EPA/ROD/R07-05/049
2005

EPA Superfund
Record of Decision:

CHEMICAL COMMODITIES, INC.
EPA ID: KSD031349624
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OLATHE, KS
05/29/2005

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

RECORD OF DECISION

Prepared by:

U.S. Environmental Protection Agency, Region 7
901 North 5th Street
Kansas City, Kansas 66101

RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Chemical Commodities, Inc. Site
Olathe, Kansas
CERCLIS ID No. KSD031349624

STATEMENT OF BASIS AND PURPOSE

The U.S. Environmental Protection Agency (EPA) has prepared this decision document to present the selected remedial action for the Chemical Commodities, Inc. (CCI) site located in Olathe, Kansas. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Contingency Plan (NCP). This decision is based on the administrative record for this site. The administrative record file is located in the following information repositories:

Olathe Public Library 201 East Park Olathe, Kansas	U.S. EPA Region 7 901 N. 5th Street Kansas City, Kansas

The EPA has coordinated selection of this remedial action with the Kansas Department of Health and Environment (KDHE). The KDHE concurs with the selected remedy.

ASSESSMENT OF THE SITE

The response action selected in the Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses site soils and groundwater through a variety of actions to achieve source control, risk reduction, migration control, and treatment. The selected remedy for site soils achieves source control and risk reduction by removing the areas of highest concentration from the site, applying chemical oxidation treatment, and constructing a cap over the site to prevent future exposures. This remedy also includes institutional controls to restrict land use. The selected remedy for groundwater achieves risk reduction, migration control, and treatment through the use of chemical oxidation treatment applied to the areas of highest concentration. In addition, the remedy includes monitored natural attenuation, groundwater monitoring, maintenance of the vapor control systems, and institutional controls to manage groundwater use.

The main elements of the selected remedy include:

- ✓ Excavation of soils in the 0-5' depth range containing metals above target cleanup levels;
- ✓ Excavation of soils in the 0-5' depth range to a level of 110 mg/kg TCE;
- ✓ Excavation to bedrock using large diameter drilling of soils containing high concentrations of VOCs;
- ✓ Transportation of excavated soils to an offsite disposal facility;
- ✓ Chemical oxidation treatment of soils and bedrock surface in areas of deep excavation;
- ✓ Chemical oxidation treatment of high VOC area near bedrock surface in area of buried tanks;
- ✓ Backfill of excavated areas;
- ✓ Construction of soil cap over entire fenced area of CCI property;
- ✓ Implementation of land use restrictions;
- ✓ Chemical Oxidation Treatment of Onsite and Offsite Groundwater;
- ✓ Monitored Natural Attenuation;
- ✓ Groundwater Monitoring;
- ✓ Operation and Maintenance of Ventilation Systems; and
- ✓ Institutional Controls.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the administrative record file for this site.

- Chemicals of concern and their respective concentrations;
- Baseline risk represented by the chemicals of concern;
- Cleanup levels established for chemicals of concern and the basis for these levels;
- A description of how source materials constituting principal threats are addressed;
- Current and reasonable anticipated future land use assumptions, and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD;

- Potential land and groundwater use that will be available at the site as a result of the selected remedy;
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected; and
- Key factors that led to selecting the remedy.

Cecilia Tapia, Director
Superfund Division
U.S. EPA, Region 7

5/28/05
Date

RECORD OF DECISION

DECISION SUMMARY

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

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DECISION SUMMARY

1.0 Site Name, Location, and Description

This Record of Decision (ROD) has been developed by the United States Environmental Protection Agency (EPA) to select a remedial alternative at the Chemical Commodities, Inc. site (CCI) in Olathe, Kansas. The Comprehensive Environmental Response, Compensation, and Liability Information System identification number for the site is KSD031349624. The EPA is the lead agency and the Kansas Department of Health and Environment (KDHE) is the support agency.

The CCI site is located at 320 South Blake Street in the city of Olathe, Johnson County, Kansas. A site location map is included as Figure 1. The site consists of an approximately 1.5 acre parcel of land owned by CCI, adjoining property owned by BNSF Railway Company, and associated groundwater contamination which has migrated underneath neighborhoods west and north of the site. The site is located in a mixed commercial/industrial and residential area. A major rail line lies adjacent to the east of the site, and residences are located adjacent to the north and west of the site.

CCI was a chemical brokerage facility that operated at the site from 1951 until 1989. Recycling activities were conducted using a filter press. Hazardous chemicals processed through the filter press were spilled or leaked into site soils. Some chemical repackaging activities were also conducted on the CCI property. Chemicals of all types were stored on the property in a variety of containers including above ground tanks, under ground tanks, drums, barrels, cylinders, bottles, etc. Many of the containers leaked, causing a release of hazardous substances to the site soils and groundwater.

A group of Potentially Responsible Parties (PRPs) has been identified for the site. Site investigations and removal actions have been conducted by the PRPs. The PRPs will be offered an opportunity to perform the remedial action under the terms of a Consent Decree.

2.0 Site History and Enforcement Activities

CCI began operations at the site prior to any federal environmental laws. There were numerous fires and explosions that occurred at the site during the 1960s and 1970s. The city of Olathe Fire Department responded to the fires and cited CCI for unsafe conditions. The local citizens lodged numerous complaints with the city regarding the fires and drainage flowing from the site down Keeler Street and onto surrounding properties.

The EPA first became involved at the site in the early 1980s after receiving numerous complaints from local and state agencies regarding operations at the site. Initial inspections revealed the need to redirect drainage to control surface runoff, inadequate waste storage practices, poor general housekeeping practices, and uncertain conditions of underground storage tanks.

In May 1985, EPA signed an administrative order on consent (AOC) with the site owner to conduct certain cleanup activities. Under the order, three underground storage tanks, which had been found to be leaking, were removed. The EPA enforcement activities resumed in 1988 following a dangerous incident in which a CCI truck caught on fire while transporting waste. An investigation of the CCI facility revealed numerous environmental and public health threats. As a result of this investigation, EPA issued a unilateral administrative order (UAO) to CCI, requiring it to perform cleanup activities at the site. Initially the site owner expressed an intent to comply. CCI submitted a cleanup plan for the facility, however, EPA determined that the plan was inadequate. The EPA signed an Action Memorandum in July 1989 supporting the use of federal funds to conduct the necessary cleanup actions.

Investigations of the site conducted by EPA and KDHE revealed site soils containing a host of contaminants including volatile organic compounds (VOCs), heavy metals, polychlorinated biphenyls (PCBs), semi-volatile organic compounds, and polyaromatic hydrocarbons (PAHs). Groundwater monitoring wells were installed on the CCI property to allow for the collection of groundwater samples. Results of groundwater sampling revealed the presence of high concentrations of VOCs in the groundwater.

Between 1989 and 1991, an extensive removal action was conducted at the site in phases. Phase 1 consisted of site characterization, segregation of wastes, and packaging of wastes for disposal. Phase 2 included the transportation and disposal of containerized wastes. Phase 3 involved excavation and offsite disposal of highly contaminated soils, onsite capping of moderately contaminated soils, decontamination of the main warehouse building, and installation of a groundwater interceptor trench and water treatment system to collect and treat contaminated groundwater.

In September 1991, Jerald Gershon, the sole officer and director of CCI and the operator of the facility, filed bankruptcy. The EPA filed a civil action under Section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for reimbursement of response costs in federal district court against Gershon and CCI on September 30, 1991. The EPA also filed a claim in the bankruptcy proceeding for past response costs and objections to the discharge of the debtor. In 1993, EPA and Gershon entered into a settlement agreement requiring payments from remaining unsecured assets of the estate for partial reimbursement of EPA response costs. A default judgement was entered by the district court against CCI.

The EPA listed the site on the National Priorities List (NPL) in June 1994. In September 1994, Rockwell International Corporation was identified as a PRP. Then in September 1995, EPA issued a UAO to Rockwell to perform a site characterization study. An extensive site characterization study focusing on onsite soils and groundwater was completed by Rockwell in September 1996. An Engineering Evaluation and Cost Analysis (EE/CA) was also prepared by Rockwell. However, the EE/CA was never approved by EPA due to a number of disagreements between EPA, KDHE, and Rockwell.

After a thorough review of site records, EPA identified several additional PRPs. In October 1998, EPA signed an AOC with the PRP group for a time-critical removal action involving the dismantling of the water treatment system and long-term operation of the interceptor trench. Under the 1998 AOC, the PRP group is obligated to drain the trench until the trench is decommissioned or 90 days following signature of the ROD. The trench may be decommissioned prior to or during remedial design, or may become part of the final remedy.

In May 2000, an AOC for the performance of an Remedial Investigation/Feasibility Study (RI/FS) was signed between EPA and two of the major PRPs. The RI focused on offsite groundwater since onsite soils and groundwater were characterized during the site characterization study completed in 1996. An initial RI Report was partially approved by EPA in December 2001. The report was approved in part due to the remaining data gaps, mainly relating to the fractured bedrock. Additional phases of investigation were conducted by the PRPs in order to produce a more complete conceptual site model. The RI was approved for completion in February 2004.

The RI included treatability studies to evaluate the effectiveness of certain remedial technologies. Specifically, dual phase extraction with hydro-fracturing and in-situ chemical oxidation technologies were evaluated. Due to the tightly compacted clays onsite, hydro-fracturing was performed to increase the available void spaces for air to flow through the subsurface. Dual phase extraction was then performed to evaluate the effectiveness of the two technologies. Even at high vacuum pressures, a significant air flow could not be sustained, rendering the dual phase extraction ineffective for treating the subsurface source soils and groundwater. A study of the effectiveness of in-situ chemical oxidation was also conducted at the site. Potassium permanganate was delivered to the subsurface environment via gravity feed and allowed to react with the soils and groundwater. Samples collected from nearby monitoring wells were used to evaluate the effectiveness of the technology. Test results showed the technology to be effective where good distribution of the oxidant could be achieved. However, due to the tightly compacted clays, good distribution of the chemical was hard to achieve.

A Baseline Risk Assessment (BLRA) was also completed as part of the RI/FS. The Supplemental BLRA was approved by EPA in February 2003. This BLRA is a supplement to previous risk assessment work completed during the site characterization study in the mid 1990s.

The EPA continued an effort to evaluate potential indoor air impacts due to vapor intrusion from the groundwater. Residential indoor air samples had been collected periodically by EPA since as early as 1989. Results of the historical air sampling showed detections of many of the groundwater constituents in air samples collected from crawl spaces beneath homes closest to the site. The contaminant levels initially did not present human health threats, but did suggest the need for continued monitoring. The EPA launched an indoor air monitoring campaign in November 2000, coinciding with the start of RI field activities. The indoor air monitoring effort was redoubled after initial RI results indicated the presence of high concentrations of chlorinated solvents, primarily trichloroethylene (TCE), in groundwater beneath the residential neighborhood west of the site.

Between November 2000 and November 2002, increasing concentrations of chlorinated solvents were observed in crawl space and indoor air samples collected from homes near the site. The EPA developed a health based action level for TCE for the CCI site based on a risk range of 10^{-5} to 10^{-4}. The site-specific action level for TCE is 2 micrograms per cubic meter (ug/m^3). Only a few homes exceeded the action level. The EPA signed an Action Memorandum in December 2002 for a time-critical removal action calling for the installation of ventilation systems in homes designated as phase 1 homes, confirmation sampling, and additional sampling beyond the phase 1 homes to determine whether additional ventilation systems would be needed. The ventilation systems for the phase 1 homes were installed by the PRPs pursuant to a February 2003 amendment to the RI/FS AOC. However, EPA retained responsibility for the confirmation sampling and additional air sampling beyond the phase 1 area. Since the initial phase 1 action, an additional 13 homes have received ventilation systems. Air sampling in the neighborhood continues. The PRPs have agreed to conduct the air sampling program and to perform operation and maintenance of ventilation systems pursuant to the August 2005 modification of the RI/FS AOC.

The EPA conducted a time-critical removal action in June 2003 to address contaminated soils which had been stockpiled onsite since the early removal actions conducted between 1989 and 1991. The removal action also addressed the onsite warehouse building which had become badly deteriorated and presented a threat to site workers and trespassers. The building was demolished and the building debris along with the stockpiled soils were transported offsite for disposal in a permitted waste disposal facility.

3.0 Community Participation

The local community is actively involved in all aspects of site progress. Shortly following the start of RI field activities in November 2000, interest from the local community rose and a Community Advisory Group (CAG) was formed. The CAG has incorporated as the CCI Concerned Citizen's Group, Inc. Initially, monthly CAG meetings were held to keep the community informed and to listen and respond to their concerns. Currently, CAG meetings are held on a quarterly basis. The EPA and PRPs are generally present at the CAG meetings to give site updates. The EPA facilitates the CAG meetings by reserving the meeting room and sending out postcard invitations to the entire mailing list prior to the meetings.

The EPA has solicited comments from the CAG on a number of technical documents leading up to this ROD. The CAG has acquired technical assistance through the Technical Outreach Services for Communities program. The CAG has provided meaningful input and has been integrated into the remedy selection process.

The RI/FS Report and Proposed Plan for the CCI site were made available to the public in July 2004. Based on feedback received from the state and community during the public comment period, a Supplemental Investigation Report and Second Feasibility Study Addendum were completed in 2005. A revised Proposed Plan was presented to the public in July 2005. All of these documents can be found in the administrative record file and in the information repository stored at the Olathe Public Library. A public comment period was held from July 19, 2005 to August 19, 2005. A public meeting was held on July 26, 2005, to present the revised proposed plan to the community. At this meeting, EPA and the state were present to answer questions about the preferred alternatives and other alternatives evaluated in the FS. The EPA's response to comments received during the public meeting is included in the Responsiveness Summary, which is a part of this ROD. Additionally, EPA established an administrative record which contains supporting documents for this decision. The administrative record is available for review during normal business hours at the following locations:

Olathe Public Library
201 E. Park Street
Olathe, KS 66061

U.S. Environmental Protection Agency
901 N. 5th Street
Kansas City, KS 66101

4.0 Scope and Role of Response Action

The response actions selected in this ROD will address the remaining threats at the site. A series of early removal actions has been completed at the site to address immediate threats. The early removal actions are summarized in the table below.

CCI Removal Actions		
Description of Action	**Lead**	**Date of Completion**
Removal of above ground tanks	site owner	1986
Characterization, segregation, and removal of containerized wastes, excavation of surface soils and offsite disposal, onsite capping of soils, warehouse decontamination, installation of groundwater interceptor trench and treatment system	EPA	1989-1991
Dismantling of treatment system, periodic drainage of groundwater interceptor trench	PRPs	1998
Installation of indoor air ventilation systems	PRPs	2003
Removal of stockpiled soil pile and offsite disposal, demolition of onsite warehouse building and offsite disposal of debris	EPA	2003

The early removal actions addressed immediate threats associated with containerized chemical wastes, contaminated surface soils, building surfaces, and an onsite area of groundwater contaminated with high levels of chlorinated solvents. Threats remaining at the site include subsurface source soils, onsite and offsite groundwater. The activities proposed in this ROD are outlined below. These activities will address each of the remaining threats at the site.

This response action is expected to be the final remedial action selected for the site.

5.0 Site Characteristics

The site is located in a mixed industrial/residential area. There are no buildings remaining on the site, and access to the property owned by CCI is secured by a six foot chain link security fence with a gate and lock. Remaining threats at the site include subsurface source soils and groundwater containing high concentrations of chlorinated solvents. Contaminated groundwater exists both onsite and offsite, having migrated at least a distance of 1,000 feet beneath a neighborhood west of the site. Refer to Figure 2 for a map of the groundwater plume.

A groundwater interceptor trench is located along the north and east boundaries of the site. The trench was installed in 1991, along with a water treatment system, as part of an early removal action to capture and treat dense nonaqueous phase liquids (DNAPLs) which had been found in that part of the site. In 1998, a group of PRPs agreed to dismantle the water treatment system, and continue to drain the trench periodically and treat the water prior to discharge. Currently, the trench is drained every six months. Site data indicate that the trench is no longer providing a significant benefit, and the remedial actions proposed in this ROD do not call for the continued operation of the trench. The trench will likely be decommissioned prior to or during the remedial design and remedial action phase.

5.1 Conceptual Site Model

During historical operations at the site, chemicals stored in leaking tanks and other poorly maintained containers were released to the subsurface soils, bedrock, and groundwater. Releases at the site have impacted soil and groundwater within the residuum, transition zone, and the upper 10 feet of bedrock. Figure 3 depicts a conceptual model of the site based on information collected during the RI and previous studies.

Aspects of the conceptual site model include:

- DNAPL has persisted on site as observed during historical as well as recent sampling events.
- DNAPL may have migrated laterally from the site to a bedrock low in the area of MW-26B, resulting in high TCE concentrations at this location.
- The primary migration route for dissolved phase contaminants in groundwater is laterally within the transport zone.

- The transport zone consists of the transition zone at the base of the residuum and approximately the top 10 feet of bedrock.
- Groundwater flows primarily in the horizontal direction; vertical flow is limited by low vertical hydraulic conductivities.
- The dissolved phase TCE plume in the transport zone extends to the southwest. The edge of the plume has reached the vicinity of Mill Creek. Vertical and horizontal hydraulic gradients indicate that Mill Creek acts as a discharge area, and would prevent further migration of contaminated groundwater.
- No detectable VOCs were present in Mill Creek surface water and sediment samples.

5.2 Site Geology

The Conceptual Site Model depicts the general geologic conditions at the site. Strata encountered during site investigations include the residuum, transition zone, and three limestone and three shale units. Each of these three stratigraphic divisions are discussed below.

The residuum consists mostly of clays and silts resulting from the weathering of limestone and shale bedrock. The residuum is up to 20 feet thick beneath and adjacent to the site. However, the thickness of the residuum decreases down slope away from the site to the south and west.

The transition zone is a thin zone between the residuum and bedrock, and consists of weathered bedrock. The transition zone is on the order of several inches thick where underlain by South Bend Limestone or the Stoner Limestone. Where underlain by the Rock Lake Shale, the transition zone can range from 15 feet to 5 feet thick. The transition zone behaves as a porous medium and is characterized as having a higher effective permeability than the residuum.

Bedrock investigations have provided detailed stratigraphic information about the first 65 feet of bedrock. The lithology at each of three bedrock coreholes revealed a greater amount of weathering and fractures within the top ten feet of the bedrock than in the deeper bedrock. There is an elevation change of approximately ten feet in the stratigraphic horizons from east to west across the site.

5.3 Hydrogeology

Shallow groundwater occurs within the residuum at the site at depths of about eight feet below ground surface. The hydraulic conductivity of the residuum has been measured as low as 10^{-8} centimeters per second as a result of the high silt and clay content. The transition zone and upper ten feet of bedrock are collectively termed the "transport zone". Estimated bulk hydraulic conductivity in the transport zone ranged from 10^{-4} to 10^{-5} centimeters per second. Data collected indicate that the transition zone is of higher permeability than the residuum. An extensive bedrock investigation conducted at the site indicates that the lateral migration of groundwater from the site occurs through the transport zone.

Groundwater flows to the west, southwest, and south away from the site under gradients ranging from 0.058 to 0.01 feet per foot. The average horizontal gradient in the site vicinity is 0.019 feet per foot, with the steepest gradients in the vicinity of the site.

Comparison of hydraulic head measurements in residuum, transition zone, and bedrock wells indicates the presence of both upward and downward vertical hydraulic gradients. Although vertical gradients exist within the area of the site, groundwater flows primarily in the horizontal direction through the transport zone. Vertical flow is limited by low vertical hydraulic conductivities.

5.4 Nature and Extent of Contamination

Various media at the site including sediment and surface water, soil, soil vapor, groundwater, and indoor air have been evaluated through a series of investigations conducted since 1995. For each of these media, a summary of the sampling activities conducted and the results are presented below.

5.4.1 Sediment and Surface Water

Sediment samples were collected from drainage channels leading from the site towards Mill Creek. In addition, sediment and surface water samples were collected from Mill Creek. The RI data show that the only impacts are in drainage areas closest to the site. Concentrations of hazardous substances decrease to non-detect or background (for metals) within a short distance from the site. Compounds detected in these drainage areas include several metals slightly above background, low level detections of PCBs, and several VOCs at trace concentrations. None of the surface water or sediment samples collected from Mill Creek contained detectable levels of VOCs.

5.4.2 Soil

Soil samples were collected from more than 175 locations within and around the site during the various investigations completed since 1981. Soil samples were analyzed for VOCs, PAHs, pesticides, metals, and perchlorate. Soil was evaluated to a depth of ten feet below ground surface for non-VOCs, and to bedrock for VOCs. Hazardous substances detected in soils on the site include VOCs, PAHs, pesticides, PCBs, and metals. Soils containing these substances generally are located within the site (fenced area and the BNSF property historically used by CCI located on the northeast corner of the fenced area). Soils containing VOCs are also found on an area just south and east of the CCI fence.

The lateral extent of chlorinated VOCs in soil was evaluated at various depths as depicted in Figures 4, 5, 6, and 7.

Soils containing a total pesticides concentration greater than 1 milligram/kilogram (mg/kg) are generally located in the southern portion of the site in the area of the former soil pile. The highest concentration of total pesticides detected was 22.18 mg/kg. Only trace concentrations of PCBs were detected in a few surficial soil samples. Only one sample contained PCBs greater than 1 mg/kg.

Metals that exceed target cleanup levels or background concentrations consist of chromium and arsenic. Soils that contain these metals above target cleanup levels are generally located in the 0-5' depth range in the area of the former soil pile.

5.4.3 Soil Vapor

Soil gas sampling was conducted and samples were found to contain VOCs at concentrations up to 639 micrograms per liter (TCE).

5.4.4 Groundwater

Groundwater quality at the site has been investigated through the installation of more than 35 monitoring wells and 30 temporary sampling points. Groundwater within the transport zone has been investigated both on site and off site. Numerous VOCs have been detected in groundwater with TCE being the most frequently detected and at the highest concentrations.

In some of the early groundwater investigations, groundwater samples were analyzed for SVOCs, pesticides, PCBs, metals, and perchlorate. These constituents have not been consistently detected throughout the years of investigation, and are not considered to be a threat.

As depicted by the Site Conceptual Model, contaminants have migrated in groundwater through the transport zone in a southwesterly direction towards Mill Creek. High concentrations of VOCs exist in the groundwater beneath a residential area west of the site. DNAPL has historically been observed in a few wells on the site.

An investigation was conducted in 2003 to evaluate the lateral extent of VOCs in groundwater within the upper ten feet of bedrock. Results confirm that TCE is found at higher concentrations and in a larger number of samples than other VOCs. For that reason, TCE concentrations have been used to illustrate the extent of VOCs in groundwater in Figure 2.

5.4.5 Indoor Air

Air samples were collected from crawl spaces and inside living spaces of several homes near the site. Several of the same constituents found in groundwater were also detected in air samples collected from homes located above areas of known groundwater contamination. Some of the residences included in the air sampling effort show levels of certain compounds which exceed health-based levels. Table 1 below lists the compounds that were detected in both groundwater and residential air samples. The table shows the maximum concentrations detected in groundwater, the maximum concentrations found in crawl space, basement, or indoor air of nearby residences, and the health-based action level. Compounds shown in bold face type have been found at levels that exceed the health-based action level. All of the compounds listed on Table 1 are CERCLA hazardous substances.

Table 1			
Compound	Max. Concentration in groundwater (ug/l)	Max. Concentration in residential air (ug/m^3)	Health-based Action Level (ug/m^3)
1,1,1-Trichloroethane	42,000	37	2,300
1,1-Dichloroethene	26,000	8.87	209
1,2-Dichloroethane	220,000	0.304	0.70
Benzene	530	18	
Ethyl benzene	10	8.6	
Carbon Tetrachloride	**200,000**	**28.1**	**1.3**
Chloroform	**12,000**	**6.1**	**0.8**
cis1,2-Dichloroethene	**100,000**	**306**	**37**
Methylene Chloride	**1,300**	**388**	**40.3**
Tetrachloroethene	**70,000**	**14**	**6.6**
Trichloroethene	**1,100,000**	**186**	**2.0**
Chloromethane	**13,000**	**1150**	**10.5**

6.0 Current and Potential Future Land and Resource Uses

6.1 Land Uses

Currently, the CCI property is zoned M3 industrial, but the city's master plan shows the property as residential. The EPA and the city have proposed that CCI seek to have the property re-zoned as residential, with restrictions to allow only for open space or recreational uses. Land use around the CCI property is a mixture of residential and light industrial. The site is bounded on the east by a major rail line. Residences are located adjacent to the north and west of the site. A large residential neighborhood is located west of the site.

The reasonable anticipated future land use of the CCI property is open green space or recreational use. Given the proximity to the railroad and the length of time needed to complete remedial actions, the site is not a candidate for residential development. The local community has indicated a preference for open green space or recreational use, and is opposed to industrial or commercial uses.

7.0 Summary of Site Risks

A BLRA estimates what risks the site poses if no action were taken. A BLRA includes an assessment of human health risks as well as ecological risks. The BLRA provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

The BLRA for the CCI site was prepared in stages. The early stages were completed in the mid 1990's and consisted of both a human health risk assessment and an ecological assessment. The first human health risk assessment focused on exposures associated with on-site and near-site areas, but did not evaluate off-site areas. The results of this assessment are found in the Site Characterization Study Report dated September 17, 1996. The exposure scenarios evaluated in this assessment which are relevant to the remedial actions selected in this ROD include soil exposures for the on-site recreator and soil exposures for the on-site construction worker.

The remedial investigation focused on groundwater contamination in off-site areas and served as the basis for the third stage of the BLRA, titled the Supplemental BLRA Report dated January 2003. The Supplemental BLRA contains a summary of the earlier risk assessment stages as well as an evaluation of human health and ecological risks associated with groundwater and surface water. The exposure scenarios evaluated in this assessment which are relevant to the remedial actions selected in this ROD include exposures of off-site residents to groundwater, and exposures of on-site construction workers to groundwater.

The final stage of the BLRA was a brief addendum prepared in September 2003 to evaluate risks associated with vapor intrusion of certain contaminants into homes above the groundwater plume.

