ARCADIS
Infrastructure, environment, facilities

**NCR Corporation**

# Assessment of Recent Soil Vapor Investigations in the South Hill Area of Ithaca, New York

February 2008

ARCADIS

# Assessment of Recent Soil Vapor Investigations in the South Hill Area of Ithaca, New York

Prepared for:
NCR Corporation

Prepared by:
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017

Our Ref.:
B0066501

Date:
February 2008

# Table of Contents

## Figures



## Appendices

# 1. Introduction

## 1.1 General

This report has been prepared on behalf of NCR Corporation (NCR) to assess on-going vapor intrusion evaluations conducted in the South Hill area of Ithaca, New York by the New York State Department of Environmental Conservation (NYSDEC) and Emerson Power Transmission (Emerson). This report has been prepared in response to a January 11, 2008 letter issued by the New York State Department of Environmental Conservation (NYSDEC) addressed to Ms. Maureen Crough of Sidley and Austin, LLP. In this letter, the NYSDEC alleges that soil gas samples collected in the vicinity of the Danby Road sewer ("Danby Sewer Line") contain elevated concentrations of volatile organic compounds, specifically trichloroethylene (TCE), and suggests that the source of these elevated TCE concentrations in soil gas is the result of past discharges of TCE from the former NCR facility located at 950 Danby Road in Ithaca, New York ("950 Danby Road") to the sanitary sewer system. Additionally, the January 11th letter suggests that the elevated concentrations of TCE in soil gas may result in off site soil vapor concerns in the vicinity of Danby Road.

A depiction of 950 Danby Road, the adjacent Emerson facility, and the associated soil vapor sample results is included as Figure 1.

Based on our review of information evaluated during the preparation of this report, it is highly unlikely that NCR is responsible for elevated levels of soil vapor offsite of 950 Danby Road. Key reasons for our conclusion are the following:

- The discharge of TCE by NCR via the sanitary sewer system has not been established. In contrast, historic discharges of TCE to the sanitary sewer system by Emerson have been documented.

- Hydro-geology and contaminant fate and transport mechanisms associated with the known subsurface Emerson facility TCE contamination remain incompletely explored. Many of the conclusions drawn and inferences made in the WSP Environmental Strategies Supplemental Remedial Investigation; December 7, 2007 (WSP SRI Report) are based on incomplete data. The unanswered questions about the hydro-geology and contaminant fate and transport are critical due to the significant possibility that contamination from the Emerson facility is the source of elevated soil vapor concentrations near the Danby Road Sewer Line

north of the Emerson facility. TCE in groundwater from the Emerson facility could readily volatilize and migrate along portions of the Danby Sewer Line[1].

- No information supports the theory that the bedding along the Danby Road Sewer Line is contaminated with residual TCE. Accordingly, there is no support for the theory that TCE is volatilizing from the sewer bedding material and migrating along the Danby Sewer Line.

- Multiple existing sewer laterals are connected to the Danby Sewer Line and may well have historically conveyed chemicals (including TCE) into the Danby Sewer Line. Two of these laterals are connected to manufacturing facilities (Emerson and Therm) that have been required to monitor TCE discharges to the sanitary sewer system. The allegation that NCR is responsible for TCE discharges to the sewer that may result in vapor intrusion concerns is unsubstantiated and fails to properly take into account other sources.

- Significantly elevated concentrations of TCE containing soil vapor have been collected along sewers laterals originating at both the northern and western areas of the Emerson facility. These elevated concentrations were recorded prior to the point of flow from the Emerson Sewer Line commingling with flow from the Danby Sewer Line.

- Numerous Areas of Concern (AOCs) have been identified throughout the Emerson facility including several drum disposal areas. It is possible that subsurface contamination resulting from drum disposal areas, or other disposal areas, near the southern portion of the Emerson property are the source of elevated concentrations of TCE in soil vapor in the vicinity of soil vapor sample SV-51 near the Danby Sewer Line (see Figure 1).

- Based on the information summarized above, ARCADIS thinks that the most likely source of TCE in soil vapor along the Danby Sewer Line originates on the Emerson property or is due to the off site migration of TCE northwards from the Emerson property.

---

[1] Additionally, the WSP SRI Report does not confirm that 950 Danby Road is the source of elevated concentrations of TCE containing soil vapor based on sound interpretation of technically definitive data.

### 1.2 Report Organization

This report is organized as follows:

- Section 1 presents an introduction and an overview of the information reviewed.
- Section 2 presents our review of the hydro-geologic data presented in the WSP SRI Report as it pertains to the subsurface geology and fate and transport mechanisms of TCE as a potential source of vapor intrusion.
- Section 3 presents an evaluation of the sewer pipe network north of 950 Danby Road relative to the soil vapor investigation.
- Section 4 presents our review of soil vapor data available to us for review along the Danby Sewer Line and residential neighborhood to the north of the Emerson facility.
- Section 5 presents an evaluation of additional data that may be pertinent to potential vapor intrusion source areas.
- Section 6 presents our summary and conclusions.

### 1.3 Review and Interpretation of Data and Reports

ARCADIS reviewed numerous reports, data sets, and other publicly available information that may pertain to TCE soil vapor concerns in Ithaca's South Hill area. Specific information reviewed during the preparation of this report is identified below.

- WSP Environmental Strategies Supplemental Remedial Investigation, December 7, 2007 (WSP SRI Report)
- WSP Environmental Strategies Soil Vapor Testing Report, August 17, 2007
- S&W Redevelopment Report, August 10, 2007
- Various Soil Vapor Samples Collected by EA Engineering, Science, and Technology on Behalf of NYSDEC
- NYSDEC Spills Database
- Right to Know Network Databases

- Aerial Photographs
- Remedial Actions Implementation Report Petroleum-Containing Soil and 2-Phase Extraction (Radian 1997)
- Onsite Assessment of Former Borg Warner - Morse Chain Facility (ESC 2005)
- Summary of Drum Recovery and Soil Sampling Activities (ESC 2005)

Additional information regarding the above referenced reports and reference materials is provided in Appendix 1.

## 2. Hydro-Geologic Evaluation

### 2.1 General

ARCADIS has performed an evaluation of the hydro-geologic related sections of the WSP SRI Report dated December 7, 2007, including selected appendices. Specific portions of the SRI Report reviewed by ARCADIS are identified in Appendix 2.

The focus of our evaluation was to understand the conceptual site model for groundwater movement and contaminant transport relative to subsurface TCE contamination for the Emerson property and the property to the north developed in the report; however, as described in subsequent sections of this report, no such model was explicitly presented.

The report does not contain all of the components of a Remedial Investigation (RI) as presented in the USEPA RI/FS guidance document (1988), and therefore is not considered (nor intended to be) a comprehensive RI report. The sections of the report addressing the hydro-geologic issues included little interpretation or discussion of how the data related to "the big picture". In many instances where some interpretations were made, they were often not well supported by either a rationale or the data. Additionally, WSP did not incorporate the data collected during previous investigations (e.g., the Remedial Investigation ["Stages 1 and 2"] conducted by Radian Corporation) into their assessment.

Based on the above observations, as well as the information provided in the WSP SRI Report, the report does not adequately characterize groundwater movement in the bedrock beneath the study area, or the extent and movement of contamination. The authors make certain implications regarding NCR's potential contribution to groundwater contamination in the area that cannot be substantiated if groundwater movement and quality are not sufficiently understood, which they are not. ARCADIS recommends that a report be prepared that analyzes all of the available hydro-geological and contaminant data, develops a thorough conceptual model for groundwater movement, and contaminant extent, fate, and transport. If WSP has such an understanding, it is not conveyed in the SRI Report. For WSP to substantiate any claims made regarding the contribution of alleged leaks from the Danby Sewer Line to groundwater contamination (or from groundwater to vapor) in the area, they would first need to establish that leaks occurred and second to rely on considerably more than the analysis presented in the WSP SRI Report.

The following presents more specific findings of our evaluation.

### 2.2 Geology/Groundwater Movement Evaluation

Within Section 2.0 of the WSP SRI Report, the discussion of site geology is general in nature. Considerable attention is given to hydro-stratigraphic zones in the bedrock[2] and to joint measurements. No discussion on how groundwater moves through and between these zones is presented here, or anywhere else in the report. The focus on joints (near vertical fractures in the rock) here and elsewhere in the report suggests they are the dominant feature controlling groundwater movement in the bedrock; however, no coherent argument supporting this suggestion is presented. Also, the locations of the 25 joint-orientation measurements made by WSP are not provided in the report.

