

**SUPPLEMENTAL INVESTIGATION AND  
REMEDICATION REPORT**

**Former Kaiser Fluid Technologies  
530 East Sugar Creek Road  
Charlotte, North Carolina**

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Prepared for:

Rockwell Collins, Inc.  
400 Collins Road NE  
Cedar Rapids, Iowa 52498

Prepared by:

ETIC Engineering, Inc.  
1333 Broadway, Suite 1015  
Oakland, California 94612  
(510) 208-1600



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Joseph Muehleck  
Senior Project Manager



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Michael M. Maley, PG  
Senior Geologist



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## 1.0 INTRODUCTION AND SUMMARY

This report documents supplemental field investigation and remediation activities performed by ETIC Engineering, Inc. (ETIC) at the former Kaiser Fluid Technologies (KFT) Facility located in Charlotte, North Carolina (see Figure 1). Prior to this investigation, low concentrations of halogenated volatile organic compounds (HVOCs) had been consistently reported in groundwater beneath portions of the site. Although these concentrations were low and exhibited a stable trend over time, they locally exceeded North Carolina's 15A NCAC 02L.0202 groundwater quality standards (2L standards). In response to these exceedances, the North Carolina Department of Environment and Natural Resources (NCDENR) had required continued groundwater monitoring and had indicated that case closure would be granted after the extent of the HVOC plume in groundwater was delineated and after consecutive monitoring events demonstrated that HVOCs exist at levels below 2L standards.

Despite the stable concentration trends, case closure (i.e. reaching 2L Standards) via a monitoring only (natural attenuation) approach was estimated to require numerous years, well beyond the time frame for site closure desired by Rockwell Collins, the current owners of the site. To this end, ETIC was retained by Rockwell Collins in 2004, with the goal of developing (in conjunction with the NCDENR) and implementing a more expeditious approach to site closure. Subsequent discussions between ETIC and the NCDENR (including a 7 March 2005 meeting) resulted in development of an expedited roadmap to site closure, with the stated goal of achieving closure by December 2005. During these discussions, the site was identified by the NCDENR and ETIC as a good candidate for site closure via the NCDENR's variance (from 2L standards) process for the following reasons:

- The HVOC concentrations are stable and only locally exceed 2L standards;
- The HVOC plume appears to be entirely contained within the site boundaries;
- All site activities and sources associated with the observed contamination have been ceased and/or removed;
- Historical site operations and dissolved HVOC concentrations in groundwater across the site, including beneath the former source area, do not reflect the presence of dense non-aqueous phase liquids (DNAPLs) beneath the site;
- Groundwater in the vicinity of the site is regionally impacted by other sources which are not under active remediation and which continue to exist at levels above 2L standards;
- Groundwater in the general area of the site is not used for potable purposes; and
- Due to the nature of HVOCs and the characteristics of the fractured-bedrock aquifer system beneath the site, technology and practicable limitations restrict the potential for reduction of HVOC levels to those adopted as 2L standards.

To meet the goal of site closure via the variance process, the NCDENR requested that the following actions be implemented at the site:

- Complete characterization of the former source area and the downgradient (i.e., northern) extent of the HVOC plume;
- Apply a best available technology (BAT) to reduce HVOC mass within the former source area to the extent practicable;
- Update the historical well survey for the site and identify the location of existing water supply wells;
- Demonstrate the absence of significant risks to human health and the environment, with particular emphasis on potential impacts to the nearest water supply wells; and
- Initiate the variance request.

To this end, this report documents the additional plume characterization requested by the NCDENR, an updated water supply well survey for the vicinity of the site, and the results of applying a BAT for remediation of HVOC mass within the former source area. The supplemental field investigation activities were performed between August and November 2004. In December 2004, remediation for HVOC mass reduction within the former source area was performed via application of high-vacuum dual-phase extraction (HVDPE). A follow-up investigation was conducted in March and April 2005, per NCDENR request. These activities were conducted in general accordance with the August 2004 *Memorandum - Scope of Work for Supplemental Investigation* (ETIC 2004a) and the November 2004 *Memorandum - Scope of Work for High Vacuum Dual-Phase Extraction Pilot Test* (ETIC 2004b) submitted to the NCDENR.

The results of the supplemental investigation and remediation activities documented herein indicate that:

- the primary source/release area was a subsurface settling tank which contained dilute solutions of industrial solvents as part of site operations and has been removed;
- the extent of HVOCs underlying the site has been adequately defined and is contained within the site boundaries;
- the HVOC plume remains stable;
- the HVOC plume exists within a weathered, fractured rock formation characterized by limited permeability, dual porosity, and fracture aperture, all of which continue to significantly limit migration of the HVOC plume away from the former source area and toward the site boundaries;
- application of HVDPE to the former source area resulted in reduction in HVOC concentrations and mass to the extent practicable;
- continued application of HVDPE or application of other technologies are not likely to result in additional, appreciable reductions in HVOC mass/concentrations, and are not considered cost-effective remedial alternatives; and

- there are no active water supply wells in the vicinity of the site and regionally impacted groundwater in the vicinity of the site is not being used for potable purposes.

For the above reasons, a variance application for case closure above 2L standards has been prepared and is being submitted concurrently.

### **1.1 Report Layout**

The basis for the above-summarized conclusions are documented in Sections 3 through 5 of this report, which are preceded by additional site background information in Section 2. Specifically, Section 2 documents a more detailed summary of the site background and includes findings associated with previous investigations. Section 3 documents the supplemental investigation activities, including field investigation activities, procedures, and results, together with the results of the well survey. Section 4 documents the conceptual site model (CSM), which summarizes ETIC's understanding of hydrogeologic conditions, the occurrence and distribution of HVOCs, the potential for offsite migration of HVOCs, and potential remedial options, including the recommended use of HVDPE as the BAT for reducing the HVOC mass. Section 5 summarizes the approach and findings associated with application of HVDPE to reduce the HVOC mass in the former source area. Lastly, Section 6 provides the conclusions and recommendations of the supplemental investigation and remediation activities.

Appendices referenced in these sections summarize historical groundwater monitoring results (Appendix A), standard protocols for field sampling (Appendix B), supplemental investigation boring logs (Appendix C), supplemental investigation laboratory analytical reports (Appendix D), well development forms and field notes (Appendix E), a surveyor's map (Appendix F), and calculations in support of estimating mass removal and the radius of influence associated with the remedial activities (Appendix G).

## 2.0 SITE BACKGROUND

### 2.1 Site Description

The KFT facility is located at 530 East Sugar Creek Road in Charlotte, North Carolina (see Figure 1). Topography in the site vicinity generally slopes northward (see Figure 1). Little Sugar Creek is located approximately 1,100 feet northwest of the site.

The facility has a 77,000-square foot building on a 5.02-acre parcel of land (see Figure 2). The original building was constructed in 1956 and expanded in 1964 and 1968. Land use in the vicinity is commercial and industrial, and was largely developed during the same time period as the site. The site has been inactive since operations were discontinued in late 2002/early 2003.

Site operations, which included the design and manufacture of fluid control systems for the aerospace industries, began in 1956. Materials used in the manufacturing included steel, aluminum, and titanium. During the finishing processes, synthetic coatings and various plating materials were used. Industrial lathes, milling and tooling machines, grinders and precision honing equipment, and cutting, cooling, and lubricating oils were used for the manufacture of the parts. Industrial solvents were used for cleaning the parts. Potential historical sources of releases include the former settling tank and degreaser, which are located near the northwestern portion of the building (see Figure 2).

### 2.2 Previous Investigations

In 2001, Phase I and Phase II site assessments were conducted at the site (Blasland, Bouck & Lee, Inc. [BBL] 2001a, 2001b). In an 11 September 2001 letter, the NCDENR requested a comprehensive site assessment in response to the report of trichloroethene (TCE) at levels exceeding 2L standards (NCDENR 2001). A comprehensive site assessment was subsequently conducted for the site (BBL 2001c). In August 2002, wells MW-5 through MW-9 were installed to evaluate potential HVOC sources (Montgomery Watson Harza [MWH] 2002).

During these site assessments, soil samples were collected from 12 locations (SB-1 to SB-12), soil vapor samples were collected from 12 locations (SG-1 to SG-12), grab groundwater samples were collected from 5 locations (GW-1, GW-2, GW-3, GW-5, and GW-6), and 9 groundwater monitoring wells were installed (MW-1 to MW-9) (see Figure 2). Well construction details are summarized in Table 1. Soil analytical results and soil vapor results are summarized in Tables 2 and 2A, respectively. Grab groundwater and cumulative well analytical results are summarized in Tables 3 and 4, respectively.

#### 2.2.1 Hydrogeology

The site lies in the Piedmont Physiographic Province of North Carolina, which is characterized by a rolling landscape and broad ridges (BBL 2001c). It is located in the area referred to as the Charlotte Belt, which consists of crystalline metamorphic and igneous rocks; namely gneiss, schist, quartzite, granite, diorite, gabbro, and volcanic rocks. In the area of the Charlotte Belt, the bedrock is typically blanketed by weathered or partially weathered rock known as saprolite.

The subsurface beneath the site consists of silty clays to approximately 5 to 14 feet below ground surface (bgs), which are underlain in turn by the saprolite to approximately 22 feet bgs or more,

and bedrock. Beneath the saprolite, the bedrock consists of metamorphosed quartz diorite and schist.

Groundwater beneath the site typically occurs within the primary and secondary porosities of the weathered saprolite and at an approximate depth of 15 feet bgs. Previous investigations have indicated that the hydrogeologic conditions and groundwater hydraulics beneath the site are characterized by fractured flow, with hydraulic gradients toward the northwest. Rising head tests were performed on wells MW-1, MW-3, MW-5, and MW-7 and a groundwater seepage velocity of less than two feet per year was estimated (MWH 2002).

### **2.2.2 Groundwater Monitoring**

Semi-annual groundwater monitoring at the site has been conducted in response to a 25 March 2002 NCDENR letter (NCDENR 2002). Prior to the supplemental investigations described herein, nine monitoring wells (MW-1 to MW-9) were part of the active monitoring network (see Figure 2). These nine wells have been gauged semi-annually, while wells MW-1, MW-3, and MW-5 (which typically exceed 2L standards) have been sampled semi-annually. Monitoring results have been reported on an annual basis (MWH 2002, 2004, 2005). The MWH *Groundwater Monitoring Report for 2004* (MWH 2005) is included herein as Appendix A.

### **2.2.3 Constituents of Potential Concern**

The primary COPCs encountered in groundwater are limited to select HVOCs. Groundwater monitoring activities indicate that TCE, 1,1,1-trichloroethane (TCA), and 1,1-dichloroethene (DCE) consistently exceed 2L standards in one or more of the site wells. In addition, tetrachloroethene (perchloroethene or PCE), cis-1,2-DCE, carbon tetrachloride, methylene chloride, and chloromethane have exceeded 2L standards, but have not been consistently detected in previous water samples from the site. Based on concentration and distribution, TCE is the primary COPC for the site. Other HVOCs are locally and sporadically detected and primarily reflect daughter products as a result of natural attenuation and biodegradation of TCE.

### **2.2.4 Past Distribution of HVOCs**

Prior to the supplemental investigations documented herein, characterization of HVOCs in groundwater was primarily limited to the southern boundary of the onsite building, together with select locations within, north, and northwest of the onsite building (see Figure 3). These investigations indicated that limited portions of the subsurface near the southwestern property boundary and the northwestern corner of the building were characterized by HVOC concentrations in groundwater at levels above the 2L standards. Importantly, at the southwestern property boundary, well MW-2 reported 0.0019 milligrams per liter (mg/L) of vinyl chloride; however, in the 25 March 2002 letter, the NCDENR attributed this plume to an upgradient source and did not require further investigation or monitoring of the southwestern portion of the property.

At the northwestern corner of the building, TCE and/or 1,1-DCE exceeded 2L standards at borehole GW-1 and wells MW-1, MW-3, and MW-5 (see Figure 3). Prior to the supplemental investigation activities described herein, the highest TCE and 1,1-DCE concentrations were reported in well MW-5, the most northerly (farthest downgradient) well. The potential historical sources of these HVOCs included the former degreaser, located inside the building south of well MW-3, and the former settling tank, located outside the building at the northwest corner (see Figure 2). As described in Section 3 herein, supplemental investigation activities determined that the former settling tank was incorrectly identified as being approximately 40 feet to the east on previous site plans, and HVOC concentration trends and distribution indicate that the former settling tank is the primary former source area, while impacts associated with the degreaser are considered negligible.

### 3.0 SUPPLEMENTAL INVESTIGATION

As previously indicated, ETIC conducted supplemental investigation activities at the KFT site from August to November 2004, with follow-up investigation activities conducted in March and April 2005. The primary objectives of the supplemental investigation included:

- Identifying and characterizing the former source areas;
- Defining the nature and extent of onsite HVOC plumes in groundwater, including the previously undefined downgradient extent of the plume;
- Developing a site conceptual model of groundwater occurrence, HVOC occurrence and transport, and remedial alternatives; and
- Updating the water supply well survey in support of evaluating potential impacts, if any, to nearby water supply wells.

#### 3.1 Supplemental Field Investigation Overview

Previous investigations had noted that monitoring wells MW-1, MW-3, and MW-5, which are located near the northwestern corner of the building and parking area north of the building, were characterized by TCE concentrations exceeding 2L standards (MWH 2002, 2004, 2005). The recent supplemental investigation was focused on the areas near these wells (see Figure 3), areas near the suspected former source areas, and areas north of the building to characterize the downgradient extent of the HVOC plume.

The supplemental investigation activities were conducted during four field events in August, October, and November 2004, and March/April 2005. To summarize, from 25 to 27 August 2004, fifteen boreholes were drilled and groundwater samples were collected at the site. The results of this phase of the investigation identified the former settling tank as the primary former source/release area at the northwest corner of the building, and delineated the extent of HVOCs in groundwater at that location. These results were used to conceptualize and outline the subsequent set of boreholes.

From 4 to 7 October 2004, two additional boreholes were drilled and groundwater samples were collected to further define the lateral extent of HVOCs. In addition, four monitoring wells were installed. Well MW10 was installed to verify the downgradient extent of HVOCs, and wells RW1, RW1A, and RW2 were installed to better characterize the former source area (i.e., former settling tank) and to support the subsequent remedial efforts (see Figure 2). During investigation of the former source area, concrete rubble was encountered near borehole SB-15C (Figure 2), which reported a TCE concentration of 1.1 mg/L. Due to the concrete rubble, additional drilling locations in the immediate area were not clear for advancing augers.

From 15 to 18 November 2004, the area near borehole SB-15C, which was determined to be the location of the former settling tank, was excavated and four additional boreholes were drilled and groundwater samples were collected to further characterize HVOC levels within the former source area. In addition, two wells (RW3 and RW4) were installed through the former settling tank backfill to support the subsequent remedial efforts (see Figure 2).

From 30 March to 1 April 2005, four additional borings and one groundwater monitoring well were installed to further define the lateral extent of HVOCs to the north.

### **3.2 Supplemental Field Investigation Procedures**

Field procedures for supplemental investigation activities conducted are summarized below. Standard field protocols are presented in Appendix B. Boring logs are provided in Appendix C.

#### **3.2.1 Site Health and Safety Procedures**

A comprehensive site health and safety plan was prepared and updated for each phase of work. These plans provided guidelines for the use of personal protective equipment, location of the nearest hospital, and contingency plans. In addition, the potential chemical and physical hazards that may be encountered during field activities were identified. The plans were kept onsite and signed by each site worker during field activities.

Prior to drilling, North Carolina One-Call was notified to locate relevant utilities. A geophysical surveyor, On Target of Charlotte, North Carolina, was contracted to verify utility locations and to identify subsurface anomalies across the site. In addition, each borehole location was cleared by hand augering to a depth of at least 4 feet bgs at the diameter of the downhole equipment. No utilities were identified at the proposed drilling locations.

#### **3.2.2 Drilling Procedures**

In general, soil (including rock matrix) samples were collected to 16 feet bgs, the approximate depth of the water table, and a grab groundwater sample was obtained from 20 to 25 feet bgs using a Hydropunch or temporary piezometer. During sampling, soils were logged and field screened for total volatile organics using a photoionization detector (PID).

The initial drilling and sampling program in August 2004 used a direct-push Geoprobe rig equipped with a single wall macro-core continuous sampling system to collect soil samples. This method was consistent with the previous investigations performed by BBL (2001b, 2001c). However, because shallow refusal was previously encountered in some boreholes, a contingency plan was developed to use an auger rig if Geoprobe refusal was encountered. An auger rig was used to collect the groundwater samples at locations where the Geoprobe was unable to advance to target depths.

The auger rig was used for the October/November 2004 and March/April 2005 field investigations. Specifically, a truck-mounted B57 drill auger rig equipped with solid flight augers, hollow-stem augers, and a split spoon sampler was used. Drilling was contracted to ARM Environmental Services, Inc. of Columbia, South Carolina (William Ewing, North Carolina License No. 3110). A CME75 drill rig was contracted for Graham and Currie of West End, North Carolina (License No. WC3612) to install borehole LMW1 to a depth of 17.5 feet bgs in the immediate vicinity of borehole SB-26.

Following sampling, the boreholes were sealed or completed as groundwater monitoring wells. Boreholes were sealed to the surface with bentonite-cement grout and capped with asphalt or concrete. Soil cuttings and decontamination water were placed in drums onsite for subsequent transport offsite for proper handling.

### 3.2.3 Sampling Procedures

Soil samples were field screened for total volatile organic compounds (VOCs) using a PID. Selected soil samples were collected using Encore sample kits supplied by Pace Analytical Laboratories (Pace) of Huntersville, North Carolina.

During direct-push activities, groundwater samples were collected using a Hydropunch. To collect groundwater samples from the auger boreholes, the auger was advanced to 25 feet or until auger refusal and a temporary piezometer was installed by placing a 1-inch diameter polyvinyl chloride (PVC) pipe into the open borehole. Water was allowed to enter the borehole and samples were collected using a bailer.

Selected soil and groundwater samples were analyzed by Pace for VOCs, including HVOCs, using EPA Method 8260B. Copies of laboratory analytical reports are provided in Appendix D.

## 3.3 Supplemental Field Investigation Activity Summary

### 3.3.1 Drilling and Sampling Activities

**August 2004:** On 25 August 2004, boreholes SB-13, SB-14, SB-15A, SB-17, SB-18, SB-20 and SB-22 were advanced using a Geoprobe rig. Soil samples were collected from boreholes SB-13, SB-14, SB-15A, and SB-20. Geoprobe refusal was encountered before the target depth of 25 feet bgs for boreholes SB-14, SB-15A, SB-18, SB-20, and SB-22. Attempts were made to collect groundwater samples using a Hydropunch at boreholes SB-13 and SB-17. After 4 hours, enough water had entered into the sampler to collect a groundwater sample from borehole SB-17. Borehole SB-13 was allowed to recharge overnight, but no water had entered the sampler. Hydropunch samples were not attempted at other borehole locations after encountering Geoprobe refusal at depths above anticipated water levels.

For 26 and 27 August 2004, drilling was converted to the auger rig due to the shallow refusal encountered using the Geoprobe rig. During this time, nine groundwater samples were collected from eleven boreholes. One borehole (SB-15B) reached auger refusal at shallow depths above the water table. Groundwater samples were collected from boreholes SB-13A, SB-14, SB-15C, SB-16, SB-18, SB-19, SB-20, SB-21, and SB-23. Groundwater was collected by installing temporary piezometers as previously described. Groundwater flow rates encountered at the site were typically low and consistent with the low permeability of the fractured rock saprolite; sufficient water for sampling took more than 4 hours at boreholes SB-15C, SB-19, SB-20, and SB-21. Five boreholes (SB-14, SB-16, SB-18, and SB-23) were left to recharge overnight. One borehole (SB-22A) was unable to produce sufficient water for sampling after being left open overnight. An exception was borehole SB-13A, where sufficient water for sampling was obtained in 10 minutes.

**October 2004:** From 4 to 7 October 2004, boreholes SB-24 and SB-25 were drilled using the auger rig. Groundwater samples were collected from temporary piezometers after allowing water to enter the borehole for approximately 4 hours. Four other boreholes (MW10, RW1, RW1A, and RW2) were drilled using an auger rig, soil sampled using a split-spoon sampler, and completed as wells. Unsaturated zone soil samples were collected for laboratory analysis.

