INTERIM REMEDIAL MEASURES WORK PLAN

Orangeburg (Orangetown) Shopping Center

1-45 Orangetown Shopping Center

Orangeburg, NY 10962

NYSDEC Index #A3-0563-0906

NYSDEC Site #C344066

Prepared For:

JLJ Management Company, Inc.
197 Trenor Drive
New Rochelle, NY 10804

Prepared By:

Kleinfelder Engineering, P.C.
One Corporate Drive
Suite 201
Bohemia, NY 11716

June 2008
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Quality Assurance/Quality Control

The undersigned Kleinfelder personnel certify that this report is true and accurate to the best of their knowledge.

Date August 28, 2008

Justin R. Moses, P.E.
Vice President, Secretary

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Acronym List

AOC: Area of Concern

BCP: Brownfield Cleanup Program

bgs: below ground surface

cDCE: cis-1,2-Dichloroethene

CSM: Conceptual Site Model

DNAPL: Dense Non-Aqueous Phase Liquid

DUSR: Data Usability Summary Report

EIP: Electronic Interface Probe

ESA: Environmental Site Assessment

FOIA: Freedom of Information Act

FWIA: Fish and Wildlife Impact Analysis

IC/EC: Institutional Controls/Engineering Controls

IRM: Interim Remedial Measure

IWP: Investigation Work Plan

MNA: Monitored Natural Attenuation

msl: mean sea level

mV: millivolt

mg/L: milligrams per liter

µg/L: micrograms per liter

$\mu g/m^3$: micrograms per cubic meter

NYS: New York State

NYSDEC: New York State Department of Environmental Conservation

NYSDOH: New York State Department of Health

NYSGS: New York State Geological Survey

NRCS: Natural Resource Conservation Service

OM&M: Operations, Monitoring and Maintenance

PCE: Tetrachloroethene

PID: Photo Ionization Detector

RI: Remedial Investigation

RWP: Remedial Work Plan

SVOC: Semi-Volatile Organic Compound

tDCE: trans-1,2-Dichloroethene

TCE: Trichloroethene

USEPA: United States Environmental Protection Agency

USGS: United States Geological Survey

VC: Vinyl Chloride

VOC: Volatile Organic Compound

1.0 Introduction and Purpose

The subject New York State Brownfield Site is a 1.2-acre portion of the approximately 11-acre parcel located at 1-45 Orangetown Shopping Center, at the southeast corner of Orangeburg and Dutch Hill Roads, in the Town of Orangetown (Orangeburg), County of Rockland, New York. The Site is in the New York Brownfield Cleanup Program (BCP), assigned Site number C344066.

The purpose of the Interim Remedial Measures (IRM) as presented in this work plan report are to quickly mitigate or eliminate pressing environmental or human hazards through source removal and subsequent chemical and biological treatment, as needed. This Work Plan (IRMWP) presents the proposed supplemental investigative steps required to address the Remedial Investigation Report (RI) prepared by Kleinfelder East, Inc. (2008), so that the general conditions of establishing the nature and extent of contamination and assessing the potential impact to public health and environment can be met. Additionally, the proposed investigation will provide data required to direct selection of additional remedial approaches.

The tasks to resolve the data gaps identified in previous investigations include the following:

- Evaluation, repair and sampling of damaged groundwater monitoring wells;
- Gauging and sampling of all[1] groundwater monitoring wells;
- Investigation of soil beneath Sparkle Cleaners and an investigation of soil vapor beneath the Sparkle Cleaners building;
- Installation of a soil vapor point in the vicinity of 5 Oak Street; and
- Indoor and sub-slab air sampling at five (5) commercial locations and seven (7) residential properties.

The interim remedial measures will include the following:

- Development and implementation of a vapor intrusion mitigation plan at Sparkle Cleaners;
- Review and evaluation of the operating procedures, heating, ventilation and air conditioning (HVAC) system and plumbing system at Sparkle Cleaners;
- Review and evaluation of the HVAC system in Building #2; and
- Soil excavation of the on-site source area.

[1] A list of all groundwater monitoring wells may be found in Section 4.1.1 of the Remedial Investigation Report.

The evaluation of bio-augmentation and/or chemical treatment as the final remedy will include the following:

- Evaluation of post excavation soil sample analytical results and comparison to the clean up standards to determine the amount of residual contamination within the source area which may need additional remedial action;
- Bench study of site contaminated site soils to determine the efficacy of bio-augmentation and chemical treatment approaches; and
- Evaluation of groundwater sampling results to determine the current level of contamination in overburden groundwater and comparison to the groundwater clean up standards to determine what actions, if any, are appropriate to address remaining groundwater impacts.

2.0 Site History and Description

2.1 Description

The subject New York State Brownfield Site (Site) is a 1.2-acre portion of the approximately 11-acre parcel (Subject Property) located at 1-45 Orangetown Shopping Center, at the southeast corner of Orangeburg and Dutch Hill Roads, Town of Orangetown (Orangeburg), County of Rockland, New York. The Subject Property was acquired by JLJ Management Company (JLJ) in April 1990. Currently, the Subject Property is a strip mall, with a Dry Cleaning operation.

Owner:	JLJ Management Company
Street Address:	1-45 Orangetown Shopping Center
Hamlet/Town:	Orangeburg / Orangetown
County:	Rockland
State:	New York
Zip Code:	10962
Latitude (North):	41.045100 - 41° 2’ 42.4’’
Longitude (West):	3.953400 - 73° 57’ 12.2’’
Universal Transverse Mercator:	Zone 18
UTM X (Meters):	587963.7
UTM Y (Meters):	4544079.0
Elevation:	175 ft. above sea level (approx.)
Tax Identification:	74.10-1-67

The Subject Property is located in a suburban area of mixed land use, and improved with a retail strip shopping center comprised of five buildings and a total of seven distinct building components. The area is a well-developed village/town setting, characterized by general business, commercial, and institutional (public) development. The Town of Orangetown designates this general area as a Commercial (CS) Zone.

As mentioned above, the Subject Property is improved with three large buildings (of 1- or 2-stories) that appear to be built-up from or extended from connections between several smaller buildings, with a floor space in excess of 70,000 square feet and divided into more than 30 separate commercial units. The buildings were constructed in phases, with the first three buildings being erected in 1966. Building #1 now houses CVS and a small grocery. Building #2 houses various stores, including Sparkle Cleaners and restaurants. The bank (Building #4, WaMu is the current tenant), bridges the two smaller structures (Buildings #3 [a former movie theater], #5, and #6 [US Post Office] originally built in the 1960s), and was erected around 1974. The western-most retail building (Building #7), with its back towards Dutch Hill Road, was built around 1978.

Figure 1 (Site Location) graphically indicates the physical location of the Subject Property within the state and locally. Figure 2 (Site Plan) diagrammatically presents the boundaries of the designated Brownfields Site and general layout of the project area within the Subject Property.

2.2 Historic Use of the Site and Adjoining Parcels

2.2.1 Historic Use

Before 1940, the area and the Subject Property were rural in character, with farmland as the primary land use, and some areas immediately to the east of the Site and west of Highway 303 subdivided into residential use.

The general area became part of Camp Shanks in September 1942. The Subject Property was developed by the US Army Corps of Engineers into an amphitheater, and this use persisted apparently through the World War II era and beyond, at least until the decline of Shanks Village and its ultimate sale to Sandra Construction in 1956 (Webber 1991).

At some point between 1956 and the early 1960s, the Subject Property was sold to the Prel Corporation; apparently, the property had not yet been developed, although there is some photographic evidence suggesting that Prel Plaza (at the southwest corner of Orangeburg Blvd. and Dutch Hill Rd.) was built by perhaps 1962.

In 1964, Prel Corp. sold the Subject Property to an investment group (Baum, Baum, Heiman, and Lehrer, also called BBH&L). This group developed the retail shopping center now extant at the Subject Property. In 1990, the property was purchased by the Client.

2.2.2 Abutters

North

Beyond Orangeburg Road, the Town's offices are across the intersection with Dutch Hill Road and the Fire Department is immediately north.

A bank is located on the same block, at the intersection of Orangeburg Road and Dutch Hill Road.

East

Single-family residential homes exist along the western side of Oak Street.

A residential apartment complex exists along the eastern side of Oak Street.

South

Both single-family residential homes and commercial property exist along the northern side of Highview Avenue.

Single-family residential homes exist along the southern side of Highview Avenue.

West

Dutch Hill Road has commercial and office property along both sides west of the Site.

2.3 Remedial Investigation Discussion

Please see Section 2.4 of the RI report completed by Kleinfelder in February 2008 for a detailed summary of previous investigations at the Site.

2.3.1 Remedial Investigation

The February 2008 RI Report presented the results of the remedial investigation conducted in September and October 2007. The investigation included installation of soil borings and groundwater monitoring wells, groundwater sampling for appropriate chemical and biological constituents and an air quality sampling evaluation within and surrounding the Site.

Results of the Remedial Investigation indicated the following:

- Soil contamination on site is limited in both concentration and physical extent.
- The source of contamination on site is most likely a historical release of PCE, originating from a sewer break or leakage at the joint where the Sparkle Cleaner sewer line connects into the connector line.
- The highly compacted "tight" nature of the subsurface appears to have limited the horizontal migration of the impact to less than approximately 20 feet.
- Available groundwater gauging data did not indicate the presence of DNAPL below the groundwater table.
- A dissolved phase plume of TCE, cDCE and VC has migrated horizontally in groundwater, with a primary flow direction towards the east-northeast.
- It appears that the overburden groundwater plume extends off the property to the northeast.
- Vapor phase chlorinated solvents exist nearly exclusively in the immediate vicinity of the source zone around Sparkle Cleaners.
- During sampling, concentrations of chlorinated solvents in indoor air were highest in Sparkle Cleaners and Building #2, where a correlation of sub-slab soil vapor and indoor air quality appears to exist.

Based on these results, Kleinfelder recommended three interim remedial measures:

- Remediate (via soil removal and/or vapor venting/extraction) the source area behind Building #2 and treat and develop a monitoring program for the overburden groundwater plume.
- Address soil vapors beneath Sparkle Cleaners and mitigate indoor air concentrations of chlorinated solvents.
- Evaluate Sparkle Cleaners HVAC system, plumbing system and operating procedures.

3.0 IRM Work Plan Objectives

By entering the Site into Brownfields Cleanup Agreement the Site must proceed through several stages:

- *Investigation Work Plan (IWP)*
  - Develop an IWP and submit to NYSDEC for approval (The *Remedial Investigation Work Plan* was submitted and approved by NYSDEC in July, 2007).
- *Investigation*
  - Complete investigation and submit report to NYSDEC for approval.

    Additional investigatory items will be completed in this step and implementation of the interim remedial measures will aid in remedy selection.
- *Remedy Selection*
  - Based upon the investigation results and results of the interim remedial measures, an approach to remedying the contamination, if deemed necessary, will be developed in consultation with NYSDEC.
- *Construction*
  - Implement remediation, which will likely include:
    - Excavation of source soils.
    - Treatment of the dissolved overburden plume and depressing post excavation soil concentrations.
  - Complete construction and create/record any Institutional Controls/Engineering Controls (IC/EC) issues and Environmental Easement.
- *Release and Operations, Monitoring and Maintenance (OM&M)*
  - NYSDEC issues statement of completion.
  - Perform supplemental monitoring as needed.
  - Achieve regulatory closure.

3.1 Additional Investigation

Upon review of the Remedial Investigation Report, the NYSDEC, in a letter dated March 14, 2007 (this was improperly dated and should have read March 14, 2008), indicated that prior to conducting the interim remedial measures, additional investigation was warranted. The following supplemental investigation items address the NYSDEC's request:

- An additional round of groundwater sampling from all wells should be conducted and samples should be analyzed for VOCs, metals, PCBs/Pesticides and any other analyses necessary for the design of remedial actions.
- Groundwater depths should be gauged quarterly.
- Groundwater monitoring wells which have been paved over should be located and evaluated; if the wells are intact, they should be repaired and sampled; if the wells are not intact they should be properly decommissioned.
- Additional borings should be installed through the floor of the Sparkle Cleaners and soil samples should be collected and analyzed for VOCs, metals and PCBs/Pesticides.

- Sub-slab soil vapor sampling should be conducted in the vicinity of the structure located at 5 Oak Street.
- Soil vapor intrusion sampling will be conducted at the identified structures during the 2008-2009 heating season.

3.2 Interim Remedial Measure

Based on the findings of the Remedial Investigation, Kleinfelder recommended a number of interim remedial measures to be conducted. The recommendations included measures to address soil, groundwater, soil vapor and indoor air quality. Upon review of these recommendations, and discussion with JLJ and Kleinfelder, the NYSDEC agreed that remedial measures were necessary, that an IRM would substantially remedy the critical findings of the RI, and an IRM WP with the following items should be submitted:

- A means to address the area of shallow soil contamination found previously.
- A means to mitigate the soil vapor intrusion into Building #2.
- An assessment of the operating procedures of Sparkle Cleaners and a review of the HVAC and plumbing systems within Sparkle Cleaners and Building #2.

4.0 Additional Investigatory Items

4.1 Scope and Rationale

4.1.1 Additional Investigation Project Team

The project team will consist of the same team as listed in Appendix E of the *Remedial Investigation Work Plan*, completed by Kleinfelder East, Inc. in July 2007, with the addition of Justin Moses. Mr. Moses' resume is included in Appendix C.

4.1.2 Goals

The purposes of the additional investigatory items are:

1. To locate and repair lost or damaged monitoring wells and collect groundwater samples from all monitoring wells on Site in order to monitor the groundwater plume.
2. To gauge all monitoring wells quarterly to monitor seasonal changes in groundwater elevations and flow direction.
3. To conduct soil vapor monitoring to evaluate shallow soil vapor concentrations beneath CVS in Building #1, Sparkle Cleaners, Deli Spot and Hikaru Sushi Restaurants in Building #2, vacant tenant space in Building #3, 55 Highview Avenue, 1 Oak Street, 3 Oak Street and 9 Oak Street, and to evaluate shallow soil vapor within the vicinity of 5 Oak Street.

4.1.3 Groundwater Sampling of All Monitoring Wells

All Site monitoring wells will be gauged for depth to water and the presence of DNAPL using an electronic interface probe. Selected monitoring wells will be sampled using low flow sampling following the USEPA Region I *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells* (July 1996). The low flow sampling will utilize Teflon-lined polyethylene tubing.

The wells not sampled using the low flow sampling procedure will be sampled by purging three well volumes from each well using disposable Teflon lined polyethylene bailers. Sample collection will be via bailers following completion of the purge.

Monitoring wells which are aiding in the evaluation of the extent of the groundwater plume and those that are being utilized for the continued evaluation of vapor intrusion potential will be monitored during this investigation.

All groundwater samples will be submitted for analysis of volatile organic compounds (VOC) by EPA method 8260. Four select samples from wells upgradient, side gradient, down gradient and centrally located on the Site will be submitted for analysis of pesticides by EPA method 8081A, PCBs by EPA method 8082, semi-volatile organic compounds (SVOC) by EPA method 8270 and Resource Conservation and Recovery Act (RCRA) 13 metals, including mercury. A summary of the wells to be sampled, sampling methods and analytical methods is included in Table 1.

Five monitoring wells, MW-3, MW-4, MW-5, MW-8A and MW-8B, will also be sampled for parameters to assess the potential bioremediation activities, discussed in section 5.2 of this report. The specific parameters that will be tested include pH, oxidation reduction potential (ORP), dissolved oxygen (DO), iron and dissolved organic carbon.

The gauging of static head in each groundwater monitoring well will be used along with relative well head elevations to determine both horizontal and vertical groundwater gradients.

4.1.4 Groundwater Gauging of Monitoring Wells Quarterly

All Site Monitoring wells will continue to be gauged for depth to water the presence of DNAPL using an electronic interface probe on a quarterly basis.

4.1.5 Evaluate/Repair Damaged Monitoring Wells

Monitoring wells which were not sampled during the remedial investigation due to damage will be evaluated and the damage will be repaired if possible. If repair is not possible, the wells will be properly decommissioned. The required permits will be obtained prior to decommissioning and the wells shall be properly abandoned using the following procedure;

1. The existing well casing and screen will be removed from below grade using the cable apparatus of the drill rig to the maximum extent possible.

2. The resulting open borehole will be backfilled with grout from bottom to top using a tremie pipe to within six inches of the surface.

3. The borehole will be finished to surface grade with concrete.

4.1.6 Conduct a Sub-Slab Soil and Soil Vapor Investigation at Sparkle Cleaners and Other Sites already sampled and Install a Soil Vapor Implant at 5 Oak Street

The purpose of the sub-slab soil vapor investigation is to evaluate the potential for human exposure to soil vapors within a building. Sub-slab soil vapor samples for the Orangeburg JLJ project will be collected through the floor at CVS in Building #1, Sparkle Cleaners, Deli Spot, Hikaru Sushi, and New China House restaurants located in Building #2, 43 Highview Avenue, 47 Highview Avenue, 55 Highview Avenue, 1 Oak Street, 3 Oak Street, 7 Oak Street, and 9 Oak Street. The purpose of the soil investigation at Sparkle Cleaners is to assess the potential for chlorinated VOC impact to soils below the building slab. The sampling locations will be positioned away from the foundation footings, and within the soil aggregate immediately below the basement slab or slab-on-grade. Each of these locations must also be sampled during the heating season in late 2008.

The sample locations are depicted on Figure 3.

Preparation for Sub-Slab Sampling

At each sub-slab sampling location a hole appropriate for the diameter of the sampling tube will be drilled completely through the concrete floor slab using an electric rotary hammer drill and masonry bit. The concrete dust will be brushed away from the hole after drilling is completed and the approximate thickness of the slab will be recorded. The interior of the drill hole will then be cleaned with small round brush to remove any concrete dust. The flexible tubing will be inserted

through the hole ensuring that the distal end of the tubing does not extend more than two inches below the bottom of the slab. The tubing will be sealed into the hole using plumbers putty or bees wax. Any remaining concrete dust will be cleaned up with a vacuum equipped with a HEPA filter after the sample tubing is properly sealed and sample collection has been initiated.

Collection of Sub-Slab Soil Samples (Sparkle Cleaners only)

Soil samples will be collected using a Geoprobe® LB Soil Sampler to a maximum depth of 12 feet below grade. Soil sampling will be conducted at three locations; one near the back door, one next to the dry cleaning machine enclosure, one mid way between the dry cleaning machine and the front of the building.

Installation of Soil Vapor Implant

The property owner of 5 Oak Street has not granted permission for routine sampling of a sub-slab soil vapor point, if one were to be installed at the property. To circumvent the need for permission to collect a sample from within the structure at 5 Oak Street, Kleinfelder will install a soil vapor implant in the driveway of 5 Oak Street, which is currently owned by the Client.

A stainless steel soil vapor implant will be installed in the driveway of 5 Oak Street by means of a hand geoprobe to a depth of approximately five feet below ground surface (bgs). Flexible tubing will extend from the soil vapor implant to the ground surface. The soil vapor implant will be constructed with clean sand surrounding the vapor implant, with a bentonite seal from 2 feet bgs to one foot bgs. A water tight road box set into a two feet by two feet concrete pad will be installed over the soil vapor implant to allow access to the point for routine sampling.

Purging and Pre-Sample Testing of Sub-Slab Sample Points and the Vapor Implant

The same purging and pre-sample testing methods as were listed in section 4.4.1.1 of the *Remedial Investigation Work Plan* (Kleinfelder, 2007) will be applied to the purging and pre-sample testing of sub-slab sample points and the vapor implant during this investigation.

Sample Collection of Soil Vapor

The same sample collection methods as were listed in section 4.4.1.1 of the *Remedial Investigation Work Plan* (Kleinfelder, 2007) will be applied to the sample collection of soil vapor during this investigation as well.

4.2 Quality Assurance and Quality Control

The same quality assurance and quality control plan which was presented in the *Remedial Investigation Work Plan*, Kleinfelder, July 2007, will be implemented during all the additional investigation activities.

5.0 Interim Remedial Measures

5.1 Scope and Rationale of Interim Remedial Measures

5.1.1 Additional Investigation Project Team

The project team will consist of the same team as listed in Appendix E of the *Remedial Investigation Work Plan*, completed by Kleinfelder in July 2007, with the addition of Justin Moses. Mr. Moses' resume is included in Appendix C.

5.1.2 Goals

The purposes of the interim remedial measures are:

1. To remove the shallow soil source area, to prevent further impact migration.
2. To evaluate the HVAC and plumbing systems at Sparkle Cleaners and the total HVAC system in Building #2 and repair any damage, perform any maintenance and improve systems, as needed.
3. To develop a soil vapor mitigation plan for Sparkle Cleaners and to begin routine soil vapor sampling within Sparkle Cleaners.
4. To evaluate potential groundwater remedial options for groundwater in the source area.

5.1.3 Impacted Soil Removal Plan and Soil Sampling Procedures

The intent of the excavation of the impacted soil is to remove the shallow soil source area of impact on-site. Currently, the source area appears localized in the vicinity of the faulty sanitary sewer pipe behind the Sparkle Cleaners shop in Building #2. Soil samples will be collected at approximately 10 locations along the extents of the excavation area and submitted for laboratory analysis.

A private utility markout company will be contracted to markout the location of the sewer line behind the Sparkle Cleaners portion of Building #2. During this markout multiple technologies, such as ground penetrating radar and radio frequencies will be employed to accurately locate the sewer line prior to the start of excavation.

Once the utility has been marked adequately on the ground, an excavator will remove impacted soil surrounding the sewer pipe. A field scientist will oversee the excavation activities and will visually inspect and screen each bucket of soil removed to determine what is impacted and what is not. Screening with a photoionization detector (PID) with an 11.7 micro-volt lamp will be used to identify impacted soil. Any sample above 50 parts per million (ppm) will be considered impacted, and will be removed and disposed of off-site. In addition, select buckets of soil will be field screened with a Dexsil® chlorinated solvent screening kit.