The subsection on site hydrogeology (2.3), which consists of only two sentences, is too general to be of much use.

Throughout the remainder of the report, no comprehensive discussion of the nature of groundwater movement through the rock is presented. The major pathways for groundwater movement are inferred to be near-vertical joints and near-horizontal bedding plains; however, a conceptual model that integrates available information on these different types of fractures into a coherent picture of how the fracture network would be expected to affect groundwater movement is not presented. As noted above, considerable weight is afforded to joints; however, the relative importance of bedding planes regarding groundwater movement is not discussed. For example, it is possible that bedding-plane fractures could potentially be the most significant feature with respect to lateral movement of groundwater, with the joints serving primarily as pathways for water to enter (or leave) them. Also, the dip direction of bedding is an important element of the bedrock characterization that is not explicitly addressed. The report does make one reference to a "structural feature" that "…was near parallel to bedding plane [sic], with a dip measured at 28° NW" (p. 46). This information came from information provided in Appendix H, which provides estimated dip angles and directions for fractures identified in optical televiewer logs of boreholes. Dr. Dan Karig, former chair of the Geology Department of Cornell University, notes that the regional dip of bedding in the area is approximately 50 feet per mile (i.e., 0.5°) to the south (pers. com., February 12, 2008). In reviewing the fracture dip/direction data provided in Appendices D and H, the majority of fractures (62%) are reported as having a dip angle

[2] Previously identified by Radian Corporation.

of 10° or less; however, no consistent dip angle or direction is evident. This may be due to the fact that errors in measuring strike and dip are much greater for slightly dipping features than for steeply dipping features (Keys, 1990).

Detailed information required to reasonably characterize groundwater movement in fractured rock (e.g., hydraulic conductivity data, matrix and fracture porosity, vertical head distribution, tracer tests to measure groundwater flow velocities, heat-pulse flow meter logs to identify hydraulically significant fractures in boreholes, fracture spacing and aperture data) is either not presented or not evaluated in the context of overall groundwater movement. Groundwater movement in the bedrock is likely to be complex.

The approach used by WSP to evaluate groundwater movement in the bedrock (e.g., a contour map of hydraulic head distribution) is one of “equivalent porous medium” or “EPM”, that is, the bedrock is assumed to be sufficiently fractured to represent a porous medium. The information presented does not support this assumption. This has serious implications regarding the report’s conclusions about groundwater movement, and the data used to draw such conclusions. It is inappropriate to treat the bedrock as an EPM. The “standard” investigation approach used by WSP (e.g., head measurements and groundwater-quality samples collected from traditional monitoring wells) is probably inadequate to characterize and/or monitor groundwater movement as well as contaminant concentrations for the purposes of regulatory monitoring or site remediation (Muldoon and Bradbury, 2005).

Even if an EPM approach can be demonstrated to be valid at this site, there are several problems with the “Groundwater Contour Map” (Figure 10 in the WSP SRI Report). To be useful, such a map must target a relevant potentiometric surface (such as the water table). Looking at the well-construction and water-level data contained in the report, the data used to construct the map appear representative of the water table. However, including data from wells screened 20 feet or more below the water table, (e.g., well MW-44T) is inappropriate in situations where there may be a significant vertical hydraulic gradient (such is the case at this site).

Additionally, the report presents no discussion on the effect of pumping the extraction wells near the Fire Water Reservoir; therefore it is unclear how operation of that pumping system affects groundwater movement, and what groundwater is being captured by it.

Lastly, included among the five objectives of the report listed in Section 1.0 is the following, "evaluating potential groundwater discharge areas north of the site." From this description, it is unclear what was being evaluated (was an objective to evaluate whether the area was, in fact, a discharge area, or rather to characterize the quality of groundwater and soil vapor in this area?) It appears only one such area was identified, being located "…along the lower portion of Turner Place and East Spencer Street." Two wells were installed near one another in this area, MW-34B and MW-37B. MW-34B is screened entirely in the bedrock, including weathered and more competent rock. In contrast, MW-37B is screened across highly weathered bedrock as well as the overlying unconsolidated materials.

ARCADIS found no evaluation of whether or not this area was, in fact, a groundwater discharge area, other than the following:

> "*It should be noted the saturated alluvial deposits (silt, sand, and gravel) were encountered above bedrock at the EB-2 [MW-34B] and EB-5 [MW-37B] locations. This suggests that bedrock groundwater is discharging into the alluvial material northwest of East Spencer.*"

Regarding this statement, the fact that saturated unconsolidated materials exist above bedrock is not sufficient evidence to demonstrate that discharge from the bedrock is occurring. The saturated conditions could be due simply to infiltration of precipitation falling on this relatively flat-lying area along Six Mile Creek. In fact, there is more reliable evidence that the area is *not* an area where groundwater is discharging from the bedrock. That evidence is the hydraulic head data presented in Table 7 of the SRI report, although an error was observed in that table[3]. The data in the table show that there is a substantial *downward* vertical gradient between MW-37B and MW-34B, not upward, as the hydraulic head in MW-37B is 406.11 FAMSL compared to 401.71 FAMSL in MW-34B. If groundwater were discharging from the bedrock into the overlying unconsolidated material, the hydraulic head in well MW-34B, which is screened entirely in the bedrock, would be higher than the head in MW-37B.

[3] The table appears to incorporate an incorrect top-of-casing elevation for well MW-34B (586.47 feet above mean sea level [FAMSL]), which yields an incorrect groundwater elevation in the table (576.97 FAMSL). Using the top-of-casing elevation provided on the boring log for MW-34B (411.21 FAMSL) yields a groundwater elevation of 401.71 FAMSL.

The report makes several inferences that groundwater contamination is due to leakage from the NCR sewer as noted below:

- "The results of soil vapor collected near the groundwater discharge area [that is, north of East Spencer Street (MW-37B)] indicate that *historical releases from these sanitary sewer lines* [where the Danby Street Sewer joins the Turner Place sewer] *likely have migrated into the surrounding unsaturated soils and shallow bedrock, flowed through fractures and joints, and discharged to alluvial deposits observed northwest of East Spencer Street*." (p. 60).

- "Two VOCs were detected at concentrations slightly above the state ambient water quality standards in one offsite bedrock monitoring well (MW-37B) located northwest of East Spencer Street. *The source of the VOCs detected in this well is most likely attributable to historic releases from the sanitary sewer lines on Turner Place and Columbia Street. Such historic released would have migrated within the unsaturated fractured bedrock and ultimately discharged into the upper section of fractured bedrock which is saturated in the area to the north of East Spencer Street (MW-37B)"* (pp. 65-66).

- *Releases from the sewer line on Turner Place would have migrated downgradient within the surrounding unsaturated fractured bedrock and ultimately discharge* [sic] *into the alluvial deposits northwest of East Spencer Street.* (p. 67).

The report provides no evidence to support these inferences (italicized). No evidence has been provided that material has been released from the Danby Sewer Line. Second, even if such a release occurred, as noted earlier in this report, the available hydraulic head data in this area contradict the presumption that groundwater in the bedrock is discharging to the overlying alluvial deposits (i.e., unconsolidated materials).

The WSP SRI Report relies heavily on the assumption that the VOCs detected in the subsurface vapor samples collected above the various sewer lines indicate that the sewers leaked. No evidence is presented to support this assumption. Furthermore, the sampling locations were biased toward the sewer lines, with little or no data collected at varying distances away from them or in between different sewer lines.

### 2.3 Groundwater Contamination Evaluation

If groundwater movement is not well characterized, the extent of groundwater contamination usually cannot be reliably defined since incorrect characterizations in groundwater movement will result in the selection of investigation areas that are not representative of areas with the most significant contamination (if any). The WSP SRI

Report recognizes that the extent of groundwater contamination requires further characterization, though specific recommendations are not provided. Key points regarding investigations of groundwater contamination are presented below.

- *DNAPL* – While the report indirectly suggests that DNAPL was not released to the bedrock, using statements such as "DNAPL was not observed" in certain borings, groundwater chemistry data indicate otherwise. The high levels of chlorinated solvents detected during packer testing of the extraction wells (e.g., 100,000 µg/L of TCE) indicate that DNAPL is likely nearby.

  If DNAPL is present and its extents are not reasonably known, and a credible conceptual model describing its behavior in the fracture network is not developed, the prospects for reliably understanding the extent of dissolved-phase contamination emanating from such a DNAPL zone are poor.