**November 2004:** From 15 to 18 November 2004, six boreholes (SB-22B, SB-26, SB-27, LMW1, RW1 and RW2) were drilled using an auger rig and soil sampled using a split-spoon sampler. Groundwater samples were collected from temporary piezometers at boreholes SB-22B, SB-26, and SB-27 after approximately 4 hours. Boreholes RW3 and RW4 were completed as wells. Unsaturated zone soil samples were collected for laboratory analysis.

**March/April 2005:** On 30 March 2005, four boreholes (SB28-SB31) were drilled using an auger rig. Groundwater samples were collected from temporary piezometers after allowing water to enter the boreholes for 20 to 50 minutes (SB29-SB31); water entered boring SB28 immediately. One additional borehole was completed as well MW11 on 1 April 2005.

### 3.3.2 Well Installation

**Well Construction:** Seven wells were installed during the supplemental investigation. Five of these wells (RW1, RW1A, RW2, RW3, and RW4) were installed near the former settling tank (see Figure 2). These wells were constructed with 4-inch diameter schedule 40 PVC well casing, allowing for their use in support of the remedial activities. The other wells (MW10 and MW11) were constructed with 2-inch diameter schedule 40 PVC well casing for use as downgradient monitoring wells.

The wells were screened with approximately 10 to 15 feet of 0.010-inch machine-slotted schedule 40 PVC casing and constructed with a filter pack of No. 2 sand that extended from the bottom of the borehole to approximately 1 to 2 feet above the top of the screen (see Table 1). Bentonite and bentonite-cement grout were used to seal the annular space of the wells above the filter pack to the surface. Each well was completed with a water-tight traffic box at the surface. Well construction details are summarized in Table 1 and shown on boring logs presented in Appendix C.

**Well Development:** Well development consisted of surging using a 2- or 4-inch diameter surge block and subsequently purging approximately 10 casing volumes of water prior to the placement of the bentonite seal. Wells RW1 and RW1A did not contain enough water to purge prior to the placement of the bentonite seal. These wells were, however, purged of 12.5 gallons and 11.15 gallons of groundwater, respectively, once the grout seal was set. Well development forms are included as Appendix E.

**Groundwater Sampling:** After well development, groundwater samples were collected from the wells using disposable bailers after purging at least 3 casing volumes and allowing for at least 80 percent recharge. Groundwater samples were collected in appropriate containers, capped, and labeled. Samples were placed in coolers with ice pending delivery to Pace for analysis.

**Well-Head Survey:** The top-of-casing elevations and locations of four of the recently installed wells (MW10, RW1, RW1A, and RW2) and five previously installed wells (MW-5, MW-6, MW-7, MW-8 and MW-9) were surveyed by Mulkey Surveying of Charlotte, North Carolina on 18 October 2004. The wellhead survey data are presented in Tables 1 and 4 and Appendix F.

### 3.3.3 Former Settling Tank Area Excavation

According to the BBL documents and maps, an “in-line settling tank” (settling tank) was installed at the request of the local regulatory authority to prevent the discharge of solids into the storm sewer. The former settling tank was plumbed to the sanitary sewer according to engineering drawings. The tank was reported to be located approximately 40 feet east of the northwestern corner of the building in previous documents (BBL 2001b, 2001c). However, the settling tank, which was decommissioned in the late 1960's, was actually located at the northwest corner of the building (see Figure 2). This location was verified through discussions with Richard Pickard, a former site employee, review of engineering site plans, and during the subsequent November 2004 field activities.

On 15 and 16 November 2004, concrete rubble at the former settling tank area was removed with a backhoe in an effort to facilitate installation of wells RW3 and RW4. Previous attempts to install these wells were unsuccessful because concrete rubble was encountered at shallow depths in that area. The rubble was removed from a 13-foot by 6-foot by 5-foot volume. Approximately 7 cubic yards of concrete was removed. Following backfilling with native and imported fill material, wells RW3 and RW4 were installed at the excavation (i.e. former settling tank) location.

### 3.4 Supplemental Field Investigation Results

The analytical results of the supplemental field investigation are summarized in Tables 2, 3, and 4, while Figure 4 is a plan view illustrating the estimated lateral extent of TCE, the predominant HVOC present beneath the site, in groundwater prior to remediation. Cross-section locations are also shown on Figure 4. Figures 5 and 6 illustrate these schematic cross-sections, which detail the data from the supplemental investigation.

As indicated on Figure 4, the distribution of HVOCs in groundwater, conservatively represented by the distribution of TCE, depicts a distinctive pattern that is primarily concentrated at the northwest corner of the building, at the location of the former settling tank previously identified as the primary former source area. Migrating toward the north in response to the observed hydraulic gradient and secondary porosity, the plume has dispersed and extended across the parking area, where significantly lower concentrations exist as a result of natural attenuation along the path of plume migration.

Important components of this plume include:

- Most concentrated area limited to the settling tank and immediate adjacent areas,
- Concentrations within the former source area do not reflect the potential presence of DNAPLs;
- A significant concentration gradient exists between the former source area and locations immediately (i.e. within 25 feet) downgradient;
- The extent of the plume is defined;
- Based on the rate of decline in concentrations observed along the length of the plume, concentrations of HVOCs above 2L standards are expected to remain fully contained

within the property boundaries, including the northern property boundary which is located more than 100 feet downgradient of the estimated 0.010 mg/L concentration contour for TCE (see Figure 4);

- Concentrations of HVOCs remain stable everywhere historical and multiple rounds of sampling are available (see Table 4) as illustrated graphically for TCE and 1,1-DCE concentration over time in well MW5, located along the downgradient path of the plume (See Figure 7).

A more detailed discussion of the investigation results by location is summarized below.

### 3.4.1 HVOC Plume Boundaries

The absence of reported HVOCs in groundwater samples from boreholes SB-13A, SB-14, SB-16, SB-17, SB-19, SB-20 and SB-25 provide lateral definition to the HVOC plume. Importantly, data from these borings indicate that the plume is limited to a narrow strip approximately 60 feet wide beneath the parking area (see Figure 4). Groundwater samples collected at boreholes SB29 through SB31 and well MW11 define the northern extent of HVOCs with concentrations below the laboratory reporting limits. The extent of 1,1,1-TCA and 1,1-DCE exceeding 2L standards are more limited than TCE.

Figures 5 and 6 correspond to schematic cross-sections (cross-section locations shown on Figure 4) depicting the vertical extent of the TCE plume. Vertically, the plume is considered to be confined by the bottom of saprolite and top of the bedrock formation. This conceptualization is based on the permeability contrast between the saprolite and bedrock, and the generally decreasing fracture density with depth typical of such weathered formations, both of which are apparent based on increasing blow counts (with depth) and field observations during drilling activities. In addition, the absence of DNAPLs and elevated dissolved HVOC levels correspond to negligible vertical density gradients which in turn further limit the vertical extent of the HVOC plume.

### 3.4.2 Former Settling Tank Area

As shown on Figure 4, the highest TCE concentrations occur at the northwestern corner of the building, where the former settling tank was located. Groundwater concentrations of up to 4.2 mg/L (RW3) for TCE, 0.42 mg/L (RW1) for 1,1,1-TCA and 0.31 mg/L (RW1) for 1,1-DCE, were reported in this area prior to remediation. Four samples (SB-15C, RW1A, RW3, and RW4) had TCE concentrations above 1.0 mg/L; however, these sample locations are within 10 feet of each other, with wells RW1A, RW3, and RW4 intentionally installed in the source area as extraction wells. Importantly, the area characterized by TCE concentrations above 1.0 mg/L is estimated to be less than 20 feet wide (see Figure 4). Moreover, although data from the former settling tank are the highest reported onsite, these concentrations are indicative of residual source material and do not suggest the presence of DNAPLs within the former source area.

Markedly lower concentrations are noted laterally away from the former settling tank. Borehole SB-23, located only 15 feet west of the former settling tank area, had significantly lower concentrations of TCE (0.0077 mg/L) and 1,1-DCE (0.024 mg/L). The groundwater sample

collected from borehole SB-14, located approximately 30 feet east of the former settling tank, was below laboratory reporting limits for HVOCs.

Unsaturated soil samples collected at the former settling tank area were below laboratory reporting limits for HVOCs, with the exception of dichlorofluoromethane reported in wells RW1 and RW2, and methylene chloride, a common laboratory contaminant, reported in borehole SB-27 and well RW3. The general absence of HVOCs in soils within the former source area and in borings containing TCE at levels as high as 4.2 mg/L suggests that the potential for future contribution of HVOC mass from unsaturated soils to groundwater is negligible. Moreover, the absence of HVOC mass in the unsaturated zone is consistent with a historical release.

### 3.4.3 Degreaser Area

Earlier investigations evaluated the area along the building east of well MW-3. During the supplemental investigation, groundwater samples were collected from boreholes SB-13A and SB-14 in the area between well MW-3 and the former settling tank. These groundwater samples were below 2L standards for the analyzed HVOCs (see Table 3). In addition, historical soil matrix and soil vapor samples (Table 2 and 2A) from the immediate vicinity of the degreaser contained negligible to non-detectable levels of HVOCs. These data, together with the relatively low levels of HVOCs in groundwater samples from wells MW-3 and MW-7 suggest that the former degreaser is not a significant source of HVOCs to groundwater.

### 3.4.4 Other Areas

Soil-vapor, soil and groundwater data from previous investigations (BBL 2001a, 2001b, 2001c; MWH 2002) indicate that no other significant source areas exist at the site. This indicates that there are no additional source areas along the building, and that the former settling tank is the primary source area at the site. As mentioned previously, vinyl chloride detections above 2L standards in well MW-2 were attributed to an offsite source and no further monitoring or investigation of the southwestern portion of the property were required (NCDENR 2002).

## 3.5 Water Well Survey Results

A well survey performed in 2001 indicated that no water supply wells were present within 1,500 feet of the site (BBL 2001c). The 2001 well survey included identification by the Mecklenburg County Department of Environmental Protection (MCDEP) of two private water supply wells outside the 1,500-foot radius and crossgradient of the site.

As part of this supplemental investigation, the Mecklenburg County Well Information System website (<http://maps.co.mecklenburg.nc.us/website/ros/default.asp>) was reviewed for wells located within one half-mile radius of the site. Three properties were identified with one water supply well present at each. Two of the wells are located approximately 1,500 and 2,600 feet west of the site and correspond to those previously identified by BBL (2001c) (see Figure 8). These wells are located crossgradient to the site and away from the orientation of the plume. The third identified well is located approximately 2,300 feet northeast of the site (crossgradient to the overall site hydraulic gradient) and 300 feet east of Little Sugar Creek.

Importantly, according to Mecklenburg County staff, water supply wells in the county are typically constructed to depths ranging from 100 to 300 feet bgs, well below the shallow groundwater impacted within the site boundaries. Wells are constructed with casing from ground surface to the depth of bedrock and are an open borehole from the casing bottom to the total depth.

Based on the above information, the HVOC plume, which is confined to the site boundaries and predominantly characterized by residual levels of HVOCs in shallow groundwater, does not pose a significant threat to the existing water supply wells located crossgradient and tapping deeper water-bearing zones.

### 3.6 Supplemental Investigation Conclusions

The following conclusions are drawn from the data gathered during the investigations conducted by ETIC from August 2004 through April 2005:

- The primary source of HVOCs at the KFT site has been identified as the area of the former settling tank based on HVOC distribution and concentration gradient.
- The location of the former settling tank was investigated and determined to occur at the northwest corner of the building, which is approximately 40 feet west of where previously mapped.
- HVOCs in groundwater (primarily TCE with 1,1,1-TCA and 1,1-DCE) from the former settling tank area has been defined to extend northerly across the parking area. The plume orientation is interpreted as the result of a dominant fracture orientation in the weathered bedrock that causes the local groundwater flowpath at the site to be oriented at an angle to the more northwesterly regional hydraulic gradient.
- Results of the supplemental investigation indicate that the HVOC plume has not migrated offsite.
- Data from previous investigations and the supplemental investigation have sufficiently characterized the site. The available data indicate that there are no additional significant source areas along the building, and that the former settling tank is the primary source area at the site.
- HVOCs reported in groundwater have not been identified in unsaturated zone soil samples in the settling tank area, indicating that there is no active source in the unsaturated zone contributing HVOC mass to the groundwater. Rather, the former settling tank area represents residual mass in groundwater from an older source.
- The relatively low HVOC concentrations reported in groundwater are not consistent with the presence of DNAPLs.

#### 4.0 CONCEPTUAL SITE MODEL

The locations of cross-sections A-A' and B-B' are shown on Figure 4. Figures 5 and 6 illustrate these schematic cross-sections, which detail the data from the supplemental investigation. The subsurface beneath the site is generally characterized by silts and clays from just beneath the surface to depths ranging from 5 to 14 feet bgs. These soils are in turn underlain by variably fractured and weathered bedrock (saprolite) from 22 feet bgs to more than 31 feet bgs. Fractured, unweathered bedrock was encountered in boreholes in the vicinity of the former settling tank. The unweathered bedrock was characterized as hard rock that could not be penetrated by an auger.

Shallow, unconfined groundwater occurs within the fractures characteristic of the weathered saprolite at an approximate depth of 15 feet bgs. While groundwater flow in larger, fresher individual fractures is typically conceptualized as flow between two parallel and smooth plates, flow within weathered, smaller fractures is constrained due to the presence of minerals and clays which occupy such fractures. Hence, pressure drops reflecting hydraulic gradients are typically determined more by the physical size of the infilling material, as opposed to fracture orientation and aperture. As a result of the weathering and occurrence of the infilling material, groundwater flow and chemical transport rates are reduced.

Groundwater flow and associated HVOC migration occurs primarily as horizontal flow through fractures and along the saprolite/bedrock interface. The groundwater flow direction has previously been inferred to be to the northwest based on groundwater elevations (MWH 2002, 2004, 2005). However, the supplemental investigation has identified a more northerly concentration gradient in the TCE plume. This is attributed to the nature of the fractured saprolite that forms the water-bearing zone. The northwesterly overall hydraulic gradient is governed by and reflects the regional gradient. However, the actual flow path followed by the TCE has a more predominant northward component, following the local scale fracture patterns within the water-bearing weathered bedrock. This site-specific flow pattern is further supported by groundwater drawdown data collected during the December 2004 HVDPE event (see Section 5).

As shown on Figures 5 and 6, TCE, the primary HVOC of concern beneath the site, has not been observed in unsaturated soils in the former settling tank area. Consistent with an historical release (site operations date back to more than 40 years ago) and a shallow water table, HVOCs appear to be generally confined to the saturated zone beneath the 16-foot wide former settling tank area and above the saprolite/bedrock interface, which is likely to represent a significant contrast in permeability. Prior to remediation efforts, maximum concentrations across the 16-foot wide former source area approximated 4.0 mg/L (TCE), with residual to non-detect levels in areas immediately adjacent to this former source. Importantly, data collected to date suggest that remaining HVOC mass is adsorbed onto sediments and/or mineral deposits in saprolite fractures in the saturated zone, and exists at equilibrium between adsorbed and dissolved phase; no ongoing secondary sources such as DNAPLs appear to be present beneath the site.

The HVOC distribution within the weathered fractures is expected to be largely limited to the shallow depths where fracture-related secondary porosity predominates; this secondary porosity is expected to significantly decrease with increasing depth. Individual fracture size and nature of deposits govern permeability differences, which are expected to vary widely between individual fractures. While connectivity between larger, fresher fractures allows for presence of a continuous and connected groundwater flow field across the site, the more abundant weathered fractures of limited permeability and aperture and/or fractures that dead-end into consolidated rock (see Figure 9) also exist and likely contain an appreciable proportion of the HVOC mass beneath the site.

The mobility of the HVOC mass within the limited permeability and dead-end fractures is expected to be significantly limited and governed primarily by the slow (compared to advective transport) and restrictive process of diffusion, which is governed by mechanical dispersion and by localized concentration gradients. As a result, the entire HVOC plume appears to be confined to locations well within the site boundaries. The limited permeability and restricted potential for migration of the plume are further corroborated by data and field observations during subsurface investigations, including:

- observations of slow groundwater recharge in sampling points and wells, indicating limited fracture permeabilities within the weathered bedrock unit;
- the estimated groundwater seepage velocities on the order of less than two feet per year (MWH 2002), which indicate limited advective transport away from the former source area;
- the significant concentration gradient within the portions of the plume closest to the former source area, which further reflect limited advective transport away from the former source area;
- the fact that the majority of the plume and its centerline are characterized by TCE concentrations of less than 0.1 mg/L, which suggest diffusive transport (and not advective transport) is the dominant transport mechanism and has significantly limited migration of HVOCs at higher concentrations away from the source area; and
- the limited overall extent of the HVOC plume (approximately 200 feet in length).

This conceptualization is further corroborated by data collected during the HVDPE event as discussed in Section 5.

To summarize, the HVOC plume beneath the site is confined to the low-permeability weathered bedrock (sapolite) unit characterized by limited groundwater/chemical transport velocities, is likely to remain entirely within the footprint of the site boundaries, and is not likely to threaten any water supply wells in the area.

## 5.0 REMEDIATION ACTIVITIES

HVDPE was applied at the source area as the BAT to rapidly remove HVOC mass. HVDPE involves application of vacuum of up to 29 inches of mercury (in. Hg) to an extraction well through an airtight well seal to simultaneously extract soil vapor, groundwater, and DNAPL, if present, from the subsurface. Implementation of HVDPE requires one or more source area extraction wells and can rapidly remove significant contaminant mass adsorbed to unsaturated soil and saturated soils that are dewatered, groundwater with elevated concentrations, and DNAPL. Due to the radius of influence created during HVDPE, extraction wells can be effective while located near source materials.

HVDPE extracts vapors and water, producing rapid HVOC mass removal by evaporation, advection and volatilization and providing a means to aggressively remediate sites. HVDPE can show results within days, unlike biological degradation processes which require months or years. HVDPE was selected for application at the site to rapidly remove HVOC mass from the subsurface without significant site disruption.

On 9 December 2004, ETIC initiated a 10-day HVDPE event using a mobile system. The event was conducted to reduce the mass of HVOCs in soil and groundwater at the former settling tank area and to assess the effectiveness of HVDPE. Specifically, the purposes of the event were to:

- Measure the extent of groundwater dewatering and capture of soil vapor during the HVDPE event and how this relates to the extent of the source area;
- Measure the effect on groundwater concentrations as a result of dewatering the source area and extracting soil vapor for 10 days;
- Measure the rates, relative proportion and total mass of HVOCs removed in the liquid and vapor phases.

The HVDPE event consisted of 1-hour individual well tests on four source area wells RW1, RW1A, RW3, and RW4 to measure the relationship between applied vacuum and vapor flow rate. The individual well tests were followed by a 10-day combined well HVDPE event on wells RW1, RW1A, RW3, and RW4 at maximum extraction capacity. A copy of the field notes is presented in Appendix E.

### 5.1 HVDPE Event Procedures

#### 5.1.1 HVDPE System

HVDPE equipment consisted of an extraction hose or “stinger” installed in each extraction well, a vacuum source, a knockout vessel to separate the extracted vapor and liquid mixture, and treatment and/or collection systems for the vapor and liquid streams. A process flow diagram of the HVDPE system is shown in Figure 10.

The vacuum was applied using a trailer-mounted HVDPE system equipped with an oil-sealed liquid ring vacuum pump (Dekker Vacuum Technologies Model VMX0303KA1-20) powered by a 20 horsepower (hp) electric motor (see Figure 10). The pump is capable of developing 29 in. Hg vacuum at a nominal flow rate of 300 cubic feet per minute (cfm). The unit was equipped with a 200-gallon primary knockout tank to separate the liquid and vapor phases. The primary knockout tank included high and low level controls and a transfer pump. The separated vapor stream was passed through a heat exchanger and a 60-gallon secondary knockout tank to remove additional moisture from the vapor stream. The secondary knockout tank was equipped with high level control and a manual drain valve to recycle liquid back to the primary knockout tank.

The vapor stream from the secondary knockout tank was passed through two 1,000-pound vapor phase granular activated carbon adsorbers in series before discharge to the atmosphere through a 4-inch diameter 10-foot high PVC stack. The vapor was discharged under an “Air Quality Source Exemption” issued by the Mecklenburg County Air Quality (MCAQ) in a 8 October 2004 letter.

The liquid stream from the primary knockout tank was pumped by a 1.5 hp transfer pump and passed through a 500-pound (primary) and a 200-pound (secondary) liquid phase granular activated carbon vessels in series. The treated liquid stream was stored in a 21,000 gallon closed top storage tank before being transported offsite for disposal.