Prior to being disposed of, soil identified as impacted will be stockpiled onsite, on top of and covered by 6 millimeter plastic sheeting. Soil samples will be collected from the soil pile and transferred to laboratory provided, clean, sample containers using aluminum or stainless steel

disposable scoops, disposal plastic soil syringes, and hands gloved with new nitrile disposal gloves. Following the use of any of the soil sample handling tools the tools with be isolated and disposed of with other wastes from the Site.

Soil samples will be stored on-site in a cooler with temperature maintained at 4 degrees Celsius or cooler using ice. The sample bottles will be placed into zip lock or similar plastic bags prior to placement in the cooler. Samples will be maintained under chain of custody and in the immediate control of the field personnel. Samples will either be shipped directly to the laboratory from the Site or will be transported to a Kleinfelder office location for pick up by a lab courier. Samples stored at Kleinfelder offices will be maintained within a refrigerator at 4 degrees Celsius or cooler until pick up by the laboratory. Laboratory analysis will be conducted for VOC by EPA 8260.

The details of the location, construction, and security of the soil stockpile and truck decontamination areas are provided on Figure 4. Stockpile and decontamination areas will be bermed on all sides to prevent migration of excavated soils or generated truck rinseate. Rinsewater will be contained into 55-gallon drums pending proper waste characterization. It is anticipated that stockpiled soils and drummed rinseate will remain on-site no longer than 60 days.

5.1.3.1 Soil Excavation Boundaries

The proposed extent of the soil excavation will be determined in real-time based on field soil screening results. It is anticipated that the total excavation limits will be approximately 15 feet by 20 feet, to maximum depth of 12 feet (approximately 130 cubic yards). An excavation depth of 12 feet has been specified to preserve foundation integrity and because this is the maximum vertical extent of soil impact observed during the remedial investigation. The source area is depicted on Figure 4.

5.1.3.2 Dewatering

A fractionization tank will be available to store the first 21,000 gallons of water from the excavation if dewatering is required. Water collected from the excavation will be sampled and samples submitted for waste characterization. Water will be hauled to an approved treatment facility or discharged to site sewer under an approved permit depending on the volume and characteristics of the water generated.

5.1.3.3 Soil Excavation Sampling Plan

Soil samples will be collected from the sidewalls and excavation bottom and will be submitted for laboratory analysis of VOCs by USEPA method 8260 (see Section 4.1.1 of the *Remedial Investigation Report*). Samples will be collected approximately every 10 feet along the sidewalls and in three locations along the excavation bottom. Sidewall samples will be collected from the most impacted depth and, where the excavation extends significantly deeper than the most impacted interval, from the base of the sidewall on an alternating basis. If the excavation area exceeds 2,700 square feet, additional samples will be collected from the bottom of the excavation at a frequency of one sample per 900 square feet. At a minimum, for every 20 soil samples, a duplicate will be collected and submitted for laboratory analysis.

5.1.4 HVAC and Plumbing System Evaluation at Sparkle Cleaners and HVAC System Evaluation within Building #2

5.1.4.1 HVAC Evaluation at Sparkle Cleaners

The HVAC system at Sparkle Cleaners, within Building #2, will be evaluated by a licensed HVAC professional that is appropriately registered with the NYSDEC as a dry cleaner compliance inspector. They will identify if the system is failing in either Sparkle Cleaners, or the greater Building #2 as a whole, and recommend improvements to ensure it is in proper working condition, based on the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbook to HVAC Applications, the National Institute for Occupational Safety and Health (NIOSH) guidance document on Control of Health and Safety Hazards in Commercial Dry Cleaners and the Occupational Safety and Health Administration (OSHA) handbook on Reducing Worker Exposure to PERC in Dry Cleaning. Additionally, they will assess the system for compliance with any requirements in 6 NYCRR 232.

Sparkle Cleaners will be requested to comply with all dry cleaning procedures, and update their operating procedures and HVAC facilities as necessary.

5.1.4.2 Plumbing Evaluation at Sparkle Cleaners

A plumbing system evaluation will be conducted by a licensed plumber at Sparkle Cleaners to ensure that all the plumbing running out of Sparkle Cleaners is connected to appropriate drainage locations and that no unauthorized discharges exist.

5.1.5 Vapor Intrusion Mitigation Plan and Indoor Air Sampling Procedures at Sparkle Cleaners

5.1.5.1 Vapor Intrusion Mitigation Plan

The purpose of developing a vapor intrusion mitigation and indoor air sampling plan at Sparkle Cleaners is to minimize human exposure to harmful vapors within the building. The vapors detected during previous investigative activities in the Sparkle Cleaners building may be coming from either, impacted soil beneath the store, or they may be migrating from the groundwater and are being pulled through the soil and concrete building slab by the HVAC system, or they may be coming from improper dry cleaning practices. While completing the additional investigatory items above, Kleinfelder will determine if the soil beneath Sparkle Cleaners is impacted by dry cleaning solvents or their degradation byproducts. During this supplemental investigation, Kleinfelder will evaluate the HVAC and plumbing systems at Sparkle Cleaners, as detailed above in section 5.1.2. Based on the plumber's and mechanical contractor's evaluations, Kleinfelder will understand whether systems are in proper working order. The findings of these two investigations will lead to a choice of vapor mitigation plans. Additionally, Kleinfelder, on behalf of JLJ, will request that Sparkle Cleaners retain a licensed dry-cleaner inspector to verify regulatory compliance.

If impacted soil is found beneath the building, Kleinfelder will discuss the next steps with the NYSDEC. It is very possible that a soil vapor extraction system will be installed.

If the soil beneath the building is not impacted, then Kleinfelder will review the next steps with the NYSDEC. It is very likely that a sub-slab venting system will be installed in such a case. This system will remove sub-slab vapors before they are able to migrate through the slab and into the

building. Also, to avoid human exposure to the sub-slab vapors, any cracks in the sub-slab will be filled and the HVAC system will be evaluated, as stated above in section 5.1.2, to ensure it is in proper working order.

5.1.5.2 Indoor Air Sampling Procedures

Sample volumes, container types, and preservation methods are included in the air and soil vapor sampling summary included as Table 2.

The purpose of indoor air sampling is to characterize contaminant concentrations trends and potential exposures within Sparkle Cleaners. Indoor air sampling for this project will consist of samples collected in the basement and first or ground floor of the Sparkle Cleaners portion of Building #2. The samples will be collected from within the breathing zone (three to five feet above the floor).

Prior to the indoor air sampling event a pre-sampling walk-through or building inspection will be conducted to identify conditions that may affect or interfere with the prescribed sampling event. The components of the building inspection will include: identification and compilation of potential background sources and generation of plot sketches of the building interior. For more information please refer to the *Remedial Investigation Work Plan, Appendix D,* dated July 2007.

If potential background sources are identified the occupant(s) will be asked to remove potential background sources and to ensure that all containers storing volatile chemicals are tightly sealed. After removal or sealing the building will be ventilated by operating the HVAC system. This preparation of the structure for sampling will occur twenty-four hours in advance of the scheduled sampling event.

Before sample collection, field screening of the structure will be conducted using a PPB Rae, or a similar instrument, which can detect VOCs in parts per billion. An inventory of any products stored in the building also will be completed.

The sample collection procedure for the indoor air samples will be the same as for the sub-slab sampling described in Section 4.4.1 of the *Remedial Investigation Work Plan,* dated July 2007, with a few exceptions. The sample canister will be placed such that the sample tube inlet is between three and five feet off the floor and helium tracer testing will not be conducted. The sampling periods for the indoor air sampling will 8 hours. During air sampling, the pre-set flow controllers will be calibrated such that the flow rates do not exceed 0.2 liters per minute.

5.1.5.3 Analytical Methods

All air samples collected at Sparkle Cleaners will be analyzed by USEPA Method TO-15 for the full compendium list of analytes. Selective ion monitoring (SIM) with a reporting limit of 0.25 micrograms per cubic meter will be used for trichloroethene and vinyl chloride for the indoor and outdoor air samples.

Laboratory analysis for the air samples will be conducted by a NYSDOH ELAP certified laboratory. The detection limits for USEPA Method TO-15 are typically 1 microgram per cubic meter or less.

5.1.5.4 Quality Assurance / Quality Control Samples

The Quality Assurance / Quality Control Samples for the indoor air quality sampling will include co-located duplicates at a rate of one per twenty samples, equipment blank at a rate of one per

twenty samples (conducted at the analytical laboratory), and trip blank samples at a rate of one trip blank sample per batch of sample containers shipped. The total number of these quality control samples is detailed in Table 2.

5.2 Evaluation of Bioaugmentation and Chemical Treatment as a Final Remedy

5.2.1 Method Selection Criteria

There are two basic types of remediation that have been identified as viable for this project, bioaugmentation and chemical treatment. Bioaugmentation and chemical treatment are both in situ techniques for the remediation of soil or groundwater.

The bioaugmentation method Kleinfelder has identified as a viable option for this project includes a mixture of lactates, fatty acids and a phosphate buffer which promote anaerobic bioremediation of chlorinated solvents when injected into or mixed with impacted media. An industry leader in bioremediation, Redox-Tech, LLC stated that with anaerobic biodegradation, the target contaminants are "reduced" with hydrogen, unlike chemical oxidation or aerobic processes where oxygen is the working chemical. For optimal anaerobic degradation to occur, more energetically favorable electron acceptors such as oxygen, nitrate, manganese, ferric iron or sulfate must first be consumed. There also must be sufficient carbon source or food for the bacteria to thrive. Carbon sources can include co-contaminants such as petroleum hydrocarbons or natural organic matter. If these carbon sources are not metabolically available or are not sufficient, the anaerobic process can be enhanced by introducing a food source into the subsurface.

The chemical treatment method of remediation Kleinfelder has identified as potential treatment at this site includes the injection of a zero-valent iron formula and the subsequent oxidation of the zero-valent iron that releases electrons for the reductive dechlorination of the target compounds.

The selection of the remedial strategy will be based upon the results of the groundwater sampling event to be conducted as part of the additional investigation activities and the soil samples collected at the final limits of the remedial excavation, described above in Section 4.1.3. As stated above, for bioaugmentation to succeed, energetically favorable electron acceptors must not be present, or present at concentrations that can be consumed. If the electron acceptors are present, since the degradation process of zero-valent iron is a reductive dechlorination process working at the surface of the granular iron, the iron will act as an electron donor. Consequently, depending on the nature and characteristics of the groundwater plume and potential post-excavation residual impacted soils, one technology, or a combination of both technologies, will be used to reduce the groundwater plume. A proposed injection plan is included as Figure 5.

5.2.2 Potential Bioaugmentation and Chemical Treatment Plan

The recommended treatment plan depends on the concentrations of contaminants and the nature of the groundwater plume being remediated. Typically, one or two injections are planned, and the groundwater plume is monitored, before and after the treatments. Upon receiving the groundwater sampling results, a more comprehensive treatment plan will be developed, if it is found to be necessary.

6.0 Quality Assurance

6.1 Quality Assurance Plan for Air Sampling

The same quality assurance plan as was stated in section 4.5 of the *Remedial Investigation Work Plan* will be used during this assessment.

6.2 Quality Assurance Plan for Impacted Soil Removal

6.2.1 Field Screening

6.2.1.1 Summary

The quality of data collected in an environmental study depends on the quality and thoroughness of field sampling activities. Due to the sensitivity of analytical methods and the extremely low levels of detection specified for sample analysis, the sampling process becomes integral to the integrity of the data generated. As a result, general field operations and practices, and specific sample collection and inventory must be well planned and carefully implemented.

The sampling methods and appropriate quality control measures for sample collection are included in the sampling procedures in Sections 5.1 of this report.

Sample volumes, container types, and preservation methods are included in the soil-sampling summary included as Table 3.

6.2.1.2 Sampling Instruments / Equipment Calibration and Frequency

Field screening of ambient air for volatile organic compounds will be conducted using photo ionization detectors during the excavation operations as sampling protocol.

The field staff operating the analytical equipment are experienced in its operation and will perform proper calibrations and measurements.

Photo ionization detectors will be fitted with an 11.7 eV lamp and will be calibrated to ambient air for zero and a 100 ppm isobutylene standard for the span calibration at 100 ppm. Photo ionization detectors will be checked against the 100 ppm isobutylene standard at mid day. If the calibration is off by 5% or greater the instrument will be recalibrated. Water trap and particulate filters will be used on the photo ionization detectors and will be in place during calibration. The photo ionization detectors will be recalibrated if the filters are changed during the course of the work day.

6.2.2 Laboratories

The laboratory selected for soil quality analysis will be certified pursuant to NYSDOH ELAP Certification for all constituents or constituent categories for which it analyzes in soil samples.

6.2.3 Analytical Methods

The analytical methods utilized in the laboratory analyses will be those published by the USEPA and in the most recent NYSDEC Analytical Services Protocol where applicable. The laboratories will perform the prescribed quality assurance for each analytical method that is used. To the extent that the methods accommodate, detection limits will be below the lowest standard guidance value in Part 375-6 Brownfield Soil Cleanup Objectives. Laboratory data reports will meet ASP Category B.

6.2.4 Environmental Media Sampling

Sample collection methods, sample preservation, sample holding times, and the number of field blank, field duplicate, and trip blank samples will conform to the NYSDEC Analytical Services Protocol (ASP). Details of the collection and comments concerning the samples will be included on chains of custody that will accompany the samples from the collector to the receiving laboratory. Tables 1, 2 and 3 included in this report, provide a summary of the proposed sampling program, including the required QA/QC samples.

Soil samples will be collected utilizing the excavator bucket. Portions of the soil collected will be transferred to laboratory provided, clean, sample containers using aluminum or stainless steel disposable scoops, disposal plastic soil syringes, and hands gloved with new nitrile disposal gloves. Following the use of any of the disposal soil sample handling tools the tool with be isolated and disposed of with other wastes from the Site.

Soil samples will be stored on-site in a cooler with temperature maintained at 4 degrees Celsius or cooler using ice. The sample bottles will be placed into zip lock or similar plastic bags prior to placement in the cooler. Samples will be maintained under chain of custody and in the immediate control of the field personnel. Samples will either be shipped directly to the laboratory from the Site or will be transported to a Kleinfelder office location for pick up by a lab courier. Samples stored at Kleinfelder offices will be maintained within a refrigerator at 4 degrees Celsius or cooler until pick up by the laboratory.

6.2.5 Data Usability Report

The project manager will prepare a Data Usability Summary Report (DUSR) documenting the sampling and analytical procedures and results. This will certify that the data are valid and usable.

6.3 Quality Assurance Plan for Sparkle Cleaners and Building #2 HVAC and Sparkle Cleaners Plumbing Evaluation

The HVAC and plumbing system evaluations will be consistent with criteria and specification presented by ASHRAE, NIOSH and OSHA. Also, the licensed HVAC and plumbing contractors will be responsible for providing their own Quality Assurance Plans for their work.

6.4 Quality Assurance Plan for Potential Bioaugmentation or Chemical Treatment

The quality assurance plan will depend upon which technology is utilized to treat source area groundwater, if needed, based upon post excavation and groundwater sampling results. Initially, before the treatment plan is implemented, a baseline of natural parameters, including pH, iron content, oxidation reduction potential, dissolved oxygen content, dissolved organic carbon and chemical oxygen demand will be established. Following the treatment, the same parameters will be collected and based upon the injection formula; the parameters should go up in such ways that would indicate that a reducing environment has been created, with the appropriate pH.

A more comprehensive quality assurance plan will developed once the final source-area groundwater remedial technology and a remediation contractor are chosen, if bioremediation or ZVI treatment is determined to be needed.

7.0 Schedule

7.1 Additional Investigatory Items

The additional investigatory items will be initiated within 60 days of the approval of this work plan. Table 4 contains the proposed schedule for Additional Investigatory Items.

7.2 Vapor Intrusion Mitigation at Sparkle Cleaners and in the Vicinity of 5 Oak Street

The vapor intrusion mitigation and the installation of a soil vapor point in the vicinity of 5 Oak Street will be conducted within 60 days of approval of this work plan.

7.3 Impacted Soil Removal

The private utility contractor will be scheduled to conduct the utility location within 30 days of the approval of this work plan. Following the utility markout, the impacted soil removal will occur within 90 days of the markout.

7.4 Sparkle Cleaners Operating Procedures Assessment and Building #2 HVAC Evaluation

A licensed HVAC contractor or mechanical, electrical and plumbing engineer and a licensed plumber will be contracted within 60 days of the approval of this work plan to conduct an evaluation of Sparkle Cleaners and Building #2.

TABLES

Table 1
Proposed Groundwater Sampling Locations and Analytical Methods
Orangetown Shopping Center
1-45 Orangetown Shopping Center
Orangeburg, New York

Analytical Methods	VOC 8260B	SVOC 8270	Total Metals (including Mercury) USEPA Method 6010B	Pesticides USEPA Method 8081A	PCBs USEPA Method 8082	Dissolved organic carbon USEPA Method 415.1	Iron (total, Fe2+, Fe3+) SM 3500	pH USEPA Method 9040B	Comments
Sample container and preservation method	(3) 40 ml VOA vials, HCL, 14 day hold time	1 Liter amber, 4 degrees C.	500 ml minimum volume, plastic container, HNO3 to pH<2, 4 degrees C, 28 day hold time	(2) 1liter minimum volume, amber glass teflon lined, unpreserved, 4 degrees C, 7 day hold time	(2) 1liter minimum volume, amber glass teflon lined, unpreserved, 4 degrees C, 7 day hold time	1 Liter, glass contaner, H2SO4 to pH<2, 4 degrees C, 48 hour hold time	1 Liter, glass container, unpreserved, 4 degrees C, immediately upon receipt by the lab	250 ml minimum volume, plastic container, unpreserved, 4 degrees C, immediately upon reciept by the lab	
MW-1	X								
MW-2	X								
MW-3	X					X	X	X	located in the source area
MW-4	X	X	X	X	X	X	X	X	located in the source area, and in center of site
MW-5	X					X	X	X	located in the source area
MW-6	X	X	X	X	X				sidegradient of source area
MW-7	X	X	X	X	X				upgradient of source to the west
MW-8A, B	X					X	X	X	located in the source area
MW-9A, B, C	X								
MW-10	X								
MW-11A, B	X								
MW-12A, B, C	X								
MW-13A	X								
MW-14A	X								
MW-15A	X	X	X	X	X				downgradient of source area
Field Blank 1	X	X	X	X	X				
Equipment Blank 1	X	X	X	X	X				
Sample Duplicate	X	X	X	X	X				
Trip Blank 1	X	X	X	X	X				

Green = Pre-existing Monitoring wells

Orange "X" = To be sampled

Table 2
Proposed Air and Soil Vapor Sampling Locations and Analytical Methods
Orangetown Shopping Center
1-45 Orangetown Shopping Center
Orangeburg, New York

Locations	# of Samples	Method	Sample Container
Basement Subslab	11	EPA Method TO-15	6 Liter SUMA analysis within 28 days
Basement Indoor Air	7	EPA Method TO-15	6 Liter SUMA analysis within 28 days
First Floor Indoor Air	11	EPA Method TO-15	6 Liter SUMA analysis within 28 days
Outdoor Air	7	EPA Method TO-15	6 Liter SUMA analysis within 28 days
Vapor Implant Sample	1	EPA Method TO-15	6 Liter SUMA analysis within 28 days
Co-located Duplicates	2	EPA Method TO-15	6 Liter SUMA for sub slab colocated sample, 6 Liter SUMA for Indoor air colocated sample, both with analysis within 28 days
Equipment Blank	2	EPA Method TO-15	conducted at the laboratory, SUMA size at the discression of the laboratory
Trip Blanks	2	EPA Method TO-15	6 Liter SUMA analysis within 28 days
Totals	43		

Table 3
Proposed Soil Sampling Locations and Analytical Methods
Orangetown Shopping Center
1-45 Orangetown Shopping Center
Orangeburg, New York

Location	Depths	# of Samples	Methods	Comments
Soil Excavation Area	bottom of excavation	12 (includes 2 samples for bench study for bioremediation subcontractor)	EPA 8260, Iron (SM 3500), Total Organic Carbon, soil pH (EPA 9045C), chemical oxygen demand (EPA Modified 5220D**)**	Continuous soil screening will be conducted using a PID and Dexsil® L-2000 PCB/Chloride Analyzer™.
Sparkle Cleaners below sub-slab	highest PID reading at each boring location; boring to a maximum depth of 10 feet	3	EPA 8260, EPA 8270, EPA 6010B, EPA 8082, EPA 8081A	Continuous soil screening will be conducted using a PID and Dexil chlorinated solvent screening method.

EPA 8260 samples will be collected in VOA vials and preserved with either methanol or sodium bi-sulfate and will be extracted and analyzed by the lab within 14 days.

EPA 8081A, EPA 8082, EPA 8270 and Total Organic Carbon samples will be collected in unpreserved 1 liter amber glass bottles and will be extracted by the lab within 7 days and analyzed within 40 days.

EPA 6010B samples will be collected in unpreserved 1liter amber glass bottles and will be extracted by the lab within 180 days.

