability
15. Units of measure and reporting detection limit
16. Quality control data for: % Recovery surrogates, % Recovery of LCS, % RPD of LCSD, Blank analysis, % Recovery Matrix Spike, %RPD of Laboratory Duplicates, as applicable
17. Signature, title and date of report
18. A “Certificate/Approval Program Summary” page is included at the end of the report that identifies analytes for which Alpha Analytical

holds certification and for those analytes reported that it does not. This summary also includes the certification numbers for either NELAP certified states, State certifications (e.g. Massachusetts laboratory certification identification number) and DoD certification identifications.

19. Alpha Analytical does not accept samples from private residents for drinking water analysis and therefore maximum contaminant levels are not necessary. If Alpha were to change its policy and report drinking water samples, MCLs would be included with the report.

Results transmitted by facsimile or other electronic means include a statement of confidentiality and return of the materials at the laboratory's expense.

The laboratory notifies the customer in writing of any circumstance that causes doubt on the validity of the results. The amended or modified report lists the change, reason for the change, affected page numbers, date of the amendment and authorized signature. The customer will be notified prior to changes in LIMs software or hardware configurations that will adversely affect customer electronic data.

### 13.1 Data Qualifiers

The following data qualifiers are used in conjunction with analytical results depending on the definition, state or regulatory program and report type.

Note: "J" Estimated value: Upon customer request, the Target analyte concentration can be reported below the quantitation limit (RL), but above the Method Detection Limit (DL) with a "J" qualifier as long as there is a LOD study on file. (See section 5.11)

| Data Qualifier | Qualifier Information | Regulatory Requirement |
|---|---|---|
| **A** | Spectra identified as "Aldol Condensation Product". | CT RCP, NC |
| | | |
| **B** | The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at <5x the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than 10x the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at <10x the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone) | EPA Functional Guidelines 'MassDEP MCP, CT RCP, DoD, NJ-TO15/LL-TO15; NJ Tech Guidance 2014 |
| | | |
| **C** | Co-elution: target analyte co-elutes with a known lab standard (i.e. surrogates, internal standards, etc.) for co-extracted analyses. | |
| | | |

| | | | |
|---|---|---|---|
| **D** | | Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte. | NJ-TO15/LL-TO15 - Air only EPA Functional Guidelines; EPA Region 2,5 |
| **DL** | | Same was re-analyzed at a dilution. Qualifier applied to sample number. | |
| **E** | | Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument. | EPA Region 2,5 CT RCP, NJ-TO15/LL-TO15 |
| **G** | | The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated. | In-house/Forensics. |
| **H** | | The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection. | NELAC |
| **I** | | The lower value for the two columns has been reported due to obvious interference. | In-house. |
| **J** | | Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs). | CT RCP (for TICs), DoD |
| **JN (NJ)** | | Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search. | EPA Functional Guidelines 'NJ-TO15-LL |
| **ND** | DU-J | Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for same-related analysis | In-house |
| **P** | All DU | The RPD between the results for the two columns exceeds the method-specified criteria. | MassDEP MCP, CT RCP |
| **Q** | All DU | The quality control sample exceeds the associated acceptance criteria. Note: This flag is not applicable for matrix spike recoveries when the | DoD |

| | | | |
|---|---|---|---|
| | | sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.) | |
| **R** | All DU | Analytical results are from sample re-analysis | DoD, Customer-specific |
| **RE** | All DU | Analytical results are from sample re-extraction. | DoD, Customer-specific |
| | | | |
| **S** | | Analytical results are from modified screening analysis | |

### 13.2 Compound Summation for Organic Analyses

In order to be compliant with regulations from certain states, Alpha Analytical has created the following Summation Rules to cover reporting "Total Analytes". The following are an example of several compounds that can be reported as "Totals":

| | |
|---|---|
| Volatiles: | |
| 1,3-Dichloropropene, Total | cis + trans isomers |
| Xylenes, Total | m/p + o isomers |
| 1,2-Dichloroethene, Total | cis + trans isomers |
| Trihalomethanes, Total | Chloroform + Bromoform + |
| | Dibromochloromethane + |
| | Dichlorobromomethane |
| PCBs: | |
| PCBs, Total | Sum of reportable Aroclors |
| | (all Aroclors reported for the project) |

The following are the summation rules that the LIMs uses to calculate the Total values:

| Summation Rules: | | |
|---|---|---|
| | | |
| H + H = H | | Key: |
| H + J = J | | H = Hit (above RL) |
| J + J = J | | J = J-flagged value |
| H + ND = H | | ND = U-flagged value |
| J + ND = J | | |
| ND + ND = ND | | |

The ND values are considered "0" during the calculations.
The "E" flagged values (over the calibration) are ignored and not utilized during the calculations.
Any "N" flagged values (do not report) are ignored and not utilized during the calculations.
For dual-column analysis, the Total is reported as part of column "A" data, unless all individuals are reported from "B" column.

For analytical group summations, the Total is reported based on the associated "Reporting List".
For example, if only 7 Aroclors are requested, then the Total is based on 7 Aroclors, not 9.

The RL and MDL for Totals will always be the lowest of the individual compounds used in the summation.

For each Total summation, two values are calculated: TOTALH (calculated from all associated hits above the R L– used in DU reporting formats) and TOTALJ (calculated from all associated hits and J flagged values – used in DJQL reporting formats). Total concentrations are calculated for all samples and QC samples (however, recoveries are not calculated since they are only calculated for the compounds spiked)

If a Total summation is requested, the individual compounds must also be reported.

# 14 Outside Support Services and Supplies

When Alpha Analytical purchases outside services and supplies in support of tests, the laboratory uses only those outside services and supplies that are of adequate quality to maintain confidence in the tests. Differences between Request/Tender and Contracts must be resolved before work commences.

The Purchasing SOP/1726 describes approval and monitoring of all suppliers and subcontractors used by the laboratory. Where no independent assurance of the quality of outside support services or supplies is available, the laboratory ensures that purchased equipment, materials, and services comply with specifications by evaluating method performance before routine use.

The laboratory checks shipments upon receipt as complying with purchase specifications. The use of purchased equipment and consumables is only after the evaluation and compliance to the specifications is complete. The Purchasing SOP/1726 describes the details for receipt and inspection of purchased product.

The Purchasing SOP describes the process for raising, review and placement of purchase orders. It is company policy to purchase from third party certified suppliers and subcontractors wherever possible. Purchases must be from suppliers approved by the Laboratory. Laboratory or sampling subcontractors specified by the customer are noted as “Trial” on the purchase order. This identifies the subcontractor as a non-approved subcontractor.

The laboratory maintains list of approved vendors (Form 13-01) and subcontractors from whom it obtains support services or supplies required for tests.

## 14.1 Subcontracting Analytical Samples

Customers are advised, verbally and/or in writing, if any analyses will be subcontracted to another laboratory. Any testing covered under NELAC that requires subcontracting, will be subcontracted to another NELAC accredited laboratory for the tests to be performed. Any testing covered under the DOD QSM that requires subcontracting, will be subcontracted to another accredited DOD laboratory and must be project-specific approved from the DOD customer before analysis begins. These requirements for DOD projects pertain to both Westboro and Mansfield facilities. The laboratory approves testing and sampling subcontractors by review of current state, national or other external parties’ certifications or approvals. This document must indicate current approval for the subcontracted work. Any sample(s) needing special reports (*i.e*., MCL exceedance) will be identified on the chain of custody when the laboratory subcontracts with another laboratory. Subcontractor Laboratory Certifications are located in Qualtrax under Customer Services folder

The Sample Receipt and Login Procedure describes the process for sample handling when subcontracting samples. The quotation form lists the subcontractor in order to notify the customer of any subcontracted work. Customer notification of subcontracted work is in writing before releasing samples to the subcontractor.

The review of subcontractor documents for completeness and meeting the specifications defined for the project follows the laboratory process for reporting and verification of process data. The person responsible for receiving the order reviews the information supplied by the subcontractor instead of the Department Supervisor.

# 15 Customer Relations

## 15.1 Customer Service

The majority of the customer services occur from personnel in the administration, sample receiving and sampling areas. Customer service involves inquiries into services offered, technical consulting, placing orders, and receiving orders, providing updates on the status of orders and completing orders. Personnel interacting with customers must document and review customer specific project requirements. Call Tracker is used to document communications with customers (SOP/1723). Personnel must document customer interactions following the appropriate laboratory procedures. Each person must communicate deviations, modifications and customer requests following the laboratory defined procedures.

## 15.2 Project Management

During staff meetings the laboratory management reviews requests for new work. The Operations Director and/or Laboratory Technical Manager address all capacity and capability issues. Where conflicts in workload arise, customer notification is immediate. The Project Communication Form (PCF) contains the documentation of all project information. Cooperation between laboratory and customer services staff allows direct communication and scheduling. Management arranges complex scheduling and coordination between departmental areas.

## 15.3 Complaint Processing

The laboratory staff documents all customers or other parties' complaints or concerns regarding the data quality or laboratory operations. The Nonconformance Report records complaints, correcting the concern, and resolving the concern with the customer or other party. The process uses the same form and process as the nonconformance action process. Where repetitive corrective actions indicate a problem, an audit of the area, Customer Inquiry and Complaint SOP/1722 is immediate to ensure the corrective action has effectively solved the concern.

## 16 Appendix A – Definitions/References

The following definitions are from Section 3.0 of the 2009 TNI Standard. The laboratory adopts these definitions for all work performed in the laboratory. In addition, there are clarifications to certain definitions according to the DoD QSM.

**Acceptance Criteria:** specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

**Accreditation:** the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. (TNI)

**Accuracy**: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (TNI)

**Aliquot**: A discrete, measured, representative portion of a sample taken for analysis. (DoD; EPA QAD glossary)

**Analyst:** The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (TNI)

**Analyte:** The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family, and which are analyzed together. (EPA Risk Assessment Guide for Superfund; OSHA Glossary)

**Analytical Uncertainty:** A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

**Assessment**: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation. (TNI)

**Assessment (Clarification):** The evaluation process used to measure the performance or effectiveness of a system and its elements against specific criteria. (DoD)

**Assessment Criteria**: the measures established by NELAC and applied in establishing the extent to which an applicant is in conformance with NELAC requirements. (NELAC)

**Audit:** A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI).

**Batch**: Environmental samples, which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates), which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples. (TNI)

**Bias:** The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). (TNI)

**Blank:** a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (TNI)

Blanks include:

**Equipment Blank:** a sample of analyte-free media, which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

**Field Blank:** blank prepared in the field by filling a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)

**Instrument Blank:** a clean sample (e.g. distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

**Method Blank:** A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses, (TNI)

**Reagent Blank:** (method reagent blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

**Blind Sample**: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst or laboratory's proficiency in the execution of the measurement process.