### 5.1.2 HVDPE Well System

Wells RW1, RW1A, RW3, and RW4 were used as extraction wells. Vacuum was applied to each extraction well through above-ground piping and then to a 1-inch diameter hose (“stinger”) at the wellhead, which extended to the desired extraction depth. The wells were sealed at the wellhead with an airtight well seal cap to ensure that only vapor and water from the subsurface were extracted. The stinger was marked to indicate the length of hose in the well (i.e., the stinger depth). The well seal caps included ports to measure well casing vacuum and to supply bleed air to the wells if needed. A typical extraction well detail is shown in Figure 11.

Wells MW-1, MW-3, MW-5, MW-6, MW-8, MW-9, MW10, and RW2 were gauged during the event to measure potential groundwater drawdown. The monitoring wellheads were modified to accommodate a dip tube for water level measurements while maintaining an airtight well seal, and a sample port to measure induced vacuum. The dip tube was inserted in the well casing through an airtight well seal below the water level to ensure that the well remained sealed to the atmosphere. This enabled the depth to water to be measured relative to atmospheric pressure without disrupting any vacuum influence that may have been induced in the well. A typical dip tube detail is shown in Figure 11.

### 5.1.3 Monitoring

The following parameters were measured during the event: applied vacuum, stinger vacuum, casing vacuum, vapor flow rate, vapor concentrations, vapor temperature, groundwater elevation, and groundwater flow rate. Vacuum gauges of various ranges were used to measure applied and observed vacuums on the unit and at extraction and observation wells. A thermal anemometer (Veloci-calc TSI Inc. Model 8355) was used to measure the extracted vapor flow rate after the secondary knockout tank. A thermometer was used to measure the temperature of extracted vapors after the secondary knockout tank. An electronic water level meter was used to measure depth to water in the extraction and monitoring wells. A totalizing water meter was used to monitor the amount of water produced during HVDPE.

Vapor samples were collected for field readings in a tedlar bag using a vacuum chamber designed to collect the sample without cross-contamination from previous samples. Extracted vapor concentrations were measured using a PID. A LandTec GEM 500 gas monitor was used to measure oxygen and carbon dioxide levels in the extracted vapors after the secondary knockout tank. Vapor samples were collected for laboratory analysis using evacuated Summa canisters. Samples were analyzed by Pace for VOCs or HVOCs by EPA Method TO14.

Individual extraction and observation well groundwater samples were collected for analysis using a bailer (see Appendix B). The HVDPE system was periodically shut down during the HVDPE event and groundwater was allowed to recharge in extraction wells prior to sampling. Groundwater samples were analyzed by Pace for VOCs or HVOCs by EPA Method 8260B.

### 5.1.4 HVDPE Event Sequence

Individual well tests were conducted on wells RW1A, RW3 and RW4 on 9 December 2004 and on well RW1 on 10 December 2004. During these individual well tests: Soil vapor and groundwater were extracted from the target stinger depth for extraction wells RW1 (22.5 feet), RW1A (21.5 feet), RW3 (24.5 feet), and RW4 (24 feet), stable vacuum (maximum achievable by the unit) was established at the extraction well and operated for approximately 45 minutes to 1 hour at this level, and then step tests were conducted by decreasing applied vacuum starting at 25, 20, 15, and 10 in. Hg in 5-minute intervals. During the individual well tests, vapor flow rates with and without bleed air, and total groundwater extracted were measured at the extraction well, and water level and induced vacuum were measured in adjacent monitoring wells.

Following the individual well tests, combined HVDPE was conducted on extraction wells RW1, RW1A, RW3, and RW4 from 10-20 December 2004. The system was operated from 10-14 December 2004 with atmospheric bleed air valves open at the extraction wellheads. Atmospheric air was initially needed to provide enough vapor flow to allow sufficient lift for water to be extracted from the wells. As the subsurface dewatered during HVDPE, atmospheric air was not needed, as sufficient vapor was produced by the formation to allow water to be extracted from the wells. The bleed air valves were closed on 14 December 2004 and remained shut through the end of the event. HVDPE was shut down briefly on 13 December 2004 and 16 December 2004 to collect water samples from the extraction wells. An additional individual well step test was again conducted on well RW3 prior to shutting down on 20 December 2004 to observe behavior after significant dewatering had occurred in the subsurface.

## 5.2 HVDPE Event – Groundwater Results

### 5.2.1 Groundwater Volume and Flow Rate

Groundwater was extracted from wells RW1, RW1A, RW3, and RW4 during the individual well tests and combined well HVDPE. A total of 169 gallons of groundwater was extracted during the individual well tests. Groundwater flow rates were approximately 0.3 gallons per minute (gpm) in well RW1, RW1A, and RW3, and approximately 0.2 gpm in RW4. The total volume of groundwater extracted during the individual tests for wells RW1, RW1A, RW3, and RW4 was 29, 53, 60, and 27 gallons, respectively.

During the combined well event, approximately 12,462 gallons of groundwater was extracted at combined flow rates ranging from 0.2 to 2.2 gpm and averaging 0.9 gpm. An average flow rate of 0.8 gpm was observed when the atmospheric bleed air valves were open at the extraction wellheads from 10 to 14 December 2004. A rise in the average flow rate to 1 gpm was observed after 14 December 2004, when the atmospheric bleed air valve was closed at the extraction wellheads.

### 5.2.2 Groundwater Drawdown

**Hydraulic Gradient:** As a result of groundwater extraction during the HVDPE event, drawdown was observed in several wells. In November 2004, the hydraulic gradient was approximately 0.027 towards the north-northwest (see Figure 12). During the HVDPE event, the groundwater elevations show a marked change (see Figure 13). The hydraulic gradient was increased to approximately 0.11 in the vicinity of the former settling tank and directed toward the extraction wells.

**Drawdown in Observation Wells:** Groundwater elevations during the HVDPE event are graphically presented in Figure 14. Groundwater drawdown during the event is depicted in cross-section on Figure 15 and estimated drawdown contours are shown on Figure 16. Well MW-1, located approximately 25 feet from the extraction locations, had the highest measured drawdown for an observation well of approximately 5.5 feet. Lesser drawdowns were observed in more distant observation wells including wells RW2 (4.4 feet), MW-5 (2.0 feet), and MW10 (0.3 feet) along the length of the TCE plume. Comparatively minor drawdown was observed in cross/upgradient wells MW-3 and MW-9, and no significant groundwater elevation change was observed in cross/upgradient wells MW-6 and MW-8.

**Dewatering Stabilization:** Groundwater drawdown in wells MW-1, MW-5, and RW2 reaches a near asymptotic level 8 days after the HVDPE start up. As shown in Figure 14, no significant change in groundwater elevation was observed beyond 8 days, indicating that the HVDPE event duration was sufficient to achieve groundwater drawdown to the extent possible with the well configuration. As shown in cross-section on Figure 15, HVDPE was able to dewater most of the saprolite/weathered bedrock in the source area.

**Asymmetric Drawdown:** Plotting and contouring the estimated drawdown for the HVDPE event shows an elliptical pattern (see Figure 16). The long axis of the ellipse is oriented in a northerly direction from the former settling tank area toward well MW10. The asymmetrical drawdown

pattern can be seen through comparison of similarly spaced wells. Well MW-5, which is located approximately 80 feet north of the extraction locations, had a drawdown of approximately 2.0 feet. However, well MW-9, which is located approximately 90 feet west of the extraction locations, had a drawdown of less than 0.1 feet. Furthermore, well MW10, which is located approximately 180 feet north of the extraction locations, had a drawdown of approximately 0.3 feet (see Figure 16).

The asymmetrical drawdown pattern is indicative of anisotropic groundwater flow conditions as would be found in fractured rock such as is observed at the site. The regional hydraulic gradient (see Figure 12) is a response to regional conditions of flow from recharge areas toward discharge areas, such as streams. Local groundwater flow directions may be at angles to regional hydraulic gradient due to the influences of fractured rock. The orientation of the major axis of the drawdown ellipse also coincides with the orientation of the TCE plume (see Figure 4). This coincidence is considered further evidence that the local groundwater flow is dominated by fractures that are oriented at an angle to the overall regional hydraulic gradient.

### 5.2.3 Groundwater Concentrations

Groundwater analytical results for individual well samples were collected before the event (October and November 2004), during the event (13, 16, 17, and 20 December 2004), and approximately monthly after the event (25 January, 23 February, and 4 April 2005) (see Table 4). Copies of the laboratory analytical reports are provided in Appendix D.

**TCE Concentrations:** Reductions in TCE groundwater concentrations ranging from a factor of 5 to over 100 were observed in the source area over the course of the event. Recent monitoring results indicate that TCE concentrations have rebounded locally in a small portion of the source area (around RW3), but remain below pre-remediation levels throughout the entire source area (see Figure 17, Table 5). The local rebounding appears to be due to immobile HVOC mass trapped in localized secondary fractures in the immediate vicinity of RW3, located within the footprint of the former source area. Importantly, concentrations no more than a few feet away from this well exhibited significantly less rebound, while concentrations outside of the source area remain stable at lower levels.

The estimated distribution of groundwater above 1.0 mg/L TCE prior to the HVDPE event is also shown on cross section A-A' (see Figure 15). As previously stated, most of this area appears to have been dewatered during the event.

**1,1,1-TCA and 1,1-DCE Concentrations:** Isoconcentration contour maps of 1,1,1-TCA and 1,1-DCE prior to and three months after the HVDPE event are shown in Figures 18 and 19, respectively. The concentration contours illustrate a reduction at the settling tank, but no significant change in the area of well RW1. Importantly, 1,1,1-TCA and 1,1-DCE are fully defined downgradient to below 2L standards and are more limited in extent than TCE.

**Observation Well Concentrations:** Prior to, during and following the HVDPE event, HVOC concentrations in samples collected from observation wells MW-1, MW-3, MW-5, MW10 and RW2 remained relatively stable.

#### 5.2.4 TCE Mass Removed in Groundwater

Groundwater treatment system influent sample results are presented in Table 4. Estimated TCE mass removed and mass removal rates are presented in Table 5. The mass of TCE removed in the liquid phase was calculated based on the groundwater concentrations from samples collected before the HVDPE event in October and November 2004 (baseline), as well as during the event on 13 December, 16 December, and 20 December 2004. A total of 0.07 lbs of TCE mass was removed during the 10 days of the combined well event. The estimated TCE mass extraction rate declined from 0.01 lbs/day near the beginning of the event to 0.003 lbs/day near the end of the event. Mass removed calculations are shown in Appendix G.

### 5.3 HVDPE Event – Vapor Results

#### 5.3.1 Vapor Flow Rate

The vapor flow rate during the event ranged from approximately 2.5 to 22 standard cubic feet per minute (scfm). An average vapor flow rate of approximately 19 scfm was observed before the bleed air valves were shut (10 through 14 December 2004). The average vapor flow rate dropped down to approximately 6 scfm after the valves were shut (14 through 20 December 2004). The operation of bleed air valves is discussed in Section 5.1.4.

#### 5.3.2 Induced Vacuum Influence

Induced vacuum was monitored at observation wells during the individual well tests, and during the combined well event as described in Section 5.1. The induced vacuum observations are presented in the field notes (see Appendix E). Table 6 presents the observed induced vacuum data and the distance to observation wells for each extraction well. The induced vacuum observed in wells MW-1, MW-5 and RW2 are graphically presented with groundwater elevation over time in Appendix G.

Initially during the combined well event, relatively high induced vacuum levels were observed. For example, an induced vacuum of 5 inches of water column was observed in well MW-1. Over time, these induced vacuum observations decreased significantly. When the system was restarted after a temporary shutdown, the induced vacuum would initially rise, then decrease again over time. The induced vacuum eventually decreased during the combined well event to zero in all vacuum observation points measured, except for in well RW2.

These initial, relatively high induced vacuum readings are most likely due to the groundwater drawdown in the observation wells, which were sealed air-tight. As the groundwater level in the wells dropped due to the groundwater extraction component of the HVDPE, this would have induced a vacuum in the wells in the space above the surface of the water. As air slowly seeped into the wells, the induced vacuum observed in the wells dropped. During the combined well event, the nearest monitoring point for induced vacuum was approximately 22 feet from the closest extraction well.

During the individual well tests, there were at least three vacuum observation points within 15 feet of each extraction well. The induced vacuums observed during these tests in the wells within 15 feet of the extraction wells were most likely due to the vapor extraction portion of the HVDPE. Induced vacuum was observed in monitoring points beyond 15 feet, but it is uncertain

that these observations were due to changes in the groundwater level or due to vapor extraction. The individual well tests were each performed for less than 2 hours, and the vacuum measurements in outlying wells often varied significantly more than observations in the wells located closer to the extraction wells. Although site conditions, including lithology and well construction, make it difficult to accurately estimate the extent of vacuum influence due to vapor extraction, a conservative estimate of the radius of vacuum influence is 10-15 feet.

### 5.3.3 Vapor Concentrations

Vapor concentrations were monitored through PID readings in the field as well as laboratory analysis (see Table 7 and Appendix D). The vapor analytical results showed maximum concentrations of 2.0 parts per million by volume (ppmv) TCE in well RW3 and 1.6 ppmv TCE in system influent. Except for 1,1,1-TCA, 1,1-DCA, and 1,1-DCE, which were reported at low concentrations, other HVOCs were not reported above the laboratory reporting limits. PID readings were also generally low, and a concentration trend could not be identified during the course of the event. The vapor concentrations observed during the event indicate the presence of a limited mass of HVOCs in the vadose zone and saturated zone exposed to HVDPE as a result of dewatering.

### 5.3.4 TCE Mass Removed in Vapor

The mass of TCE removed in the vapor phase was calculated based on the vapor concentrations observed for the influent samples collected on 10, 12, and 20 December 2004 (see Tables 5 and 7). Mass removed in vapor up to 12 December 2004 was estimated using the average flow rate of 19 scfm, measured when the atmospheric bleed air valves were open. Mass removed from 12 through 20 December 2004 was estimated based on the average flow rate of 6 scfm, measured after the valves were shut. Approximately 0.04 lbs of TCE was removed in the vapor phase during the combined well event. Estimated mass removal rates declined from 0.01 lbs/day between 10 and 12 December 2004 and to 0.002 lbs/day between 12 and 20 December 2004. As mentioned above, the small amount of mass removed in vapor and the low observed extracted vapor concentrations indicate the presence of a limited mass of HVOCs in the vadose zone and saturated zone exposed to HVDPE as a result of dewatering. Mass removed calculations are shown in Appendix G.

## 5.4 Evaluation of Additional Remediation

### 5.4.1 HVDPE Completed to Extent Practicable

HVDPE is considered the BAT for HVOC remediation at the site for the following reasons:

- HVDPE dewatered the source area, establishing the most favorable conditions for HVOC mass removal;
- HVDPE extracted HVOC mass in both the water and vapor phases, maximizing mass removal; and
- HVDPE lowered the pressure in the subsurface, facilitating volatilization of HVOCs.

HVDPE conducted during the 10-day time frame was sufficient to create the maximum drawdown achievable in the source area with the current well configuration, as indicated by

stabilized drawdown observed in wells by the eighth day of the event (see Section 5.2.2). Greater drawdown with the current well configuration is not expected if HVDPE is run for a longer period of time.

During the HVDPE event, a limited mass of 0.11 pounds TCE was removed and declining mass removal rates were observed. Considering the conceptual model (see Section 4.0), residual HVOC mass trapped in limited permeability and dead-end fractures cannot be effectively removed. The additional pore space that may be exposed to vapor flow during a longer period of HVDPE is expected to be minimal. A significant increase in extractable mass is not expected over a longer term, either with another temporary event or with installation of a more permanent, fixed-base system. Therefore, HVDPE has been completed to the extent practicable and additional operation of HVDPE is not likely to cost-effectively reduce HVOC concentrations and mass.

#### **5.4.2 Alternative Remedial Technologies**

Other remediation technologies, such as steam stripping, air sparging, ozone sparging, enhanced bioremediation, or chemical injection, face challenges similar to HVDPE with regard to the conceptual model of a fractured low-permeability heterogeneous subsurface, which limits the ability of each technology to effectively address HVOC mass trapped in lower-permeability and dead-end fractures. In addition, these technologies introduce the risk of mobilizing HVOCs and/or creating unwanted by-products. Accordingly, these alternative remedial technologies are not likely to be cost-effective approaches for site remediation.

An evaluation of active remedial alternatives is presented in a request for variance, which is being submitted concurrently.

#### **5.5 HVDPE Event Conclusions**

The following can be concluded based on the HVDPE event conducted in December 2004:

- HVDPE effectively dewatered the identified source area, as indicated by groundwater drawdown nearly to the saprolite/bedrock interface in the area of the highest TCE groundwater concentrations reported at the site.
- HVDPE conducted during the 10-day time frame was sufficient to create maximum drawdown achievable in the source area with the current well configuration, as indicated by near asymptotic drawdown observed in wells around the source area by the eighth day of the event.
- Reductions in TCE groundwater concentrations ranging from a factor of 5 to over 100 were observed in the source area over the course of the event. Recent monitoring results indicate that TCE concentrations have rebounded locally in a small portion of the source area (around RW3), but remain below pre-remediation levels throughout the entire source area (see Figure 17, Table 5). The local rebounding appears to be due to immobile HVOC mass trapped in localized secondary fractures in the immediate vicinity of RW3, located within the footprint of the former source area. Importantly, concentrations no more than a few feet away from this well exhibited significantly less rebound, while concentrations outside of the source area remain stable at lower levels. Extracted vapor

---

analytical results and TCE mass removed in the vapor phase indicate limited HVOCs in the vadose zone and limited extractable mass in the area dewatered during the event.

- Considering the above conclusions, which are consistent with the CSM presented in Section 4, residual HVOC mass trapped in limited permeability and dead-end fractures cannot be effectively removed with this technology. The additional pore space that may be exposed to vapor flow during a longer period of HVDPE is expected to be minimal. A significant increase in extractable mass is not expected over a longer term, either with another temporary event or with installation of a more permanent, fixed-base system. Therefore, HVDPE has been completed to the extent practicable.

## 6.0 CLOSING

### 6.1 Conclusions

The following is concluded from the supplemental investigation activities conducted from August through April 2005 and the HVDPE event conducted in December 2004:

- The primary suspected source of HVOCs has been identified as the area of the former settling tank, based on extensive soil and groundwater investigation and the elevated HVOC groundwater concentrations in this area. The settling tank was previously decommissioned, indicating that the primary source is no longer active. In addition, the general absence of HVOCs in soil and low concentrations reported in extracted soil vapor indicate that secondary sources are not likely to contribute significantly to groundwater.
- Limited HVOC mass has been identified in unsaturated zone soil samples, indicating that there is no active source in the unsaturated zone contributing HVOC mass to the groundwater. HVOC groundwater and soil concentrations reported during the investigations do not indicate the presence of DNAPL.
- A TCE plume from the former settling tank area has been defined to extend northerly across the parking area. Data indicate that the plume has not migrated offsite. Based on the rate of decline in concentrations observed along the length of the plume, concentrations of TCE above 2L standards are not anticipated to migrate across the property boundary. Other HVOCs (e.g., 1,1,1-TCA, 1,1-DCE) exhibit a more limited distribution. These data indicate that the extent of HVOCs has been adequately defined.
- The nearest water supply well is located approximately 1,500 feet west (crossgradient) of the site. No other water supply wells have been identified within 2,000 feet of the site. Based on the low concentration of the HVOCs in groundwater, low groundwater flow rates, and the nearest water supply well locations, there does not appear to be a significant risk to human health.
- During the HVDPE event, TCE concentrations in source area extraction wells declined in response to HVDPE. Stabilized water levels in observation wells and low and declining TCE mass removal rates indicate that HVDPE reached its maximum effectiveness during the 10-day event. Monitoring results indicate that TCE concentrations have rebounded locally in a small portion of the source area (around RW3), but remain below pre-remediation levels throughout the entire source area. These findings are consistent with the CSM and indicate that remaining HVOC mass is trapped in limited permeability and dead-end fractures, mobility is diffusion limited, and further HVDPE or other remedial activities are not likely to cost-effectively reduce the limited mass of HVOCs remaining beneath the site. Evaluation of alternative active remediation technologies is presented in a request for variance, which is being submitted concurrently.