7.1 Summary of Human Health Risk Assessment

The human health risk assessment process is comprised of several steps including identification of chemicals of concern, exposure assessment, toxicity assessment, and risk characterization. In general, EPA requires remedial actions for Superfund sites when the excess carcinogenic (cancer) risk exceeds 10^{-4}. Risk is expressed in terms of a probability. A risk of 10^{-4} represents an increase of one in ten thousand, or 1/10,000, for a reasonable maximum exposure (RME). This risk represents the lifetime risk of developing cancer as a result of releases from the site.

Remedial actions may also be conducted at sites when the Hazard Index (HI) equals or exceeds a value of 1.0 for the RME scenario. The HI is a numeric expression of the noncarcinogenic risk to human health resulting from releases from the site.

7.1.1 Identification of Chemicals of Concern

Various environmental media were evaluated during the different stages of the BLRA. However, only a few of the media evaluated resulted in risks which require that action be taken. The discussion below is therefore limited to those media to be addressed by the remedial actions.

7.1.1.1 Soil

During the site characterization study performed in the mid 1990s, numerous soil samples were collected from various locations and at various depths across the site. As a result, a broad range of chemicals were identified as chemicals of potential concern for each exposure scenario evaluated. The chemicals of potential concern are classified in general groups including metals, semi-volatile organic compounds, PAHs, pesticides, and VOCs. The table below presents information about the chemicals of concern for the exposure scenarios that are relevant to the remedial actions selected in this ROD. It is also important to note that the table presents only those chemicals that significantly contribute to the overall risk, and does not include all chemicals of potential concern evaluated in the BLRA. More comprehensive information regarding the chemicals of potential concern for all exposure scenarios evaluated for site soils can be found in Tables 4.3.1-4.3.7 of the Site Characterization Report dated September 17, 1996.

Chemical of Concern	Number of Samples	Number of Detects	Frequency of Detection	Max. Concentration	Exposure Point Concentration
Future On-Site Recreator:					
benzo(a)pyrene	78	42	54%	10 mg/kg	3.61 mg/kg
chromium	89	89	100%	530 mg/kg	63.2 mg/kg
1,1-dichloroethene	81	15	19%	18.4 mg/kg	3.83 mg/kg
Future On-Site Construction Worker:					
carbon tetrachloride	123	20	16%	42 mg/kg	42 mg/kg
1,1-dichloroethene	123	27	225	8.4 mg/kg	8.4 mg/kg
1,2-dichloroethane	123	72	59%	250 mg/kg	97.5 mg/kg
1,1,2,2-tetrachloroethane	123	57	46%	5700 mg/kg	28.7 mg/kg
tetrachloroethylene	123	89	72%	300 mg/kg	300 mg/kg

Chemical of Concern	Number of Samples	Number of Detects	Frequency of Detection	Max. Concentration	Exposure Point Concentration
trichloroethylene	123	109	89%	2100 mg/kg	2100 mg/kg
vinyl chloride	123	14	11%	10 mg/kg	10 mg/kg

NOTES:
1. Exposure point concentrations represent the 95% upper confidence limit (UCL) of the arithmetic mean, except where the 95% UCL exceeded the maximum concentration. In those cases, the maximum concentration was used as the exposure point concentration.

2. The chemicals of concern for the future on-site recreator are the risk drivers for carcinogenic risk only. Noncarcinogenic risks associated with this exposure scenario do not exceed the level generally considered acceptable by EPA.

Direct contact exposures to soil in drainage areas were evaluated in the Supplemental BLRA. The primary COCs in these areas included arsenic and Aroclor 1260. The resulting cancer and noncancer risks were within the range considered acceptable by EPA, and no remedial actions are required to address these risks in drainage areas associated with the site.

7.1.1.2 Groundwater

Human health risks associated with groundwater exposures were evaluated in the 1996 Site Characterization Study as well as in the 2003 Supplemental BLRA. Information presented in the tables below is based upon the more recent Supplemental Baseline Risk Assessment Report. In general, the earlier assessment concluded that for on-site receptors, theoretical exposures to groundwater chemicals of potential concern contributed most to the calculated noncarcinogenic risk.

The Supplemental BLRA is based upon data collected during the RI. All chemicals detected in the vicinity of the plume during the February/March 2001 groundwater monitoring event are considered COPCs in addition to chemicals detected in wells TMW-008, TMW-009, TMW-10 and TMW-11 directly adjacent to the CCI property during the February/March 2001 sampling event. The chemicals of concern listed in the table below represent those which contribute more significantly to the human health risk than other chemicals identified in the BLRA as chemicals of potential concern for groundwater.

Due to the limited number of samples collected, a statistical approach for defining the exposure point concentrations for the COCs was not used. Rather, the maximum detected concentrations from certain wells during the February/March 2001 sampling event were used for evaluating risks associated with direct contact exposures for future off-site residents and construction workers. Modeled COC concentrations from groundwater were used as the exposure point concentrations for construction worker inhalation exposures. The COCs and exposure point concentrations (EPCs) are summarized in the table below.

Groundwater Chemicals of Concern			
Chemical	EPC (Off-site Resident Direct Contact Exposures)	EPC (Construction Worker Direct Contact Exposures)	EPC (Inhalation Exposures)
carbon tetrachloride	690 ug/l	690 ug/l	5.3 x 10^{-4} mg/m^3
chloroform	1,100 ug/l	170 ug/l	1.3 x 10^{-4} mg/m^3
1,2-dichloroethane	550 ug/l	66 ug/l	5.1 x 10^{-5} mg/m^3
1,2-dichloropropane	170 ug/l	170 ug/l	1.3 x 10^{-4} mg/m^3
1,1,2,2-tetrachloroethane	95 ug/l	95 ug/l	7.3 x 10^{-5} mg/m^3
tetrachloroethylene	970 ug/l	970 ug/l	7.5 x 10^{-4} mg/m^3
trichloroethylene	8,400 ug/l	8,400 ug/l	6.5 x 10^{-3} mg/m^3

7.1.1.3 Indoor Air

In the BLRA, the chemicals of potential concern for residential indoor air were chosen based on the results of samples collected from inside living spaces, crawl spaces or basements, and outdoors of homes near the site, as well as groundwater sampling results. The air samples collected contained several VOCs which could have a number of sources including groundwater, dry cleaned clothing, cigarette smoke, tap water, commercial products used in the home, etc. Due to the variety of potential sources, only those chemicals that were detected in both air and groundwater samples were considered chemicals of potential concern. Risks were characterized for each sampling location (residence) and the exposure point concentrations used were the concentrations detected at each location.

Subsequent to the BLRA, the EPA prepared an addendum to the BLRA which evaluated risks due to indoor air exposures using additional data. Chemicals of potential concern were chosen based on results of measured indoor or crawl space air samples collected from residences near the site. Exposure point concentrations were selected as the maximum concentration detected at each location.

Based on a collective analysis of both the BLRA and EPA's addendum to the BLRA, the chemicals which contribute most significantly to the human health risks associated with indoor air exposures include carbon tetrachloride, chloroform, methylene chloride, tetrachloroethylene, and trichloroethylene. A significant contribution to the human health risk was considered to be a HI greater than 0.1 or an Incremental Lifetime Cancer Risk (ILCR) greater than 1×10^{-6} in both the BLRA and the addendum to the BLRA.

7.1.3.2 Groundwater

Risks associated with groundwater exposures were characterized in the Supplemental Baseline Risk Assessment. The table below summarizes the toxicity information used in that assessment for the groundwater COCs.

Chemical	Oral		Inhalation	
	Cancer Slope Factor (kg-day/mg)	Reference Dose (mg/kg-day)	Cancer Slope Factor (kg-day/mg)	Reference Dose (mg/kg-day)
carbon tetrachloride	0.13[a]	$7.0x10^{-4}$[a]	0.0525[a]	NE
chloroform	NE	0.001[a]	0.081[a]	$8.6x10^{-5}$[c]
1,2-dichloroethane	0.091[a]	0.03[c]	0.091[a]	$1.4x10^{-3}$[c]
1,2-dichloropropane	0.068[b]	NE	NE	$1.1x10^{-3}$[a]
methylene chloride	0.0075[a]	0.06[a]	0.0016[a]	0.86[b]
tetrachloroethylene	0.052[c]	0.01[a]	$2.0x10^{-3}$[c]	0.11[c]
trichloroethylene	0.011[c]	$6.0x10^{-3}$[c]	$6.0x10^{-3}$[d]	$6.0x10^{-3}$[c]
a - IRIS	b - HEAST	c - NCEA-Cincinnati, OH	d - route-to-route extrapolation	

7.1.3.3 Indoor Air

For the BLRA, toxicity values are presented in Section 7.1.3.2 above. It may be important to note that for TCE, a route to route extrapolation from oral toxicity information was used for evaluating health risks associated with inhalation exposures because at that time EPA had not finalized a TCE inhalation non-cancer toxicity value.

For the addendum to the BLRA prepared by EPA, the toxicity values in the table below were used.

Addendum to BLRA Toxicity Values				
Chemical	Cancer Slope Factor (kg-day/mg)	Source	Reference Dose (mg/kg-day)	Source
carbon tetrachloride	0.053	IRIS	0.0114	CalEPA
chloroform	0.081	IRIS	$8.6x10^{-4}$	NCEA
methylene chloride	0.0016	IRIS	0.86	NCEA

The EPA's addendum to the BLRA evaluated exposures to indoor air for current residents using measured concentrations in air samples collected from indoor living spaces, crawl spaces, and basements. For risk characterization purposes, crawl space air was considered breathable air.

7.1.3 Toxicity Assessment

The toxicity assessment examines information concerning the potential human health effects of exposure to the chemicals of concern. In each of the subsections below, the toxicity information for the chemicals of concern is presented for each of the media evaluated in the various stages of the BLRA.

7.1.3.1 Soil

Risks associated with exposures to site soil were evaluated in the 1996 Site Characterization Study. The table below summarizes the toxicity information used in that evaluation for the chemicals of concern. The primary sources of the toxicity values are the Integrated Risk Information System (IRIS) (1996) and the Health Effects Assessment Summary Tables (HEAST) (1995), both compiled by EPA.

Chemical	Carcinogen Class	Cancer Slope Factor $_{oral}$ (kg-day/mg)	Cancer Slope Factor $_{inh}$ (kg-day/mg)	Reference Dose $_{oral}$ (mg/kg-day)	Reference Dose $_{inh}$ (mg/kg-day)
benzo(a)pyrene	B2	7.3	0.73	ND	ND
carbon tetrachloride	B2	0.13	0.053	0.0007	ND
chromium	A	ND	41	0.005	P
1,2-dichloroethane	B2	0.091	0.091	ND	ND
1,1-dichloroethylene	C	0.6	0.18	0.009	P
1,1,2,2-tetrachloroethane	C	0.2	0.2	P	ND
tetrachloroethylene	B2	0.052	0.002	.01	.01
trichloroethylene	W	0.011	0.006	0.006	P
vinyl chloride	P	1.9	0.3	ND	ND
NOTES: NA = not applicable ND = no data P = pending					

7.1.3.2 Groundwater

Risks associated with groundwater exposures were characterized in the Supplemental Baseline Risk Assessment. The table below summarizes the toxicity information used in that assessment for the groundwater COCs.

Chemical	Oral		Inhalation	
	Cancer Slope Factor (kg-day/mg)	Reference Dose (mg/kg-day)	Cancer Slope Factor (kg-day/mg)	Reference Dose (mg/kg-day)
carbon tetrachloride	0.13[a]	$7.0x10^{-4}$[a]	0.0525[a]	NE
chloroform	NE	0.001[a]	0.081[a]	$8.6x10^{-5}$[c]
1,2-dichloroethane	0.091[a]	0.03[c]	0.091[a]	$1.4x10^{-3}$[c]
1,2-dichloropropane	0.068[b]	NE	NE	$1.1x10^{-3}$[a]
methylene chloride	0.0075[a]	0.06[a]	0.0016[a]	0.86[b]
tetrachloroethylene	0.052[c]	0.01[a]	$2.0x10^{-3}$[c]	0.11[c]
trichloroethylene	0.011[c]	$6.0x10^{-3}$[c]	$6.0x10^{-3}$[d]	$6.0x10^{-3}$[c]
a - IRIS	b - HEAST	c - NCEA-Cincinnati, OH		d - route-to-route extrapolation

7.1.3.3 Indoor Air

For the BLRA, toxicity values are presented in Section 7.1.3.2 above. It may be important to note that for TCE, a route to route extrapolation from oral toxicity information was used for evaluating health risks associated with inhalation exposures because at that time EPA had not finalized a TCE inhalation non-cancer toxicity value.

For the addendum to the BLRA prepared by EPA, the toxicity values in the table below were used.

Addendum to BLRA Toxicity Values				
Chemical	Cancer Slope Factor (kg-day/mg)	Source	Reference Dose (mg/kg-day)	Source
carbon tetrachloride	0.053	IRIS	0.0114	CalEPA
chloroform	0.081	IRIS	$8.6x10^{-4}$	NCEA
methylene chloride	0.0016	IRIS	0.86	NCEA

Addendum to BLRA Toxicity Values				
tetrachloroethylene	0.021	CalEPA	0.17	NCEA
trichloroethylene	0.020 0.40 0.0060	NCEA NCEA NCEA	0.014	NCEA

7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where: risk = a unitless probability of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that are expressed in scientific notation (e.g., 1×10^{-6}). This is referred to as an excess lifetime cancer risk because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to the sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. The EPA generally considers risks in the range of 10^{-4} to 10^{-6} to be acceptable.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effects. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that noncarcinogenic effects from that chemical are unlikely. The HI is generated by adding the HQs for all chemicals of concern that affect the same target organ or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A HI<1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. A HI>1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

$$\text{Non-Cancer HQ} = \text{CDI}/\text{RfD}$$

where: CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period.

The subsections below present the results of the risk characterization for each of the media of interest at the site.

7.1.4.1 Soil

The 1996 risk assessment work that was completed evaluated numerous exposure pathways and receptor populations. However, based on the most reasonably anticipated future land uses, several of those receptor populations are no longer relevant. The tables below summarize carcinogenic and noncarcinogenic risks associated with exposures to soil for a future on-site recreator and a future on-site construction worker.

The carcinogenic risk associated with soil exposures for a future on-site recreational visitor exceeds the level generally considered acceptable by EPA. The noncarcinogenic risk for this exposure scenario does not exceed EPA's acceptable level. The table below for noncarcinogens shows the three chemicals that contributed most to the total hazard index, but it should be noted that these chemicals are different than the chemicals of concern identified for this exposure scenario in section 7.1.1.1 above. The chemicals of concern include only those that contribute to a risk which exceeds EPA's acceptable level.

Risk Characterization Summary - Carcinogens						
Exposure Scenario : Future On-site Recreator						
Medium	Exposure Medium	Chemical of Concern	Carcinogenic Risks			
			Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	benzo(a)pyrene	5 x10-6	8 x 10-12	3 x 10-5	3 x 10-5
Soil	Soil	chromium	5 x 10-4	8 x 10-10	0	5 x 10-4
Soil	Soil	1,1-dichloroethylene	5 x 10-7	1 x 10-5	1 x 10-7	1 x 10-5
					Soil Risk Total	**5.4 x10-4**
Exposure Scenario: On-Site Construction Worker						
Soil	Soil	carbon tetrachloride	2 x 10-7	7 x 10-6	6 x 10-8	7 x 10-6
Soil	Soil	1,1-dichloroethylene	1 x 10-7	1 x 10-5	5 x 10-8	1 x 10-5
Soil	Soil	1,2-dichloroethane	3 x 10-7	2 x 10-5	6 x 10-7	2 x 10-5
Soil	Soil	1,1,2,2-tetrachloroethane	2 x 10-8	7 x 10-8	5 x 10-8	1 x 10-7
Soil	Soil	tetrachloroethylene	5 x 10-7	9 x 10-7	2 x 10-7	2 x 10-6
Soil	Soil	trichloroethylene	7 x10-7	2 x 10-5	3 x 10-7	2 x10-5
Soil	Soil	vinyl chloride	6 x10-7	5 x10-3	2 x10-7	5 x10-3
					Soil Risk Total	**5 x 10-3**

Risk Characterization - Noncarcinogens						
Exposure Scenario: Future On-Site Recreator						
Medium	Exposure Medium	Chemical of Concern	Hazard Quotients			
			Ingestion	Inhalation	Dermal	Total
Soil	Soil	carbon tetrachloride	4.2 x 10-3	1.5 x 10-1	1.3 x 10-3	1.6 x 10-1
Soil	Soil	trichloroethylene	1.1 x 10-2	2.1 x 10-1	3.3 x 10-3	2.3 x 10-1
Soil	Soil	1,1-dichloroethylene	NA	3.9 x 10-2	NA	3.9 x 10-2
					Hazard Index	4.3 x 10-1
Exposure Scenario: On-Site Construction Worker						
Medium	Exposure Medium	Chemical of Concern	Hazard Quotients			
			Ingestion	Inhalation	Dermal	Total
Soil	Soil	carbon tetrachloride	1.2 x10-1	1.9 x 10-1	4.6 x 10-2	3.6 x 10-1
Soil	Soil	chlordane	7.9 x 10-3	5 x 10-10	9.8 x 10-2	1.1 x 10-1
Soil	Soil	tetrachloroethylene	6.1 x 10-2	4.5 x 10-2	2.3 x 10-2	1.3 x 10-1
Soil	Soil	trichloroethylene	7.1 x 10-1	6 x 10-1	2.7 x 10-1	1.6
					Hazard Index	2.2

7.1.4.2 Groundwater

The table below summarizes the carcinogenic and noncarcinogenic risks calculated for ingestion of groundwater by a hypothetical future offsite resident. Both risks exceed EPA's acceptable levels.

Human Health Risk Summary Ingestion of Groundwater by Offsite Residents		
chemical	HQ	ILCR
carbon tetrachloride	63	$1x10^{-3}$
chloroform	7.0	NA
1,2-dichloroethane	1.2	$7x10^{-4}$
1,2-dichloropropane	NA	$2x10^{-4}$
tetrachloroethylene	6.2	$8x10^{-4}$
trichloroethylene	89	$1x10^{-3}$
Pathway Total	**166.4**	**$5.7x10^{-3}$**

The table below summarizes the carcinogenic and noncarcinogenic risks associated with ingestion, dermal contact, and inhalation of groundwater for off-site construction workers.

Human Health Risk Summary Offsite Construction Worker						
chemical	Ingestion		Dermal		Inhalation	
	Hazard Quotient	ILCR	Hazard Quotient	ILCR	Hazard Quotient	ILCR
carbon tetrachloride	0.12	2x10-7	0.25	3x10-7	NA	3x10-9
chloroform	0.0021	NA	0.0024	NA	0.012	1x10-9
1,2-dichloroethane	0.00028	1x10-8	0.0019	7x10-8	0.00028	5x10-10
1,2-dichloropropane	NA	2x10-8	NA	3x10-8	0.00093	NA
tetrachloroethylene	0.012	9x10-8	0.068	5x10-7	5.1x10-5	2x10-10
trichloroethylene	0.18	2x10-7	0.32	3x10-7	0.0084	4x10-9
Pathway Total	0.31	5x10-7	0.65	1x10-6	0.022	1x10-8
Sum of ingestion, dermal, and inhalation exposures HI=0.99 ILCR=2x10-6						

7.1.4.3 Indoor Air

In the BLRA, risks for indoor air exposures were quantified for each sampling location (residence). A HI and an ILCR were calculated for each residence where indoor air samples were collected. In a similar manner, HIs and ILCRs were calculated for each residence where air samples were collected from crawl spaces. The table below presents the ranges of HIs and ILCRs calculated for indoor air and crawl space air in the BLRA for the chemicals of concern.

Cancer and Non-Cancer Risks for Indoor Air and Crawl Space Exposures in the BLRA				
chemical	Indoor Air		Crawl Space	
	HI	ILCR	HI	ILCR
carbon tetrachloride	na	4x10-6	na	$1x10^{-5}$-$3x10^{-6}$
chloroform	3.6-36	$7x10^{-5}$-$7x10^{-6}$	1.4-23	$4x10^{-5}$-$3x10^{-6}$
methylene chloride	.0012-.0095	$4x10^{-6}$-$4x10^{-7}$	.0038-.11	$4x10^{-5}$-$1x10^{-6}$
tetrachloroethylene	.0018-.063	$4x10^{-6}$-$1x10^{-7}$	.0015-.063	$4x10^{-6}$-$1x10^{-7}$

Cancer and Non-Cancer Risks for Indoor Air and Crawl Space Exposures in the BLRA				
chemical	Indoor Air		Crawl Space	
trichloroethylene	.23-.53	$5x10^{-6}$-$2x10^{-6}$	.4-2	$2x10^{-5}$-$4x10^{-6}$
Total	3.9-36.5	$8.7x10^{-5}$-$1.4x10^{-5}$	1.8-25.2	$1.1x10^{-4}$-$1.1x10^{-5}$

In the addendum to the BLRA prepared by EPA, cancer and non-cancer health risks were quantified for each residence where air samples were collected. However, crawl space air was considered breathable air, so the maximum concentration found in either crawl space, basement, or living space was used as the exposure point concentration for that residence. The table below presents the range of HIs and ILCRs calculated for the residences.

It is important to note that a range of toxicity values for TCE was used. At the time the addendum to the BLRA was prepared, draft TCE slope factors for high end and low end were available for use in EPA risk assessments. Since these slope factors were in draft and had not been finalized, the old provisional slope factor for TCE was also used. Using all three available slope factors for TCE demonstrates the effect of the slope factor on the final ILCR. As shown in the table below, at least one residence exceeds EPA's acceptable ILCR of $1x10^{-4}$ using the old provisional TCE slope factor. The draft TCE slope factors result in even greater exceedances of the $1x10^{-4}$ ILCR level.

Cancer and Non-Cancer Risks for Indoor Air Exposures in the Addendum to the BLRA		
Chemical	HI	ILCR
carbon tetrachloride	.002-.049	$1.6x10^{-5}$-$6.6x10^{-7}$
chloroform	.093-.28	$1.1x10^{-5}$-$3.6x10^{-6}$
methylene chloride	.000053-.0046	$3.6x10^{-6}$-$4.1x10^{-8}$
tetrachloroethylene	.000088-.016	$3.0x10^{-5}$-$1.7x10^{-7}$
trichloroethylene	.0031-3.4	$4.3x10^{-4}$-$3.9x10^{-7}$ $8.3x10^{-3}$-$7.9x10^{-6}$ $1.3x10^{-4}$-$1.2x10^{-7}$
Total HI Total ILCR(low end draft TCE SF) Total ILCR(high end draft TCE SF) Total ILCR(old provisional TCE SF)	.098-3.7	$4.9x10^{-4}$- $7.7x10^{-7}$ $8.6x10^{-3}$- $8.3x10^{-6}$ $1.9x10^{-4}$- $4.9x10^{-7}$

7.2 Summary of Ecological Risk Assessment

An ecological risk assessment was conducted in two separate phases. A screening ecological risk assessment (SERA) was conducted in 1995 by EPA. The 1995 SERA evaluated areas on and near the CCI property. In conjunction with the Supplemental BLRA completed in 2003, a focused ecological risk assessment (ERA) was performed for areas beyond the CCI property. The 2003 SERA focused on drainage pathways and groundwater discharges to surface water.

In the 1995 SERA, few terrestrial receptors were identified due to a lack of habitat on the site. Potential terrestrial receptors noted included small mammals, primarily rodents, and birds. Primary routes of exposure included contact with soil, sediment, surface water, and air. The effects of these potential exposures were concluded to be minimal because of early removal actions which had removed or capped much of the contaminated soils. Aquatic species do not exist at the site since no surface water bodies are present. However, the 1995 SERA noted the importance of evaluating risks for offsite aquatic receptors which may be exposed in Mill Creek.

The 2003 ERA was performed in accordance with the "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final" dated 1997. The purpose of the 2003 ERA was to address the potential for adverse ecological impact that may occur as a result of off-site transport and exposures that were not evaluated in the 1995 SERA. Specifically, drainage pathways carrying surface water and sediments from the site were evaluated.

Surficial soil samples collected during the RI from the drainage pathways indicated a single detection of Aroclor 1260. To address the potential for foodweb transfer, an evaluation of risks for small herbivorous mammals and carnivorous birds was conducted. Also, to address the concern about off-site transport of chemicals to sediments, an evaluation of risks to sediment-dwelling biota was performed. Similarly, an evaluation of risks to aquatic biota was performed to address the potential off-site discharge of groundwater to surface water.

Chemicals of potential ecological concern (COPECS) are listed in the table below and were identified according to the following factors:

- detected chemicals in surface soils samples that exceeded both soil screening levels and background soil concentrations;
- detected chemicals in sediment samples that exceeded protective sediment benchmarks; and
- detected chemicals in groundwater potentially discharging to the drainage pathways that exceeded available surface water quality criteria.

Chemicals of Potential Ecological Concern	
Aroclor 1260	2-Butanone
Arsenic	Benzene
Cadmium	Carbon disulfide
Chromium	Toluene
Mercury	Barium
Selenium	Silver
Acetone	

The potentially complete exposure pathways evaluated in the ERA included:

- Incidental ingestion of Aroclor 1260 and metal COPECS in soils by small herbivorous mammals and carnivorous birds;
- Ingestion of Aroclor 1260 and metal COPECS that have bioaccumulated from soils into food sources of small herbivorous mammals and carnivorous birds; and
- Ingestion and direct contact of sediments for sediment-dwelling biota.

No COPECs were identified in groundwater potentially discharging to surface water. Therefore the pathway is incomplete and aquatic biota are considered to be not exposed to site-related chemicals in groundwater potentially discharging to surface water.

The ERA concluded that there is minimal potential for impact to small mammals and that impact is unlikely to be of ecological significance. For carnivorous birds, chronic exposures to COPECs pose a negligible potential for adverse impacts. Calculated hazard quotients suggest a minimal potential for adverse impacts to sediment-dwelling biota, but these impacts are unlikely to be ecologically significant. The potential discharge of groundwater to surface water is unlikely to adversely impact aquatic biota in the drainage pathway.

7.3 Basis for Action

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment which may present an imminent and substantial endangerment to public health or welfare.