**Calibration:** set of operations which establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of Reference Standards that are traceable to the International System of Units (SI).

2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the Laboratory with a certificate of analysis or purity, or prepared by the Laboratory using support equipment that has been calibrated verified to meet specifications.

**Calibration Range:** The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.

**Calibration Curve**: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

**Calibration Method:** A defined technical procedure for performing a calibration.

**Calibration Standard**: A substance or reference material used to calibrate an instrument. (TNI)

**Certified Reference Material (CRM**): Reference material, accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI)

**Chain of Custody Form:** Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. See also Legal Chain of Custody Protocols (TNI)

**Clean Air Act:** the enabling legislation in 42 U.S.C. 7401 *et seq*., Public Law 91-604, 84 Stat. 1676 Pub.L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and to enforce them.

**Confirmation:** Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors, or Additional cleanup procedures (TNI)

**Customer:** Any individual or organization for which items or services are furnished or work performed in response to defined requirements and expectations. (ANSI/ASQ E4-2004)

**Congener:** A member of a class of related chemical compounds (e.g., PCBs, PCDDs)

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund):** the enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites.

**Conformance:** an affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

**Consensus Standard**: A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof. (ANSI/ASQ ANSI/ASQ E4-2004)

**Continuing calibration verification**: The verification of the initial calibration that is required during the course of analysis at periodic intervals. Continuing calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. (IDQTF)

**Corrective Action:** the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

**Completeness:** the percentage of measurements judged to be valid compared to the total number of measurements made for a specific sample matrix and analysis.

**Data Quality Objectives (DQO):**

**Data Reduction:** the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (TNI)

**Definitive Data**: Analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Suitable for final decision-making. (UFP-QAPP)

**Demonstration of Capability:** a procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

**Detection Limit: (previously referred to as Method Detection Limit –MDL)** the lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit.

**Detection Limit (DL) (Clarification):** The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level

of confidence. At the DL, the false positive rate (Type I error) is 1%. (DoD)

**Document Control:** the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC)

**Environmental Data:** Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology. (ANSI/ASQ E4-2004)

**False Negative**: An analyte incorrectly reported as absent from the sample, resulting in potential risks from their presence.

**False Positive**: An item incorrectly identified as present in the sample, resulting in a high reporting value for the analyte of concern.

**Federal Insecticide, Fungicide and Rodenticide Act (FIFRA):** the enabling legislation under 7 U.S.C. 135 *et seq*., as amended, that empowers the EPA to register insecticides, fungicides, and rodenticides.

**Federal Water Pollution Control Act (Clean Water Act, CWA):** the enabling legislation under 33 U.S.C 1251 et seq., Public Law 92-50086 Stat. 8.16, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance.

**Field Measurement:** The determination of physical, biological, or radiological properties, or chemical constituents; that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.

**Field of Accreditation:** Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation. (TNI)

**Finding:** an assessment conclusion, referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. (TNI)

**Finding (Clarification):** An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative and is normally accompanied by specific examples of the observed condition (ANSI/ASQ E4-2004).

**Holding Times:** The maximum time that can elapse between two (2) specified activities. (TNI)

The maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR part 136)

**Holding Times (DoD Clarification):** The time elapsed from the time of sampling to the time of extraction or analysis, or from extraction to analysis, as appropriate.

**Inspection:** An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQC E4-1994)

**Internal Standard:** A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (TNI)

**Isomer:** One of two or more compounds, radicals, or ions that contain the same number of atoms of the same elements but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.

**Laboratory:** Body that calibrates and/or tests. (ISO 25)

**Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank or QC check sample)**: a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (TNI).

**Laboratory Duplicate:** aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.

**Legal Chain of Custody Protocols**: procedures employed to record the possession of samples from the time of sampling until analysis and are performed at the special request of the customer. These protocols include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory. (TNI)

**Limit of Detection (LOD):** A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. (TNI)

**Limit of Detection (Clarification):** The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%. (DoD)

**Limits of Quantitation (LOQ):** The minimum levels, concentrations, or quantities of a target variable (e.g. target analyte) that can be reported with a specified degree of confidence. (TNI)

**Limit of Quantitation (Clarification):** The lowest concentration that produces a quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration

standard. (DoD)

**Management:** Those individuals directly responsible and accountable for planning, implementing, and assessing work. (ANSI/ASQ E4-2004)

**Management System:** System to establish policy and objectives and to achieve those objectives (ISO 9000).

**Matrix:** The substrate of a test sample. (TNI)

**Matrix Spike (spiked sample, fortified sample)**: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of Target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (TNI).

**Matrix Spike Duplicate (spiked sample or fortified sample duplicate)**: a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (TNI).

**Measurement System:** A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). (TNI)

**Method:** A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed. (TNI)

**Method Detection Limit**: (now referred to as Detection Limit) one way to establish a Detection Limit, defined as the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

**Method Detection Limit (MDL) (Clarification):** The MDL is one way to establish a Detection Limit, not a Limit of Detection. (DoD)

**Method of Standard Additions:** A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration. (This process is often called spiking the sample.) (Modified Skoog, Holler, and Nieman. Principles of Instrumental Analysis. 1998)

**Mobile Laboratory**: A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans and skid-mounted structures configured to house testing equipment and personnel. (TNI)

**National Institute of Standards and Technology (NIST):** A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute. (NMI). (TNI)

**National Environmental Laboratory Accreditation Program (NELAP):** The overall National Environmental Laboratory Accreditation Program of which TNI is a part.

**Negative Control:** Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

**Positive Control:** Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

**Precision**: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI).

**Preservation**: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

**Procedure:** A specified way to carry out an activity or a process. Procedures can be documented or not. (TNI)

**Proficiency Testing:** A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

**Proficiency Testing Program:** The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

**Proficiency Test Sample (PT)**: A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (TNI).

**Protocol:** A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (TNI)

**Quality Assurance**: An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is the type and quality needed and expected by the customer. (TNI)

**Quality Assurance [Project] Plan (QAPP)**: A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EPA-QAD)

**Quality Control**: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements or quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality. (TNI)

**Quality Control Sample**: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking intended to demonstrate that a measurement system or activity is in control. (TNI)

**Quality Manual:** A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, the ensure the quality of its product and the utility of its product to the users. (TNI)

**Quality Manual Clarification:** Alpha Analytical refers to Quality Manual as Corporate Quality Systems Manual (CQSM). (Alpha)

**Quality System:** A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC) activities. (TNI)

**Quality System Matrix:** These matrix definitions are to be used for purposes of batch and quality control requirements: (TNI)

*Air and Emissions:* Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.

*Aqueous:* Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, ground water effluents, and TCLP or other extracts.

*Biological Tissue:* Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

*Chemical Waste:* A product or by-product of an industrial process that results in a matrix not previously defined.

*Drinking Water:* Any aqueous sample that has been designated a potable or potential potable water source.

*Non-Aqueous Liquid:* Any organic liquid with <15% settleable solids.

*Saline/Estuarine:* Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

*Solids:* Includes soils, sediments, sludges and other matrices with >15% settleable solids.

**Raw Data:** The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

**Reference Material:** Material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

**Reference Standard:** Standard used for the calibration of working measurement standards in a given organization or at a given location. (TNI)

**Representativeness:** the degree to which the sample represents the properties of the particular sample being analyzed.

**Resource Conservation and Recovery Act (RCRA):** the enabling legislation under 42 USC 321 *et seq.* (1976), that gives EPA the authority to control hazardous waste from the "cradle-to-grave", including its generation, transportation, treatment, storage and disposal.

**Safe Drinking Water Act (SDWA):** the enabling legislation, 42 USC 300f *et seq.* (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

**Sample Tracking:** procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.

**Sampling:** Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure. (TNI)**Second source calibration verification (ICV):** A standard obtained or prepared from a source independent of the source of standards for the initial calibration. Its concentration should be at or near the middle of the calibration range. It is done after the initial calibration.

**Selectivity:** The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent. (TNI)

**Sensitivity:** The capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

**Signal to Noise Ratio:** The signal carries information about the analyte, while noise is

made up of extraneous information that is unwanted because it degrades the accuracy and precision of an analysis and also places a lower limit on the amount of analyte that can be detected. In most measurements, the average strength of the noise is constant and independent of the magnitude of the signal. Thus, the effect of noise on the relative error of a measurement becomes greater and greater as the quantity being measured (producing the signal) decreases in magnitude. (Skoog, Holler, and Nieman. Principles of Instrumental Analysis. 1998)

**Standard:** The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)

**Standard Operating Procedures (SOPs)**: A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (TNI)

**Standard Method:** a test method issued by an organization generally recognized as competent to do so.

**Standardized Reference Material (SRM):** a certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method.

**Surrogate**: a substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

**Technology**: a specific arrangement of analytical instruments, detection systems, and/or preparation techniques. (TNI)

**Test:** A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2 - 12.1, amended)

**Test Method**: An adoption of a scientific technique for performing a specific measurement, as documented in a laboratory SOP or as published by a recognized authority.

**Toxic Substances Control Act (TSCA):** the enabling legislation in 15 USC 2601 et seq. (1976), the provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture.

