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Site: Chemical Commodities Olathe
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Break: 2.4
Other:
10-29-96

In reply refer to 96RC05840

October 29, 1996

Bruce A. Morrison
Environmental Engineer
US EPA
Environmental Services Group
726 Minnesota Avenue
Kansas City, Kansas 66101

Subject: Submittal of Engineering Evaluation/Cost Assessment (EECA) for the Chemical Commodities, Inc., Superfund Site, Olathe, Kansas

Dear Mr. Morrison:

Rockwell International Corporation (Rockwell) herein submits the Engineering Evaluation/Cost Assessment (EECA) for the Chemical Commodities, Inc. (CCI) site in Olathe, Kansas. This submittal completes Rockwell's obligations as defined in the October 12, 1996 Unilateral Administrative Order.

Rockwell is also in receipt of USEPA's letter dated September 6, 1996 regarding the Agency's position on cleanup goals at the CCI site and other site-related issues. Response to that letter is contained within the EECA.

If you have any questions regarding the issues discussed, please do not hesitate to contact me at (818) 586-6004

Sincerely,

Michael J. Sullivan, Ph.D.
Environmental Remediation

cc: w/encl. T. Waller - KDHE
J. Harte - Rockwell
N. Calton - Burlington Northern
R. Andrachek - GTI

FLUOR DANIEL GTI

ENGINEERING EVALUATION/COST ANALYSIS
FOR SOIL AND GROUNDWATER
FORMER CHEMICAL COMMODITIES, INC.
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OLATHE, JOHNSON COUNTY, KANSAS

Fluor Daniel GTI Project 022300193

October 29, 1996

Prepared For:
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22300193.EEA

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action has been prepared for the former Chemical Commodities, Inc. (CCI) site in Olathe, Kansas (Figures 1-1 and 1-2) by Fluor Daniel GTI, Inc. (Fluor Daniel GTI), on behalf of Rockwell International Corporation, Rocketdyne Division (Rockwell). The EE/CA has been prepared in response to the Unilateral Administrative Order (UAO) for Removal Response Activities, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Docket No. VII-95-F-0030 dated September 7, 1995, and amended on October 12, 1995. The UAO was issued by the United States Environmental Protection Agency (EPA) and listed Rockwell as the respondent.

An amendment to the UAO required Rockwell to submit an EE/CA analyzing the effectiveness, implementability, and cost of various removal alternatives to address soil and groundwater contamination at the site. The site was defined in the UAO as the Chemical Commodities, Inc. facility located at 300-320 South Blake Street in Olathe, Kansas. Submittal of this EE/CA fulfills the requirements of Section VII of the UAO, *Work To Be Performed*. The EE/CA has been prepared following the guidance contained in *Guidance for Conducting Non-Time-Critical Removal Actions Under CERCLA*, August 1993, EPA 540-R-93-057 (EPA 1993a).

Soil and shallow groundwater at the former CCI site have been impacted by a number of chemicals. The soil and shallow groundwater were characterized in 1995 and the results of the characterization were reported in the *Site Characterization Report* (SCR) (Groundwater Technology 1996). Soil is defined as the unconsolidated soil, both saturated and unsaturated, that is present above the bedrock. Shallow groundwater is defined as the groundwater encountered in the unconsolidated soil above the bedrock. The characterization showed that the surface soils (0-1 foot deep) contained elevated concentrations of volatile organic compounds (VOCs), pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and semivolatile organic compounds. Elevated concentrations of VOCs are present at depths greater than 7 feet below ground surface. The characterization also showed that shallow groundwater containing elevated concentrations of VOCs, including trichloroethene (TCE), tetrachloroethene (PCE), carbon tetrachloride and chloroform existed beneath the site.

The data presented in the *SCR* were used to evaluate the five factors that were identified in the UAO as constituting a potential threat to human health. The review indicated that only two of the five factors which substantiated a threat to public health and welfare were indeed present at the site. These two factors are listed below:

- actual or potential exposure to hazardous substances of nearby populations
- high levels of chemicals in soils largely at or near the surface, that may migrate

A baseline human health risk assessment (BHRA) was also completed as required by the UAO. The data generated during the site characterization served as the basis for completing the BHRA. The BHRA showed that risk to human health and public welfare from chemicals present at the site may exist above the acceptable range established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The potential risks are associated with dermal contact and ingestion of surface soils, inhalation of dust from surface soils and inhalation of VOC vapors from surface and subsurface soils, assuming future on-site land uses (*e.g.*, commercial or recreational). Evaluations of the shallow groundwater that were performed as part of the site characterization indicate that ingestion of, or direct exposure to, groundwater containing VOCs is not a complete exposure pathway since the groundwater is not being used for beneficial purposes and is highly unlikely to be used for such because of insufficient well yields. Indirect exposure to vapors emanating from groundwater may be a significant exposure concern for some potential future on-site uses.

The information contained in the BHRA was used to assist in establishing the goals and objectives for the removal action considered in this EE/CA. Five different human exposure scenarios were evaluated in the BHRA. These exposure scenarios included (1) the actual current land use, (2) current and future land uses based upon zoning, and (3) other potential land uses based upon surrounding land use. The only significant risks associated with the on-property area are from the current land use: inactive industrial land fenced and posted to prevent trespassing. Therefore, even though other land uses were considered, including the zoned land-use of commercial/industrial, the mitigation of risks associated with current land use has been selected as the focus of this EE/CA.

Once the land use was established, an exposure scenario that is consistent with the land use was chosen and the scope of the removal action more clearly defined. The site is vacant and access is restricted by a fence around the perimeter of the property. The only potential users of the property would be those populations which trespass onto the site from surrounding properties. Although a trespasser scenario was not evaluated in the BHRA, the recreational user exposure scenario was selected as equivalent to the trespasser scenario since the exposure conditions are similar but more conservative.

A removal action goal was developed once a reasonable exposure scenario was established. Following is the removal action goal for the CCI site:

- Implement a removal action which will result in reducing carcinogenic risk levels from approximately 1 in 1,000 to less than 1 in 10,000 for the recreational user exposure scenario.

A removal action objective was also established after further review of the site characterization data and the BHRA. The removal action objective to achieve the above-stated goal is as follows:

- Implement a removal action alternative which will eliminate or control exposure to the ingestion, inhalation and dermal contact with near surface soils containing PAHs, metals, pesticides and VOCs and inhalation of VOCs generated from subsurface soils.

After considering the various factors affecting the ability to accomplish the removal action objective, including the criteria set forth in Section 121 of CERCLA, containment of the surface soils was selected as the best removal action response, based on effectiveness, implementability, and cost.

Capping of the surface soils was chosen as the primary technology for isolating the surface soils from the recreational user. Furthermore, capping would also prove effective at reducing health risks for any of the exposure scenarios considered in the BHRA. Capping involves covering contaminated materials to prevent direct contact with receptors, control of the release of soil vapors, and reducing or limiting infiltration by surface water or rain water. Capping is also consistent with the removal actions that are identified in Section 300.415(d) of the NCP for abating the factors at the site which constitute a threat to human health, namely, actual or potential exposure to nearby populations from hazardous substances and high levels of chemicals in soils at or near the surface that may migrate. Three removal action alternatives were then identified and evaluated:

1. construction of a clay cap
2. construction of an asphalt concrete cap
3. construction of a multimedia cap

The recommended removal action alternative for achieving the removal action goal and objective is to construct and maintain an asphalt concrete (AC) cap over the complete site. An AC cap is recommended over a clay or multimedia cap for the following reasons:

- The AC cap provides better overall protection of human health and the environment over either the clay or multimedia cap. The AC cap provides better long-term effectiveness than the clay cap because it is more effective at controlling VOC vapor emissions from the surface soils. Also, the protection provided by the AC cap in controlling VOC emissions is equivalent to that afforded by the multimedia cap. The AC cap provides an advantage over the multimedia cap in the area of long-term effectiveness and permanence because it can be easily repaired and maintained. This is particularly important should additional subsurface investigations or remedial actions be necessary at the site.

- The AC cap provides cost advantages over the clay or multimedia cap in annual operating costs associated with maintaining the caps. This cost advantage equates to approximately $500,000 in savings over the 30-year life of the project.

- There is a slight disadvantage associated with the timing for constructing the AC cap (construction must be performed during the warm weather months) relative to the clay or multimedia cap. However, this disadvantage does not outweigh the advantages provided by the AC cap in overall protectiveness of human health and the environment.

Details of the EE/CA are provided in the following sections of this document.

GLOSSARY OF ABBREVIATIONS

AC	asphalt concrete
AKAL	Alternate Kansas Action Level
AKNL	Alternate Kansas Notification Level
ARARs	applicable or relevant and appropriate requirements
ASTs	Aboveground Storage Tanks
ATSDR	Agency of Toxic Substances and Disease Registry
bgs	Below Ground Surface
BHRA	Baseline Human Health Risk Assessment
CCI	Chemical Commodities, Inc.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
DDT	Dichlorodiphenyltrichloroethane
DNAPL	Dense Non-aqueous Phase Liquid
DQOs	Data Quality Objectives
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ft/ft	foot per foot
FWQC	federal water quality criteria
gpm	gallons per minute
KAL	Kansas Action Level
KAR	Kansas Administrative Regulations
KNL	Kansas Notification Level
MCL	maximum contaminant level
MCLGs	maximum contaminant level goals
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and Maintenance
OSWER	Office of Solid Waste Emergency Response
PAHs	Polycyclic Aromatic Hydrocarbons
PCE	Tetrachloroethene
PCBs	Polychlorinated Biphenyls
PRSCs	Post Removal Site Costs
PVC	polyvinyl chloride
SCR	Site Characterization Report
TBC	to be considered
TCE	Trichloroethene
TM	Technical Memorandum
UAO	Unilateral Administrative Order
USTs	Underground Storage Tanks
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
VOCs	Volatile Organic Compounds

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1.0 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action has been prepared for the former Chemical Commodities, Inc. (CCI) site in Olathe, Kansas (Figures 1-1 and 1-2) by Fluor Daniel GTI, Inc. (Fluor Daniel GTI) on behalf of Rockwell International Corporation, Rocketdyne Division (Rockwell). The EE/CA has been prepared in response to the Unilateral Administrative Order (UAO) for Removal Response Activities, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Docket No. VII-95-F-0030 dated September 7, 1995, and amended on October 12, 1995. The UAO was issued by the United States Environmental Protection Agency (EPA) and listed Rockwell as the respondent (EPA 1995a). Submittal of this EE/CA fulfills the requirements of Section VII of the UAO, *Work To Be Performed.* The EE/CA has been prepared following the guidance contained in *Guidance for Conducting Non-Time-Critical Removal Actions under CERCLA*, August 1993, EPA 540-R-93-057 (EPA 1993a).

1.1 UAO Requirement for EE/CA

The requirement for Rockwell to perform this EE/CA was established in the first amendment to the UAO dated October 12, 1995 (EPA 1995b). The first amendment to the UAO clarified the work which was to be performed by Rockwell at the CCI site. The amendment required Rockwell to submit an EE/CA analyzing the effectiveness, implementability, and cost of various removal alternatives to address soil and groundwater contamination at the site. The site was defined in the UAO as the Chemical Commodities, Inc. facility located at 300-320 South Blake Street in Olathe, Kansas.

The UAO also stated that certain environmental conditions were present at the site which constituted a threat to public health or welfare based on consideration of the following factors as set forth in the National Contingency Plan (NCP):

- actual or potential exposure to hazardous substances of nearby populations
- actual or potential contamination of drinking water supplies
- hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release
- high levels of lead in soils largely at or near the surface, that may migrate
- threat of fire or explosion

Other work, namely, the site characterization and baseline human health risk assessment, has been completed under the UAO. These reports have been utilized to focus the EE/CA toward implementing a removal action which is protective of the public health, i.e., will abate, prevent, minimize, stabilize, mitigate, or eliminate the environmental conditions which constitute a threat to the public health or welfare associated with the factors identified above.

1.2 Other Work Requirements Contained in UAO

The following work was also required by the UAO in addition to this EE/CA:

- A Field Sampling Plan and Quality Assurance Project Plan (Groundwater Technology 1995a) and Health and Safety Plan (Groundwater Technology 1995b) were to be prepared and submitted to the EPA Region 7.
- A Baseline Human Health Risk Assessment (BHRA) work plan (Groundwater Technology 1995c) and a BHRA report (Fluor Daniel GTI 1996a) were to be prepared and submitted. The BHRA report was to identify and characterize the actual and potential risks to human health posed by the chemicals in the soil and groundwater at the site.
- A Site Characterization Report (SCR) (Groundwater Technology 1996) was to be prepared and submitted to the EPA for review and approval. The SCR was to present information which characterized the lateral and vertical extent of various chemicals in soil and the lateral extent of impacted groundwater on the site. The SCR was also to include information on the geology and hydrogeology at and near the site.

All of these work elements have been completed.

1.3 Report Organization

As described above, Section 1 of the EE/CA identifies the requirement to perform the EE/CA and presents the definitions contained in the UAO which identity the site and the factors which constitute a threat to public health and welfare due to the environmental conditions present at the site. Section 2 provides a summary of the historical site activities and the results of the site characterization which was performed in 1995 and the baseline human health risk assessment. This summary is supported by additional descriptions which are incorporated as appendixes. Section 3 of the EE/CA provides the methodology which was used to establish the removal action objectives and presents the scope, goals and objectives for this removal action project. The identification and analysis of removal action alternatives are presented in Section 4. A comparative analysis of the removal action alternatives and the recommended removal action is presented in Section 5 . Section 6 contains a list of references which were used in preparing this EE/CA.

2.0 SITE CHARACTERIZATION

This section of the EE/CA provides background information on the site related to historical operations, regulatory agency involvement, and the physical characteristics of the site including the topography, geology and hydrogeology. A summary of the previous removal actions which were performed by the EPA is provided in this section, as well as the additional subsurface investigation work and baseline human health risk assessment.

2.1 Site Description and Background

The CCI facility is located at 320 South Blake Street (on the southwest quarter of the northeast quarter of Section 36, Range 23 East, Township 13 South), in the city of Olathe, Johnson County, Kansas (Figure 1-1). Olathe is a city of approximately 63,000 people and is the county seat of Johnson County. The facility occupies approximately 1.5 acres in the southeast portion of the city. Surrounding properties include the Burlington Northern Railroad to the east (some light industry and residences are east of the railroad); a vacant lot to the south; Keeler Street and residential areas to the west; and residences to the north. A warehouse measuring 100 feet long and 50 feet wide is the only building remaining on-site. A site map is presented on Figure 1-2.