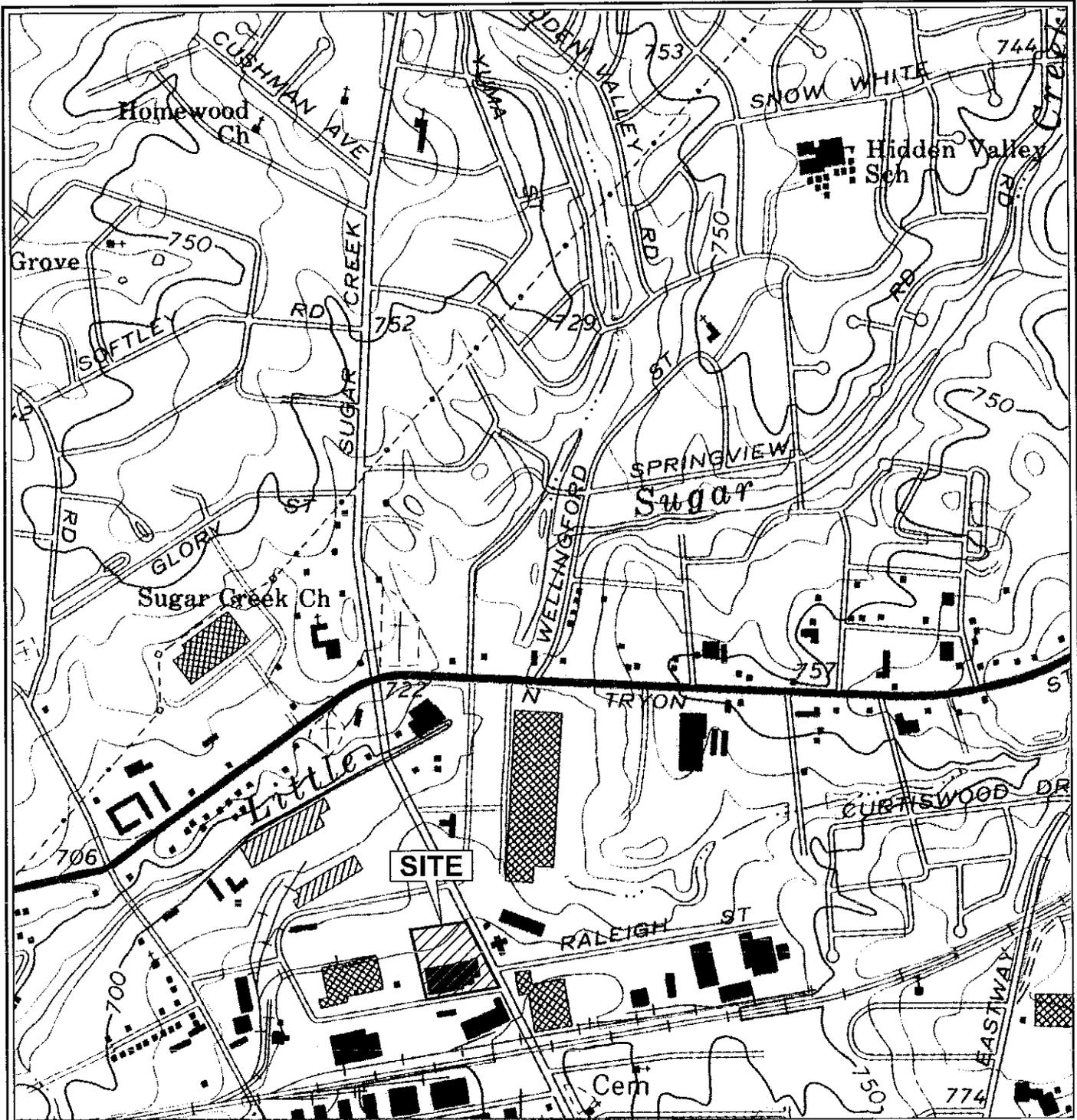
## 6.2 Variance Application

Based on the site activities presented herein, (1) the sources have been identified and are no longer active, (2) the extent of HVOCs in the subsurface is adequately defined, (3) the absence of water supply wells and shallow soil contamination indicates that there is no significant risk to human health, and (4) a BAT was applied to reduce mass to the extent practicable. Accordingly, a request for variance from 2L standards has been prepared.

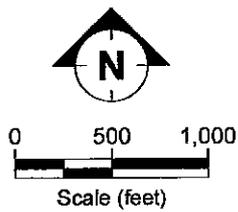
## 7.0 REFERENCES

- Blasland, Bouck & Lee, Inc. 2001a. Phase I Environmental Site Assessment. Kaiser Fluid Technologies. March.
- Blasland, Bouck & Lee, Inc. 2001b. Phase II Environmental Site Assessment. Kaiser Fluid Technologies, Inc. August
- Blasland, Bouck & Lee, Inc. 2001c. Comprehensive Site Assessment. Kaiser Fluid Technologies, Inc. December.
- ETIC Engineering, Inc. 2004a. Scope of Work for Supplemental Investigation Memorandum, Kaiser Fluid Technologies, 530 East Sugar Creek Road, Charlotte, North Carolina. 10 August.
- ETIC Engineering, Inc. 2004b. Scope of Work for High Vacuum Dual-Phase Extraction Pilot Test Memorandum, Kaiser Fluid Technologies, 530 East Sugar Creek Road, Charlotte, North Carolina. 29 November.
- Montgomery Watson Harza 2002. Groundwater Monitoring Report for 2002, Kaiser Fluid Technologies Facility, 530 East Sugar Creek Road, Charlotte, NC, NC Groundwater Incident 85906, December.
- Montgomery Watson Harza 2004. Groundwater Monitoring Report for 2003, Kaiser Fluid Technologies Facility, 530 East Sugar Creek Road, Charlotte, NC, NC Groundwater Incident 85906, January.
- Montgomery Watson Harza (MWH). 2005. Groundwater Monitoring Report for 2004, Kaiser Fluid Technologies Facility, 530 East Sugar Creek Road, Charlotte, NC, NC Groundwater Incident 85906, February. (Contained in this report as Appendix A).
- North Carolina Department of Environment and Natural Resources, Division of Water Quality. 2001. Notice of Violation. 11 September.
- North Carolina Department of Environment and Natural Resources, Division of Water Quality. 2002. Acknowledgement of Receipt –Assessment Report Letter. 25 March.

## **Figures**



Source Map: USGS Derita, NC Quadrangle

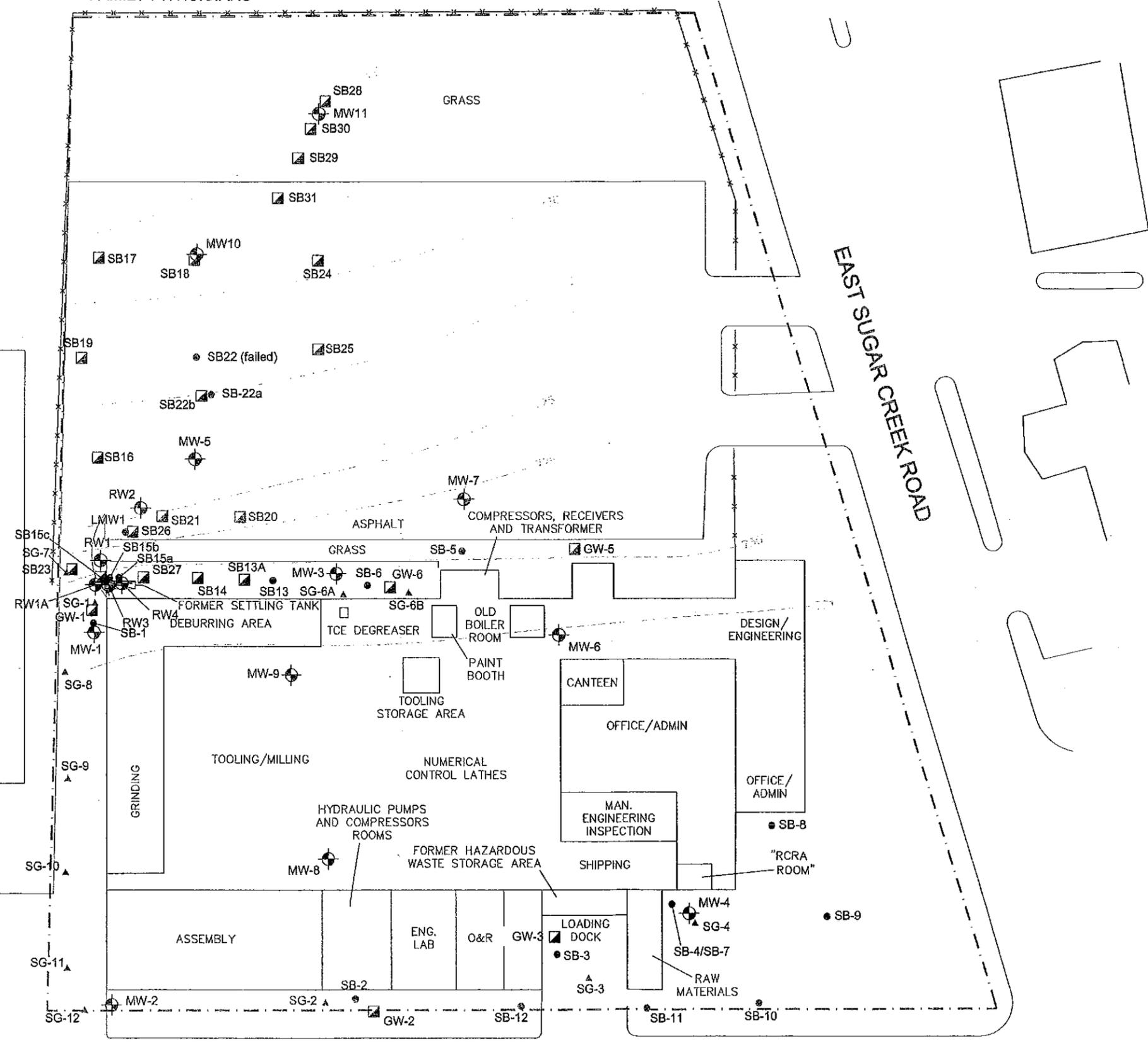


<b>SITE VICINITY MAP</b>		
FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
 <b>ETIC</b> ENGINEERING	Date: 4/18/2005	Figure: <b>1</b>
	TOPO0405.DWG	

FORMER METROLINA  
FAMILY PHYSICIANS

CONCRETE  
SUPPLY CO.

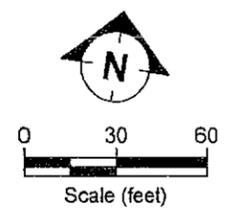
GENERAL  
BONDED  
WAREHOUSE



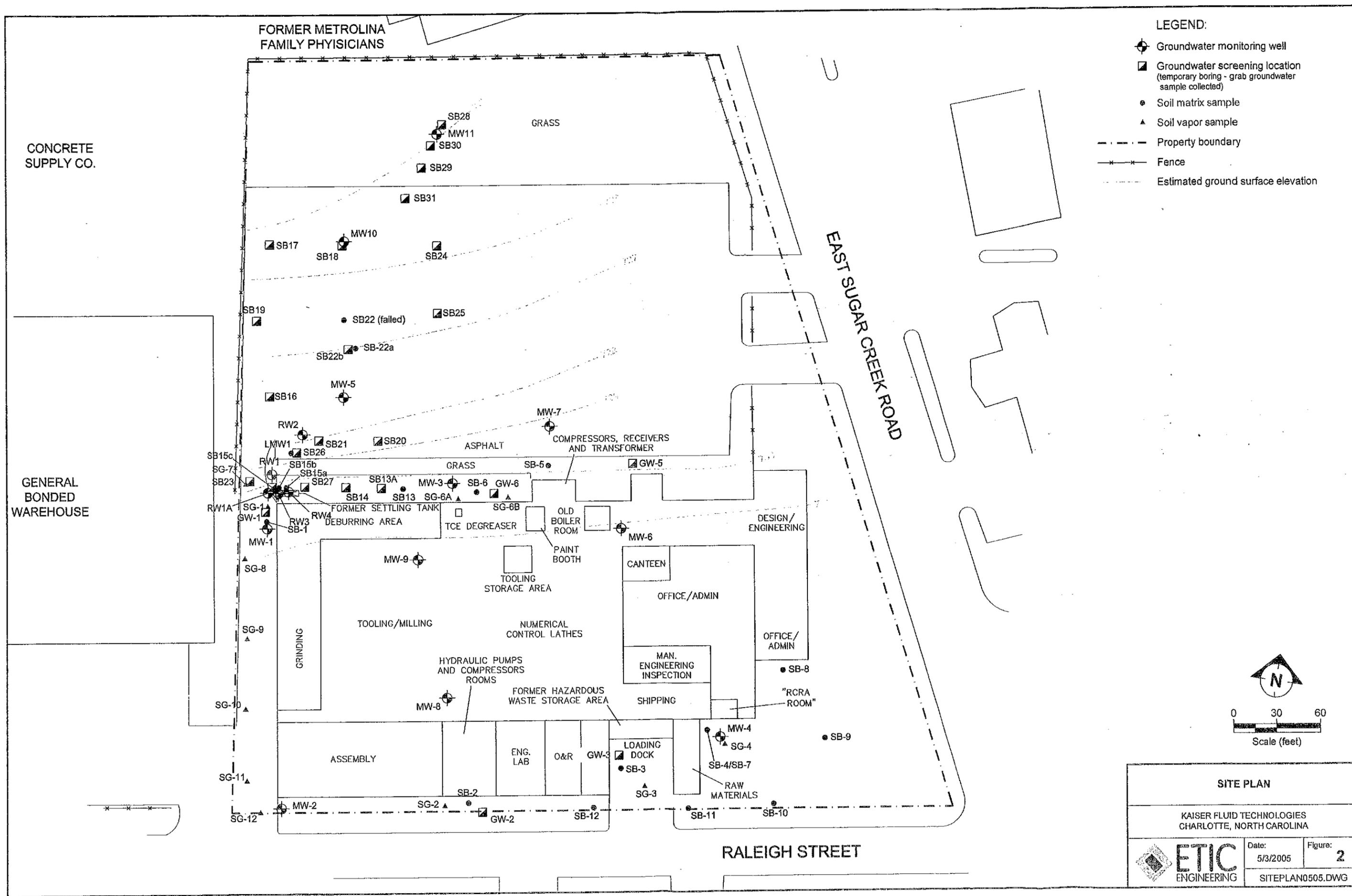
- LEGEND:**
- ⊕ Groundwater monitoring well
  - ▣ Groundwater screening location (temporary boring - grab groundwater sample collected)
  - Soil matrix sample
  - ▲ Soil vapor sample
  - - - Property boundary
  - x - x - Fence
  - ⋯ Estimated ground surface elevation

EAST SUGAR CREEK ROAD

RALEIGH STREET



<b>SITE PLAN</b>		
KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
	Date: 5/3/2005	Figure: <b>2</b>
	SITEPLAN0505.DWG	



FORMER METROLINA  
FAMILY PHYSICIANS

CONCRETE  
SUPPLY CO.

GENERAL BONDED  
WAREHOUSE

EAST SUGAR CREEK ROAD

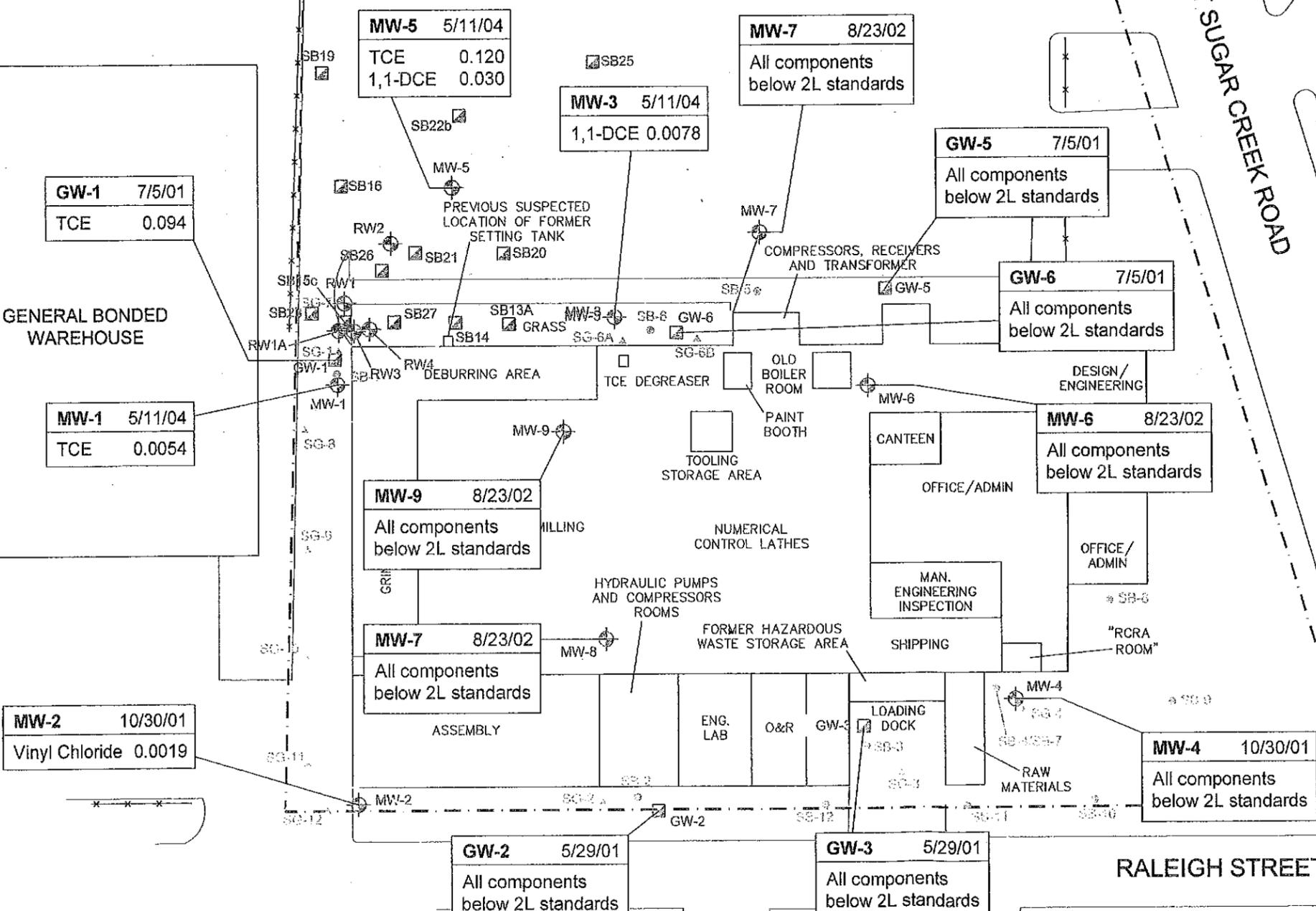
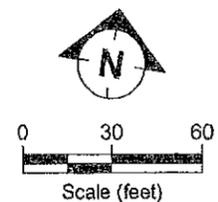
RALEIGH STREET

**LEGEND:**

- Groundwater monitoring well
- Groundwater screening location
- Soil matrix sample
- Soil vapor sample
- Property boundary
- Fence
- Potential area above 15A NCAC 2L standards

Well/Boring number	Date of groundwater results
Analyte	Concentration in milligrams per liter (if above 2L standard)