- *Vertical Profiling of Groundwater Quality* – The procedures used to collect groundwater samples (Section 4.3.5) are questionable. The procedure involved placing the intake of a bladder pump at the depth of a targeted feature in the open rock borehole and collecting a sample. The targeted features consisted of fractures and were selected, "Based on observations made during drilling, examination of rock cores, and the results of the downhole geophysical logging…" Unfortunately, the downhole logging did not include heat-pulse flow meter logging. Such logging is important because it identifies those fractures that are hydraulically significant by measuring the flow rate and direction (that is, whether water is flowing into or out of the borehole). In boreholes that connect several individual fractures, it is not uncommon for water to flow into the borehole from one fracture, and migrate upward or downward and exit through another fracture. If it is not known whether water in the borehole at a given fracture is entering the borehole, or leaving it, it is not clear which fracture (or fractures) is producing the water sampled. Without such knowledge, it is possible, that the water sampled at a given fracture was actually produced by another fracture at a different depth in the borehole.

- *Chloroform* – Page 66 of the report notes that, "It should be noted that chloroform was detected in all soil vapor samples collected above the NCR sewer line on the Emerson property. The source of the chloroform detected in well MW-39T is most likely attributable to historic releases from the NCR sewer line." The above statement attributing the source of the chloroform as historical releases from the NCR sewer is unsubstantiated. First, chloroform was detected in *every* vapor sample analyzed, not just in those collected near the NCR sewer. Second, chloroform was detected in many groundwater samples, not just at locations that might reasonably be inferred to intercept water that may have leaked from the

sewer (if any). Third, chloroform is relatively common in groundwater and drinking water. In fact, chloroform was the most frequently detected volatile organic compound in the Nation's ground water sampled by the U.S. Geological Survey's National Water-Quality Assessment Program (Squillace and others, 1999; Moran and others, 2002; Zogorski and others, 2006). One of the reasons for this is that chloroform is a byproduct of chlorinating drinking water. As such, common sources of chloroform in groundwater include irrigation with public water (homeowner lawns, golf courses, etc.), use of septic systems, leakage from swimming pools, and leakage from sanitary sewers (Ivahnenko and Zogorski, 2006). Another potential source of chloroform in monitoring wells is the use of chlorinated water as a drilling fluid. The SRI report did not indicate whether the water used to perform the drilling was analyzed for volatile organic compounds.

### 2.4 Data Quality Evaluation

During the review of the WSP SRI Report, several apparent errors were noted with respect to the presentation of data including groundwater elevations depicted on Figure 10 of the report. Additionally, questions were raised with regards to the presentation of analytical results associated with both bromofluorobenzene and dibromofluoromethane. A more detailed description of these concerns is presented in Appendix 3.

# 3. Sanitary Sewer Piping Network Evaluation

## 3.1 General

ARCADIS performed an evaluation of the South Hill sewer network relative to inferences made by the NYSDEC that alleged (and unsubstantiated) historic releases of TCE by NCR to the sanitary sewer system have resulted in possible vapor intrusion impacts at various locations north of 950 Danby Road. This evaluation included a review of drawings obtained from the City of Ithaca and Town of Ithaca Municipal Offices as well as discussions with Mr. Scott Gibson of the City of Ithaca Water and Sewer Department. The review targeted the sewer piping network in the area along Danby Road between 950 Danby Road and the Emerson facility and portions of the residential neighborhood to the north of Emerson. A general layout of the South Hill Area sewer network is presented on Figures 2A and 2B. Our findings following this review are summarized below:

## 3.2 Danby Sewer Line Routing and Lateral Connections

The sanitary sewer distribution system in the South Hill area of Ithaca consists of an aging combined sewer overflow design which has undergone numerous renovations over the years resulting in materials of construction ranging from clay tile and transite to PVC piping. The Danby Sewer Line main services much of the west side of the South Hill area. Historically, the Danby Sewer Line flowed north from 950 Danby Road to Columbia Street where it turns to the west. This sewer continues west for one city block where it intersects the sewer main in Turner Street which originates at the Emerson facility approximately 1,000 feet south of the intersection of Columbia and Turner Streets.

As a result of sewer renovations conducted between 2006 and 2007, flow in the Danby Street Sewer currently flows north past Columbia Street or west along Columbia Street depending on manhole flow elevations at the intersection of Danby Road and Columbia Street.

Sewer lateral connections along Danby Road include but are not limited to two laterals originating from Ithaca College, one lateral from the South Hill Elementary School, and the Hudson Street sanitary sewer trunk (Hudson Street sewer). These laterals are designated as laterals 1, 2, 3, and 4 respectively on Figure 1. In addition, numerous small business and residential properties connect to the sewer main along Danby Road north of 950 Danby Road.

The Hudson Street Sewer services much of the east side of the South Hill area. Lateral connections to the Hudson Street sewer include but are not limited to numerous residential and commercial properties including Therm, Inc., a manufacturing facility known to have used TCE during manufacturing operations. The Hudson Street sewer tie-in to the Danby Sewer Line is located at the intersection of Columbia and South Aurora Street. The current usage of TCE by Therm, Inc. (if any) is unknown.

An internet search of the Right To Know Network (www.rtknet.org) databases and a Morse Industries Corporation report was performed for Emerson Power Transmission, Therm, Inc., and NCR. The search results indicated that TCE was monitored in sanitary sewers originating from Emerson Power Transmission and Therm, Inc., as described below:

Emerson Power Transmission – The maximum allowable load for the discharge was 0.2 pounds per day (lbs/day). Monthly discharge sampling and analysis of TCE was performed from January 1, 1995 through February 28, 1997 and June 30, 1999 through March 31, 2004. According to database information, TCE did not exceed the allowable daily load however, TCE was detected in 11 of 84 monthly samples at loading rates between 0.0002 lbs/day and 0.00128 lbs/day. The remaining 73 monthly samples reportedly did not detect TCE above laboratory detection limits.

Therm, Inc. – Performed monthly discharge sampling and analysis of TCE. The maximum allowable effluent concentration was 0.01 milligrams per liter (mg/L). The facility sampled each month from January 31, 1995 through February 28, 1997. TCE reportedly did not exceed the allowable effluent concentration in the samples and was not detected above laboratory detection limits.

### 3.3 Shared Utility Bedding Locations

ARCADIS' review of the Danby Sewer Line drawings identified an area on the northwest side of the Emerson property where the potable water supply shares bedding with the Danby Sewer Line. This instance of shared bedding presents a potential pathway for TCE-contaminated soil gas to migrate to the Danby Sewer Line bedding. No investigation has been performed of this potential migration pathway.

Based on information provided by the City of Ithaca Water and Sewer Department as well as information presented by the NYSDEC during the January 24, 2008 public meeting regarding environmental impacts to the South Hill area, a majority of the sewer distribution piping was installed in trenched rock with little or no associated bedding material. These conditions were observed during the 2006-2007 renovations to the

Danby Sewer Line as reported by both the NYSCEC during the January 24th public meeting and during discussions with the City of Ithaca Water and Sewer Department.

The lack of observed bedding material would indicate that the source of soil vapors detected during recent investigations is not a porous sewer bedding containing residual TCE from historic discharges to the sanitary sewer. It is plausible, however, that the sewer trenches are creating a preferential pathway for the migration of TCE containing soil vapor originating from a TCE contaminated groundwater plume. Accordingly, as discussed in Section 2 of this report, it is necessary for the hydro-geology and contaminant fate and transport mechanism associated with this TCE contamination from the Emerson facility to be completely understood.

# 4. Evaluation of Soil Vapor Data

## 4.1 General

ARCADIS performed a review of the available soil vapor data collected in Ithaca's South Hill area. This review included data associated with soil vapor samples collected between 2005 and 2007. A summary of the findings is presented below.

## 4.2 Soil Vapor Sample Location

The TCE soil vapor sample results reviewed were for samples collected from over 50 locations including 950 Danby Road, Emerson property, South Hill Elementary School property, and several locations along the Danby Sewer Line and intercepting sewer pipe laterals.

The location of the soil vapor samples tended to be biased towards the location of sewer piping. Additionally, few samples were collected to establish TCE soil gas concentrations in areas that were not in close proximity to the sewer laterals which would provide an indication of the soil vapor concentrations in areas for which the NYSDEC seeks an investigation of potential soil vapor intrusion concerns.