The site is currently an inactive facility where chemical handling and storage practices in the past resulted in chemical releases that contaminated surface and subsurface soils, ambient air, and groundwater (Agency of Toxic Substances and Disease Registry [ATSDR] 1990).

2.1.1 Historical Operations

The former CCI facility began operation in Olathe in 1951. It was operated as a chemical recycling facility which bought and sold used, off-specification, and surplus chemicals of all types. CCI also operated an on-site still for the reclamation of spent solvents. Chemicals were stored using numerous methods including the following containers:

- aboveground storage tanks (ASTs): three with capacities of 14,915 gallons each; four with capacities of 10,000 gallons each; one with a capacity of 9,504 gallons; and one with a capacity of 1,000 gallons
- at least one tanker trailer with a capacity of 5,800 gallons
- underground storage tanks (USTs): one with a capacity of 4,000 gallons, one with a capacity of 1,000 gallons, and one UST of unknown capacity
- drums, barrels, boxes, sheds, and other miscellaneous containers not documented, or varying in size and description over the years of operation

2.1.2 Regulatory Involvement

Environmental inspection and investigation activities were initiated at the site in 1981 by the EPA after receiving complaints by local and state agencies regarding operations at the CCI facility. Inspection and investigation activities continued at the site through 1991.

2.1.3 Physical Characteristics of the Study Area

The surface features and regional geology and hydrogeology of the site are summarized in Appendix A.

The geology of the site consists of silt and clay ranging in total thickness from 12 to 22 feet. This interval is dominated by clay which typically comprises more than 75% of total thickness. Clay aquifers produce very little, if any, water and are not usually considered potential water sources. This is also true of the CCI site where monitoring well recharge rates suggest water yield below 0.1 gallons per minute (gpm). The clay is underlain by limestone and locally weathered shale, at 19 to 23 feet below grade. Limestone typically has low permeability. However, the limestone at this site is positioned near the base of the vadose zone where weathering can enlarge joints and fractures and increase vertical permeability. The actual degree of weathering cannot be determined without additional drilling.

In November 1995, the depth to the shallow aquifer beneath the site ranged from 15 to 20 feet below grade. At that time, the observed gradient ranged from 0.014 to 0.13 foot/foot (ft/ft) with a southwesterly direction.

2.2 Previous Removal Actions

Removal response actions were performed at the CCI site by the EPA in 1989 and 1991. The 1989 action consisted of the following activities:

- Removal and off-site disposal of several hundred drums and other containers which contained hazardous substances.
- Excavation and off-site disposal of approximately 300 tons of surface soil containing volatile organic compounds (VOCs).
- Relocation, consolidation and stockpiling of between 1,100 and 1,300 cubic yards of soil containing VOCs and leachable chromium. The stockpiled soil was covered with polyvinyl chloride (PVC) sheeting and two feet of clean soil.

The removal action taken in 1991 consisted of the installation of an interceptor/recovery trench to collect groundwater and dense non-aqueous phase liquid (DNAPL) and a treatment system to treat the extracted groundwater.

The scope of the removal action being addressed by this EE/CA does not include addressing any of the environmental conditions associated with the previous removal actions described above, since the threat to public health and welfare which existed prior to implementation of these removal actions has been abated.

2.3 Additional Investigations Performed as Part of Site Characterization

A Site Characterization work plan was prepared and submitted by Fluor Daniel GTI, on behalf of Rockwell and subsequently approved for implementation by the EPA. The objectives of the additional site characterization are listed below:

- further define the physical characteristics of the site
- evaluate the horizontal and vertical extent of chemicals in soil and groundwater
- define the depth to groundwater and the flow gradient across the site
- identify potential source areas
- identify potential human receptors
- collect data to complete the baseline risk assessment

The site characterization was completed in 1995 and the results documented in the SCR (Groundwater Technology 1996). All of the objectives which were established for the site characterization were met.

The soil was characterized during the installation of 51 soil borings. Soil is defined as the unconsolidated soil, both saturated and unsaturated, that is present above the bedrock. Twelve of the borings were hand-augured and the remainder were installed by hollow-stem auger drilling methods. Soil samples were collected at a specified frequency and analyzed for VOCs, pesticides, polycyclic aromatic hydrocarbons (PAHs), semi-volatile organic compounds and polychlorinated biphenyls (PCBs) and metals. The results of the soil sampling showed that the surface soils (0-1 foot deep) contained VOCs, pesticides, PCBs, PAHs and semivolatile organic compounds at elevated concentrations and VOCs at depths of 7.5 feet and deeper.

The shallow groundwater was characterized through the installation of 15 additional monitoring wells and the collection and analysis of groundwater samples from 16 monitoring wells. Shallow groundwater is defined as the groundwater encountered in the unconsolidated soil above the bedrock. The groundwater samples were analyzed for VOCs by EPA Method 8260. The results of the groundwater sampling event showed that elevated concentrations of VOCs, including trichloroethene (TCE), tetrachloroethene (PCE), carbon tetrachloride, and chloroform, existed throughout the site.

Work was also performed to characterize the soil vapors in the subsurface and at the surface. Characterization of the soil vapors was completed by a soil gas survey. Soil gas samples were collected at specified depths at three locations. Soil vapors at the surface were characterized by completing a soil vapor flux study. Soil vapor flux samples were collected at six locations. The sampling locations for the subsurface soil vapor study and soil vapor flux study were co-located with soil sample locations so that a correlation could be developed between concentrations of VOCs in soil, soil gas, and soil vapor flux at the ground surface.

A summary of the site characterization work is provided in Appendix B. The SCR contains a detailed description of all of the previously mentioned work.

2.4 Summary of Baseline Human Health Risk

A Baseline Human Health Risk Assessment (BHRA) (Fluor Daniel GTI 1996b) was also completed as required in the UAO. The executive summary from the BHRA is provided in Appendix C. The risk assessment methodology was described in a Technical Memorandum (TM) that was submitted and approved by the EPA Region 7 (Groundwater Technology 1995c). The objective of the TM was to present the data quality objectives (DQOs), the assumptions, and the statistical uncertainties of the BHRA. By establishing the DQOs in the TM, data of sufficient quality and quantity were collected in the site characterization phase so that the BHRA would be valid and defensible.

The BHRA is based on data collected during the 1995 site characterization investigations. Data collected prior to this date were used to guide removal actions conducted at the CCI facility in 1989 and 1991 (Jacobs Engineering Group 1995) and do not reflect current conditions; therefore, this information was not included in the BHRA.

The objective of the BHRA was to evaluate the magnitude of the risks/hazards to human health caused by contaminants present at the facility. The assessment is premised on the baseline conditions of the site and on the current and projected land use. Risks were evaluated quantitatively for the identified chemicals of potential concern (COPC) in designated exposure areas referred to as near-property and on-property. Near-property refers to adjacent areas that may have been impacted by CCI operations. On-property refers to areas where CCI operations took place.

The potential receptors which were evaluated in the BHRA are listed below:

- current and future near-property resident
- future on-property resident
- future on-property commercial worker
- future on-property recreational user
- future on-property construction worker

An additional exposure scenario which was considered but not evaluated is the trespasser scenario. The trespasser scenario was not evaluated because the exposure conditions of a recreational user represent a similar, but somewhat greater exposure scenario. Therefore, the risk characterization for the recreational user is deemed applicable to the trespasser.

The groundwater is not a current source of water supply and will not be a likely source of water supply in the future. Thus, exposure to groundwater COPC through inhalation of volatiles that may intrude into potential homes or buildings was the only groundwater-related pathway evaluated for the on-property resident and the on-property commercial worker.

The estimated cancer and noncancer risks posed by chemicals at the site to the different receptors are listed in Table 2-1.

3.0 REMOVAL ACTION SCOPE, GOALS AND OBJECTIVES

The Guidance for Conducting Non-Time-Critical Removal Actions under CERCLA stresses the importance of establishing the proper scope, goals and objectives for a removal action. The scope of the removal action for the CCI site was defined in the UAO. As stated in Section 1.1 of this report, the scope of this EE/CA is to analyze the effectiveness, implementability and cost of various removal alternatives to address soil and groundwater contamination at the site.

3.1 Removal Action Goals and Objectives

Since the scope of the EE/CA is fairly broad, the data which were collected during the site characterization work and analyzed in the BHRA was reviewed to establish a more specific goal for the removal action, which in turn would allow for the development of specific objectives that could be implemented to achieve the goal. A methodology was utilized which directed the development of the goal and objective for this removal action. The methodology is described below.

Step 1 - Review the requirements established in the UAO for the removal action and preparation of the EE/CA

The UAO provided definitions and clarifications regarding the scope of the removal actions which were to be implemented. The UAO defined the site, described the environmental media for which the removal actions were to be completed, identified the factors which EPA determined may present a potential threat to human health and described the requirements for this EE/CA. These definitions and descriptions have been discussed in prior sections of this report.

Step 2 - Review the environmental conditions present at the site subsequent to the completion of the site characterization work

The environmental conditions at the site were reviewed to develop a better understanding of the distribution, extent and concentrations of chemicals in soil and groundwater. The SCR showed which chemicals and groups of chemicals were the most broadly distributed.

The data presented in the SCR were also evaluated against the five factors identified in the UAO as constituting a potential threat to human health. As mentioned in Section 1.1, the five factors are:

- actual or potential exposure to hazardous substances of nearby populations
- actual or potential contamination of drinking water supplies
- hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release
- high levels of lead in soils largely at or near the surface, that may migrate
- threat of fire or explosion

An analysis of each of the five factors against the site conditions is provided below.

1. **Actual or potential exposure to hazardous substances:** The chemicals present in the soil and groundwater at the site are hazardous substances. The chemicals are present in surface soils at concentrations which, as quantified in the baseline human health risk assessment, could potentially expose nearby populations to elevated health risks through direct contact or inhalation. Therefore, site conditions show that this factor does substantiate a potential threat to public health and welfare.

2. **Actual or potential contamination of drinking water supplies:** According to conversations with representatives of the City of Olathe (personal communication with Mr. David Breeze), there are no groundwater wells within one mile of the site which are used for municipal water supply or domestic or industrial use. Drinking water supplies are provided by surface water stored in reservoirs and the closest known groundwater water supply used for drinking water is located nine miles from the site along the Kansas River. Also, the groundwater investigated at the site lies within 20 feet of the surface. These investigations have shown that VOCs are present in the aquifer. Some are present as DNAPL. The thickness of the aquifer is between 3 and 5 feet. The aquifer consists of clay with very low hydraulic conductivities (10^{-3} to 10^{-6} gallons per day per square foot). These conditions would likely generate well yields below 0.1 gpm, thus providing insufficient water supply for any beneficial purpose. Therefore, the site characterization work shows that there is no actual or potential threat to drinking water supplies posed by the chemicals in groundwater at the site.

3. **Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release:** Previous removal action work completed by the EPA in 1989 included the removal of these potential threats from the site. Therefore, removal actions associated with abating potential threats to human health and welfare associated with this factor are not warranted.

4. **High levels of lead in soils largely at or near the surface that may migrate:** The site characterization and baseline human health risk assessment work has shown that there are a number of chemicals in the surface soils that may migrate and could potentially expose people who enter the site through direct contact and/or inhalation. A removal action to eliminate or abate this condition is appropriate.

5. **Threat of fire or explosion:** There were no conditions discovered during the site characterization work which could yield a possible threat of fire or explosion. Hence, implementing a removal action to abate this threat is not necessary.

A summary of the five factors that could constitute a threat to human health and the environment compared with the current environmental conditions at the site is provided in Table 3-1.

As discussed above and as shown in the table, only two of the five factors identified in the UAO substantiate a potential threat to human health. These two factors are:

1. actual or potential exposure to hazardous substances of nearby populations
2. high levels of chemicals in soils largely at or near the surface, that may migrate

Step 3 - Review the current and future health risks posed by site chemicals to the various receptor groups as presented in the baseline human health risk assessment

The baseline human health risk assessment report was reviewed to develop an accurate understanding as to which chemicals presented the most significant risks to the five receptor groups evaluated in the BHRA. This information was presented in the BHRA. Once the chemicals which presented the most risk were identified, the exposure pathways were reviewed so that any removal actions which would be implemented would control risks posed by these pathways.

Step 4 - Review EPA guidance on the role of the baseline risk assessment in developing removal action alternatives and supporting risk management decisions

A memorandum issued by the EPA Office of Solid Waste Emergency Response (OSWER), Directive 9355.0-30 (EPA 1991), defined the role of the baseline risk assessment in developing Superfund remedial alternatives and supporting risk management decisions. The memorandum states that action generally is not warranted when the cumulative carcinogenic site risk to an individual based on a reasonable maximum exposure for both current and future land use is less than 1 in 10,000, and the noncarcinogenic hazard quotient is less than 1. "A specific risk estimate of approximately 1 in 10,000 may be considered acceptable if supported by site-specific conditions, including any remaining uncertainties on the nature and extent of contamination and associated risks. Therefore, in certain cases the EPA may consider risk estimates slightly greater than 1 in 10,000 to be protective" (EPA 1991).

This guidance was used to determine if a cumulative carcinogenic risk of greater than 1 in 10,000 or a noncarcinogenic hazard index greater than 1 occurred for the evaluated exposure scenarios. A summary of both the carcinogenic and noncarcinogenic risks was previously presented in Table 2-1.

Carcinogenic risks are present at the site which exceed 1 in 10,000.

Step 5 - Establish a reasonable exposure scenario based on historic and current land use and establish a removal action goal.

Five different human exposure scenarios were evaluated in the BHRA. These exposure scenarios included (1) the actual current land use, (2) current and future land uses based upon zoning, and (3) other potential land uses based upon surrounding land use. The only significant risks associated with the on-property area are from the current land use: inactive industrial land fenced and posted to prevent trespassing. Although portions of the northern and western boundaries of the site are bordered by residents, other portions of the site are bordered by properties used for commercial or industrial purposes (former nursery to the south, railroad and vacant land to the east, and former industrial operations to the north). Inquiries regarding the City of Olathe's current zoning of the property indicates that the site is zoned M-2, General Industrial District. An M-2 property is "intended to provide for the development of a wide variety of light industrial uses, including warehousing, manufacture, and assembly." The City also indicated that rezoning the property for residential use would require submittal of a development plan and a ruling by the planning department. Therefore, even though other land uses were considered, including the zoned land-use of commercial/industrial, the mitigation of current human health risks has been selected as the focus of this EE/CA.