8.0 Remedial Action Objectives

Remedial Action Objectives (RAOs) provide a general description of what the clean up will accomplish. The environmental media to be addressed by this ROD include soils on the CCI property and groundwater. RAOs are developed for each affected media at the site and include the following:

- mitigate risk from ingestion, inhalation, and dermal contact with onsite soils to acceptable levels;
- minimize further offsite migration of groundwater containing VOCs in excess of target cleanup levels;
- reduce VOC concentrations in onsite and offsite groundwater to levels that are adequately protective of indoor air quality;
- prevent ingestion of groundwater containing VOCs in excess of target cleanup levels;
- mitigate risk from direct contact with groundwater containing VOCs in excess of target cleanup levels; and
- mitigate risk associated with inhalation of residential indoor air containing vapors emanating from groundwater.

Target cleanup levels were selected for soil and groundwater based on the above RAOs. For soil, target cleanup levels were calculated for each COPC which resulted in an excess cancer risk greater than one in one million (expressed as $1x10^{-6}$) or a hazard index greater than 1 for non-cancer risks. The target cleanup levels for soil are presented in the table below.

SUMMARY OF SOIL TARGET LEVELS Construction/Maintenance Worker and Recreational User Scenarios			
Chemical of Potential Concern	Estimated Background Levels mg/kg	Future On-Site Construction/Maintenance Worker Cleanup Level mg/kg	Future On-Site Recreational User Cleanup Level mg/kg
Metals			
Arsenic	10	16	3.0
Chromium III	-	>100,000	>100,000
Chromium, Total	23	16	7,200

Semi VOCs/Polyaromatic Hydrocarbons			
Benzo(a)anthracene	-	41	4.5
Benzo(a)pyrene	-	4.0	0.45
Benzo(b)flouranthene	-	41	4.5
Dibenzo(ah)anthracene	-	4.1	0.45
Indeno(1,2,3-cd)pyrene	-	41	4.5
Pesticides			
Aldrin	-	1.8	0.21
Aroclor 1260	-	15	1.8
Chlordane	-	100	12
4,4-DDD	-	130	15
Dieldrin	-	1.9	0.22
Heptachlor epoxide	-	3.4	0.39
VOCs			
Carbon tetrachloride	-	10	24
1,2-Dichloroethane	-	35	35
1,1-Dichloroethene	-	780	780
1,1,1,2-tetrachloroethane	-	220	150
1,1,2,2-tetrachloroethane	-	29	19
Tetrachloroethene	-	120	80
Trichloroethene	-	110	300
Vinyl chloride	-	14	3.4

Target cleanup levels for VOCs in groundwater are the Maximum Contaminant Levels (MCLs), promulgated under the Safe Drinking Water Act. The MCLs are considered ARARs for this site because the groundwater is considered by EPA and the state to be a potential drinking water source.

The RAOs were selected in concert with future land use assumptions. The CCI property is currently zoned for industrial use, but the most reasonably anticipated future land use is a recreational use scenario based on discussions with the city and the local residents.

9.0 Description of Alternatives

In the FS, remedial alternatives were developed separately for the affected media at the site; soil and groundwater. Alternatives for soil were developed in three separate phases of the FS. The initial FS report dated March 2004 evaluates four soil alternatives. The FS Addendum

Report dated June 2004 develops an additional soil alternative. A Second FS Addendum dated June 2005 presents one additional alternative for soil. In this section, alternatives addressing soil will be described first, followed by a description of alternatives addressing groundwater.

9.1 Description of Soil Alternatives

In the FS, a total of six alternatives for addressing site soils were evaluated in detail. The elements which are common to each of the soil alternatives, except the no action alternative, are discussed below, and are not repeated in each description of the individual alternatives.

Common Elements

Institutional controls to prevent residential, commercial, and industrial development of the CCI property, and restricting on-site excavation activities are included in each of the soil alternatives, except the no action alternative, and are necessary because of the soil contamination that will remain on the CCI property. The institutional controls will likely include the following: rezoning; restrictive covenants; local ordinances; and, recorded notices to property deeds indicating the type, location and concentration of residual contamination and associated use restrictions.

Alternative S1: No Action

The National Contingency Plan (NCP) requires that the EPA consider a no action alternative to serve as a baseline against which other remedial alternatives can be compared. Under this alternative, no actions would be taken to address the threats posed by onsite soils and onsite and offsite groundwater. Alternative S1 would not meet the RAOs established for soil because it would not reduce or prevent exposures to contaminated soils.

Alternative S2: Off-Site Disposal and LTTD

This alternative consists of excavation of onsite soils and onsite treatment using a technology called low temperature thermal desorption (LTTD). Alternative S2 includes the following major elements:

- Excavate soils containing metals at concentrations that exceed target cleanup levels, pretreat as needed with LTTD, and dispose offsite in a landfill. (2,000 cubic yards);
- Excavate soils containing organic constituents above target cleanup levels and treat soils onsite using LTTD. (volume depends on excavation scenario);
- Backfill the excavated areas with treated soils; and
- Compact, grade, and revegetate the site.

This alternative evaluates three different excavation scenarios discussed below. Elements specific to that scenario are provided below.

<u>S2A</u> - excavation of the top two feet of soil within the CCI fenced area plus excavation of soils exceeding target cleanup levels for metals and for VOCs to a depth of six feet. Soils containing metals above target cleanup levels would be disposed off-site. Soils treated through LTTD would be used to backfill excavated areas. The volume of soils containing metals is approximately 2,000 cubic yards and the volume of soils containing VOCs is approximately 7,500 cubic yards.

<u>S2B</u> - excavation of all of the S2A soils plus areas where DNAPL has historically been found. In the DNAPL areas, soil would be excavated to bedrock (or a depth of about 20 feet). Under this scenario, the volume of soils containing metals is approximately 2,000 cubic yards and the volume of soils containing VOCs is approximately 18,000 cubic yards.

For areas requiring deeper excavations to bedrock, shoring will likely be necessary to support the excavation. This would be accomplished by driving sheet piling into bedrock around the proposed area of excavation. For areas near the BNSF railroad tracks, special construction techniques may be required.

Excavation at depth would also likely require dewatering since groundwater occurs at depths as shallow as eight feet. Dewatering would be accomplished by using pumps and portable sediment filters and granular activated carbon treatment units. Treated water would be discharged to the POTW, storm drain, or nearby surface water drainage in compliance with NPDES or local requirements.

The deeper excavations would provide an opportunity to deliver chemical oxidants to treat groundwater. Chemical oxidants could be introduced to groundwater through perforated piping installed horizontally within a gravel bed placed at the base of excavation. The horizontal pipe would be connected to a vertical riser pipe that would be used to add oxidant at periodic intervals.

<u>S2C</u> - excavation of the entire site within the CCI fence line (1.5 acres) to bedrock. The volume of soil to be excavated under this scenario is 50,000 cubic yards. Of this total, approximately 2,000 cubic yards contains metals above target cleanup levels.

As in scenario S2B, shoring and dewatering would likely be required due to the depth of excavation. In addition, the chemical oxidant delivery system would be installed in select areas at the base of excavation. With regard to stormwater management, since scenario S2C would involve excavation of more than one acre of land, specific requirements of the NPDES Phase II stormwater program would have to be met.

For all of the excavation scenarios, soils containing metals above target cleanup levels (approximately 2,000 cubic yards) would be pretreated onsite in the LTTD unit to remove any VOCs. The pretreated soils would then be transported by truck offsite to a disposal facility.

Due to limitations on the particle size that can be handled by a LTTD unit, it is likely that the clayey soils at the site will require mechanical processing prior to treatment. In addition, wet soils would need to be dewatered and may require a double pass through the LTTD unit. Soil processing would be conducted in a temporary enclosure where VOC emissions can be contained and treated. An air handling system would consist of blowers and vapor phase carbon treatment units.

The duration of treatment is dependent on two factors; rate of treatment and hours of operation. The FS evaluated two treatment rates of three tons per hour and ten tons per hour based on information supplied by LTTD vendors. Optimum equipment productivity is realized when the equipment can be operated 24 hours per day, seven days per week. However, in a residential setting, this may not be reasonable due to noise, lights, emissions, and truck traffic. Therefore, a second operating scenario consisting of ten hours per day, five days per week was evaluated along with the optimal scenario. This resulted in a wide range of costs and treatment durations for each excavation scenario.

Following treatment, soils would be backfilled into open excavations and compacted in place. The site would be revegetated or otherwise finished at the surface consistent with the final site use with input from the community.

During excavation, dust and VOC emissions are likely to occur. The FS contains estimates of the total mass of VOCs which could be released during the various excavation scenarios. Extensive monitoring of ambient air quality would be performed. It is likely that respiratory protection would be required for workers during some portions of the work. Air monitoring would likely be performed at several locations on and around the site perimeter. Health-based thresholds for the community would be developed and if these levels are reached, mitigation measures would be implemented or work activities would be modified or ceased. An emergency response plan for the community would be developed.

As with any excavation action, a storm water management plan would be developed and implemented.

The estimated soil volumes, duration ranges for treatment, and costs associated with each of the three excavation scenarios are presented in the table below.

Scenario	Soil Volume	Duration	Estimated Capital Cost	Estimated Annual O&M Cost	Estimated Net Present Worth
S2A	9,500 cubic yards	60-400 days	$4.8-5.7 million	$0	$4.8-5.7 million
S2B	20,000 cubic yards	200-1,000 days	$12.5-15.2 million	$131,000	$14.5-17.2 million
S2C	50,000 cubic yards	300-3,000 days	$35.6-44.1 million	$131,000	$37.6-46.1 million

Alternative S3: Off-Site Disposal

This alternative includes excavation of site soils and transportation to an offsite disposal facility. Alternative S3 includes the following major elements:

- Excavate soils containing constituents which exceed target cleanup levels;
- Transport soils containing hazardous constituents above target cleanup levels offsite to a landfill for disposal, where pretreatment to meet land disposal restrictions would be conducted;
- Import clean soils for backfill; and
- Compact, grade, and revegetate the site.

This alternative includes the same three excavation scenarios, A, B, and C as were evaluated in alternative S2, plus one additional excavation scenario, S3D, to focus on removing the areas of highest VOC concentration. Following the Supplemental Investigation performed in 2005, two additional excavation scenarios were evaluated and were named S3D-PLUS OptionA and S3D-PLUS Option B. All of the details provided under the discussion of S2B and S2C above are also relevant to alternatives S3B and S3C, and those discussions are not repeated here. Details specific to Alternatives S3D, S3D-PLUS Option A, and S3D-PLUS Option B are provided below, along with other details pertaining to all the S3 alternatives.

S3D

This scenario includes excavation of soils containing metals above target cleanup levels and soils containing concentrations of VOCs greater than 1,000 mg/kg. This alternative also includes a soil cap to cover the entire site following backfill of the high concentration areas. The cap would be designed to accommodate a wide variety of open space uses. The cap would result in the overall site elevation being raised by approximately two feet.

Surface water control features would be constructed to manage storm water. An operation and maintenance plan would be developed and implemented to ensure the integrity of the cap over the long term.

Excavations would be conducted in such a way as to maximize VOC mass removal while minimizing the volume removed. Soil data indicate that approximately 50% of the VOC mass in vadose zone soils could be removed by excavating to a depth of six feet in three separate areas. The actual depth of excavation will be determined by field samples to be collected during excavation.

S3D-PLUS OptionA

This alternative includes excavation of shallow soils (to a depth of 5') containing metals above target cleanup levels and excavation of soils in two VOC source areas containing total VOCs greater than 1,000 mg/kg. Additional excavations would be performed in two source areas to remove soils at depth (5-20') containing high VOC concentrations. These excavations would be performed using a large diameter (5') drill rig with a shroud to prevent offsite emissions during excavation. Following excavation, the hole would be filled with a permanganate slurry to provide treatment throughout the soil column and at the bedrock surface. To address an area where high VOC concentrations were found to exist only near the bedrock surface, potassium permanganate would be injected using portions of the existing interceptor trench. As in alternative S3D, a protective soil cover would be constructed over the entire site to prevent exposures, and various institutional controls would be utilized to restrict future land use.

S3D-PLUS Option B

This alternative is similar to S3D-PLUS Option A, except the shallow soil excavations in the two VOC source areas would be excavated to a level of 110 mg/kg TCE as defined by the Supplemental Investigation. All other aspects would be the same as for S3D-PLUS Option A.

S3 Alternatives in General

Under all of the S3 alternatives, excavated soil would be loaded onto trucks and transported offsite to a disposal facility. The deeper excavations under alternatives S3B and S3C would likely require shoring and dewatering.

A portion of the soils to be excavated may be classified as TCLP characteristic hazardous waste, and may be subject to LDRs. Field sampling will be performed as required by the disposal facilities and appropriate measures will be taken to properly pretreat and arrange for disposal of excavated soil.

During excavation, dust and VOC emissions are likely to occur. However, these emissions would be minimized for the S3D-PLUS alternatives which include the use of a large diameter drill rig with a shroud. The FS contains estimates of the total mass of VOCs which could be released during the various excavation scenarios. Extensive monitoring of ambient air quality would be performed. It is likely that respiratory protection would be required for workers during some portions of the work. Air monitoring would likely be performed at several locations on and around the site perimeter. Health-based thresholds for the community would be developed and if these levels are reached, mitigation measures would be implemented or work activities would be modified or ceased. An emergency response plan for the community would be developed.

The estimated soil volumes, duration of implementation, and costs associated with each of the three excavation scenarios are presented in the table below.

Scenario	Soil Volume	Duration	Estimated Capital Cost	Estimated Annual O&M Cost	Estimated Net Present Worth
S3A	9,500 cubic yards	27 days	$6.2 million	$0	$6.2 million
S3B	20,000 cubic yards	56 days	$11.5 million	$131,000	$13.5 million
S3C	50,000 cubic yards	140 days	$21.1 million	$131,000	$23.1 million
S3D	2,500 cubic yards	60 days	$3 million	$39,000	$3.6 million
S3D-PLUS A	1,600 cubic yards	75 days	$3.5 million	$39,000	$4.2 million
S3D-PLUS B	1,800 cubic yards	75 days	$3.8 million	$39,000	$4.4 million

Alternative S4: Capping

This alternative involves the construction of a cap over the site, and does not call for the removal of contaminated soils. The major elements of this alternative include:

- Clear the site of existing vegetation and debris;
- Construct a cap consisting of a soil layer (2-4 feet thick), a physical barrier and drainage layer, infiltration control layer, and a passive gas collection layer;
- Construct surface water control features; and
- Revegetate the cap

Following clearing and grubbing activities, resulting debris would be transported offsite for disposal. Some re-grading activities may be conducted to control surface water runoff, especially around the edges of the cap. The quality of cap construction would be monitored and tested as part of a construction quality assurance program. Cap construction is estimated to require between 25 and 30 days.

An operation and maintenance program would be required in order to ensure the long term integrity of the cap. The O&M program would likely include mowing, routine inspections, air quality monitoring, settlement monitoring, repairs, and reporting. This alternative would require only about 30 days to implement. Estimated costs associated with Alternative S4 are as follows:

Estimated Capital Cost	$1.1 million
Estimated Annual O&M Cost	$39,000
Estimated Net Present Worth	$1.7 million

9.2 Description of Groundwater Alternatives

In the FS, four alternatives for addressing groundwater contamination at the site were evaluated in detail. The elements which are common to each of the groundwater alternatives, except the no action alternative, are discussed below, and are not repeated in each description of the individual alternatives.

Common Elements

1. Institutional Controls

Institutional controls for groundwater use are needed to prevent exposure of future residents to the contaminated groundwater. Specifically, the groundwater institutional controls for this site include:

> City of Olathe Ordinance No. 03-17 provides that a property owner is to disconnect personal use water wells and connect instead to a pubic water supply system at the time property is offered for sale or rent, if: (1) a public water supply system is within two hundred (200) feet of the property lines; and (2) a potable water sample cannot be obtained from a properly constructed and located existing well or a newly constructed water well. The city of Olathe Ordinance also provides that any existing water well shall cease to be used for personal use if the health officer determines that: (1) the well is in a contaminated area or is within 500 feet of a contaminated area; (2) public water is available to the water well user; and (3) the cessation of use of the water well for personal use is in the best interest of public health, safety and welfare. The ordinance also incorporates a state regulation that requires proper abandonment of unused wells. Restrictive Covenant will be place on the property owned by CCI. The restrictive covenant will prohibit the installation of wells on CCI property to be used for potable purposes.

2. Engineering Controls

Engineering controls would consist of a maintenance program for ventilation systems installed in homes most vulnerable to vapor intrusion. The maintenance program would likely include periodic inspections, compliance monitoring, and routine repairs.

3. Monitored Natural Attenuation

This element would rely on naturally occurring processes such as biodegradation, dispersion, dilution, sorption, volatilization, among others, to reduce contaminant mass, toxicity, mobility, and volume. A monitoring program would evaluate the progress of these natural processes over time.

4. Groundwater Monitoring

A comprehensive groundwater monitoring program would be implemented to evaluate the progress of the groundwater remediation. The monitoring program would include the collection of groundwater samples from new or existing wells, laboratory analysis for select chemicals, data evaluation, and reporting.

5. CERCLA Five Year Review

For sites where contamination remains at levels that do not allow for unrestricted use, CERCLA requires that a review be conducted no less often than every five years to ensure that the remedial actions remain protective of human health and the environment. This review would include a review of all relevant site documents, a site inspection, and preparation of a report.

Alternative G1: No Action

The no action alternative consists of no actions or controls to address groundwater exceeding target cleanup levels. The no action alternative is required by the NCP to be considered as a baseline against which the other alternatives can be compared. There are no costs or implementation time associated with this alternative. This alternative would clearly not meet the RAOs for onsite or offsite groundwater.

Alternative G2: In-Situ Chemical Oxidation

This alternative involves treating the contaminated groundwater in place using chemical oxidation. The areas of highest VOC concentrations would be targeted for treatment, and areas of lower VOC concentrations would be addressed by MNA and monitoring. Treatment would be achieved by the installation of a chemical delivery system to certain portions of the affected area to promote oxidation of the contaminants in groundwater. The major elements of this alternative include:

1. Installation of a trench along the western boundary of the CCI property to deliver the chemical oxidant to the subsurface;
2. Installation of a chemical injection system along Ocheltree Street to deliver chemical oxidant to the subsurface; and
3. Periodic recharging of the systems with the chemical oxidant.

This alternative would meet the RAOs for groundwater by minimizing offsite migration of groundwater by intercepting it in the treatment trench. Also, the chemical treatment would reduce VOC concentrations over time.

The estimated time frame to implement this alternative is 20 days. The time frame required to meet the RAOs is highly unpredictable, but is expected to be on the order of 100 years. Estimated costs associated with this alternative are as follows:

Estimated Capital Cost	$750,000
Estimated Annual O&M Cost	$250,000
Estimated Net Present Worth	$4.6 million

Alternative G3: Pump and Treat

This alternative involves physically extracting the groundwater using pumping wells and treating the water in an air stripping unit. Similar to Alternative G2, areas of highest VOC concentration would be targeted for treatment. Areas of lower VOC concentration would be addressed by MNA and monitoring. The major elements of this alternative include:

1. Installation of a series of groundwater extraction wells situated along the western boundary of the CCI property;
2. Installation of a second series of extraction wells along Ocheltree Street;
3. Installation of a groundwater treatment system (air stripper) within a fenced area or structure on the CCI property; and
4. Installation of piping to convey groundwater from the extraction wells to the treatment system.

Treatment by air stripping is a proven effective technology for the removal of VOCs from water. However, the effectiveness of this alternative will be limited by the low rate of extraction possible due to subsurface conditions.

This alternative would achieve RAOs for groundwater by minimizing further offsite migration of groundwater and by reducing VOC concentrations in groundwater onsite and offsite.

The estimated time frame to implement this alternative is 20 days. The time frame required to meet RAOs is highly unpredictable, but is expected to be on the order of 100 years. The estimated costs associated with this alternative are:

Estimated Capital Cost	$1.1 million
Estimated Annual O&M Cost	$360,000
Estimated Net Present Worth	$6.7 million

Alternative G4: Monitored Natural Attenuation

This alternative would not include active groundwater treatment, but would include all of the common elements for groundwater remediation alternatives described above. For cost estimating purposes, it is assumed that ten new ventilation systems would be installed. Alternative G4 would eventually achieve RAOs over time.

The time frame to implement this alternative is negligible since it does not call for the installation of new wells. Rather, existing wells will be used for sample collection. Estimated costs associated with this alternative are:

Estimated Capital Cost	\$166,000
Estimated Annual O&M Cost	\$170,000
Estimated Net Present Worth	\$2.8 million

10.0 Summary of Comparative Analysis of Alternatives

Nine criteria are used to evaluate the different remediation alternatives individually and in relation to one another in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration.

10.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks are reduced, eliminated, or controlled through institutional controls, engineering controls, or through treatment.

Of the soil alternatives, all except the no action alternative are protective of human health and the environment by eliminating, reducing or controlling health risks. Alternative S4 provides long term protection of human health by controlling the exposure pathway. Maintenance of the cap would be required to ensure protectiveness over the long term. Alternative S2 (all excavation scenarios) provides long term protection by removing soils from the site and treating soils containing high concentrations of VOCs. By treating and removing soils from the site, risks would be greatly reduced in the long-term, but short-term risks to the community during excavation and treatment could be significant, especially for the high volume excavation scenarios S2B and S2C. Alternative S3 (all excavation scenarios) offers long term protection of human health and the environment by removing source soils from the site. Removal of high concentration areas not only reduces human health risk, but also reduces the amount of source soil contributing to the groundwater contamination. Excavation activities associated with alternative S3 could present significant short term risks to the community, especially for the high volume scenarios S3B and S3C. The S3D alternatives provide the greatest amount of long-term protection by removing contaminated soils in such a way as to maximize the contaminant mass removed while minimizing the volume removed, especially S3D-PLUS Option B. This is achieved by excavating high VOC concentration areas which are smaller in volume and easier to control emissions during excavation. In addition, the S3D alternatives include placement of a cap across the entire site following removal of soils. The cap would prevent any future exposures and would protect groundwater by controlling infiltration.

All of the groundwater alternatives, except the no action alternative, meet this criterion in various ways, and all offer the protective measures of groundwater use restrictions and vapor control systems. Alternative G4 provides protection by reducing contaminant concentrations through natural processes over time. Alternatives G2 and G3 provide a greater degree of protection because they each include an active treatment component, coupled with the benefits of monitored natural attenuation. Due to subsurface conditions which would likely hinder groundwater extraction in alternative G3, alternative G2 is expected to be the most protective.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 122(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and state requirements, standards, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location, or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site.

There are three types of ARARs: chemical-specific; action-specific; and location-specific. Chemical-specific ARARs may determine cleanup levels for specific chemicals or discharge limits. Action-specific ARARs establish controls or restrictions on the remedial activities that are part of the remedial solution. Action-specific ARARs are triggered by the specific remedial activity rather than the contaminants present. Location-specific ARARs set limitations on remedial activities as a result of the site's location or characteristics (such as being located in a flood plain). Also considered at the time ARARs are established are policies, guidance, and other sources of information which, though not enforceable, are "to be considered"in the selection of the remedy and the implementation of the ROD. These "to be considered" standards may provide additional important benchmarks that can be considered in selecting a remedy.

There is only one location-specific ARAR for the site. This ARAR is:

- City of Olathe, KS Ordinance No. 03-17 - Prohibits construction of new water wells or use of existing water wells for personal use if a public water supply exists within 200 feet of property line or if well is within 500 feet of a contaminated area. This ordinance also adopts state well construction and abandonment regulations.

The chemical-specific ARARs for the site include:

- Safe Drinking Water Act of 1974, 42 U.S.C. Section 300(f) et seq., as amended in 1986 - establishes chemical-specific standards, applicable at the tap. Under the NCP, 40 C.F.R. 300.430(e)(2)(i)(B), these standards are relevant and appropriate to a cleanup of groundwater which is a current or potential source of drinking water. The SDWA's maximum contaminant level (MCL) is used for any contaminant whose maximum contaminant level goal (MCLG) is zero; otherwise, the MCLG is used.
- Kansas Drinking Water Rules - provides Maximum Contaminant Levels for drinking water supplies.

There are numerous action-specific ARARs associated with the various alternatives, but those are not discussed here since these vary with each of the different alternatives. A detailed discussion of action-specific ARARs associated with the selected remedy is presented later in this ROD. In short, alternatives S2, S3, and S4 would all comply with ARARs, and all of the groundwater alternatives, except the no action alternative, would comply with ARARs.

10.3 Long Term Effectiveness and Permanence

Long term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Alternatives S2, S3, and S4 perform equally well in relation to this criterion. Alternatives S2 and S3 provide long term effectiveness by physically removing contaminated material from the site and replacing it with clean material. In particular, alternative S3D-PLUS Option B provides removal or treatment of approximately 8,300 pounds of VOCs. These actions prevent future exposures and also aid in the long term groundwater cleanup by removing soils that can act as a continuing source of groundwater contamination. Alternative S4 also provides a high degree of long term effectiveness, provided that sufficient maintenance of the cap is performed over the long term. Alternatives S2C and S3C would result in the lowest residual risk. However, the short term risks to the community during implementation are believed to be unacceptable. All other alternatives would result in some residual risk following implementation, but adequate controls would be included to manage those risks.

Groundwater alternatives G2, G3, and G4 perform equally well with respect to this criterion. Alternative G4 employs natural attenuation processes to degrade chemical mass over time. Alternative G3 provides an active approach for migration control and treatment by air stripping. Under alternative G2, chemical oxidation and natural degradation processes provide destruction of the chemical mass resulting in a long term, permanent solution.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Of the soil alternatives, S4 ranks the lowest since it does not include a treatment component. Alternative S3 provides some degree of treatment for soils which exceed land disposal restriction. The S3D-PLUS alternatives provide a higher degree of treatment because they each employ chemical oxidation treatment in certain high concentration areas. Alternative S2 ranks highest for this criterion since it entails onsite treatment for excavated soils.

Each of the groundwater alternatives provide some degree of treatment. However, the treatment offered by alternative G4 is limited to the degradation achieved through natural processes. Alternatives G2 and G3 both provide active treatment in addition to the benefits of monitored natural attenuation.