## 5. Evaluation of Additional Information

### 5.1 General

In order to evaluate potential source areas of TCE in soil gas, ARCADIS reviewed environmental databases, aerial photographs, and various reports containing spill information as presented below.

### 5.2 Local Spill Information

An internet search of the NYSDEC Spill Incidents Database was performed for three streets adjacent to or in the vicinity of Danby Road, South Aurora Street, and Hudson Street. Results of the search for reported spills in the area are presented below:

South Aurora Street - The database search returned 10 documented spills between February 1, 1978 and February 12, 2008. Spills included non-PCB oil, waste oil/used oil, lube oil, wood alcohol, soap, hydraulic oil, and ammonia, as well as unknown petroleum and unknown materials A reported spill quantity was recorded for only six of the spill reports, which ranged from 4 gallons to 409 gallons. The spill locations were listed as Emerson Power Transmission and the intersection of Green Street and South Aurora Street.

Hudson Street - The database search returned six documented spills between February 1, 1978 and February 12, 2008. Spills included waste oil/used oil, non-PCB oil, zyglo penetrant, and transformer oil, as well as unknown materials. A reported spill quantity was recorded only for the spill report of 17 gallons of transformer oil. The spill locations were listed as Therm, Inc., 613 Hudson Street, and Oak Hill Nursing Home.

Danby Road - The database search returned 19 documented spills between February 1, 1978 and February 12, 2008. Spills included diesel, #2 fuel oil, gasoline, petroleum, and hydraulic oil, as well as unknown petroleum and unknown materials. A reported spill quantity was recorded for only seven of the spill reports, which ranged from 4 gallons to 20 gallons. The spill locations were listed as Rogan's Service Station, Ithaca College, Big Al's Hilltop Quickstop, Danby Market, NCR, Axiohm, Benjiman's One Stop, and 1103 Danby Road.

The spills database listed only the address or company name for the spill location. It is unknown where on the premises the spill occurred, or if they were in proximity to drains/sewers. There were also multiple spill reports that did not list the quantity, material spilled or listed the material as unknown. These spills could have been composed of TCE or materials that contain TCE.

### 5.3 Additional Information Reviewed – Need for Further investigation on Southern Area of Emerson Site

Numerous additional sources of information were reviewed related to potential environmental concerns associated with the Emerson facility including aerial photographs, and documentation associated with NYSDEC oversight of remedial programs undertaken by Emerson. Detailed information obtained during a review of available information is provided in Appendix.4. This information indicates that numerous remedial programs have been undertaken to address environmental areas of concern throughout numerous areas on the Emerson property. The location of areas of concern referenced in Appendix 4 are shown in Figure 3.

Several of these programs include the investigation/remediation of environmental impacts that may include TCE releases, such as contamination associated with soil and groundwater from Emerson's on site fire water reservoir and the removal of hundreds of drums in wooded areas throughout the southern portion of the Emerson property. The document review did not indicate that methods other than visual observations were used to locate areas where drums and scrap metal were disposed of. Assessment of the southern portion of the Emerson site using methods such as ground penetrating radar and test pitting may reveal additional drums and scrap metal below the ground surface. An approximately 1,350 foot distance between the oil shed area of concern and the southern most drum removal location was observed in the southern portion of the Emerson site (see Figure 3). This large area, which according to the available information has not been investigated, may contain additional undiscovered drums and scrap metal below ground surface.

Our review of information associated with the drum removal program did not indicate that a groundwater water quality evaluation was performed in the areas of drum removal. Given the significant historic releases of TCE to the environment at the Emerson site and the past practice of widespread drum disposal in wooded areas near the southern portion of the Emerson property, it is possible that improper drum disposal has resulted in TCE releases to the environmental that may be causing the elevated TCE concentrations in soil gas along the Danby Sewer Line as it runs across the Emerson site.

Most notably, no soil or groundwater investigation has been conducted along the southern area of the Emerson site near SV-51 (see Figure 1) to evaluate the potential source of elevated TCE readings in soil vapor at that sampling point.

## 6. Summary and Conclusions

The January 11, 2008 letter from the NYSDEC requests that NCR indicate its willingness to finance off site investigations relative to potential vapor intrusion impacts along the Danby Sewer Line as well as portions of the residential area to the north of the Emerson facility. The basis of this request is detected concentrations of TCE in soil vapor samples collected along the Danby Sewer Line and nearby laterals as discussed in the WSP SRI Report. Based on the information reviewed by ARCADIS it is highly unlikely that NCR is wholly (or partially) responsible for potential vapor intrusion concerns alleged by the NYSDEC. This conclusion is based on the issues discussed in this report which include the lack of identified TCE source material allegedly discharged by NCR, the lack of identified releases from the Danby Sewer Line, incomplete information regarding the fate and transport of known subsurface TCE contamination originating from the Emerson site, lack of investigation of numerous discharges to the Danby Sewer Line and multiple lateral connections to that sewer, and the incomplete characterization of potential TCE contaminant sources on the Emerson property that may result in potential soil vapor contamination. Moreover, significant concentrations of TCE containing soil vapor have been documented in sewer laterals originating from the northern and eastern boundaries of the Emerson property prior to the point of connection to the Danby Road Sewer. The northern Emerson sewer lateral connects to the Danby Road Sewer lateral at Columbia Street where TCE containing vapors, including from groundwater, can migrate along preferential pathways created by sewer trenches.

Based on our review of the data, reports, and documents described in this report, Emerson should more fully characterize the horizontal and vertical extent of sub-surface TCE impacts throughout their property and the areas to the north. This characterization would include fate and transport mechanisms associated with the migration of all phases of TCE (DNAPL, dissolved phase, and soil vapor) throughout groundwater, bedrock, and soil. Only once this information has been obtained, can the critical questions raised in this report regarding the conceptual site model be fully addressed.

## References

Ivahnenko, T. and Zogorski, J.S., 2006. Sources and Occurrence of Chloroform and Other Trihalomethanes in Drinking-Water Supply Wells in the United States, 1986–2001. U.S. Geological Survey Scientific Investigations Report 2006–5015, 13 p.

Keys, W. Scott, 1990. Borehole geophysics applied to ground-water investigations, USGS—TWRI Book 2, Chapter E2. p. 118.

Moran, M.J., Lapham, W.W., Rowe, B.L., and Zogorski, J.S., 2002, Occurrence and status of volatile organic compounds in ground water from rural, untreated, self-supplied, domestic wells in the United States, 1986–1999: U.S. Geological Survey Water-Resources Investigations Report 02–4085, 51 p.

Muldoon, M.A., and Bradbury, K.R., 2005, Site characterization in densely fractured dolomite: Comparison of methods. *Ground Water*, v. 43, no. 6, p. 863–876.