Once the land use was established, an exposure scenario that is consistent with the land use could be chosen and the scope of the removal action more clearly defined. The site is vacant and access is restricted by a fence around the perimeter of the property. The only users of the property then would be those populations which trespass onto the site from surrounding properties. The exposure scenario modeled in the BHRA which most closely represents current site conditions is the recreational user. As stated in Section 2.4, the recreational user exposure scenario is equivalent to the trespasser scenario since the exposure conditions are similar but more conservative than a trespasser scenario.

A removal action goal was able to be developed once the review of the BHRA was completed and a reasonable exposure scenario established. The removal action goal for the CCI site is as follows:

- Implement a removal action which will result in reducing carcinogenic risk levels from approximately 1 in 1,000 to less than 1 in 10,000 for the recreational user exposure scenario.

Step 6 - Determine the location, concentration and distribution of the site chemicals which present elevated health risks under the selected exposure scenario

The BHRA presented proposed cleanup levels for each of the exposure scenarios modeled. Since the recreational user exposure scenario was chosen for this removal action, the chemical-specific cleanup levels were reviewed and evaluated. The chemical-specific cleanup levels for the recreational user scenario are summarized in Table 3-2.

This information was then used to determine the occurrence and lateral and vertical distribution of these chemicals at the site. Figures 3-1 and 3-2 present the distribution and concentrations of the chemicals which exceed the cleanup levels at a depth of 0.5 foot and 7.5 feet, respectively. The following observations can be made regarding the types, frequencies, and distribution of the chemicals:

- PAHs, mainly benzo-a-pyrene, are the most widely distributed chemicals exceeding the cleanup levels at the 0.5 foot depth. The PAHs are distributed at concentrations exceeding the cleanup levels throughout most of the site.

- Arsenic and 4,4'-dichlorodiphenyl dichloroethane are also present at the 0.5 foot depth in concentrations which exceed the cleanup levels.

- Three VOCs are present at the 0.5 foot depth in concentrations which exceed the cleanup levels. Vinyl chloride concentrations were not posted on the figures because the cleanup level is below the analytical method detection limit established during the site characterization work.

- VOCs are the only chemicals exceeding the cleanup levels at the 7.5 feet depth, except at two locations where PAHs exceed the cleanup levels.

The information presented in these figures was also used in developing the removal action objectives and alternatives which are presented in subsequent sections of this EE/CA.

Step 7 - Determine the exposure pathways which create elevated health risks and establish removal action objective

The BHRA was further reviewed to identify the exposure pathways which resulted in the elevated health risks to the recreational user. The following exposure pathways were identified as part of this review:

- ingestion of soil containing site chemicals
- inhalation of dust containing site chemicals
- inhalation of VOCs generated at the surface and subsurface
- dermal contact with soil containing site chemicals

The removal action for the site was then developed to control each of the exposure pathways identified above. The removal action objective which has been established for this EE/CA is as follows:

Implement a removal action alternative which will eliminate or control exposure to the ingestion, inhalation and dermal contact with near surface soils containing PAHs, metals, pesticides and VOCs and inhalation of VOCs generated from surface and subsurface soils.

3.2 Other Removal Action Objectives Considered

Two other removal action objectives were considered but were not retained as part of this EE/CA. The two objectives which were considered but not retained are described below:

1. implement a removal action alternative which will prevent the further off-site migration of VOCs in the subsurface soil

2. implement a removal action alternative which will prevent the further off-site migration of VOCs in the groundwater

Neither of these two alternatives was retained as part of this removal action because the results of the human health risk assessment demonstrate the following:

1. Preventing further migration of VOCs in the subsurface is not warranted because concentrations contained in subsurface soil at the property line do not produce concentrations at the ground surface (which an exposed population could inhale) that will result in carcinogenic risks exceeding the 1 in 1,000,000 level.

2. Preventing further migration of groundwater containing VOCs is not warranted because the shallow groundwater at the site is currently not being used for domestic or industrial purposes and is not likely to be used in the future, therefore there is no complete exposure pathway for ingestion of groundwater. Also, the concentrations of VOCs in groundwater at the downgradient property boundary are not high enough to produce VOC concentrations at the ground surface (which an exposed population could inhale) that will result in carcinogenic risks exceeding the 1 in 1,000,000 level.

This conclusion is further summarized in Table 3-3.

3.3 Identification of Applicable or Relevant and Appropriate Requirements

The purpose of this section is to identify the applicable or relevant and appropriate requirements (ARARs) which will govern removal action implementation at the CCI site. Most of this information has been previously transmitted to the EPA in the *Draft Technical Memorandum on Identification of Applicable or Relevant and Appropriate Requirements* (Fluor Daniel GTI 1996c). The NCP requires compliance with federal and state environmental laws that are legally applicable or are relevant and appropriate to the extent practicable considering the scope of the removal action. Evaluation and selection of the removal action alternatives in the EE/CA will include an analysis of the proposed action's ability to comply with the identified ARARs. In addition, relative costs and the implementability of a removal action alternative will depend, in part, on the ARARs, which may specify substantive permit requirements; air, soil, or groundwater treatment standards; monitoring requirements; or waste treatment or land disposal restrictions.

3.3.1 Definition of ARARs

Applicable requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site (EPA 1988).

Relevant and appropriate requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria or limitations promulgated under federal or state law that, while not legally applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the site such that their use is well-suited to the particular site (EPA 1988).

When the analysis shows that a requirement is both relevant and appropriate, it must be complied with to the same degree as if it were applicable (EPA 1988) for implementation of a removal action. For on-site removal actions, the NCP requires attainment of ARARs to the extent practicable. The NCP specifies eight factors to be used in evaluating whether a requirement is relevant and appropriate. The factors are used to determine if the requirement is addressing a problem or situation that is sufficiently similar to the proposed remedial action (relevant) and also whether the requirement is applicable to the site (appropriate). This evaluation ensures that a requirement that is determined to be relevant is also determined to be appropriate and therefore is qualified as an ARAR. The ARAR provision in CERCLA addresses only on-site actions. Section 121(e) exempts on-site actions from having to obtain federal, state, and local permits.

An additional factor to consider in evaluating requirements for compliance is whether the requirement is administrative or substantive. Substantive requirements are those requirements that pertain directly to actions or conditions in the environment; administrative requirements are those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation. On-site CERCLA response actions must comply with substantive requirements of other environmental laws, but not administrative requirements. Substantive requirements include cleanup standards or levels of control. Administrative requirements include procedures such as fees, permitting, inspection, and reporting. Off-site actions must comply not only with requirements that are legally applicable, but must comply as well with both the substantive and administrative parts of those requirements.

Proposed standards and nonpromulgated criteria, advisories, and/or guidance documents issued by either state or federal agencies are not considered ARARs. These nonpromulgated criteria, advisories, and/or guidance documents may be classified as "to be considered" (TBC) when no specific ARARs exist for a chemical or when ARARs are not sufficiently protective of human health and environment. TBCs are not enforceable; therefore, identification of and compliance with TBCs are not mandatory. TBCs may be used to interpret ARARs or determine cleanup levels that are protective of human health and environment.

ARARs can be placed into three categories: chemical-specific, location-specific, and action-specific. The definition of each type is given below.

- **Chemical-specific requirements** are usually established numerical standards that represent an acceptable amount or concentration in the environmental medium of concern (groundwater, surface water, soil, or air). If a chemical has more than one standard, the more stringent standard is used as the appropriate ARAR.

- **Location-specific requirements** are limitations on allowable concentrations of hazardous substances or on activities solely because they may impact special locations including fragile ecosystems, flood plains, wetlands, or historic designations.

- **Action-specific requirements** are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. The requirements are triggered not by the specific chemicals present at a site but rather by the particular remedial activities that are selected.

3.3.2 Applicable or Relevant and Appropriate Requirement Identification

The following sections detail the potential chemical-specific, location-specific, and action-specific ARARs and TBCs. The potential ARARs and TBCs are grouped by ARAR designation (chemical, location, and action, with identification of both potential state and federal ARARs under each category).

Tables 3-4 through 3-7 summarize the potential ARARs by type. Table 3-4 summarizes potential chemical-specific ARARs. Table 3-5 summarizes potential location-specific ARARs. Table 3-6 summarizes potential federal action-specific ARARs, and Table 3-7 summarizes potential state action-specific ARARs.

3.3.2.1 Potential Chemical-Specific ARARs. Potential federal and state chemical-specific requirements are described in this subsection, and summarized in Table 3-4. Although there are several potential ARARs, none of the potential requirements are deemed applicable or relevant and appropriate for removal action implementation at the CCI site. Because no chemical-specific ARARs exist for soil or the shallow groundwater, chemical-specific cleanup levels, which were calculated in the BHRA, will be used to evaluate the removal action alternatives.

3.3.2.2 Potential Federal Chemical-Specific Requirements and TBCs. The Safe Drinking Water Act (42 USC 300C[E]) authorizes promulgation of maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) for both primary and secondary drinking water standards. MCLs are enforceable standards for contaminants in public drinking water supply systems. They not only consider health factors, but also the economic and technical feasibility of removing a contaminant from a water supply system.

CERCLA states that MCLs are cleanup standards for groundwater when it is determined to be a current or potential source of drinking water and if the MCLs are relevant and appropriate. The thickness of the shallow groundwater zone is between 3 feet and 5 feet. The shallow groundwater is contained in tight clays that exhibit very low hydraulic conductivities (10^{-3} to 10^{-6} gallons per day per square foot). These conditions would likely generate well yields of below 0.1 gpm and hence would not provide sufficient water supply for any beneficial purpose, including a potential source of drinking water. Therefore, MCLs and MCLGs are not ARARs at the CCI site.

Furthermore, due to the presence of DNAPL beneath the site, it is highly unlikely that the dissolved VOC concentrations can be reduced below the MCLs. Several technical documents developed by EPA and the regulated community discuss the impracticability of aquifer restoration when DNAPLs are present (*Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration,* EPA, September 1993, OSWER Directive 9234.2-25 and *Alternatives for Ground Water Cleanup,* National Research Council, 1994). Therefore, in addition to low well yields, establishing MCLs as cleanup goals for groundwater beneath the site appears to be inconsistent with current technical approaches for dealing with groundwater containing DNAPLs.

***3.3.2.3 Potential State Chemical-Specific Requirements and TBCs*.** Potential state chemical-specific ARARs include the following (see also Table 3-4):

Kansas Surface Water Quality Standards (Kansas Administrative Regulations [KAR 28-16-28b]): These water quality standards shall be applied to situations in which minimum treatment requirements described in KAR 28-16-28c are not adequate. These are not ARARs for this action because no surface water is impacted.

Groundwater Contaminant Cleanup Target Concentrations, Kansas Department of Health And Environment, Bureau of Water Protection: The purpose of these cleanup criteria is to provide a perspective on the relative health significance of various chemicals. The established Kansas Notification Level/Kansas Action Level (KNL/KAL) and Alternate Kansas Action Level/Alternate Kansas Notification Level (AKAL/AKNL) for a specific chemical reflect the scientific judgement on the health effects of that particular chemical. Other factors, such as natural occurrence and feasible treatment technologies of a chemical, must be taken into consideration in determining the appropriate cleanup target in response to a groundwater contamination incident. Since the shallow groundwater is not considered to be a current or future drinking water source, these are not ARARs for any removal action for the CCI site.

Criteria Development Guidance (KAR 28-16-28e): The development of surface water quality criteria for substances not listed in these standards shall be guided by water quality criteria published by the Environmental Protection Agency, including the primary and secondary drinking water regulations found at 40 CFR 141 promulgated pursuant to the Clean Water Act. When the department finds the criteria listed in these standards under-protective or overprotective for a given surface water segment, the department may in accordance with Kansas Administrative Regulations develop and apply appropriate site-specific criteria. These are not ARARs for any removal action at the CCI site because no surface water is impacted.

3.3.2.4 Potential Location-Specific Requirements. Location-specific ARARs are used to protect sensitive locations, such as wetlands, historical places, flood plains, or sensitive habitats. These ARARs may restrict the concentration of a hazardous substance that may be disposed of in the location or may restrict or regulate the types of remedial activities that can be performed in the location.

Table 3-5 lists the potential federal and state location-specific ARARs for the CCI site. The table includes the citation for the ARAR, a description, whether the ARAR is applicable or relevant and appropriate, and an explanatory comment. No location-specific requirements were determined to be ARARs for removal action implementation at the CCI site.

3.3.2.5 Potential Action-Specific Requirements. Action-specific requirements are not established for a specific contaminant, but rather by the activities that are selected to accomplish a removal action. They may establish performance levels, actions, or technologies as well as specific levels for discharged or residual contaminants. A discussion of both the federal and state action-specific ARARs is presented in Appendix D. Table 3-6 lists the potential federal action-specific ARARs for the CCI site, and Table 3-7 lists the potential state action-specific ARARs. The action-specific ARARs for each alternative will vary, depending on the technologies employed to meet the removal action objectives.

3.3.3 Summary of ARAR Identification.

No potential chemical-specific or location-specific requirements are ARARs for a removal action at the CCI site. Site and chemical specific cleanup levels developed in the BHRA, will be used to evaluate each removal action alternative evaluated in the EE/CA, with respect to the alternative's ability to achieve the removal action objectives. Action-specific ARARs were identified for the CCI site, which may be applicable or relevant and appropriate, depending upon the actual technology selected as the removal action alternative. The evaluation of each removal alternative's compliance with ARARs is described in Section 4.0.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Any removal action alternative that is to be considered and evaluated as part of this EE/CA must accomplish the removal action objective which was established in Section 3.1. The alternative must be effective at controlling, eliminating or isolating the surface soils containing PAHs, metals, pesticides and VOCs from dermal contact, inhalation and ingestion. Information from the following sources was used to develop the list of removal action alternatives which were considered for the CCI site:

- The applicable removal actions identified in Section 300.415(d) of the NCP (Title 40 of the Code of Federal Regulations [CFR]). This section of the NCP identified nine removal actions that may be appropriate depending upon the conditions encountered at the specific site for which the removal action is being considered.

- EPA guidance provided in *Presumptive Remedies: Site Characterization and Technology Selection For CERCLA Sites With Volatile Organic Compounds in Soils* (EPA 1993b). The presumptive remedies guidance was used to determine if the three technologies for sites containing VOCs in soil (soil vapor extraction, thermal desportion, and incineration) were applicable to the CCI site.

- The *Draft Technical Memorandum on Identification of Removal Action Alternatives* (Fluor Daniel GTI 1996a). The draft TM on removal action alternatives was a preliminary analysis of alternatives which may have been applicable to this EE/CA. This preliminary draft TM identified alternatives for soil and shallow groundwater which were to be reconsidered after the goals and objectives for the removal action had been established.