**Traceability:** The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection

sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

**Tuning:** A check and/or adjustment of instrument performance for mass spectrometry as required by the method.

**United States Environmental Protection Agency (EPA):** the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e. the air, water and land) upon which human life depends. (US-EPA)

**Validation:** the confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

**Verification**: confirmation by examination and provision of evidence that specified requirements have been met. (TNI)

NOTE - In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustments, or to repair, or to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring

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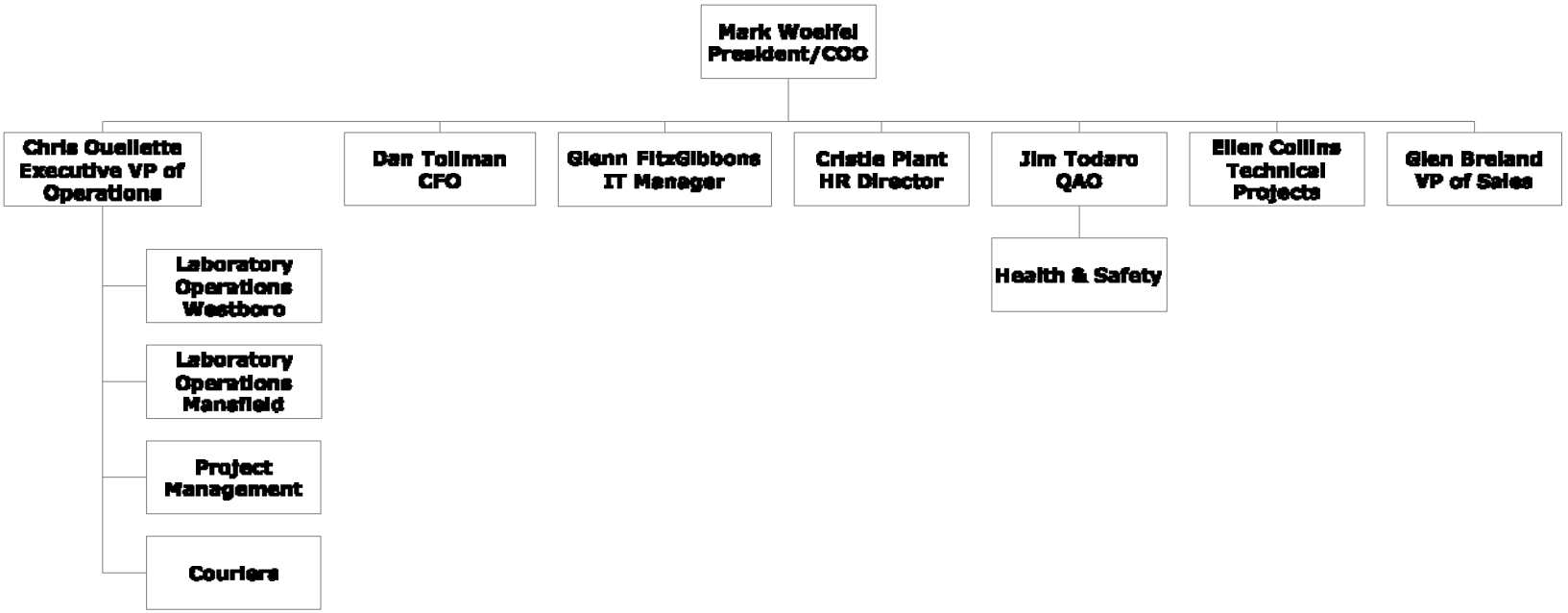
## 17 Appendix B – Organization Charts

The following charts provide an overview of the organizational structure of Alpha Analytical. The chart also identifies the key personnel responsible for the listed positions. For the various laboratory areas, the individual departmental supervisors are noted. For a listing of all current key personnel, please refer to Section 18, Appendix C.