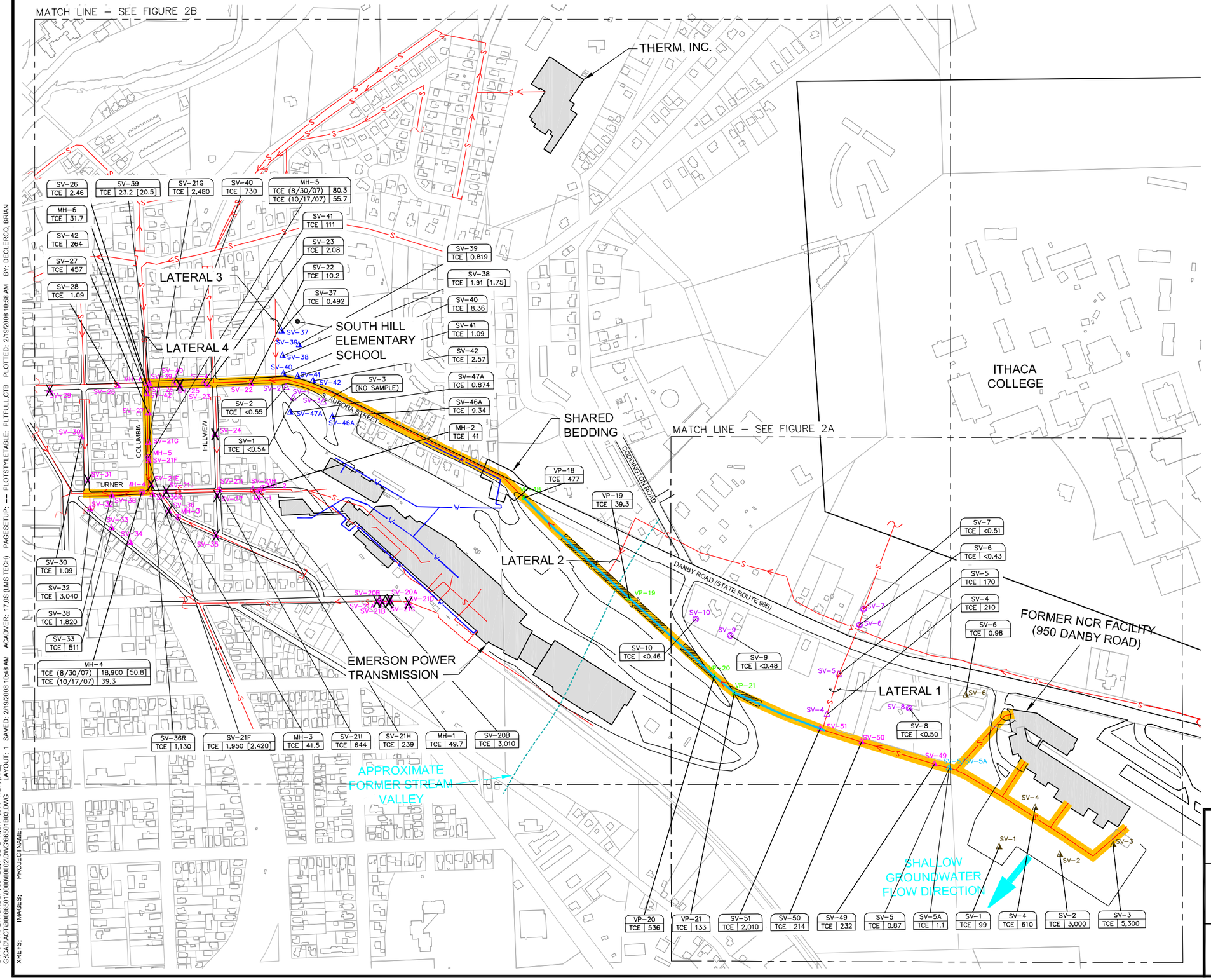
Squillace, P.J., Moran, M.J., Lapham, W.W., Price, C.V., Clawges, R.M., and Zogorski, J.S., 1999, Volatile organic compounds in untreated ambient groundwater of the United States, 1985–1995: *Environmental Science & Technology*, v. 33, no. 23, p. 4176–4187.

United States Environmental Protection Agency, 1988. "*Guidelines for Conducting Remedial Investigations and Feasibility Studies Under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA)*," October 1988.

Zogorski, J.S., Carter, J.M., Ivahnenko, Tamara, Lapham, W.W., Moran, M.J., Rowe, B.L., Squillace, P.J., and Toccolino, P.L., 2006, Volatile organic compounds in the Nation's ground water and drinking-water supply wells: U.S. Geological Survey Circular 1292, 101 p.

ARCADIS

# Figures




**LEGEND:**

- APPROXIMATE LOCATION OF SEWER LINE REPLACED IN 1994
- APPROXIMATE LOCATION OF SANITARY SEWER WITH FLOW DIRECTION
- SANITARY SEWER PIPE CAP
- APPROXIMATE WATER LINE LOCATION SERVICING EMERSON BUILDING
- APPROXIMATE FORMER STREAM VALLEY LOCATION
- APPROXIMATE AREA OF FILL PLACED IN 1994 SEWER REPLACEMENT (0 – 2.5' DEEP)
- HISTORIC DANBY ROAD SEWER FLOW DIRECTION
- SV-6 SHBC SOIL VAPOR SAMPLING LOCATION (JULY 11, 2006)
- SV-5/SV-5A SHBC SOIL VAPOR SAMPLING LOCATION (SV-5: JULY 11, 2006; SV-5A: AUGUST 1, 2007)
- VP-18 EMERSON SOIL VAPOR SAMPLING LOCATION (NOVEMBER 18, 2005)
- SV-37 EMERSON SOIL VAPOR SAMPLING LOCATION (JULY 18, 2007)
- SV-49 EMERSON SOIL VAPOR SAMPLING LOCATION (AUGUST/OCTOBER 2007)
- SV-5 NYSDEC SOIL VAPOR SAMPLING LOCATION (SEPTEMBER 2007)
- SV-7 NYSDEC SOIL VAPOR SAMPLING LOCATION (DECEMBER 2007)
- SOIL VAPOR LOCATION NOT COMPLETED DUE TO SHALLOW BEDROCK REFUSAL OR UTILITY CONFLICT

**NOTES:**

1. BASE MAP WAS OBTAINED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SERVICES (GIS) CLEARINGHOUSE AT HTTP://WWW.NYSGIS.STATE.NY.US.
2. LOCATIONS OF SEWER LINES ARE FROM: (1) CADD DRAWING PRINTED BY THE TOWN OF ITHACA ENGINEERING DEPARTMENT ON SEPTEMBER 7, 2006; (2) TOWN OF ITHACA ENGINEERING DEPARTMENT DRAWINGS TITLED "DANBY ROAD SEWER MAIN REPLACEMENT" LAST REVISED APRIL 1994; AND (3) FIGURE 13 OF THE REPORT TITLED "SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT, EMERSON POWER TRANSMISSION FACILITY", PREPARED BY WSP ENVIRONMENTAL STRATEGIES CONSULTING LLC (WSP, FORMERLY KNOWN AS ESC), DATED DECEMBER 7, 2007.
3. THE APPROXIMATE LOCATIONS OF THE STREAM VALLEY AND WATER LINES ON EMERSON'S PROPERTY ARE FROM FIGURE 1 OF ESC'S LETTER TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) DATED JANUARY 27, 2006.
4. SOIL VAPOR SAMPLES WERE COLLECTED BY THE FOLLOWING:

– EMERSON SOIL VAPOR SAMPLES WERE COLLECTED BY WSP/ESC AS PART OF INVESTIGATIONS OF THE EMERSON PROPERTY.

– SHBC SOIL VAPOR SAMPLES WERE COLLECTED BY STEARNS & WHELER (S&W) AS PART OF THE BROWNFIELD REMEDIAL INVESTIGATION (RI) AT THE 950 DANBY ROAD PROPERTY.

– NYSDEC SOIL VAPOR SAMPLES WERE COLLECTED BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) AS PART OF A FOLLOW-UP TO AREA SOIL VAPOR SAMPLING.

5. SOIL VAPOR SAMPLING LOCATIONS WERE OBTAINED FROM THE FOLLOWING DOCUMENTS:

– THE EMERSON SAMPLING LOCATIONS ARE FROM THE REPORT TITLED, "SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT, EMERSON POWER TRANSIMISSION FACILITY", PREPARED BY WSP, DATED DECEMBER 7, 2007.

– THE SHBC SAMPLING LOCATIONS ARE FROM THE REPORT TITLED, "BROWNFIELD CLEANUP PROGRAM REMEDIATION INVESTIGATION", PREPARED BY STEARNS AND WHELER (S&W), DATED MAY 2007 AND A FOLLOW-UP LETTER FROM S&W TO THE NYSDEC DATED AUGUST 10, 2007.

– THE NYSDEC SAMPLING LOCATIONS ARE FROM A NYSDEC LETTER TO SIDLEY AUSTIN DATED JANUARY 11, 2008 AND E-MAIL COORESPONDENCE TO ARCADIS DATED JANUARY 22, 2008.

6. SAMPLE ANALYSIS WAS PERFORMED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD TO-15.
7. CONCENTRATIONS ARE REPORTED IN MICROGRAMS PER CUBIC METER (ug/m3).
8. TCE = TRICHLOROETHENE.
9. [ ] = FIELD DUPLICATE SAMPLE RESULTS ARE PRESENTED IN BRACKETS.
10. ND: NOT DETECTED

0 250' 500'
GRAPHIC SCALE

SOUTH HILL & ITHACA
SOIL VAPOR SAMPLING
ITHACA, NEW YORK

# SOUTH HILL SOIL VAPOR SAMPLING RESULTS

ARCADIS

FIGURE 1

ITHACA
COLLEGE

DANBY ROAD (STATE ROUTE 96B)

FORMER NCR FACILITY
(950 DANBY ROAD)

LATERAL 1

SHALLOW GROUNDWATER
FLOW DIRECTION

**LEGEND:**

- APPROXIMATE LOCATION OF SEWER LINE REPLACED IN 1994
- APPROXIMATE LOCATION OF SANITARY SEWER WITH FLOW DIRECTION
- SANITARY SEWER PIPE CAP
- APPROXIMATE AREA OF FILL PLACED IN 1994 SEWER REPLACEMENT (0 – 2.5' DEEP)
- HISTORIC DANBY ROAD SEWER FLOW DIRECTION

**NOTES:**

1. BASE MAP WAS OBTAINED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SERVICES (GIS) CLEARINGHOUSE AT HTTP://WWW.NYSGIS.STATE.NY.US.