Four general response actions were considered in establishing the removal action alternatives that would be capable of achieving the project objective. The four general response actions considered are:

1. Containment
   Containment would provide a means of isolating the surface soils from the three exposure pathways which resulted in the elevated health risks.

2. Excavation
   Excavation of the surface soils would result in the physical movement of the soils containing concentrations of chemicals exceeding the cleanup levels and would be followed by implementation of one or both of the general response actions identified below.

3. Treatment
   This general response action would be applied to surface soils to remove or reduce the mobility of chemicals exceeding the cleanup levels. The different technologies which could be utilized for treatment of the surface soils include: incineration, thermal desorption, vapor extraction, bioremediation and soil washing. Treatment of the soil could either be performed *ex situ* or *in situ* depending on the technology(ies) which could be applied.

4. Disposal
   Disposal of the soil could occur either on-site or off-site depending upon the ability to construct an on-site disposal cell and the availability of off-site waste disposal facilities, in addition to other factors.

An evaluation of each of these general response actions against the conditions encountered at the site was performed in an effort to focus and identify the removal action alternatives that would be most effective at achieving the removal action objective. This evaluation is presented below.

1. Containment
Containment of the surface soils containing chemicals in concentrations exceeding the proposed clean-up levels, most likely through the application of a cap, would result in isolating the soils from the recreational user from the dermal contact, ingestion and inhalation exposure pathways. Additionally, containment of the surface soils would be protective of other exposure scenarios evaluated in the BHRA. The use of a cap to contain the surface soils is consistent with the removal actions identified in 40 CFR 300.415(d). Containment would be effective at isolating each and all of the different chemical groups from the exposed populations and would also most likely be consistent with any long term remedial action to be implemented at the site. Containment of the surface soils would eliminate any potential off-site transport of sediments containing site chemicals due to stormwater runoff. A cap would also prevent further rainwater infiltration and transport of VOCs to the groundwater. A similar response action had previously been implemented at the site by EPA in 1989.

2. Excavation:
Excavation would be effective at removing the surface soils containing chemicals at concentrations exceeding the clean-up levels thus eliminating the direct contact exposure pathways from the recreational user. A similar response had been implemented by EPA in 1989, which resulted in the excavation and stockpiling of surface soils which were subsequently capped. The vertical control on the excavation of the surface soils would be unknown since current site data shows that chemicals exceed the proposed clean-up levels at a depth of 6" below ground surface (bgs), but the vertical extent below this depth is unknown since the next depth at which data was collected was 7.5 feet bgs. Excavation would have to be combined with one or more of the other general response actions mentioned here. At a minimum, excavation would have to be coupled with either treatment or containment to control exposure to VOCs through inhalation, and/or disposal to control exposure via direct contact to PAHs, pesticides and metals.

3. Treatment:
Treatment of the surface soils would most likely have to be performed *ex situ* due to the physical characteristics of the chemicals contained in the soil. Therefore, this general response action would have to be coupled with excavation to prove effective. Similar barriers would have to be overcome regarding the depth of excavation and the resultant volume of soils which would require treatment. Treatment of the surface soils would be quite complex to implement due to the various physical characteristics of the chemicals contained in the soil. Different treatment technologies would be required to treat the PAHs, VOCs, metals and pesticides, thus requiring the establishment of a treatment train consisting of at least two technologies, one for treating the organics (PAHs, pesticides and VOCs) and one for treating the inorganics (arsenic). Also, thermal treatment of surface soils containing organics could result in the inadvertent production of dioxins, resulting in greater health risk than that posed by current environmental conditions at the site.

4. Disposal:
   The general response action of disposal would be implemented in conjunction with excavation and possibly treatment. Disposal of the surface soils on-site would require the design and construction of a disposal cell and may require pre-treatment of the soil prior to placement in the cell in order to comply with land disposal restrictions. Disposal off-site at a permitted waste disposal facility would also be possible and may also require pre-treatment at the facility to comply with land disposal restrictions. Disposal of the surface soils would be effective at controlling the direct contact exposure pathways. Excavation and disposal of the surface soils would present similar problems as identified above under the evaluation of the excavation scenario, e.g the depth of excavation, volume of soils requiring treatment and additional control through the placement of a cap to eliminate the potential inhalation of VOCs.

After considering the various factors affecting the ability to accomplish the removal action objective, containment of the surface soils was retained as being the most effective removal action response. Table 4-1 provides a summary of each of the general response actions considered.

4.1 Identification of Removal Action Alternatives

A number of removal action alternatives are available for containment of the surface soils. Capping of the surface soils is the primary technology for isolating the surface soils from the recreational user. Furthermore, capping would also prove effective at reducing health risks for any of the exposure scenarios considered in the BHRA. Capping involves covering contaminated materials to prevent direct contact with receptors, control of the release of soil vapors, and reducing or limiting infiltration by surface water or rain water. Capping is also consistent with the removal actions that are identified in 40 CFR 300.415(d) for abating the factors at the site which constitute a threat to human health, namely; actual or potential exposure to nearby populations from hazardous substances and, high levels of chemicals in soils at or near the surface that may migrate. The area of the site over which the cap would be placed is shown in Figure 4-1. The soils beneath the warehouse located on the site would also be included in the capping of the site once the warehouse is demolished and the concrete floor removed. Descriptions of the different types of caps that can be placed over the surface soils are provided below.

- Clay (organic) cap: The application of a clay cap at the former CCI site would consist of regrading and compacting the existing surface soils, application of a 1 foot thick layer of clay and/or engineered clay mix (conductivity of less than 1×10^{-7} cm/sec), overlain by a 6 inch layer of a granular drainage material to enhance the movement of surface waters, overlain by a 6-inch-thick vegetative cover to aid in preventing erosion. The use of a clay cap would be technically feasible for the CCI site and will be retained as a removal action alternative in this EE/CA. A cross section of a clay cap is shown in Figure 4-2

- Asphalt concrete (AC) cap: The installation of an AC cap over the surface soils would consist of regrading of some areas of the site, placement of a crushed rock base to support the AC and then placement of the asphalt concrete. The application of an asphalt concrete cap is easily implementable and will be retained as a removal action alternative. A cross section of the AC cap is shown in Figure 4-3.

- Multimedia cap: The use of a multimedia cap would consist of a drainage layer covering the present soil surface, overlain by a 1 foot layer of clay, overlain by a synthetic membrane, overlain by a 6-inch drainage layer to assist in the movement of surface water, overlain by a geotextile liner, overlain by vegetative cover to aid in preventing erosion. The use of a multimedia cap is technically feasible and will be retained as a removal action alternative. A cross section of the multimedia cap is shown in Figure 4-4.

The application of a cap at the former CCI site will require regrading of the surface to ensure proper drainage of stormwater runoff and to reduce the potential for erosion, resulting in a longer life and improved integrity of the cap. The current site topography is shown in Figure 4-5. The objective of regrading the surface soils is to re-direct the flow of the surface water runoff, away from residential properties which are to the north and west of the property boundaries. The surface water currently flows toward the residential properties and is intercepted by a concrete culvert, which directs the water to the south and east across the site. The conceptual regrading of the surface soils would include the installation of a concrete retaining wall along the western and northwestern property boundaries. The area between the surface soils and the concrete retaining wall would be filled with surface soils that are to be cut from the north central-portion of the property. This regrading would result in the redirection of stormwater runoff toward the east and south, away from the residential properties. A conceptual regrading plan is provided in Figure 4-6.

Construction of a cap over the surface soils will have to be integrated with the existing soil pile that was constructed in 1989 during the previous removal action implemented by EPA. It is the understanding of Fluor Daniel GTI that the waste pile was constructed using an impermeable liner overlain with a drainage layer, overlain with vegetative cover. Any cap constructed at the site will be connected to the cap covering the existing soil pile so that the integrity of the existing cap is maintained.

The three removal action alternatives that will be evaluated for effectiveness, implementability and cost are the following:

Alternative 1 - Construction and maintenance of a clay cap
Alternative 2 - Construction and maintenance of an asphalt concrete cap
Alternative 3 - Construction and maintenance of a multimedia cap

A description of the comparative analysis categories and criteria for analyzing and evaluating the removal action alternatives is provided in Appendix E.

4.1.1 Analysis of Removal Action Alternative 1: Construction and Maintenance of a Clay Cap

This alternative would consist of constructing a clay cap to cover the surface and near surface soils on the CCI site. As mentioned above, the cap would be constructed by regrading portions of the former CCI site to provide for site drainage, followed by the application of a one-foot-thick layer of clay or an engineered clay product, overlain by a 6-inch-thick layer of a drainage material to aid in the drainage of stormwater runoff, overlain by a geotextile liner, overlain by a 6-inch-thick application of a vegetative/top soil cover. The application of the vegetative cover will help to minimize erosion and stabilize the cap. Some long-term maintenance will be required in the event that cracks or weathering occur.

A minor portion of the site would require a concrete cap adjacent to the railroad right-of-way. The slope of the existing grade in this area and the need for clearance to allow for use of the existing rail siding limit the use of other capping methods here. A concrete retaining wall would be constructed along the eastern property boundary prior to placement of the cap. The void created by the retaining wall would be backfilled and compacted prior to placing the concrete cap adjacent to the existing warehouse building.

The existing soil pile constructed during the removal action performed by the EPA in 1989 will remain as originally constructed. The application of the soil cap will effectively join the remaining surfaces of the site to the cap which was placed over the soil pile. During design and construction a limited amount of regrading will be required to eliminate low and/or high spots and promote cap stability. As mentioned previously, the regrading which would be required is shown on Figure 4-6. An evaluation of the effectiveness, implementability, and cost of this alternative is provided below.

Effectiveness

- Short-Term Effectiveness: The construction of a clay cap would pose a minimal risk to near property residents and site workers. The generation of VOC vapors and dust emissions from regrading activities could effectively be controlled. These potential risks can be controlled using standard construction dust suppression techniques and monitoring for VOCs and particulates to ensure worker and resident safety.

  Once the grading is completed, the site construction activities would pose minimal threat to nearby residents or workers, since the cap would be constructed with the sequential addition of 'clean' off-site materials.

- Long-Term Effectiveness and Permanence: A clay cap would prove effective as a long-term solution in preventing exposure to the recreational user. The degree of permanence will depend on the long-term stability of the cap, and the maintenance of the cap over time. Maintenance of the cap, which would consist of periodic inspections to assess cap quality and maintenance of vegetative cover, would be a critical factor in ensuring the long-term effectiveness and permanence. The integrity of the clay cap can be compromised if construction or regrading of the site were to occur after placement of the cap. Therefore, a deed restriction would likely be required to ensure the cap's integrity. Repairs to the cap would have to be made if the cap were breached. Using an upper vegetative cover allows for a degree of "self-healing" to the top of the cap. If the cap is properly inspected and maintained, and in particular if cracks are sealed if they occur, the cap will provide an effective long-term solution. Also, a cap would be a likely component to the overall remedy developed for the site.

- Reduction of Toxicity, Mobility, and Volume: As a cap is a containment technology, this alternative would not reduce the toxicity or volume of contaminants present in the soils at the site. This alternative would reduce contaminant mobility by isolating the soils and chemicals from human exposure.

- Compliance with ARARs: The pertinent ARARs for this alternative are all action-specific. The action-specific ARARs would include federal and state air quality standards, and federal closure and post closure standards for RCRA landfills. The applicability of the air quality standards relates to the potential for VOC or particulate emission during the construction of the cap. The federal closure and post closure standards for RCRA landfills would not be applicable, but would be relevant and appropriate in establishing the long-term monitoring and requirements for the site cap. It is anticipated that this alternative would comply with all action-specific ARARs.

- Overall Protection of Human Health and the Environment: A clay cap will prevent exposure to the surface soils containing chemicals and VOC vapors by eliminating the exposure pathways of direct contact and inhalation. The clay cap will be effective at achieving the goal for this EE/CA which is to reduce the risk of site chemicals to the recreational user from 1 in 1,000 to less than 1 in 10,000. The resultant risk after construction of the cap will likely be less than 1 in 1,000,000. Some remaining exposure to VOCs will likely result from transport of vapors through the clay even though the permeability is very low ($<1x10^{-7}$ cm/sec).

  Protection of near-by residents and construction workers during construction can be controlled through the application of dust suppression measures and air monitoring. Properly maintained, a clay cap would prove protective over the long term, as the 2 foot thickness of the cap would provide an effective means of isolating the surface soil.

Implementability

- Technical and Administrative Feasibility: This alternative would be technically feasible. The application of a clay cap would use standard construction practices, with materials and technical skills which are readily available. The application of a clay cap would be limited to areas of the CCI site which do not present a drastic change in grade or elevation which would effect the integrity of the clay liner. Therefore, an alternate capping media would have to be placed at areas of the site where such grade changes occur.

The design considerations for the cap would need to address the change in stormwater runoff created by the site regrading. A stormwater collection trench is currently in-place in the north west corner of the site bordering the residential properties. The design of the trench may need to be revised as a result of the topographic changes which will be created by the application of the cap.

Restrictions related to the penetration, removal, or excavation of the cap would have to be added to the property deed in order to ensure adequate protection of potentially exposed populations. The application of deed restrictions limiting development and on-site action would need to be negotiated with the potentially responsible parties, current property owner, and where applicable, with the City of Olathe in areas of utility or city right-of-way.

- Availability of Services and Materials: The construction materials related to the application of the cap are readily available, and would not be a hindrance to the implementation of this alternative. Qualified local contractors are also available to perform the site activities related to cap construction
- State Acceptance: It is anticipated that a clay cap would be accepted by the state since previous removal actions conducted by the EPA, which included the construction of a cap on the soil pile, were accepted. The clay cap will also control site risks and likely enhance the physical appearance of the site.
- Community Acceptance: It is believed that a clay cap over the surface soils would be acceptable to the community since it will reduce the health risks by controlling exposure and will likely result in a visual enhancement of the site since the cap would include vegetative cover that will be maintained.

Cost

The direct costs include construction labor, equipment, materials, and contingency costs. The indirect capital cost include such items as engineering design cost, permit fees, legal fees, and startup costs. The annual post removal site costs (PRSC) include the operational, maintenance, energy, monitoring, and support costs related to the alternative.

The development of the cost estimate for the cap is presented in Table 4-2. The estimated direct cost of this alternative is $ 391,500 The estimated indirect and annual PRSC costs are approximately $48,000 and $14,000 respectively. In addition, present worth cost was estimated at slightly over $1,370,000 based on a 30 year project life cycle.