10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Of the soil alternatives, alternative S2 requires the longest amount of time to implement due to the onsite treatment system. This alternative also presents the greatest risk to site workers and the most disruption to the community in terms of noise, dust, and risks due to VOC emissions during excavation. Alternative S3 also requires excavation and therefore presents risks to site workers and residents due to exposures to the contaminated soils. However, the use of large diameter drilling with a shroud under S3D-PLUS will minimize emissions, and all of the S3 alternatives can be implemented in a much shorter amount of time than alternative S2. Alternative S3 may present short term concerns related to increased traffic through the community, depending on whether soil transportation is done by truck or by rail. In general, risks to site workers and residents increase with the volume of material to be excavated. For alternatives S2 and S3, excavation scenario A is the least risk, with scenarios B and C increasing in risks. For alternative S3, excavation scenario D involves excavating a lower volume of soils than scenario A, but the soils would contain higher concentrations of contaminants. Scenario D presents short term concerns related to the excavation of contaminated material. However, since the areas to be excavated are small in size, techniques can be employed more easily to minimize emissions. In addition, alternative S3D can be implemented relatively quickly. For this criterion, alternative S4 outperforms alternatives S2 and S3. A cap can be constructed quickly with minimal disruption to the surrounding community, and with very low risks to site workers and local residents.

All the remaining groundwater alternatives can be implemented relatively quickly. Alternatives G2 and G3 present some risks to site workers in the construction of the chemical oxidation delivery systems and extraction well network and treatment systems, but those can be effectively managed. Also, alternatives G2 and G3 require activity in the neighborhood west of the site, and could cause some short term disruptions such as noise and traffic detours. While alternative G4 would require the least amount of time to implement, it would require a very long time to achieve RAOs. Alternatives G2 and G3 would also require a long time to achieve RAOs, but it is believed that they would reduce chemical concentrations more quickly than alternative G4.

10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative S2 is relatively difficult to implement due to the onsite treatment system and the limited number of contractors that can supply and operate the specialized equipment. Both alternatives S2 and S3 present implementability concerns with respect to shoring and dewatering required during excavation; particularly during the more extensive excavations under scenarios B and C. Of the alternatives involving excavation, alternative S3D presents the fewest implementability concerns. Alternative S4 is the most easily implemented soil remedial alternative. Conditions at the site do not present any technical or administrative challenges for construction of a cap. Alternatives S3D and S3D-PLUS are also easily implemented due to the low volume of soils to be removed and construction of a soil cap.

All of the groundwater alternatives are readily implementable. Contractors, materials, and services are commonly used and available for each of the remaining groundwater alternatives.

10.7 Cost

Cost includes estimated capital and O&M costs as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent. The table below summarizes the cost estimates for each alternative.

For site soils, alternative S2 is the most costly. Alternative S3 presents a wide range of costs associated with the various excavation scenarios. The least costly option is alternative S4.

Among the groundwater alternatives, G3 is the most costly, followed by G2. Alternative G4 is the least costly.

Cost Estimate Summary			
Remedial Alternative	Capital Cost	Annual O&M	Net Present Worth
Soil Alternatives			
S1 - No Action	$0	$0	$0
S2A - Off-Site Disposal and LTTD (24 hr/day operation)	$ 4,858,000	$0	$ 4,858,000
S2A - Off-Site Disposal and LTTD (10 hr/day operation)	$ 5,734,000	$0	$ 5,734,000
S2B - Off-Site Disposal and LTTD (24 hr/day operation)	$12,532,000	$131,000	$14,545,000
S2B - Off-Site Disposal and LTTD (10 hr/day operation)	$15,237,000	$131,000	$17,251,000
S2C - Off-Site Disposal and LTTD (24 hr/day operation)	$35,619,000	$131,000	$37,633,000
S2C - Off-Site Disposal and LTTD (10 hr/day operation)	$44,117,000	$131,000	$46,131,000
S3A - Off-Site Disposal	$ 6,189,000	$0	$ 6,189,000
S3B - Off-Site Disposal	$11,518,000	$131,000	$13,531,000
S3C - Off-Site Disposal	$21,100,000	$131,000	$23,113,000
S3D - Off-Site Disposal	$ 3,050,000	$ 39,000	$ 3,655,000
S3D-PLUS Option A	$ 3,558,000	$ 39,000	$ 4,162,000
S3D-PLUS Option B	$ 3,780,000	$ 39,000	$ 4,384,000
S4 - Capping	$ 1,143,000	$ 39,000	$ 1,748,000
Groundwater Alternatives			
G1 - No Action	$0	$0	$0
G2 - In-Situ Chemical Oxidation	$ 757,000	$251,000	$ 4,611,000
G3 - Pump and Treat	$1,181,000	$360,000	$ 6,711,000
G4 - Monitored Natural Attenuation	$ 166,000	$170,000	$ 2,787,000

10.8 State/Support Agency Acceptance

The state has expressed its support for the selected alternatives. The state does not believe that alternative S4 adequately protects the environment because it does not include any source soil removal. Also, the state does not support the use of monitored natural attenuation as a sole remedy for groundwater, but supports its use as a component of an active treatment remedy.

10.9 Community Acceptance

Written and oral comments were received from the general public during the public comment period. Following release of the July 2004 Proposed Plan, which presented alternative S3D as the preferred alternative for soil, comments from both the state and community were received indicating a lack of support, and general concerns about the need for more aggressive actions to address onsite source soils. In response to these comments, EPA directed the PRPs to conduct additional investigation necessary to support a more aggressive action for onsite soils. The additional investigation resulted in the development of alternatives S3D-PLUS A and B. Alternative S3D-PLUS B was presented to the public in a revised Proposed Plan dated July 2005. The community has expressed a high degree of satisfaction with this alternative. Responses to all comments received during both comment periods are found in the responsiveness summary section of this ROD.

11.0 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP 300.430(a)(1)(iii)(A)). In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally can not be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. A source material is material that contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater is not generally considered to be a source material.

Source material at this site includes subsurface soils containing high concentrations of VOCs, and DNAPL that has been sporadically encountered at the site. Subsurface soils at the site have been characterized by various site investigations. The Supplemental Investigation conducted in 2005 included a comprehensive analysis of the vertical soil profile across the site. The data gathered during this investigation indicates that there are two main areas where the shallow soils contain high concentrations of VOCs. There are two areas where the deeper soils between 5-15' contain high VOC concentrations, and there are two areas where VOCs are high very near the bedrock surface (refer to Figures 4-7). The selected remedy addresses each of these source areas.

DNAPL has historically been encountered at the site in a few distinct locations, but these detections have been sporadic throughout the history of site investigations. No recoverable DNAPL has been found at the site. Based on site data, it is believed that DNAPL migrated downward through the residuum to the upper bedrock and may have migrated laterally westward along the bedrock surface. It is believed that DNAPL has dissolved over time and now exists as residual DNAPL.

For the CCI site, the anticipated land use is open space or recreational use. Residential and industrial/commercial development of the site will be prohibited through the use of various institutional controls. In addition, groundwater use restrictions already in place prohibit the use of private wells for potable water supply within the vicinity of the affected area, and all local residents are connected to the public water supply.

Subsurface soils are a principal threat in that they present a potential threat to construction workers and site visitors who may be exposed to metals and pesticides via direct contact and to VOCs via inhalation of VOCs evaporating into the ambient air. Subsurface soils containing VOCs also may act as a continuing source of groundwater contamination. The selected remedy addresses the threat to site workers and visitors by removing soils containing metals, pesticides, and VOCs above risk-based concentrations. Soils will be excavated and transported offsite for treatment and disposal as appropriate. Following excavation, a cap will be constructed which will prevent further direct contact exposures. While the remedy will result in some contaminated soils remaining at the site which could continue to contribute to groundwater contamination, the selected remedy will effectively control the migration of contaminants in groundwater by applying chemical oxidation treatment along the downgradient boundary of the site.

DNAPL is a principal threat at the site only to the extent that it continues to act as a source of groundwater contamination in its residual state; it is not believed to be mobile. The selected remedy will address residual DNAPL by applying chemical oxidation treatment in the areas of the highest VOC concentrations in subsurface soils as well as in zones of highest groundwater VOC concentrations both on the CCI property and in the neighborhood west and north of the site.

12.0 Selected Remedy

The selected remedy for addressing soil at the site is alternative S3D-PLUS Option B. This alternative provides for excavation and offsite disposal of soils contaminated with metals and pesticides above health-based concentrations and shallow soils from two source areas containing VOCs in high concentrations. In addition, soils at depth in two source areas will be excavated and transported offsite for disposal. Chemical oxidation using potassium permanganate or other chemical oxidant will be applied in the areas of deep excavations as well as in strategic locations where there are high VOC concentrations at depth. A soil cap will be constructed over the entire fenced area of the site to prevent future exposures to soils remaining at the site following excavation. Institutional controls to prevent residential and industrial/commercial development of the site will also be implemented.

The selected remedy for groundwater at the site is alternative G2. This alternative involves in-situ treatment by chemical oxidation in areas of high VOC concentrations both on the CCI property and in the neighborhood west and north of the site. The remedy also includes monitored natural attenuation in areas of lower VOC concentration, a comprehensive groundwater monitoring program, engineering controls including operation and maintenance of ventilation systems, and institutional controls which are already in place to restrict the use of groundwater as a potable water source.

12.1 Summary of the Rationale for the Selected Remedy

The selected remedy for soil was chosen because it represents the best balance of trade-offs among the balancing criteria and meets the modifying criteria. Excavation and off site disposal of the highest VOC concentration areas will maximize mass contaminant removal while minimizing the volume removed. Chemical oxidation treatment of the high VOC source soils will provide additional mass removal. This remedy will result in significant reduction of contaminant mass available to serve as a continuing source of groundwater contamination, while minimizing short term risks to the surrounding community during implementation. By excavating discreet source areas and using large diameter drilling with a shroud for the deeper excavations, emissions can be more effectively controlled. Also, risk reduction is achieved by this alternative since the soil cap will prevent future exposures to site soils that remain following removal of the high concentration areas.

While the removal of all contaminated soil at the site would seem to be a more complete response and would shorten the life of the groundwater remedy to some extent, it is important to consider that the majority of contaminant mass (source material) is in bedrock. Because of this, removal of all soil will likely not have a significant impact on the time required to clean up the groundwater. Also, if all contaminated soil were removed, it is likely that soils in the saturated zone would become recontaminated as the groundwater elevation fluctuates naturally. Therefore, removal of all site soils does not offer any advantages that would justify the substantially higher costs and short term risks to the community.

The selected remedy for groundwater was chosen because it is believed to have the highest degree of effectiveness in reducing groundwater concentrations and human health risk. In situ chemical oxidation can be easily implemented and provides an aggressive treatment for areas of high contaminant concentration. Ex situ treatment alternatives are not likely to be as effective due to low hydraulic conductivity which would hinder extraction. The selected remedy will provide an effective treatment barrier along the down gradient boundary of the CCI property, preventing further offsite migration. Treatment will also be applied at key areas of high concentration both on the CCI property and in the neighborhood west of the site.

12.2 Description of the Selected Remedy

The selected remedy addresses site soils and groundwater through a variety of actions to achieve source control, risk reduction, migration control, and treatment. The selected remedy for site soils achieves source control and risk reduction by removing the areas of highest concentration from the site, applying chemical oxidation treatment, and constructing a cap over the site to prevent future exposures. This remedy also includes institutional controls to restrict land use. The selected remedy for groundwater achieves risk reduction, migration control, and treatment through the use of chemical oxidation treatment applied to the areas of highest concentration. In addition, the remedy includes monitored natural attenuation, groundwater monitoring, maintenance of the vapor control systems, and institutional controls to manage groundwater use. Specific details of the design of the cap, the chemical oxidation treatment system and monitoring program will be determined during the remedial design.

12.2.1 Description of Remedy for Site Soil

The main elements of the selected remedy for addressing site soil include:

- Excavation of soils in the 0-5' depth range containing metals above target cleanup levels;
- Excavation of soils in the 0-5' depth range to a level of 110 mg/kg TCE;
- Excavation to bedrock using large diameter drilling of soils containing high concentrations of VOCs;
- Transportation of excavated soils to an offsite disposal facility;
- Chemical oxidation treatment of soils and bedrock surface in areas of deep excavation;
- Chemical oxidation treatment of high VOC area near bedrock surface in area of buried tanks;
- Backfill of excavated areas;
- Construction of soil cap over entire fenced area of CCI property; and
- Implementation of land use restrictions.

First, the entire area within the fence would be cleared and grubbed of existing vegetation and debris. Soils containing metals above health-based cleanup levels would be excavated, and soils from the 0-5' depth range in two source areas containing high VOC concentrations would be excavated. The VOC soils would be removed to the 110 mg/kg TCE level, as defined by the Supplemental Investigation. Soils from two other source areas would be excavated to bedrock using large diameter drilling equipment, and chemical oxidation would be applied throughout the soil column and at the bedrock surface in the areas of deep excavations. It is estimated that the volume of metals contaminated soil to be removed is approximately 1,000 cubic yards, and the volume of VOC contaminated soil to be removed is approximately 830 cubic yards. The volume of soils to be removed would be confirmed through field sampling during implementation. All excavated soils would be transported off site to a disposal facility.

Excavations would be conducted in such a way as to minimize emissions. The use of large diameter drilling equipment with a shroud for the deep excavations and other emission controls such as foams, water sprays, tarps, and enclosures would be employed to protect local residents from off site emissions. Due to the high VOC concentrations in some areas to be excavated, it is likely that site workers would be equipped with air purifying respirators or supplied air respirators. Continuous air monitoring around the excavations and at the site perimeter would be conducted to ensure the safety of workers and residents. If air levels exceed pre-determined thresholds, excavation activities may be ceased for a time, and emission control methods would be evaluated and modified as appropriate.

Chemical oxidation treatment would be applied to an area of deep VOC contamination near the bedrock surface where underground tanks were historically buried. The chemical oxidant may be delivered either through the existing trench system or through large diameter drilling. The method of oxidant delivery will be determined during remedial design. Figure 8 provides a conceptual illustration of the onsite areas to be excavated and/or treated.

Specific elements of the soil cover would be determined during remedial design. A conceptual design of the soil cover includes a two foot thick native soil cover, passive gas collection layer, and geotextile layers. The cover would be vegetated and maintained. Surface water drainage would also be provided for, and landscaping would be put into place consistent with the site reuse plan.

Excavated soils would be transported off site by truck. Assuming that work at the site would be performed 10 hours per day, 5 days per week, excavation and off site disposal would take approximately 20 days to complete. The large diameter drilling and chemical oxidation injection would take approximately 15 days to complete. The remaining work including backfill, cap construction, grading, and mobilization would take an additional 40 days, for a total of 75 days to implement the selected remedy for site soil.

A number of institutional controls would be used to restrict future site use. First, EPA will seek imposition of a restrictive covenant on the CCI property by the landowner. The objectives of imposing a restrictive covenant are to eliminate or minimize exposures to contamination remaining on the property and limit the possibility of the spread of contamination. These objectives will be achieved by use of a restrictive covenant as it will:

- provide notice to prospective purchasers and users that there are contaminants in the soil
- ensure that future owners are aware of any engineered controls put into place as part of the remedial action
- prohibit residential, commercial, and industrial uses, except those that would be consistent with the remedial action
- limit the disturbance of contaminated soils
- prohibit the placement of groundwater wells, except as consistent with the remedial action

- prohibit other ground penetrating activities which may result in the creation of a hydraulic conduit between water bearing zones
- provide access to EPA and the state of Kansas for verifying land use
- proscribe actions that must be taken to install and/or maintain engineered controls (if applicable)
- provide access to EPA and the state of Kansas for sampling and the maintenance of engineered controls

The restrictive covenant will be filed with the Johnson County Register of Deeds.

In addition to the above controls, the landowner has agreed to submit an application for re-zoning to the appropriate local authorities. The CCI property is located in an area which is currently zoned for industrial and residential uses. The landowner will request that the property be re-zoned to RP-1. The new re-zoning classification will preclude residential, commercial, and industrial development of the property. The city of Olathe has agreed to assist in the re-zoning process.

12.2.2 Description of Remedy for Site Groundwater

This alternative involves treating the contaminated groundwater in place using chemical oxidation. The areas of highest VOC concentrations would be targeted for treatment, and areas of lower VOC concentrations would be addressed by MNA and monitoring. Treatment would be achieved by the installation of a chemical delivery system to certain portions of the affected area to promote oxidation of the contaminants in groundwater. The major elements of this alternative include:

- Chemical Oxidation Treatment of Onsite and Offsite Groundwater;
- Monitored Natural Attenuation;
- Groundwater Monitoring;
- Operation and Maintenance of Ventilation Systems; and
- Institutional Controls.

Chemical oxidation treatment for onsite groundwater would be achieved by installing a chemical delivery trench along the down-gradient boundary of the CCI property. In this way, groundwater migrating from CCI would contact the chemical oxidant in the trench and be destroyed, thereby preventing further offsite migration. Treatment of offsite groundwater would be achieved by delivering chemical oxidant to the subsurface at strategic high concentration areas using either trenches or injection wells.

For areas of low to moderate VOC concentrations, the natural attenuation processes would be allowed to degrade VOCs over time. A comprehensive groundwater monitoring program would be employed to evaluate the effectiveness of both the chemical oxidation treatment systems and the MNA.

Ventilation systems installed due to concerns about vapor intrusion in homes above the plume would continue to be operated and maintained. Procedures for O&M of these systems would be specified in a site-wide O&M Plan to be developed during remedial design. As plume concentrations decrease over time, the need for these ventilation systems will be reduced. The O&M Plan may specify a point at which the individual homeowners would become responsible for O&M of their systems.

This alternative would meet the RAOs for groundwater by minimizing offsite migration of groundwater by intercepting it in the treatment trench. Also, the chemical treatment would reduce VOC concentrations over time. The estimated time frame to implement this alternative is 20 days. The time frame required to meet the RAOs is highly unpredictable, but is expected to be on the order of 100 years.

Institutional controls associated with the groundwater remedy include an ordinance to restrict the installation of private water wells near the site. Specifically, an ordinance was passed by the city of Olathe in February 2003. The city of Olathe Ordinance No. 03-17 provides that a property owner is to disconnect personal use water wells and connect instead to a pubic water supply system at the time property is offered for sale or rent if: (1) a public water supply system is within two hundred (200) feet of the property lines; and (2) a potable water sample cannot be obtained from a properly constructed and located existing well or a newly constructed water well. The city of Olathe Ordinance also provides that any existing water well shall cease to be used for personal use if the health officer determines that: (1) the well is in a contaminated area or is within 500 feet of a contaminated area; (2) public water is available to the water well user; and (3) the cessation of use of the water well for personal use is in the best interest of public health, safety, and welfare. The ordinance also incorporates a state regulation that requires proper abandonment of unused wells.

12.3 Summary of the Estimated Remedy Costs

Cost estimates were prepared in the various phases of the FS. Separate cost estimates were developed for the soil alternatives and groundwater alternatives. The detailed cost estimates from the FS for each of the selected alternatives are included as attachments to this ROD. All cost information provided below and in the attached detailed cost estimates has an accuracy expectation of +50 percent to -30 percent.

12.3.1 Summary of Costs for Site Soil Remedy

The selected remedy for site soils involves multiple components including excavation, treatment, and capping. For this reason, the detailed cost estimate from the FS is complex, and is included as an attachment rather than being summarized here.

The capital costs for the major components of the remedy for site soils are presented below. The capital costs shown include contractor and miscellaneous overhead, permitting, engineering design, construction quality assurance, and contingency as a percentage of the capital cost. The percentages associated with each of these items are specified in the detailed cost estimates for each component.

Capital Costs for Major Components of Soil Remedy		
Component	Activities Included	Capital Cost
General Costs	site security, power, site prep, air monitoring, site survey	$355,181
Excavation , Treatment and Disposal of VOC Impacted Soil	Mob/demob, emissions control, liners, excavation and hauling, disposal, soil testing	$1,850,566
Large Diameter Drilling	Mob/demob, power, emissions control, auger drilling, soil staging, hauling, disposal, site prep for soil cover	$755,442
Permanganate Addition	backfill auger holes, permanganate for auger holes, grout seal, permanganate treatment for deep source area	$214,441
Cap Construction	regrading, geotextiles, crushed rock, soil cover, passive gas collection, water management, revegetation/ landscaping	$603,988
Total Capital Cost		**$3,779,618**

Areas of uncertainty in the capital costs include the level of personal protection required for site workers to implement the remedy, soil volumes requiring incineration versus disposal in a class C facility, and uncertainties regarding offsite emissions during excavation. In addition, the method of chemical delivery to a deep source area on the site is uncertain.

Operation and Maintenance Costs for Soil Remedy				
Item	Unit	Unit Cost ($)	Quantity	Cost ($)
Routine Site Inspections	each	$500	4	$2,000
Settlement Monitoring	each	$750	1	$750
Air Monitoring	each	$1,000	4	$4,000
Repairs	LS	$10,000	1	$10,000
Annual Report	Annually	$15,000	1	$15,000
5 Year Review	5 Yrs	$20,000	0.2	$4,000
Annual Contingency			10%	$3,575
Subtotal				$39,325
Annual O&M 30-Yr NPV Subtotal (5% discount rate)				$604,522
30 Yr O&M Subtotal				$1,179,750
Total Capital & 30 Yr O&M Current $				**$4,959,368**
Total Capital & 30 Yr O&M NPV				**$4,384,139**

The O&M costs were calculated for a 30 year remedy lifetime. However, certain O&M activities are expected to continue beyond that timeframe. These activities include maintenance of the site cover, routine inspections, reporting, and five year reviews. Data obtained from remedial action and five year reviews will be used to refine the long term O&M cost estimates.

12.3.2 Summary of Costs for Groundwater Remedy

The selected remedy for addressing groundwater at the site is alternative G2 from the Feasibility Study. Similar to the remedy for site soil, the remedy for site groundwater involves multiple components, and the itemized cost estimate is too complex to present within the text of this document. Therefore, the detailed cost estimate is attached for reference. The table below presents the capital costs associated with the major components of the groundwater remedy. The capital costs shown include contractor and miscellaneous overhead, permitting, engineering design, construction quality assurance, and contingency as a percentage of the capital cost. The percentages associated with each of these items are specified in the detailed cost estimates for each component.

Capital Costs for Major Components of Groundwater Remedy		
Component	Activities Included	Capital Cost ($)
General Costs	security, fencing, power, air monitoring	$106,215
Trench Construction	soil removal, disposal, trench construction, piping, surface restoration, permanganate delivery	$407,578
Monitoring Well Installation	Mob/demob, drill and install wells, well development, soil and water testing,	$77,779
Vapor Control Systems	Installation of additional residential vapor control systems	$165,900
Total Capital Costs		**$757,472**

Areas of uncertainty in the capital costs include the number of additional vapor control systems needed and the method of delivery for the chemical oxidant in the neighborhood west of the site. Project cost estimates will be refined at various stages throughout the remedial action and long term operation of the remedy.

Operation and Maintenance Costs for Groundwater Remedy				
Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Treatment system O&M	Yr	$12,000	1	$12,000
Treatment System Rehab	Yr	$1,500	2	$3,000
Chemical Dosing	Yr	$17,600	2	$35,200
Reporting	Yr	$7,500	4	$30,000
Subtotal				**$80,200**
O&M Subtotal from Groundwater monitoring alternative				**$170,479**
Total Annual O&M Cost				**$250,679**
Total Capital and 30 Yr O&M NPV (5% discount rate)				**$4,611,023**
Total Capital and 30 Yr O&M current				**$8,277,842**

The O&M costs were calculated for a 30 year remedy lifetime. However, certain O&M activities are expected to continue beyond that time frame. These activities include groundwater monitoring and reporting and five year reviews. Other activities such as maintenance of the trench, chemical dosing, and maintenance of vapor control systems could extend beyond the thirty year time frame. Data obtained from remedial action and five year reviews will be used to refine the long term O&M cost estimates.

12.4 Expected Outcomes of the Selected Remedy

The expected outcomes of the selected remedy for soil include reduced contaminant mass and controlled exposure due to the soil cover to be constructed over the entire area within the fence. Contaminant mass will be reduced by removing soils containing metals above health-based levels and by removing soils in certain high concentration areas containing VOCs. The primary means of risk reduction will be achieved by the soil cover which will prevent exposures to remaining contaminated soils.

As a result of this action, the site may be restored to a beneficial use for the community. The site has been a constant eyesore for the community for many years. Completion of this action will allow the site to be used as green space or for recreational purposes. Institutional controls will prevent future residential, commercial, or industrial development. Anticipated socio-economic and community revitalization impacts include increased property values through the restoration of a blighted area.

The expected outcomes of the selected remedy for groundwater include the prevention of offsite migration, controlled exposures to groundwater and vapors in residential indoor air, and reduction of contaminant mass. Offsite migration will be prevented by the construction of a treatment trench along the down gradient property boundary. Groundwater will be intercepted and treated in the trench as it moves naturally westward into the neighborhood. In addition, groundwater concentrations in the neighborhood will be reduced through chemical oxidation treatment. Groundwater exposures will be controlled by institutional controls which will prevent the installation of private water wells within a certain distance of the contaminated area. Exposures to vapors will be controlled through the installation and maintenance of residential vapor control systems.

Environmental benefits of this action include restoration of the groundwater to its beneficial use as a potential drinking water supply. Existing city ordinances prevent the use of groundwater in the vicinity of the site for potable purposes. An additional environmental benefit of this action is the protection of surface water quality and ecological receptors in Mill Creek.

Cleanup Levels for Chemicals of Concern		
Chemical of Concern	Cleanup Level	Basis for Cleanup Level
Soil		
Arsenic	16 mg/kg	Risk Assessment
Chromium, Total	23 mg/kg	Risk Assessment
Trichloroethylene	110 mg/kg	Risk Assessment
Groundwater		
Trichloroethylene	5 ug/l	MCL
Tetrachloroethylene	5 ug/l	MCL
Chloroform	80 ug/l	MCL
cis 1,2-Dichloroethylene	70 ug/l	MCL
Crabon Tetrachloride	5 ug/l	MCL

13.0 Statutory Determinations

Section 121 of CERCLA establishes several statutory requirements and preferences for remedies at Superfund sites. The first requirement is that remedies must be protective of human health and the environment. Secondly, remedies must comply with standards, criteria, or limitations established under federal or state regulations which are determined to be legally applicable or relevant and appropriate at a site. In addition, the selected remedy must be cost effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute states a preference for remedies that utilize treatment as a principle element. The following sections discuss how the selected remedies for site soil and groundwater meet these statutory requirements and preferences.