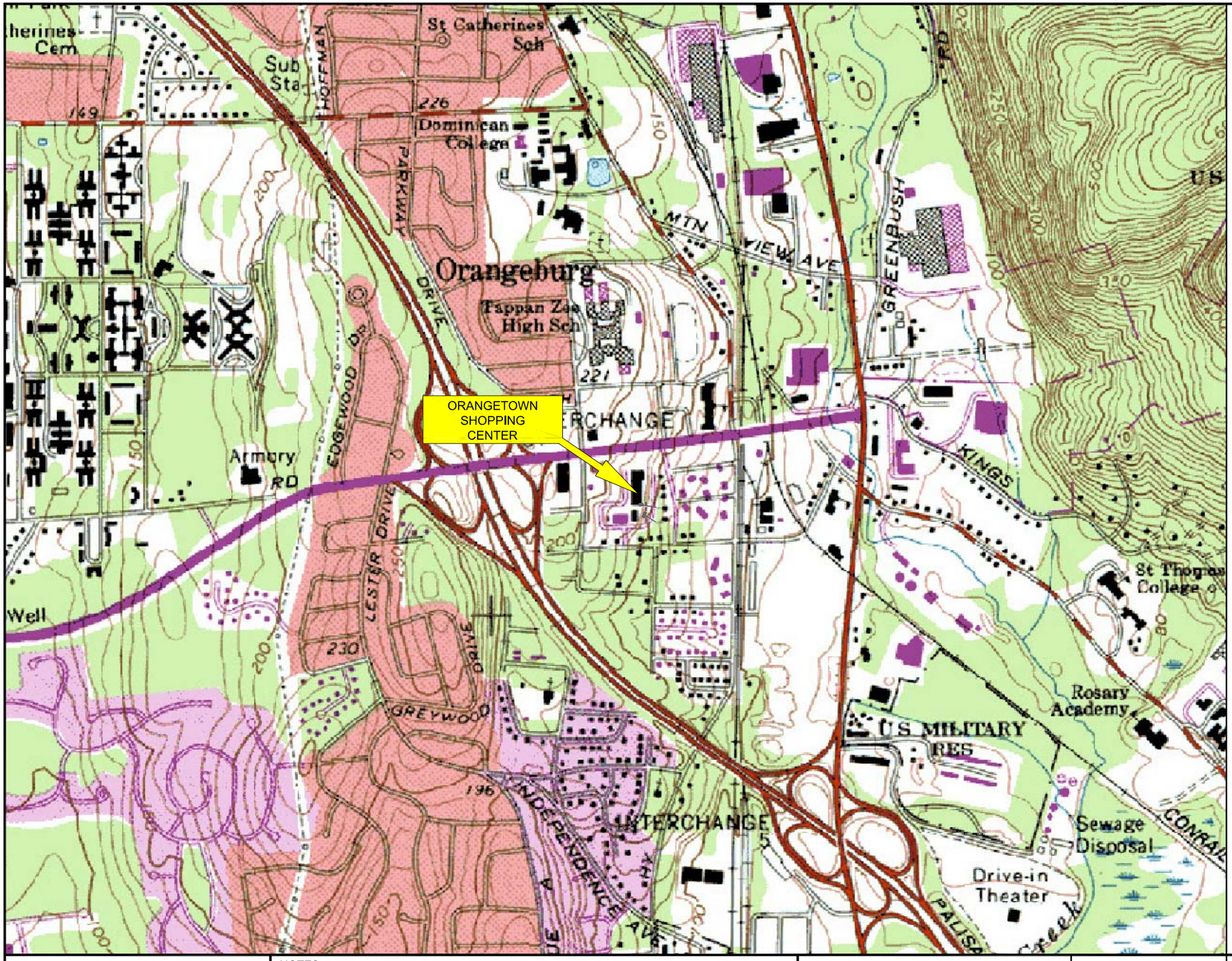
SM 3500 and EPA 9045C samples will be collected in unpreserved 1liter amber glass bottles and will immediately be extracted upon reciept by the lab.

EPA Modified 5220D samples will be collected in unpreserved 500mL amber glass bottles and will be extracted by the lab within 28 days.

Table 4
Proposed Schedule for Additional Investigatory Items and Interim Remedial Measures
Orangetown Shopping Center
1-45 Orangetown Shopping Center
Orangeburg, New York

Task	Months past approval of Work Plan						
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
Additonal Investigatory Items							
Monitoring well repair and groundwater sampling							
Quarterly monitoring well gauging							
Vapor point installation in vicinity of 5 Oak Street							
Sub-slab investigation at Sparkle Cleaners							
Air sampling							
Interim Remedial Measures							
Remove source area soils							
Evaluate HVAC and plumbing systems at Sparkle Cleaners							
Develop vapor mitigation plan within Sparkle Cleaners							
Chemical injection to address potential source area groundwater and residual soil impact, if warranted							
Heating season air sampling							
Data review and remedial investigation addendum preparation							

FIGURES



0 500 1,000 2,000

APPROXIMATE SCALE (feet)

N

LATITUDE: 41° 02' 41" N

LONGITUDE: 73° 57' 57" W

USGS 7.5' SERIES TOPOGRAPHIC MAP,
NYACK NEW YORK-NEW JERSEY
QUADRANGLE

QUADRANGLE LOCATION

NOTES:

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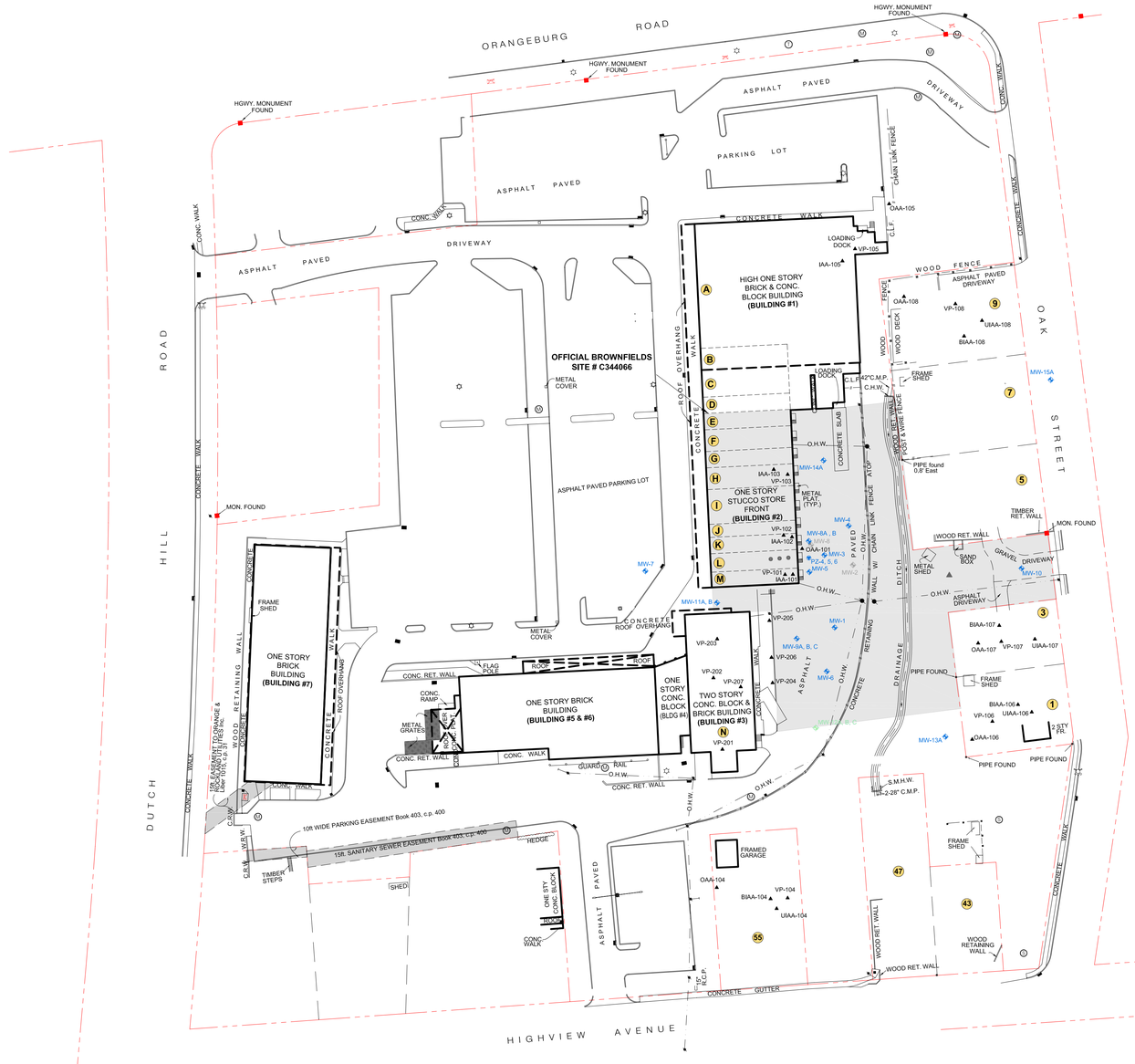
PROJECT NO.	69972
DRAWN:	08/27/08
DRAWN BY:	CTH
CHECKED BY:	
FILE NAME:	69972IRMJUNB08

LOCUS PLAN

ORANGETOWN SHOPPING CENTER
1-45 ORANGEBURG ROAD
ORANGEBURG, NEW YORK

FIGURE

1



LEGEND

	PROPERTY BOUNDARY
	HYDRANT
	UTILITY POLE
	ELECTRIC COVER
	MANHOLE COVER (UNKNOWN)
	TELEPHONE MANHOLE COVER
	CATCH BASIN
	LIGHT POLE
S	SEWER MANHOLE
C.L.F	C.L.F CHAIN LINK FENCE
C.H.W.	C.H.W. CONCRETE HEAD WALL
C.M.P	C.M.P. CORRUGATED METAL PIPE
O.H.W.	O.H.W. OVERHEAD WIRES
R.C.P.	R.C.P. REINFORCED CONCRETE PIPE
S.M.H.W.	S.M.H.W. STONE MASONRY HEAD WALL
	MONITORING WELL
	MONITORING WELL (PAVED OVER OR ABANDONED)
	PIEZOMETER
	VAPOR POINT/AMBIENT AIR SAMPLE
	PROPOSED VAPOR IMPLANT POINT
	PROPOSED SOIL BORING LOCATION (APPROXIMATE)
#	STREET ADDRESS NUMBER

COMMERCIAL STORE ID TABLE (BUILDING #2)

A	CVS PHARMACY
B	ORANGE FARM MARKET
C	RAINBOW LAUNDROMAT
D	MAGIE TOUCH NAILS
E	STELLA LUNA
F	TIP TOP SHOPPER
G	ALL STATE INSURANCE
H	HIKARO SUSHI
I	KARATE
J	JIU JITSU
K	THE DELI SPOT
L	SPARKLE CLEANERS
M	NEW CHINA HOUSE
N	VACANT

SOURCE:

1. LAND LINK SURVEYORS P.C. SURVEY MAP DATED NOVEMBER 4, 2003.
2. SURVEY AMENDED TO SHOW NEW CERTIFICATION JUNE 1, 2005.
3. SURVEY AMENDED WELL LOCATION DECEMBER 19, 2007.
4. ADDITIONAL WELLS MW10, MW12, AND MW13 LOCATED DECEMBER 27, 2007

NOTES:

1. THE PREMISES SHOWN HEREON DESIGNATED AS LOT 1 ON A CERTAIN MAP ENTITLED " SUBDIVISION OF PROPERTY ORANGETOWN CENTER" AS FILED IN THE ROCKLAND COUNTY CLERK'S OFFICE ON FEBRUARY 26, 1990 AS MAP No. 6427 IN Book 111 Page 59 AND ARE DESCRIBED IN DEED RECORDED REEL 404, PAGE 2555.
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3. ENCROACHMENTS BELOW GRADE AND/OR SUBSURFACE FEATURES, IF ANY, NOT LOCATED OR SHOWN HEREON.
4. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS MAP WAS PREPARED FROM AN ACTUAL FIELD SURVEY CONDUCTED ON THE DATE SHOWN AND THAT SAID SURVEY WAS PERFORMED IN ACCORDANCE WITH THE EXISTING " CODE OF PRACTICE FOR LAND SURVEYS " ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. THIS CERTIFICATION SHALL RUN ONLY TO THE PARTY FOR WHOM THIS SURVEY WAS PREPARED AND ON THEIR BEHALF TO THE TITLE COMPANY AND LENDING INSTITUTION LISTED HEREON. THIS CERTIFICATION SHALL NOT BE TRANSFERABLE.

NO.	REVISION	BY	DATE
1			

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BOHEMIA, NEW YORK
PH. (631) 218-0612 FAX. (631) 218-0787
www.kleinfelder.com

PROJ. NO: 69972
ACAD FILE: 69972RMJNB08
DRAWN BY: CTH
CHECKED BY: EH
DESIGNED BY: EH

SITE PLAN WITH SAMPLING LOCATIONS

ORANGETOWN SHOPPING CENTER
41-45 ORANGEBURG ROAD
ORANGEBURG, NEW YORK

FOR REDUCED PLANS: ORIGINAL IN INCHES
0 0.5 1.0 1.5

DATE: AUGUST 27, 2008
SCALE: 1" = 60'
FIGURE **2**

LEGEND

	PROPERTY BOUNDARY
	HYDRANT
	UTILITY POLE
	ELECTRIC COVER
	MANHOLE COVER (UNKNOWN)
	TELEPHONE MANHOLE COVER
	CATCH BASIN
	LIGHT POLE
S	SEWER MANHOLE
C.L.F	C.L.F CHAIN LINK FENCE
C.H.W.	C.H.W. CONCRETE HEAD WALL
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S.M.H.W.	S.M.H.W. STONE MASONRY HEAD WALL
	MONITORING WELL
	MONITORING WELL (PAVED OVER OR ABANDONED)
	PIEZOMETER
	VAPOR POINT/AMBIENT AIR SAMPLE
	PROPOSED VAPOR IMPLANT POINT
#	STREET ADDRESS NUMBER
A	PROPOSED OUTDOOR AMBIENT LOCATION
BA	PROPOSED BASEMENT LOCATION
GA	PROPOSED GROUND FLOOR LOCATION
SS	PROPOSED SUB-SLAB LOCATION
SB	PROPOSED SOIL BORING

COMMERCIAL STORE ID TABLE (BUILDING #2)

A	CVS PHARMACY
B	ORANGE FARM MARKET
C	RAINBOW LAUNDROMAT
D	MAGIE TOUCH NAILS
E	STELLA LUNA
F	TIP TOP SHOPPER
G	ALL STATE INSURANCE
H	HIKARO SUSHI
I	KARATE
J	JIU JITSU
K	THE DELI SPOT
L	SPARKLE CLEANERS
M	NEW CHINA HOUSE
N	VACANT

SOURCE:

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NO.	REVISION	BY	DATE
1			

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PROJ. NO. 69972 | ACAD FILE: 69972RMJUN08 | DRAWN BY: CTH | CHECKED BY: EH | DESIGNED BY: EH

PROPOSED SUB-SLAB AND INDOOR AIR SAMPLE LOCATION PLAN

ORANGETOWN SHOPPING CENTER
1-45 ORANGEBURG ROAD
ORANGEBURG, NEW YORK

FOR REDUCED PLANS: ORIGINAL IN INCHES
0 0.5 1.0 1.5

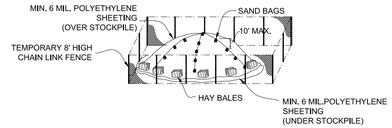
DATE: AUGUST 27, 2008

SCALE: 1" = 60'

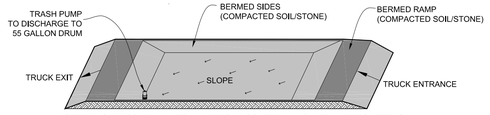
FIGURE **3**

3 of 5 sheets

TEMPORARY SOIL STAGING AREA
DETAIL A



TEMPORARY TRUCK DECONTAMINATION AREA
DETAIL B



NOTE: TRUCK DECONTAMINATION AREA TO BE COVERED IN POLYETHYLENE SHEETING

LEGEND

	PROPERTY BOUNDARY
	HYDRANT
	UTILITY POLE
	ELECTRIC COVER
	MANHOLE COVER (UNKNOWN)
	TELEPHONE MANHOLE COVER
	CATCH BASIN
	LIGHT POLE
S	SEWER MANHOLE
C.L.F	C.L.F CHAIN LINK FENCE
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R.C.P.	R.C.P. REINFORCED CONCRETE PIPE
S.M.H.W.	S.M.H.W. STONE MASONRY HEAD WALL
	MONITORING WELL
	MONITORING WELL (PAVED OVER OR ABANDONED)
	PIEZOMETER
#	STREET ADDRESS NUMBER

COMMERCIAL STORE ID TABLE (BUILDING #2)

A	CVS PHARMACY
B	ORANGE FARM MARKET
C	RAINBOW LAUNDROMAT
D	MAGIE TOUCH NAILS
E	STELLA LUNA
F	TIP TOP SHOPPER
G	ALL STATE INSURANCE
H	HIKARO SUSHI
I	KARATE
J	JIU JITSU
K	THE DELI SPOT
L	SPARKLE CLEANERS
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N	VACANT

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NO.	REVISION	BY	DATE
1			

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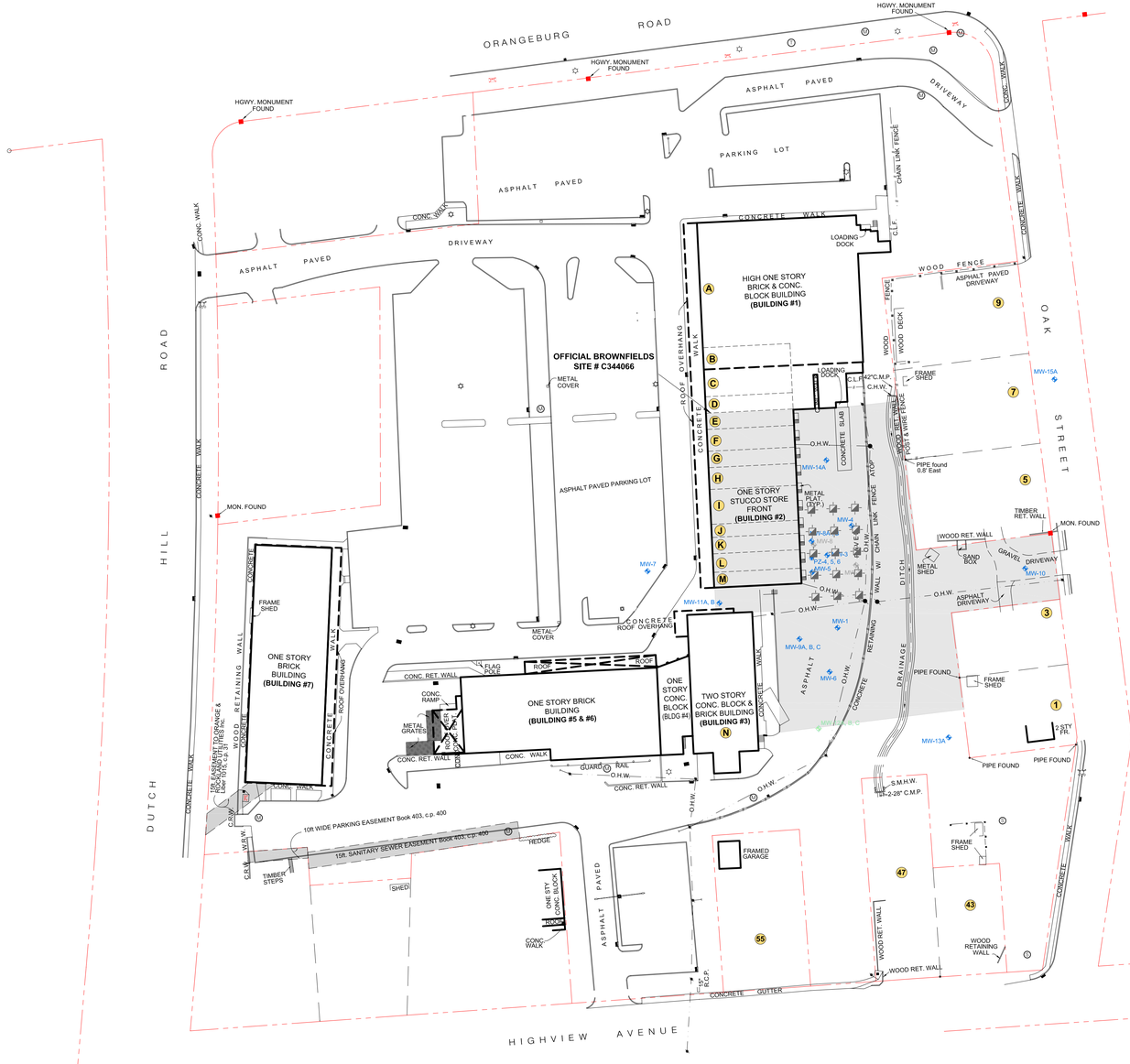
PROJ. NO: 69972
ACAD FILE: 69972RMJNB08
DRAWN BY: CTH
CHECKED BY: EH
DESIGNED BY: EH

SOURCE REMOVAL AREA

ORANGETOWN SHOPPING CENTER
11-45 ORANGEBURG ROAD
ORANGEBURG, NEW YORK

FOR REDUCED PLANS: ORIGINAL IN INCHES
0 0.5 1.0 1.5

DATE: AUGUST 27, 2008
SCALE: 1" = 60'
FIGURE **4**



60 30 0 60

APPROXIMATE SCALE (feet)

LEGEND

	PROPERTY BOUNDARY
	HYDRANT
	UTILITY POLE
	ELECTRIC COVER
	MANHOLE COVER (UNKNOWN)
	TELEPHONE MANHOLE COVER
	CATCH BASIN
	LIGHT POLE
S	SEWER MANHOLE
C.L.F	C.L.F CHAIN LINK FENCE
C.H.W.	C.H.W. CONCRETE HEAD WALL
C.M.P	C.M.P. CORRUGATED METAL PIPE
O.H.W.	O.H.W. OVERHEAD WIRES
R.C.P.	R.C.P. REINFORCED CONCRETE PIPE
S.M.H.W.	S.M.H.W. STONE MASONRY HEAD WALL
	MONITORING WELL
	MONITORING WELL (PAVED OVER OR ABANDONED)
	PIEZOMETER
	PROPOSED ZVI/BIOAUGMENTATION INJECTION LOCATION
#	STREET ADDRESS NUMBER

COMMERCIAL STORE ID TABLE (BUILDING #2)

A	CVS PHARMACY
B	ORANGE FARM MARKET
C	RAINBOW LAUNDROMAT
D	MAGIE TOUCH NAILS
E	STELLA LUNA
F	TIP TOP SHOPPER
G	ALL STATE INSURANCE
H	HIKARO SUSHI
I	KARATE
J	JIU JITSU
K	THE DELI SPOT
L	SPARKLE CLEANERS
M	NEW CHINA HOUSE
N	VACANT

SOURCE:

1. LAND LINK SURVEYORS P.C. SURVEY MAP DATED NOVEMBER 4, 2003.
2. SURVEY AMENDED TO SHOW NEW CERTIFICATION JUNE 1, 2005.
3. SURVEY AMENDED WELL LOCATION DECEMBER 19, 2007.
4. ADDITIONAL WELLS MW10, MW12, AND MW13 LOCATED DECEMBER 27, 2007

NOTES:

1. THE PREMISES SHOWN HEREON DESIGNATED AS LOT 1 ON A CERTAIN MAP ENTITLED " SUBDIVISION OF PROPERTY ORANGETOWN CENTER" AS FILED IN THE ROCKLAND COUNTY CLERK'S OFFICE ON FEBRUARY 26, 1990 AS MAP No. 6427 IN Book 111 Page 59 AND ARE DESCRIBED IN DEED RECORDED REEL 404, PAGE 2555.
2. THE DIMENSIONS SHOWN HEREON, FROM THE STRUCTURES TO THE PROPERTY LINE ARE NOT INTENDED TO BE USED FOR THE ERECTION OF FENCES, STRUCTURES OR ANY OTHER IMPROVEMENT.
3. ENCROACHMENTS BELOW GRADE AND/OR SUBSURFACE FEATURES, IF ANY, NOT LOCATED OR SHOWN HEREON.
4. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS MAP WAS PREPARED FROM AN ACTUAL FIELD SURVEY CONDUCTED ON THE DATE SHOWN AND THAT SAID SURVEY WAS PERFORMED IN ACCORDANCE WITH THE EXISTING " CODE OF PRACTICE FOR LAND SURVEYS " ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. THIS CERTIFICATION SHALL RUN ONLY TO THE PARTY FOR WHOM THIS SURVEY WAS PREPARED AND ON THEIR BEHALF TO THE TITLE COMPANY AND LENDING INSTITUTION LISTED HEREON. THIS CERTIFICATION SHALL NOT BE TRANSFERABLE.