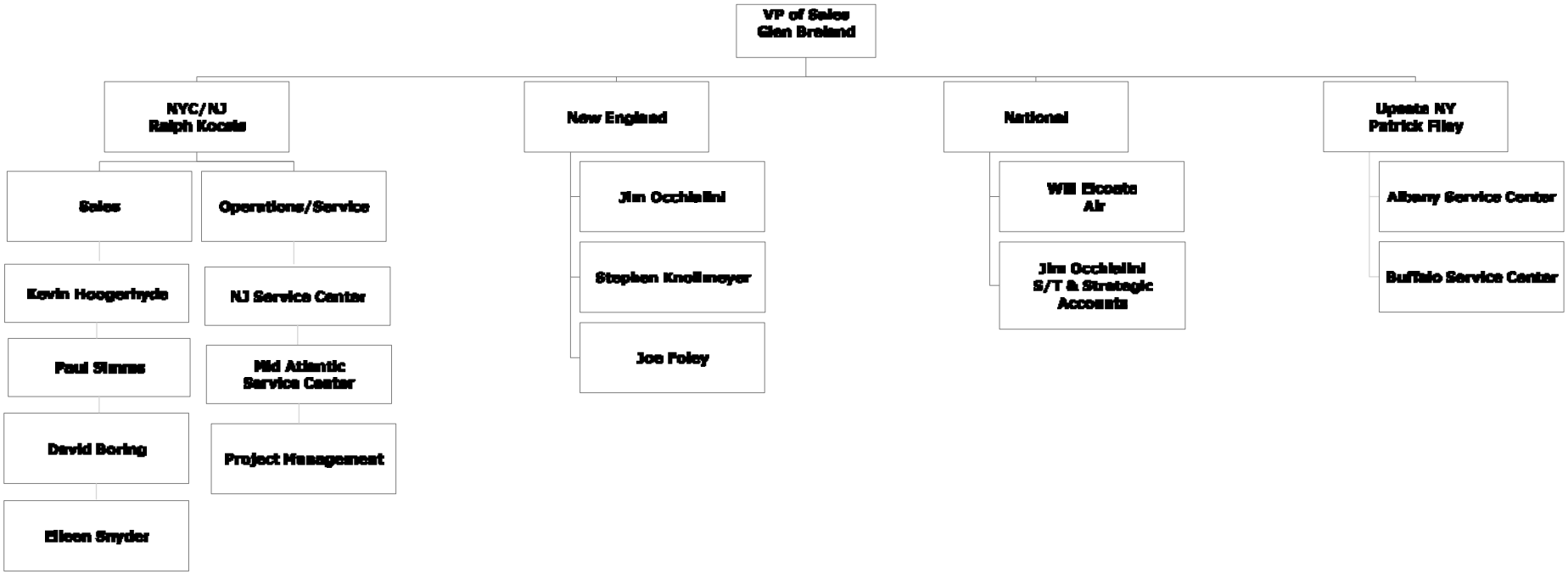
**Updated** 10/4/2014

**2014**
**Alpha Analytical**
**Company Organizational Chart**



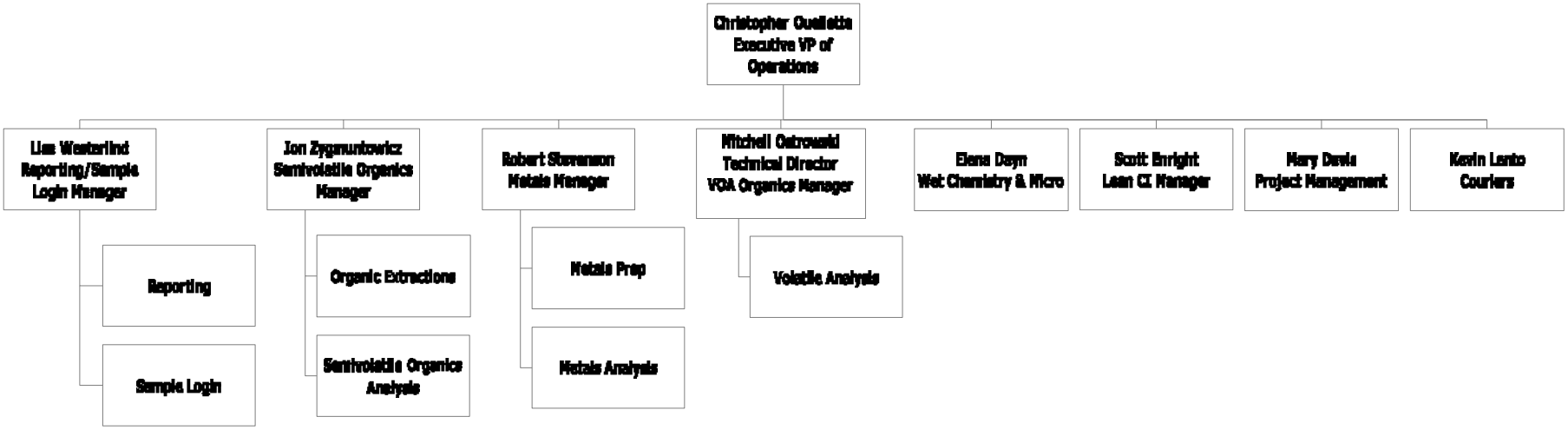
**Updated** 10/07/2014

**2014 Sales Organization**

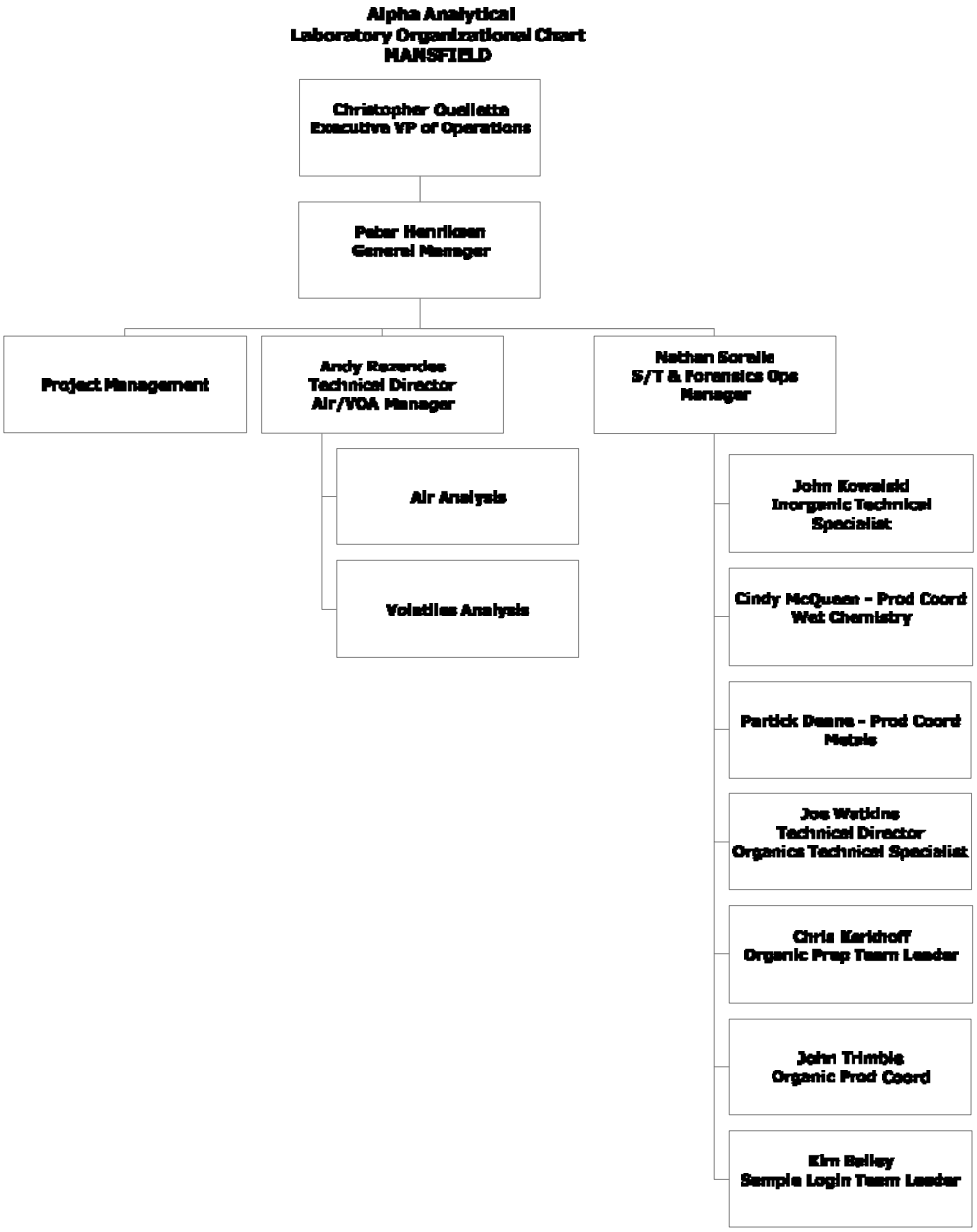


**Updated** 10/4/2014

**Alpha Analytical**
**Laboratory Organizational Chart**
**WESTBOROUGH**



**Updated** 03/31/2015



## 18 Appendix C – List of Key Personnel

The following is a listing of all current key personnel. If role is specific to a facility it is denoted by either Westboro or Mansfield following the position title. **Updated 10/7/2014.**

**President / COO:** Mark Woelfel

**Executive VP of Operations:** Christopher Ouellette

**CFO:** Dan Tollman

**Laboratory Technical Manager - Westboro:** Mitchell Ostrowski

**Laboratory Technical Manager - Mansfield:** Joseph Watkins

**Laboratory Technical Manager- Air, Volatiles Manager - Mansfield:** Andy Rezendes

**Quality Assurance Officer/Health & Safety Manager:** James C. Todaro

**VP, Technical Projects:** Ellen Collins

**VP Technical Sales/Sales Manager:** Glen Breland

**VP, Technical Sales:** James Occhialini, Ralph Kocsis, Pat Filey, Kevin Hoogerhyde, Steven Knollmeyer

**Technical Sales Reps:** Paul Simms; Joe Foley, David Boring

**General Manager, Mansfield:** Peter Henriksen

**Director of Project Management:** Mary Davis

**National Air Account Manager:** Will Elcoate

**Information Technology Manager:** Glenn Fitzgibbons

**Human Resources Director:** Cristie Plant

**Health & Safety Officer:** Jeanette Soucy

**Forensic & S/T Operations Manager, Mansfield:** Nathan Sorelle

**SVOA/Extractions Manager, Westboro:** John Zygmuntowicz

**VOA Department Manager, Westboro:** Mitch Ostrowski

**Wet Chemistry Department Manager, Westboro:** Elena Dayn

**Metals Department Manager, Westboro:** Robert Stevenson

**Login Manager/ Reporting Manager, Westboro** Lisa Westerlind

**Quality Systems Specialists:** Amy Rice, Rene Bennett, Jason Hebert, Blake Buckalew

**Purchasing:** Rosemarie Pederson

**Environmental Health & Safety/Hazardous Waste Coordinator:** Jeanette Soucy

**Logistics Manager:** Kevin Lento

**Equipment Specialists:** Pat Sullivan, Greg Yogis

## 19 Appendix D – Preventive Maintenance Procedures

| Optimized Service-Calibration Intervals | | |
|---|---|---|
| **Equipment** | **Frequency** | **Type of Calibration or Maintenance** |
| Balances | semiannually<br>daily | cleaning & operations check by service technician (external)<br>calibration verification using Class S-1 certified weights |
| COD Reactor | annually<br>annually | complete operations check by service technician (external)<br>reaction temperature verification |
| Conductivity Bridge | annually<br><br>each use | verification of cell constant<br>complete operations check by service technician (external)<br>calibration verification |
| DI Water System | as needed<br>monthly<br>annually<br>daily | complete operations check by service technician (external)<br>Residual Chlorine check<br>Biosuitability testing (external)<br>pH and Conductivity check |
| DO Meter | annually<br>each use | complete operations check by service technician (external)<br>calibration against air as specified by manufacturer |
| Emergency/Safety Equipment | annually<br>monthly | fire extinguishers and emergency exit lighting check<br>eye washes, showers, fire blanket and first aid kits checked |
| Freezers | daily | temperature verification |
| Gas Chromatographs | as needed<br>as needed<br>beginning and end of batch and 10 to 20 samples as per method | injection port preparation; cleaning of detectors<br>initial multi-point calibration<br>continuing calibration verification (CCV) against initial calibration |
| ICP | Every other day<br>Daily<br>Annually<br>Annually<br>As needed | Change pump tubing<br>Calibration, profile<br>Complete operations check by service technician (external),<br>Linear Dynamic Range determination<br>Clean torch, clean nebulizer, clean spray chamber |
| Lachat analyzer | Daily<br>As needed | Calibration, clean lines<br>Change tubing, change O-rings |
| Mass Spectrometers (GC & ICP) | bi-annually<br>as needed<br>12 hour or daily | change of mechanical pump oil by service technician (external)<br>cleaning of source<br>BFB, DFTPP or ICP-MS tune analysis followed by ICAL or CCV |
| Mercury Analyzer | monthly<br>each use | clean cell and change pump windings<br>calibration using multi-point curve |
| Auto-pipettes | Monthly<br>Annually | verification of accuracy<br>verification of precision |
| Microwave | Quarterly<br>Annually | power and temperature verification<br>RPM verification |
| Ovens | annually<br>daily | complete operations check by service technician (external)<br>temperature verification |
| pH Meters | annually<br>each use | complete operations check by service technician (external)<br>calibration using certified buffers |
| Refrigerators (General Use) | daily | temperature verification |
| Refrigerators (Sample Management) | daily | temperature verification |
| Spectrophotometer | Semi-annually<br>Semi-annually<br>daily | cleaning & operations check by service technician (external)<br>wavelength verification (external)<br>continuing calibration verification (CCV) against initial calibration |
| TCLP Rotator | annually | RPM verification |
| Thermometers (Mercury/Alcohol) | annually | calibration against NIST traceable thermometer (internal) |
| Thermometers (digital) | Quarterly | calibration against NIST traceable thermometer (external) |
| Thermometer (NIST Traceable) | annually | calibration and certification of conformance (external) |
| Turbidity meter | annually<br>each use | cleaning & operations check by service technician (external)<br>calibration using formazin |
| Weights (Class S-1) | annually | service/calibration and certification of conformance (external) |

## 20 Appendix E – Alpha Code of Ethics Agreement

Alpha Analytical, Inc.
***Ethical Conduct and Data Integrity Agreement***

A. ***Personal Pledge:*** I understand that I am charged with meeting the highest degree of ethical standards in performing all of my duties and responsibilities and pledge to only report data, test results and conclusions that are accurate, precise and of the highest quality.

B. ***Protocol Pledges:*** I agree to adhere to the following protocols and principles of ethical conduct in fulfilling my work assignments at Alpha:

1. All work assigned to me will be performed using Standard Operating Procedures (SOPs) that are based on EPA approved methods or Alpha methods.

2. I will only report results or data that match the actual results observed or measured.

3. I will not intentionally nor improperly manipulate or falsify data in any manner, including both sample and QC data. Furthermore, I will not modify data values unless the modification can be technically justified through a measurable analytical process or method acceptable to Alpha. All such modifications will be clearly and thoroughly documented in the appropriate laboratory notebooks and raw data and include my initials or signature and date.

4. I will not intentionally report dates and times of analyses that are not the actual dates and times the analyses were conducted.

5. I will not intentionally represent another individual's work as my own or represent my work as someone else's.

6. I will not make false statements to, or seek to otherwise deceive Alpha staff, leaders or customers. I will not, through acts of commission, omission, erasure or destruction, improperly report measurements, standards results, data, test results or conclusions.

C. ***Guardian Pledge:***

1. I will not condone any accidental or intentional reporting of unauthentic data by other Alpha staff and will immediately report such occurrences to my supervisor, the QA Officer, the Laboratory Technical Manager or corporate leadership. I understand that failure to report such occurrences may subject me to immediate discipline, including termination.

2. If a supervisor or other member of the Alpha leadership group requests me to engage in, or perform an activity that I feel is compromising data validity or quality, I have the right to not comply with the request and appeal this action through Alpha's QA Officer, senior leadership or corporate officers, including the President of the company.

3. I understand that, if my job includes supervisory responsibilities, then I will not instruct, request or direct any subordinate to perform any laboratory practice that is unethical or improper. Also, I will not discourage, intimidate or inhibit a staff member who may

choose to appropriately appeal my supervisory instruction, request or directive that may be perceived to be improper, nor retaliate against those who do so.

D. ***Agreement Signature:*** I have read and fully understand all provisions of the *Alpha Analytical Ethical Conduct and Data Integrity Agreement*. I further realize and acknowledge my responsibility as an Alpha staff member to follow these standards. I clearly understand that adherence to these standards is a requirement of continued employment at Alpha.