4.1.2 Analysis of Removal Action Alternative 2: Construction and Maintenance of an Asphalt Concrete Cap

This alternative would consist of constructing an AC cap over the surface soils to eliminate the direct contact and inhalation exposure pathways. A description of the AC cap was provided in Section 4.1 and a cross-section of the cap is shown in Figure 4-3. Many of the features of an AC cap are similar to a clay cap. Therefore, the analysis of the AC cap's ability to achieve the removal action objective has been limited to describing the differences from the analysis presented in Section 4.1.1 for the clay cap. The differential analysis is provided below.

Effectiveness

- Short-Term Effectiveness: The only difference in the short-term effectiveness between the AC cap and the clay cap would be the timing on constructing the AC cap. The availability of asphalt is likely to be limited except during the warm weather months between May and October.

- Long-Term Effectiveness and Permanence: The long term effectiveness and permanence of the AC cap would be similar to the clay cap with the following exceptions. Any repairs or penetrations through the asphalt will be relatively easy to accomplish. Should any additional subsurface investigation work be needed at the CCI site, penetrations through the AC cap could be easily accomplished. Also, any additional repairs associated with weathering or use of the AC surface could be made through the application of sealers, chip-and-seal coats, or removal and patching or replacement of the AC.

  An AC cap would also most probably be consistent with any future usage of the site. Since the site is currently zoned commercial/industrial, business development would likely require such a surface over portions of the site.

- Reduction of Toxicity, Mobility, and Volume: This alternative would not reduce the toxicity or volume of contaminants present in the soils, but would reduce the mobility of the chemicals by isolating them from human exposure to the surface soils.

- Compliance with ARARs: Consistent with alternative 1 (clay capping), the pertinent ARARs are all action-specific and it is anticipated that ARAR compliance would be achieved during the construction and maintenance of the AC cap.

- Overall Protection of Human Health and the Environment: Similar to a clay cap, an AC cap will provide protection of human health and the environment during construction and over the life of the cap (estimated at 30 years). An AC cap will achieve the removal action goals and objectives as described in Section 3 of this EE/CA. Additionally, the possible transport of VOC vapors, which could expose any users of the property would be nil because of the very low permeability to air that AC provides and will thus provide additional protection. The AC cap will also provide effective protection from exposure to the surface soils over the long term because it will be easy to maintain.

Implementability

- Technical and Administrative Feasibility: Constructing and maintaining the AC cap would be technically and administratively feasible. The discussion contained in Section 4.1.1 on this topic is directly applicable here.

- Availability of Services and Materials: Construction materials for an AC cap are readily available, and would not be a hindrance to the implementation of this alternative. Qualified local contractors are available to perform the regrading and construction related to this alternative. It is likely that the availability of asphalt will be limited to the warmer weather months from approximately May through October, thus limiting the timing of construction of the AC cap to this period.

- State Acceptance: It is anticipated that the state would accept the construction of an AC cap at the site, as the cap will isolate the surface soils from direct contact to exposed populations and will comply with state ARARs.

- Community Acceptance: Similar to a clay cap, it is anticipated that an AC cap would be accepted by the community. The existence of an asphalted area of approximately 1.5 acres adjacent to residents located to the north and west may not be as acceptable as an area covered with vegetation, but will still likely result in an improvement over current site conditions. Also, placement of an asphalt surface at the site would likely be consistent with future usage, since it is zoned for industrial/commercial purposes and the development of any business at the site would likely include areas of asphalt for either parking or working surfaces.

Cost

The direct costs include construction labor, equipment, materials, and contingency costs. The indirect capital cost include such items as engineering design cost, permit fees, legal fees, and startup costs. The annual PRSCs include the operational, maintenance, energy, monitoring and support costs related to the alternative.

The development of the cost estimate for the cap is presented in Table 4-3. The estimated direct cost of this alternative is approximately $419,000. The estimated indirect and annual PRSC costs are approximately $52,000 and $5,600, respectively. In addition, present worth cost was estimated at $843,500, based on a 30 year project life cycle.

4.1.3 Analysis of Removal Action Alternative 3: Construction and Maintenance of a Multimedia Cap

This alternative would consist of a cap constructed from multiple materials, effectively covering the surface soils at the site. The multimedia cap would be constructed using imported materials as described in Section 4.1 and as shown in Figure 4-4. Similar to a clay cap, a small section of the site would have to be capped with concrete. This area is adjacent to the railroad siding which runs on the eastern section of the property. As described in Section 4.1.1 the existing soil pile will remain undisturbed and the multimedia cap will effectively join the cap overlying the soil pile. As with alternative 1, a limited amount of regrading will be required to eliminate low and/or high spots to promote cap stability.

This section of the EE/CA analyzes only those categories and criteria for the multimedia cap which differ from the clay cap presented in Section 4.1.1. This differential analysis is presented below.

Effectiveness

- Short-Term Effectiveness: Similar to a clay cap, a multimedia cap would pose minimal risk to near-by property residents and site workers during construction since effective engineered controls would be implemented to control dust generation and/or VOC emissions.

- Long-Term Effectiveness and Permanence: A multimedia cap would present the same type of long-term effectiveness and permanence as a clay cap. Its permanence could be affected by any construction or investigation activities which might be performed at the site if the cap is breached and repairs are necessary. The long-term effectiveness would be enhanced by the synthetic membrane liner, which would provide an effective barrier against migration of VOC vapors to the surface.

- Reduction of Toxicity, Mobility, and Volume: As a multimedia cap is a containment technology, this alternative would be effective only at reducing the mobility of the chemicals in the surface soils through isolation and would have no effect on the toxicity or volume.

- Compliance with ARARs: Consistent with alternative 1, clay capping, the pertinent ARARs are all action-specific and ARAR compliance can be achieved during implementation and maintenance.

- Overall Protection of Human Health and the Environment: As with a clay cap, a multimedia cap will provide effective protection of human health and the environment by isolating the surface soils from exposed populations thus achieving the goals and objectives for this removal action. Short-term protection will be provided during construction to control dust generation and VOC vapor emissions through engineered controls and monitoring. Long-term protection will be provided by the 2-foot-thick cap and geosynthetic membrane line, a maintenance program, and deed restrictions.

Implementability

- Technical and Administrative Feasibility: Constructing and maintaining a multimedia cap would be technically and administratively feasible. The discussions on the technical and administrative feasibility contained in Section 4.1.1 would also apply here.

- Availability of Services and Materials: As with alternative 1, clay capping, the materials needed to complete construction of the multimedia cap are readily available, as are qualified local contractors to perform all the installation tasks with the possible exception of the synthetic membrane liner. Installation of the synthetic liner may need to be performed by a specialized contractor whose availability may be somewhat limited. This can be effectively overcome through proper scheduling of the necessary contractors.

- State Acceptance: As described in Sections 4.1.1 and 4.1.2, it is anticipated that the construction of a multimedia cap would meet state acceptance due to the fact that it controls site risks, complies with state ARARs and a similar solution for the soil pile was previously accepted in 1989.

- Community Acceptance: It is anticipated that a multimedia cap will be accepted by the community since it will result in an improvement in the physical appearance to the site and will control site risks.

Cost

The direct costs include construction labor, equipment, materials, and contingency costs. The indirect capital cost include such items as engineering design cost, permit fees, legal fees, and startup costs. The annual PRSCs include the operational, maintenance, energy, monitoring and support costs related to the alternative.

The development of the cost estimate for the multimedia cap is presented in Table 4-4. The estimated direct cost of this alternative is approximately $377,440. The estimated indirect and annual PRSC costs are approximately $46,000 and $14,000, respectively. In addition, present worth cost was estimated at approximately $1,354,000 based on a 30 year project life cycle.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES AND RECOMMENDED REMOVAL ACTION

This section of the EE/CA provides a comparative analysis of the three removal action alternatives which were considered for the former CCI site. Section 4 presented the three alternatives and provided an evaluation of the effectiveness, implementability and cost of each alternative's ability to achieve the removal action goals and objectives which were established in Section 3. This section discusses the advantages and disadvantages of each alternative relative to the other. The three alternatives which were considered are listed below:

Alternative 1 - Construction and maintenance of a clay cap
Alternative 2 - Construction and maintenance of an AC cap
Alternative 3 - Construction and maintenance of a multimedia cap

Since all three alternatives are variations of a single containment technology (capping), the differences in their ability to achieve the removal action goals and objectives are subtle. As such, the comparability of the following categories which were analyzed in Section 4.2 are the same:

Effectiveness:

- short-term effectiveness
- reduction of mobility, toxicity and volume
- compliance with ARARs

Implementability:

- technical and administrative feasibility
- state acceptance

Cost:

- capital (direct and indirect) cost

Differences in the comparability of the three alternatives, which are evaluated in this section of the EE/CA, exist in the following categories

Effectiveness:

- long-term effectiveness and permanence
- overall protection of human health and the environment

Implementability:

- availability of services and materials
- community acceptance

Cost:

- annual operating and maintenance costs
- total net present worth cost

5.1 Comparative Analysis

The comparative analysis of the three removal action alternatives relative to effectiveness, implementability and cost is provided below.

5.1.1 Comparative Analysis of Effectiveness

Alternative 2, the AC cap, and alternative 3, the multimedia cap, provide additional long-term protectiveness over alternative 1, the clay cap, because of their increased ability to prevent VOC vapors from being generated at the surface, although alternative 1 would still prove effective at reducing the carcinogenic site risks below the 1 in 10,000 level, which was the goal established in this EE/CA. Also, alternative 2 (AC capping) provides additional protectiveness over alternatives 1 (clay capping) and 3 (multimedia capping) in the long-term maintenance of the caps. Maintenance of an AC cap would not require frequent visits to the site to control and maintain a vegetative cover as would be required in alternatives 1 and 3. An AC cap would also be easier to maintain and repair, particularly if additional subsurface environmental investigations or remedial actions are required on the CCI property. Therefore, alternatives 2 and 3 would provide improved overall protection of human health and the environment over alternative 1, with the AC cap having a slightly better protectiveness over the multimedia cap.

5.1.2 Comparative Analysis of Implementability

A clay and multimedia cap are likely to offer a minimal advantage over an AC cap in the acceptance of the removal action alternative by the community. It is anticipated that the residents located near the property would prefer to have an adjacent 1.5 acre open parcel covered with vegetation, in lieu of asphalt concrete as would be the case in alternative 2. However, the AC cap will be an improvement over the current physical condition of the site, since the action will include a cap over the area where the dilapidated former warehouse currently exists. Therefore, the advantage offered by the vegetative cover provided in alternatives 1 and 3 would be minimal.

Also, the timing of implementing alternative 2 (AC cap) may be restricted between the warmer weather months of May and October when asphalt is available for placement. The construction of alternative 1 would only be limited by very poor weather conditions and could be constructed at almost any time during the year. The implementation of alternative 3 (multimedia cap), which would include the placement of a synthetic membrane liner, may require a specialty contractor to place the synthetic liner and would require proper scheduling of this resource to ensure availability.

5.1.3 Comparative Analysis of Cost

The capital cost (direct and indirect) of implementing any of the three alternatives is roughly the same. A cost advantage is offered by alternative 2 over alternatives 1 and 3, in the area of annual operating costs. The periodic maintenance of the AC cap will require significantly less activity than either of the caps with vegetative cover, thus resulting in a significantly lower net present worth. A summary of the cost differences is presented in Table 5-1.

5.2 Recommended Removal Action

As presented in Section 3, the removal action objective for this EE/CA is to eliminate the dermal contact, ingestion and inhalation exposure pathways from surface soils containing PAHs, metals, pesticides and surface and subsurface soils containing VOCs.

The recommended removal action alternative for achieving this objective is to construct and maintain an asphalt concrete cap over the complete site. The AC cap would be supplemented by a concrete cap at a small portion of the site near the eastern property boundary. An AC cap is recommended over a clay or multimedia cap for the following reasons:

- The AC cap provides better overall protection of human health and the environment over either the clay or multimedia cap. The AC cap provides better long-term effectiveness than the clay cap because it is more effective at controlling VOC vapor emissions from the surface soils. Also, the protection provided by the AC cap in controlling VOC emissions is equivalent to that afforded by the multimedia cap. The AC cap provides an advantage over the multimedia cap in the area of long-term effectiveness and permanence because it can be easily repaired and maintained. This is particularly important should additional subsurface investigations or remedial actions be necessary at the site.

- The AC cap provides cost advantages over the clay or multimedia cap in annual operating costs associated with maintaining the caps. This cost advantage equates to approximately $500,000 in savings over the 30-year life of the project.

- The slight disadvantage associated with the timing for constructing the AC cap relative to the clay or multimedia cap is not outweighed by the advantages provided by the AC cap in overall protectiveness of human health and the environment.