NO.	REVISION	BY	DATE
1			

KLEINFELDER ENGINEERING P.C.
ONE CORPORATE DRIVE
BOHEMIA, NEW YORK
PH. (631) 218-0612 FAX. (631) 218-0787
www.kleinfelder.com

ACAD FILE: 69972RMJUN808
PROJ. NO. 69972
DESIGNED BY: EH
CHECKED BY: EH
DRAWN BY: CTH

POTENTIAL ZVI/BIOAUGMENTATION INJECTION LOCATIONS

ORANGETOWN SHOPPING CENTER
1-45 ORANGEBURG ROAD
ORANGEBURG, NEW YORK

FOR REDUCED PLANS: ORIGINAL IN INCHES
0 0.5 1.0 1.5

DATE: AUGUST 27, 2008

SCALE: 1" = 60'

FIGURE **5**

5 of 5 sheets

APPENDIX A

Waste Management Plan

99 Lamberton Road, Suite 201
Windsor, CT 06095
p| 860.683.4200
f| 860.683.4206
kleinfelder.com

WASTE MANGEMENT PLAN FOR REMEDIAL INVESTIGATION WORK PLAN

Orangeburg (Orangetown) Shopping Center

1-45 Orangetown Shopping Center

Orangeburg, NY 10962

NYSDEC Index #A3-0563-0906

NYSDEC Site #C344066

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The purpose of a waste management plan is to establish procedures for proper collection, storage, transportation, and disposal of wasted generated from a specific activity or set of activities.

As part of the work plan proposed in the Remedial Investigation Work Plan wastes will be generated on-site. These wastes may include:

- soil removed from the subsurface during drilling activities
- groundwater removed from the subsurface during monitoring well development and sampling
- water used for the decontamination of equipment and sampling materials
- used sampling equipment, and used personal protective equipment

Soil removed from the subsurface during drilling activities will be collected on-site in 55-gallon steel DOT rated drums. These drums will be appropriately labeled and stored on site during the duration of the drilling activities. Following completion of the drilling waste characterization samples will be collected from the drums and submitted for laboratory analysis. Following receipt of the laboratory analytical results a classification of the soil will be made. If the soil is not suitable for re-use on site the drummed soil will be relabeled based on the waste classification in accordance with 49 CFR 172 and will be transported by a waste hauler with appropriate certifications to an approved disposal facility. If the material is classified as hazardous the transportation and disposal will be conducted in compliance with 6 NYCRR Part 372 “Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities”.

Groundwater removed from the subsurface during well development and sampling along with water from the decontamination of equipment and sampling materials will be managed as a single waste stream. This water will be collected on site in 55-gallon steel DOT rated drums. These drums will be appropriately labeled and stored on site during the duration of the drilling and sampling activities. Following completion of the groundwater sampling waste characterization samples will be collected from the drums and submitted for laboratory analysis. Following receipt of the laboratory analytical results a classification of the water will be made. If the water is not suitable for on-site infiltration the water will be relabeled based on the waste classification 49 CFR 172 and will be transported by a waste hauler with appropriate certifications to an approved facility for treatment. If the material is classified as hazardous the transportation and disposal will be conducted in compliance with 6 NYCRR Part 372 “Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities”.

Used disposable equipment including sample tubing, polyethylene bailers, nitrile gloves, and soil scoops will be collected on-site in 55-gallon steel DOT rated drums. Following completion of the monitoring well installation and groundwater sampling this material will be transported by a waste hauler with appropriate certifications to an approved facility for disposal.

APPENDIX B

Health and Safety Plan

99 Lamberton Road, Suite 201
Windsor, CT 06095
p| 860.683.4200
f| 860.683.4206
kleinfelder.com

SITE-SPECIFIC HEALTH AND SAFETY PLAN

BROWNFIELD SITE NUMBER C344066
1-45 ORANGEBURG SHOPPING CENTER
ORANGEBURG, NEW YORK

PREPARED BY:

Kleinfelder

KLEINFELDER

SITE SPECIFIC HEALTH AND SAFETY PLAN

BROWNFIELD SITE NUMBER C344066
1-45 ORANGEBURG SHOPPING CENTER
ORANGEBURG, NEW YORK

HASP REVISION 1
Revision Date: 8/28/2008

TABLE OF CONTENTS

HASP prepared by: **William E. Peters**

HASP approval: **Matthew Pickard**

Project Manager Approval: **Brian Kelly**

REVISION HISTORY:

3/15/07 – Original

6/12/08 – Kleinfelder Logo Change

8/28/08 – Inclusion of NYSDOH Community Air Monitoring Plan and Section 4 text change

KLEINFELDER

SITE HEALTH AND SAFETY PLAN —FOR CHLORONATED SOLVENTS INVESTIGATION/REMEDIATION ONLY

(For specific Procedures, refer to Kleinfelder's Health and Safety Procedures Manual)

I. PROJECT IDENTIFICATION

Project Name: **Orangetown Shopping Center**

Address of Site: **1-45 Orangeburg Shopping Center**
Orangeburg, New York
Site ID No.: NA

Client Contact: **Kurt A. Frantzen Ph.D.** Phone: **(609) 306-8281**

Kleinfelder Project Manager: **Ben Reiger** Phone: **(609) 306-8281**

Health and Safety Oversight: **Matthew Pickard** Phone:(**845) 567-6530**

II. EMERGENCY CONTACTS

Police: **911** **Fire**: **911** **Ambulance**: **911**

National Poison Control Center: **800-222-1222**

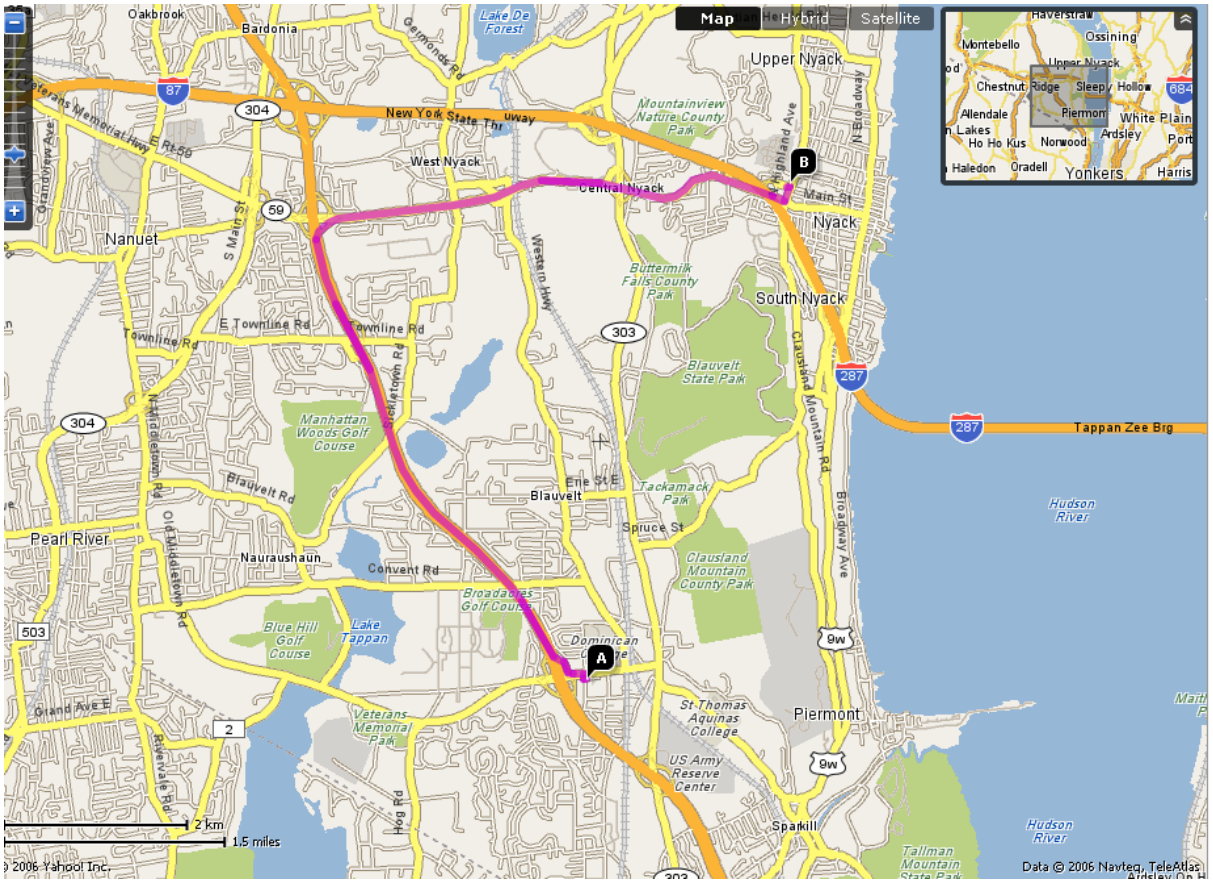
Utilities: Gas _____ Electric _____ Water _____

Phone _____ **One call/equivalent**: **1-800-272-4480**

Medical Treatment Facility: **Nyack Hospital** **Phone #**: **(845) 348-2000**
Address: **258 High Ave**
Nyack, New York

Directions from Site: (see attached map showing location of hospital relative to Site)

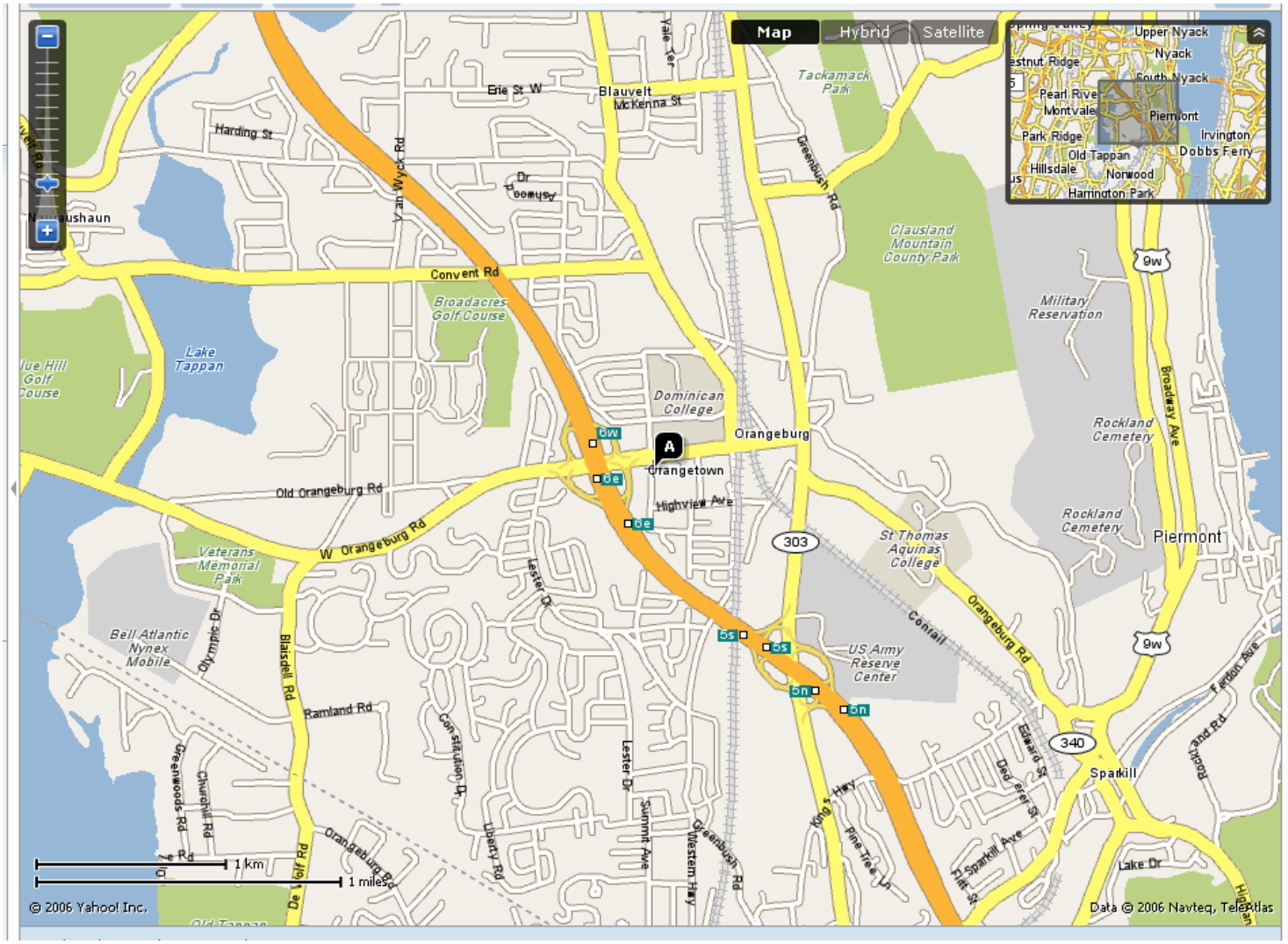
MAP TO HOSPITAL



1) Start at **1-45 Orangeburg Shopping Center**
2) Turn **right** on **Dutch Hill Road** – 0.0 mi
3) Turn **Left** on **W. Orangeburg Road** – 0.1 mi
4) Take ramp to **Palisades Interstate Parkway** and go **North** – 3.5 mi
5) Take **Exit 8E** to **Route 59 East** towards Nyack – 3.3 mi
6) Continue on **Main Street** - 0.1 mi
7) Turn **Left** onto **N Highland Ave (US-9W)** – 0.1 mi
8) Turn **Left** onto **High Ave** -0.0 mi
9) **Hospital** will be on the **Right** – 258 High Ave

III. SITE BACKGROUND INFORMATION (See attached Site Plan and map, page 6)

SITE LOCATION



IV. ANTICIPATED TASKS TO BE PERFORMED: (Check all appropriate tasks.)

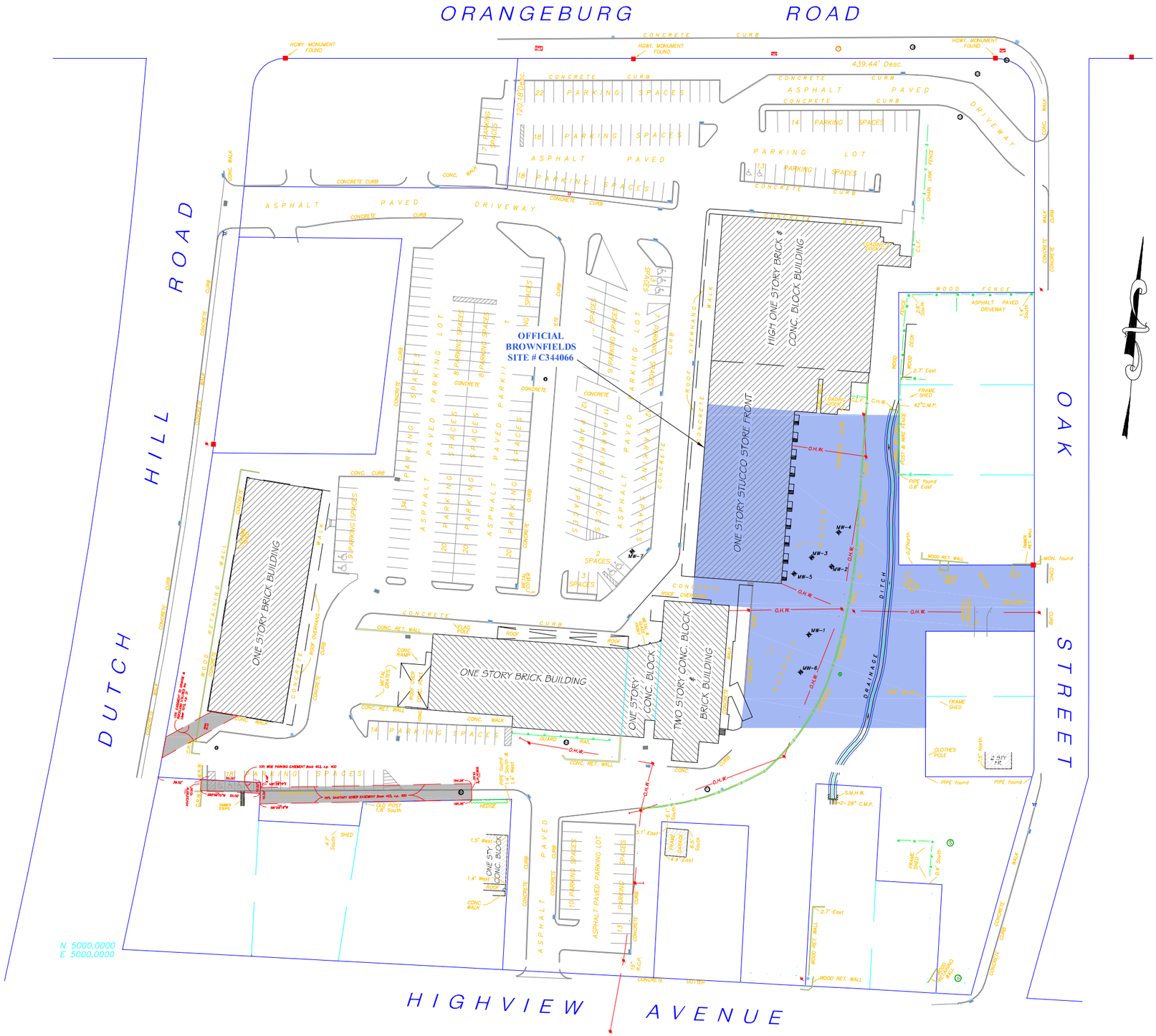
	Task	Personnel/ContractorsPerforming Task
X	Supervision of Soil Boring/Monitoring Well Installation	Subcontractor Personnel[1]
X	Gauging/Sampling of Monitoring Well	Kleinfelder Personnel
___	Assessment of Tank Excavation	_____
X	Supervision of General Construction	_____
___	Trenching	_____
___	Dry well excavation	_____
___	Line replacement	_____
X	Soil loading and transport, etc.	Subcontractor Personnel[1]
X	Other (remedial excavation)	Subcontractor Personnel[1]
X	Collection of Soil Samples	Kleinfelder Personnel
X	Split spoon	Kleinfelder Personnel
X	Hand auger	Kleinfelder Personnel
___	Grab Samples	
___	Jar headspace	
X	Soil Vapor Survey	Kleinfelder Personnel
X	Ambient Indoor Air Sampling	Kleinfelder Personnel
X	Subslab Vapor Sampling	Kleinfelder Personnel
X	External Ambient Air Sampling	Kleinfelder Personnel
___	Other	_____
___	Remedial System Operation & Maintenance	_____
___	OTHER:	_____

[1] Subcontractor shall develop and conduct work under their own heath and safety plan in accordance with 29CFR 1910

SITE MAP INSERT

(print out the latest Site Plan and attach behind this sheet)

See Attached



LEGEND

- MONITORING WELL LOCATION
- SOIL GAS MONITORING POINT
- HYDRANT
- UTILITY POLE
- ELECTRIC COVER
- MANHOLE COVER (unknown)
- TELEPHONE MANHOLE COVER
- CATCH BASIN
- LIGHT POLE
- SEWER MANHOLE

C.L.F.	CHAIN LINK FENCE
C.H.W.	CONCRETE HEAD WALL
C.M.P.	CORRUGATED METAL PIPE
O.H.W.	OVERHEAD WIRES
R.C.P.	REINFORCED CONCRETE PIPE
S.M.H.W.	STONE MASONRY HEAD WALL

SCALE

0 100 200

1 inch = 100 feet

FIGURE 2
SITE PLAN

ORANGETOWN SHOPPING CENTER
1-45 ORANGE BURG SHOPPING CENTER
ORANGEBURG, NEW YORK

DRAWN BY:	-	SCALE:	SEE ABOVE
REVISED BY:	CTH	PROJECT NUMBER:	69972
CHECKED BY:		SOURCE: LINK LAND SURVEYORS	
DATE:	FEBRUARY 7, 2007		

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V. CHEMICAL HAZARDS/PPE (also refer to Kleinfelder Site Health and Safety Procedures sections 6.0, 7.0 and 9.0)

Level of PPE Required: X D — *Zones established*: ___ NA
___C — ___Support (52) — ___ Decontamination (CRZ)
___B* — ___Ground Intrusive (no eating, drinking smoking) (EZ)

*Level C and B work MAY NOT be done under this HASP. Contact HSO for further direction and assistance!