13.1 Protection of Human Health and the Environment

The selected remedy for soil achieves protection of human health and the environment through a variety of means including treatment, engineering controls, and institutional controls. The treatment component includes excavation and transportation to an offsite treatment and disposal facility. Soil containing high VOC concentrations will be incinerated. Additional treatment will include chemical oxidation treatment of soils and groundwater at certain areas containing high VOC concentrations at depth. These treatment activities will permanently reduce the contaminant mass at the site.

Engineering controls include the construction of a soil cover and surface drainage pathways. The soil cover will prevent exposures to contaminated soil remaining at the site. Institutional controls include land use restrictions to prevent residential, commercial, or industrial uses of the site. These controls will prevent the site from becoming recontaminated by future onsite activities and will provide for the continued maintenance of the soil cover over time.

The selected remedy for groundwater achieves protection of human health and the environment through treatment of contaminated groundwater, engineering controls, and institutional controls. Groundwater concentrations will be reduced to ARAR levels by chemical oxidation treatment and by natural attenuation processes. Engineering controls include a treatment trench which will prevent the further offsite migration of contaminated groundwater and residential vapor control systems which will prevent exposures associated with vapor intrusion into homes above the plume. Institutional controls include city ordinances to prevent the consumption of groundwater by prohibiting the installation of private water wells within the vicinity of the plume and a restrictive convenant.

Implementation of the selected remedies will not pose unacceptable short term risks or cross-media impacts. Excavation of high VOC concentration areas will be performed using commonly available methods to minimize fugitive emissions. An air monitoring program will also be conducted during onsite operations to monitor impacts on air quality. If threshold levels are reached, then operations will cease for an appropriate amount of time. Large diameter drilling operations will be conducted using a shroud to minimize emissions.

13.2 Compliance with ARARs

A comprehensive list of potential federal, state, and local ARARs was developed in the Feasibility Study. From that list, ARARs to be attained by the selected remedies were determined. The table below presents the action-specific ARARs for the selected remedy.

Description of Action-Specific ARARs for Selected Remedy					
Authority	**Media**	**Requirement**	**Status**	**Synopsis of Requirement**	**Action to be Taken to Attain Requirement**
Federal Regulatory Requirement	Air	National Ambient Air Quality Standards 40 CFR 61.01-18, 61.50-112, 61.240-247	Relevant and Appropriate	Sets treatment technology standards for emissions to air from incinerators and fugitive emissions.	Only permitted facilities will be used for disposal of wastes requiring incineration, and an air monitoring program will be conducted onsite to ensure compliance with standards for fugitive air emissions.
Federal Regulatory Requirement	Water	National Pollutant Discharge Elimination System 40 CFR 122.1-64	Applicable only for direct discharges	Regulates the point source discharge of water into surface water bodies. Substantive requirements include discharge limitations, monitoring, and best management practices.	Substantive requirements will be met through testing and pretreatment as necessary for discharges to surface water bodies. A permit will not likely be required if the discharge point is onsite.
Federal Regulatory Requirement	Water	Storm Water Discharge Requirements 40 CFR 122.26	Applicable	Regulates the management of storm water runoff for construction sites greater than 1 acre in size.	During onsite construction activities, storm water will be managed in accordance with the substantive requirements. Appropriate erosion control and sediment control practices will be implemented during construction.
Federal Regulatory Requirement	Water	Underground Injection Control Program 40 CFR Part 144.1-70	Applicable	Controls the underground injection of fluids. Requirements include construction, operation, maintenance, and closure requirements.	Injection of chemical oxidizer may trigger administrative and substantive requirements.
Federal Regulatory Requirement	Soil	Definition and Identification of Hazardous Waste 40 CFR Part 261	Applicable	Identifies those wastes subject to regulation	Waste characterization will be performed to appropriately identify any wastes as hazardous.
Federal Regulatory Requirement	Soil	Hazardous Waste Management	Applicable	Manages the generation, treatment, storage, disposal, and transport of hazardous wastes.	The selected remedy will comply with these rules by properly arranging for the offsite shipment and disposal of all wastes identified as hazardous.

Description of Action-Specific ARARs for Selected Remedy					
Authority	**Media**	**Requirement**	**Status**	**Synopsis of Requirement**	**Action to be Taken to Attain Requirement**
Federal Regulatory Requirement	Soil	Standards for Generators 40 CFR Part 262.10-40	Applicable	Regulates activities of generators of hazardous waste.	The requirements for ID number, record keeping, and use of uniform national manifest will be met for hazardous waste generated onsite.
Federal Regulatory Requirement	Soil	Subpart G - Closure/Post-Closure 40 CFR Part 264	Relevant and Appropriate	Specifies site closure requirements including operation and maintenance, site monitoring, and record keeping.	Since hazardous waste will likely remain beneath the soil cover, post-closure requirements will be met through the O&M program which will require inspections and repairs to maintain the integrity of the cover, and reporting.
Federal Regulatory Requirement	Soil	Subpart I - Storage Container 40 CFR Part 264	Applicable	Requirements for the onsite storage of hazardous wastes or temporary storage phases during cleanup actions.	Substantive requirements will be met if hazardous wastes are stored in containers prior to offsite shipment.
Federal Regulatory Requirement	Soil	Land Disposal Restrictions 40 CFR Part 268	Applicable	Sets restrictions and treatment requirements for materials subject to restrictions on land disposal.	These requirements will be met by appropriately characterizing and segregating wastes prior to offsite shipment for pre-treatment, if required, and disposal.
Federal Regulatory Requirement	N/A	Emergency Planning and Community Right to Know Act 42 U.S.C. 11001	Applicable	Requires companies to report the release of hazardous substances.	The substantive requirements may be applicable if hazardous chemicals are stored at the site in excess of threshold amounts. Appropriate steps will be taken to ensure the community and local government officials are kept informed.
State Regulatory Requirement	Air	Ambient Air Quality Standards and Kansas Air Pollution Control Regulations	Relevant and Appropriate	Establishes emission standards for new sources and for hazardous air pollutants.	These standards are considered relevant and appropriate for all offsite emissions during construction activities. The standards will be met by the air monitoring program.

Description of Action-Specific ARARs for Selected Remedy					
Authority	**Media**	**Requirement**	**Status**	**Synopsis of Requirement**	**Action to be Taken to Attain Requirement**
State Regulatory Requirement	N/A	Water Well Contractor's License; Water Well Construction and Abandonment	Applicable	Requirements for driller's licensing and regulations for installation and abandonment of wells.	These requirements will be met by using only contractors who are licensed in the state of Kansas for all drilling activities. All requirements for the construction and abandonment of wells will be met throughout remedial action and operation and maintenance.
State Regulatory Requirement	Water	Surface Water Quality Standards KAR 28-16-28B	Applicable	Regulates discharges to surface water bodies.	Substantive requirements will be met through testing and pretreatment for discharges to surface water bodies.
State Regulatory Requirement	N/A	Hazardous Waste Management Standards and Regulations KAR 28-31	Applicable	Establishes standards for generators or transporters of hazardous waste, and establishes standards for hazardous waste treatment, storage and disposal facilities.	Substantive requirements will be met if hazardous wastes are present at the site.
State Regulatory Requirement	N/A	Emergency Planning and Right-to-Know KAR 28-65	Applicable	Requires facilities where hazardous substances are present to report the presence of these materials to emergency responders.	These requirements will be met by coordinating with the local emergency response unit if hazardous substances are stored or used at the site.
State Regulatory Requirement	N/A	Kansas Board of Technical Professions KAR 66-6 through 66-14	Applicable	Contains requirements for licensing of engineers, land surveyors, geologists and architects.	Only qualified, licensed professionals will be used for conducting site work.
State Regulatory Requirement	N/A	Pesticides KAR 4-13	Applicable	Requires certification of persons that apply pesticides.	Only certified personnel will be used if pesticide applications are performed as part of the remedial action.
State Regulatory Requirement	N/A	Solid Waste Management KAR 28-29	Applicable	Provides standards for the management of solid wastes.	Substantive requirements will be met for solid wastes generated at the site.

Description of Action-Specific ARARs for Selected Remedy					
Authority	**Media**	**Requirement**	**Status**	**Synopsis of Requirement**	**Action to be Taken to Attain Requirement**
State Regulatory Requirement	N/A	Spill Reporting KAR 28-48	Applicable	Requires reporting for unpermitted or accidental spills, and requires that containment and environmental response measures are implemented.	Accidental spills will be reported and appropriate response measures including containment will be conducted for any spills that occur on site.
State Regulatory Requirement	N/A	Underground Injection Control Regulations KAR 28-46	Applicable	Provides regulations governing the use of underground injection wells. Includes requirements for construction, operation, monitoring, testing, reporting, and plugging.	These requirements will be met for the underground injection of fluids into the subsurface.
State Regulatory Requirement	Water	Water Pollution Control KAR 28-16	Applicable	Establishes surface water quality criteria and pretreatment standards.	Standards will be met if water is discharged to a state waterway.
State Regulatory Requirement	N/A	Risk-Based Standards for Kansas	To be considered	Describes the process for establishing site specific cleanup goals for soil and water.	Consideration will be given to standards which may be relevant to the actions being implemented at the site.

13.3 Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness. The overall effectiveness of a remedy is determined by examining three of the balancing criteria used in the detailed analysis of alternatives. The three pertinent criteria include: 1) long-term effectiveness and permanence, 2) reduction of toxicity, mobility, and volume, and 3) short-term effectiveness.

The selected remedy provides a high degree of long term effectiveness and permanence through risk reduction and exposure control. The most highly contaminated soils will be removed from the site, and treatment by chemical oxidation will be applied to certain high concentration areas. The treatment will permanently destroy contaminants in those areas. A soil cover will be constructed over the entire site following excavation and treatment of high concentration areas. The cover will prevent future exposures to contaminated soils that remain at the site. Contaminated groundwater at the site will be treated with chemical oxidation, which will permanently destroy the contaminants and reduce contaminant concentrations over time. In addition, the processes of natural attenuation will permanently reduce contaminant concentrations over time.

Reduction of toxicity, mobility, and volume are achieved by the selected remedy through mass removal and treatment. Toxicity is reduced by permanently destroying the chlorinated organic compounds using chemical oxidation and monitored natural attenuation. Mobility of the groundwater is reduced through the use of a treatment trench which will prevent future offsite migration of the contaminated groundwater. Volume is reduced by excavation and offsite disposal of high concentration source soils.

Short-term effectiveness considers such things as the length of time needed to physically construct the remedy and short term impacts to the community. The selected remedy can be implemented in a very short period of time. Onsite soil removal and construction of the soil cover will take approximately 75 days to complete. Construction of the groundwater treatment trench and offsite injection system can be implemented in a few weeks. Short-term impacts associated with removal of contaminated soil include emissions during excavation, additional truck traffic, and noise. Emissions will be minimized through the use of conventional dust control measures and the use of a shroud during large-diameter drilling. Also, an air monitoring program will ensure protection of public health during onsite activities. Short term impacts associated with the groundwater remedy include noise and possibly street closures during construction. However, these disruptions would be minor and would not cause significant traffic delays in the neighborhood.

In terms of cost comparison between soil alternatives, the selected remedy is not the least costly. Among the soil alternatives that meet the threshold criteria, alternatives S3D and S4 are less costly than the selected alternative S3D-PLUS Option B. However, the selected alternative offers a higher degree of reduction of toxicity, mobility, and volume, with only a minimally longer time frame to implement. In addition, alternatives S3D and S4 were not acceptable to the state or community. The selected alternative for soil meets the selection criteria to the highest degree at the most reasonable cost, and is therefore considered to be cost-effective.

For the groundwater alternatives, the selected alternative, G2, is also not the least costly. The only other alternative that meets the threshold criteria and is less costly than G2 is alternative G4, monitored natural attenuation with institutional and engineering controls. However, alternative G4 does not provide nearly the degree of reduction of toxicity, mobility, or volume achieved by the selected alternative. In addition, alternative G4 would not have been supported by the state and community acceptance would have been low. The selected alternative for groundwater meets the selection criteria to the highest degree at a reasonable cost, and is therefore considered to be cost-effective.

13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at this site through a variety of means including source removal, treatment of contaminated soil and groundwater, and monitored natural attenuation. The selected alternatives combine components from other alternatives considered in the FS to maximize effectiveness of the remedy while holding costs at a reasonable level. This combined approach has resulted in a selected remedy which is supported by the community and the state, while the individual components as separate alternatives (i.e., capping, MNA) would not have received such support. For these reasons, the selected remedy provides the best balance of tradeoffs as compared to the other options.

There were many tradeoffs among the alternatives. For example, soil alternative S2, excavation and onsite thermal treatment, provided a high degree of long-term effectiveness and permanence, but was very high in cost, required a substantially longer time to implement, and presented significant short term impacts to the community. Alternative S4, capping, provided a high degree of long-term effectiveness and permanence at a relatively low cost, but did not offer reduction of toxicity, mobility, or volume, was not acceptable to the state or community, and would not have utilized permanent solutions and treatment technologies to the extent practicable. For groundwater alternatives, the tradeoffs related mainly to the reduction of toxicity, mobility, volume, cost, and state and community acceptance.

13.5 Preference for Treatment as a Principal Element

By treating contaminated soils and groundwater at the site through the use of chemical oxidation, the selected remedy addresses principal threats posed by the site through the use of treatment technologies. Because chemical oxidation treatment is a major component of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

13.6 Five Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action. This review will ensure that the remedy is, or will be, protective of human health and the environment.

14.0 Documentation of Significant Changes

In July 2004, EPA issued a Proposed Plan presenting alternatives S3D and G2 as the preferred alternatives for addressing site soil and groundwater, respectively. Comments received from the state and community during the public comment period indicated a lack of support for alternative S3D. The primary concerns with this alternative related to the level of cleanup and treatment being achieved, as well as a lack of information regarding the presence of recoverable DNAPL onsite.

To appropriately address these comments, EPA postponed signature of the ROD and required additional work to be conducted to better define onsite soil contamination and to evaluate the presence of recoverable DNAPL. The additional work was conducted and a Supplemental Investigation Report was completed in 2005. In addition, an addendum to the FS was prepared. The FS addendum evaluated a new alternative, S3D-PLUS. This alternative draws upon the strengths of the original S3D alternative, with the addition of components specifically aimed at addressing the state's and community's concerns.

In July 2005, EPA released a Revised Proposed Plan for public comment. The Revised Proposed Plan presents alternatives S3D-PLUS Option B and G2 as the preferred alternatives for addressing site soil and groundwater, respectively. The EPA has reviewed comments received during the public comment period, and has determined that no significant changes are necessary to the remedy as presented in the July 2005 Revised Proposed Plan.

Responsiveness Summary 1

Public Comment Period 7/10/04 - 9/15/04

Chemical Commodities, Inc. Site
Olathe, Kansas

This Responsiveness Summary has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the National Contingency Plan (NCP) 40 CFR 300.430(f). This document provides the United States Environmental Protection Agency's (EPA's) response to all significant comments received on the July 2004 Proposed Plan for the Chemical Commodities, Inc. (CCI) Site from the public during the public comment period.

On July 10, 2004, the EPA released the Proposed Plan and Administrative Record files for the CCI site. The Administrative Record files contain site-related documents and are located at the Olathe Public Library and the EPA, Region 7 office. The Proposed Plan presented EPA's proposed actions to address contaminated soil and groundwater at the CCI site. The public comment period began on July 10, 2004, and ended on September 15, 2004. The EPA held a public meeting on July 20, 2004, to present the Proposed Plan and provide the public an opportunity to comment. A copy of the transcript from the public meeting is included in the Administrative Record file.

Stakeholder Issues and Lead Agency Responses

Written comments received from individual community members, the community group, the city, and the potentially responsible parties (PRPs) are summarized below in bold face type. The full text of the comments received are included in the Administrative Record. The EPA's responses are provided in standard type following each comment.

Written comments were submitted by the Kansas Department of Health and Environment (KDHE) in a letter dated August 25, 2004, and EPA responded to those comments in a letter dated September 10, 2004. Both of these letters are included in the Administrative Record file. In addition, several questions were posed by community members during the July 2004 public meeting. These questions and EPA's responses are documented in the official transcript for the meeting which is available in the Administrative Record file.

A community member commented about overgrown brush and a box car left on the site.

The city of Olathe has removed the overgrown brush from around the fence line of the CCI property. The box car is used to store equipment used during field investigations at the site. The Boeing Company agreed to move the box car to a less visible part of the site.

A community member requested that the soil be removed completely from the entire area of the site, along with continued groundwater treatment.

The final remedy will provide a combination of actions that will address the risks posed by the site, and will allow the site to be restored to a useful purpose. Full scale removal of all contaminated soil from the site is not feasible and would pose unacceptable short term risks to the community during excavation. Other soil alternatives evaluated in the Feasibility Study provide the same degree of long term protection without posing short term risks to the community and can be implemented at a much lower cost.

A community member asked for an explanation of the purpose of excavating "hot spots" if a cap is going to be placed over the entire site.

The purpose of excavation is different than the purpose of capping. The purpose of excavation is to reduce the contaminant mass and volume at the site, while the purpose of capping is to prevent exposure to contaminated soil. The excavation component is not necessary for the protection of human health, but EPA believes it is warranted to reduce the contaminant mass and volume posed by certain high concentration areas at the site.

The city of Olathe supports the remediation method that will result in the most effective long-term solution to protect the health, safety, and welfare of residents and visitors to the area surrounding the site as well as the community at large.

The EPA believes the selected remedy satisfies the expectations supported by the city.

The city of Olathe supports a cleanup plan that protects human health and the environment with as little inconvenience and negative impact on the residents as possible.

Protection of human health and the environment is the highest priority for EPA in selecting remedies, and impacts on the community are also an important consideration. The EPA believes the selected remedy provides the necessary protections while minimizing adverse impacts on the community.

The city of Olathe supports inclusion of a funding mechanism in the ROD to pay for future maintenance of the site. This may help attract a future owner and ensure the site becomes a productive part of the neighborhood.

The ROD documents EPA's selected remedy for a site. These are not legally binding agreements and do not include funding mechanisms. However, the ROD will present the plan for implementation of institutional controls at the site, which will include provisions for future site maintenance. Funding mechanisms to support future site maintenance will be included in a Long-Term Care Agreement under the KDHE's Environmental Use Controls program.

The city of Olathe supports in general, the CCI CAG's efforts, involvements, and general concerns.

The EPA agrees with the comment.

The city of Olathe supports the use of best available technologies now and in the future to fully remediate the site and eliminate any risk to area properties.

Treatability studies were performed to demonstrate the effectiveness of various treatment technologies at the site. The selected remedy employs the technology that performed the best during treatability studies. The EPA believes this is the best available technology to address the conditions at the site. The NCP requires a review of remedies at least every five years to ensure the remedies continue to be protective of human health and the environment. During these reviews, newly developed technologies are evaluated. This process provides for potential changes in the remedy as new technologies are developed in the future.

The city of Olathe supports the remediation method that will result in the most effective long term positive perception of the area and positive impact on residents' property value and resale ability.

The EPA's mission is to protect human health and the environment. The selected remedy is consistent with this mission, and should help to restore a positive perception of the area. The EPA encourages the city to seek opportunities it may have under the Community Development Block Grant program or other programs which could restore a positive perception of the area and improve property values.

The city of Olathe supports long term monitoring of the effectiveness of the selected remediation method onsite, in properties known to be above the groundwater plume and in Mill Creek.

Long-term monitoring will be provided for in the Operation and Maintenance (O&M) Plan to be developed during the Remedial Design phase. Monitoring of Mill Creek may or may not be included in the plan since all sampling performed to date in Mill Creek has not shown any impact to surface water or sediments. A likely scenario is that the O&M plan will include extensive groundwater monitoring, and a caveat that if significant groundwater concentrations are found approaching Mill Creek, then sampling in Mill Creek will be performed.

The CCI Citizen's Advisory Group (CAG) provided a general comment that it is generally supportive of the basic concepts proposed for the soil and groundwater cleanup plans. Specifically, the CAG supports a soil cleanup approach limited to TCE hot spots, and the use of chemical oxidation to treat groundwater. However, the CAG suggested a more aggressive overall approach for both soil and groundwater cleanup.

The selected remedy provides a significantly more aggressive onsite soil and groundwater cleanup effort than the originally proposed remedy. The cleanup level for areas to be excavated has been reduced to a health-based level, and onsite chemical oxidation has been added.

The CCI CAG comments that the definition of a hot spot as having a TCE concentration above 1,000 ppm is not acceptable. More stringent criteria for the removal of hot spots should be developed. The CAG suggests a 60 ppm TCE cleanup standard for excavated areas since this level can be disposed of without treatment.

The 60 ppm TCE level is a regulatory level and is not a health risk-based level. A health risk-based level for soil exposures was developed during the Baseline Risk Assessment and is 110 ppm TCE. This level has been adopted as the cleanup level for the areas selected for shallow excavation onsite. Areas not being excavated will be capped, preventing exposure to underlying soil, and institutional controls will be put into place to control future uses of the property and activities which may be conducted on the property to ensure the long term integrity of the cap.

The CCI CAG commented that the proposed depth of excavation to 6 feet is too arbitrary, and that soils above the target level should be removed regardless of the depth or width of the excavation.

The 6 foot depth was not arbitrarily chosen, but was based on hypothetical exposure scenario for an onsite construction worker. Exposures to soils up to 6 feet in depth are conceivable for onsite construction workers. Soils below 6 feet are not considered to present a health risk because exposures to soils at this depth are unlikely.

Regardless of the low likelihood of exposure to soils at depth, the selected remedy includes excavation of certain hot spot areas to bedrock (or approximately 20 feet). This will increase the mass contaminant removal and will allow for placement of chemical oxidation delivery systems at the soil/bedrock interface where the most groundwater flow occurs. The chemical oxidation systems will provide treatment of groundwater hot spots on the site.

The CCI CAG comments that the TCE levels in soil immediately around the CCI site are high, particularly on the property owned by Janet Trotter at 318 S. Keeler Street. The CCI CAG further comments that the cleanup plan should include the purchase of this property and the permanent relocation of this resident.

The EPA collected surface and subsurface soil samples from the 318 S. Keeler property and several other residential properties near the CCI site in 2003. Results of these samples do not show elevated levels of TCE or other site-related compounds. The 318 S. Keeler Street property is the closest residence to the site, and is in close proximity to one of the high concentration areas onsite to be excavated.

The EPA's preference is to address risks to human health and the environment posed by the release or threat of release of hazardous substances by using well designed methods of cleanup which allow people to remain safely in their homes. This is consistent with the mandate of CERCLA and the implementing requirements of the NCP. Generally, the primary reasons for conducting a permanent relocation (buyout) would be to address an immediate risk to human health (where an engineering solution is not readily available) or where the structure itself is an impediment to implementing a protective cleanup. The excavation and offsite disposal of contaminated soil on the CCI property, and chemical oxidation treatment of the contaminated groundwater beneath and in the vicinity of the site are readily available engineering solutions to address the human health and environmental risks posed by the site. Implementation of the selected remedy will not be impeded by the residence at 318 S. Keeler Street or other nearby residences.

The CCI CAG comments that the onsite soil should be left as clean as possible and that some disruption to the community during excavation will be tolerated. However, the community expects the cleanup to be conducted in a manner that will ensure the residents are protected from vapors during the excavation process.

The EPA believes the selected remedy provides a balanced approach to removing the most contaminated soils while minimizing disruption to the community. Excavation of discreet areas onsite and the use of a shroud on the large diameter drilling equipment will allow for better control of vapors and fugitive dust. An extensive air monitoring program and contingency plan will be employed during the onsite activities to ensure the protection of local residents. If the selected remedy called for a full-scale removal of onsite soils, then temporary relocation of residents along S. Keeler Street would likely have been recommended by EPA.

The selected remedy will ensure that soils remaining onsite will allow for a variety of non-residential uses.

The CCI CAG comments that the high concentrations of TCE in groundwater directly underneath the CCI site should be addressed. TCE concentrations under the hot spot areas are extreme and may still include pools of pure chemical. Permanganate should be applied to excavated hot spot areas and injected to treat the groundwater.

The selected remedy provides for chemical oxidation treatment of groundwater hot spots on the site, as recommended by the CAG. However, additional information gathered during the supplemental investigation in February 2005 indicates that pools of pure chemical do not exist, even in the hot spot locations.

The CCI CAG comments that the proposed chemical delivery trench on Ocheltree Street is too short and should be lengthened.

The best method for delivery of the chemical oxidant into the transition zone in the neighborhood has not been determined. Shortly following construction of the trench along the western site boundary, the effectiveness of this delivery method will be evaluated. It is possible that injection points (wells) rather than a second trench will be more effective and more implementable in the neighborhood.

The CCI CAG suggests an additional chemical delivery trench on Park Street, closer to the leading edge of the plume.

The selected remedy allows for the inclusion of additional points in the neighborhood where chemical oxidation may be applied.

The CCI CAG comments that a method must be developed to ensure the trenches are properly placed and function optimally.

Placement of trenches or injection points will be based on existing groundwater data and other factors such as utility lines and roads. In general terms, treatment points or zones will be strategically located to cover as much of the affected area as possible, and to intercept groundwater as it flows across the area. An O&M plan will be employed to evaluate the effectiveness of the treatment over time, and will include plans for an optimization review after two years of operation.

The CCI CAG comments that groundwater treatment methods are not well developed at this time, and that the ROD should provide for changes in the remedy as new technologies become available.

This type of review process is already built in to the Superfund process as part of the Five Year Review. It is not necessary to include such stipulations in the ROD.

The Boeing Company objects to EPA's assessment of historical groundwater use, and provides its arguments against the conclusion that the shallow groundwater is a viable source of drinking water. Furthermore, Boeing argues that MCLs should not be ARARs because shallow groundwater is not a viable drinking water source due to low yield of the formation and salinity of the water.