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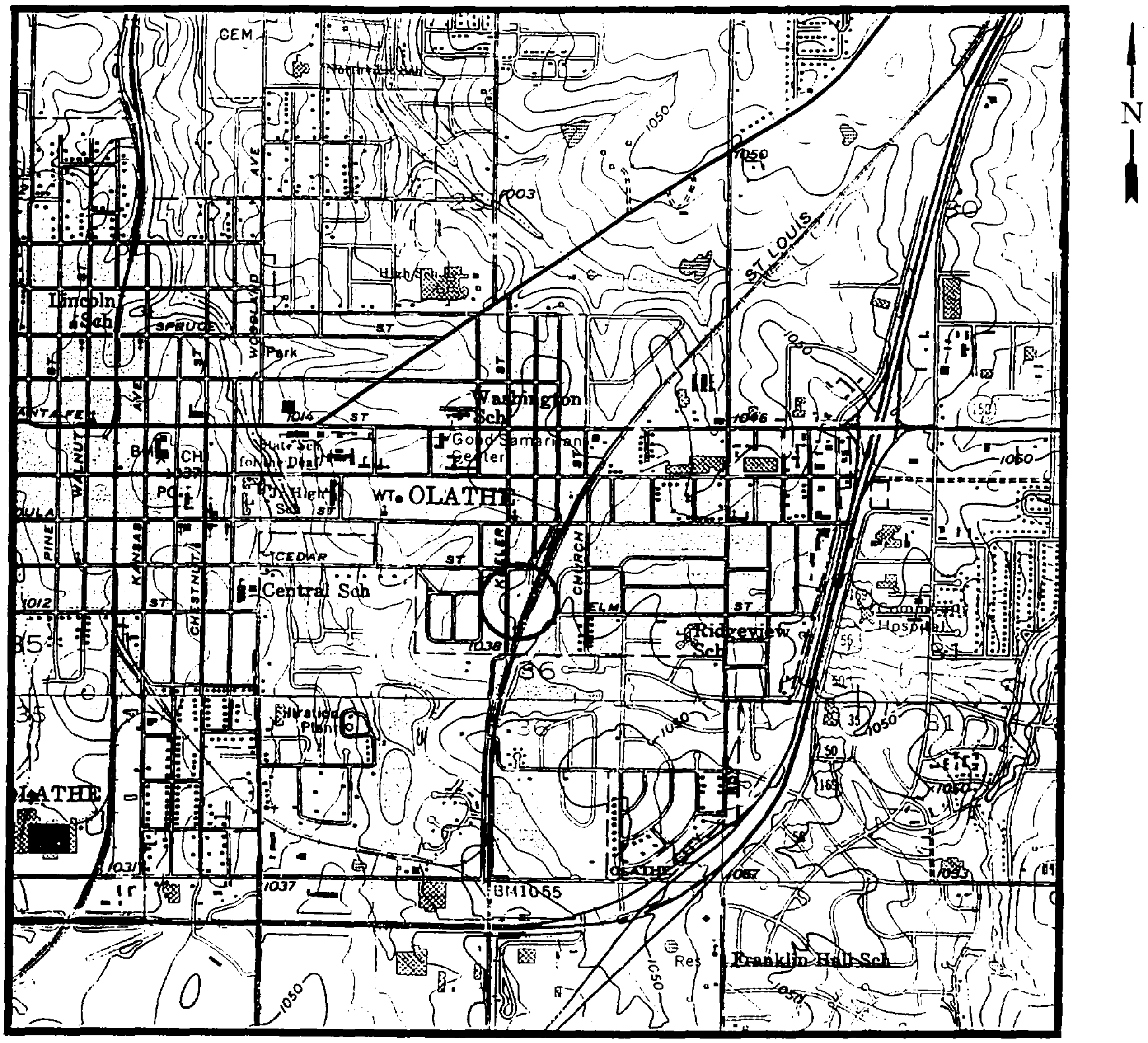
FIGURES



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7.5 MINUTE SERIES

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FLUOR DANIEL GTI

SITE LOCATION MAP

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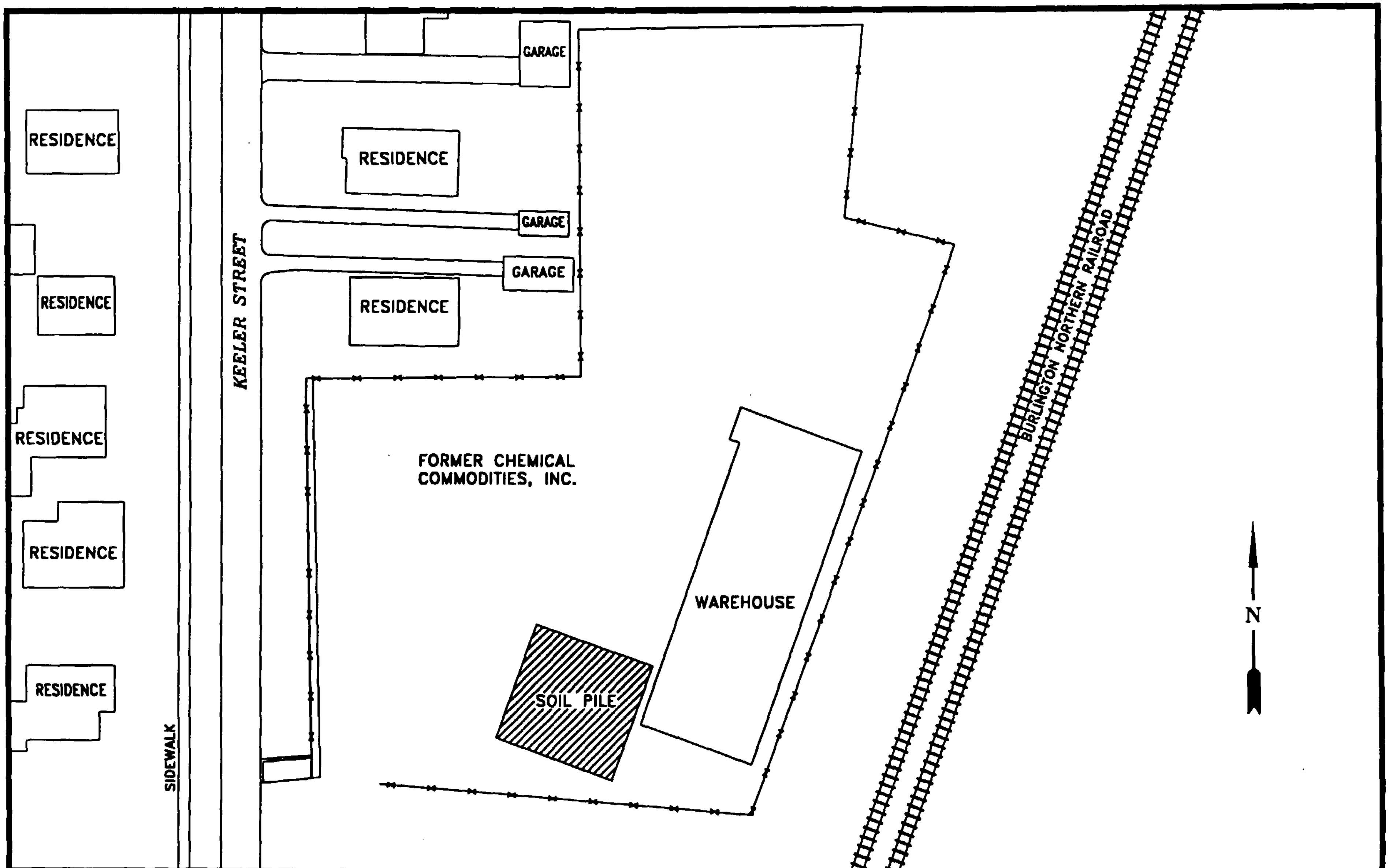

FLUOR DANIEL GTI

0 FEET 60
SCALE

CLIENT: CHEMICAL COMMODITIES, INC.

LOCATION: OLATHE, KANSAS

SITE PLAN

FILE: SPA990

PROJECT NO.: 042500193

REV.: 1

DES.: RA

DET.: CY

DATE: 9/30/96

PM:

PE/RG:

FIGURE: 1-2

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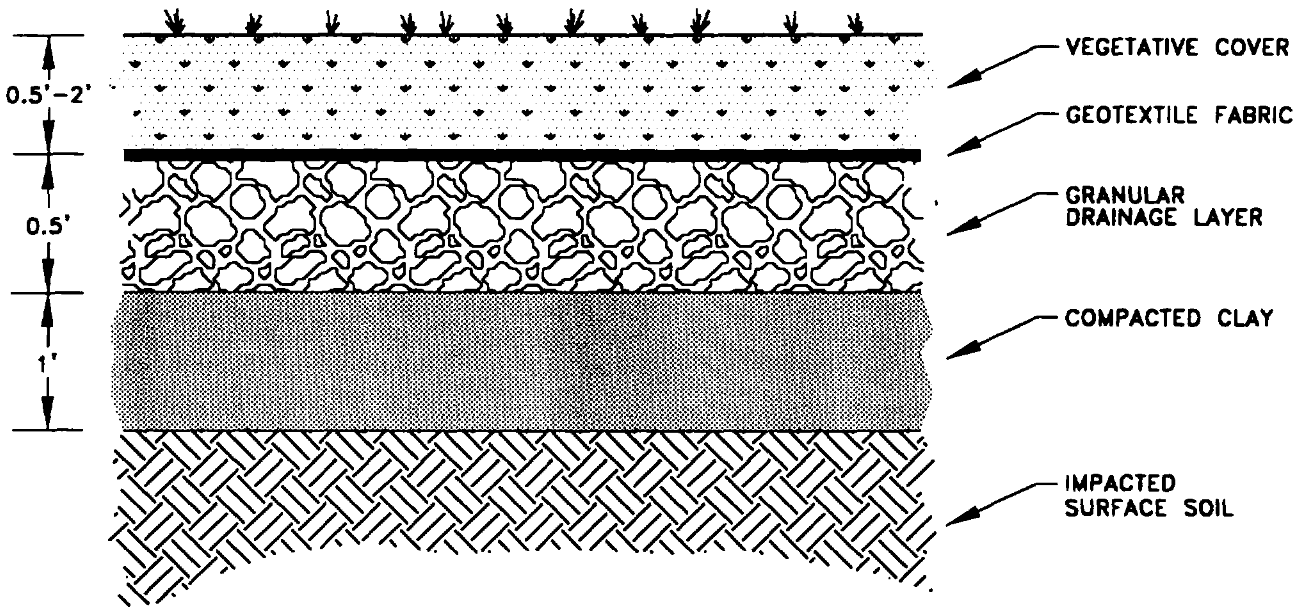

FLUOR DANIEL GTI	NOT TO SCALE	CROSS SECTION OF CLAY CAP

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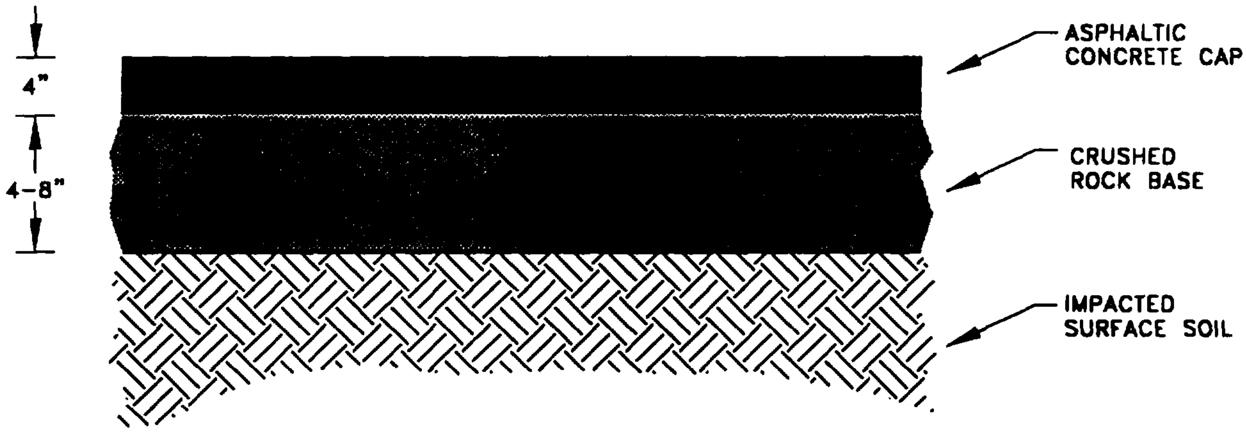
	REV. 1			
LOCATION: OLATHE, KANSAS	DES. RA	DET. CY	DATE: 9/9/96	FIGURE: 4-2



FLUOR DANIEL GTI	NOT TO SCALE	CROSS SECTION OF ASPHALT CONCRETE CAP

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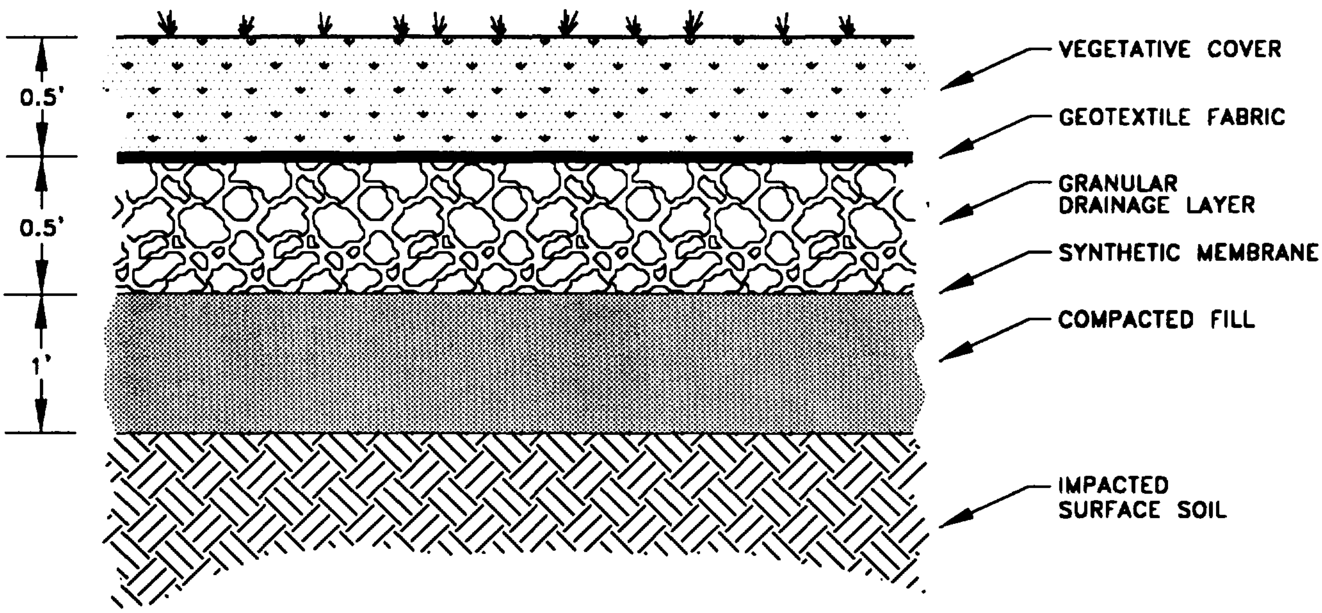

FLUOR DANIEL GTI	NOT TO SCALE	**CROSS SECTION OF MULTI-MEDIA CAP**

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	REV. 1					
LOCATION: OLATHE, KANSAS	DES. RA	DET. CY	DATE: 9/9/96		FIGURE: 4-4	

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TABLES

TABLE 2-1
Estimation of Risks
Posed by Site Chemicals

Former CCI Site, Olathe, Kansas

Receptor	Soil		Groundwater		Total	
	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index
Near-Property Resident	2E-04	0.87	NE	NE	2E-04	0.87
On-Property Resident	8E-03	0.52	4E-04	26	8.3E-3	23.6
On-Property Commercial	8E-04	0.6	1E-05	2.0	8.1E-4	2.6
On-Property Recreational User	1E-03	0.49	NE	NE	1E-03	0.49
On-Property Construction	6E-03	2.4	NE	NE	6E-03	2.4

NE = Not Evaluated
A detailed description of the baseline risk assessment is presented in the report titled *Baseline Human Health Risk Assessment* (Fluor Daniel GTI 1996).