TCE Trichloroethene  
DCE Dichloroethene



**GW-1** 7/5/01  
TCE 0.094

**MW-5** 5/11/04  
TCE 0.120  
1,1-DCE 0.030

**MW-3** 5/11/04  
1,1-DCE 0.0078

**MW-7** 8/23/02  
All components below 2L standards

**GW-5** 7/5/01  
All components below 2L standards

**GW-6** 7/5/01  
All components below 2L standards

**MW-1** 5/11/04  
TCE 0.0054

**MW-9** 8/23/02  
All components below 2L standards

**MW-6** 8/23/02  
All components below 2L standards

**MW-2** 10/30/01  
Vinyl Chloride 0.0019

**MW-7** 8/23/02  
All components below 2L standards

**MW-4** 10/30/01  
All components below 2L standards

**GW-2** 5/29/01  
All components below 2L standards

**GW-3** 5/29/01  
All components below 2L standards

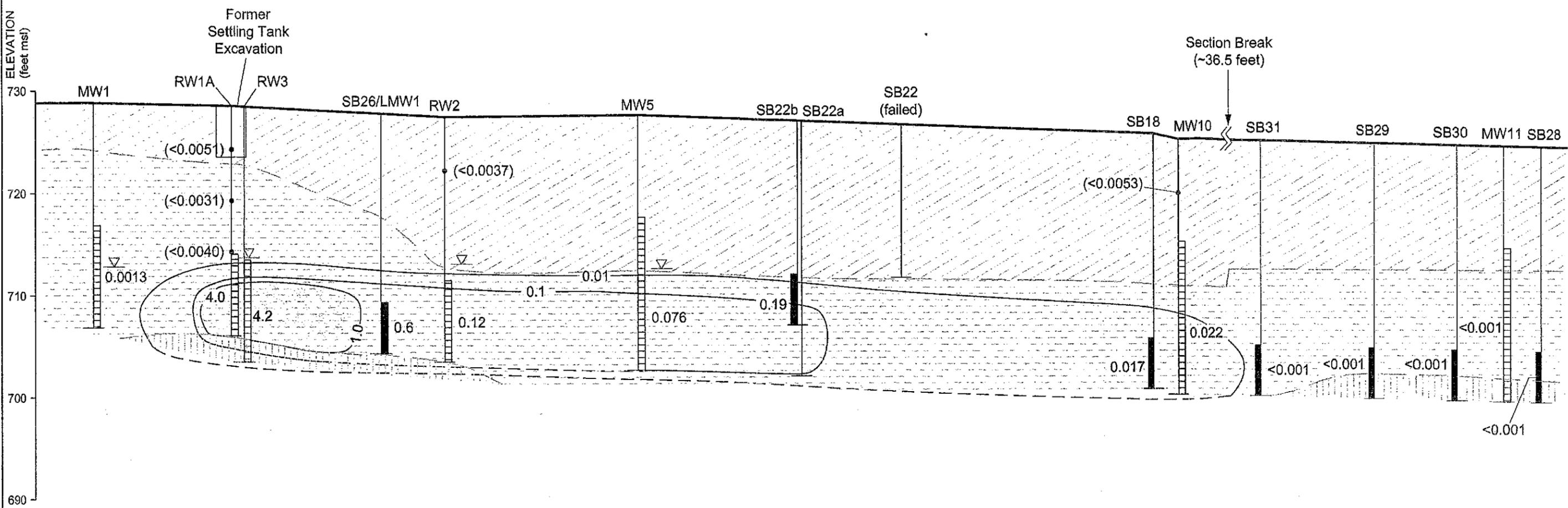
**SITE PLAN SHOWING HVOC DISTRIBUTION PRIOR TO 2004 SUPPLEMENTAL INVESTIGATION**

KAISER FLUID TECHNOLOGIES  
CHARLOTTE, NORTH CAROLINA

**ETIC ENGINEERING**

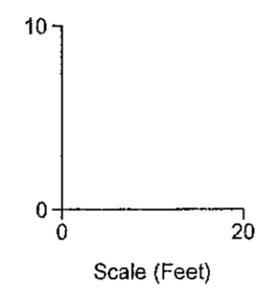
Date: 3/1/2005 Figure: 3  
SITEPLAN0305.DWG

**A** (South) **A'** (North)



**LEGEND:**

- Grab groundwater location
- Soil sample location
- Screen interval
- (<math><0.0053</math>) TCE concentration in soil (mg/kg)
- 0.12 TCE concentration in groundwater (mg/L)
- Approximate groundwater level
- mg/L Milligrams per liter
- mg/kg Milligrams per kilogram
- TCE Trichloroethene
- MSL Mean Sea Level
- Silt and clay
- Weathered bedrock (Saprolite)
- Bedrock
- 0.01 - 0.1 mg/L TCE in groundwater
- 0.1 - 1.0 mg/L TCE in groundwater
- >1.0 mg/L TCE in groundwater

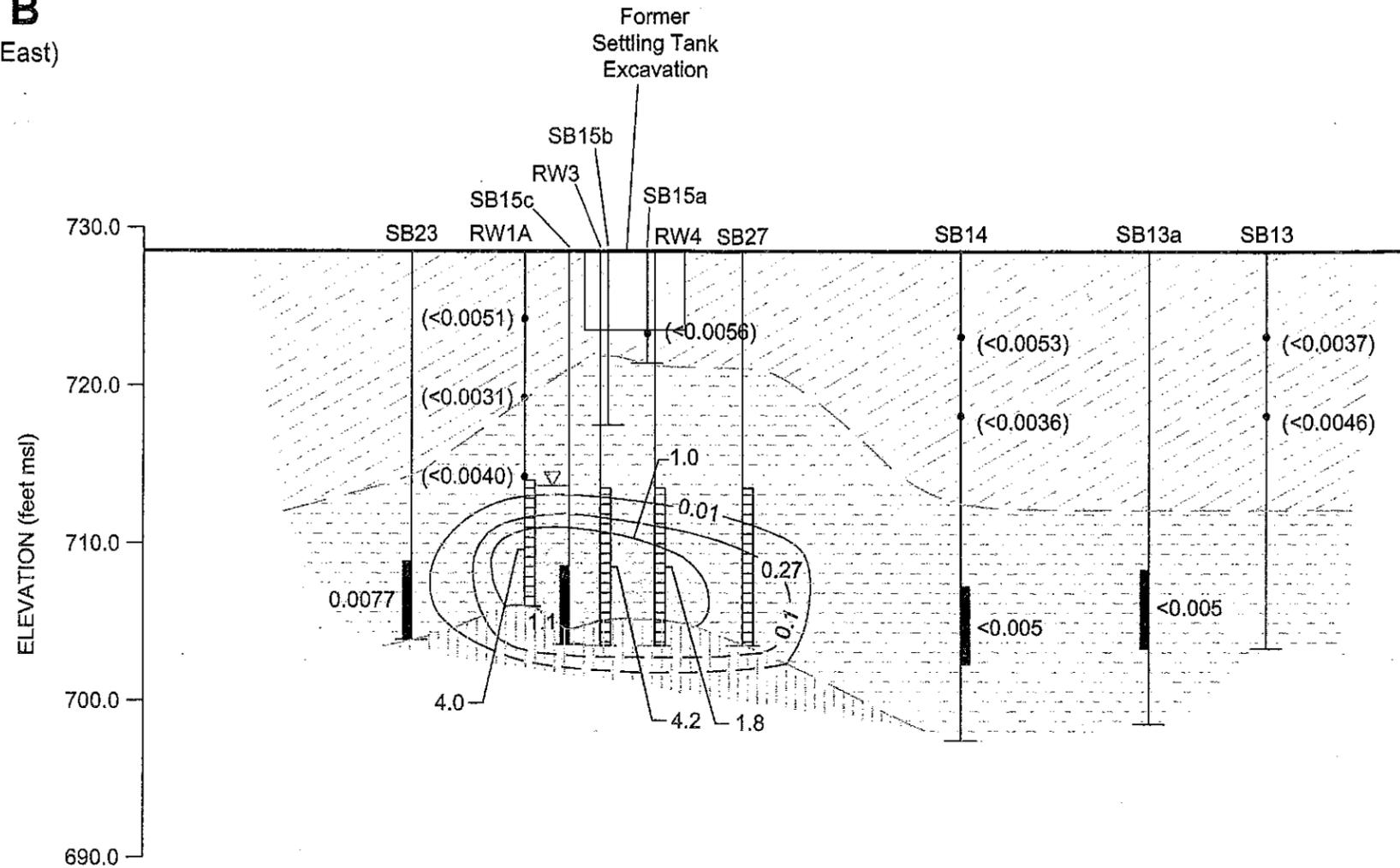


Note: Groundwater results are from August - November 2004, except SB-28-SB31 (March 2005) and MW11 (April 2005).

<b>SCHEMATIC CROSS SECTION A-A'</b>		
FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
	Date: 5/2/2005	Figure: 5
	SECTIONS0405.DWG	

**B**  
(East)

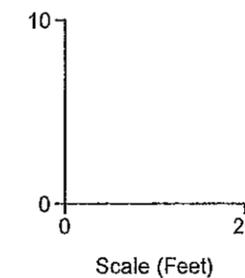
**B'**  
(West)



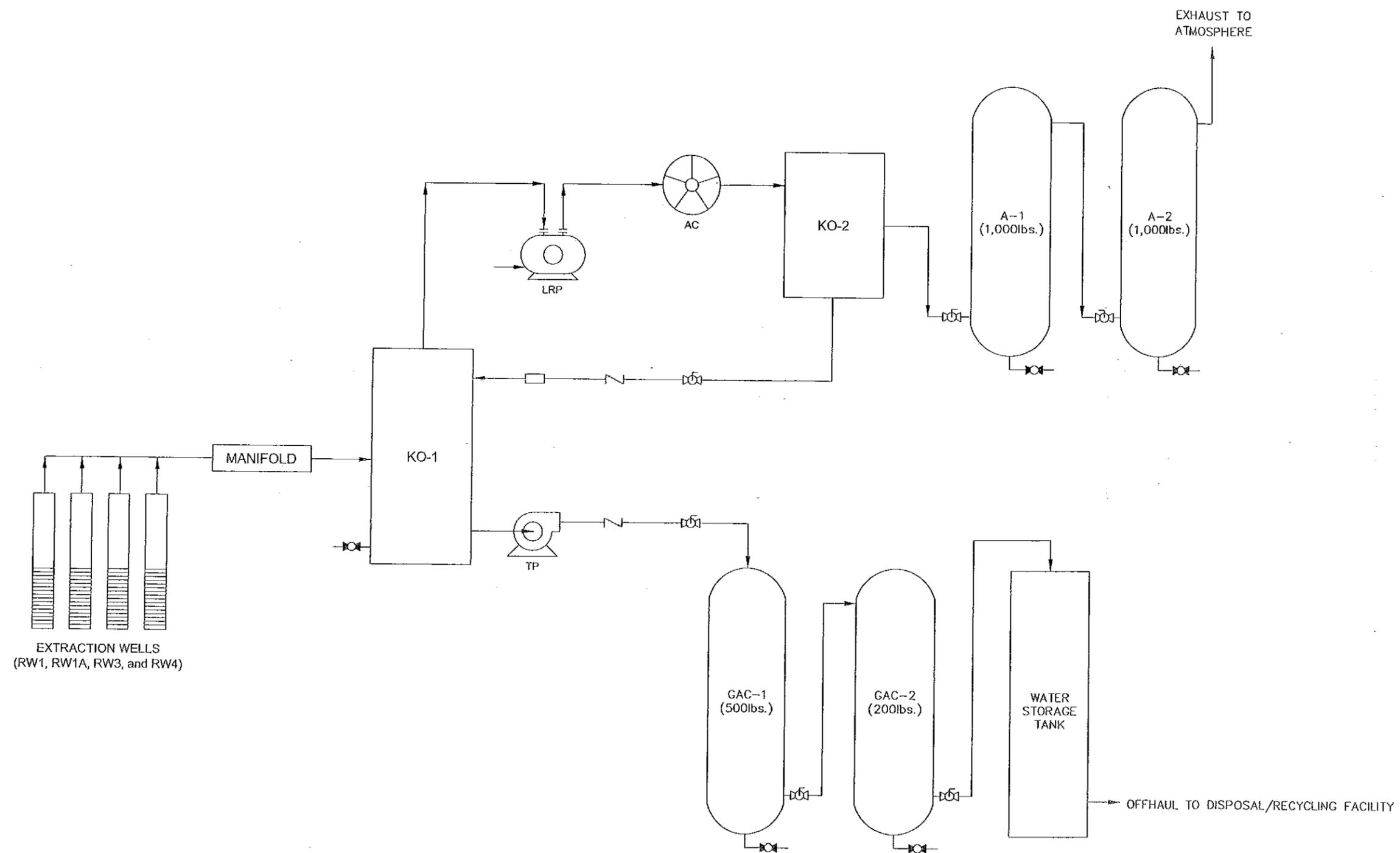
LEGEND:

- Grab groundwater location
  - Soil sample location
  - Screen interval
  - Silt and clay
  - Weathered bedrock (Saprolite)
  - Bedrock
  - 0.01 - 0.1 mg/L TCE in groundwater
  - 0.1 - 1.0 mg/L TCE in groundwater
  - >1.0 mg/L TCE in groundwater
- (<0.0053) TCE concentration in soil (mg/kg)  
 0.120 TCE concentration in groundwater (mg/L)  
 Approximate groundwater level  
 mg/L Milligrams per liter  
 mg/kg Milligrams per kilogram  
 TCE Trichloroethene  
 MSL Mean Sea Level

Note: Groundwater results are from August - November 2004.



<b>SCHEMATIC CROSS SECTION B-B'</b>		
FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
	Date: 5/2/2005	Figure: 6
	SECTIONS0405.DWG	



LRP LIQUID RING PUMP  
 KO-1 PRIMARY KNOCK-OUT VESSEL  
 KO-2 SECONDARY KNOCK-OUT VESSEL  
 AC AFTERCOOLER  
 TP KNOCK-OUT TRANSFER PUMP  
 A-1, A-2 VAPOR PHASE GRANULAR ACTIVATED CARBON VESSELS  
 GAC-1, GAC-2 LIQUID PHASE GRANULAR ACTIVATED CARBON VESSELS

**HVDPE PROCESS FLOW DIAGRAM**  
 FORMER KAISER FLUID TECHNOLOGIES  
 CHARLOTTE, NORTH CAROLINA

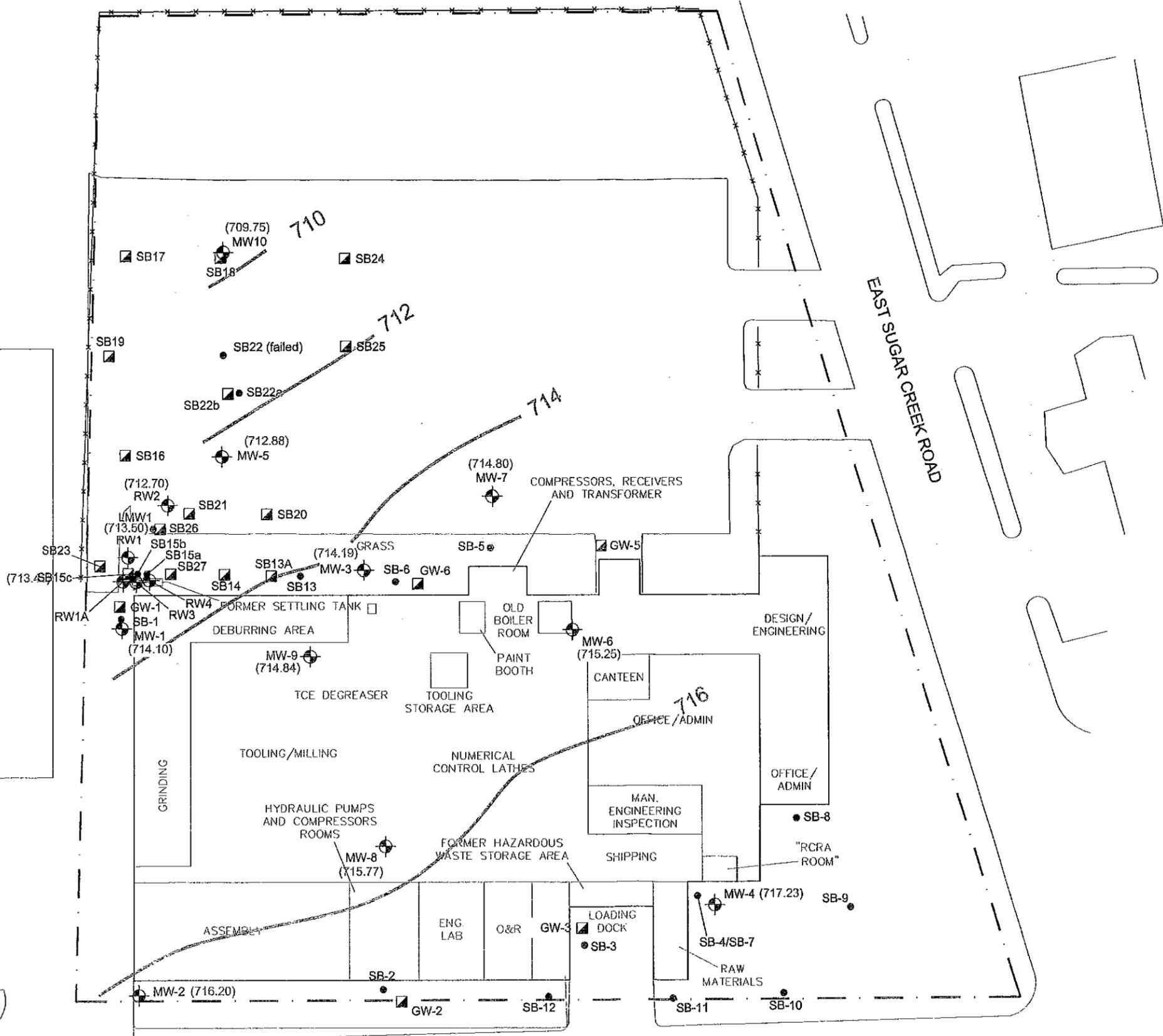
	DESIGN: VIBHAV MANKAD	DRAWING: --	FIGURE 10
	DRAWN: MICHAEL WOTTRICH		
	DATE: 2/8/2005	FILENAME: Process Flow 0105.DWG	
	PROJECT NUMBER: TMFKT 2.19		

FORMER METROLINA  
FAMILY PHYSICIANS

CONCRETE  
SUPPLY CO.