The EPA does not disagree with many of the points made by Boeing regarding the current state of the shallow groundwater. Furthermore, EPA agrees that the shallow groundwater in the vicinity of the CCI site is not likely to be a future source of drinking water due to the availability of a public water supply and the recent city ordinance prohibiting installations of new wells.

The EPA's claims regarding historical groundwater use were not based solely on the existence of the hand-dug cistern on the farm property west of the site. Rather several of the residents on S. Keeler Street have notified EPA of old wells on their properties. In addition, EPA has observed wells at homes on S. Keeler Street during air sampling events. No details about these residential wells are known. However their existence indicates that groundwater was available and was used for some purpose in the past. In addition, a well survey conducted by the KDHE indicates that there remain private water wells in service within four miles of the site.

Boeing has not provided any evidence to support its contention regarding the salinity of groundwater being too high to serve as a drinking water source. As for Boeing's contention of low yield, EPA's guidance documents state that "in establishing aquifer characteristics, Superfund always considers factors other than yield in determining whether an aquifer is useable".

The EPA's Groundwater Protection Policy and the NCP Preamble state a goal of restoring groundwater to its beneficial uses. The EPA's CERCLA Compliance with Other Laws manual states that "MCLs (under RCRA and under SDWA) are relevant and appropriate to remediation of groundwater that may be used for drinking". Furthermore, the manual indicates that MCLs are relevant and appropriate where the groundwater is potentially drinkable. Groundwater in the vicinity of the site is considered by EPA and KDHE to be potentially drinkable; thus its beneficial use is drinking water. The determination that groundwater in the vicinity of the site is "potentially drinkable" is based on the fact that groundwater in the area (within four miles of the site) is still used for domestic purposes and groundwater near the site was historically used for domestic purposes.

The existence of the city ordinance is not relevant to whether the aquifer is a potential drinking water source. If it were not for the contamination and the city ordinance, the groundwater would be potentially drinkable. Plus, the ordinance cannot ensure that no one will drink the water and cannot be a substitute to taking the necessary response actions to address contamination in the groundwater.

Boeing comments on the likelihood of releases from underground storage tanks being greater than releases from above ground storage tanks.

The EPA does not believe this comment is relevant to the Proposed Plan.

Boeing asserts that there is not sufficient information to support the conclusion in the Proposed Plan that ventilation systems are necessary to protect human health and the environment. Boeing's assertion is divided into several bullet points presented below, with EPA's response immediately following each.

- **There is no data demonstrating that levels of constituents detected in homes are caused by vapor intrusion.**

The EPA has collected hundreds of air samples from crawl spaces, basements, and indoor living spaces of more than 50 homes near the CCI site. At the same time, EPA conducted inspections of the home and required residents to complete building surveys for the purpose of identifying potential household sources of the suspect constituents. Crawl spaces were sealed prior to sampling to ensure that air within the crawl space was not affected by outdoor sources, and to provide a better simulation of air that is coming up from the ground into the crawl spaces. Some homes had crawl spaces with high levels of TCE, the primary groundwater constituent, with lower levels indoors, and had no indication of any household sources of TCE according to the inspection and building surveys. This data provides a strong line of evidence that vapor intrusion is occurring. Also, the air data correlates well with areas of known groundwater contamination, which serves as another line of evidence indicating vapor intrusion.

- **Quality assurance/quality control (QA/QC) samples were not collected during the sampling activities at individual houses. These QA/QC samples would assist in evaluating whether the analytical results for indoor air samples are valid or whether the detected constituents are analytical artifacts.**

QA/QC samples were collected with each sampling event, consistent with the approved Quality Assurance Project Plan (QAPP) for the air sampling work at the site, and consistent with EPA's QA/QC guidance. QA/QC samples are not required for each individual sampling point (house) in the same way that QA/QC samples are not required for each individual monitoring well during groundwater monitoring events.

- **Ambient background levels in indoor air were not determined for individual residences. Many household products contribute chemicals to air.**

Ambient background levels are not required for each individual house in the same way that background concentrations are not determined for each individual well during groundwater monitoring events. The EPA conducted inspections and building surveys to account for household chemical sources.

- **Background in-house data from homes at a distance from the affected area were not collected. These would have helped determine the source of constituents in indoor air.**

The EPA collected in-house samples of air from homes close to CCI and from homes farther away from CCI. In general, homes farther away showed lower levels of TCE in indoor air, except for homes with basements which are more vulnerable to vapor intrusion.

- **The decision to install a vapor abatement system was not consistently applied. Some homes were given systems even though their indoor air levels were below the EPA's TCE action level. In addition, the decision for some homes was based on measured levels in living spaces while at other homes the decision was based on measured levels in non-living spaces like crawl spaces.**

The decision to install vapor systems has been consistently applied, as outlined in the Action Memorandum supporting the response action. The initial phase of response included installing systems in a set of homes within a geographical boundary called "Phase 1". Not all homes within this boundary exceeded the action level. In fact, a few homes within this boundary were not even tested prior to installing the system. The EPA determined that given the high degree of variability in air data, and the significant levels of TCE found in homes close to the CCI site, a protective response would be to install systems in homes exceeding the action level and in homes located adjacent to or in close proximity to homes exceeding the action level. This protective approach was used for the Phase 1 response and is explained in detail in the Action Memorandum supporting the response action. In subsequent phases, only homes exceeding the action level received systems.

Crawl space air is considered breathable air and was viewed by EPA as representing a worst case scenario. Although residents do not live in their crawl spaces, during certain months of the year (winter) when the home is closed and the furnace is on, a negative pressure is created which causes air from the crawl spaces to enter the home through cracks in the floorboards. It is highly conceivable that air from crawl spaces enters the homes.

- **Region VII has based its TCE action level on a provisional toxicity value that has not been finalized or adopted by EPA. This toxicity value is inconsistent with the known human exposure experience (epidemiology data) as presented by both EPA and the ATSDR at a CCI public meeting.**

A range of TCE action levels were developed and proposed using the range of draft cancer slope factors provided in the August 2001 *Draft Trichloroethylene Health Risk Assessment: Synthesis and Characterization* (TCE Draft Assessment). In addition, the original 1987 provisional slope factor was also considered. While neither of these sets of values has been "finalized", it is general consensus among the EPA Regions to consider all values when setting an action level. The action level set at CCI was based on a consideration of the proposed action levels, site-specific information regarding the potential for vapor intrusion, and the ambient background levels of TCE. Note, the action level is set at a level that is approximately equal to a cancer risk of 1 E -05 using the lower end of the draft range and 1 E -06 using the 1987 provisional value.

There is no direct correlation between the TCE toxicity values used in developing the action level and the other regulatory threshold values presented to the public. Comparing the TCE toxicity value to an OSHA PEL or to the NOAEL is like comparing apples to oranges. The TCE toxicity value is used to quantify the incremental excess cancer risk associated with chronic exposures. In this assessment, chronic exposures to concentrations of 2 ug/m3 TCE in indoor air result in an increased cancer risk of 1x10-5, which is within EPA's acceptable risk range of 1x10-4 to 1x10-6. Therefore, the 2 ug/m3 was determined to be an appropriate action level for the CCI site. It is not inconsistent at all to say that epidemiological data does not indicate observable human health effects at this low level. Current epidemiological data shows that actual health effects are not observable until concentrations reach many times the levels observed in homes near the CCI site.

Incremental cancer risk is an entirely different thing than observable human health effects.

Boeing comments that EPA's use of the provisional TCE toxicity criteria in calculating an indoor air action level is not appropriate for determining that the ventilation systems are necessary to protect human health and the environment for the following reasons:

- **It is invalid to use the provisional TCE toxicity criteria in risk-based decision-making. There is no consensus in the scientific community on the propriety of this value. For example, some EPA regions have declined to use the value because methods used to reconstruct TCE exposures are inappropriate and comments provided by the EPA's Science Advisory Board TCE Review Panel indicated numerous critical scientific issues. There is also no consensus between federal agencies; the Department of Defense has officially disagreed with the conclusions and methodologies used to prepare the draft TCE health risk assessment study from which the provisional toxicity values were derived. ATSDR, which has performed health assessments of the CCI site, does not use the provisional TCE value.**

EPA Region 7 believes it is valid to use provisional TCE toxicity criteria in risk-based decision making. Because TCE toxicity values are not available on the Integrated Risk Information System (IRIS), provisional values and other appropriate criteria can be used to develop TCE action levels. These levels include the range a draft toxicity values provided in the TCE Draft Assessment and the 1987 provisional value.

EPA Region 7 does not agree with the statement "There is no consensus in the scientific community on the propriety of this value", nor the reasoning behind the statement. First, there is consensus among EPA regions to consider all the toxicity values including the draft values and the 1987 provisional values when evaluating TCE. Also, the SAB review of the TCE Draft Assessment, available at http://www.epa.gov/sab/pdf/ehc03002.pdf, commended the EPA for its "groundbreaking" efforts and advised the agency to move ahead and revise and complete the assessment. The SAB, consisting of experts from academia, environmental communities, and industry, also noted that the draft assessment is a good starting point for completing the risk assessment for TCE.

Additionally, EPA does not agree with the implication that there should be consensus among federal agencies with respect to the TCE Draft Assessment. Each agency plays a different role related to cleanup activities and hence possess a different perspective on the TCE Draft Assessment and TCE contamination. Since DOD is routinely a PRP, it is unreasonable to expect that it would draw the same conclusion as EPA or necessarily agree with the conclusions of the TCE Draft Assessment.

With respect to ATSDR, it should be noted that while two of the three ATSDR health consults do not reflect the provisional TCE value, these consults were completed prior to Region 7's decision to use the full range of slope factors and the 1987 provisional values. ATSDR's final consult in March 2003 evaluated cancêr risks using slope factors provided in the TCE Draft Assessment. Finally, the ATSDR does not have its own toxicity value (MRL) for TCE for evaluating chronic exposures. It only has MRLs for acute and subchronic exposures for TCE. When evaluating an exposure pathway for which there is no MRL, ATSDR uses EPA's toxicity value.

- **The provisional TCE toxicity value has been questioned in relation to significant scientific issues regarding TCE's mechanism of action. The SAB review of the provisional value raised significant questions in the areas of dose-response, mechanism of action, weight of evidence evaluation, and consideration of epidemiological evidence.**

The EPA Region 7 disagrees with these conclusions in that they do not accurately summarize comments provided by the SAB nor do they accurately reflect the core issues addressed by the SAB. First, the SAB review did not state that "EPA failed to quantitatively evaluate the dosimetry and dose-response relationships of TCE and its metabolites in regards to potential carcinogenicity". Rather, the SAB stated that it "strongly advises the Agency to add a more thorough quantitative evaluation of dose response relationships and dosimetry to its discussion of the role of different metabolites and multiple modes of action". Second, the SAB recommended that a qualitative comparative analysis be completed to correlate between the peroxisome proliferation potency and the apparent carcinogenic potency of TCE. Several members noted they do not completely understand the relatively favorable attention given to this possibility in the draft assessment.

The SAB report does not state that EPA failed to follow its own guidance in performing a weight-of-evidence evaluation regarding the carcinogenic potential of TCE. Rather, the SAB was asked if the cancer weight-of-evidence characterization is adequately supported. The SAB panel felt that the Agency's overall qualitative cancer risk characterization was "reasonable", but recommended that the Agency improve the characterization of the cancer weight-of-evidence by evaluating human and animal studies more rigorously. Also, note the following passages provided in the SAB report:

"Panel members differed in their interpretation of how to apply the draft revised cancer classification guidelines and some requested clarification of the EPA cancer guidelines classification scheme before they could form a personal opinion. Several panel members characterized the weight-of-evidence as 'very strong' and spoke in support of the Agency's proposed designation of TCE as 'highly likely to be carcinogenic to humans'. Several members, however, also suggested that the chemical could come closer to being classified as 'known to be carcinogenic to humans'.

"The TCE draft assessment breaks new ground in addressing the new dimensions of risk assessment that EPA and others have advocated.....The assessment implements principles of the proposed cancer guidelines by emphasizing characterization discussions, and by using information on mode-of-action and information on susceptible populations to derive cancer slope factors and RfD and RfC values."

Also, the SAB report does not state that the EPA failed to perform a balanced review of the epidemiological evidence. The SAB noted that "many carcinogenicity studies that were considered negative are not included in the tables and all studies for each tumor type should be included". Finally, there is no mention in the SAB review report that risk estimates were biased high. Instead, the SAB commended the Agency for the derivation of the set of cancer slope factors and offered guidance and suggestions to refine and improve the risk estimates.

- **Toxicologists from both EPA Region 7 and ATSDR have presented information to the public regarding the toxicity of TCE (which Boeing included as an attachment to its comments). They reported that there is a 10,000-fold difference between the lowest level shown to cause health effects in humans and the highest level of TCE measured in indoor air in the community. These facts are directly opposed to concluding that houses needed vapor systems based on an analysis using the provisional TCE toxicity value.**

The EPA makes response action decisions based on human health risk as quantified using EPA's risk assessment guidelines. EPA generally recommends a response action when human health risks exceed the acceptable risk range of 1x10-4 to 1x10-6 for cancer risks, consistent with CERCLA and the NCP. Using the provisional TCE toxicity value and the highest concentrations of TCE found in homes near the site, the resulting cancer risks exceeded the acceptable risk range. Therefore, the response action decision to install ventilation systems was justified.

Neither CERCLA nor the NCP cite lowest observable adverse effect levels as a basis for making response action decisions. And the reason for this is clear; these levels would not be protective of human health. The fact that EPA's decision-making process results in response actions being taken at levels several orders of magnitude below lowest observable effect levels should be reassuring to the general public.

Boeing provides information in support of the 1,000 ppm total VOCs as a soil cleanup level. Boeing asserts that the soil cap provides the protection of human health, and soil excavation does not add any additional protection. Soil excavation provides mass removal only. Also, excavation to lower cleanup levels would increase short term risks and inconveniences to the community during excavation.

The EPA agrees that the soil cap provides protection of human health by providing a barrier which serves to block exposure pathways. However, the excavation of high concentration soils provides additional benefit by removing source material and reducing long term impacts to groundwater. Additionally, removal of high concentration soils could help to reduce vapor intrusion impacts on homes close to the site.

While EPA believes that soil excavation provides some benefit in terms of reduction of toxicity, mobility, and volume, it is important to note that the majority of contaminant mass is in bedrock and can not be removed by excavation. Excavation of source area soils will not likely have a great impact on the length of time needed to operate the groundwater treatment program.

The EPA agrees that the greater the volume of soil to be excavated, the greater the short term risks to site workers and the local residents. Also, higher soil volumes would increase the duration of the action, traffic, noise, and cost. However, the use of large diameter drilling as opposed to conventional excavation will help to minimize these impacts. Also, the selected remedy calls for the use of a shroud on the large diameter drilling equipment that will greatly reduce exposures to site workers and area residents during the excavation process.

Boeing comments that data collected by EPA indicates that TCE levels in soils immediately around the CCI site are non-detect or very low. The comment states that EPA concluded in its 2001 Removal Site Evaluation that TCE in offsite soil is not a concern.

The EPA agrees with the comment.

Boeing comments that the extent of the proposed excavation provides removal of the highest concentrations of contaminants in the soil. The comment indicates that such limited excavation will likely have little effect on controlling groundwater contamination or vapors in homes, and adds that even if all site soils were removed, there would be little effect on controlling groundwater contamination and vapors in homes. The reason for this is that the majority of contaminant mass is in bedrock and can not be excavated.

In general, EPA agrees with the comment. However, as stated above, removal of contaminant mass from the site achieved by excavation of source soils will provide some degree of reducing long term impacts to groundwater which will in turn reduce vapor intrusion impacts.

Boeing provides a comment in opposition to KDHE's claim that the cost estimates in the Proposed Plan were inflated. Boeing states that the cost estimates were prepared by experienced practitioners and in accordance with EPA guidelines.

The EPA agrees with the comment. Furthermore, EPA had an independent contractor evaluate the cost estimates in the Feasibility Study (FS) which concluded that the estimates are sound.

Boeing comments that significant efforts to remove DNAPL have been conducted in the past, and that DNAPL will be addressed by the groundwater remedy in the Proposed Plan. Chemical oxidation at the downgradient boundary of the site will mitigate potential future migration offsite.

The EPA agrees with the comment, and adds that the selected remedy provides additional treatment using chemical oxidation onsite which will help reduce contaminant concentrations in high concentration areas (most likely to contain DNAPL). Also, the Supplemental Investigation performed in 2005 indicates that there is no recoverable DNAPL at the site.

Boeing provides a comment regarding the extent of the indoor air sampling program and ventilation system installations.

The EPA's air sampling conducted in 2004 revealed additional homes above the established action level for TCE. Boeing has installed ventilation systems in those homes and EPA has performed the confirmation air sampling. Additionally, the PRPs have signed an agreement with EPA to take over the air sampling and to perform operation and maintenance of the ventilation systems for a three year period.

Boeing provides a list of documents it believes should have been included in the July 2004 Administrative Record.

The EPA establishes Administrative Records (ARs) on an action-specific basis. Separate ARs were prepared for the building demo/soil pile removal action, the vapor intrusion removal action, and earlier actions completed at the site. Many of the documents cited in this comment are found in previous ARs.

In addition, only documents which were used by EPA in making decisions at the site are included in the AR. Documents relating to closure of the interceptor trench were not included because they were not relied upon to make decisions regarding the appropriate remedial action for the site. These documents will be included in a separate AR prepared in support of the trench closure removal action.

Responsiveness Summary 2

Public Comment Period 7/19/05 - 9/19/05

Chemical Commodities, Inc. Site
Olathe, Kansas

This Responsiveness Summary has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP) 40 CFR 300.430(f). This document provides the United States Environmental Protection Agency's (EPA's) response to all significant comments received on the July 2005 Proposed Plan for the Chemical Commodities, Inc. (CCI) site from the public during the public comment period.

On July 19, 2005, the EPA released the Revised Proposed Plan and Administrative Record files for the CCI site. The Administrative Record files contain site-related documents and are located at the Olathe Public Library and the EPA Region 7 office. The Proposed Plan presented EPA's proposed actions to address contaminated soil and groundwater at the CCI site. The public comment period began on July 19, 2005 and ended on September 19, 2005. The EPA held a public meeting on July 26, 2005, to present the Proposed Plan and provide the public an opportunity to comment. A copy of the transcript from the public meeting is included in the Administrative Record file.

Stakeholder Issues and Lead Agency Responses

Written comments were received from the community group and the potentially responsible parties (PRPs). These comments are summarized below in bold face type. The full text of the comments received are included in the Administrative Record. The EPA's responses are provided in standard type following each comment.

Community Comments

The community group indicated its support of the selected remedy for soil as it "involves the aggressive evacuation and offsite disposal of contaminated soils and in situ chemical oxidation".

The EPA is pleased to hear of the support of the community.

The community group commented that the cleanup plan should allow for additional large diameter borings, beyond the six borings called for by the feasibility study and proposed plan.

The number of large diameter borings will be determined during remedial design/remedial action. *The ROD does not limit the number of large diameter borings to six;* this number was used as a basis for developing a cost estimate.

The community group expressed a preference that soils excavated from the large diameter borings be removed from the site rather than be mixed with permanganate and used to backfill the excavated area. Furthermore, the community would like for there to be a way for periodic permanganate additions to the excavated areas without adversely affecting the visual appearance of the site.

In the feasibility study, the description of the S3D-PLUS alternative states that excavated soils will be transported offsite for disposal, and imported soil will be used for backfill. Currently, the method of permanganate delivery for the large diameter boreholes has not been determined, but will be determined during remedial design/remedial action. It is conceivable that permanganate could be mixed with the imported soil prior to backfilling the boreholes; this would be one way of delivering permanganate to the entire soil column. The idea of providing for periodic permanganate injections to the boreholes will be explored during RD/RA.

The community group expressed concern about the potential for the groundwater plume to continue to migrate even after onsite remediation. Because of this concern, the community group requested that the ROD include plans to continually monitor VOC concentrations in the groundwater and if necessary install additional chemical oxidation delivery trenches to intercept any further spread of the plume.

The ROD calls for a comprehensive groundwater monitoring program, which will provide indications of groundwater movement, if any, following the initiation of the chemical oxidation treatment systems onsite and in the neighborhood. In addition, there is a review process built into the Superfund Program which calls for periodic reviews at sites where waste remains above levels that allow for unrestricted use. These reviews must be completed at least once every five years to ensure a remedy is protective of human health and the environment. If monitoring data suggests that the existing chemical oxidation treatment systems in place are not adequately protective, additional cleanup measures would be pursued.

The community group requested that the ROD include a stipulation to allow for the use of newer cleanup technologies as they are developed in the future.

The CERCLA periodic review process provides the opportunity to assess new technologies as they are developed over time.

Potentially Responsible Party Comments

Comments were submitted by Haley & Aldrich, Inc. on behalf of their client, The Boeing Company, a potentially responsible party at the site.

The PRP commented regarding the selected alternative for addressing site soil. The PRP states that the added components to further enhance onsite source area treatment are not necessary to satisfy the threshold or balancing criteria. While the selected alternative for soil will result in additional mass removal, there may actually be a decrease in short term effectiveness due to exposures during implementation as compared to alternative S3D.

The EPA agrees that alternative S3D would satisfy the threshold criteria. However, alternative S3D did not satisfy the modifying criteria, as evidenced by the negative response from the state and community to the July 2004 Proposed Plan. With regard to the balancing criteria, the EPA believes the selected alternative offers a greater degree of reduction of toxicity, mobility and volume through treatment than what is offered by alternative S3D. In addition, EPA believes the selected alternative better meets the statutory preferences for the utilization of permanent solutions and alternative treatment technologies to the maximum extent practicable and the use of treatment as a principle element.

The PRP commented that the Revised Proposed Plan does not clearly distinguish between the two soil concentrations considered for alternatives S3D-PLUS Option A and S3D-PLUS Option B. Those two soil concentrations were 1,000 ppm total VOCs and 110 ppm TCE.

The EPA agrees with the comment and will ensure that the language in the ROD clarifies the distinction between the two concentrations.

The PRP commented that groundwater level data near the interceptor trench indicate the existence of a groundwater mound, and the effect of this mound may be to accelerate migration from the site. Because of this, the trench should continue to be periodically dewatered until such time as it is decommissioned.

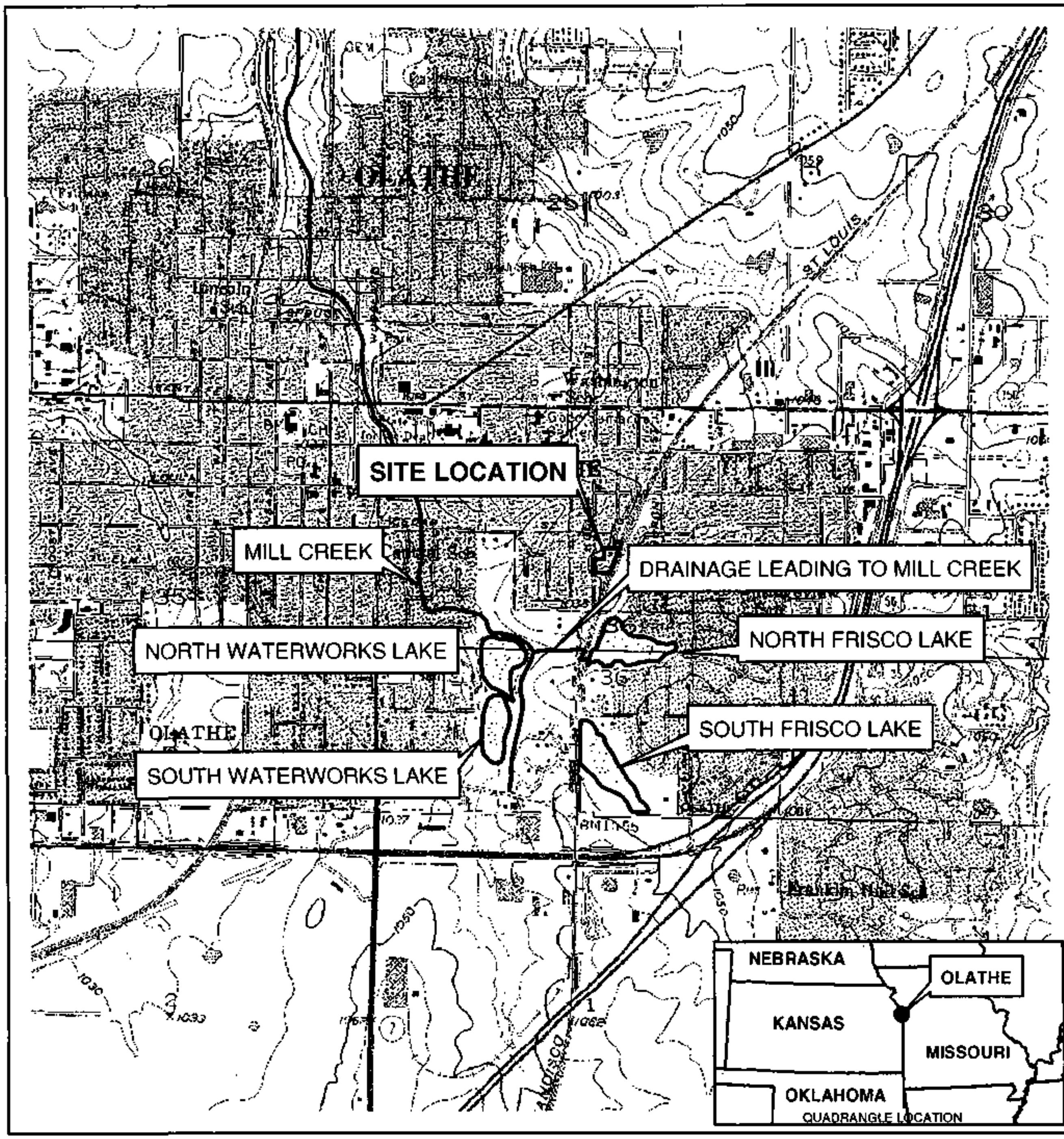
The EPA agrees with the comment.

As an editorial comment, the PRP suggests changing the word "capturing" with regard to groundwater alternative G2 to the word "intercepting".

The EPA has no objection to this wording change and will incorporate this change into the ROD.