2. LOCATIONS OF SEWER LINES ARE FROM: (1) CADD DRAWING PRINTED BY THE TOWN OF ITHACA ENGINEERING DEPARTMENT ON SEPTEMBER 7, 2006; (2) TOWN OF ITHACA ENGINEERING DEPARTMENT DRAWINGS TITLED "DANBY ROAD SEWER MAIN REPLACEMENT" LAST REVISED APRIL 1994; AND (3) FIGURE 13 OF THE REPORT TITLED "SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT, EMERSON POWER TRANSIMISSION FACILITY", PREPARED BY WSP ENVIRONMENTAL STRATEGIES CONSULTING LLC (WSP, FORMERLY KNOWN AS ESC), DATED DECEMBER 7, 2007.

3. THE APPROXIMATE LOCATIONS OF THE STREAM VALLEY AND WATER LINES ON EMERSON'S PROPERTY ARE FROM FIGURE 1 OF ESC'S LETTER TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) DATED JANUARY 27, 2006.

0 150' 300'
GRAPHIC SCALE

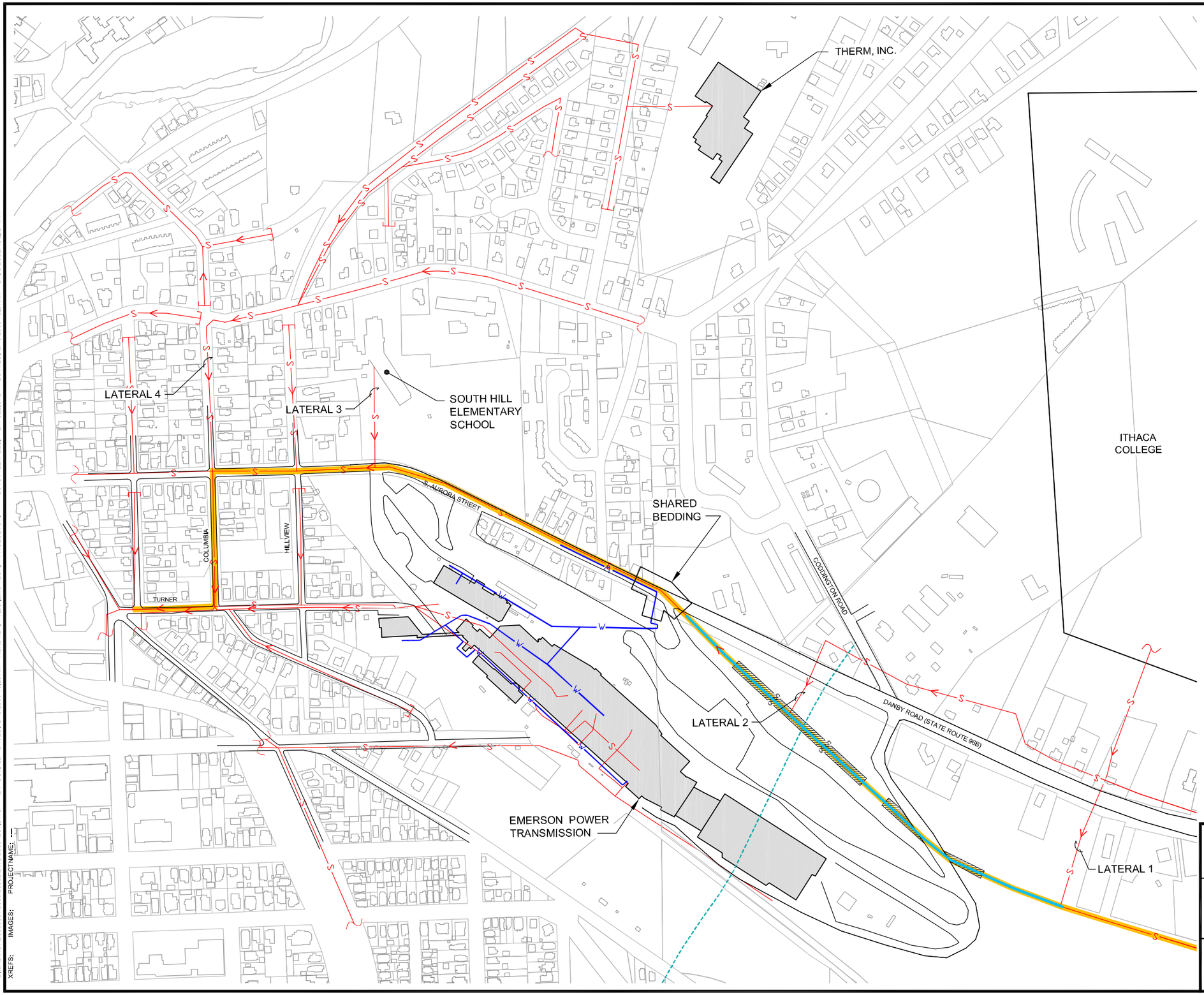
SOUTH HILL & ITHACA
SOIL VAPOR SAMPLING
ITHACA, NEW YORK

# SOUTH HILL SEWER NETWORK (SOUTH)

ARCADIS

FIGURE
**2A**

CITY: SYR DIV/GROUP: 85 DB: PGL LYR:ON=*;OFF=*REF (FRZ)
G:\CADACT\B\0065\01\0000\0002\DWG\006501B05.DWG LAYOUT: 2A SAVED: 2/19/2008 10:12 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE:
XREFS: IMAGES: PROJECTNAME: ---
PLOTTED: 2/19/2008 10:17 AM BY: DECLERCQ, BRIAN




**LEGEND:**

- APPROXIMATE LOCATION OF SEWER LINE REPLACED IN 1994
- APPROXIMATE LOCATION OF SANITARY SEWER WITH FLOW DIRECTION
- SANITARY SEWER PIPE CAP
- APPROXIMATE WATER LINE LOCATION SERVICING EMERSON BUILDING
- APPROXIMATE FORMER STREAM VALLEY LOCATION
- APPROXIMATE AREA OF FILL PLACED IN 1994 SEWER REPLACEMENT (0 – 2.5' DEEP)
- HISTORIC DANBY ROAD SEWER FLOW DIRECTION

**NOTES:**

1. BASE MAP WAS OBTAINED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SERVICES (GIS) CLEARINGHOUSE AT HTTP://WWW.NYSGIS.STATE.NY.US.
2. LOCATIONS OF SEWER LINES ARE FROM: (1) CADD DRAWING PRINTED BY THE TOWN OF ITHACA ENGINEERING DEPARTMENT ON SEPTEMBER 7, 2006; (2) TOWN OF ITHACA ENGINEERING DEPARTMENT DRAWINGS TITLED "DANBY ROAD SEWER MAIN REPLACEMENT" LAST REVISED APRIL 1994; AND (3) FIGURE 13 OF THE REPORT TITLED "SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT, EMERSON POWER TRANSIMISSION FACILITY", PREPARED BY WSP ENVIRONMENTAL STRATEGIES CONSULTING LLC (WSP, FORMERLY KNOWN AS ESC), DATED DECEMBER 7, 2007.
3. THE APPROXIMATE LOCATIONS OF THE STREAM VALLEY AND WATER LINES ON EMERSON'S PROPERTY ARE FROM FIGURE 1 OF ESC'S LETTER TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) DATED JANUARY 27, 2006.

0 200' 400'
GRAPHIC SCALE

SOUTH HILL & ITHACA
SOIL VAPOR SAMPLING
ITHACA, NEW YORK

# SOUTH HILL SEWER NETWORK (NORTH)

ARCADIS

FIGURE
**2B**

THERM, INC.