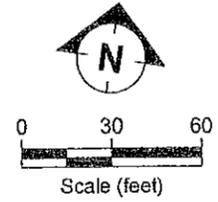
GENERAL  
BONDED  
WAREHOUSE

- LEGEND:**
- ⊕ Groundwater well
  - ▣ Groundwater screening location
  - Soil matrix sample
  - - - Property boundary
  - x-x- Fence
  - 714- Groundwater elevation contour (ft msl)



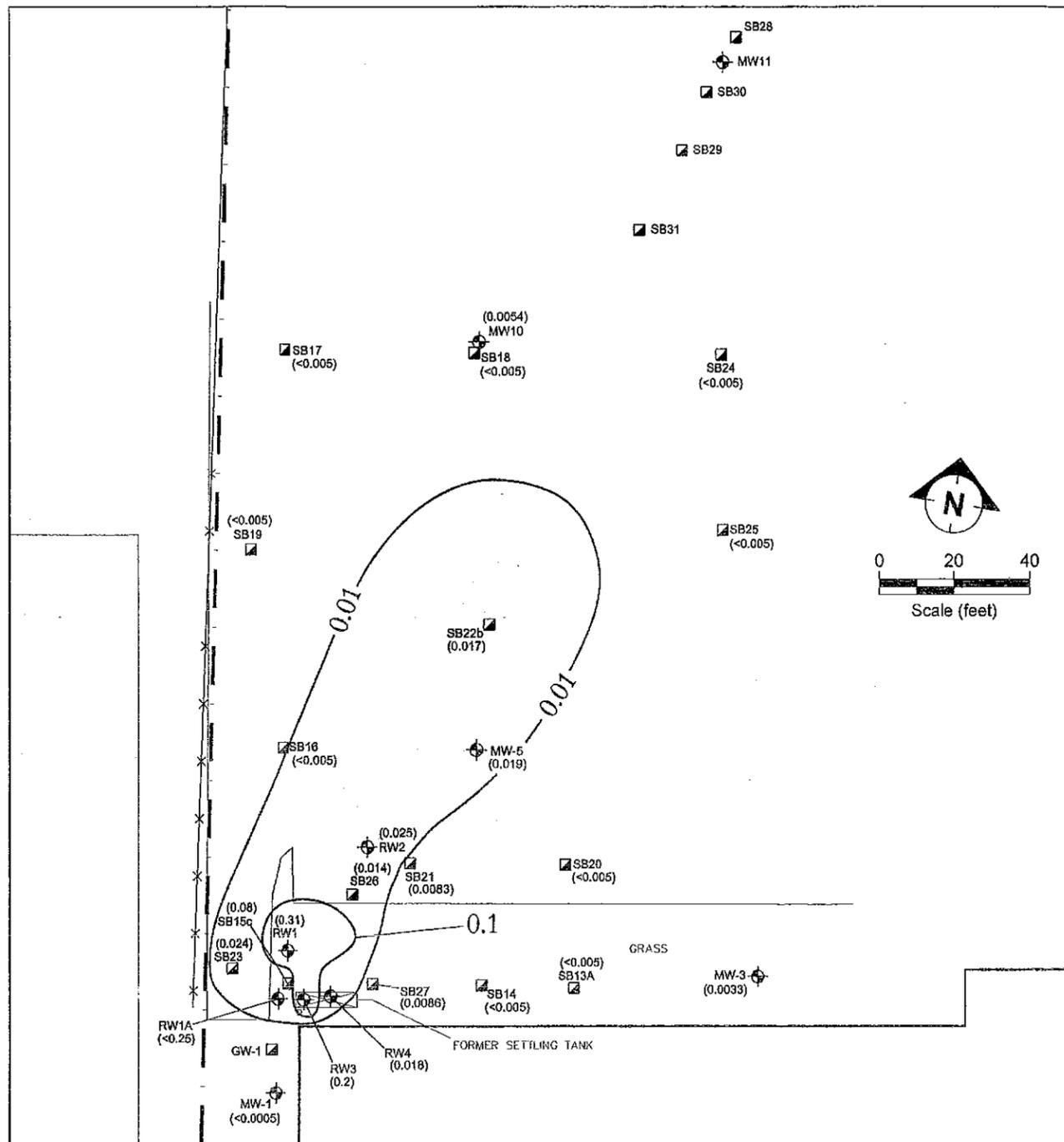
EAST SUGAR CREEK ROAD

RALEIGH STREET

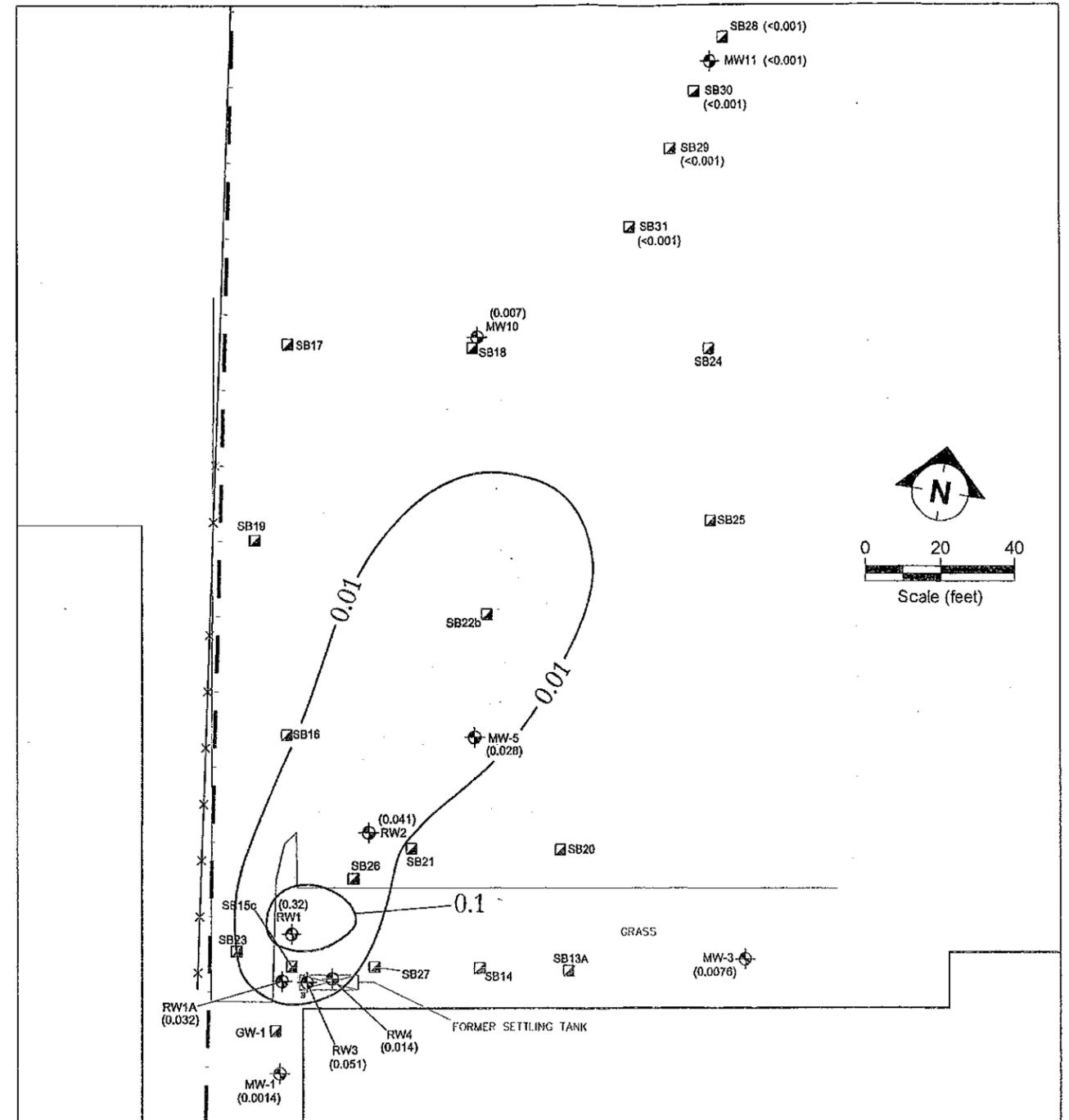


<p>PRE-HVDPE EVENT GROUNDWATER ELEVATIONS NOVEMBER 16, 2004</p>		
<p>FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA</p>		
	Date: 2/8/2005	Figure: 12
	<p>SITEPLAN0105-2.DWG</p>	





**PRE-HVDPE EVENT  
(AUGUST - NOVEMBER 2004)**



**3 MONTHS AFTER END OF HVDPE EVENT  
(APRIL 2005)**

- LEGEND:**
- Groundwater well
  - Grab groundwater sample location
  - Property boundary
  - Fence
  - (0.032) DCE concentration in mg/L
  - < Less than noted laboratory reporting limit
  - 0.01 - 0.1 mg/L DCE in groundwater
  - >0.1 mg/L DCE in groundwater contour symbol"/> >0.1 mg/L DCE in groundwater
  - mg/L Milligrams per liter
  - DCE Dichloroethene

**1,1-DCE ISOCONCENTRATION CONTOURS**

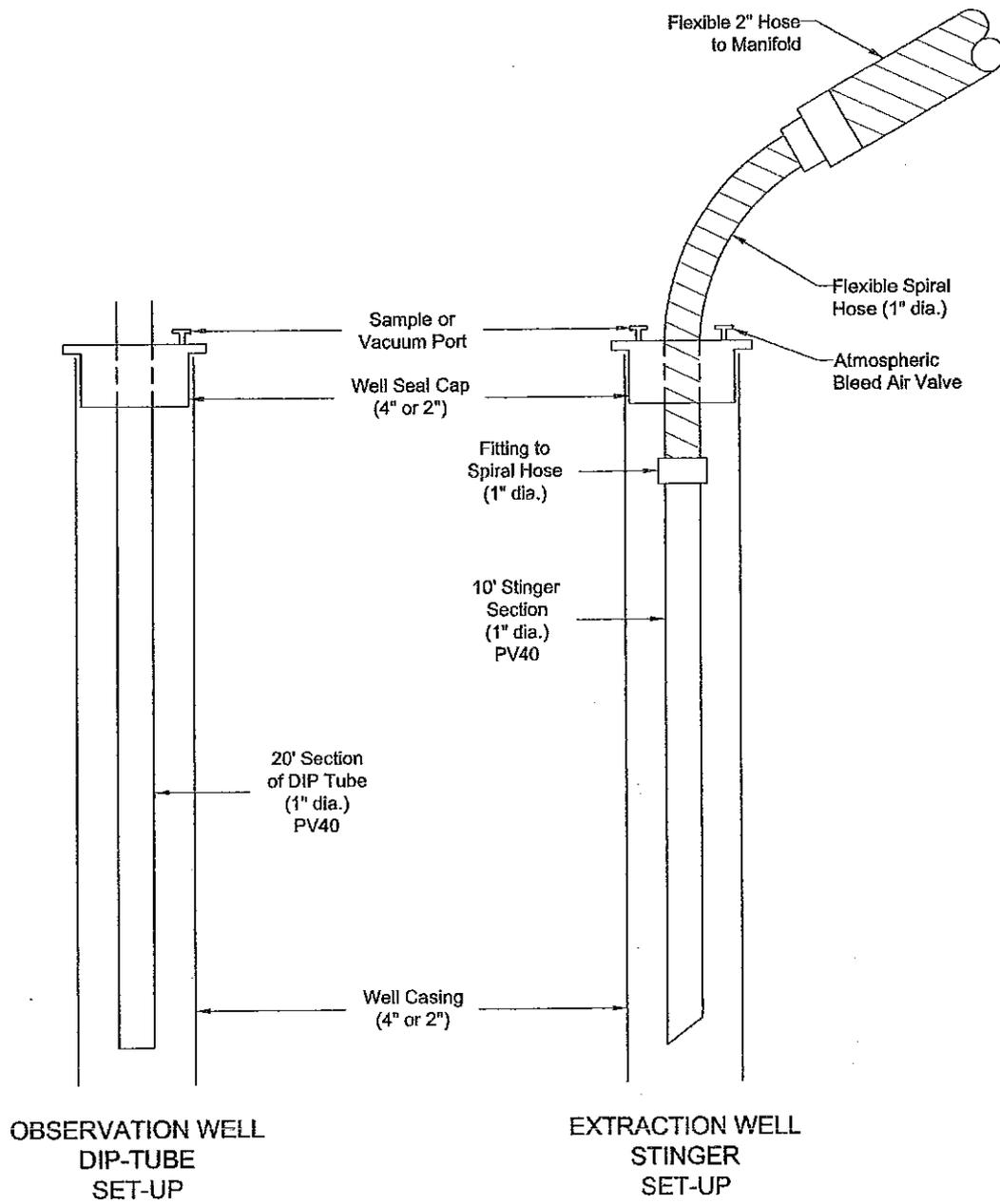
FORMER KAISER FLUID TECHNOLOGIES  
CHARLOTTE, NORTH CAROLINA



Date: 5/3/2005 Figure: 19

SITEPLAN0505-3.DWG





WELLHEAD DETAILS

FORMER KAISER FLUID TECHNOLOGIES  
CHARLOTTE, NORTH CAROLINA

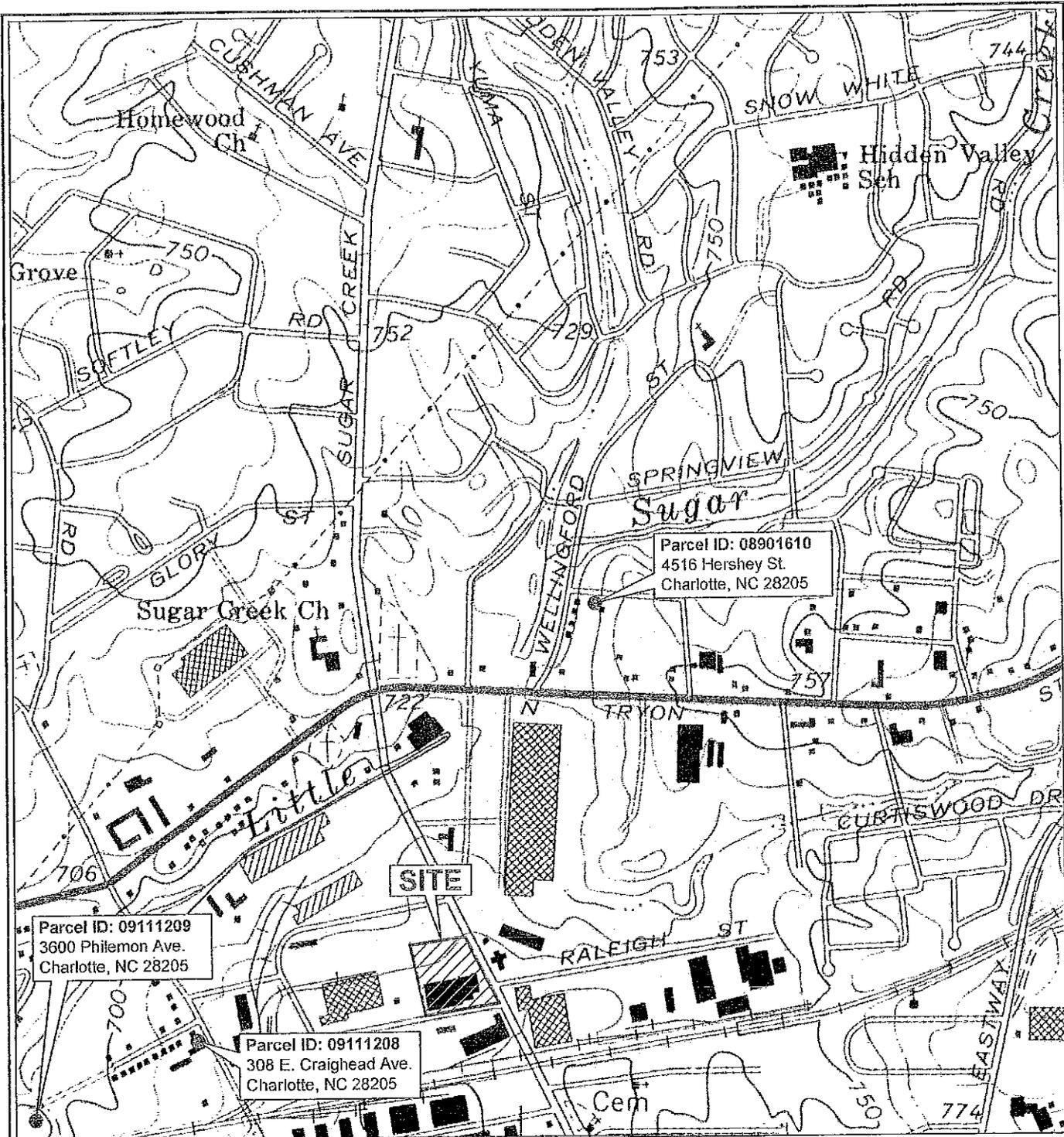


**ETIC**  
ENGINEERING

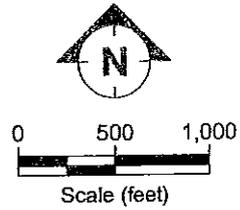
Date:  
2/23/2005

Figure:  
**11**

Well Construction.DWG



Source Map: USGS Derita, NC Quadrangle



<b>SITE VICINITY MAP WITH APPROXIMATE WATER SUPPLY WELL LOCATIONS WITHIN 1/2-MILE</b>		
FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
	Date: 5/3/2005	Figure: 8
	TOPO0405.DWG	

Ground Surface

SILT AND CLAY

SAPROLITE  
(Weathered bedrock with fractures  
containing sediment/mineral deposits)

BEDROCK

Larger, More  
Permeable Fractures  
(preferential pathways)

Smaller, Less  
Permeable Fractures

"Dead End"  
Fracture

Groundwater/  
vapor flow induced  
by HVDPE

Mobility of  
HVOC mass  
primarily limited  
to diffusion

Sediment/water/  
HVOC mass  
trapped in  
"Dead End"  
Fractures

LEGEND:

▽ Groundwater level

HVDPE High vacuum dual phase extraction

HVOC Halogenated volatile organic compound

Not To Scale

Note: Fracture size and spacing is exaggerated for clarity.

**SCHEMATIC DIAGRAM FOR  
RESIDUAL HVOC MASS IN  
WEATHERED BEDROCK FRACTURES**

FORMER KAISER FLUID TECHNOLOGIES  
CHARLOTTE, NORTH CAROLINA



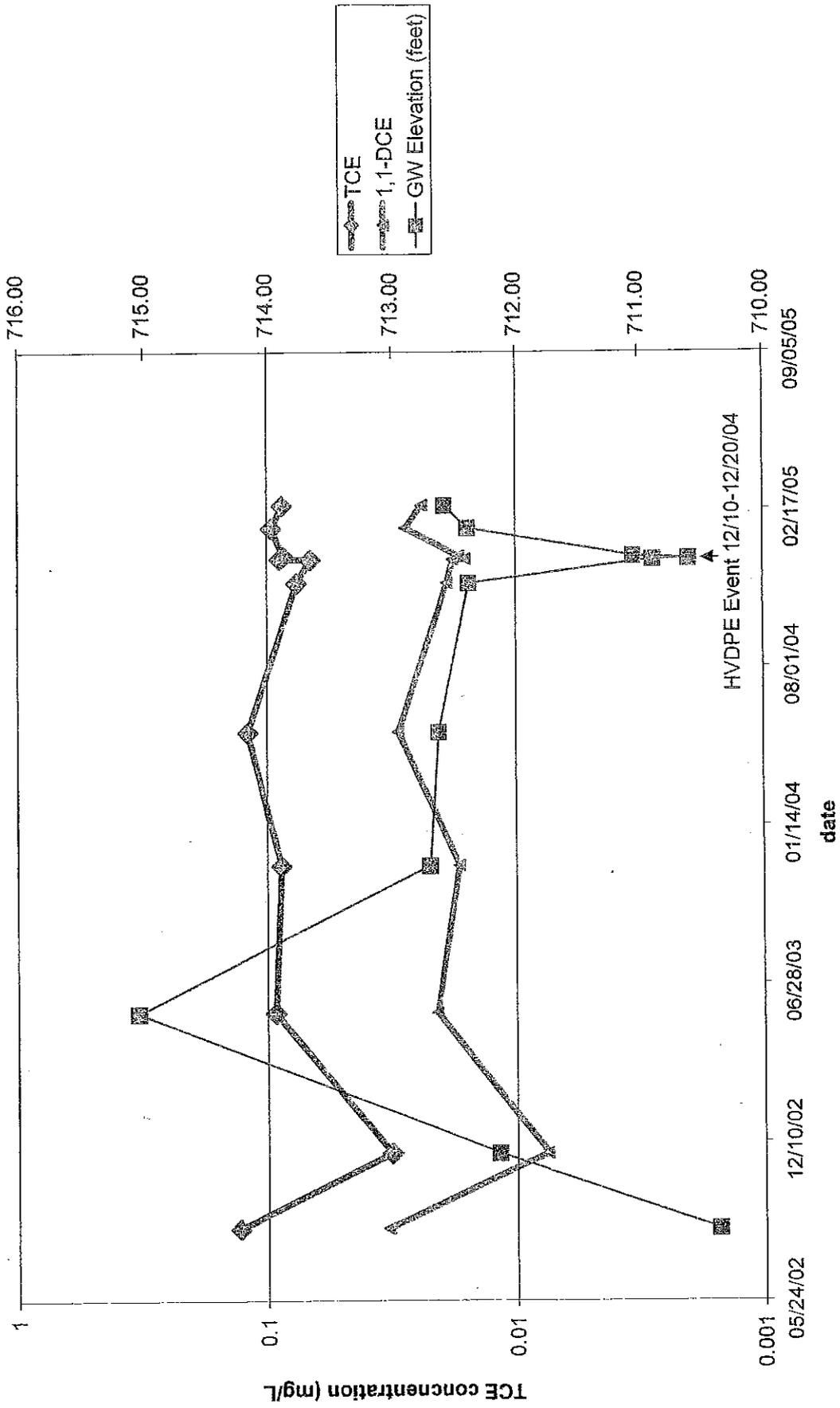
**ETIC**  
ENGINEERING

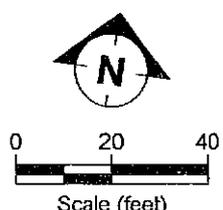
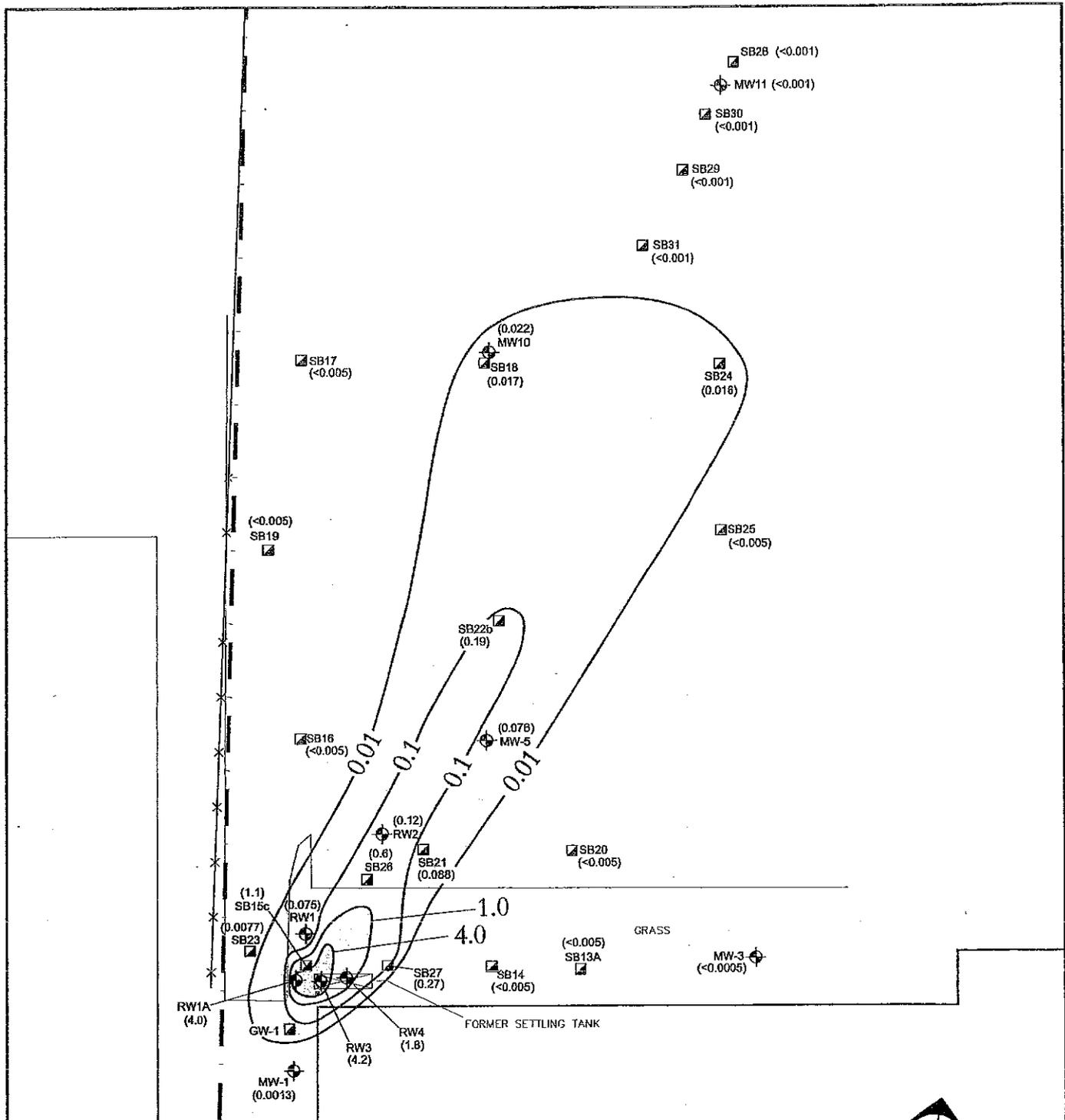
Date:  
4/18/2005