Figures

ROD Figure 1



N

0 1,000 2,000 Feet

MAP SOURCE: USGS TOPOGRAPHIC QUADRANGLE, OLATHE, KANSAS (1991)
SOURCE: MONTGOMERY WATSON HARZA, 2001

GeoSyntec Consultants	CHEMICAL COMMODITIES, INC OLATHE, KANSAS	FIGURE 2-1 SITE LOCATION

ROD Figure 2

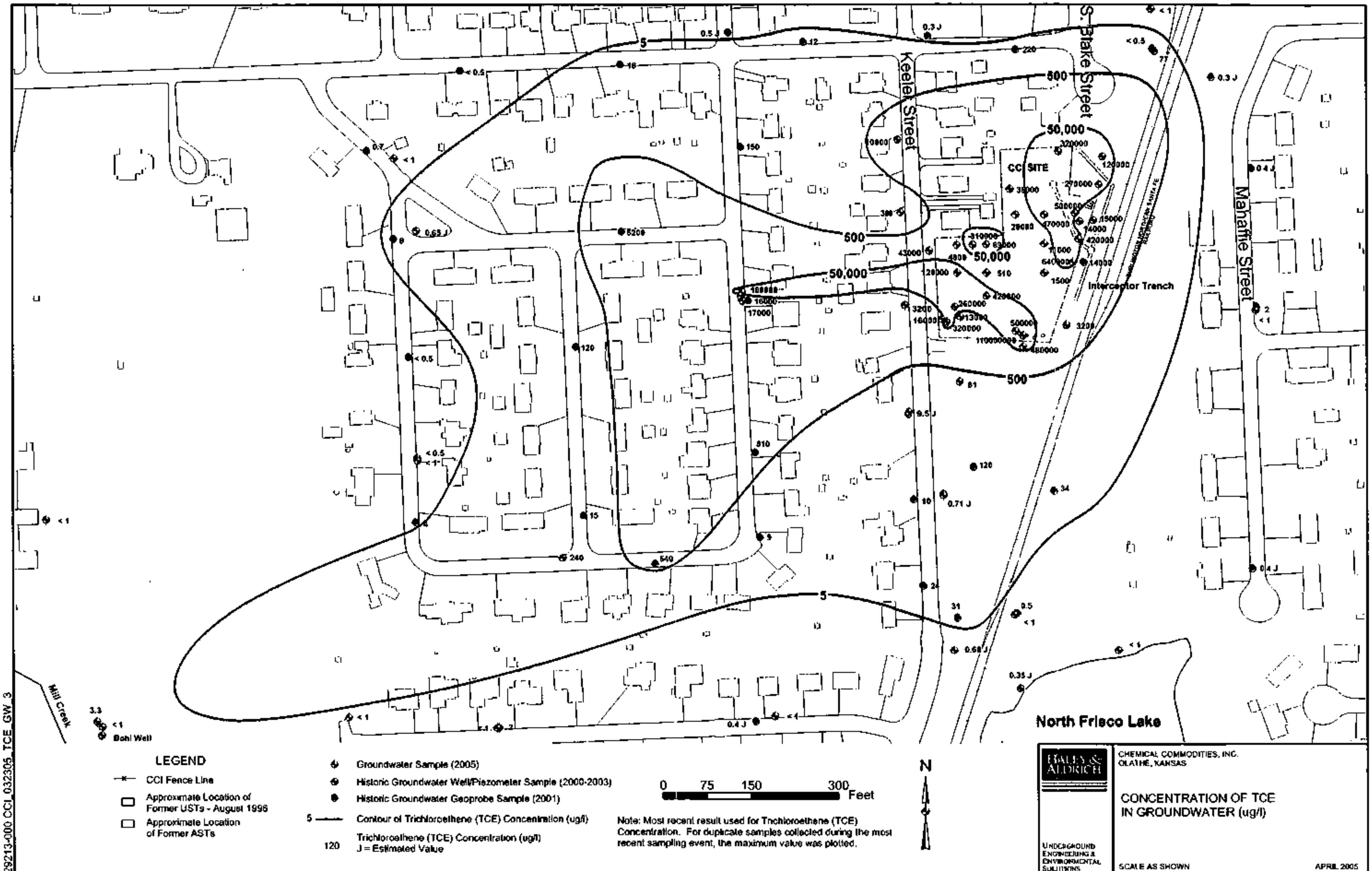
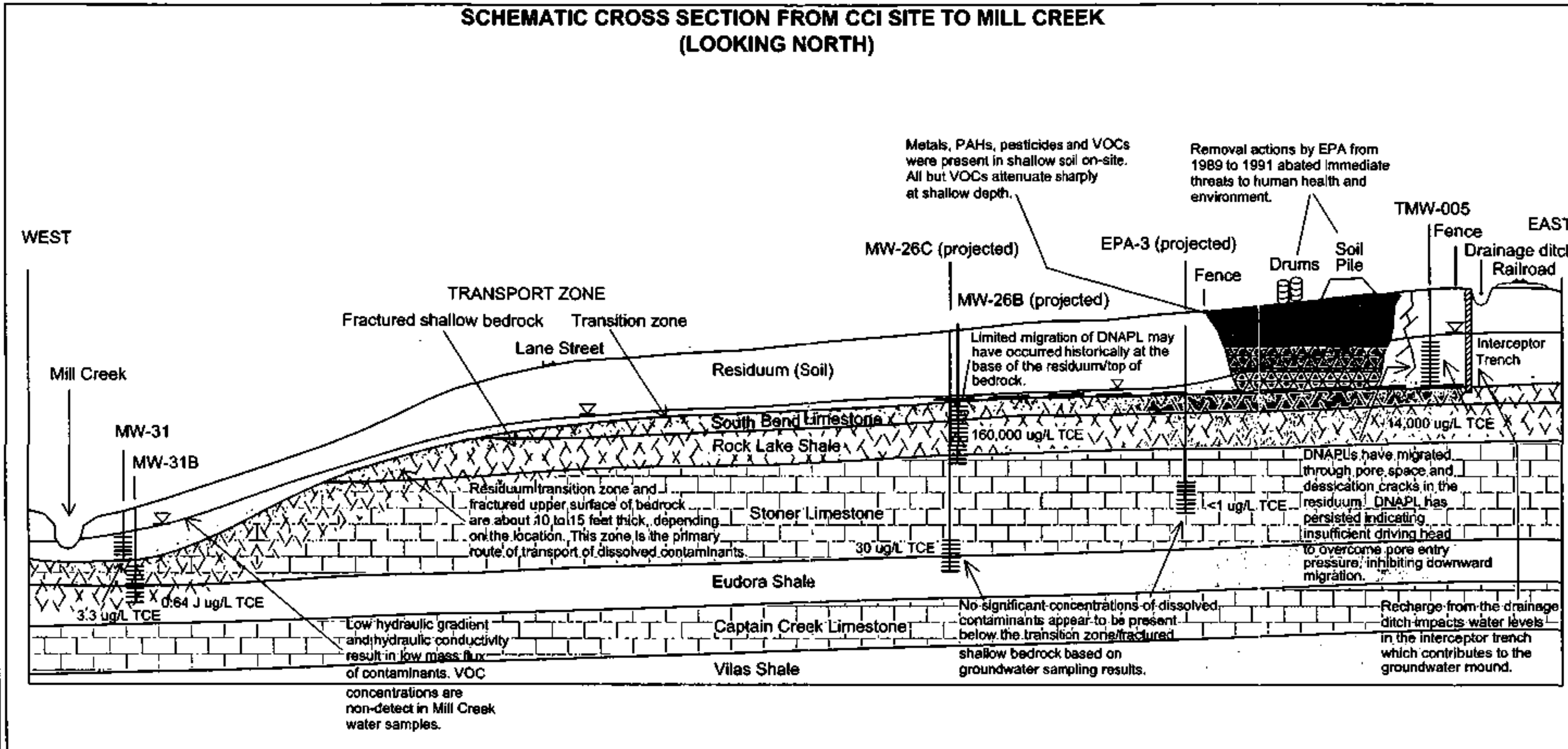


FIGURE 13



Note: Vertical exaggeration is approximately 8x.
Source: Haley & Aldrich, 2004

FIGURE 2-5

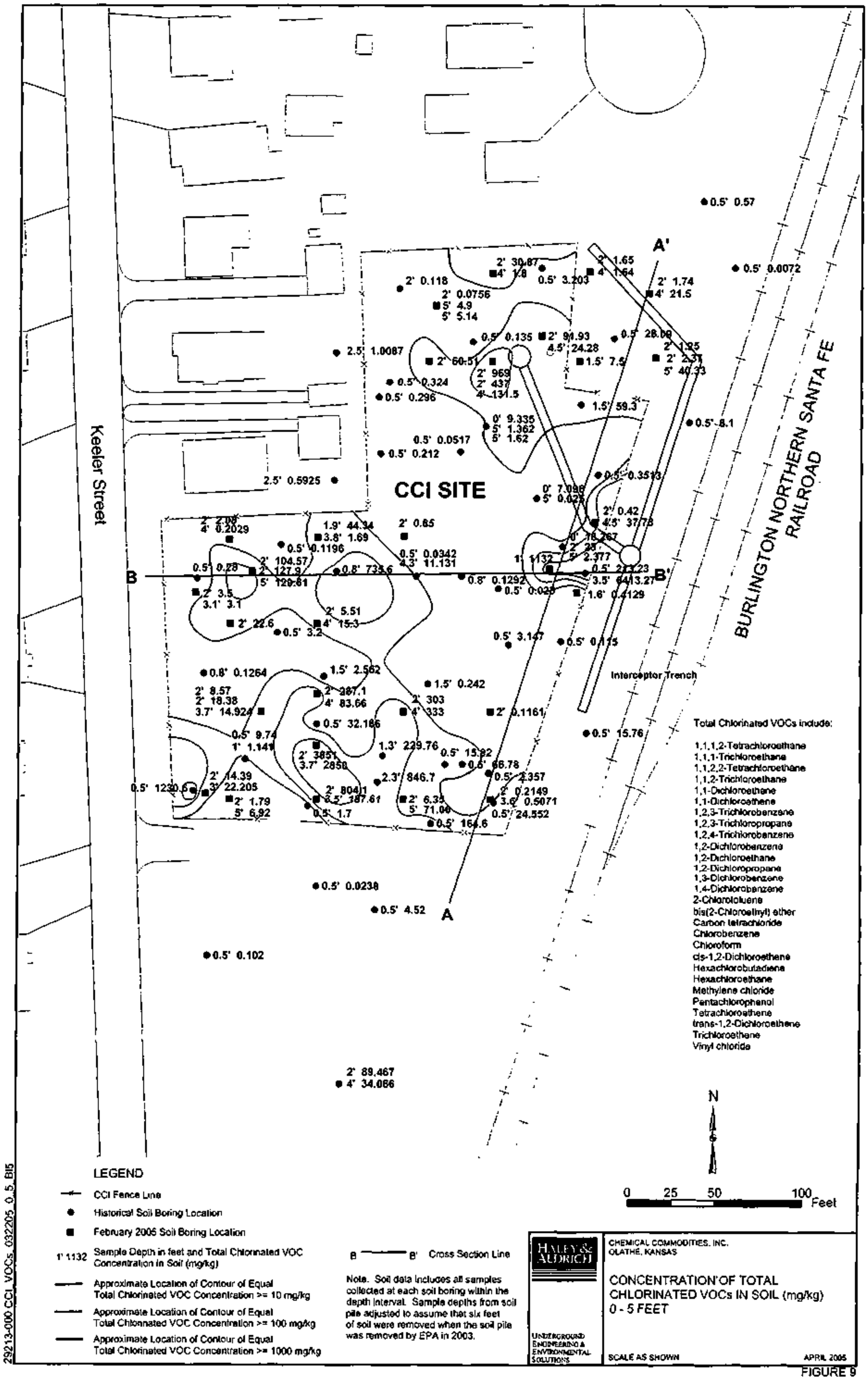
CONCEPTUAL SITE MODEL

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

GEOSYNTEC CONSULTANTS

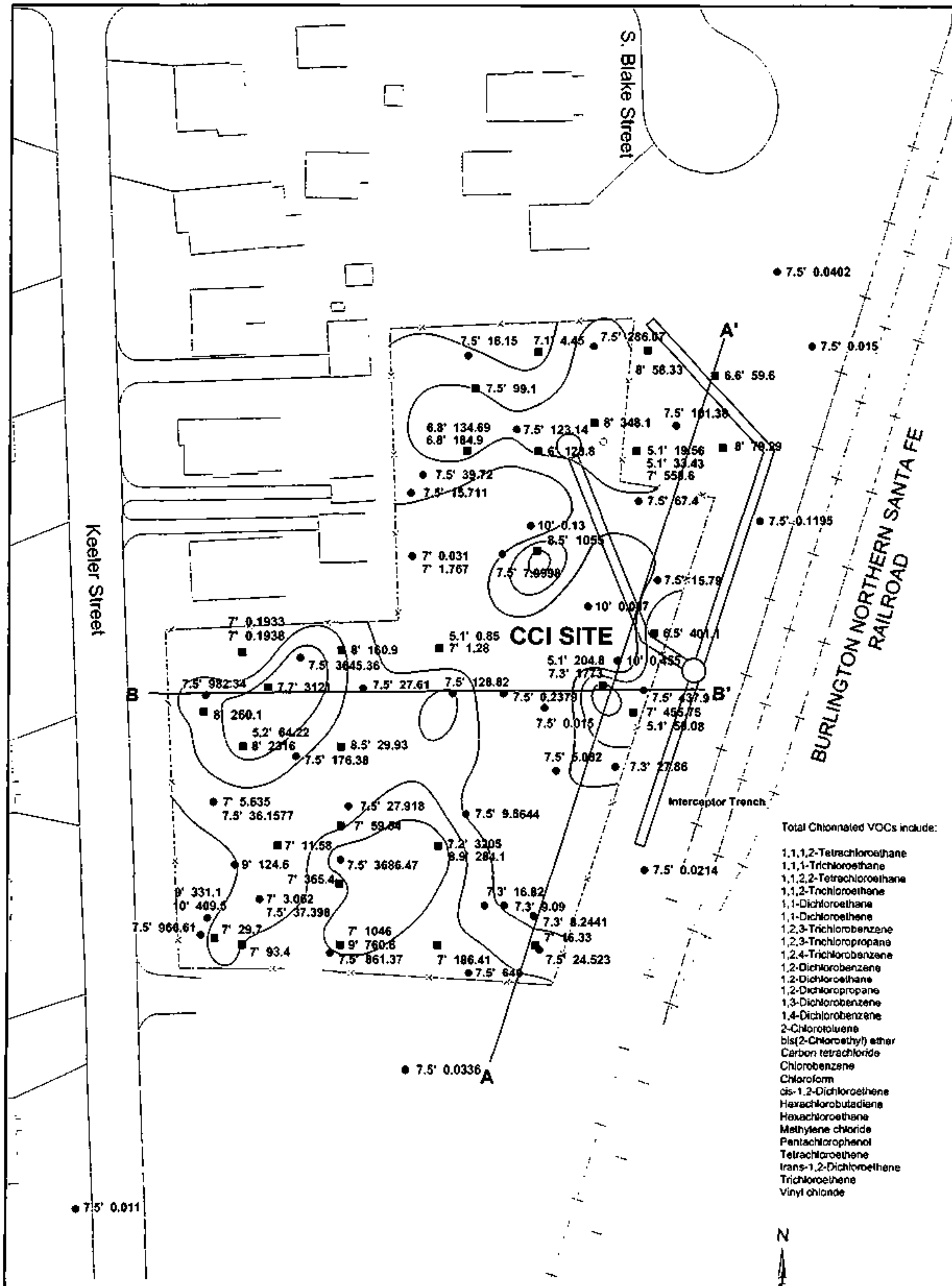
ROD Figure 3

ROD Figure 4



Keeler Street
CCI SITE
BURLINGTON NORTHERN SANTA FE RAILROAD
Interceptor Trench
A
A'
B
B'
Total Chlorinated VOCs include:
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chlorotoluene
bis(2-Chloroethyl) ether
Carbon tetrachloride
Chlorobenzene
Chloroform
cis-1,2-Dichloroethene
Hexachlorobutadiene
Hexachloroethane
Methylene chloride
Pentachlorophenol
Tetrachloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride
N
0 25 50 100 Feet
LEGEND
CCI Fence Line
Historical Soil Boring Location
February 2005 Soil Boring Location
1' 1132 Sample Depth in feet and Total Chlorinated VOC Concentration in Soil (mg/kg)
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 10 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 100 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 1000 mg/kg
B —— B' Cross Section Line
Note. Soil data includes all samples collected at each soil boring within the depth interval. Sample depths from soil pile adjusted to assume that six feet of soil were removed when the soil pile was removed by EPA in 2003.
HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS
CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS
CONCENTRATION OF TOTAL CHLORINATED VOCs IN SOIL (mg/kg)
0 - 5 FEET
SCALE AS SHOWN
APRIL 2005
FIGURE 9
29213-000 CCI VOCs 032205 0.5 BI5

ROD Figure 5



LEGEND

CCI Fence Line
Historical Soil Boring Location
February 2005 Soil Boring Location
7.5' 0.0036 Sample Depth in feet and Total Chlorinated VOC Concentration in Soil (mg/kg)
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 10 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 100 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 1000 mg/kg
B — B' Cross Section Line

Note: Soil data includes all samples collected at each soil boring within the depth interval.

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

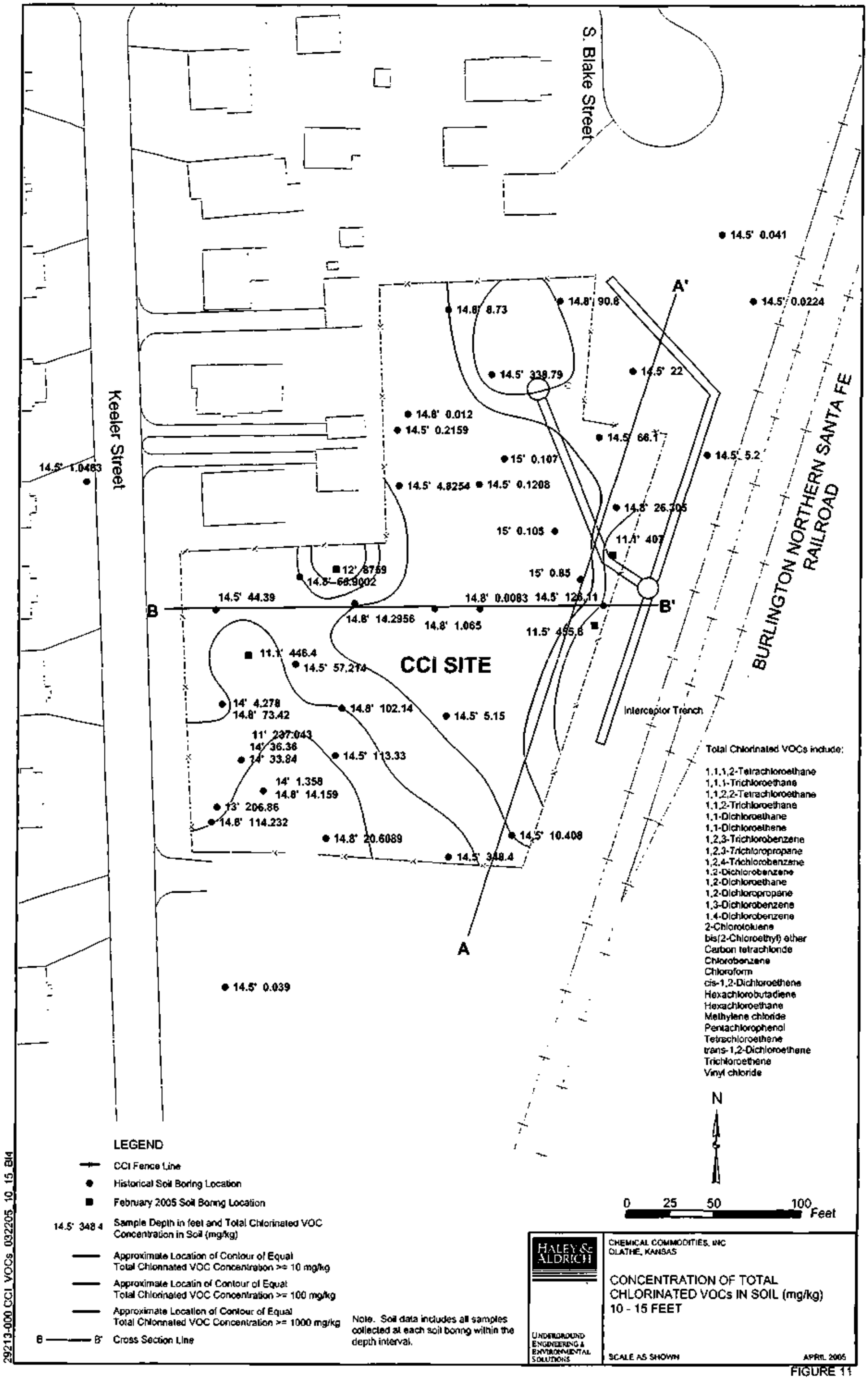
CHEMICAL COMMODITIES, INC
OLATHE, KANSAS

CONCENTRATION OF TOTAL CHLORINATED VOCs IN SOIL (mg/kg)
5 - 10 FEET

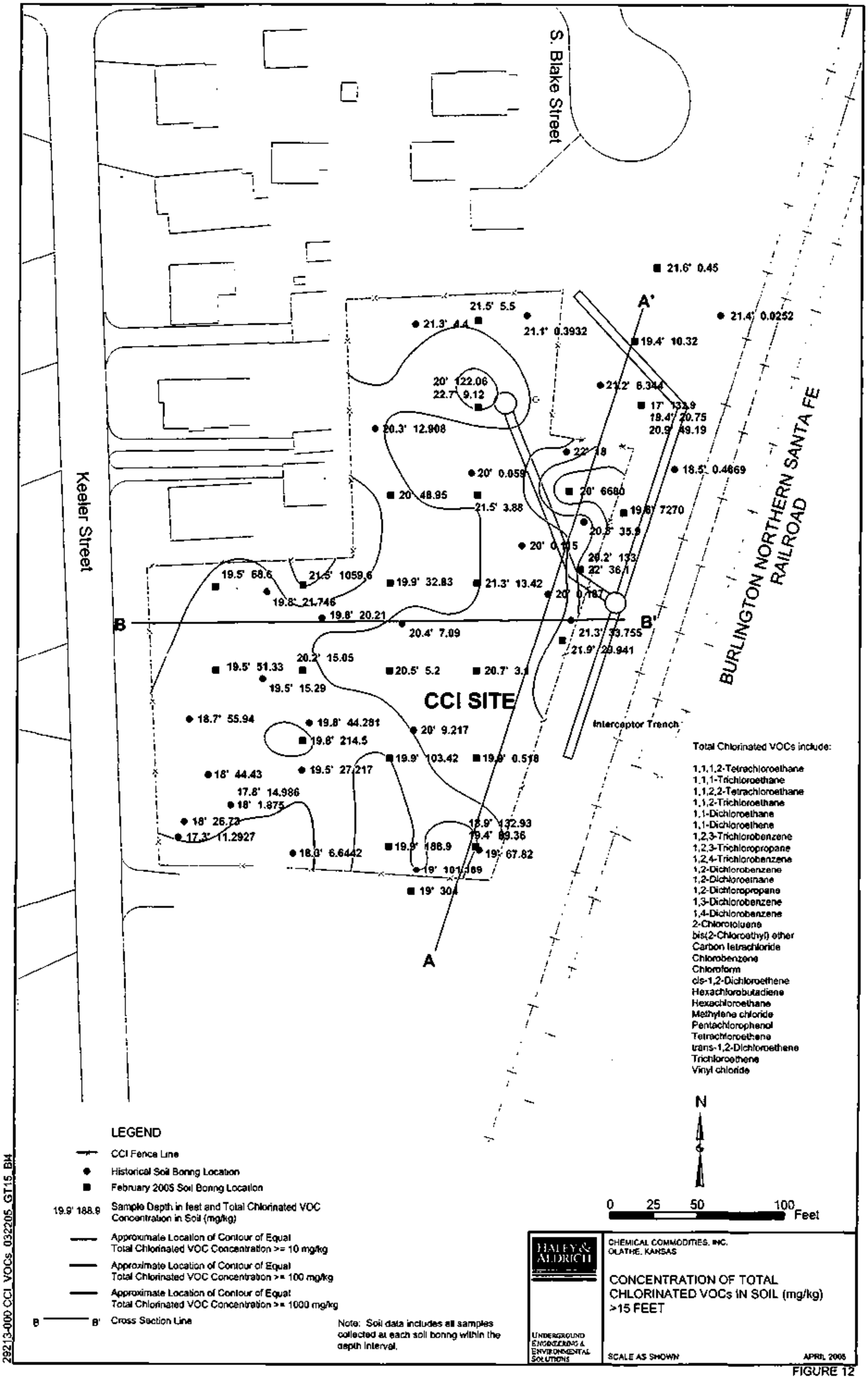
SCALE AS SHOWN
APRIL 2005
FIGURE 10

29213-000 CCI VOCs 032205 5 10 BIS

ROD Figure 6


S. Blake Street
Keeler Street
BURLINGTON NORTHERN SANTA FE RAILROAD
CCI SITE
Interceptor Trench
A
A'
B
B'
14.5' 0.041
14.5' 0.0224
14.8' 8.73
14.8' 90.8
14.5' 338.79
14.5' 22
14.8' 0.012
14.5' 0.2159
14.5' 66.1
14.5' 5.2
14.5' 1.0463
15' 0.107
14.5' 4.8254
14.5' 0.1208
14.8' 26.305
15' 0.105
11.1' 407
12' 8759
14.8' 68.9002
15' 0.85
14.5' 44.39
14.8' 0.0083
14.5' 128.11
14.8' 14.2956
14.8' 1.065
11.5' 495.6
11.1' 446.4
14.5' 57.214
14' 4.278
14.8' 73.42
14.8' 102.14
14.5' 5.15
11' 237.043
14' 36.36
14' 33.84
14.5' 113.33
14' 1.358
14.8' 14.159
13' 206.86
14.8' 114.232
14.8' 20.6089
14.5' 10.408
14.5' 348.4
14.5' 0.039
Total Chlorinated VOCs include:
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chlorotoluene
bis(2-Chloroethyl) ether
Carbon tetrachloride
Chlorobenzene
Chloroform
cis-1,2-Dichloroethene
Hexachlorobutadiene
Hexachloroethane
Methylene chloride
Pentachlorophenol
Tetrachloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride
N
0 25 50 100 Feet
LEGEND
CCI Fence Line
Historical Soil Boring Location
February 2005 Soil Boring Location
14.5' 348.4 Sample Depth in feet and Total Chlorinated VOC Concentration in Soil (mg/kg)
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 10 mg/kg
Approximate Locatin of Contour of Equal Total Chlorinated VOC Concentration >= 100 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 1000 mg/kg
B —— B' Cross Section Line
Note. Soil data includes all samples collected at each soil boring within the depth interval.
HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS
CHEMICAL COMMODITIES, INC
OLATHE, KANSAS
CONCENTRATION OF TOTAL CHLORINATED VOCs IN SOIL (mg/kg)
10 - 15 FEET
SCALE AS SHOWN
APRIL 2005
FIGURE 11
29213-000 CCI VOCs 032205 10 15 BI4