TABLE 3-1
Summary of Factors Constituting
a Threat Relative to Site Conditions

Former CCI Site, Olathe, KS

Factors Constituting a Threat to Public Health or Welfare	Are Environmental Conditions Present at Site Which Substantiate Threat?	Description of Site Conditions Relevant to Environmental Conditions
1. Actual or potential exposure to hazardous substances of nearby populations	Yes	• Site characterization work and baseline human heath risk shows that nearby populations may be exposed to site chemicals (which are hazardous substances) through inhalation of dust or dermal contact/ingestion of soil should they enter the site.
2. Actual or potential contamination of drinking water supplies	No	• Site characterization work shows that drinking water supplies are provided by surface water stored in reservoirs and • usage of groundwater as domestic water supply for the city of Olathe occurs from production wells located over 9 miles away from the site, and • Mr. David Breeze, City of Olathe, indicated that there are no known wells used for municipal water supply, domestic or industrial use within one mile of the site.
3. Hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers that may pose a threat of release	No	• All systems/containers which stored chemicals have either been removed or emptied by the previous removal action taken by US EPA in 1989 and 1991.
4. High levels of lead in soils largely at or near the surface that may migrate	Yes	• Although the site characterization work showed that lead is not a chemical of concern, there are other chemicals in the surface soils which may migrate and create a potential exposure to trespassers or nearby populations
5. Threat of fire or explosion	No	• The site characterization work shows that there are no environmental conditions at the site which create a threat of fire or explosion

TABLE 3-2
Chemical Specific Cleanup Levels
for the Recreational User Scenario

Former CCI Site, Olathe, KS

Chemical	Proposed Clean-Up Level For On-Property Recreational User (mg/kg)
Benzo(a)anthracene	1.5
Benzo(a)pyrene	0.12
4,4'-DDD	2
1,2-Dichloroethane	3
Trichloroethylene	40
Vinyl Chloride	0.001 (1)
As	9.8 (2)
Benzo(b)fluoranthene	1.5
Indeno(1,2,3-cd) pyrene	1.5
Carbon Tetrachloride	3

(1) Only inhalation route evaluated
(2) Cleanup level for arsenic is background concentrations, which has been determined to be 9.8 mg/kg

TABLE 3-3
Evaluation of Removal Action Alternatives
Considered but not Retained

Former CCI Site, Olathe, KS

Removal Action Alternative Considered	Basis for Not Retaining Removal Action Alternative
1. Prevent further migration of VOCs in subsurface soil	• Work completed during site characterization and in the Baseline Human Health Risk Assessment shows that concentrations of VOCs in soil at property boundary are not high enough to produce concentrations at the ground surface (which could be inhaled) which will produce an elevated health risk. • In situ techniques which are available to prevent further migration would be limited in effectiveness due to low permeability of clay soils at the site • Excavation technologies would likely result in increased health risks to nearby populations due to volatilization of significant mass of VOCs in subsurface soil during implementation
2. Prevent further migration of VOCs in groundwater	• Evaluation of groundwater usage in vicinity of site indicates that groundwater is currently not being used for domestic or industrial purposes, therefore, these exposure pathways are incomplete • Work performed as part of the Baseline Human Health Risk Assessment shows that concentrations of VOCs in groundwater at the down gradient property boundary are not high enough to produce VOC concentrations at the ground surface (which could be inhaled) which will produce an elevated health risk • Removal action alternative which was implemented by EPA in 1991 for groundwater consisting of the trench, extraction system, and treatment plant provides a means for VOC removal (through DNAPL recovery) and limits further migration by intercepting and removing groundwater at the source.

TABLE 3-4
Potential Chemical-Specific ARARs

Former CCI Site, Olathe, Kansas

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate?	Comment
Safe Drinking Water Act: National Secondary Drinking Water Standards (SMCLs)	40 CFR Part 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels).	No/No	Shallow groundwater is not considered a drinking water source.
Safe Drinking Water Act: National Primary Drinking Water Standards (MCLs)	40 CFR Part 141	Establishes welfare-based standards for public water systems (primary maximum contaminant levels).	No/No	Shallow groundwater is not considered a drinking water source.
Kansas Surface Water Quality Standards	KAR 28-16-28b	Establishes surface water quality standards.	No/No	Surface water is not impacted at the CCI site.

TABLE 3-5
Potential Location-Specific ARARs

Former CCI Site, Olathe, Kansas

Location-Specific Concern	Requirement	Prerequisite	Citation	Applicable/ Relevant and Appropriate?	Analysis
Wetland	Action to prohibit discharge of dredged or fill material into wetlands Action to avoid adverse effects, minimize potential harm, and enhance wetlands, to the extent possible	Wetlands as defined in US Army Corps of Engineers regulations Action involving construction of facilities or management of property in wetlands, as defined by 40 CFR Part 6, Appendix A, section 4 (j)	Clean Water Act section 404; 40 CFR parts 230; 33 Parts 320–330 Executive Order 1190, Protection of Wetlands, 40 CFR Part 6, Appendix A	No/No	No designated wetland on the site. No designated wetland on the site.
Wilderness area	Area must be administered in such manner as will leave it unimpaired and to preserve its wilderness	Federally owned area designated as wilderness area	Wilderness Act (16 USC 1311 *et seq,*); 50 CFR 35.1 *et seq,*)	No/No	Site not designated as a federal wilderness area.
Wildlife refuge	Only actions allowed under the provisions of 16 USC Section 668 dd© may be undertaken in areas that are part of the National Wildlife Refuge System	Area designated as part of National Wildlife Refuge System	16 USC 668dd *et seq*; 50 CFR Part 27	No/No	Site not designated as a National Wildlife Refuge.
Area affecting stream	Action to protect fish or wildlife	Diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife	Fish and Wildlife Coordination Act (16 USC 661 *et seq,*); 40 CFR 6.302	No/No	No stream modification anticipated.
Within area affecting	Avoid talking or assisting in action that will have direct effect on scenic river	Activities that affect or may affect any of the rivers specified in section 1276(a)	Wild Scenic Rivers Act (16 USC 1271 *et seq,*); 40 CFR 6.302(e)	No/No	No national wild or scenic rivers are located on-site or will be impacted by site remediation.
Within coastal zone	Conduct activities in manner consistent with approved State management programs	Activities affecting the coastal zone including lands therein and thereunder and adjacent shore lands	Coastal Zone Management Act (16 USC section 1451 *et seq*)	No/No	Site is not in a coastal area.
Within designated coastal zone	Prohibits any new Federal expenditure within the Coastal Barrier Resource System	Activity within the Coastal Barrier Resource System	Coastal Barrier Resources Act (16 UST 3501 *et seq*)	No/No	No dredge and fill activities planned.

TABLE 3-5
Potential Location-Specific ARARs

Former CCI Site, Olathe, Kansas

Location-Specific Concern	Requirement	Prerequisite	Citation	Applicable/ Relevant and Appropriate?	Analysis
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited	RCRA hazardous waste, treatment, storage, or disposal	40 CFR 264.18(a)	No/No	There is no evidence of a potentially active fault within 61 meters of site.
With 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout	RCRA hazardous waste, treatment, storage, and disposal	40 CFR 264.18(b)	No/No	Site is not within 100-year floodplain.
Within floodplain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas	Executive Order 11988, Protection of flood plains (40 CFR 6, Appendix A); Fish and Wildlife Coordination Act (16 USC 661 *et seq*,); 40 CFR 6.302	No/No	Site is not within the flood plain.
Within salt dome formation, underground mine, or cave	Placement of non-containerized or bulk liquid hazardous waste prohibited	RCRA hazardous waste placement	40 CFR 264.18©	No/No	Site does not contain salt dome mines or caves.
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alternation of terrain that threatens significant scientific, prehistorical, or archaeological data	National Historical Preservation Act (16 USC Section 469); 36 CFR Part 65	No/No	There are no known archaeological or historical artifacts on the site.
Historic project owned or controlled by Federal agency	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks	Property included in, or eligible for, the National Register of Historic Places	National Historical Preservation Act, Section 106 (16 USC 470 *et seq*,); 36 CFR Part 800	No/No	Site not on the National Register of Historic Places
Critical habitat upon which endangered species or threatened species depends	Action to conserve endangered species or threatened species, including consultation with the Department of Interior	Determination of presence of endangered or threatened species	Endangered Species Act of 1973 (16 USC 1531 *et seq*,); 50 CFR Part 222, 50 CFR Part 402 Fish and Wildlife Coordination Act (16 USC 661 *et seq*,) 33 CFR Parts 320–330	No/No	No endangered species are known to exist at the site. No evidence of unique habitat is present.

TABLE 3-6
Potential Federal Action-Specific ARARs
(Applicability dependent on alternative selection)

Former CCI Site, Olathe, Kansas

Federal Regulations	Requirement	Applicable/Relevant and Appropriate?	Analysis
CLEAN AIR ACT			
National Ambient Air Quality Standards NESHAP/NSPL/BACT/ PSD/LAER 40 CFR 60.1–17, 60.50–54, 60.150–154, 60.480–489 40 CFR 53.1–33 40 CFR 61.01–18, 61.50–112, 61.240–247	Establishes a limit on ambient particulate matter to protect Health Sets treatment technology standards for emissions to air from incinerators and fugitive emissions.	Yes/-- Yes/--	To be considered when disturbing soil (eg, excavation, regrading, screening) These requirements are applicable to any alternatives that involve emissions regulated by these standards.
National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart C 40 CFR Part 61.30 beryllium Subpart E 40 CFR Part 61.50–56 Mercury Subpart F 40 CFR Part 61.6–71 Vinyl Chloride Subpart I 40 CFR Part 61.100–108 Radio Nuclides Subpart FF 40 CFR Part 61.340–358 Benzene Subpart J 40 CFR Part 61.110–112 Benzene Subpart N 40 CFR Part 61.160–165 Arsenic	The regulation includes emission standards for mercury, vinyl chloride, benzene, beryllium, inorganic arsenic, and radio nuclide from specific sources.	No/No	Although not from an applicable source, some of these chemicals exist on site.
CLEAN WATER ACT			
National Pollutant Discharge Elimination System (NPDES) 40 CFR 122.1–64	Regulate the point source discharge of water into surface water bodies.	Yes/--	The removal action may include the discharge of treated or untreated groundwater to the waters of the United States. Substantive requirements will have to be met, although administrative requirements (a permit) may not be required if the discharge is on-site.

Notes: "Yes/--": If a requirement is *applicable*, determination of *appropriate and relevant* status is not made.

TABLE 3-6
Potential Federal Action-Specific ARARs
(Applicability dependent on alternative selection)

Former CCI Site, Olathe, Kansas

Federal Regulations	Requirement	Applicable/Relevant and Appropriate?	Analysis
Pretreatment Standards 40 CFR Part 403.1–18	Established pretreatment standards for the control of pollutants' discharge to POTWs. The POTW should have either an EPA-approved program or sufficient mechanism to meet the requirements of the national program in accepting CERCLA waste.	Yes/--	Discharge to POTW possible alternative. It is considered an off-site action. The substantive and administrative legally applicable requirements of the national pretreatment program must be met.
Ocean Discharge 40 CFR 227.1–32	NPDES permit required to discharge to marine water.	No/No	Not relevant to situation.
Dredge and Fill Requirement 40 CFR 230.1–80	Regulates the discharge of dredged or fill material into the water of the US.	No/No	No dredging or filling anticipated.
DEPARTMENT OF TRANSPORTATION			
Hazardous Materials Transportation Regulations 49 CFR Parts 107, 171–177	Regulates transportation of hazardous materials	Yes/--	These requirements are applicable to all alternatives involving transport of hazardous materials from the site.
SAFE DRINKING WATER ACT			
Underground Injection Control Program 40 CFR Part 144.1–70	Controls the underground injection of wastes and treated wastewater.	Yes/--	Ozone injection may trigger the UIC program requirements.
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)			
Hazardous Waste Management	Management of generation, treatment, storage, disposal, and transport of hazardous waste.	Yes/--	Waste is considered characteristic and listed.
Definition and identification of hazardous waste 40 CFR Part 261.20.33	Identifies those wastes subject to regulation.	Yes/--	RCRA requirements are applicable to treatment residues generated from remedial actions that are identified as RCRA hazardous wastes and that are stored, treated, disposed of, and/or transported.

Notes: "Yes/--": If a requirement is *applicable*, determination of *appropriate and relevant* status is not made.

TABLE 3-6
Potential Federal Action-Specific ARARs
(Applicability dependent on alternative selection)

Former CCI Site, Olathe, Kansas

Federal Regulations	Requirement	Applicable/Relevant and Appropriate?	Analysis
Standards for Generators 40 CFR 262.10–40	Establishes regulation covering activities of generators of hazardous wastes. Requirements include ID number, record keeping, and use of uniform national manifest.	Yes/--	Applicable to off-site actions if waste or treatment residues are RCRA hazardous.
Standards for Transport 40 CFR 263.10–31	The transport of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup.	Yes/--	Applicable to off-site actions if waste or treatment residues are RCRA hazardous.
REGULATIONS FOR OWNERS AND OPERATORS OF PERMITTED HAZARDOUS WASTE FACILITIES			
Subpart G – Closure/Post-Closure 40 CFR 264.111, 264.117C	Concerns site closure requirements, including operation and maintenance, site monitoring, record keeping, and site use.	No/Yes	Substantive closure and post-closure requirements are applicable to RCRA TSDF's, and may be relevant and appropriate to wastes left in place.
Subpart I – Storage Container 40 CFR 264.171–178	Requirements permit on-site storage of hazardous wastes or temporary storage phases during cleanup actions. Requirements for maintenance of storage containers, compatibility with waste, inspection, storage area, location, and closure.	Yes/--	Applicable to storage of wastes prior to off-site shipment under generator standards.
Subpart J – Tank Storage 40 CFR 264.191–198	Requirements apply to tank storage of hazardous materials.	No/No	Tank storage is not anticipated.
Subpart K – Surface Impoundments 40 CFR 264.220–231	Requirements for hazardous waste containment using new or existing surface impoundments.	No/No	No surface impoundments are anticipated.
Subpart L – Waste Piles 40 CFR 264.251–258	Requirements for hazardous waste kept in piles.	Yes/--	May be relevant and appropriate for long-term storage piles.
Subpart M – Land Treatment 40 CFR 264.271–283	Requirements pertain to land treatment of hazardous wastes.	No/No	Land treatment is not an alternative.

Notes: "Yes/--": If a requirement is *applicable*, determination of *appropriate and relevant* status is not made.