Specific Site Entry/Access Procedures: If LEL concentrations are >5% LEL, all work must cease and area(s) evacuated.

Potential/Expected Exposure Constituents: (MSDS's are Attached as Appendix)

Contaminant	Source/ Location	Acute Exposure Symptoms	PEL/TLV Established	Action Level	Level of PPE/Specific PPE required
Trichloroethylene	Former drycleaning operations	Irratation to the eyes, skin; Headache, visual disturbance, weakness, exhaustion, dizziness, tremors, drowsiness, nausea, vomiting, dermatitis, Cardiac arrhythmias.	ACGIH TLV—50 ppm		**< Action Level**—Level D > **Action Level**-Consult PM and HSO
Perchloroethylene	Former drycleaning operations	Irritation of eyes, nose, skin; CNS depression; giddiness, nausea, headache	TLV— 25 ppm		**< Action Level**—Level D > **Action Level**-Consult PM and HSO
Vinyl Chloride	Breakdown product of TCE and PCE	Irritation of eyes, nose, skin; CNS depression; giddiness, nausea, headache	PEL—1 ppm	0.5 ppm	**< Action Level**—Level D > **Action Level**-Consult PM and HSO

NOTE: IF ANY LEVELS EXCEED THE PEL/TLV BY MORE THAN 10X, ALL WORK MUST CEASE AND SPECIFIC VENTILATION PRACTICES OR RESPIRATORY PROTECTION METHODS EMPLOYED.

Air Monitoring Instruments to be Employed: (also refer to Kleinfelder HASP Manual, section 9.0)

Monitoring Instrumentation To Be Used:(SEE INDIVIDUAL PROCEDURES FOR MONITORING BELOW)

___ Combustible Gas Indicator
___ Oxygen Meter
___ Dual CGI and O2
___ Flame Ionization Detector (calibration date: ____)
X Photo Ionization Detector (calibration date: ____)
___ Hydrogen Sulfide Detector
___ Colorimetric Indicator Tubes
___ Personnel Sampling Pump w/ media
X OTHER: Multirae (LEL Meter)
___ Radiation Survey Meter w/probe
___ Particulate Monitor
___ Dosimeter Badges

Specific Personnel Air Monitoring Procedures to be employed: Personnel air monitoring samples are to be collected in workers' breathing zone (18"-24" from mouth/nose) using the monitoring instruments specified above. Air monitoring shall be conducted prior to site activities and at least once every 2 hours. Sampling shall be be conducted continuously for 15 minutes per collection. Any sustained readings above the action level shall require notification of the Project Manager and Health & Safety Officer.

VI. Physical Hazards/Traffic Control (refer to Kleinfelder Site Health and Safety Procedures, section 5.0, 6.0,7.0, and 8.0)

Hazard Description	Location	Control Methods/ Protective Equipment
Slips, Trips, and Falls	Site Wide	Good Housekeeping
Traffic	Site Wide	Set up work area
Hand Safety	Site Wide	Wear Correct PPE
Use of tools	Site Wide	Inspect tools and be trained on how to use them.

Confined Space Entry? Y N (If Y, then a completed Confined Space Permit must be attached)

Description: _____

Illumination: ____Adequate __X__ Inadequate (if inadequate, describe illumination methods to be utilized): Be prepared to set up lighting in the basements of the residents.

Hot Work? Y N (If Y, then a Hot Work Permit MUST be completed and attached)
Description: Employ hot work permit for drilling monitoring wells and for drilling for sub-slab soil vapor samples.

VII. Decontamination Procedures (also refer to Kleinfelder Site Health and Safety Procedures section 12.)

Decontamination required: Personnel? Y N Equipment? Y N
Method of Decontamination/Procedures to be Implemented: Personnel decontamination will be removing gloves between samples and drilling locations. Equipment will be decontaminated by an alconox rinse followed by a water rinse. Then a methanol rinse followed by a final water rinse. All equipment will be decontaminated between sampling locations and drilling locations.

Method of disposal for Contaminated Materials: Soil cuttings will be drummed and shipped off-site via an approved waste transporter.

VIII. Training Requirements for Site Personnel (See Kleinfelder Site Health and Safety Procedures, Sect. 10)

In addition to initial site specific health and safety training, all Kleinfelder Project Field Team Members shall be required to be trained in accordance with 29CFR 1910.120, Hazardous Waste Operations and Emergency Response. Any other personnel visiting the site must check in with the HSO, or designee, for orientation and briefing of site hazards.

Supervisory personnel on-site and specialized site workers may be required to have been trained in accordance with 29CFR 1910.120, depending on the nature of their work, exposure potential, and specific type of activities being conducted. However, each will be trained on site-specific hazards, site conditions and emergency operating procedures as well as other pertinent topics prior to job initiation in the areas of environmental concern (AOEC). All personnel on-site are required to attend pre-work "tailgate" meetings. These meetings shall discuss Health and Safety items related to those activities.

In the event hazardous waste or other conditions are encountered in the AOEC requiring upgrade from level D, all activities in the AOEC will be stopped. Continuation of work and entry into the AOEC will be conducted by personnel trained in accordance with 29 CFR 1910.120.

If respiratory protection is required, certification of mandatory training, medical monitoring and documentation of respirator fit testing shall be provided to the HSO before personnel are permitted on site. These records will be maintained as part of the permanent record.

IX. Loss/Near Loss/Injury Reporting

In the event of an injury, near miss, or incident, site personnel must **IMMEDIATELY:**

- Determine the need for medical treatment and administer First Aid. Immediately call 911 if an injury or illness is obviously serious.
- IMMEDIATELY stop operations and notify Kleinfelder contact on site.
- IMMEDIATELY notify Kleinfelder Project Management/Operations Manager.
- Complete Kleinfelder Loss/Near Loss Investigation report as soon as possible, describing the incident IN DETAIL.
- Refer to Kleinfelder Health and Safety Procedures for detailed responsibilities.

X. HASP REVISIONS/SITE CONDITION CHANGE FORM

Non-Conformance of Health and Safety Procedures/Comments regarding implementation:

_____

_____

_____

Change in Site Conditions: _____

___ Site personnel notified and informed of changes on: Date/Time notified: _____
___ Contractor Notification and Consent Form updated. Date performed: _____

Plan of Action for Non-routine task/HASP Non-Conformance Issues/Change in conditions: ____

_____

_____

_____

_____

Incident Summary: ___ NA ___ Evacuation ___ Hazardous Material Over Exposure

___ Loss ___ Near Loss ___ OTHER:_____

(complete Kleinfelder Loss/Near Loss investigation form, see Kleinfelder SOP Manual, SOP#15 for a complete analysis)

___ PM notified ___ Client notified ___ OSHA notified

___ HASP Revision Document Submitted to H&S Department for HASP revision:
Name of Submittor:_____ DATE:_____
Received By:_____ DATE:_____

FORWARD TO HSO FOR HASP REVISION AS NECESSARY; FILE A COPY UNDER "SITE INSPECTION" IN AUDIT FILE

ATTACHMENT A – Air Monitoring Data Observation Record

INSERT HARD COPY

ATTACHMENT B: AUTHORIZATION FOR MEDICAL TREATMENT/PHYSICIAN'S REPORT

PLEASE RENDER TREATMENT TO: Employee _____
for the illness/injury that occurred on: (Date) _____

____ Conduct an alcohol and drug screen (reasonable cause).

Describe nature and cause of illness/injury including the object, equipment or substance inflicting injury/illness: **(Attach copy of MSDS when a hazardous material is involved)**

_____

_____

Authorized by:

_____ _____ _____
Signature & Title Telephone Date

PHYSICIAN'S REPORT

MEDICAL FACILITY: _____
ADDRESS: _____
Treating Physician: _____ Date of illness/injury: _____

Previously treated? (Y / N) If yes, give dates_____
Diagnosis:(Industrial illness/injury only)_____

Treatment:(Industrial illness/injury only)_____
_____
Prescription medication prescribed? Yes_____ No_____

Can employee return to work on next scheduled period? Yes_____ No_____
If no, what date can employee return to work? _____
List any medical/physical restrictions: _____
Number of days of restricted activity: _____
The employee is able to return to regular work on: _____

Follow-up treatment required? Yes_____ No_____; Date_____

Physician's signature: _____

EMPLOYEE MUST RETURN THIS RELEASE TO OPERATIONS OFFICE WITHIN 24 HOURS.

ATTACHMENT C: KLEINFELDER LOSS/NEAR LOSS INVESTIGATION REPORT

KLEINFELDER-EAST INCIDENT/INJURY/NEAR LOSS INVESTIGATION REPORT (Incident #)

SECTION 1: INCIDENT INFORMATION (SUBMIT TO DIV. H&S WITHIN 24 HOURS OF INCIDENT)

KLEINFELDER-EAST Office:
☐ Hamilton, NJ ☐ MA ☐ CT ☐ HV ☐ LI ☐ AL ☐ RO ☐ West Chester, PA
☐ FL ☐ MD ☐ Cranberry, PA ☐ Cinnaminson, NJ

BUSINESS CLIENT: ☐ NONE (KLEINFELDER-EAST Internal incident only)
☐ Client and region: _____

INCIDENT STATUS and TYPE:
☐ **Initial. Date submitted:** _____
☐ **Final. Date submitted:**_____
☐ **V&V Complete; incident closed**

PERSONNEL INVOLVED
☐ **KLEINFELDER-EAST PERSONNEL** ☐ **SUB CONTRACTOR**
☐ **CONTRACTOR** ☐ **THIRD PARTY/GENERAL PUBLIC**

JOB TASK

☐ Carbon Changeout	☐ Gauging/Bailing	☐ Operations/Maintenance	☐ Subsurface Clearance
☐ Demolition	☐ Geoprobe	☐ Pavement Cutting	☐ System Install
☐ Dewatering	☐ Heavy Equip Ops	☐ Pump/Pilot Test	☐ System Startup
☐ Drilling	☐ Mobil Rem/Vac Event	☐ Rigging/Lifting	☐ UST Removal
☐ Excavation/Trenching	☐ Motor Vehicle	☐ Sampling	☐ Waste Management
☐ NAPL Recovery	☐ Other:____		

COMPANY NAME AND SUBCONTRACTOR COMPANY NAME (IF APPLICABLE)	**NAME OF EMPLOYEE INVOLVED**

DATE MM/DD/YY	**TIME** hh:mm ☐ **AM** ☐ **PM**	**# OF YEARS WORKED FOR COMPANY**	**# OF YEARS IN CURRENT POSITION**	**WAS ALCOHOL / DRUG USE SUSPECTED?** ☐ **YES** ☐ **NO**

INCIDENT LOCATION (CITY, STATE AND COUNTRY IF OUTSIDE THE U.S.)	**SITE / FACILITY / LOCATION ID#/ PROJ. #**	**SUPERVISOR'S NAME**

SUPERVISOR'S PHONE NUMBER	**CONTACT NAME**	**CONTACT PHONE NUMBER**		**DIVISION/CORP. NOTIFICATIONS MADE?** ☐ **YES** ☐ **NO**

NAMES OF OTHER INDIVIDUALS INVOLVED	**COMPANY NAME / # OF YRS. WORKING / # OF YRS. IN CURRENT POSITION / EXTENT OF INJURIES**

ESTIMATED COST OF INCIDENT: ☐ **< $500** ☐ **> $500**	**IF A SPILL / RELEASE - MATERIAL INVOLVED:**	**TOTAL QUANTITY:** ___ ___**U.S. GALLONS**

***SUMMARY DESCRIPTION OF INCIDENT / NEAR LOSS (INCLUDE THE SEQUENCE OF EVENTS, THE CAUSAL FACTORS TO EXPLAIN THE PROBLEM AND ALL PERTINENT FACTS ABOUT INJURY AND TREATMENT GIVEN, ACCIDENT, LOSS or NEAR MISS; RESPONSE ACTIONS TAKEN)**

BRIEF DESCRIPTION OF INCIDENT:

POTENTIAL LOSS/INJURY (if Near Loss):

BACKGROUND DETAILS (i.e. overview of activities being performed; locations; etc.):

SECTION 2: INCIDENT DETAILS

TYPE OF INCIDENT: (Check all that apply)

INCIDENT TYPES
- ☐ INJURY
- ☐ ILLNESS

------Severity Level------
- ☐ Fatality
- ☐ Lost Time
- ☐ Restricted Work
- ☐ Medical Treatment
- ☐ First Aid

ENVIRONMENTAL
- ☐ Spill / Release
- ☐ Permit Exceedance
- ☐ Fine / Penalty
- ☐ NOV
- ☐ Misdirected Waste
- ☐ Consent Order

PROPERTY DAMAGE
- ☐ Property Damage

IF DRUG/ALCOHOL TESTING WAS CONDUCTED, SUMMARIZE ACTIONS TAKEN/ TESTING (NOTE: ANY KA EMPLOYEE INVOLVED IN A MOTOR VEHICLE ACCIDENT, OR SUSTAINS AN INJURY REQUIRING PROFESSIONAL MEDICAL TREATMENT MUST SUBMIT TO A DRUG/ALCOHOL SCREEN).

EQUIPMENT INVOLVED: (Select all that apply)

Fixed – Piping, General
- ☐ Piping
- ☐ Piping, Hose

Fixed – Storage/Tankage
- ☐ Tank, Underground
- ☐ Tank, Underground Double Wall

Fixed - Vessel
- ☐ Drum, Separator, Vertical

Instrumentation – Instrument System
- ☐ Local Control Panel

Machinery – Drilling Equipment
- ☐ Drill Rig

Machinery - Pump
- ☐ Pump, Submerged

Support Equipment – Communication/Computing
- ☐ Audio Communication (Telemetry)

Support Equipment – Maintenance/Testing Tools
- ☐ Hand Tool, Hammer
- ☐ Hand Tool, Knife
- ☐ Hand Tool, Non Powered
- ☐ Hand Tool, Powered
- ☐ Hand Tool, Powered, Drill
- ☐ Hand Tool, Powered, Grinder
- ☐ Hand Tool, Powered, Hydraulic Torque
- ☐ Hand Tool, Powered, Saw
- ☐ Hand Tool, Powered, Wrench
- ☐ Hand Tool, Saw
- ☐ Hand Tool, Screwdriver
- ☐ Hand Tool, Shears
- ☐ Hand Tool, Shovel
- ☐ Hand Tool, Wrench
- ☐ Ladder, Extension
- ☐ Ladder, Platform
- ☐ Ladder, Step
- ☐ Maintenance Tool, General
- ☐ Space Heater, Electric

Support Equipment – Oil Spill Response
- ☐ Boom Material

Support Equipment – Remediation Equipment
- ☐ Blower
- ☐ Carbon Drum/Vessel
- ☐ Compressor
- ☐ Critical Equipment
- ☐ Drilling Equipment, Vacuum
- ☐ Exclusion Zone Equipment
- ☐ Fencing
- ☐ Filter
- ☐ Fire Extinguisher
- ☐ Manifold
- ☐ Oxidizer
- ☐ PPE - Eye
- ☐ PPE - Fall
- ☐ PPE - Foot
- ☐ PPE - Hand
- ☐ PPE - Head
- ☐ PPE - Hearing
- ☐ PPE - Respiratory
- ☐ PPE – Vest/Clothing
- ☐ PPE - Other
- ☐ Pumps (transfer, electrical)
- ☐ Remediation Shed/Trailer
- ☐ Separator
- ☐ Surge Tanks
- ☐ System - Air Sparging
- ☐ System - Carbon Treatment
- ☐ System - Chemical Oxidation
- ☐ System - Dual Phase Product Recovery
- ☐ System - Groundwater Pump and Treat
- ☐ System - Vapor Extraction
- ☐ System - Vapor Phase Treatment
- ☐ System - Other
- ☐ Well - Extraction
- ☐ Well - Monitoring
- ☐ Well - Recovery

Support Equipment – Sampling Equipment
- ☐ Bailer
- ☐ Geoprobe
- ☐ Hand Auger
- ☐ Photo-ionization Device
- ☐ Sample Container
- ☐ Split Spoon Sampler

Support Equipment - Snow Removal
- ☐ Snow Plow

Work Equipment – Crane
- ☐ Crane, Mobile

Work Equipment – Earth Moving Equip.
- ☐ Bulldozer
- ☐ Dump Truck
- ☐ Excavator/Power Shovel
- ☐ Front End Loader
- ☐ Grader

Work Equipment – Lifting Equipment
- ☐ Chain Block
- ☐ Forklift
- ☐ Hoist
- ☐ Hook/Clamp/Buckle etc.
- ☐ Jack
- ☐ Manlift/Basket/Cherry Picker
- ☐ Rope
- ☐ Sling
- ☐ Winch
- ☐ Wire Rope

Work Equipment - Transportation
- ☐ Automobile
- ☐ Tractor Trailer
- ☐ Truck, Flatbed
- ☐ Truck, Pick-up
- ☐ Truck, Tank Truck
- ☐ Truck, Vacuum

Other:_____

TYPE OF INJURY/ILLNESS (OR POTENTIAL IF NEAR LOSS)
- ☐ Amputation/Avulsion
- ☐ Bruise/Contusion
- ☐ Burn - Chemical
- ☐ Burn - Thermal or Electrical
- ☐ Concussion/Unconscious
- ☐ Crush
- ☐ Cut/Scrape/Puncture
- ☐ Dislocation
- ☐ Foreign Object in Eye
- ☐ Fracture
- ☐ Hernia/Rupture
- ☐ Irritation
- ☐ Poisoning
- ☐ Sprain/Strain
- ☐ Sting/Bite
- ☐ Heat Stress/Exhaustion/Sunstroke
- ☐ Hypothermia
- ☐ Physical Agents - Radiation, etc.
- ☐ Repeat Trauma - CTS
- ☐ Repeat Trauma - Other Disorder
- ☐ Respiratory - Toxic Agents
- ☐ Skin Disease or Disorder
- ☐ Other _____
- ☐ Unknown

BODY PART AFFECTED (OR LIKELY PRIMARY INJURY IF NEAR LOSS)
- ☐ Abdomen/Groin
- ☐ Ankle
- ☐ Back/Spine
- ☐ Calf/Shin
- ☐ Central Nervous
- ☐ Chest
- ☐ Circulatory/Blood
- ☐ Ear
- ☐ Elbow
- ☐ Eye
- ☐ Face
- ☐ Fingers
- ☐ Foot
- ☐ Forearm
- ☐ Hand
- ☐ Hip
- ☐ Internal Organs
- ☐ Jaw
- ☐ Knee
- ☐ Neck
- ☐ Nose
- ☐ Respiratory
- ☐ Ribs
- ☐ Scalp
- ☐ Shoulder
- ☐ Skull
- ☐ Thigh
- ☐ Toes
- ☐ Tongue
- ☐ Tooth/Teeth
- ☐ Upper Arm
- ☐ Urinary
- ☐ Wrist

SOURCE OF INCIDENT

Body Position/Force
- ☐ Line of Fire
- ☐ Overexertion/Strain
- ☐ Personal Energy
- ☐ Struck Against Object
- ☐ Struck By Object
- ☐ **Buried**
- ☐ **Caught In, Under, Between**

Chemical Exposure
- ☐ Inhalation
- ☐ Ingestion
- ☐ Physical Contact

Contact By
- ☐ Animal/Insect/Plant
- ☐ Blood/Potentially Infectious Materials
- ☐ Electricity
- ☐ Noise
- ☐ Other Physical Agents
- ☐ Radiation
- ☐ Temperature Extremes

- ☐ **Drowning**

Falls
- ☐ Fall, From Elevation
- ☐ Fall, Same Level
- ☐ Slip or Trip Without Fall
- ☐ **Other**
- ☐ **Suffocate/Asphyxiate (Lack of Oxygen)**
- ☐ **Transportation Incident**

LOST TIME or RESTRICTED WORK:	START DATE	# OF ESTIMATED DAYS	# OF ACTUAL DAYS	☐ No Reassignment ☐ Permanently Reassigned ☐ Temporarily Reassigned

ATTACHED INFORMATION: ☐ **NEWSPAPERS** ☐ **PHOTO** ☐ **SKETCHES** ☐ **VEHICLE REPORT (ATTACHMENT 21A)** ☐ **OTHER**
(Check all that apply)

NAME OF OWNER	ADDRESS	PHONE

DESCRIPTION OF INJURY / DAMAGE

NAME	STREET ADDRESS	CITY/STATE	PHONE

AUTHORITIES NOTIFIED

PUBLICITY

COMMENTS

PREPARED BY	PREPARER'S TITLE	PHONE	DATE PREPARED MM/DD/YY

SECTION 3: INVESTIGATION INFORMATION

INVESTIGATION AND CONCLUSIONS: DESCRIBE IN DETAIL THE CAUSAL FACTORS; WHY THE INCIDENT OCCURRED AND IDENTIFY THE ROOT CAUSES

List all factors relevant to the incident

Brief summary of incident/near loss:

Potential loss/injury (if near loss):

Brief background description (i.e. locations; activities being performed; general background of task):

ROOT CAUSE ANALYSIS AND RECOMMENDATIONS: HOW TO PREVENT INCIDENT FROM RECURRING

FACTOR #	ROOT CAUSE #	Recommendations	PERSON RESPONSIBLE	AGREED DUE DATE	COMPLETION DATE

INVESTIGATION TEAM			
PRINT NAME	JOB POSITION	DATE	SIGNATURE

REVIEWED BY:			
PRINT NAME	JOB POSITION	DATE	SIGNATURE

SECTION 4: STEWARDSHIP ACTIONS

QUALITY REVIEW QUESTIONS

Were the root causes identified? ☐YES If no, explain: _____

Do root cause and recommendation "match?" ☐YES If no, explain:_____

Is the recommendation feasible and maintainable? ☐YES If no, explain:_____

Is this a repeat incident? ☐NO If yes, explain: _____

QUALITY REVIEWED BY: (See questions above)

PRINT NAME	JOB POSITION	DATE	SIGNATURE

RESULTS OF VERIFICATION AND VALIDATION

Verification: Were the solutions implemented? ☐YES ☐NO

VERIFICATION BY:

SOL #	VERIFIER'S NAME	JOB POSITION (COMPANY)	DATE VERIFIED	DETAILS	SIGNATURE

Validation: Were the solutions effective in addressing the root causes? ☐YES ☐NO

VALIDATION BY:

SOL #	VALIDATOR'S NAME	JOB POSITION (COMPANY)	DATE VALIDATED	DETAILS	SIGNATURE

APPENDIX 1A

New York State Department of Health
Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

APPENDIX C

Investigation Team Qualifications

KURT FRANTZEN

Program Manager

Principal Professional

Eastern Division Leader--Risk Analysis & Toxicology Practice

Summary of Experience

Through risk-based approaches that limit remedial cost, Dr. Frantzen serves clients by interfacing science, engineering, and planning to resolve complex property contamination matters. With extensive risk assessment experience and with large investigation/remediation project management experience, he is a hands-on practitioner achieving high equity results for his clients. A biochemist by training, he has more than 20 years of experience in environmental risk analysis, hazardous waste site/Brownfields investigation/remediation, environmental R&D, and cost accountable management. He has worked on state-led, Superfund, DOE, and DOD sites around the US.