LATERAL 4

LATERAL 3

SOUTH HILL ELEMENTARY SCHOOL

SHARED BEDDING

S. AURORA STREET

COLUMBIA

HILLVIEW

TURNER

EPT SEWER

FORMER OIL STORAGE SHED (AOC 9)

SPRAY POND (AOC 3)

FIRE WATER RESERVOIR

FORMER 500-GAL GASOLINE TANK (AOC 15)

DEAPARTMENT 507 DECREASERS (AOC 1)

DRUM REMOVAL

STORM SEWER ALONG CAYUGA STREET (AOC 20)

EMERSON POWER TRANSMISSION

APPROXIMATE FORMER STREAM VALLEY

FORMER QUENCH OIL PIT (AOC 12)

FORMER OPEN RESERVOIR (AOC 4)

SOIL STOCKPILE AREA

AST EMPTY SADDLES

OIL SHED (AOC 6)

DRUM REMOVAL (AOC 10)

DRUM REMOVAL

SHALLOW GROUNDWATER FLOW DIRECTION

LATERAL 2

LATERAL 1

GODDINGTON ROAD

DANBY ROAD (STATE ROUTE 96B)

ITHACA COLLEGE

FORMER NCR FACILITY (950 DANBY ROAD)

**LEGEND:**

- APPROXIMATE LOCATION OF SEWER LINE REPLACED IN 1994
- APPROXIMATE LOCATION OF SANITARY SEWER WITH FLOW DIRECTION
- SANITARY SEWER PIPE CAP
- APPROXIMATE WATER LINE LOCATION SERVICING EMERSON BUILDING
- APPROXIMATE FORMER STREAM VALLEY LOCATION
- APPROXIMATE AREA OF FILL PLACED IN 1994 SEWER REPLACEMENT (0 – 2.5' DEEP)
- HISTORIC DANBY ROAD SEWER FLOW DIRECTION
- AREAS OF CONCERN

**NOTES:**

1. BASE MAP WAS OBTAINED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SERVICES (GIS) CLEARINGHOUSE AT HTTP://WWW.NYSGIS.STATE.NY.US.
2. LOCATIONS OF SEWER LINES ARE FROM: (1) CADD DRAWING PRINTED BY THE TOWN OF ITHACA ENGINEERING DEPARTMENT ON SEPTEMBER 7, 2006; (2) TOWN OF ITHACA ENGINEERING DEPARTMENT DRAWINGS TITLED "DANBY ROAD SEWER MAIN REPLACEMENT" LAST REVISED APRIL 1994; AND (3) FIGURE 13 OF THE REPORT TITLED "SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT, EMERSON POWER TRANSMISSION FACILITY", PREPARED BY WSP ENVIRONMENTAL STRATEGIES CONSULTING LLC (WSP, FORMERLY KNOWN AS ESC), DATED DECEMBER 7, 2007.
3. THE APPROXIMATE LOCATIONS OF THE STREAM VALLEY AND WATER LINES ON EMERSON'S PROPERTY ARE FROM FIGURE 1 OF ESC'S LETTER TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) DATED JANUARY 27, 2006.
4. THE APPROXIMATE LOCATIONS OF THE AREAS OF CONCERN ARE FROM FIGURE 4 OF ESC'S ONSITE ASSESSMENT OF FORMER BORG WARNER–MORSE CHAIN FACILITY DATED DECEMBER 13, 2005 AND FIGURE 1 OF ESC'S 2004 DRUM REMOVAL REPORT.

0 250' 500'
GRAPHIC SCALE

SOUTH HILL & ITHACA
SOIL VAPOR SAMPLING
ITHACA, NEW YORK

# EMERSON POWER TRANSMISSION AREAS OF CONCERN

ARCADIS

FIGURE
3

# Appendices

ARCADIS

**Appendix 1**

**Appendix 1**

WSP Environmental Strategies Supplemental Remedial Investigation; December 7, 2007

WSP Environmental Strategies LLC (WSP) prepared a Supplemental Remedial Investigation (SRI) Report for the Emerson Electric Co. and its subsidiary, Emerson Power Transmission Corp. (Emerson) site in Ithaca, New York. The scope of the Supplemental Remedial Investigation comprised of:

- Investigating 25 Areas of Concern (AOCs) identified in the December 2005 Onsite Assessment Report
- Investigating the extent of the impacts in the vicinity of the Emerson fire water reservoir
- Evaluating the hydrogeology both onsite and offsite near the Emerson facility
- Evaluating the potential presence of site related compounds in soil vapor in the Phase VI Expansion area identified by the NYSDEC
- Evaluating potential groundwater discharge areas north of the Emerson site

WSP Environmental Strategies Soil Vapor Testing Report, August 17, 2007

This report summarizes results of soil vapor sampling performed by WSP during November, 2005 and July, 2007 on behalf of Emerson. The areas investigated in the report include the South Hill Elementary School property, the northern portion of the Emerson site, and the southeast portion of the Emerson site above the Danby Sewer Line line.

S&W Redevelopment Letter, August 10, 2007

The S&W Redevelopment Letter; August 10, 2007 was reviewed to obtain information regarding soil vapor sample SV-5A adjacent to the sanitary sewer line near the northern property boundary of 950 Danby Road.

Various Soil Vapor Samples Collected by EA Engineering, Science, and Technology on Behalf of NYSDEC

Numerous soil vapor samples have been collected and analyzed on behalf of Emerson and the NYSDEC throughout the South Hill area.

NYSDEC Spills Database

The NYSDEC spills database is a compilation of historical spills information in New York State. The information is managed by the NYSDEC and is frequently updated to provide the public with current spill information. The NYSDEC spills database was searched to identify historical information regarding South Hill area spills between February 1, 1978 and present day, specifically targeting TCE or TCE containing materials in the vicinity of the NCR, Emerson, and Therm, Inc. facilities. The database provides the following information specific to each spill, if available:

- NYSDEC region
- spill number
- date and time of spill
- spill name
- county
- city/town
- address
- material spilled
- amount spilled
- cause and source
- resource affected
- impacted water body
- Petroleum Bulk Storage (PBS) Number
- tank number and size
- test method
- leak rate

Right to Know Network Databases

The Right to Know databases are a compilation of toxic release inventories. These databases are managed by OBM Watch and provide free public access to numerous databases and resources on the environment. The Right to Know Network databases were searched to identify historical information regarding local spills and discharges. The following were applicable databases on the Right to Know Network:

- Toxic Release Inventory (TRI)
- Biennial Reporting System (BRS)
- Permit Compliance System (PCS)

The Right to Know Network databases were specifically targeted to gather information on releases of TCE or TCE containing materials, documented TCE discharges to sanitary sewers/surface waters, and TCE monitoring/sampling of TCE discharges in the vicinity of the NCR, Emerson, and Therm, Inc. facilities.

Aerial Photographs

Historical aerial photographs of the South Hill area were reviewed to identify additional potential areas of concern that may suggest environmental impacts. These areas may be identified by clearings, disposal areas, or areas of significant surface staining.

Remedial Actions Implementation Report Petroleum-Containing Soil and 2-Phase Extraction (Radian 1997)

The Remedial Actions Implementation Report Petroleum-Containing Soil and 2-Phase Extraction, (Radian 1997) was prepared for Emerson. The report summarized excavation of petroleum containing soil and railroad ties located at the Emerson facility between October 1995 and January 1996. The report was reviewed to obtain information regarding the soil stockpile area in the south parking lot of Emerson and other potential areas of concern in the South Hill area.

Onsite Assessment of Former Borg Warner - Morse Chain Facility (ESC 2005)

The Onsite Assessment of Former Borg Warner – Morse Chain Facilities (ESC 2005) was prepared for Emerson. The report describes the historic information of the site, geology, previous investigations, and historic use and handling of storage tanks. Areas of concern are also proposed based on available records including onsite files, database reports, NYSDEC and NYSDOH site files, and historical maps.

Summary of Drum Recovery and Soil Sampling Activities (ESC 2005)

The Summary of Drum Recovery and Soil Sampling Activities (ESC 2005) was prepared for Emerson. The report described the 2004 drum and scrap metal removal activities and the shallow subsurface soil samples analyzed from drum locations. The report was reviewed to obtain information regarding previous drum removal and sampling activities.