Figure:  
**9**

CRACKS0105.DWG

Figure 7 TCE and 1,1-DCE Groundwater Concentration vs. Time in Well MW-5





**LEGEND:**

- Groundwater well
  - Groundwater screening location
  - Fence
  - Property boundary
  - 0.01 - 0.1 mg/L TCE in groundwater
  - 0.1 - 1.0 mg/L TCE in groundwater
  - >1.0 mg/L TCE in groundwater
- (0.42) TCE concentration in mg/L  
 < Less than noted laboratory reporting limit  
 TCE Trichloroethene  
 mg/L Milligrams per liter

**NOTE:**  
 All data except SB28-SB31 and MW11 are prior to December 2004 remediation.

<b>TCE ISOCONCENTRATION CONTOURS AND LOCATIONS OF CROSS SECTIONS</b>		
FORMER KAISER FLUID TECHNOLOGIES CHARLOTTE, NORTH CAROLINA		
	Date: 5/3/2005	Figure: <b>4</b>
	siteplan0505 blowup.dwg	

TABLE 7 CUMULATIVE HVDPE VAPOR ANALYTICAL DATA  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Test Phase	Concentration (ppmv)			
			1,1,1-TCA	1,1-DCA	TCE	1,1-DCE
RW1	12/10/04	Step Test	<0.64	<0.71	<0.61	<0.71
RW1	12/12/04	Day 3	<0.20	<0.20	0.49	<0.20
RW1	12/20/04	Day 10	0.247	0.0045	0.0395	0.0421
RW1A	12/09/04	Step Test	<0.17	<0.17	0.47	<0.17
RW1A	12/20/04	Day 10	<0.34	<0.34	0.5	<0.34
RW3	12/09/04	Step Test	<0.19	<0.19	1.9	<0.19
RW3	12/12/04	Day 3	-	-	-	-
RW3	12/20/04	Day 10	<0.45	<0.45	2.0	<0.45
RW4	12/09/04	Step Test	<0.16	<0.16	0.35	<0.16
RW4	12/12/04	Day 3	<0.19	<0.19	0.52	<0.19
RW4	12/20/04	Day 10	<0.002	<0.002	0.0252	<0.002
Sys Inf	12/10/04	Step Test	0.22	<0.18	1.6	<0.18
Sys Inf	12/12/04	Day 3	<0.32	<0.32	0.60	<0.32
Sys Inf	12/20/04	Day 10	<0.37	<0.37	1.2	<0.37
TCA	Trichloroethane.					
DCA	Dichloroethane.					
DCE	Dichloroethene.					
PCE	Tetrachloroethene.					
TCE	Trichloroethene.					
ppmv	Parts per million by volume.					
<	Less than the laboratory reporting limits.					

TABLE 6

INDIVIDUAL WELL TEST ESTIMATED RADIUS OF INFLUENCE OF VAPOR EXTRACTION  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Date/Time	Extraction Well	Applied Vacuum		Casing Vacuum		Stinger Vacuum		Observation Well	Distance from Extraction Well feet	Observed Induced Vacuum in. H2O
		in. Hg	in. H2O	in. Hg	in. H2O	in. Hg	in. H2O			
12/10/2004 9:40	RW1	26	354	23	313	26	354	MW1	36.3	0.1
	RW1	26	354	23	313	26	354	MW5	72	0
	RW1	26	354	23	313	26	354	RW1A	12.5	4
	RW1	26	354	23	313	26	354	RW2	34.3	0.32
	RW1	26	354	23	313	26	354	RW3	12.6	0.6
	RW1	26	354	23	313	26	354	RW4	14.75	
	ROI								34	
12/9/2004 13:45	RW1A	26	354	19	258	26	354	MW1	24	0
	RW1A	26	354	19	258	26	354	MW5	83.1	0.09
	RW1A	26	354	19	258	26	354	MW10	NM	0
	RW1A	26	354	19	258	26	354	RW1	12.5	0.86
	RW1A	26	354	19	258	26	354	RW2	45.9	0.6
	RW1A	26	354	19	258	26	354	RW3	8.6	0.35
	RW1A	26	354	19	258	26	354	RW4	15.2	0.12
	ROI								60	
12/9/2004 11:15	RW3	27	367	19	258	27	367	MW1	25.5	0.02
	RW3	27	367	19	258	27	367	MW5	77.2	0
	RW3	27	367	19	258	27	367	RW1	12.6	0.75
	RW3	27	367	19	258	27	367	RW1A	8.6	0.7
	RW3	27	367	19	258	27	367	RW2	41.3	0.15
	RW3	27	367	19	258	27	367	RW4	6.8	0.4
	ROI								21	
12/20/2004 3:00	RW3	25	340	22	299	NM	NM	MW1	25.5	0
	RW3	25	340	22	299	NM	NM	RW1	12.6	0.27
	RW3	25	340	22	299	NM	NM	RW1A	8.6	0.32
	RW3	25	340	22	299	NM	NM	RW2	41.3	0.37
	RW3	25	340	22	299	NM	NM	RW4	6.8	4.1
	ROI								41	
12/9/2004 15:45	RW4	25	340	20	272	25	340	MW1	28.4	0.14
	RW4	25	340	20	272	25	340	MW5	71.7	0
	RW4	25	340	20	272	25	340	RW1	14.75	
	RW4	25	340	20	272	25	340	RW1A	15.2	
	RW4	25	340	20	272	25	340	RW2	36.9	
	RW4	25	340	20	272	25	340	RW3	6.8	12
	ROI								27	

in. Hg           Inches of mercury  
 in. H2O        Inches of water column  
 NM             Not Measured  
 ROI            Estimated radius of influence

TABLE 5 CHANGES IN SOURCE AREA CONCENTRATIONS AND MASS REMOVAL AFTER 10 DAYS OF HVDPE  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Change in Source Area Concentrations after 10 Days of HVDPE

Well	Compound	Before Event	1 Month after End of Event	2 Months after End of Event	3 Months after End of Event
RW1A	TCE	4.0	0.42	0.61	0.71
RW3	TCE	4.2	1.8	3.9	2.4
RW4	TCE	1.8	0.47	0.42	0.48

Change in Source Area Mass after 10 Days of HVDPE

Phase	Total Mass Recovered (lb)
Vapor	0.04
Water	0.07
<b>Total:</b>	<b>0.11</b>

Change in Mass Removal Rate During HVDPE

Phase	Beginning of Event	End of Event
Vapor	0.01 lb/day	0.002 lb/day
Water	0.01 lb/day	0.003 lb/day

HVDPE High vacuum dual-phase extraction.  
 TCE Trichloroethene.  
 mg/L Milligrams per liter.

TABLE 4 CUMULATIVE GROUNDWATER ANALYTICAL DATA  
FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Casing Elevation (feet)	Depth to Water (feet)	GW Elevation (feet)	Concentration (mg/L)									
					Benzene	Chloro-benzene	Dichloro-difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride
15A NCAC 2L Groundwater Standards														
RW4	11/18/04	NM	16.90	NM	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
RW4	12/13/04	NM	22.06*	NM	NA	<0.010	<0.010	0.074	<0.010	<0.010	1.8	NA	0.018	<0.010
RW4	12/16/04	NM	23.12*	NM	NA	<0.0050	<0.0050	0.034	<0.0050	<0.0050	0.92	NA	0.018	<0.0050
RW4	12/20/04	NM	20.69*	NM	NA	<0.001	<0.001	0.00786	<0.001	<0.001	0.32	0.0015	0.0055	<0.001
RW4	01/25/05	NM	16.36	NM	NA	<0.0050	<0.0050	0.013	<0.0050	<0.0050	0.42	<0.0050	0.011	<0.0050
RW4	02/23/05	NM	16.47	NM	NA	<0.0050	<0.0050	0.025	<0.0050	<0.0050	0.47	<0.0050	0.014	<0.0050
RW4	04/04/05	NM	14.79	NM	NA	<0.0020	<0.0020	0.019	<0.0020	<0.0020	0.42	0.003	0.0097	<0.0020
RW4	04/04/05	NM	14.79	NM	NA	<0.0050	<0.0050	0.02	<0.0050	<0.0050	0.48	<0.0050	0.014	<0.0050
Sys Inf	12/10/04				NA	<0.001	<0.001	<0.001	<0.001	<0.001	0.024	NA	<0.001	<0.001
Sys Inf	12/12/04				NA	<0.0050	<0.0050	<0.00050	<0.00050	<0.00050	0.0043	NA	<0.00050	<0.00050
Sys Inf	12/19/04				NA	<0.001	<0.001	<0.001	<0.001	<0.001	0.0048	NA	<0.001	<0.001

Maximum detected concentrations

15A NCAC 2L Groundwater Standards	<0.0005	0.0072	0.00078	1.6	0.01	0.014	4.2	0.074	0.8	0.0021
GW	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
TCA	Groundwater.									
DCA	Trichloroethane.									
DCE	Dichloroethane.									
PCE	Dichloroethane.									
TCE	Tetrachloroethene.									
NA	Trichloroethene.									
NM	Not analyzed.									
NS	Not measured.									
	Not sampled.									
All constituents analyzed by EPA Method 8260B or SM6230D.										
mg/L										
Milligrams per liter.										
< Less than the laboratory reporting limits.										
Chloromethane - 0.0049 mg/L in MW5 sample collected 5/11/04. (15A NCAC 2L standard = 0.0026 mg/L)										
Carbon tetrachloride - 0.0011 mg/L (12/13/04), 0.0067 mg/L (2/23/05) in RW1A; 0.024 mg/L (2/23/05) in RW3; 0.2 mg/L (2/23/05) in RW1. (15A NCAC 2L standard = 0.0003 mg/L)										
Methylene chloride - 0.058 mg/L (11/18/04) and 0.012 mg/L (12/20/04) in RW4 and 0.10 mg/L (12/20/04) in RW1A. (15A NCAC 2L standard = 0.005 mg/L)										
High vacuum dual-phase extraction event conducted 12/10/04 - 12/20/04. Wells RW1, RW1A, RW3, and RW4 used for extraction.										
* well gauged and grab sample collected during recharge period after shutdown of dual-phase extraction										

TABLE 4 CUMULATIVE GROUNDWATER ANALYTICAL DATA  
FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Casing Elevation (feet)	Depth to Water (feet)	Water Elevation (feet)	Concentration (mg/L)									
					Benzene	Chloro-benzene	Dichloro-difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride
15A NCAC 2L Groundwater Standards														
RW1	10/11/04	728.66	14.72	713.94	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
RW1	11/16/04	728.66	15.16	713.50	NA	<0.025	<0.025	0.42	<0.025	<0.025	0.075	<0.025	0.31	<0.025
RW1	12/13/04	728.66	19.16*	709.50	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RW1	12/16/04	728.66	20.96*	707.70	<0.00050	<0.00050	<0.00050	1.2	0.0059	0.014	0.064	NA	0.8	<0.00050
RW1	12/20/04	728.66	16.80*	711.86	<0.001	<0.001	<0.001	0.36	0.0013	0.00273	0.0356	0.0013	0.19	<0.001
RW1	01/25/05	728.66	15.57	713.09	NA	<0.0050	<0.0050	0.58	<0.0050	<0.0050	0.044	<0.0050	0.36	<0.0050
RW1	02/23/05	728.66	15.36	713.30	-	<0.0050	<0.0050	1.6	0.0095	0.011	0.082	<0.0050	0.72	<0.0050
RW1	04/03/05	728.66	14.15	714.51	NA	<0.010	<0.010	1.3	0.01	0.01	0.12	<0.010	0.65	<0.010
RW1	10/11/04	728.52	14.92	713.60	NA	<0.005	<0.005	0.61	0.006	<0.005	0.072	<0.005	0.32	<0.005
RW1A	11/16/04	728.52	15.09	713.43	NS	NS	NS	<0.25	<0.25	<0.25	4	<0.25	<0.25	<0.25
RW1A	12/13/04	728.52	15.85*	712.67	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RW1A	12/16/04	728.52	16.96*	711.56	<0.00050	<0.00050	<0.00050	0.007	<0.0050	<0.0050	0.15	NA	0.0063	<0.00050
RW1A	12/20/04	728.52	16.00*	712.52	<0.001	<0.001	<0.001	0.00573	<0.001	<0.001	0.11	0.0014	0.0072	<0.001
RW1A	01/25/05	728.52	15.47	713.05	NA	<0.001	<0.001	0.0035	<0.001	<0.001	0.036	<0.001	0.0043	<0.001
RW1A	02/23/05	728.52	15.24	713.28	NA	<0.001	<0.001	0.038	<0.001	0.0013	0.42	0.0033	0.034	<0.001
RW1A	04/03/05	728.52	14.06	714.46	NA	<0.001	<0.001	0.032	0.0019	0.0014	0.61	0.0048	0.033	<0.001
RW2	10/11/04	727.41	14.04	713.37	NA	<0.005	<0.005	0.029	<0.005	<0.005	0.71	0.0056	0.032	<0.005
RW2	11/16/04	727.41	14.71	712.70	NS	NS	NS	0.015	<0.0050	<0.0050	0.12	<0.0050	0.025	<0.0050
RW2	12/16/04	727.41	16.97*	710.44	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RW2	12/17/04	727.41	18.74	708.67	NA	<0.001	<0.001	0.0058	<0.001	<0.001	0.065	0.0025	0.0067	<0.001
RW2	12/20/04	727.41	16.22	711.19	NA	<0.001	<0.001	0.0096	1.1	<0.001	0.12	0.0026	0.016	<0.001
RW2	01/25/05	727.41	14.66	712.75	NA	<0.001	<0.001	0.013	<0.001	<0.001	0.091	0.0021	0.02	<0.001
RW2	02/23/05	727.41	14.47	712.94	NA	<0.001	<0.001	0.023	<0.001	<0.001	0.17	0.0026	0.043	<0.001
RW2	04/03/05	727.41	13.24	714.17	-	<0.001	<0.001	0.015	<0.001	<0.001	0.11	0.0025	0.039	<0.001
RW3	11/18/04	NM	16.59	NM	NA	<0.001	<0.001	0.017	<0.001	<0.001	0.12	0.0023	0.041	<0.001
RW3	12/13/04	NM	18.58*	NM	NA	<0.001	<0.001	0.25	0.0075	0.008	4.2	NA	0.2	<0.001
RW3	12/16/04	NM	20.14*	NM	NA	<0.0050	<0.0050	0.034	<0.0050	<0.0050	1.5	NA	0.034	<0.0050
RW3	12/20/04	NM	17.58*	NM	NA	<0.001	<0.001	0.025	0.0018	0.0013	0.82	0.0053	0.02	<0.001
RW3	01/25/05	NM	16.53	NM	NA	<0.0050	<0.0050	0.021	<0.0050	<0.0050	0.86	0.0055	0.025	<0.0050
RW3	02/23/05	NM	16.31	NM	NA	<0.0050	<0.0050	0.095	<0.0050	<0.0050	1.8	0.026	0.052	<0.0050
RW3	04/03/05	NM	15.18	NM	NA	<0.020	<0.020	0.15	<0.020	<0.020	3.9	0.031	0.071	<0.020
					NA	<0.020	<0.020	0.1	<0.020	<0.020	2.4	0.037	0.051	<0.020