Education

BS, Biology, University of Nebraska System : Omaha, Nebraska, 1978
MS, Plant Pathology, Kansas State University, Kansas, 1980
PhD, Life Sciences/Biochemistry, University of Nebraska System : Omaha, Nebraska, 1985

Registrations

Certified Hazardous Materials Manager (C.H.M.M.), No.14143,

Select Project Experience

The following is a representative selection of Kurt Frantzen's project experience.

Environmental Site Assessment & Characterization

Fish and Wildlife Impact Assessment REALCO Incorporated Site, Dunkirk, NY, 2006
Prepared an assessment of potential environmental/ecological impacts due to polychlorinated biphenyls (PCBs) released from the site into a nearby stream and wetland. For NYSDEC via Benchmark Engineering and Environmental Sciences, PLLC, Buffalo, NY.

Phase I Environmental Site Assessment Newburgh Dye & Printing, Newburgh, NY, 2005
Prepared an assessment of environmental concerns to support real estate due diligence. Magna Fabrics, Hackensack, NJ

Phase II Environmental Site Assessments for the Commonwealth Heights and Beacon Parcel Developments, Marlborough, MA, 2005
Prepared a site assessment evaluating residual pesticides (lead arsenate, DDT, and dieldrin) in the soils of these former orchard sites to support future real estate development. The Gutierrez Company, Burlington, MA

Phase IIB Site Characterization for the Orangeburg Shopping Center, Orangeburg, NY, 2005
Additional assessment of nature and extent a chlorinated solvent release on the subject property. JLJ Management.

Phase II On-Site Environmental Site Assessment for the Orangeburg Shopping Center, Orangeburg, NY, 2004
Assessed the nature and extent a chlorinated solvent release on the subject property. JLJ Management

Phase I Plus Environmental Site Assessment Orangeburg Shopping Center, Orangeburg, NY, 2004
Prepared an assessment of environmental concerns specially regarding a potential chlorinated solvent release at the subject property. JLJ Management

Risk Assessment & Characterization

Ecological Risk Assessment for the Hinkley Site, 1988
Compressor station in Mojave Desert with hexavalent chromium spill to groundwater - the Erin Brockovich - Evaluated fate and transport, the baseline ecological risks and risks associated with remedial alternatives. Concept creator of the implemented remedial alternative that involved pumping and treatment by natural attenuation. Prepared for Pacific Gas and Electric Co. Served as Task Manager and lead ecotoxicologist.

Superfund Ecological Risk Assessment - Peter Cooper/Markhams Sites, Town of Dayton, NY, 2005
Prepared screening-level ecological risk assessment of upland and wetland resources at a large landfill with hide/glue manufacturing wastes from the former Peter Cooper operation in Gowanda, NY, which contained chromium, arsenic, zinc, and various organic solvents. Benchmark EE&S, PLLC

Risk Appraisal Transactional Due Diligence Support of a Chlorinated Solvent Contaminated Property, Stamford, CT. 2001
Prepared appraisal of the environmental risk issues associated with a property transaction involving a contaminated commercial property. Followed the Risk Appraisal approach developed by K. Frantzen (see Books and Articles section below). Confidential Client. Project Manager.

Baseline Risk Assessment for Former MGP Site, Plattsburgh, NY. 1998
Prepared a baseline human health and ecological risk assessment for the upland portion of this former manufactured gas plant site situated within an urban area and along the Saranac River, an important trout fishery. The work included development of remedial objectives and target cleanup levels. For NYSEG, Task Manager and lead author.

Method 3 Risk Characterization for a Former Manufactured Gas Plant Site, Southbridge, MA, 1998.
Completed a Massachusetts Contingency Plan (MCP) Method 3 Risk Characterization to support a Phase II investigation at a former MGP site currently used as a utility service center. For Mass. Electric Corp., Task Manager.

Method 2 Risk Characterization for Franklin Manufacturing Facility, MA, 1998.
Evaluated risks associated with the accumulation of volatile organics within a facility overlying contaminated soils and groundwater to support a No Further Action (NFA) decision. Prepared for Franklin Manufacturing Co. Risk Assessor.

Risk Assessment for the Former Manufactured Gas Plant Site, Cambridge, MD, 1997
prepared a site-specific analysis of risk associated with MGP-related chemicals in surface soil. The assessment was prepared to guide decision-making regarding future use and need for mitigative actions. Prepared for confidential client. Task manager and author.

Bioaccumulation of PAHs into Garden Produce and Associated Health Risks, 1997
Literature review and geochemical analysis of distribution of PAHs in soils, and exposure and associated health risk to gardeners and consumers of garden produce grown in PAH contaminated soils. Prepared for a confidential client. Project Manager and lead author.

Screening-level Ecological Risk Assessment for the Chevron Cincinnati Refinery, 1996
Multimedia analysis of potential risks to ecological resources. Prepared for Chevron Research and Technical Co. Served as Project Director.

Human Health Risk Assessment for the Tar Creek Superfund Site, Ottawa County, Oklahoma, 1995
An assessment of residential exposures to lead and other metals in the soils in and around homes located near former Picher Mine in the Tri-State Mining District. Part of remedial investigation. Prepared for U.S. EPA Region VI. Served as Task Manager.

Public Health and Ecological Risk Assessment, 1994
Part of a series of reports for a comprehensive investigation of a former manufactured gas plant site for Brooklyn Union Gas Co. Served as lead author and Program Manager.

Risk Assessment Guidance, 1993
Developed a six part series of guidance documents for use by various contractors at the U.S. Department of Energy Idaho National Engineering Laboratory (INEL). Served as technical coordinator and principal author.

Public Health and Ecological Risk Assessment, 1993
Part of a series of reports for a comprehensive investigation and remediation of a former manufactured gas plant site in San Francisco. Developed supporting scientific document for cleanup goal negotiations. Prepared for Pacific Gas and Electric. Served as Principal Toxicologist.

Risk Assessment for the Madison Wire/Orban Industries Site Remedial Investigation, 1989
Prepared for the New York State Department of Environmental Conservation. Served as Task Manager and lead toxicologist.

Human Health Risks Associated with Cooling Tower Emissions, 1987
Prepared for Ocean States Public Power as part of an Environmental Assessment, evaluated potential human health risks from both heavy metals and Legionella in tower drift. A member of the risk assessment team.

Environmental Risk Management

Environmental Risk Management Support and Program Consultant 1997-2004
Key consultant for a program involving a large portfolio of former Manufactured Gas Plant (MGP) sites and ancillary properties for an energy company in the eastern U.S. (100 in all). The scope of work included coordinating site reconnaissance, quality assurance of work plans, participating in developing strategic and tactical approaches to regulatory issues and negotiations, preparing individual property risk appraisals and portfolio threat analysis (comparative risk ranking), quality assurance of remedial investigations, and service as technical spokesperson in public forums. Managed teams performing investigation and remediation of sites, and led the team preparing all exposure and risk assessments and establishing cleanup goals. KeySpan Energy

Environmental Manager for Nott Street Industrial Park, Schenectady, NY, 2001-present
Serve as environmental consultant overseeing and monitoring conditions at the Park, which is under a Stipulation and a VCA from the NYSDEC. Interact with counsel, agency personnel, and tenets (including GE Power Systems) to assure compliance and direct work to achieve closure of extant environmental orders. Schenectady Industrial Corporation. Project Manager.

Environmental Risk Management Support to Real Estate Developers of Former Apple Orchards, Marlborough, MA. 2000-2001
Providing technical (toxicology and exposure analysis) support during the evaluation of environmental reports of several large parcels former part of a large apple orchard. Public concern expressed over lead arsenate and chlorinated pesticides in soils and their disturbance during development. Also, supported risk communication program at public hearings. MetLife, Avalon, and Gutierrez Companies.

Environmental Risk Management Due Diligence Review of a Mercury Contaminated Building Planned for Redevelopment as Office Space, Danvers, MA. 2000 - 2001
Worked as senior environmental reviewer and consultant to guide Phase I and II ESA activities of the former OSRAM Sylvania Manufacturing Facility. Worked for Redeveloper. Project Manager and Risk Analyst.

Environmental Risk Management Program for the Brooklyn Borough Gas Works Site, 1997-1998
Conducted baseline human health and ecological risk assessment of the former manufactured gas plant site (18 acres) along Coney Island Creek. Prepared and supported negotiations of remedial objectives and target cleanup levels. The project also required supporting a risk communication program of newsletters, public documents, public meetings, and hearings. For Brooklyn Union / KeySpan Energy. Project Manager and lead author.

General

Soil Management Plans for the Commonwealth Heights and Beacon Parcel Developments, Marlborough, MA, 2005
Prepared soil management plans to deal with residual pesticides (lead arsenate, DDT, and dieldrin) in the soils of these former orchard sites during real estate development (single family homes and commercial restaurant, respectively. The Gutierrez Company, Burlington, MA

Publications and Papers

Author, *Risk-Based Analysis for Environmental Managers*, Lewis Publishers/CRC Press, Boca Raton, FL, 2001

Author, *Using Risk Appraisals to Manage Environmentally Impaired Properties*, VHB SiteWorks, Watertown, MA, Report 108, 28p, 1999.

Author, *Risk-Based Analysis*, The Brownfields Newsletter , 3(17) 1, King Communication, Washington, D.C., August 27th Issue, 1998.

Author, *Chapters on Antimony and Chromium*, Hamilton and Hardy's Industrial Toxicology, RD Harbison, Ed., New York: Mosby, Chapter 5 and 12, pp. 25-26 and 51-54, respectively, 1998.

Author, *Risk Appraisals: A Pivotal Brownfields Management Tool*, Abstract, Conference Papers, Brownfields 2000, Atlantic City, NJ.

JUSTIN MOSES
Principal Engineer

Summary of Experience

Responsible for managing Kleinfelder's Long Island, New York Engineering Group, Mr. Moses brings over twelve years of engineering and consulting experience to clients internationally. His leadership has resulted in consistent project excellence, supporting remediation projects, Superfund ground and wastewater treatment and brownfield redevelopment, as well as manufacturing and industrial projects for clients in the pharmaceuticals, chemicals, electronics, metals machining, and alternative fuels industries. His client support experience includes proposal and budget development, conceptual evaluations, cost estimation, systems analysis, design, field engineering, construction oversight, client coordination, and general program management.

Education

BS, Civil/Environmental Engineering, University of Vermont, 1995
MS, Chemical Engineering, Syracuse University, NY, 2001

Registrations

Professional (P.E.) - Civil, No.077926, New York State Department of Education, NY, 2001

Project Experience

The following is a representative selection of Justin Moses's project experience.

Remedial System Design

ExxonMobil, Groundwater and Vapor Recovery Remediation System, Jacksonville, MD
Lead engineer for the remediation of a petroleum release in bedrock geology. The location of the release was on a topographic, bedrock and potentiometric high elevation and resulted in two separate impacted areas to the northeast and the southwest of the site. Feasibility testing was completed including pump tests, slug tests, vacuum influence testing, air sparging, and ozone sparging. Developed a basis of design for mass removal of the core of the impacted area, fenceline containment, and peripheral polishing. The vapor treatment system consisted of liquid ring pumps, rotary claw, and positive displacement blowers. The extracted soil vapor was transferred to off-gas treatment consisting of centralized flame, thermal, and catalytic oxidation. The groundwater extraction system was designed to transfer water from the core and the fenceline areas to a centralized groundwater treatment system. The groundwater treatment system consisted of source segregation of groundwater (dilute and concentrated), filtration, air stripping, bioreactors, and carbon adsorption polishers. The system was designed to meet the MTBE, BTEX, and TBA surface discharge limits and the treated effluent was discharged proportionately to two separate watersheds.

Honeywell Superfund Site Syracuse, NY
Managed an ex-situ thermal desorption program to assess technologies to remediate tar impoundments that contained distillation bottoms from an acid coke washing process. The tar had a hazardous classification and the primary constituents of concern included benzene,

naphthalene, methyl mercaptan, and sulfuric acid with a pH less than 1.0 S.U. Developed a synthetic fuel recycle process pilot program as part of the Focused Feasibility Study and managed a team for the design/build execution of a pilot scale program to thermally process the hazardous classified tar material for beneficial use as an alternative fuel source. The pilot program included the design and construction of a building and ventilation systems including segregated process and work space ventilation and treatment systems. The unit processes included the following: a heat-jacketed screw conveyor for viscosity conditioning and material conveyance; heat-jacketed paddle dryer for thermal desorption of the tar; chilled roll flaker for treated product conditioning and sizing; shell and tube condenser for off-gas recovery; and carbon adsorption for off-gas treatment and odor control. Additionally, utilities were designed and installed to support the process including hot water recirculation for the screw conveyor, hot oil recirculation for the paddle dryer, and cold water recirculation for the condenser.

Honeywell Superfund Site Syracuse, NY
Developed innovative leachate treatment process consisting of acidification, decarbonation, and chemical sequestering to condition leachate and minimize the fouling potential for the deep injection well. Assessed the subsurface geochemistry for functionality of a deep injection well for the disposal of the conditioned leachate.

Wyeth Superfund Site, Bound Brook, NY
Designed RCRA-approved landfill and leachate collection system. Developed plans and specifications for the excavation of soils from an impoundment and stabilization in the landfill using cement kiln dust, Portland cement, and fly ash. Solicited competitive bids from contractors and completed shop drawing review through construction.

Retail Petroleum Remediation Systems,57 Systems, NY-Metro
Principal engineer for the turnkey delivery of remediation systems at over 30 retail petroleum sites, including design, construction management, and start-up. Management of a team of engineers and remedial technicians to optimize and maintain product recovery, soil vapor extraction, air sparge, high vacuum dual-phase extraction, and ground water pump and treat systems. Developed and steward system integrity/safety programs.

Large-scale Ground-water Pump and Treatment Facility, Smithtown, NY
Principal engineer for the design, construction, operation, and maintenance of a 0.5 MGD groundwater treatment facility. The facility is fully integrated with a web-based SCADA system with unit processes consisting of recovery wells, influent aeration and equalization, filtration, air stripping, carbon adsorption, and recharge gallery infiltration. The system was designed to meet the New York State Department of Environmental Conservation stringent Corrective Action Plan requirements for the capture, removal, and treatment of methyl tertiary butyl ether (MTBE) from the regional aquifer. Facility construction capital cost approximately $3M with annual O&M cost over $2M.

Water/Wastewater Treatment Systems

Corning, Inc. Corning, NY
Managed project team for the design from concept through engineering and construction of an integrated high purity water and wastewater treatment facility. The system was designed to support the manufacture of diesel ceramic filters in a 400,000 sf manufacturing facility. The high

purity water treatment system unit processes consisted of water softeners, reverse osmosis, equalization, and distribution. The wastewater treatment unit processes consisted of fluoride treatment with microfiltration and total suspended solids treatment with polymer addition and an inclined plate clarifier. The sludge from the microfilter and the clarifier was dewatered using a plate and frame filter process and the final effluent was polished with pH neutralization prior to discharge. The system was fully automated using a Supervisory Control and Data Acquisition (SCADA) system.

DOE Facility, Schenectady, NY
High purity water treatment system at a secure DOE facility. Designed system from the concept through engineering and construction for the replacement of an existing dual-bed ion exchange demineralizer system with a two-pass reverse osmosis system. The process water was used as make-up water to support processes for nuclear submarine training. Approved for level "L" security clearance.

GE Aircraft Engines, Lynn, MA
Consolidated drainage system upgrades. Designed and constructed gravity storm drainage conveyance systems, existing vault wet well rehabilitation, and duplex submersible pump station. The stormwater conveyance system was integrated into an on-site treatment system that polished the water using dissolved air flotation (DAF) and activated carbon prior to discharge.

Eaton, Matamoros, Mexico
Developed design/build engineering package for a pre-fabricated sanitary wastewater treatment system, lift station and conveyance system. The sanitary wastewater system consisted of extended aeration chamber and sludge dewatering.

Philips Display Components, Torreon, Mexico
Designed the full-scale system for an integrated zero-discharge high purity water/wastewater treatment and recycle facility. Developed a wastewater source segregation strategy for focused treatment for optimal recycle and reuse. The segregated wastewater consisted of general, acidic, organic, and chrome. The general wastewater treatment consisted of solids removal using an inclined plate clarifier and pH adjustment. The acidic wastewater was treated using a two-stage lime and calcium chloride addition process for pH adjustment as well as polymer addition and inclined plate clarifier for solids removal. The organic wastewater was treated using pH adjustment and ferrous sulfate and hydrogen peroxide addition for Fenton's reagent oxidation. The chrome wastewater was treated using pH adjustment and sodium metabisulfite to reduce hexavalent chrome to trivalent chrome and lime addition for the precipitation and removal using an inclined plate clarifier. The sludge from the general and acidic treatment processes was decanted in holding tanks and dewatered using a plate and frame filter press for off-site landfill disposal. The sludge from the chrome treatment process was decanted in a holding tank and dewatered using a plate and frame filter press for hazardous waste disposal. The general and acidic wastewaters were recycled to the high purity water treatment system for reuse. The high purity water system consisted of equalization, filtration, contact organic removal, reverse osmosis, permeate storage and distribution, mixed bed demineralizers, and demineralized water storage and distribution with UV sterilization.

Robert Bosch Braking Systems, Sumter, SC
Wastewater treatment system upgrades for regulatory compliance. Analyzed data and evaluated

treatment alternatives for paint process wastewater to meet MP&M and local discharge requirements. Developed plant modifications to improve the Autophoretic paint process and minimize the wastewater requiring treatment.

Process Design

Bristol Myers Squibb, Barceloneta, PR
Managed an on-site process engineering team to design and construct pharmaceutical maximum achievable control technology (MACT) process vent, scrubber, and thermal oxidizer upgrades. The project included the design/build construction of facilities to support manufacturing upgrades associated with the Pharm MACT compliance project. Developed design and managed the construction of segregated extraction and process vent headers as well as the site-wide vent header to the site thermal oxidizer and acid gas scrubber. Evaluated TOU heat load and volumetric capacity based on manufacturing facility operations. Integrated the process scrubbers and the thermal oxidizer into the site Supervisory Control and Data Acquisition (SCADA) system. Developed design and coordinated with vendors to implement a continuous emissions monitoring system (CEMS). Developed a testing protocol and managed the successful execution of a test to validate the thermal oxidizer destruction removal efficiency, acid gas scrubber operation, and CEMS that consisted of loading the system with methanol and methylene chloride for three repeatable tests.

Dynegy, Newburgh, NY
Managed the concept through final design for the implementation of a pre-coat condensate polisher system and piping upgrades to optimize the operational performance of a 145 and 250 MW coal-fired power generation facility. The pre-coat condensate polisher was designed to treat the recirculated condensate for dissolved inorganic species as well as suspended solids using ion exchange resin coated on a filter.