ARCADIS

**Appendix 2**

**Appendix 2**

- Section 2.0 – Site Background
- Section 4.0 – Supplemental Fire Water Reservoir Investigation
- Section 5.0 – Bedrock Evaluation
- Section 7.0 – Conclusions (subsections 7.2 *Fire Water Reservoir Investigation* and 7.3 *Bedrock Evaluation* only)
- Appendix B – Soil Boring Logs [which also included rock boring logs]
- Appendices D and H – Geophysical Reports #1 and #2
- Appendix E – Groundwater Sampling and Development Logs

In addition to these sections, ARCADIS reviewed groundwater-related portions of Section 6.0 – S*oil Vapor and Manhole Vapor Sampling.*

ARCADIS

**Appendix 3**

**Appendix 3**

The “Groundwater Contour Map” provided in the WSP SRI Report as Figure 10 contained significant inaccuracies along the northern portion of South Cayuga Street and West Spencer Street, where the figure depicts water-table elevations up to 40 feet above the land surface, and similarly along Six Mile Creek.

An observation made regarding the groundwater analytical results summarized in Table 8 – Exploratory Boring Groundwater Sample Results[4] causes some concern as to the integrity of the summarized data. That table shows that the compound 4-bromofluorobenzene was detected in every groundwater sample analyzed, at a narrow concentration range of between 27 and 29 µg/L; however, these detections are not depicted on Figure 12, which presents these groundwater analytical results. It is expected that the explanation for this is that 4-bromofluorobenzene is used by laboratories performing Method 8260B VOC analyses as a volatile surrogate for quality control (QC) purposes. That is, this compound is intentionally added to samples by the laboratory and is reported in the laboratory QC package that accompanies the laboratory analytical results. The same is likely true for the detections reported (for all groundwater samples) of dibromofluoromethane. This observation also calls into question the other data contained in this (and other) analytical data summary tables presented in the report.

[4] Note that, in the Table of Contents, this table is titled “Groundwater Results – Bedrock Evaluation”.

ARCADIS

**Appendix 4**

**Appendix 4**

A review of NYSDEC daily inspection reports and aerial photographs indicated that the south parking area of the Emerson facility was used as a soil stockpile area on two separate occasions.

A daily inspection report dated November 14, 1995 identifies the excavation of oil contaminated soil from the Area A (beneath the abandoned railroad bridge into the upper portion of South Cayuga Street). The excavated soil was stockpiled on poly sheeting with a cover. The NYSDEC observer also noted that the open excavation was collecting snow and rain, and a sheen was visible. A December 5, 1996 NYSDEC daily inspection report noted that two-thirds of the soil stockpiled in the south parking had been removed. A sample from the soil stockpile was analyzed for percent solids, volatile organic compounds (VOCs), and semi-volatile organic compounds, (SVOCs) and that naphthalene was detected at a concentration 2.5 micrograms per kilogram (ug/kg) in this sample. A January 1, 1997 NYSDEC daily inspection report noted that the soil stockpile was removed from the parking lot and the excavation area was restored with topsoil and seeding.

Aerial photographs, available on the internet (http://maps.live.com/), of the south parking lot showed soil stockpiled in the same approximate location described in the above excavation. The origin of this stockpile was not able to be determined.

The correspondence and aerial photo review revealed two documented occasions where materials were stockpiled in the south parking lot, and the repeated use of this area suggests that this location might have been used to stockpile materials on additional occasions.

Emerson completed drum and soil removal programs during three separate mobilizations between 1980 and 2004. The number of drums and dates of removal activities are presented below.

1980-1982 – Between 75 and 100 drums were removed from an area near the oil shed, which is shown as AOC 6 on Figure 3.

1987 – A total of between 201 and 236 drums were removed during this mobilization at the following locations as shown on Figure 3:

- 55-60 drums were removed from an area above the railroad bed which is shown as AOC 10 [50-60 Drums (former)]

- 6 drums were removed from the ravine below the outfall which is shown as AOC 10 [6 Drums (former)]

- 20 drums were removed down the hill from the NYSEG substation which is shown as AOC 10 [20 Drums (former)]

- 120-150 drums were removed down the hill from the railroad bed which is shown as AOC 10 [120-150 Drums (former)]

2004 – Drums were removed from locations in wooded areas at the site. The location of the drums is generally in a straight line along the western side of the Emerson facility from approximately the midpoint between the groundwater treatment building and the former railroad bed to the oil shed. One additional drum location was approximately 1350 feet south of the oil shed (AOC 6).

Soil samples were collected from 14 of the locations (two of the locations were combined due to their proximity). Samples were taken from 0.5-feet to 1.0-feet below ground surface (bgs) and analyzed for VOCs, SVOCs, and polychlorinated biphenyls (PCBs). One sample detected TCE at a concentration of 2 ug/kg, but did not exceed New York State Technical and Administrative Guidance Memorandum (TAGM) 4046 Recommended Soil Cleanup Objectives (SCOs) dated January 1994. Five samples exceeded TAGM 4046 SCOs for SVOCs, including some or all of the following: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzoic acid, and chrysene. PCBs were detected above the SCOs at one location.

Scrap metal located during this mobilization was removed along with the drums, but sampling at these locations was not conducted.

As part of the WSP SRI Report, twenty five areas of concern (AOCs) were identified on the Emerson property as areas of possible environmental impacts due to past releases. During the investigation of these areas, sixty-six soil borings were drilled and 4 test pits were excavated to assess possible environmental impacts associated with the AOCs. A total of eighty nine soil samples were collected from the soil borings and tests pits, however only fifty nine samples were analyzed for trichloroethylene (TCE) and its derivatives. Twelve of these samples detected the presence of TCE above the laboratory detection limit. Vinyl chloride, a common derivative of TCE, was detected at a concentration greater than NYSDEC TAGM Recommended Cleanup Objectives in AOC 1. Low concentrations of TCE and its derivatives in soils may indicate higher

historical concentrations of the TCE in the soil which over years of precipitation and surface water run-off has leached through the bedrock and into the groundwater below.

The shallow soil borings drilled by WSP do not characterize the extent of the groundwater contamination below each AOC. Only the samples tested for VOCs in AOC 1, 3, & 4 were from depths greater than 5 feet. All of the samples conducted at depths greater than 5 feet indicated some VOC contamination. The greatest concentrations of VOCs were detected at a depth of 11-12 feet for SB-1d and at a depth of 7-8 and 10-11 feet for SB-3b with the exception of AOC 20 near the storm sewer along Cayuga Street.

Area of Concern 1 is the location of a former Department 507 degreaser. This area is less than 70 feet south of the fire reservoir remediation area. A groundwater water sample was collected from SB-1a which contained TCE and its derivatives. TCE was detected at a concentration of 31 µg/l; cis-1,2-DCE was detected at a concentration of 1,800 µg/l; trans-1,2-DCE was detected at a concentration of 15 µg/l; and vinyl chloride was detected at a concentration of 190 µg/l in this water sample. An additional groundwater water sample collected west of the degreaser indicated no VOC contamination. However, based on the complex hydrogeology of the site, the location of this sample may or may not be hydraulically downgradient from the former degreaser.

Area of concern 4 is the location of a former open reservoir. This area is in Building 6A where the north wall of Building 35 meets Building 6A's east wall. A petroleum product was encountered in the down gradient boring at a depth of 8-10 feet below the concrete slab. Methylene chloride concentrations were detected in each soil sample. No additional VOCs were detected. Also, no VOCs were detected in the petroleum product.

Area of concern 10 consists of various locations throughout the property where more than 230 drums were formerly dumped. There are various locations where these drums were buried. However, WSP only tested the soil in Area A where 6 of the drums were discovered. Soil samples were apparently not collected from the remaining 3 areas containing more than 224 former drums. The extent of possible environmental impacts associated with these drums is unknown.

Area of concern 12 is the location of former quench oil pits. The pits were located in the southeast vicinity of Building 2. Two soil borings were advanced in the vicinity of the former quench oil pits and oil staining was noted in both soil borings. TCE and methylene chloride were also detected in both soil samples. A groundwater sample located west of the former oil pits indicated no VOC contamination. However, based

on the complex hydrogeology of the site, this sample location may not be hydraulically down gradient of the groundwater flow from this AOC.

Area of concern 15 is the location of a former 500 gallon gasoline aboveground tank which is located northwest of AOC 1. Petroleum staining and a weathered petroleum product were identified during installation of the boring. Samples collected from this location were not analyzed for TCE and its derivatives at this AOC. The extent of VOC contamination at this location is unknown.

The storm sewer along Cayuga Street between the Emerson Facility and South Hill Terrace is designated as AOC 20. Both TCE and cis-1,2-DCE were detected in soil gas samples collected along the storm sewer.