Employee Signature

Printed Name

Date

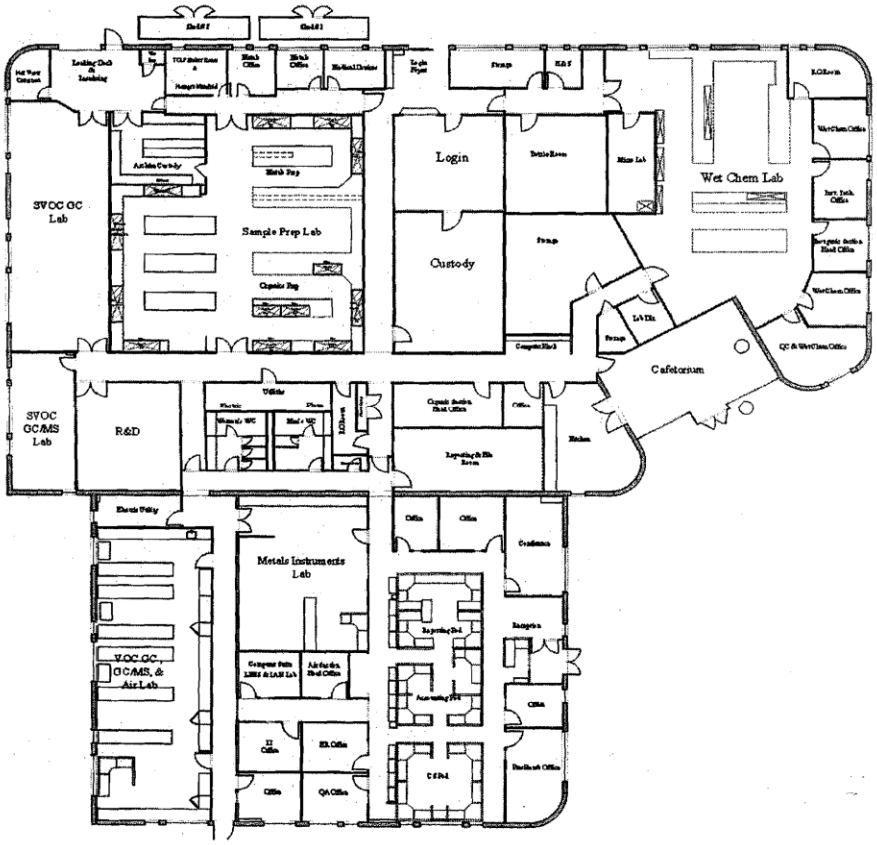
**Review Requirements**

The *Ethical Conduct and Data Integrity Agreement* must be signed at the time of hire (or within 2 weeks of a staff member's receipt of this policy). Furthermore, each staff member will be required to review and sign this agreement every year. Such signature is a condition of continued employment at Alpha. Failure to comply with these requirements will result in immediate discharge from Alpha employment. This agreement is not an employment contract and does not modify in any manner the company's *Employment-at-Will* Agreement.

## 21 Appendix F – Floor Plan Westboro Facility

**Alpha Woods Hole Labs**

**FIGURE II**
**FLOOR PLAN**

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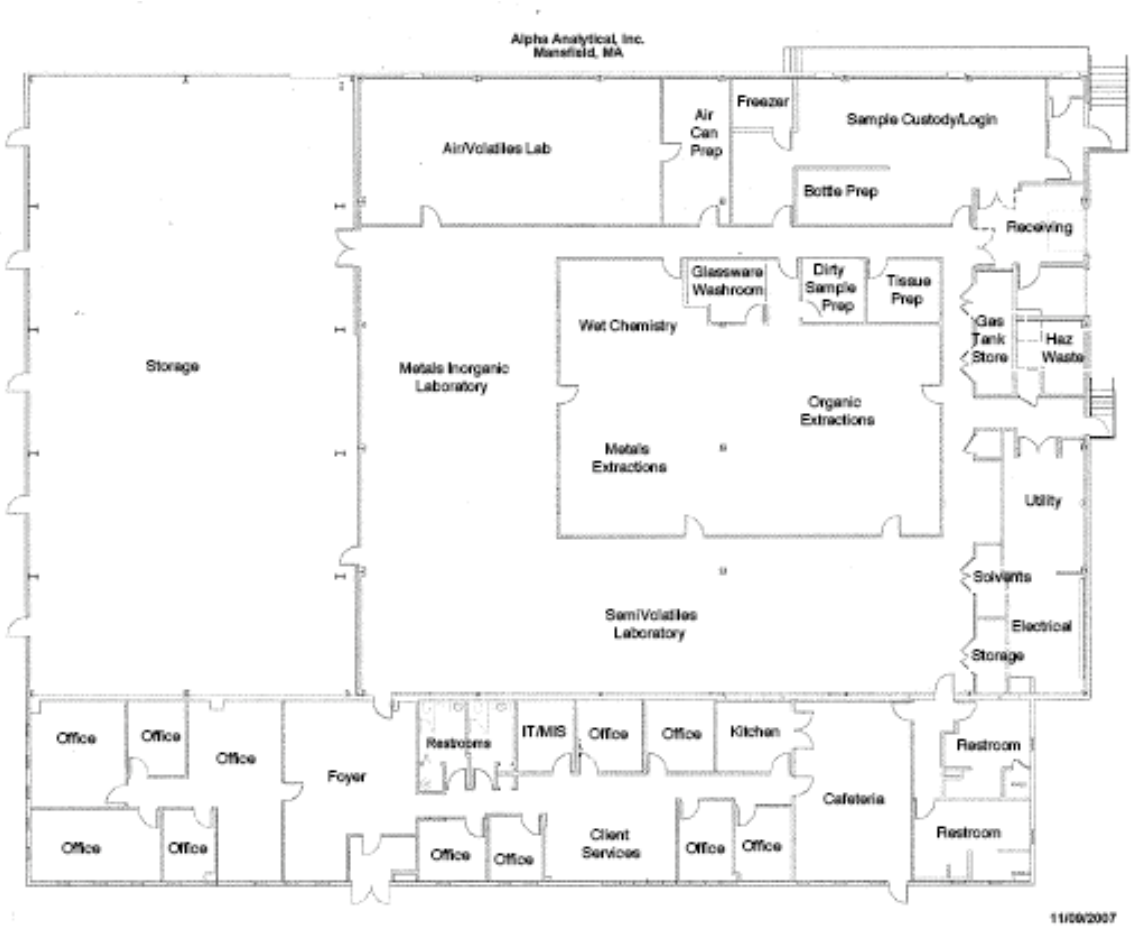
## 22 Appendix G– Floor Plan Mansfield Facility



## 23 Appendix H – Job Titles and Requirements

| TITLE* | REQUIRED EDUCATION** | MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE | MINIMUM REQUIRED SKILLS*** |
|---|---|---|---|
| **Technical Manager (Director) Organic Laboratory** | BS or BA in Chemical, Environmental, or Biological Science; including minimum 24 credit hours in Chemistry. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience. | Two (2) years with the analysis of organic analytes in an environmental laboratory | 1. Advanced technical knowledge of all analytical methods performed by the lab<br>2. Advanced technical instrumentation/lab systems knowledge<br>3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols<br>4. Experience with and understanding of LIMS<br>5. Experience with method development and implementation<br>6. Experience monitoring standards of performance in Quality Control and Quality Assurance |
| **Technical Manager (Director) Inorganic Laboratory** | BS or BA in Chemical, Environmental, or Biological Science; including minimum 16 credit hours in Chemistry. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience. | Two (2) years with the analysis of inorganic analytes in an environmental laboratory | 1. Advanced technical knowledge of all analytical methods performed by the lab<br>2. Advanced technical instrumentation/lab systems knowledge<br>3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols<br>4. Experience with and understanding of LIMS<br>5. Experience with method development and implementation<br>6. Experience monitoring standards of performance in Quality Control and Quality Assurance |
| **Technical Manager (Director) Microbiology Laboratory** | BS or BA in Chemical, Environmental, or Biological Science; including minimum 16 credit hours in the Biological Sciences, including at least one course having microbiology as a major component. Masters or Doctoral degree in one of above disciplines may be substituted for 1 year of experience. | Two (2) years with the analysis of microbiological analytes in an environmental laboratory | 1. Advanced technical knowledge of all analytical methods performed by the lab<br>2. Advanced technical instrumentation/lab systems knowledge<br>3. Knowledge of safe laboratory practices, OSHA regs and emergency protocols<br>4. Experience with and understanding of LIMS<br>5. Experience with method development and implementation<br>6. Experience monitoring standards of performance in Quality Control and Quality Assurance |
| **Quality Assurance Officer** | BS/BA in Chemistry, Biology, Environmental or related Science | Two (2) years Environmental Laboratory Experience | 1. Advanced technical knowledge of all analytical methods performed by the lab<br>2. Knowledgeable in Federal, State and DOD Programs (NELAC, etc.)<br>3. Able to develop QA/QC policies and certification requirements<br>4. Able to develop training programs for quality procedures<br>5. Documented training and/or experience in QA and QA procedures<br>6. Knowledge of safe laboratory practices and emergency protocols |