Church & Dwight, Inc., North Brunswick, NJ/Kansas City, MO
Managed project team to develop concept through final design for a surfactant sulfation process as part of laundry detergent manufacturing. The process involved the sulfation of two types of non-ionic surfactants (ethoxylated alcohol) using 99% sulfuric acid with a viscosity modifier. The process involved an in-line reaction with the transfer of two types of non-ionic surfactant and 99% sulfuric acid using positive displacement pumps and coriolis-effect type mass flow meters to control the reaction rate. The reactants were mixed in-line with a static mixer and the heat of reaction was controlled using a plate and frame heat exchanger and chiller. The sulfated surfactant was transferred to batch tanks for transfer to the bottling and distribution system. Prepared design/build cost estimates to implement the process at two active manufacturing facilities.

GE Aircraft Engines, Lynn, MA
Central coolant vacuum filtration system upgrade for an aircraft engine manufacturing facility. Provided on-site process engineering support for the design/build construction of central coolant system to distribute, filter and recycle machine coolant for milling and lathing workstations. The system included central vacuum filtration system with a cyclonic separator and distribution supply pumps.

Buckbee Mears, Cortland, NY
Supported engineering, procurement, and construction phases of a 400,000 square foot expansion of an aperture mask production facility.

BENJAMIN RIEGER

Environmental Scientist

Project Manager

Summary of Experience

Mr. Rieger is currently a program manager, based out of Kleinfelder's Connecticut and Massachusetts offices. His responsibilities include management of junior and senior staff working on more than 160 environmental projects across the New England region, programmatic client account management, scope of work and cost development, project coordination and implementation, direction and oversight of field activities and report preparation and review.

Mr Rieger oversees environmental data warehousing and geographic information systems in the Connecticut office. In this capacity Mr. Rieger facilitates the collection of spatial data and the integration of spatial data with an EPA Region 5 format environmental database.

Mr. Rieger has conducted and/or supervised subsurface investigations on more than 50 commercial petroleum sites in Connecticut, Massachusetts, New Hampshire, New York and Rhode Island. Responsibilities have included historical and regulatory research, design and implementation of sampling programs for soil, soil vapor and groundwater, well installation (monitoring wells, multi-level piezometers, bedrock wells), data evaluation and report preparation and review.

Mr. Rieger designed and supervised feasibility testing for remediation system design including soil vapor extraction, air sparging, and groundwater pump and treat at multiple petroleum impacted sites in Connecticut and Rhode Island.

Mr. Rieger has installed environmental remediation systems to address soil and groundwater contamination at various petroleum sites in Connecticut, Rhode Island and New Hampshire. These installation included contractor safety oversight and system performance optimization during the initial period of operation.

Education

BS, Biology, Houghton College, New York, 1997
MS, Environmental Studies, State University of New York System : College of Environmental Science & Forestry, New York, 2002

Professional Affiliations

National Groundwater Association
Environmental Professionals of Connecticut
Urban Land Institute

Select Project Experience

The following is a representative selection of Benjamin Rieger's project experience.

Assessment & Remediation

Gasoline Release at an Active Retail Gasoline Facility

Mr. Rieger is in the process of conducting a subsurface site assessment to determine the potential for offsite migration of a contaminant plume in an aquifer with known drinking water wells and no alternative source of drinking water. A series of multilevel piezometers were installed to just above the bedrock surface. Relative piezometric surfaces from the multilevel wells along with contaminant concentrations in these wells will be used to determine the extent and flow path of the plume.

MTBE Impacted Bedrock Aquifer

Mr. Rieger oversees groundwater monitoring and remedial system operation for a property currently under a Connecticut Department of Environmental Protection Consent Order. He evaluates data from site monitoring wells and twenty three active drinking water wells. He manages interaction with State and Local regulators and residents. The groundwater extraction system has pumped and treated in excess of six million gallons of water. Contaminant concentrations surrounding bedrock wells have decreased by four orders of magnitude during system operation.

Pilot Testing of a Subslab Liquid Phase Petroleum Plume

Mr. Rieger designed and executed an assessment and remediation feasibility study for LNAPL plume that has migrated under an occupied offsite building. Mr. Rieger coordinated with the offsite property owner to install ten monitoring wells and eight soil vapor sampling points within an active warehouse. Pilot testing was conducted within the warehouse. Mr. Rieger designed a remediation system to address the liquid phase petroleum and sub slab soil vapor. This system was designed to allow for all routine operation to be conducted on the client's property reducing the interference to offsite parties.

*Emergency Spill Response Activities
*

Mr. Rieger served as incident commander for a 21,000 gallon gasoline release in Rhode Island. Gasoline was release to groundwater surface in a excavation due to contractor error. Mr. Rieger coordinated response contractors, RI DEM spill response staff, two fire companies and GSC|Kleinfelder staff during the incident. Mr. Rieger was responsible for the Health and Safety of all personnel on site and in the surrounding neighborhood. Over the first two days of the response action approximately 18,000 gallons of gasoline was recovered.

MATTHEW PICKARD

Regional Health & Safety Manager

Certified Industrial Hygienist

Summary of Experience

Mr. Pickard is the Regional Health and Safety Manager for the Great Lakes Region. He is a Certified Industrial Hygienist, and is based out of the Newburgh, NY, office. He is responsible for the management of the corporate health and safety program in four area offices, and in addition, he is also responsible for the development and delivery of industrial hygiene services. His fields of competence include occupational health and safety program development, compliance and liability auditing, employee work task hazard evaluations, building decontamination and demolition, safety and industrial hygiene management, and accident investigation.

Education

BS, Environmental Toxicology/ Industrial Hygiene, Clarkson University, 1999

Registrations

Certified Industrial Hygienist (C.I.H.), No.9240CP, American Board of Industrial Hygienists, 2006

Professional Affiliations

Member of the American Society of Safety Engineers
Member of American Industrial Hygiene Association

Select Project Experience

The following is a representative selection of Matthew Pickard's project experience.

Key Projects

St. Lawrence River PCB Remediation Project - From 9/1/2001 To 9/16/2002
Mr. Pickard managed the health and safety for all land based operations involving 50 people at the St. Lawrence River PCB Remediation Project. This included, conducting scheduled and unscheduled field audits to ensure worker compliance with mandated health and safety/personal protective equipment procedures. Additionally, Mr. Pickard was responsible for health and safety plan development and compliance including field investigative techniques and accuracy of sampling methodology, equipment calibration and quality control procedures during the performance of remedial investigations.

Demolition of Defense Supply Center for the Department of Defense - From 2/1/99 To 8/2/99
Mr. Pickard managed the health and safety for demoltion activities involving 20 people at the Demolition of the Defense Supply Center. This included, conducting scheduled and unscheduled field audits to ensure worker compliance with mandated health and safety/personal protective equipment procedures. Additionally, Mr. Pickard was responsible for health and safety plan development and compliance including field investigative techniques .

Implosion of Three Rivers Stadium City of Pittsburgh - From 1/1/2001 To 5/22/2001
Mr. Pickard managed the health and safety of 200 individuals and 30 different subcontractors over three shifts at the Implosion of Three Rivers Stadium Project. Mr. Pickard's duties included, coordination of subcontractor activities, conducting scheduled and unscheduled field audits to ensure worker compliance with mandated health and safety/personal protective equipment procedures. Additionally, Mr. Pickard was responsible for health and safety plan development and compliance including field investigative techniques and accuracy of sampling methodology, equipment calibration and quality control procedures during the performance of remedial investigations.

New York City Transit Authority, Long Island Rail Road and Metro North Rail Roads - From 9/1/2002 To 9/2/2003
Mr. Pickard managed the health and safety of 200 individuals at multiple rail yards within the New York City Metropolitan area during the installation of new subway cars for the NYCTA, Long Island Railroad, and Metro North Railroads. Mr. Pickard was responsible for the generation and institution of a uniform Blue Flag Policy within his orgainization. Additionally, Mr. Pickard generated and instituted formal a Job Hazard Analyses Policy.

Environmental Health and Safety Audits for General Electric and NBC Universal
Mr. Pickard reviewed on-site records for injuries, training, and process specific activities. Work processes and on-site employee activities were observed. Recommendations for compliance were developed from record review and observations.

Industrial Hygiene Assessment of Tubing Manufacturing Facility - From 10/16/06 To 10/22/06
Mr. Pickard reviewed on-site records for injuries, training, and process specific activities. Work processes and on-site employee activities were observed. Recommendations for compliance were developed from record review and observations. Additionally, Mr. Pickard performed exposure assessments for operations involving cyclohexanone and soldering flux to assess employee exposure during these activities. Moreover, Mr. Pickard assisted the facility's Health and Safety committee in generating a Hazard Communication Policy.

Mold Investigations and Assessment of Indoor Air Quality
Mr. Pickard has inspected multiple office facilities. Varied construction types and different extent of water intrusion make each project unique. Mr. Pickard is experienced in visually identifying mold contamination and understands the different types of samples that can be collected to ensure that potential mold contamination is identified.

Drafted and Implemented Lead Health Protection Plans for the Demolition of Catenary Structures Transit Authority Railroad
Mr. Pickard drafted and implemented Lead Health Protection Plans for the abatement and demolition of various lead coated steel catenary structures. The plans included outlining acceptable work practices, engineering and administrative controls, determining similar exposure groups and instituting representative air monitoring and wipe sampling plans to assess employee exposures. Additionally, Mr. Pickard provided consultation on medical surveillance results and drafted and implemented a respiratory protection plan for those employees involved in lead emitting operations.

Hydrated Lime Exposure Assessment at Local Water Bureau
Mr. Pickard determined similar exposure groups and implemented a representative sampling plan for respirable dusts within individuals breathing zones during pH adjustment operations. Moreover, Mr. Pickard assessed the efficacy of the existing engineering controls and work procedures.

Exposure Assessment for the Application of Alkyd Base Enamel Paint
The exposure assessment consisted of the review of pertinent Material Safety Data Sheets (MSDSs), the review of existing standard operating procedures, and the subsequent generation and implementation of a personnel sampling plan outlining the chemical constituents of concern associated with Alkyd Oil Base Enamel with a volatile organic compound (VOC) mass to volume ratio of 380 grams/liter. Moreover, the use of dilution ventilation as an engineering control was assessed.

UST Removal Program
Mr. Pickard managed the health and safety for a UST removal program involving multiple retail gasoline sites. The managment of the program included, conducting scheduled and unscheduled field audits to ensure worker compliance with mandated health and safety/personal protective equipment procedures. Additionally, Mr. Pickard was responsible for the management of health and safety plan development and compliance including field investigative techniques. Moreover, Mr. Pickard oversaw the implementation of a behavior based safety system including the management of the incident investigation program.

Additional Experience

Conducted scheduled and unscheduled field audits to ensure worker compliance with mandated health and safety/personal protective equipment procedures.

Conducted facility audits for a variety of manufacturers to evaluate compliance with state and federal employee safety, health and environmental regulations.

Responsible for the development and implementation of health and safety procedures during the excavation and processing of chemical, biological and high hazard materials.

Evaluated worker exposures to a variety of chemicals for comparison to applicable permissible exposure limits and appropriate personal protective equipment.

Responsible for health and safety plan development and compliance including field investigative techniques and accuracy of sampling methodology, equipment calibration and quality control procedures during the performance of remedial investigations and corrective actions conducted at hazardous waste sites and various manufacturing and industrial facilities.

Supervised Lead-Based Paint (LBP) surveys to identify potential risks with both interior and exterior LBP.

Responsible for development and implementation of blue flag and railcar offloading policies and procedures in accordance with Federal Railroad Administration guidelines within an active rail yard and subsequent shops.

Seminars/Training

Emergency Program Manager IS-1.This independent study course provides an introduction to Comprehensive Emergency Management (CEM) and the Integrated emergency Management System (IEMS). Included is an in-depth look at the four phases of comprehensive emergency management; mitigation, preparedness, response, and recovery. The text is accompanied by illustrations, diagrams, and figures. In most units, there are worksheets, exercises, and tasks to complete.

Emergency Preparedness IS-2.This independent study course provides an introduction to Comprehensive Emergency Management (CEM) and the Integrated emergency Management System (IEMS). Included is an in-depth look at the four phases of comprehensive emergency management; mitigation, preparedness, response, and recovery. The text is accompanied by illustrations, diagrams, and figures. In most units, there are worksheets, exercises, and tasks to complete.

APPENDIX D

DEXSIL® Technical Documentation

DETERMINATION OF CHLORINATED HYDROCARBON CONCENTRATIONS IN SOIL USING A TOTAL ORGANIC HALOGEN METHOD

T.B. Lynn, J.C. Kneece, B.J. Meyer, A.C. Lynn, Dexsil Corporation, Hamden, Connecticut

Presented at the 13th Annual Waste Testing & Quality Assurance Symposium, July 6-9, 1997, Arlington, VA

ABSTRACT

Total organic halogen screening has been used extensively to quantify chlorinated organic compounds in soil and is the basis for a new EPA method — SW-846 Draft Method 9078 "Screening Test Method for Polychlorinated Biphenyls (PCB) in Soil". This method uses an organic solvent to extract the chlorinated organics from the soil and a Florisil column to remove any inorganic chloride from the extract. The extracted chlorinated organics are then reacted with metallic sodium and the resulting chloride ions are quantified using a chloride specific electrode. Using a commercially available field test kit (the L-2000 PCB/Chloride Analyzer™), the ability of this technology to measure concentrations of chlorinated pesticides and chlorinated solvents in soil was determined. The compounds investigated were: DDT, pentachlorophenol (PCP), toxaphene, chlordane, trichloroethylene, tetrachloroethylene. The L2000 response was found to be linear over the range 0-100 ppm for all analytes and the method detection limits for these analytes ranged from a low of 2.7 ppm for Chlordane to a high of 4.8 ppm for Trichloroethylene. The average extraction efficiency varied from 39% for PCP to greater than 90% for the chlorinated solvents.

INTRODUCTION

The procedure for total organic chloride analysis was originally developed for use on PCB contaminated soils and the L2000 has been used extensively since 1990 for this purpose. There is a fairly large body of data amassed demonstrating the effectiveness of the L2000 at quantifying PCB in soil.[1-7] The underlying principals, however, are equally applicable to other chlorinated organic compounds such as chlorinated solvents and chlorinated pesticides, most of which are regulated in some way.

The L2000 has, in fact, been used to measure other chlorinated compounds in soil. In the majority of these cases the end user has undertaken to validate the feasibility of the technology for their particular use. This validation information is usually site specific and not available to the general public. With the growing interest in the remediation of other chlorinated compounds in soil and the increase in information requests for L2000 chlorinated organics applications, we have undertaken a validation program for these applications of the L2000.

The first and most important step in a total organic halogen analysis, or any chemical analysis, is the extraction of the chlorinated compounds, quantitatively, from the soil matrix. Performing this step in the field, quickly and reproducibly, on the broad range of soil matrices typically encountered is not a simple task. The solvent system must be designed to handle everything from wet clay to bone dry organic material. Unlike other field analytical methods, the organic chlorine is converted to inorganic chloride in a non aqueous solvent. (The chloride ions are then extracted for quantification using a chloride specific electrode.) The solvent can, therefore, be easily tailored and optimized for a particular application.

The standard L2000 procedure uses a proprietary organic solvent that is polar enough to penetrate a wet clay matrix to solvate the PCB, but is itself not soluble in water. Water is added to the system to help partition the inorganic chloride into the water layer and away from the solvent layer. A Florisil column is used to remove any residual water and inorganic chloride from the extract.

This solvent/clean-up procedure has been shown to be effective at extracting PCB from most types of soils.[1-7] In some types of heavy clay soils with high water content, the extraction efficiency may be lowered and some of the more polar chlorinated organic

compounds are removed by the Florisil column. Dexsil has developed an improved alternative two-step extraction procedure that has been shown to efficiently extract PCB from wet clay soils and can also be used on polar compounds such as PCP.[8] This system uses both a polar and a non-polar organic solvent combination and an aqueous / organic solvent partition step. An optional Florisil clean-up step can be added if the analyte is not one of the polar chlorinated organics such as PCP or if PCP is considered an interfering compound.

In this study all of the non-polar compounds were analyzed using the standard solvent system and the alternative system was used to analyze the PCP contaminated soils. PCP was analyzed in this study using the alternative solvent system to demonstrate the flexibility of the L2000 solvent system.

Following the solvent extraction and clean-up (if necessary), the extract is reacted with metallic sodium in the presence of a catalyst. This removes the covalently bonded chlorine from the organic backbone producing chloride ions. The chloride is then extracted into an aqueous buffer and then quantified using a chloride specific electrode. The user can select a standard conversion factor for one of the typical PCB Aroclors to quantify the chloride ions as "equivalent Aroclor". The actual chlorine content of the original sample can be also be displayed. Using the chlorine content of the specific analyte, the equivalent concentration of the specific contaminant can be determined. Because the response of the instrument follows the standard Nernst equation and the quantified result is the chlorine content of the sample, any chlorinated organic compound can be quantified knowing only the percent chlorine in the compound. If the contaminant is unknown at the time of measurement, the results can later be converted using a simple linear transform, once the contaminant has been identified.

This study is the first in a series documenting the performance of the L2000 in new applications. Starting with the fundamental information required to determine if the L2000 technology is suitable for a particular application we have limited the scope of this investigation to determining: the method MDL, the range of linearity, and the extraction efficiency for a few of the most commonly encountered, regulated, chlorinated compounds. We have used laboratory spiked soils to simplify the experimental considerations.

EXPERIMENTAL

Preparation of Spiked Soil Samples

To ensure a consistent soil matrix throughout the spiking experiments, a large batch of composite soil was prepared prior to beginning. To simulate soils found in uncontrolled waste contaminated environments, the soil composite was prepared by mixing two types of clay and one type of sand. Each of the three soils were sifted through an 0.850 µm sieve, and then combined in a 1:1:2 ratio to form the composite.

The method of spiking depended on the particular analyte characteristics. For the non polar, semi-volatile compounds, DDT, toxaphene, and chlordane, a 1% stock solution in chlorine free mineral oil was prepared. PCP, being more polar, is not soluble in mineral oil; therefore, methanol was used to make up the 1% stock solution. The soils were spiked at 100 ppm by adding 5 grams of the 1% stock solutions to 500 gram aliquots in aluminum pans. The spiked soil aliquots were then slurried with hexane (or, in the case of PCP, methanol) and allowed to evaporate overnight in a hood space. The soils were then transferred to 16 oz glass jars and tumbled for one hour. The jars were then stored at room temperature for later use.

For each experiment, soils were prepared with the desired contaminant concentration by mixing together the correct proportions of the 100 ppm spiked soil and clean composite soil. The mixture was then tumbled for an hour prior to use.

Spiking soils with volatile solvents, uniformly and reproducibly, presented a formidable challenge. In previous work, all attempts to produce a quantity of soil, uniformly spiked, without loss of the analyte proved to be ineffective. Therefore, for the volatile solvents, trichloroethylene and tetrachloroethylene, each 10 gram soil sample was spiked, using a microliter-syringe, just prior to analysis.

Method Detection Limit Determination

The L2000 method detection limits for each of the chlorinated compounds were determined from replicate analysis using the method prescribed by the EPA[9]. An estimate of each of the detection limits was made using the concentration equivalent of three times the standard deviation of replicate measurements of the analytes in the composite soils. Soil was then spiked at the estimated detection limit. The spiking concentration for each of the chlorinated compounds are listed in Table 1 below:

Table 1: MDL Soil Spiking Concentrations

Analyte	Spiked Level	Percent Chlorine	Soil Chlorine Content
)DT	5 ppm	50.0	2.5 ppm
'CP	30 ppm	66.6	20 ppm
oxaphene	5 ppm	~68	3.4 ppm
Chlordane	5 ppm	69.2	3.5 ppm
richloroethylene	16 ppm	81	13 ppm
etrachloroethylene	24 ppm	85.5	20.5 ppm

Each of the spiked soils were analyzed seven times using the standard extraction method, or the alternative solvent method in the case of the PCP contaminated soils. Seven matrix blanks were also analyzed using each method. The average blank measurements were subtracted from the respective sample measurements. The MDL was then computed using the following formula:

$$MDL = t_{(n-1*1-a=0.99)}*S$$

where: t = the students t value
S = the standard deviation of the replicate analyses

The student's t value for 6 degrees of freedom at a 99% confidence interval used was 3.143. The mean recovery for each analyte was calculated by dividing the measured concentration by the theoretical concentration of analyte.

Response Curve Determination

In addition to the stock soil spiked at 100 ppm, standards were prepared in the composite soil at 2, 5, 10, 20, and 50 ppm of each of the chlorinated solvents and pesticides. Standards were analyzed on the L2000 using the standard extraction method, except for PCP which was analyzed using the alternative extraction method. A reagent blank was run with each analyte. These data were then compared to analysis by gas chromatography. The extraction for the DDT, PCP, chlordane and toxaphene samples to be measured by gas chromatography at the following concentrations: 2, 5, 10, 20, 50, and 100 ppm was performed by adding three 10 mL aliquots of 1:1 acetone-hexane solvent to 5 gram aliquots of each of the spiked semi-volatile soils while rinsing each soil with each addition. The solvent was then removed from the soil and run through a polypropylene filter into a 25 mL volumetric flask. The volume was filled to the mark with excess 1:1 acetone-hexane. The solvent was then transferred to another 25 mL glass test tube and capped with a teflon cap, then centrifuged to remove remaining soil particles, and prepared for gas chromatography analysis. The extraction method used for the soils spiked with volatile analytes, trichloroethylene and tetrachloroethylene, utilized 10 mL methanol mixed with 5 grams of soil at each of the concentrations 2, 5, 10, 20, 50 and 100 ppm. The methanol was then removed from the soil and the samples were then prepared for gas chromatography. The results were then analyzed and compared to the results obtained from the L-2000 analysis.