ROD Figure 7


S. Blake Street
Keeler Street
BURLINGTON NORTHERN SANTA FE RAILROAD
CCI SITE
Interceptor Trench
A
A'
B
B'
21.6' 0.45
21.5' 5.5
21.3' 4.4
21.1' 0.3932
21.4' 0.0252
19.4' 10.32
20' 122.06
22.7' 9.12
21.2' 6.344
17' 133.9
19.4' 20.75
20.9' 49.19
20.3' 12.908
22' 18
18.5' 0.4669
20' 0.059
20' 6680
20' 48.95
21.5' 3.88
19.8' 7270
20.5' 35.9
20' 0.105
20.2' 133
22' 36.1
19.5' 68.6
21.5' 1059.6
19.9' 32.83
21.3' 13.42
20' 0.187
19.8' 21.746
19.8' 20.21
20.4' 7.09
21.3' 33.755
21.9' 29.941
20.2' 15.05
19.5' 51.33
20.5' 5.2
20.7' 3.1
19.5' 15.29
18.7' 55.94
19.8' 44.281
20' 9.217
19.8' 214.5
19.9' 103.42
19.9' 0.518
18' 44.43
19.5' 27.217
17.8' 14.986
18' 1.875
18' 26.73
17.3' 11.2927
18.9' 132.93
19.4' 89.36
18.3' 6.6442
19.9' 186.9
19' 67.82
19' 101.169
19' 304
Total Chlorinated VOCs include:
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chlorotoluene
bis(2-Chloroethyl) ether
Carbon tetrachloride
Chlorobenzene
Chloroform
cis-1,2-Dichloroethene
Hexachlorobutadiene
Hexachloroethane
Methylene chloride
Pentachlorophenol
Tetrachloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride
N
0 25 50 100 Feet
LEGEND
CCI Fence Line
Historical Soil Boring Location
February 2005 Soil Boring Location
19.9' 188.9 Sample Depth in feet and Total Chlorinated VOC Concentration in Soil (mg/kg)
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 10 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 100 mg/kg
Approximate Location of Contour of Equal Total Chlorinated VOC Concentration >= 1000 mg/kg
B — B' Cross Section Line
Note: Soil data includes all samples collected at each soil boring within the depth interval.
HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS
CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS
CONCENTRATION OF TOTAL CHLORINATED VOCs IN SOIL (mg/kg) >15 FEET
SCALE AS SHOWN
APRIL 2005
FIGURE 12
29213-000 CCI VOCs 032205 GT15 BM

ROD Figure 8

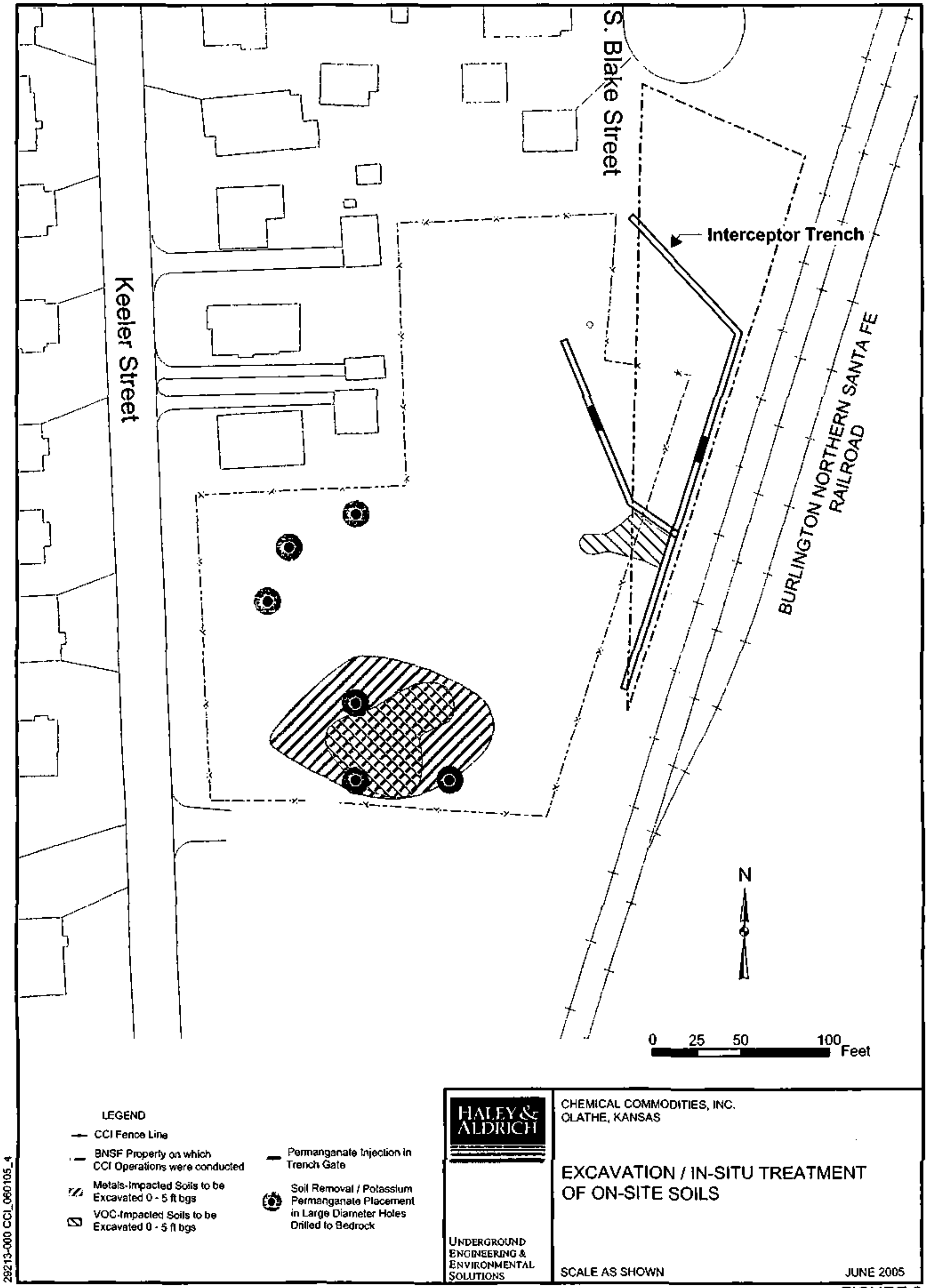


FIGURE 3

Attachments

Detailed Cost Estimates

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

SOIL ALTERNATIVE S3D-PLUS TCE > 100 ppm to 6ft bgs:

Soil Excavation

- The Site would be cleared and grubbed of remaining vegetation and debris.
- Excavate soils containing metals **(1,400 CY)** and organics that exceed **100 ppm** to 5 feet bgs **(400 CY in place)**.
- Transport excavated soils off-Site for disposal.
- Import soils for backfill of excavation.

Soil Cap

- Compact and grade Site to desired finish grade.
- Construct cap on top of the backfilled soils followed by construction of a surface water drainage system and revegetating the Site.
- Revegetate Site.

General

- Develop O&M Plan.
- Impose land use restrictions.

ITEM	Units	Unit ($)	Qnty	Extended ($)	Notes / Assumptions
General Costs					
Security[1]	Day	$ 108	35	$ 3,784	$9 per hour, 12 hrs per day (overnight), number of days from duration total.
Equipment Decontamination Station[2]	Ea	$ 15,000	1	$ 15,000	
Temporary Electrical Power[1]	HSF/Mo	$ 39	759	$ 29,609	Lighting and power for entire Site.
Clear and Grub[1]	Acre	$ 6,700	1.5	$ 10,050	
Haul Clear and Grub Material to Class C Facility[5]	CY	$ 4.75	565	$ 2,684	20 CY trailer capacity (1.4 bulking factor), 50 mile round trip.
Clear and grub disposal at Class C facility[5]	Ton	$ 30.00	565	$ 16,950	Top 2" of Site, 1.4 tons per CY in place.
Health & safety - Air Monitoring[2]	Day	$ 1,500	35	$ 52,560	Assumes 25 truck loads a day at 20 tons per truck
SWPPP[2]	Ea	$ 25,000	1	$ 25,000	
Materials Handling/Transportation Plan[2]	Ea	$ 25,000	1	$ 25,000	
Survey[2]	LS	$ 50,000	1	$ 50,000	
Contractor & Misc. Overhead[3]			8%	$ 18,451	
Permitting[3]			1%	$ 2,306	
Engineering Design[3]			15%	$ 34,596	
Construction CQA[3]			10%	$ 23,064	
Contingency[3]			20%	$ 46,127	
Subtotal				**$ 355,181**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

Excavation, Treatment, and Disposal of VOC Impacted Soil							
Mob/Demob[2]	LS	$	10,000	1	$	10,000	
Emissions Control[2]	LS	$	112,000	1	$	112,000	
Traffic Control[2]	Day	$	650	5	$	3,276	Assumes 65/hr on-Site truck traffic manager, 10 hours per day.
Liner for Materials Handling Area[1]	SF	$	1.25	21,600	$	27,000	
Berm for Materials Handling Area[1]	CY	$	4.50	4,000	$	18,000	Assumes 2 ft berm.
On-Site Soil Excavation and Haul[1]	CY	$	4.50	2,520	$	11,340	Backhoe excavate & stockpile; 1.4 bulking factor.
Haul to Class A Landfill facility[5]	CY	$	63.00	560	$	35,280	20 CY trailer cap, 400 CY, 1.4 tons per CY in place, 800 mile round trip.
Haul to Incineration Facility[5]	CY	$	110.00	1,820	$	200,200	20 CY trailer cap, 1300 CY, 1.4 tons per CY in place, 1,200 mile round trip.
Class A Facility Disposal, no treatment[5]	Ton	$	60.00	560	$	33,600	400 CY, 1.4 tons per CY in place.
Soil Incineration[5]	Ton	$	340.00	1,820	$	618,800	1300 CY, 1.4 tons per CY in place.
Haul to Class C Facility[5]	CY	$	4.75	140	$	665	20 CY trailer capacity (1.4 bulking factor), 50 mile round trip.
Class C Facility Disposal[5]	Ton	$	30.00	140	$	4,200	100 CY, 1.4 tons per CY in place.
Confirmatory soil testing[2]	Ea	$	375	25	$	9,450	VOCs, PAH, PCB & pesticide testing, 1 per 100 CY.
Estimated duration[2]	Day			5			25 truck trips per day
Contractor & Misc. Overhead[3]				6%	$	65,029	
Permitting[3]				1%	$	10,838	
Engineering Design[3]				12%	$	130,057	
Construction CQA[3]				8%	$	86,705	
Contingency[3]				20%	$	216,762	
Capital Costs Subtotal					$	**1,593,202**	
Level B Work Surcharge[1]					$	-	0% of Site work is conducted in Level B @ 55% of normal work efficiency.
Level C Work Surcharge[1]					$	**257,363**	30% of Site work is conducted in Level C @ 65% of normal work efficiency.
Subtotal					**$**	**1,850,566**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

Large Diameter Drilling					
Mob/Demob of Large Diameter Auger Rig[2]	LS	$ 50,000	1	$ 50,000	
Temporary Electrical Power[1]	HSF/Mo	$ 39	325	$ 12,675	Lighting and power for entire Site.
Construction of Soil Staging Area	LS	$ 5,000	1	$ 5,000	Rental of bins and construction of pad for wet soils from auger holes
Health & safety - Air Monitoring[2]	Day	$ 1,500	10	$ 15,000	Monitoring of isurrounding area
Emissions Control[2]	Day	$ 5,000.00	10	$ 50,000	Shroud placed on auger rig with off-gas treatment using carbon
Traffic Control[2]	Day	$ 650	5	$ 3,250	Assumes five days of off-site traffic
Large Diameter Auger Drilling	Day	$ 10,000.00	10	$ 100,000	
Noise Abatement	Day	$ 3,000.00	10	$ 30,000	Measures to reduce impact of noise on surrounding community
On-Site Soil Staging[1]	Hole	$ 2,000.00	6	$ 12,000	Soil cuttings from 6 holes to 20' depth
Water Treatment	Day	$ 2,000.00	10	$ 20,000	Collection and treatment of water from wet soils and produced during drilling
On-Site Engineer Oversight	Day	$1,500	10	$ 15,000	
Haul to Incineration Facility[5]	CY	$ 110.00	105	$ 11,550	20 CY trailer cap, 20 CY per 20-ft-deep hole, 1.4 tons per CY in place, 1,200 mile round trip.
Soil Incineration[5]	Ton	$ 340.00	105	$ 35,700	20 CY per 20-ft-deep hole, 1.4 tons per CY in place.
Site Restoration[2]	LS	$ 10,000.00	1	$ 10,000	Preparation of site for soil cover
Estimated duration[2]	Day		10		
Contractor & Misc. Overhead[3]			8%	$ 29,614	
Permitting[3]			1%	$ 3,702	
Engineering Design[3]			15%	$ 55,526	
Construction CQA[3]			10%	$ 37,018	
Contingency[3]			20%	$ 74,035	
Capital Costs Subtotal				**$ 570,070**	
Level B Work Surcharge[1]				**$ 93,284**	20% of Site work is conducted in Level B @ 55% of normal work efficiency.
Level C Work Surcharge[1]				**$ 92,088**	30% of Site work is conducted in Level C @ 65% of normal work efficiency.
Subtotal				**$ 755,442**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

PERMANGANATE ADDITION						
Backfill Hole[2]	CF	$ 0.43	2,430	$	1,053	6 holes, backfilled from 20 ft to 5 ft bgs.
Potassium Permanganate For Auger Holes4	LB	$ 3.00	20,625	$	61,875	Assumes 50% of pore space can be filled with permanganate solids
Grout Seal[2]	Hole	$ 2,000.00	6	$	12,000	6 holes with 5-ft-deep grout seal
Potassium Permanganate For Two Trench Gates[4]	GAL	$ 1.10	3,927	$	4,320	Assumes 50% of pore space in two trench gates (3.5' wide, 15' long) can be filled with aqueous form permanganate
Contractor Labor/Equipment to Add/Inject Permanganate	Day	$ 5,000.00	10	$	50,000	
Potassium Permanganate Delivery[2]	LS	$ 10,000.00	1	$	10,000	
Estimated Duration[2]	Day		10			
Contractor & Misc. Overhead[3]			8%	$	11,140	
Permitting[3]			1%	$	1,392	
Engineering Design[3]			15%	$	20,887	
Construction CQA[3]			10%	$	13,925	
Contingency[3]			20%	$	27,850	
Subtotal				**$**	**214,441**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

CAP CONSTRUCTION COSTS						
Regrading[2]	SY	$ 1.50	7,260	$	10,890	
Geotextile Filter Layers[2]	SF	$ 1.00	65,000	$	65,000	
Crushed Rock[2]	SF	$ 1.30	65,000	$	84,500	
Final Soil Cover[2]	SF	$ 0.90	65,000	$	58,500	
Surface Water Management System[2]	LF	$ 20	1,600	$	32,000	
Passive Gas Collection System[2]	SF	$ 1.75	65,000	$	113,750	
Fine Grading & Revegetation[1]	SY	$ 1.00	7,260	$	7,260	
Final Landscaping[2]	LS	$ 20,000.00	1	$	20,000	Assume entire Site (1.5 acres).
Water for Compaction[1]	Day	$ 10	30	$	300	7,000 gal/day, $1. per 100 CF.
Estimated Duration[2]	Day		30			
Contractor & Misc. Overhead[3]			8%	$	31,376	
Permitting[3]			1%	$	3,922	
Engineering Design[3]			15%	$	58,830	
Construction CQA[3]			10%	$	39,220	
Contingency[3]			20%	$	78,440	
Subtotal				**$**	**603,988**	
Capital Costs Total				**$**	**3,779,618**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - PLUS (TCE > 110 mg/kg)

Operation and Maintenance Costs							
Routine Site Inspections[2]	Each	$	500	4	$	2,000	Cover Inspections performed quarterly.
Settlement Monitoring[2]	Each	$	750	1	$	750	
Air Quality Grid Monitoring[2]	Each	$	1,000	4	$	4,000	VOC emissions from cover.
Cover & Drainage System Repairs[2]	LS	$	10,000	1	$	10,000	Regrading, revegetation, concrete.
Annual Reporting[2]	Annually	$	15,000	1	$	15,000	
5 Year Status Report[2]	5 Yrs	$	20,000	0.2	$	4,000	
Annual O&M Contingency[2]				10%	$	3,575	
Subtotal					**$**	**39,325**	
ANNUAL O&M 30-YR NPV SUBTOTAL					**$**	**604,522**	5 % Discount rate
30 Year O&M SUBTOTAL					**$**	**1,179,750**	
TOTAL CAPITAL & 30-YR O&M Current $					**$**	**4,959,368**	
TOTAL CAPITAL & 30-YR O&M NPV					**$**	**4,384,139**	

[1] Cost based on Means guide
[2] Cost based on professional experience
[3] Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000
[4] Cost based on personal communication with vendor
[5] Cost based on estimate from vendor

Additional Assumptions

The Site soil weighs 1.4 tons per CY in place.
The soil bulking factor is 1.4.
The excavation will be performed 10 hours per day.

TABLE D-11
ESTIMATED COSTS
GROUNDWATER ALTERNATIVE G2 - IN-SITU CHEMICAL OXIDATION TRENCH

GROUNDWATER ALTERNATIVE G2:

- Installing an infiltration trench to the top of bedrock along the downgradient boundary of the Site.
- Depending upon the effectiveness of the trench along the downgradient boundary of the Site, installing an additional infiltration trench downgradient of the Site along a portion of Ocheltree Street (potential location as shown on Figure B4-1).
- Periodically recharging a batch solution of potassium permanganate into the trenches. The solution would then infiltrate into the surrounding saturated medium over time, oxidizing VOCs contained in groundwater. Potassium permanganate also would be recharged into the infiltration gallery(s) on-Site if installed as part of soil remedial alternatives S2B, S2C, S3B, or S3C.
- The common elements of the groundwater alternatives described in Section 6.5.2.

ITEM	Units	Unit ($)	Qnty	Extended ($)	Notes /Assumptions
General Costs (For Ocheltree Street Trench)					
Security[1]	Day	$ 216	20	$ 4,320	$9 per hour, 12 hrs per day (overnight), number of days from duration total.
Fencing[1]	LF	$ 24	500	$ 12,000	6 ft chain link fence w/ fabric; estimated length of 500 ft .
Gate[1]	Ea	$ 765	1	$ 765	12 ft wide swing gate.
Temporary Electrical Power[1]	HSF/Mo	$ 39	433	$ 16,900	Lighting and power for entire Site.
Health & safety - Air Monitoring[2]	Day	$ 1,500	20	$ 30,000	
Contractor & Misc. Overhead[3]			10%	$ 6,399	
Permitting[3]			1%	$ 640	
Engineering Design[3]			20%	$ 12,797	
Construction CQA[3]			15%	$ 9,598	
Contingency[3]			20%	$ 12,797	
Subtotal				**$ 106,215**	

TABLE D-11 (cont.)
ESTIMATED COSTS
GROUNDWATER ALTERNATIVE G2 - IN-SITU CHEMICAL OXIDATION TRENCH

Trench Costs						
On-Site Soil Excavation and Haul[1]	CY	$ 6.25	1030	$	6,438	Assumes 450 x 22 x 2 ft trench (no shoring required)
Off-Site Soil Excavation and Haul[1]	CY	$ 6.50	190	$	1,235	Assumes 100 x 18 x 2 ft trench (no shoring required)
Excavation dewatering[2]	Ea	$ 7,000	2	$	14,000	Assumes two sump pumps and conveyance to GAC treatment system and storage tank.
Dewatering storage tank (For Ocheltree Trench)[5]	Ea	$ 2,600	1	$	2,600	Assumes 1,000 gallon double wall storage tank.
Liquids Management[4]	Gal	$ 1.70	5,000	$	8,500	
Haul to Class A Facility[5]	CY	$ 63.00	1,220	$	76,860	20 CY trailer cap, 60% of total soil volume, 1.4 tons per CY in place, 800 mile round trip.
Class A Facility Disposal[5]	Ton	$ 60.00	1,220	$	73,200	1.4 tons per CY in place.
Soil Backfill, purchase and Deliver[1]	CY	$ 6.00	870	$	5,220	
Short haul, backfill[1]	CY	$ 2.00	870	$	1,740	Assumes backfill with excavated material; Dozer, 300 ft max.
Compaction[1]	CY	$ 0.75	870	$	653	Sheeps foot roller 6 in. lift, 2 pass.
Trench Plating[1]	Day	$ 150.00	20	$	3,000	
Geotextile Filter[2]	SF	$ 0.50	5500	$	2,750	Assumes 550 x 10 ft area.
Gravel Backfill[1]	CY	$ 25	64	$	1,600	Assumes 550 x 2 x 2 minus pipe volume.
Piping[5]	Ft	$ 12.00	720	$	8,640	20 ft lengths, includes piping for 8 surface cleanouts.
Couplers[5]	Ea	$ 80.00	27	$	2,160	
Tees[5]	Ea	$ 830.00	4	$	3,320	Assumes clean-outs at the ends of each trench.
90 Ell[5]	Ea	$ 610.00	4	$	2,440	Assumes clean-outs at the ends of each trench.
Piping Surface Completions[2]	Ea	$ 1,500.00	8	$	12,000	Assumes surface saw cut and access box at surface.
Surface Restoration for Trench[1]	SF	$ 24	200	$	4,800	Includes asphalt for off-Site trench.
Surface Restoration for Street[1]	LS	$ 2,500.00	1	$	2,500	Includes slurry coat of entire street
Soil Sampling & Testing[2]	LS	$ 10,000	1	$	10,000	
Potassium Permanganate Cost[2]	Gal	$ 1.10	12830	$	14,113	Assumes 5% permanganate by mass solution and fills pipe and 30% pore space of gravel.
Potassium Permanganate Delivery[2]	LS	$ 3,500.00	1	$	3,500	
Estimated duration[2]	Day		20			
Contractor & Misc. Overhead[3]			8%	$	20,901	
Permitting[3]			1%	$	2,613	
Engineering Design[3]			15%	$	39,190	
Construction CQA[3]			12%	$	31,352	
Contingency[3]			20%	$	52,254	
Subtotal				$	407,578	

TABLE D-11 (cont.)
ESTIMATED COSTS
GROUNDWATER ALTERNATIVE G2 - IN-SITU CHEMICAL OXIDATION TRENCH

Treatment Performance Monitoring Well Installation					
Utility Location[2]	Day	$ 1,400	2	$ 2,800	
Mob/Demob[2]	Day	$ 300.00	8	$ 2,400	
Drill and Install Well[2]	Ea	$ 1,650	12	$ 19,800	
Well Development[2]	Ea	$ 480	12	$ 5,760	4 hrs/well at $120/hr.
Haul to Class C Facility[5]	CY	$ 4.75	20	$ 95	20 CY trailer cap (1.4 bulking factor); 50 mile round trip.
Class C Facility Disposal[5]	Ton	$ 30.00	20	$ 600	1.4 tons per CY in place.
Laboratory - Soil[2]	Sample	$ 150.00	72	$ 10,800	VOC testing only.
Laboratory - Water[2]	Sample	$ 150.00	12	$ 1,800	VOC testing only.
Equipment[2]	Day	$ 200.00	8	$ 1,600	
Sampling Supplies[2]	Per well	$ 100.00	12	$ 1,200	
Contractor & Misc. Overhead[3]			10%	$ 4,686	
Permitting[3]			1%	$ 469	
Engineering Design[3]			20%	$ 9,371	
Construction CQA[3]			15%	$ 7,028	
Contingency[3]			20%	$ 9,371	
Subtotal				$ 77,779	
Other Capital Related Costs					
Vapor Control Systems Capital Cost Subtotal				$ 165,900	
Capital Costs Total				$ 757,472	

Operation and Maintenance Costs					
Treatment System O&M[2]	Yr	$12,000	1	$12,000	1,000 a month, labor & equipment.
Treatment System Rehabilitation[2]	Yr	$1,500	2	$3,000	$65/hr person, 8 hrs/day, for three days to address precipitate, check cleanouts, etc.
Chemical Dosing[2]	Yr	$17,600	2	$35,200	Assumes potassium permanganate refill and delivery to trench.
Reporting[2]	Yr	$7,500	4	$30,000	Assumes quarterly reporting.
Subtotal				$ 80,200	
Other O&M Related Costs					
Groundwater Monitoring Annual Total (see Table D13)				$ 170,479	
Treatment System Total Annual O&M Cost				$ 250,679	
Treatment System O&M Total 30 yr NPV				$ 3,853,551	Discount Rate = 5%
Treatment System 30 Yr Current				$ 7,520,370	
TOTAL CAPITAL & 30-YR O&M NPV				$ 4,611,023	
TOTAL CAPITAL & 30-YR O&M CURRENT				$ 8,277,842	

[1] Cost based on Means guide
[2] Cost based on professional experience
[3] Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000
[4] Cost based on personal communication with vendor
[5] Cost based on estimate from vendor