| TITLE* | REQUIRED EDUCATION** | MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE | MINIMUM REQUIRED SKILLS*** |
|---|---|---|---|
| **Laboratory Coordinator** | High School Diploma; Associates or BS/BA in Chemistry, Biology or Environmental or related Science preferred | 1 year + | 1. Knowledge of safe laboratory practices and emergency protocols<br>2. Proficient in all methods and SOP's within their department<br>3. Experience with and understanding of LIMS<br>4. Proven ability to meet TAT (turnaround times) |
| **Quality Systems Specialist** | BS/BA Chemistry | 2 years + | 1. General knowledge of laboratory methods<br>2. Experience with and understanding of LIMS<br>3. Strong attention to detail<br>4. Strong oral/written communication and organizational skills<br>5. Knowledge of QA/QC policies and certification requirements |
| **EH&S Coordinator** | High School or Equivalent | 2 years + | 1. General knowledge of lab operations<br>2. Detailed knowledge of safe lab practices and emergency protocols<br>3. Hazardous Waste Management and RCRA Regulation Training<br>4. DOT Hazardous Materials Regulations Training<br>5. OSHA Compliance Training<br>6. Able to develop and deliver new hire and ongoing safety training programs |
| **Lab Technician I** | HS or Equivalent | 0-1 years. 1+ years preferred. | 1. Knowledge of safe laboratory practices<br>2. Able to follow direction and Standard Operating Procedures (SOP's)<br>3. Familiarity with standard and reagent preparation<br>4. Knowledgeable in using volumetric pipettes and glassware<br>5. Strong oral/written communication and organizational skills |
| **Lab Technician II** | HS or Equivalent | 2-4 years | 1. All skills of Lab Technician I<br>2. Trained in majority of technician skills relative to department |
| **Lab Technician III** | HS or Equivalent | 5 years + | 1. All skills of Lab Technician II<br>2. Experienced in training staff |
| **Lab Technician/Chemist I** | BS/BA in Chemistry, Biology, Environmental or related Science | 0-1 years | 1. Knowledge of safe laboratory practices<br>2. Able to follow direction and Standard Operating Procedures (SOP's)<br>3. Familiarity with standard and reagent preparation<br>4. Knowledgeable in using volumetric pipettes and glassware<br>5. Strong oral/written communication and organizational skills |
| **Lab Technician/Chemist II** | BS/BA in Chemistry, Biology, Environmental or related Science | 2-4 years | 1. All skills of Chemist I<br>2. Trained in majority of department methods |

| TITLE* | REQUIRED EDUCATION** | MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE | MINIMUM REQUIRED SKILLS*** |
|---|---|---|---|
| **Lab Technician/Chemist III** | BS/BA in Chemistry, Biology, Environmental or related Science | 5 years + | 1. All skills of Chemist II<br>2. Experienced in training staff |
| **Analyst I** | HS or Equivalent | 0-1 years | 1. Knowledge of safe laboratory practices<br>2. Able to follow direction and Standard Operating Procedures (SOP's)<br>3. Experienced with sample handling, preparation and/or extraction |
| **Analyst II** | HS or Equivalent | 2-4 years | 1. All skills of Analyst I<br>2. Experienced in machine operation, maintenance and troubleshooting |
| **Analyst III** | HS or Equivalent | 5 years + | 1. All skills of Analyst II<br>2. Experienced in data review and reporting<br>3. Experienced in training staff |
| **Analytical Chemist I** | BS/BA in Chemistry, Biology, Environmental or related Science | 6 mos-1 year | 1. Knowledge of safe laboratory practices<br>2. Able to follow direction and Standard Operating Procedures (SOP's)<br>3. Experienced with sample handling, preparation and/or extraction |
| **Analytical Chemist II** | BS/BA in Chemistry, Biology, Environmental or related Science | 2-4 years | 1. All skills of Analytical Chemist I<br>2. Experienced in machine operation, maintenance and troubleshooting |
| **Analytical Chemist III** | BS/BA in Chemistry, Biology, or Environmental or related Science | 5 years + | 1. All skills of Analytical Chemist II<br>2. Experienced in data review and reporting<br>3. Experienced in training staff |
| **Data Deliverable Specialist I** | HS Diploma, BS/BA or Associates preferred | 0-1 years | 1. Introductory knowledge of laboratory methods<br>2.Able to follow direction and Standard Operating Procedures (SOP's)<br>3. Working knowledge of Adobe Acrobat, Microsoft Word, Excel<br>4. Good writing and typing skills |
| **Data Deliverable Specialist II** | HS Diploma, BS/BA or Associates preferred | 2-4 years | 1. All skills of Data Deliverable Specialist I<br>2. General knowledge of laboratory methods<br>3. Understanding of data review/ data reporting process<br>4. Experience with and understanding of LIMS and electronic data deliverables |

| TITLE* | REQUIRED EDUCATION** | MINIMUM REQUIRED ENVIRONMENTAL LAB EXPERIENCE | MINIMUM REQUIRED SKILLS*** |
|---|---|---|---|
| **Data Deliverable Specialist III** | HS Diploma, BS/BA or Associates preferred | 5 years + | 1. All skills of Data Deliverable Specialist II<br>2. Intermediate/advanced knowledge of laboratory methods<br>3. Able to perform report review<br>4. Experience with and understanding of LIMS and electronic data deliverables<br>5. Able to initiate re-work where necessary |
| **Laboratory Intern** | 2 Semesters of Chemistry, Biology or Environmental Science | None; Lab work study experience preferred | 1. Knowledge of safe laboratory practices<br>2. Able to follow direction and Standard Operating Procedures |

**KEY**

* Internal terms only. Full title would have "Environmental Laboratory" and specific department preceding it.

** Substitutions: Equivalent knowledge may be substituted for a degree in some instances.

*** Not meant to be an exhaustive list of skill requirements. For full list of skills consult the "Laboratory Skills" list. Actual Job Duties and Responsibilities can be found within job descriptions for each position.

## 24 Appendix I – Standard Operating Procedures

| WESTBORO SOP # | Title |
|---|---|
| 1728 | Waste Management and Disposal |
| 1730 | Balance Calibration Check |
| 1733 | Thermometer Calibration |
| 1735 | Analytical Guidelines for Method Validation |
| 1737 | Inorganics Glassware Cleaning and Handling |
| 1738 | Water Quality Monitoring |
| 1745 | Reagent, Solvent and Standard Control |
| 1747 | Datalogger Operation |
| 1948 | Separatory Funnel Liquid-Liquid Extraction – EPA 3510C |
| 1953 | Organic Extraction Glassware Cleaning & Handling |
| 1954 | Soxhlet Extraction – EPA 3540C |
| 1955 | Sulfur Cleanup – EPA 3660A |
| 1956 | Oil and Waste Dilution – EPA 3580A |
| 1959 | Microwave Extraction – EPA 3546 |
| 1960 | Sulfuric Acid Cleanup – EPA 3665A |
| 1962 | Florisil Cleanup |
| 1963 | Fractionation Cleanup |
| 1964 | Preparation of Samples for Chlorinated Herbicides |
| 2022 | Volatile Organic Compounds – EPA 624 |
| 2107 | Volatile Organic Compounds – EPA 524.2 |
| 2108 | Volatile Organic Compounds – EPA 8260C |
| 2109 | Polynuclear Aromatic Hydrocarbons (PAHs) by SIM – EPA 8270D (modified) |
| 2110 | Semivolatile Organics by GC/MS – EPA 625 |
| 2111 | Semivolatile Organics by GC/MS – EPA 8270D |
| 2112 | TCLP/SPLP Extraction - Volatile Organics SW-846 Method 1311/1312 |
| 2113 | EDB & DBCP in Water by Microextraction & Gas Chromatography – EPA 504.1, 8011 |
| 2116 | Organochlorine Pesticides by Capillary Column GC – EPA 8081B |
| 2119 | Extractable Petroleum Hydrocarbons – MADEP |
| 2120 | Volatile Petroleum Hydrocarbons – MADEP |
| 2122 | Organochlorine Pesticides & PCBs by Capillary Column GC – EPA 608 |
| 2123 | Polychlorinated Biphenyls in Oil – EPA 600/4-81-045 |
| 2125 | TPH-Diesel Range Organics, Maine 4.1.25, EPA 8015C (Modified) |
| 2126 | TPH- Gasoline Range Organics, Maine 4.2.17, EPA 8015C (Modified) |
| 2127 | CT-ETPH |

| | |
|---|---|
| 2128 | Herbicides by 8151A |
| 2129 | PCBs by Capillary Column Gas Chromatography - EPA 8082A |
| 2131 | New Jersey EPH Method |
| 2132 | Microwave Assisted Acid Digestion of Aqueous Samples & Extracts – EPA 3015 |
| 2133 | TCLP Extraction Metals and Semi-Volatile Organics – SW-846 Method 1311 |
| 2134 | Hot Block Digestion for Aqueous Samples EPA 3005A |
| 2135 | SPLP Extraction Inorganics and Semivolatile Organics, EPA 1312 |
| 2136 | Hot Plate Digestion of Sediments, Sludges and Soils, EPA 3050B |
| 2144 | Metals by Inductively Coupled Plasma – EPA 6010C |
| 2145 | Mercury in Liquid Waste by Cold-Vapor Atomic Absorption – EPA 7470A |
| 2146 | Mercury in Soil or Solid Waste by Cold-Vapor AA – EPA 7471B |
| 2149 | Metals by Inductively Coupled Plasma – EPA 200.7 |
| 2153 | Mercury in Water by Automated Cold-Vapor Atomic Absorption – EPA 245.1 |
| 2156 | Metals by Inductively Coupled Plasma-Mass Spectrometry – EPA 6020A |
| 2159 | Metals by Inductively Coupled Plasma-Mass Spectrometry – EPA 200.8 |
| 2161 | Fecal Coliform by Membrane Filtration – SM 9222D |
| 2163 | Fecal Coliform by Multiple Tube Fermentation – SM 9221E |
| 2191 | Heterotrophic Plate Count – SM 9215B |
| 2192 | Total Coliform/E.Coli – Presence/Absence (Colilert) – SM 9223B |
| 2193 | Total Coliform by Membrane Filtration – SM 9222B |
| 2194 | Total Coliform by Multiple Tube Fermentation – SM 9221B |
| 2195 | Chlorophyll A – SM 10200H |
| 2196 | E. Coli – Membrane Filtration |
| 2197 | Chlorophyll A – EPA 446 |
| 2198 | Air Density Monitoring |
| 2199 | Inhibitory Residue Test |
| 2200 | Enterococcus – MF |
| 2201 | Total Coliform, E.Coli & Enterococcus by Quantification Methods (Quanti Tray) |
| 2202 | pH, Liquid Samples |
| 2203 | pH, Soil & Waste Samples |
| 2204 | Hexavalent Chromium |
| 2205 | Biological Oxygen Demand |
| 2206 | Ammonia Nitrogen |
| 2207 | Total Kjeldahl Nitrogen |
| 2208 | Chemical Oxygen Demand |
| 2209 | Oil & Grease by n-Hexane Extraction Method & Gravimetry |
| 2210 | Cyanide, Total |