RESULTS AND DISCUSSION

Method Detection Limits

The MDLs calculated from the replicate analysis of spiked soils were within the recommended range for all analytes. (See Table 2 on page 4). The MDLs calculated for the non-polar compounds using the standard analysis method ranged from a low of 2.7 ppm for Chlordane to a high of 4.8 ppm for Trichloroethylene and 4.4 ppm for Tetrachloroethylene. The semi-volatile MDLs being all lower than the MDLs for the volatile compounds. A contributing factor to the higher

Table 2: MDL Results				
Analyte	**Spiked Level**	**Mean Recovery**	**Replicate Standard Deviation**	**Calculated MDL**
DDT	5 ppm	54%	1.15 ppm	3.6 ppm
PCP	30 ppm	56%	2.8 ppm	8.7 ppm*
Toxaphene	5 ppm	37%	0.91 ppm	2.8 ppm
Chlordane	5 ppm	57%	0.85 ppm	2.7 ppm
Trichloroethylene	21 ppm	102%	1.54 ppm	4.8 ppm†
Tetrachloroethylene	23 ppm	110%	1.3 ppm	4.4 ppm†

*Determined using the alternative extraction method.
†Determined using a direct spiking method.

MDLs for the two volatile compounds was the difficulty in preparing the spiked soils. This was not unexpected, given the difficulty of working with volatile compounds in the field.

The MDL of 8.7 ppm calculated for the analysis of PCP was higher than expected. This may have been due to low extraction efficiency of the new solvent system on polar compounds. A low extraction efficiency indicates that the combination solvent was not able to penetrate the soil matrix to completely solvate the more polar PCP. In this type of a situation the analyte recovery is very sensitive to the exact handling of each sample replicate. Small changes in the shaking of the extraction tube or the length of extraction will have a larger effect on the recovery than is acceptable.

While the new solvent system facilitated the analysis of polar compounds, this sensitivity to extraction conditions is not a desirable characteristic. It produces variable results in the field and it indicates that the extraction efficiency will vary excessively with soil matrix. A second generation two-step alternative solvent system has been developed8 and will be the subject of the next phase of this project.

Response Linearity

For each of the analytes investigated, the response of the L2000 using either solvent system was found to be linear over the range of concentrations studied. The resulting R^2 was greater than 0.96 for all analytes. (See Figures 1- 6). This indicates that the extraction efficiency is consistent over this analyte range. The results from the L2000 can, therefore, be corrected using the known recovery. There is no indication from this data that the range of linearity is limited to 100 ppm.

Extraction Efficiency

Data on the extraction efficiency of both solvent systems were obtained from the MDL determinations at a single point and from the response curve determination. The single point and the response curve determination of average extraction efficiency correlated well over the range 0-100 ppm.

Table 3: Extraction Efficiency		
Analyte	**MDL Mean Recovery**	**Average Recovery (from slope)**
DDT	54%	52%
PCP	56%	39%
Toxaphene	37%	65%
Chlordane	57%	70%
Trichloroethylene	102%	112%
Tetrachloroethylene	110%	112%

Summary

In this study it has been shown that the L2000 can be used effectively to analyze soil for chlorinated volatiles and semi-volatiles. The method detection limits were shown to be in the low ppm range. This should be adequate for most contaminated sites. The response has been shown to be linear over the range of concentrations studied and a good correlation with lab methods demonstrated. A new solvent system suitable for polar organic compounds was shown to be promising. The effectiveness of a second generation two-step solvent system, demonstrated in a separate study, will be the subject of phase two of this project. Furthermore, the list of suitable chlorinated compounds will be expanded and the effectiveness of the new alternative solvent system on other chlorinated compounds will be investigated. The analyte concentration range will also be extended to 2000 ppm, the upper limit on the L2000's quantification range.

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2 "PCB Determination, Simple/Low Cost or Complex/Expensive, Which Method is the Most Reliable in the Field?", S. Finch, pp. 45-1 to 45-4; Proceedings: 1991 EPRI PCB Seminar.

3 "Application of a New PCB Field Analysis Technique for Site Assessment", Roger D. Griffin-Griffin Environmental; Proceedings of Hazmacon '92 March-1992.

4 "A Comparison of Popular Field Screening Methods for PCB Contamination in Soil", Alvia Gaskill-Environmental Reference Materials, 1993 EPRI PCB Seminar.

5 "Comparison of the Response of PCB Test Methods to Different PCB Aroclors", Stephen Finch-Dexsil Corporation; Proceedings of "The Tenth Annual Waste Testing and Quality Assurance Symposium", July 11-15, 1994 Arlington, VA.

6 "Effect of Transformer Oil & Petroleum Hydrocarbons as Interferences in Field Screening for PCB Contamination of Soil", Alvia Gaskill; Proceedings of "The Tenth Annual Waste Testing and Quality Assurance Symposium", July 11-15, 1994 Arlington, VA.

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8 "Improved Extraction Efficency of Polychlorinated Biphenyls from Contaminated Soil Using a total Halogen Screening Method, W.S. Schutt-Young, A.C. Lynn, T.B. Lynn, M.J. Krumenacher, Manuscript Submitted.

9 *Definition and Procedure for the Determination of the Method Detection Limit,* Environmental Protection Agency Publication, 40 CFR Ch.1 (7-1-89 Edition), Appendix B, part 136, 525-527.

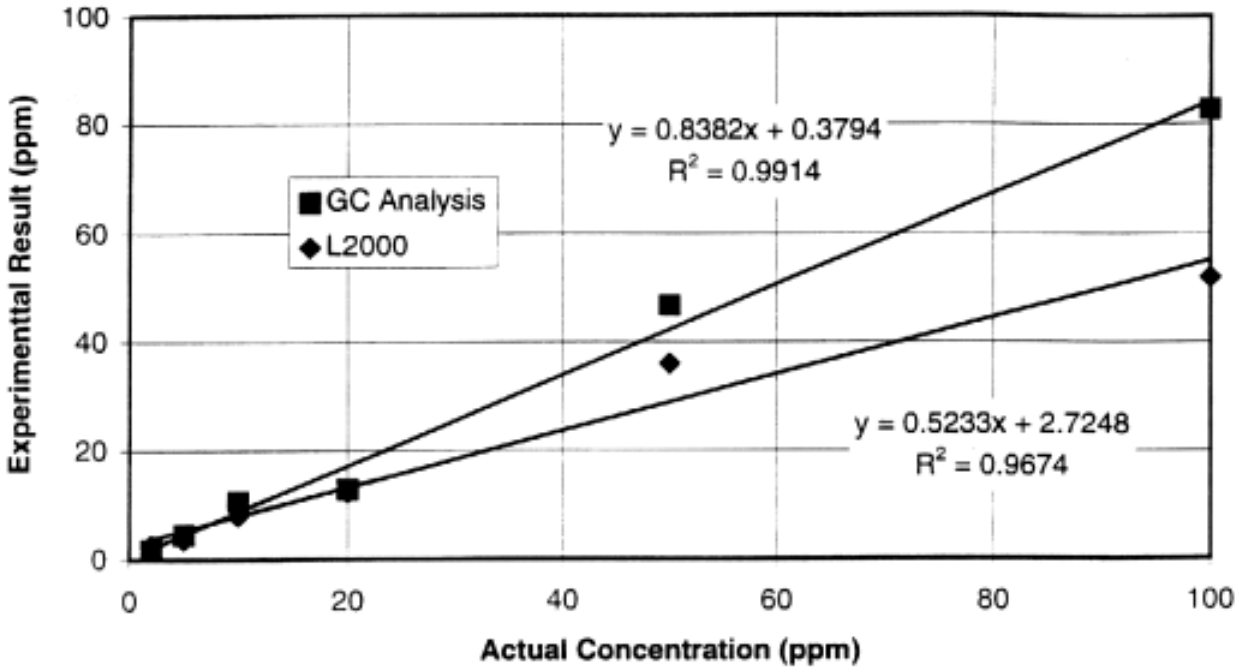

Figure 1: Response Curve for DDT

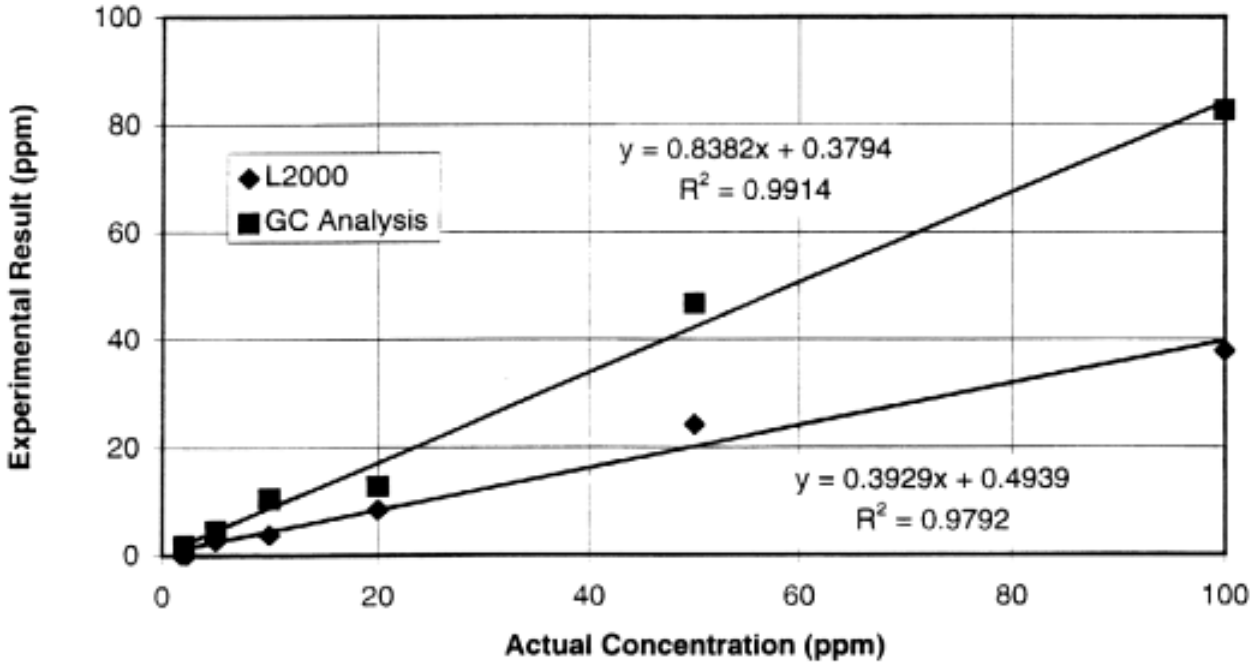

Figure 2: Response Curve for PCP

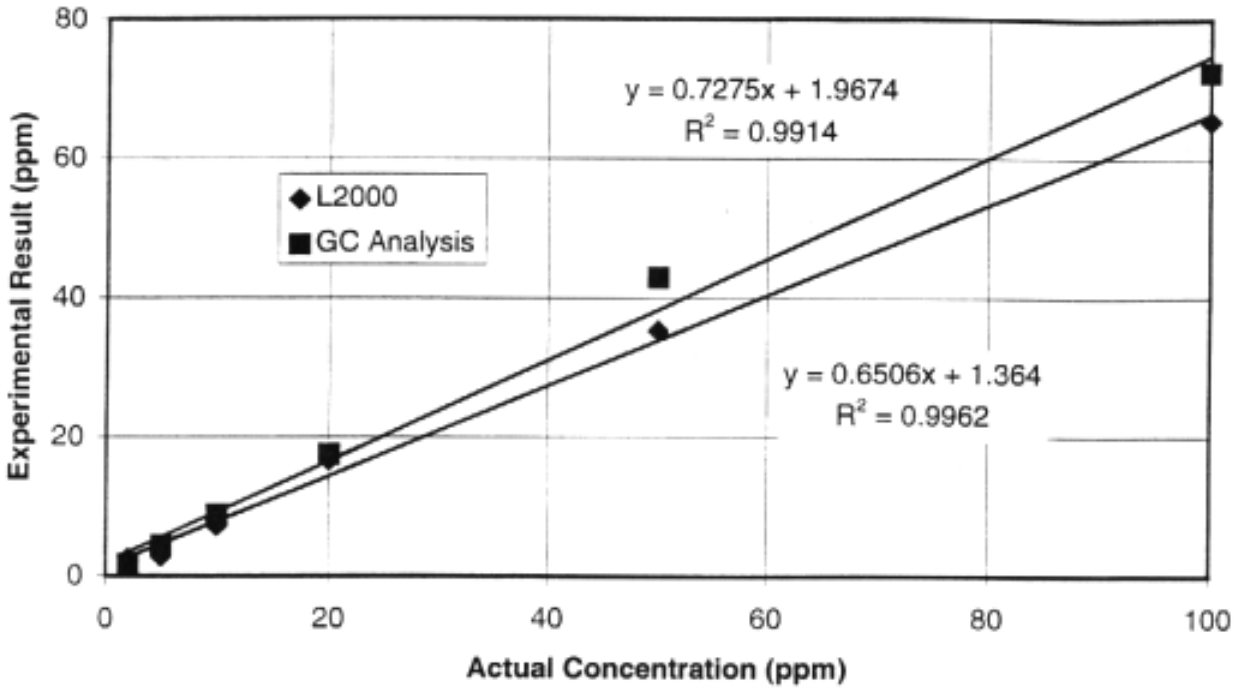

Figure 3: Response Curve for Toxaphene

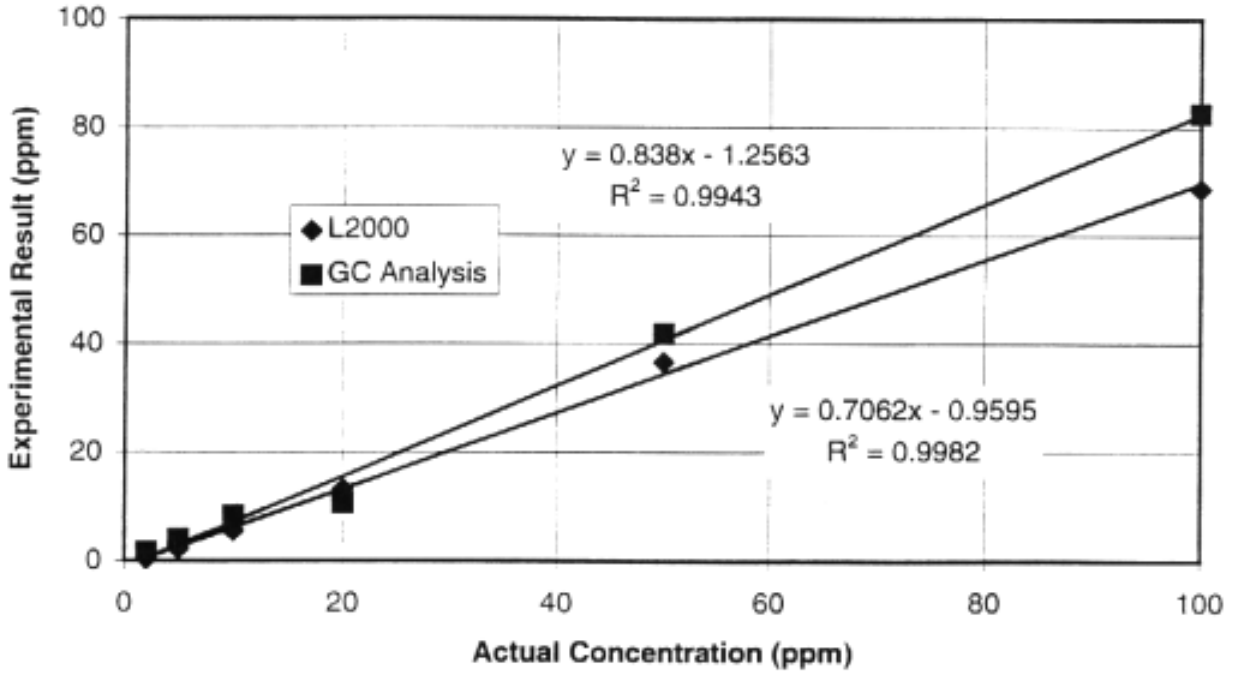

Figure 4: Response Curve for Chlordane

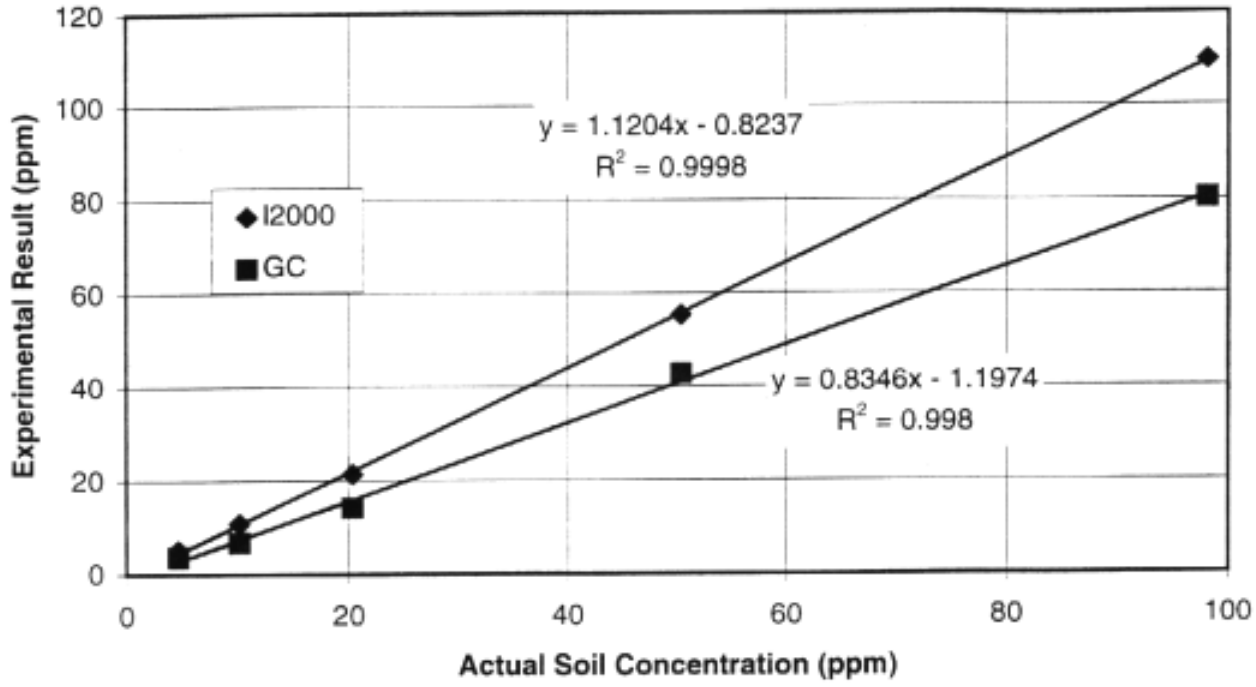

Figure 5: Response Curve for Trichloroethylene

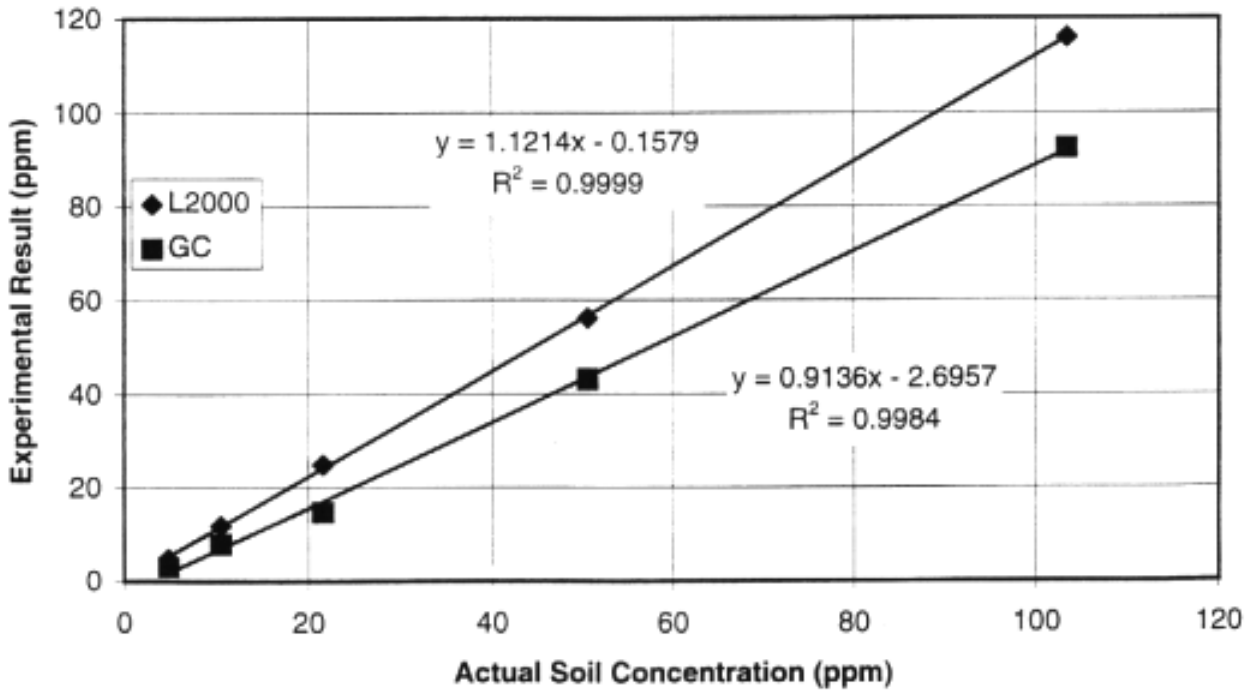

Figure 6: Response Curve for Tetrachloroethylene