TABLE 4 CUMULATIVE GROUNDWATER ANALYTICAL DATA  
FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Casing Elevation (feet)	Depth to Water (feet)	GW Elevation (feet)	Concentration (mg/L)									
					Benzene	Chloro-benzene	Dichloro-difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride
15A NCAC 2L Groundwater Standards														
MW7	08/23/02	728.59	16.55	712.04	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
MW7	10/24/02	728.59	15.42	713.17	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.022	<0.00050	<0.00050
MW7	11/26/02	728.59	14.32	714.27	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	05/22/03	728.59	11.84	716.75	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	11/24/03	728.59	13.58	715.01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	05/11/04	728.59	13.30	715.29	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	11/16/04	728.59	13.79	714.80	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	01/25/05	728.59	13.84	714.75	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW7	04/03/05	728.59	12.51	716.08	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	<0.001	0.0022
MW8	08/23/02	730.67	17.65	713.02	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0034	<0.00050
MW8	10/24/02	730.67	16.43	714.24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	11/26/02	730.67	15.28	715.39	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	05/22/03	730.67	11.66	719.01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	11/24/03	730.67	14.64	716.03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	05/11/04	730.67	14.56	716.11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	11/16/04	730.67	14.90	715.77	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	01/25/05	730.67	14.75	715.92	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW8	04/03/05	730.67	13.19	717.48	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.013	<0.001
MW9	08/23/02	730.77	18.26	712.51	<0.00050	<0.00050	<0.00050	<0.00050	0.0037	<0.00050	<0.00050	0.005	0.0065	<0.00050
MW9	10/24/02	730.77	17.21	713.56	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	11/26/02	730.77	16.18	714.59	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	05/22/03	730.77	13.06	717.71	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	11/24/03	730.77	15.55	715.22	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	05/11/04	730.77	15.60	715.17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	11/16/04	730.77	15.93	714.84	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	01/25/05	730.77	15.85	714.92	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW9	04/03/05	730.77	14.52	716.25	NA	<0.001	<0.001	<1.0	0.0088	<0.001	0.0019	0.014	0.012	<0.001
MW10	10/11/04	725.05	15.10	709.95	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.022	<0.0650	0.0054	<0.0050
MW10	11/16/04	725.05	15.30	709.75	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW10	01/25/05	725.05	15.50	709.55	NA	<0.001	<0.001	<0.001	0.0046	<0.001	0.011	0.0047	0.0065	<0.001
MW10	04/03/05	725.05	14.33	710.72	NA	<0.001	<0.001	0.0016	0.0032	<0.001	0.024	0.0031	0.007	<0.001
MW11	04/04/05	NM	12.22	NM	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE 4 CUMULATIVE GROUNDWATER ANALYTICAL DATA  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Casing Elevation (feet)	Depth to Water (feet)	GW Elevation (feet)	Concentration (mg/L)									
					Benzene	Chloro-benzene	Dichloro-difluoromethane	I,1,1-TCA	1,1-DCA	PCE	ICE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride
1.5A NCAC 2L Groundwater Standards														
MW4	09/21/01	730.47	15.49	714.98	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
MW4	10/30/01	730.47	15.89	714.58	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00085	<0.00050	<0.00050
MW4	05/16/02	730.47	14.74	715.73	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW4	08/23/02	730.47	16.09	714.38	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	10/24/02	730.47	14.83	715.64	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	11/26/02	730.47	13.70	716.77	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	05/22/03	730.47	10.84	719.63	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	11/24/03	730.47	13.00	717.47	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	03/11/04	730.47	12.78	717.69	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	11/16/04	730.47	13.24	717.23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	01/25/04	730.47	13.05	717.42	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW4	04/04/05	730.47	11.48	718.99	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0077	<0.001	<0.001
MW5	08/23/02	727.41	17.05	710.36	<0.00050	<0.00050	<0.00050	<0.00050	0.0025	<0.00050	0.13	0.0039	0.033	<0.00050
MW5	10/24/02	727.41	16.09	711.32	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW5	11/26/02	727.41	15.27	712.14	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.032	<0.0025	0.0075	<0.0025
MW5	05/22/03	727.41	12.37	715.04	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.093	0.0021	0.021	<0.00050
MW5	11/24/03	727.41	14.71	712.70	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.088	<0.00050	0.017	<0.00050
MW5	05/11/04	727.41	14.78	712.63	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.12	0.0042	0.03	<0.00050
MW5	11/16/04	727.41	15.03	712.38	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.076	<0.00050	0.019	<0.00050
MW5	12/08/04	727.41	14.85	712.56	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW5	12/16/04	727.41	16.53*	710.88	NA	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.067	<0.0050	0.018	<0.0050
MW5	12/17/04	727.41	16.82	710.59	NA	<0.001	<0.001	<0.001	0.0016	<0.001	0.089	0.0025	0.016	<0.001
MW5	12/20/04	727.41	16.37	711.04	NA	<0.001	<0.001	<0.001	0.0018	<0.001	0.086	0.0023	0.017	<0.001
MW5	01/25/05	727.41	15.02	712.39	NA	<0.001	<0.001	<0.001	0.0022	<0.001	0.096	0.0025	0.028	<0.001
MW5	02/23/05	727.41	14.83	712.58	NA	<0.001	<0.001	<0.001	0.0017	<0.001	0.087	0.0023	0.024	<0.001
MW5	04/03/05	727.41	13.63	713.78	NA	<0.001	<0.001	<0.001	0.0019	<0.001	0.099	0.0024	0.028	<0.001
MW6	08/23/02	730.73	18.12	712.61	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW6	10/24/02	730.73	16.91	713.82	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	11/26/02	730.73	15.84	714.89	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	05/22/03	730.73	13.24	717.49	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	11/24/03	730.73	15.42	715.31	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	05/11/04	730.73	15.19	715.54	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	11/16/04	730.73	15.48	715.25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW6	04/03/05	730.73	13.87	716.86	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE 4 CUMULATIVE GROUNDWATER ANALYTICAL DATA  
FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well Number	Date	Casing Elevation (feet)	Depth to Water (feet)	GW Elevation (feet)	Concentration (mg/L)									
					Benzene	Chloro-benzene	Dichloro-difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride
15A NCAC 2L Groundwater Standards														
MW1	09/21/01	728.84	16.69	712.15	0.001	0.05	1.4	0.2	0.7	0.0007	0.0028	0.07	0.007	0.000015
MW1	10/30/01	728.84	17.03	711.81	<0.00050	<0.00050	<0.00050	0.03	0.0013	<0.00050	0.0041	<0.00050	0.026	<0.00050
MW1	05/16/02	728.84	15.32	713.52	<0.00050	<0.00050	<0.00050	0.025	0.0014	<0.00050	0.0059	<0.00050	<0.00050	<0.00050
MW1	08/23/02	728.84	17.17	711.67	<0.00050	<0.00050	<0.00050	0.0044	<0.00050	<0.00050	0.0016	<0.00050	0.00093	<0.00050
MW1	10/24/02	728.84	15.98	712.86	NS	NS	NS	0.018	<0.00050	<0.00050	0.0078	<0.00050	0.0027	<0.00050
MW1	11/26/02	728.84	14.87	713.97	<0.00050	<0.00050	<0.00050	NS	NS	NS	NS	NS	NS	NS
MW1	05/22/03	728.84	12.16	716.68	<0.00050	<0.00050	<0.00050	0.013	<0.00050	<0.00050	0.0057	<0.00050	0.001	<0.00050
MW1	11/24/03	728.84	14.46	714.38	<0.00050	<0.00050	<0.00050	0.0057	0.0014	<0.00050	0.029	<0.00050	0.002	<0.00050
MW1	05/11/04	728.84	14.45	714.39	<0.00050	<0.00050	<0.00050	0.0045	0.00096	<0.00050	0.02	<0.00050	0.002	<0.00050
MW1	11/16/04	728.84	14.74	714.10	<0.00050	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	0.0054	<0.00050	<0.00050	<0.00050
MW1	01/25/05	728.84	14.76	714.08	NA	<0.001	<0.001	<0.00050	<0.00050	<0.00050	0.0013	<0.00050	<0.00050	<0.00050
MW1	04/03/05	728.84	13.76	715.08	NA	<0.001	<0.001	0.0027	<0.001	<0.001	<0.001	<0.001	0.0012	<0.001
MW2	09/21/01	730.50	16.67	713.83	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.001
MW2	10/30/01	730.50	17.03	713.47	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.001
MW2	05/16/02	730.50	16.34	714.16	NS	NS	NS	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.001
MW2	08/23/02	730.50	17.12	713.38	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	10/24/02	730.50	15.94	714.56	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	11/26/02	730.50	14.63	715.87	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	05/22/03	730.50	12.12	718.38	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	11/24/03	730.50	14.28	716.22	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	05/11/04	730.50	13.93	716.57	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	11/16/04	730.50	14.30	716.20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	01/25/05	730.50	14.25	716.25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW2	04/04/05	730.50	12.45	718.05	NA	0.0027	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0033
MW3	09/21/01	729.67	17.02	712.65	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW3	10/30/01	729.67	17.31	712.36	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW3	05/16/02	729.67	15.99	713.68	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW3	08/23/02	729.67	17.50	712.17	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW3	10/24/02	729.67	16.50	713.17	NS	NS	NS	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
MW3	11/26/02	729.67	15.56	714.11	<0.00050	<0.00050	<0.00050	NS	NS	NS	NS	NS	NS	NS
MW3	05/22/03	729.67	13.50	716.17	<0.00050	<0.00050	<0.00050	<0.00050	0.0016	<0.00050	0.0089	<0.00050	NS	NS
MW3	11/24/03	729.67	14.97	714.70	<0.00050	<0.00050	<0.00050	<0.00050	0.0028	<0.00050	0.0048	<0.00050	0.024	<0.00050
MW3	05/11/04	729.67	15.05	714.62	<0.00050	<0.00050	<0.00050	<0.00050	0.002	<0.00050	0.002	<0.00050	0.0095	<0.00050
MW3	11/16/04	729.67	15.48	714.19	<0.00050	<0.00050	<0.00050	<0.00050	0.0022	<0.00050	<0.00050	<0.00050	0.06	<0.00050
MW3	01/25/05	729.67	15.44	714.23	NA	<0.001	<0.001	<0.00050	0.0017	<0.00050	<0.00050	<0.00050	0.074	<0.00050
MW3	04/03/05	729.67	14.41	715.26	NA	<0.001	<0.001	<0.001	0.0024	<0.001	<0.001	<0.001	0.033	<0.001
									0.0019	<0.001	0.0012	<0.001	0.073	<0.001
													0.076	<0.001

TABLE 3 GRAB GROUNDWATER ANALYTICAL RESULTS  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Sample ID	Date	Sample/Screen Depth Interval (ft bgs)	Concentration (mg/L)												
			Total Xylenes	Chloro- benzene	Dichloro- difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl Chloride			
GW-2	5/29/01	20-24	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
GW-3	5/29/01	5-15	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
GW-5	7/5/01		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
GW-6	7/5/01		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
GW-1	7/5/01		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-13A	8/26/04	19-24	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-14	8/26/04	21-26	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-15C	8/26/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-16	8/27/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-17	8/25/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-18	8/26/04	18-22	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-19	8/26/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-20	8/26/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-21	8/26/04	22-27	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-22	8/26/04	15-20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-22b	11/16/04		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
SB-23	8/27/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-24	10/5/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-25	10/5/04	20-25	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SB-26	11/15/04	18.5-23.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-27	11/15/04	20-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-28	3/30/05	20-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-29	3/30/05	20-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-30	3/30/05	20-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-31	3/30/05	20-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Maximum detected concentrations

15A NCAC 2L groundwater standards	<0.005	<0.010	<0.005	<0.005	<0.005	0.072	0.01	<0.005	1.1	0.013	0.08	<0.005
ft bgs	0.001	0.53	0.05	1.4	0.2	0.7	0.0007	0.0028	0.007	0.000015		

- Feet below ground surface.
- Trichloroethene.
- DCA
- Dichloroethane.
- DCE
- Dichloroethene.
- TCA
- Trichloroethane.

All constituents analyzed by EPA Method 8260B or SM 6320D.

mg/L  
 < Milligrams per liter.  
 Less than the laboratory reporting limits.  
 NA Not analyzed.

TABLE 2A SOIL GAS ANALYTICAL RESULTS  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Sample ID	Date	Depth (ft bgs)	Concentration (ppmv)												
			Benzene	Methylene chloride	Chloro- benzene	trans-1,2-DCE	1,1,1-TCA	1,1-DCA	PCE	TCE	1,1-DCE	cis-1,2-DCE	Vinyl Chloride		
SG-1	5/29/01	6	<0.07	<0.1	<0.07	0.02	0.008	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-2	5/29/01	5	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-3	5/29/01	1	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-4	5/29/01	11	<0.07	<0.1	<0.07	0.01	<0.005	<0.05	<0.005	0.12	<0.01	<0.01	<0.01	<0.01	<0.01
SG-6A	5/29/01	12	<0.07	<0.1	<0.07	0.01	<0.005	<0.05	<0.005	0.04	0.5	0.06	0.06	0.06	<0.01
SG-6B	5/29/01	4	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	0.04	0.04	0.06	0.06	0.06	<0.01
SG-7	9/21/01	9.5	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-8	9/21/01	8	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-9	9/21/01	7	<0.07	<0.1	<0.07	<0.01	0.045	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-10	9/21/01	6	<0.07	<0.1	<0.07	<0.01	0.007	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-11	9/21/01	3	<0.07	<0.1	<0.07	<0.01	<0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SG-12	9/21/01	5	<0.07	<0.1	<0.07	<0.01	0.005	<0.05	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ft bgs Feet below ground surface.

TCA Trichloroethane.

DCA Dichloroethane.

DCE Dichloroethene.

PCE Tetrachloroethene.

TCE Trichloroethene.

ppmv Parts per million by volume.

< Less than the laboratory reporting limits.

Samples analyzed by Vaportech Services, Inc. by gas chromatograph with electron capture detector.  
 Data source: BBL 2001b,c

TABLE 2 SOIL ANALYTICAL RESULTS  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Sample ID	Date	Depth (ft bgs)	Concentration (mg/kg)													
			Benzene	Methylene chloride	Chloro- benzene	Dichloro- difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	1,1-DCE	cis-1,2-DCE	Vinyl Chloride			
<b>Maximum detected Concentrations</b>			0.011	0.03	<0.0073	0.09	<0.0073	0.025	<0.0073	1.58	4	0.0074	0.0185	0.045	0.25	0.0001
<b>NC Soil cleanup guidelines NCDENR 2000 and 2003 *</b>			0.0056	0.02	0.437	--										
ft bgs			Feet below ground surface.													
TCA			Trichloroethane.													
DCA			Dichloroethane.													
DCE			Dichloroethene.													
PCE			Tetrachloroethene.													
TCE			Trichloroethene.													
NA			Not Analyzed.													

All constituents analyzed by EPA Method 8260B  
 mg/kg Milligram per kilogram.  
 < Less than the laboratory reporting limits.  
 \* NCDENR 2000, North Carolina Department of Environment and Natural Resources, Division of Water Quality. Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, July (and 2003 Addendum [Groundwater Section Guidelines for the Investigation of Soil and Groundwater Contamination: Chlorinated Solvents and other Dense Non-Aqueous Phase Liquids]. July.)

TABLE 2 SOIL ANALYTICAL RESULTS  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Sample ID	Date	Depth (ft bgs)	Concentration (mg/kg)												
			Benzene	Methylene chloride	Chloro- benzene	Dichloro- difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	1,1-DCE	cis-1,2-DCE	Vinyl Chloride		
SB-13	8/25/04	5-5.5	<0.0037	<0.0037	<0.0037	<0.0073	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0073
	8/25/04	10-10.5	<0.0046	<0.0046	<0.0046	<0.0091	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0091
SB-14	8/25/04	5-5.5	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.011
	8/25/04	10-10.5	<0.0036	<0.0036	<0.0036	<0.0073	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0073
SB-15A	8/25/04	5-5.5	<0.0056	<0.0056	<0.0056	<0.011	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.011
SB-20	8/25/04	5-5.5	<0.0054	<0.0054	<0.0054	<0.011	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.011
	8/25/04	9.5-10	<0.0051	<0.0051	<0.0051	<0.010	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.010
SB27	11/15/04	5-5.5	NA	<0.0047	<0.0029	<0.0057	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0057
	11/15/04	14-14.25	NA	<0.0099	<0.0038	<0.0077	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0077
MW-10	10/4/04	5-5.5	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	NA	<0.0077
RW1	10/5/04	5-5.5	<0.0045	<0.0045	<0.0045	<0.0089	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0053
	10/5/04	10-10.5	<0.0047	<0.0047	<0.0047	0.090	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0045
	10/5/04	15-15.5	<0.0044	<0.0044	<0.0044	0.014	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0045
RW1A	10/7/04	4-4.5	<0.0051	<0.0051	<0.0051	<0.010	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.010
	10/7/04	9-9.5	<0.0031	<0.0031	<0.0031	<0.0062	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.010
	10/7/04	14-14.5	<0.0040	<0.0040	<0.0040	<0.0079	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0062
RW2	10/5/04	5-5.5	<0.0037	<0.0037	<0.0037	0.0087	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0040	<0.0079
RW3	11/16/04	9-9.25	NA	0.0084	<0.003	<0.0059	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	NA	<0.0074
LMW1	11/17/04	5.5-6	NA	<0.0041	<0.0038	<0.0076	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	NA	<0.0059
	11/17/04	14.5-15	NA	<0.0041	<0.0041	<0.0082	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	NA	<0.0076

TABLE 2 SOIL ANALYTICAL RESULTS  
 FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Sample ID	Date	Depth (ft bgs)	Concentration (mg/kg)												
			Benzene	Methylene chloride	Chloro- benzene	Dichloro- difluoromethane	1,1,1-TCA	1,1-DCA	PCE	TCE	1,1-DCE	cis-1,2-DCE	Vinyl Chloride		
SB-1	5/29/01	2-4	<0.0058	<0.012	<0.0058	<0.012	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.012
SB-2	5/29/01	3-5	<0.0066	<0.013	<0.0066	<0.013	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.013
SB-3	5/29/01	8-10	<0.0065	<0.013	<0.0065	<0.013	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.013
SB-3	5/29/01	3-5	<0.0073	<0.015	<0.0073	<0.015	<0.0073	<0.0073	<0.0073	<0.0073	<0.0073	<0.0073	<0.0073	<0.0073	<0.015
SB-3	5/29/01	8-10	<0.0064	<0.013	<0.0064	<0.013	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.013
SB-4	5/29/01	3-5	<0.0057	<0.011	<0.0057	<0.011	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.011
SB-4	5/29/01	8-10	<0.0061	<0.012	<0.0061	<0.012	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.012
SB-5	5/29/01	3-5	<0.0064	<0.013	<0.0064	<0.013	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.013
SB-5	5/29/01	8-10	<0.0067	<0.013	<0.0067	<0.013	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.013
SB-6	5/29/01	3-5	<0.0055	<0.011	<0.0055	<0.011	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.011
SB-6	5/29/01	8-10	<0.0064	<0.013	<0.0064	<0.013	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.013
SB-7	9/18/01	8-10	<0.0052	0.03	<0.0052	<0.010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.010
SB-7	9/18/01	12-14	0.0056	0.027	<0.0052	<0.010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.010
SB-8	9/18/01	8-10	<0.0055	0.0071	<0.0055	<0.011	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.011
SB-8	9/18/01	14-16	<0.0049	<0.0097	<0.0049	<0.0097	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0097
SB-9	9/18/01	4-6	<0.0052	<0.010	<0.0052	<0.010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.010
SB-9	9/18/01	14-16	<0.0057	<0.011	<0.0057	<0.011	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.011
SB-10	9/18/01	8-10	<0.0045	<0.009	<0.0045	<0.009	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.009
SB-10	9/18/01	14-16	<0.0048	0.0058	<0.0048	<0.0095	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095
SB-11	9/18/01	10-12	0.011	<0.012	<0.0058	<0.012	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.012
SB-11	9/18/01	14-16	0.0056	0.0066	<0.0051	<0.010	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.010
SB-12	9/18/01	6-8	<0.0055	0.026	<0.0055	<0.011	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.011
SB-12	9/18/01	14-16	<0.0052	0.023	<0.0052	<0.010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.010

TABLE 1 WELL CONSTRUCTION DETAILS

FORMER KAISER FLUID TECHNOLOGIES, 530 EAST SUGAR CREEK ROAD, CHARLOTTE, NORTH CAROLINA

Well ID	Well Installation Date	Top-of-Casing Elevation (feet)	Casing Material	Total Depth of Borehole (ft bgs)	Casing Diameter (inches)	Screened Interval (ft bgs)	Slot Size (inches)	Filter Pack Interval (ft bgs)	Filter Pack Material
MW1	9/18/01	728.84	PVC	22	2	12-22	0.010	10-22	#2 sand
MW2	9/18/01	730.50	PVC	29	2	14-24	0.010	12-29	#2 sand
MW3	9/18/01	729.67	PVC	25	2	15-25	0.010	13-25	#2 sand
MW4	9/18/01	730.47	PVC	25	2	12-22	0.010	10-22	#2 sand
MW5	8/21/02	727.41	PVC	25	2	10-25	0.010	8-25	#2 sand
MW6	8/22/02	730.73	PVC	24	2	9-24	0.010	8-24	#2 sand
MW7	8/22/02	728.59	PVC	25	2	10-25	0.010	8-25	#2 sand
MW8	8/22/02	730.99	PVC	25	2	10-25	0.010	8-25	#2 sand
MW9	8/23/02	730.77	PVC	25	2	10-25	0.010	8-25	#2 sand
MW10	10/4/04	725.05	PVC	25	2	10-25	0.010	8-25	#2 sand
RW1	10/5/04	728.66	PVC	25	2	10-25	0.010	8-25	#2 sand
RW1A	10/7/04	728.52	PVC	23	4	15-23	0.010	13-23	#2 sand
RW2	10/6/04	727.41	PVC	22.5	4	14.5-22.5	0.010	13-22.5	#2 sand
RW3	11/16/04	NM	PVC	24	4	16-24	0.010	14.5-24	#2 sand
RW4	11/16/04	NM	PVC	25	4	15-25	0.010	13.5-25	#2 sand
MW11	4/1/05	NM	PVC	25	2	15-25	0.010	13.6-25	#2 sand
						10-25	0.010	9-25	#2 sand

PVC Polyvinyl chloride.

NM Not Measured.

ft bgs Feet below ground surface.

Elevations based on a survey conducted October 2004, based on horizontal NAD83/2001 Datum and vertical is NAVD 88.