| | |
|---|---|
| 2211 | Phenol, Total |
| 2212 | Sulfate, Turbidimetric Method |
| 2213 | Alkalinity, Titration Method –SM 2320B |
| 2214 | Determination of Inorganic Anions by Ion Chromatography – EPA 300.0 |
| 2215 | Total Organic Carbon/Dissolved Organic Carbon |
| 2216 | Chloride – SM 4500Cl-E, EPA 9251 |
| 2217 | Nitrate, Nitrite and Nitrate/Nitrite Nitrogen – EPA 353.2, SM 4500$NO_3$-F |
| 2218 | Total Solids (Dried @ 103-105$^o$) and TVS – SM 2540B, SM 2540E |
| 2219 | Total Dissolved Solids – SM 2540C |
| 2220 | Total Suspended Solids – SM 2540D |
| 2221 | Total Sulfide – SM 4500S2-AD, EPA 9030B |
| 2222 | MBAS, Anionic Surfactants – SM 5540C |
| 2223 | Fluoride, Electrode Method – SM 4500F-BC |
| 2224 | Turbidity, Nephelometric Method – EPA 180.1, SM 2130B |
| 2225 | Orthophosphate, Colorimetric Single Reagent Method – SM 4500P-E |
| 2226 | Total Phosphorous, Colorimetric Combined Reagent Method – SM 4500P-E |
| 2227 | Flashpoint – EPA 1010 |
| 2228 | Reactivity – EPA Chapter 7.3 |
| 2229 | Total Solids (Dried @ 103-105$^o$) – SM 2540G |
| 2230 | Specific Conductance and Salinity |
| 2231 | True and Apparent Color, Visual Comparison Method |
| 2232 | Acidity, Titration Method |
| 2233 | Determination of Formaldehyde by HPLC, EPA 8315A |
| 2234 | Sulfite, Iodometric |
| 2235 | Ferrous Iron |
| 2236 | Residual Chlorine |
| 2237 | ORP |
| 2238 | Ignitability of Solids EPA 1030 |
| 2239 | Physiologically Available Cyanide (PAC) |
| 2240 | Total Settleable Solids SM 2540 F |
| 2241 | Fixed and Volatile Solids in Solid and Semisolid Samples – SM 2540G |
| 2242 | Tannin & Lignin |
| 2243 | Nitrite - Manual Colorimetric Method |
| 2244 | Paint Filter Liquids Test |
| 2245 | Odor, Threshold Odor Test |
| 2249 | Dissolved Oxygen |
| 2251 | Perchlorate by IC/MS/MS |
| 2274 | Data Validation Package Generation |
| 3743 | Free Cyanide |
| 9177 | Total Phenol - SEAL Method |

| | |
|---|---|
| 9733 | Oil & Grease and TPH in Soil |
| 10807 | Percent Organic Matter in Soil |
| 12838 | Buchi Concentration |

| MANSFIELD SOP # | Title |
|---|---|
| 1753 | Glassware Cleaning |
| 1754 | Balance Calibration |
| 1755 | Pipette Checks |
| 1796 | Sample Management - Forensics |
| 1797 | Haz Waste |
| 1816 | Reagent Solvent Standard Control |
| 2137 | ICP-MS EPA 6020A |
| 2138 | Mercury Aqueous 7470A |
| 2139 | Mercury Soil 7471B |
| 2140 | AVS SEM |
| 2141 | Hydride Generation |
| 2142 | Mercury Aqueous 1631E |
| 2143 | Mercury Soil 7474 |
| 2148 | Metals Soil Digestion 3050 |
| 2150 | Metals Microwave 3015 |
| 2151 | Metals Acid Digestion 3020 |
| 2152 | Seawater Extraction of Metals |
| 2154 | TCLP 1311 |
| 2155 | EPA 8270D |
| 2157 | PAH by SIM |
| 2158 | EPA 8081B |
| 2160 | EPA 8082A Aroclors/Congeners by GC |
| 2162 | Pesticides/PCB Aroclors/Congeners by GC/MS SIM |
| 2164 | 1,4-Dioxane GC/MS SIM |
| 2165 | Separatory Funnel Extraction EPA 3510C |
| 2166 | Tissue Prep |
| 2167 | GPC |
| 2168 | Sulfur Cleanup 3660 |
| 2169 | Sulfuric Acid Cleanup 3665 |
| 2170 | Silica Gel Cleanup |
| 2171 | % Lipids |
| 2172 | Microscale Solvent Extraction EPA 3570 |
| 2173 | Soxhlet Extraction EPA 3540C |

| | |
|---|---|
| 2174 | Soxhlet Extraction of PUFs |
| 2175 | % Total Solids |
| 2182 | TOC soot-soil |
| 2183 | Particle Size Determination |
| 2184 | Particulates in Air PM-10 |
| 2185 | Volatile Solids |
| 2186 | TO-15 |
| 2187 | APH |
| 2188 | Air PIANO |
| 2189 | Dissolved Gases |
| 2190 | Can Cleaning |
| 2246 | TPH and SHC |
| 2247 | Alkylated PAH |
| 2248 | Organic Lead |
| 2252 | Fixed Gases |
| 2253 | TO-11A |
| 2255 | PIANO Volatiles |
| 2256 | Ethanol in Oil |
| 2257 | Whole Oil Analysis |
| 2259 | Density Determination of Oils |
| 2260 | Alumina Cleanup |
| 2261 | Shaker Table |
| 2263 | Gravimetric Determination |
| 2264 | Tissue Extraction |
| 2265 | Organic Waste Dilution |
| 2267 | Client SOP: SGC - Manual Method |
| 2268 | Client SOP: DCM Extractable Method |
| 4246 | PAHs by SPME |
| 6398 | TO-17 |
| 6438 | Mercury in Sorbent Tubes by CVAA |
| 7900 | Mercury 1631E Using Cetac-M-8000 Analyzer |
| 9077 | Porewater Generation |
| 9480 | EPA-TO-12 |
| 9745 | Formaldehyde - HPLC |
| 12863 | EPA 8270D GC/MS Full Scan TO-13A |
| 13091 | HPAH |
| 13392 | EPA TO-10A |
| 13406 | Particulate Organic Carbon |
| 14500 | Lead in Particulate Matter |

| CORPORATE SOP # | Title |
|---|---|
| 1559 | Sample Receipt and Login |
| 1560 | Sample Custody and Tracking |
| 1561 | Bottle Order Preparation |
| 1562 | Computer System Backup/Control |
| 1563 | Computer and Network Security |
| 1564 | Software Validation and Control |
| 1565 | Training Program |
| 1566 | Report Generation and Approval |
| 1567 | Organics Data Deliverable Package Review |
| 1722 | Customer Inquiry and Complaint Procedures |
| 1723 | Customer Service |
| 1724 | Quote/Contract Procedure |
| 1725 | Project Communication Form Generation |
| 1726 | Purchasing Procedure |
| 1727 | Accounts Payable Invoice Processing |
| 1729 | Document Control |
| 1731 | Manual Integration and Compound Rejection |
| 1732 | DL LOD LOQ Generation |
| 1734 | Control Limit Generation |
| 1736 | Corrective and Preventative Actions |
| 1739 | Demonstration of Capability (DOC) Generation |
| 1740 | Internal Audit Procedure |
| 1741 | Data Review – Organics |
| 1742 | Calculating Measurement Uncertainty |
| 1743 | Annual Management Review |
| 1744 | Sample Compositing Procedure |
| 1746 | Nonconformance Planning/Procedures |

# APPENDIX 7 - SMP FORMS

# Field Data
## Water Level Gauging

**Client:** _____ **Technician:** _____

**Site:** Cornwall Shopping Plaza **Weather:** _____

**Date:** _____

| Well ID | PID (PPM) | Depth to Water from TOC (ft) | Depth to Bottom from TOC (ft) |
|---|---|---|---|
| MW-3B | | | |
| MW-3 | | | |
| MW-4R | | | |
| MW-p-1 | | | |
| MW-9 | | | |
| MW-13 | | | |
| MW-8 | | | |
| MW-7 | | | |
| MW-10 | | | |
| MW-12B | | | |
| MW-12 | | | |
| MW-11B | | | |
| MW-11 | | | |
| MW-6B | | | |
| MW-6 | | | |
| MW-1R | | | |
| MW-1 | | | |
| MW-2R | | | |
| MW-5 | | | |

VERTEX

# LOW FLOW SAMPLING
# FIELD DATA SHEETS

**Client:** Vertex **Technician:** _____

**Site:** Cornwall Shopping Plaza **Weather:** _____

**Date:** _____

**Monitoring Well #:** _____ **Well Depth:** _____ ft **Screened/Open Interval:** _____ ft

**Well Permit #:** _____ **Well Diameter:** _____ inches

**PID Readings (ppm)**

**Background:** _____ **Pump Intake Depth:** _____ ft below TOC

**Beneath Outer Cap:** _____ **Depth to Water Before Pump Installation:** _____ ft below TOC

**Beneath Inner Cap:** _____ **Purge Method** _____

| TIME | Purging | Sampling | pH (pH units) | | Temperature (°C) | | Specific Conductivity (uS/cm) | | Dissolved Oxygen (mg/L) | | Redox Potential (mV) | | Turbidity (NTU) | | Pumping Rate (ml/min) | Depth to Water (ft below TOC) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reading | Change | Reading | Change | Reading | Change | Reading | Change | Reading | Change | Reading | Change | | |
| | | | | | | | | | | | | | | | | |
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**Purge Start:**

**Purge End:**

**Sample Time:**

**Sample notes:**

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN: ± 0.1 for pH; ± 3% for Specific Conductivity and Temperature; ± 10 mV for Redox Potential; and ± 10% for Dissolved Oxygen and Turbidity

# Field Instrument and Calibration Data Sheet

**Site:** Cornwall Shopping Plaza **Client:** _____

**Field Personnel:** _____

**Date:** _____ **Start Time:** _____ **Stop:** _____

| | Meter (model/ID) | Probe (ID) |
|---|---|---|
| DO | | |
| pH | | |
| Spec. Cond | | |
| ORP | | |
| Turbidity | | |

* All meters are temperature compensating (except Turbidity)

| Dissolved Oxygen | | Turbidity | | ORP | |
|---|---|---|---|---|---|
| Water Temp | | 20.0 NTU | | Temp °C | |
| Baro Pres. | | 100 NTU | | 246mV ± 10mV | |
| O2 Satur % | | 800 NTU | | | |
| Zero mg/L | | 10.0 NTU | (check) | | |

## Specific Conductance

| Standard 1000 ± 10 uS/cm | | Lot # and Exp Date |
|---|---|---|
| Reading | | |
| Temp °C | | |

## pH Calibration

| | | | Lot # and Exp Date |
|---|---|---|---|
| Buffer 4 | | Temp °C | |
| Buffer 7 | | Temp °C | |
| Buffer 10 | | Temp °C | |

**Notes:**

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

## Contact Information

Preparer's Name: _____ Phone No: _____

Preparer's Affiliation: _____ Company Code: _____

Purpose of Investigation: _____ Date of Inspection: _____

Contact Name: _____ Affiliation: _____

Phone No: _____ Alt. Phone No: _____ Email: _____

Number of Occupants (total): _____ Number of Children: _____

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): _____ Owner Phone: _____

Owner Mailing Address: _____

## Building Details

Bldg Type (Res/Com/Ind/Mixed): _____ Bldg Size (S/M/L): _____

If Commercial or Industrial Facility, Select Operations:

If Residential Select Structure Type:

Number of Floors: _____ Approx. Year Construction: _____ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests):

## Foundation Description

Foundation Type: _____ Foundation Depth (bgs): _____ Unit: FEET

Foundation Floor Material: _____

Foundation Wall Material: _____

Foundation Floor Thickness: _____

Foundation Wall Thickness: _____ Unit: INCHES

☐ Floor penetrations? Describe Floor Penetrations: _____

☐ Wall penetrations? Describe Wall Penetrations: _____

Basement is: _____ Basement is: _____ ☐ Sumps/Drains? Water In Sump?: _____

Describe Foundation Condition (cracks, seepage, etc.) : _____

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

## Heating / Cooling / Ventilation Systems

Heating System: _____ Heat Fuel Type: _____ ☐ Central A/C Present?

### Vented Appliances

Water Heater Fuel Type: _____ Clothes Dryer Fuel Type: _____

Water Htr Vent Location: _____ Dryer Vent Location: _____

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

## PRODUCT INVENTORY

Building Name: _____ Bldg Code: _____ Date: _____

Bldg Address: _____ Apt/Suite No: _____

Bldg City/State/Zip: _____

Make and Model of PID: _____ Date of Calibration: _____

| Location | Product Name/Description | Size (oz) | Condition * | Chemical Ingredients | PID Reading | COC Y/N? |
|---|---|---|---|---|---|---|
| | | | | | | ☐ |
| | | | | | | ☐ |
| | | | | | | ☐ |
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| | | | | | | ☐ |

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

## Factors Affecting Indoor Air Quailty

Frequency Basement/Lowest Level is Occupied?: _____ Floor Material: _____

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: _____ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: _____

☐ Cleaning Products Used Recently?: Description of Cleaning Products: _____

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: _____

☐ New Carpet or Furniture? Location of New Carpet/Furniture: _____

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: _____

☐ Recent Painting/Staining? Location of New Painting: _____

☐ Solvent or Chemical Odors? Describe Odors (if any): _____

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: _____

☐ Recent Pesticide/Rodenticide? Description of Last Use: _____

Describe Any Household Activities (chemical use,/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: _____

☐ Any Prior Testing For VOCs? If So, When?: _____

## Sampling Conditions

Weather Conditions: _____ Outdoor Temperature: _____ °F

Current Building Use: _____ Barometric Pressure: _____ in(hg)

Product Inventory Complete? _____ ☐ Building Questionnaire Completed?

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: _____ Address: _____

## Sampling Information

Sampler Name(s): _____ Sampler Company Code: _____

Sample Collection Date: _____ Date Samples Sent To Lab: _____

Sample Chain of Custody Number: _____ Outdoor Air Sample Location ID: _____

## SUMMA Canister Information

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: | | | | | |
| Location Code: | | | | | |
| Location Type: | | | | | |
| Canister ID: | | | | | |
| Regulator ID: | | | | | |
| Matrix: | | | | | |
| Sampling Method: | | | | | |

## Sampling Area Info

| | | | | | |
|---|---|---|---|---|---|
| Slab Thickness (inches): | | | | | |
| Sub-Slab Material: | | | | | |
| Sub-Slab Moisture: | | | | | |
| Seal Type: | | | | | |
| Seal Adequate?: | ☐ | ☐ | ☐ | ☐ | ☐ |

## Sample Times and Vacuum Readings

| | | | | | |
|---|---|---|---|---|---|
| Sample Start Date/Time: | | | | | |
| Vacuum Gauge Start: | | | | | |
| Sample End Date/Time: | | | | | |
| Vacuum Gauge End: | | | | | |
| Sample Duration (hrs): | | | | | |
| Vacuum Gauge Unit: | | | | | |

## Sample QA/QC Readings

| | | | | | |
|---|---|---|---|---|---|
| Vapor Port Purge: | ☐ | ☐ | ☐ | ☐ | ☐ |
| Purge PID Reading: | | | | | |
| Purge PID Unit: | | | | | |
| Tracer Test Pass: | ☐ | ☐ | ☐ | ☐ | ☐ |

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

## LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level .
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

### Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

| | | | |
|---|---|---|---|
| **B** or **F** | Boiler or Furnace | o | Other floor or wall penetrations (label appropriately) |
| **HW** | Hot Water Heater | **xxxxxxx** | Perimeter Drains (draw inside or outside outer walls as appropriate) |
| **FP** | Fireplaces | **######** | Areas of broken-up concrete |
| **WS** | Wood Stoves | ● SS-1 | Location & label of sub-slab samples |
| **W/D** | Washer / Dryer | ● IA-1 | Location & label of indoor air samples |
| **S** | Sumps | ● OA-1 | Location & label of outdoor air samples |
| **@** | Floor Drains | ● PFET-1 | Location and label of any pressure field test holes. |

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

## FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building.
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

### Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

| | | | |
|---|---|---|---|
| **B** or **F** | Boiler or Furnace | o | Other floor or wall penetrations (label appropriately) |
| **HW** | Hot Water Heater | **xxxxxxx** | Perimeter Drains (draw inside or outside outer walls as appropriate) |
| **FP** | Fireplaces | **######** | Areas of broken-up concrete |
| **WS** | Wood Stoves | ● SS-1 | Location & label of sub-slab samples |
| **W/D** | Washer / Dryer | ● IA-1 | Location & label of indoor air samples |
| **S** | Sumps | ● OA-1 | Location & label of outdoor air samples |
| **@** | Floor Drains | ● PFET-1 | Location and label of any pressure field test holes. |

# Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

## OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

### Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

| | | | |
|---|---|---|---|
| **B** or **F** | Boiler or Furnace | o | Other floor or wall penetrations (label appropriately) |
| **HW** | Hot Water Heater | **xxxxxxx** | Perimeter Drains (draw inside or outside outer walls as appropriate) |
| **FP** | Fireplaces | **######** | Areas of broken-up concrete |
| **WS** | Wood Stoves | ● SS-1 | Location & label of sub-slab samples |
| **W/D** | Washer / Dryer | ● IA-1 | Location & label of indoor air samples |
| **S** | Sumps | ● OA-1 | Location & label of outdoor air samples |
| **@** | Floor Drains | ● PFET-1 | Location and label of any pressure field test holes. |

**Summary of Green Remediation Metrics for Site Management**

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

**Initial Report Period (Start Date of period covered by the Initial Report submittal)**
Start Date: _____

**Current Reporting Period**
Reporting Period From: _____ To: _____

**Contact Information**
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

**I. Energy Usage:** Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

| | **Current Reporting Period** | **Total to Date** |
|---|---|---|
| Fuel Type 1 (e.g. natural gas (cf)) | | |
| Fuel Type 2 (e.g. fuel oil, propane (gals)) | | |
| Electricity (kWh) | | |
| **Of that Electric usage, provide quantity:** | | |
| Derived from renewable sources (e.g. solar, wind) | | |
| **Other energy sources** (e.g. geothermal, solar thermal (Btu)) | | |

*Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.*

**II. Solid Waste Generation:** Quantify the management of solid waste generated on-site.

| | **Current Reporting Period (tons)** | **Total to Date (tons)** |
|---|---|---|
| **Total waste generated on-site** | | |
| O&M generated waste | | |

| **Of that total amount, provide quantity:** | | |
|---|---|---|
| Transported off-site to landfills | | |
| Transported off-site to other disposal facilities | | |
| Transported off-site for recycling/reuse | | |
| Reused on-site | | |

*Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.*

**III. Transportation/Shipping:** Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

| | **Current Reporting Period (miles)** | **Total to Date (miles)** |
|---|---|---|
| Standby Engineer/Contractor | | |
| Laboratory Courier/Delivery Service | | |
| Waste Removal/Hauling | | |

*Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.*

**IV. Water Usage:** Quantify the volume of water used on-site from various sources.

| | **Current Reporting Period (gallons)** | **Total to Date (gallons)** |
|---|---|---|
| Total quantity of water used on-site | | |
| **Of that total amount, provide quantity:** | | |
| Public potable water supply usage | | |
| Surface water usage | | |
| On-site groundwater usage | | |
| Collected or diverted storm water usage | | |

*Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.*

**V. Land Use and Ecosystems:** Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

| | **Current** | **Total to Date** |
|---|---|---|

| | **Reporting Period (acres)** | **(acres)** |
|---|---|---|
| Land disturbed | | |
| Land restored | | |

*Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.*

| **Description of green remediation programs reported above**<br>(Attach additional sheets if needed) |
|---|
| Energy Usage: |
| Waste Generation: |
| Transportation/Shipping: |
| Water usage: |
| Land Use and Ecosystems: |
| Other: |

**CERTIFICATION BY CONTRACTOR**

I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application.

_____

**Date** **Contractor**

# APPENDIX 8

# REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

# REMEDIAL SYSTEM OPTIMIZATION FOR CORNWALL PLAZA

## TABLE OF CONTENTS