TABLE 3-6
Potential Federal Action-Specific ARARs
(Applicability dependent on alternative selection)

Former CCI Site, Olathe, Kansas

Federal Regulations	Requirement	Applicable/Relevant and Appropriate?	Analysis
Subpart N – Landfills 40 CFR 264.301–314 (New landfills)	Requirement for design, operation, and maintenance of a new hazardous waste landfill, includes minimum technology requirements under HSWA.	No/Yes	Substantive requirements for post-closure care may be relevant and appropriate for wastes left in place.
Subpart O – Incinerators 40 CFR 264.340–351	Requirements for hazardous waste incinerators.	Yes/–	On-site incinerator is being considered for this site.
Subpart S – Corrective Action for Solid Waste Management Units 40 CFR Part 264.552–553	Requirements for CAMUs and temporary treatment units at RCRA-permitted TSD facilities undergoing corrective action.	No/Yes	Substantive requirements may be relevant and appropriate to temporary on-site treatment.
Subpart X – Miscellaneous Units 40 CFR Part 264.600-603	Standards for performance of miscellaneous treatment units. Miscellaneous treatment units may include shredders or desorption.	Yes/–	Subpart X may apply to use of on-site physical treatment technologies such as shredders for managing hazardous waste.
Land Disposal Restrictions 40 CFR, Part 268.30–40	The land disposal restrictions and treatment requirements for materials subject to restrictions on land disposal.	Yes/–	Excavation and removal is a potential action; therefore, LDR may be triggered. Substantive land disposal restrictions are applicable to the land disposal of RCRA hazardous wastes and residuals, when they are removed from the waste management area and re-disposed. A treatability variance can be requested to allow treatment via an alternative treatment method or to a different treatment standard.
TOXIC SUBSTANCES CONTROL ACT (TSCA) PCBs			
40 CFR Part 761.60–79	Requirement for disposal of PCBs.	No/No	PCB concentrations are below 50 milligrams per kilogram.

Notes: "Yes/–": If a requirement is *applicable*, determination of *appropriate and relevant* status is not made.

TABLE 3-7
Potential State Action-Specific ARARs
(Applicability dependent on alternative selection)

Former CCI Site, Olathe, Kansas

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
Kansas Air Pollution Control Regulations	Article 19	Establishes requirements for major stationary sources in attainment/unclassified areas (22.4) or non-attainment areas (22.5)	Yes/--	These regulations are applicable to stationary source at the site, such as incinerators or shredders.
Kansas Air Pollution Control Regulations (continued)	Article 19	Establishes emission standards for new sources and for hazardous air pollutants.	Yes/--	These regulations would be applicable to certain new sources such as incinerators. NESHAPS are not applicable.
Kansas Water Pollution Control Regulations	KAR 28-16-28	Sections 28b through 28f contain the State's antidegradation policy, discharge standards by water classification and adoption of CWA treatment requirements.	Yes/--	These regulations would be applicable to any discharge from the site to receiving waters.
	KAR 28-16-83-97	Pretreatment standards in effect in 40 CFR Part 403.2, as of July 1, 1986, are adopted by reference.	Yes/--	These regulations would be applicable to any discharge from the site to a POTW.
	KAR 28 Article 46	Federal UIC standards, in effect on April 1, 1993, are adopted by reference. The State has added provisions for a specific duration of permits based upon well classification.	Yes/--	Ozone injection or groundwater reinjection may trigger the UIC program requirements.

Notes: "Yes/--": If a requirement is *applicable*, determination of *appropriate and relevant* status is not made.

TABLE 4-1

Evaluation of General Response Actions
for Engineering Evaluation/Cost Analysis

Former CCI Site, Olathe, Kansas

General Response Action	Factors Affecting Applicability of General Response Action to Removal Action Objective and Site Conditions	Retained for Identification of Removal Action Alternatives?
Containment	• Containment of surface soils, most likely through the application of a cap, would isolate the soils containing chemicals from the recreational user and eliminate the dermal contact, ingestion and inhalation pathways. Containment would also prove protective for other exposure scenarios evaluated in the BHRA. • A similar response action had previously been implemented at the site by EPA in 1989, which resulted in the placement of a cap over the surface soils which had been consolidated into a pile southwest of the warehouse. • The use of a cap to contain contaminated soils is consistent with the removal actions identified in 40 CFR 300.415 (d) • Containment would prove effective at isolating each and all of the different chemical groups from the exposed populations. • Containment of the surface soils would most likely be consistent with any long term remedial action to be implemented at the site. • Containment would also prove effective at eliminating any potential off-site transport of sediments containing site chemicals associated with stormwater runoff.	Yes
Excavation	• Excavation of the surface soils would prove effective at removing the surface soils containing chemicals at concentrations exceeding the clean-up levels • A similar response action had previously been implemented at the site by EPA in 1989, which resulted in the excavation and stockpiling of surface soils which were subsequently capped • The vertical control on the excavation would be unknown since current site data shows that chemicals exceed clean-up levels at a depth of 6" but the vertical extent below 6" is not known since the next depth at which data was collected is 7.5' below ground surface. Therefore, additional verification sampling would be required before this response action could be implemented • This response action would have to be coupled with other response actions evaluated here in order to achieve the removal action objective for the following reasons: - Excavation would prove effective at removing soils with PAHs, pesticides and metals, but would have to be coupled with either treatment or isolation to control exposure to VOCs through inhalation - Excavated soils would either require containment, treatment, or off-site disposal to control exposure via direct contact to PAHs, pesticides, and metals	No

TABLE 4-1
Evaluation of General Response Actions
for Engineering Evaluation/Cost Analysis

Former CCI Site, Olathe, Kansas

General Response Action	Factors Affecting Applicability of General Response Action to Removal Action Objective and Site Conditions	Retained for Identification of Removal Action Alternatives?
Treatment	• Treatment of the surface soils would be quite complex to implement due to the various physical characteristics of the chemicals contained in the soil • Different technologies would be required to treat the PAHs, VOCs, metals and pesticides, thus requiring the establishment of a treatment train consisting of at least two technologies, one for treating the organics (PAHs, pesticides & VOCs) and one for treating the inorganics (arsenic) • Thermal treatment of the soils containing organics could result in the inadvertent production of dioxins and furans, resulting in a greater health risk than current conditions • Treatment would have to be performed ex-situ and would therefore require coupling this general response action with excavation • Similar barriers would have to be overcome regarding the depth of the excavation, as described above	No
Disposal	• Disposal of surface soils would be effective at controlling the direct contact exposure pathways • Disposal would most likely occur off-site at a permitted waste disposal facility and may require pre-treatment at the facility in order to comply with land disposal restrictions • This general response action would have to be coupled with excavation and the similar issues identified with excavation would be encountered (eg. Depth at which excavation would stop, additional control of VOC exposure due to inhalation or placement of cap to control VOC exposure) • On-site disposal would require the design and construction of a disposal cell and may require pre-treatment of the soil prior to placement in the cell to comply with land disposal restrictions	No

TABLE 4-2
Cost Estimate
Clay Cap Construction

Former CCI Site, Olathe, Kansas

DESCRIPTION	ESTIMATED COST	UNITS	NUMBER OF UNITS	ESTIMATED TASK COST
DIRECT COSTS				
Mobilization/Demobilization	**$10,000**	**Lump sum**	**1**	**$10,000**
Site Preparation/Grading	**$10,000**	**Lump sum**	**1**	**$10,000**
Concrete constructed retaining walls	**$75.00**	**Lineal foot**	**730**	**$54,750**
Demolish concrete slab	**$4.86**	**Square foot**	**7,000**	**$34,020**
Decontaminate and dispose of concrete slab	**$2.50**	**Square foot**	**7,000**	**$17,500**
Clay or Engineered clay	**$30.50**	**Cubic yard**	**2800**	**$85,400**
Drainage Material	**$18.85**	**Cubic yard**	**1,400**	**$26,390**
Geotextile filter fabric	**$0.30**	**Square foot**	**75,200**	**$22,560**
Top soil, graded (0.5 feet)	**$12.00**	**Cubic yard**	**1,400**	**$16,800**
Grass cover (sod)	**$1.50**	**Square yard**	**8,400**	**$12,600**
Subtotal				**$290,020**
Miscellaneous	**10% of subtotal**			**$29,000**
Contingency	**25% of subtotal**			**$72,500**
Direct Cost Subtotal				**$391,520**
INDIRECT COSTS				
Engineering	**15% of Indirect Costs**			**$48,310**
Indirect Cost Subtotal				**$48,310**
Total Direct and Indirect Costs				**$439,830**
ANNUAL OPERATING COST (PRSC)				
Maintenance	**$10,000**	**lump sum**	**1**	**$10,000**
Miscellaneous	**20% of subtotal**			**$2,000**
Contingency	**20% of subtotal**			**$2,000**
Total Annual Operating Cost				**$14,000**
Total Present Worth for 30 years of site operation at 5% inflation				**$930,200**
Total Alternative Cost-Clay Cap (Life cycle costing for 30 years)				**$1,370,030**

TABLE 4-3
Cost Estimate
Asphalt Concrete Cap Construction

Former Chemical Commodities, Inc.
Olathe, Kansas

DESCRIPTION	ESTIMATED COST	UNITS	NUMBER OF UNITS	ESTIMATED TASK COST
DIRECT COSTS				
Mobilization/Demobilization	$10,000	Lump sum	1	$10,000
Site Preparation/Grading	$10,000	Lump sum	1	$10,000
Demolish concrete slab	$4.86	Square foot	7,000	$34,020
Decontaminate and dispose of concrete slab	$2.50	Square foot	7,000	$17,500
Concrete retaining wall and limited cap	$75.00	Lineal foot	730	$54,750
Clean Fill	$12.00	Cubic yard	2,800	$33,600
Asphalt pavement (4 inch thick application)	$2.00	Square foot	75,200	$150,400
Subtotal				$310,270
Miscellaneous	10% of subtotal			$31,030
Contingency	25% of subtotal			$77,570
Direct Cost Subtotal				$418,870
INDIRECT COSTS				
Engineering	15% of Indirect Costs			$52,400
Indirect Cost Subtotal				$52,400
Total Direct and Indirect Costs				**$471,270**
ANNUAL OPERATING COST (PRSC)				
Maintenance	$4,000	lump sum	1	$4,000
Miscellaneous	20% of subtotal			$800
Contingency	20% of subtotal			$800
Total Annual Operating Cost				$5,600
Total Present Worth for 30 years of site operation at 5% inflation				**$372,100**
Total Alternative Cost-Asphalt Cap (Life cycle cost for 30 years)				**$843,370**

TABLE 4-4

Cost Estimate

Multimedia Cap Construction

Former CCI Site, Olathe, Kansas

DESCRIPTION	ESTIMATED COST	UNITS	NUMBER OF UNITS	ESTIMATED TASK COST
DIRECT COSTS				
Mobilization/Demobilization	$10,000	Lump sum	1	$10,000
Site Preparation/Grading	$10,000	Lump sum	1	$10,000
Concrete constructed retaining walls	$75.00	Lineal foot	730	$54,750
Demolish concrete slab	$4.86	Square foot	7,000	$34,020
Decontaminate and dispose of concrete slab	$2.50	Square foot	7,000	$17,500
Clean Fill	$12.00	Cubic yard	2800	$33,600
Synthetic Geomembrane Liner	$0.55	Square foot	75,200	$41,360
Drainage Material	$18.85	Cubic yard	1,400	$26,390
Geotextile filter fabric	$0.30	Square foot	75,200	$22,560
Top soil, graded (0.5 feet)	$12.00	Cubic yard	1,400	$16,800
Grass cover (sod)	$1.50	Square yard	8,400	$12,600
Subtotal				$279,580
Miscellaneous	10% of subtotal			$27,960
Contingency	25% of subtotal			$69,900
Direct Cost Subtotal				$377,440
INDIRECT COSTS				
Engineering	15% of Indirect Costs			$46,180
Indirect Cost Subtotal				$46,180
Total Direct and Indirect Costs				**$423,620**
ANNUAL OPERATING COST (PRSC)				
Maintenance	$10,000	lump sum	1	$10,000
Miscellaneous	20% of subtotal			$2,000
Contingency	20% of subtotal			$2,000
Total Annual Operating Cost				$14,000
Total Present Worth for 30 years of site operation at 5% Inflation				**$930,200**
Total Alternative Cost-Multi-Media Cap (Life cycle cost for 30 years)				**$1,353,820**

TABLE 5-1
Removal Action Alternative Cost Summary

Former CCI Site, Olathe, Kansas

Alternative	Direct Cost	Indirect Cost	Annual Post Removal Site Costs	Total Present Worth, 30 Year Term at 5% Inflation
Clay Cap	$391,520	$48,310	$14,000	$1,370,030
Asphalt Concrete Cap	$418,870	$52,400	$5,600	$843,370
Multimedia Cap	$377,440	$46,180	$14,000	$1,353,820

APPENDIXES

A. Summary of Physical Characteristics of Chemical Commodities, Inc. Study Area
B. Summary of Site Characterization
C. Executive Summary from Baseline Human Health Risk Assessment
D. Discussion of Potential Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements
E. Description of Comparative Analysis Categories and Criteria for an Engineering Evaluation/Cost Analysis

APPENDIX A

SUMMARY OF PHYSICAL CHARACTERISTICS OF CHEMICAL COMMODITIES, INC. STUDY AREA

APPENDIX A

Summary of Physical Characteristics of Chemical Commodities, Inc. Study Area

The surface features of the Chemical Commodities, Inc. (CCI) site and the regional geology and hydrogeology are described below. A complete description of these and other aspects of the site are contained in the *Site Characterization Report* prepared by Groundwater Technology, Inc. (1996).

A.1 Surface Features

The CCI facility, located in Johnson County, Kansas, lies in the Osage Cuestas division of the Osage Plains physiographic province. The Osage Cuestas is characterized by gently rolling uplands with hilly areas along streams. Relief of up to 150 feet is common along streams flowing to the south. The relief along streams flowing to the north and east into the Kansas and Missouri Rivers is up to 250 feet.

A topographic survey of the site was conducted in 1995 by George Butler Associates, Inc. The topographical survey indicates that the elevation of the property ranges from 1,059 feet along the northern perimeter to 1,052 feet at the southwest corner of the property. The northwest portion of the site drains north along Keeler Street. The southwest portion of the site drains to the south along Keeler Street. Surface water in the vicinity of the site flows to Mill Creek and then north into the Kansas River.

The surface soil encountered on the property is predominantly lean clay with a continuous thickness ranging from 2 to 10 feet. The surface of the site is approximately 60% grass, 13% concrete (including building slab), 11% soil pile, 9% gravel, and 7% weathered asphalt.

A.2 Regional Geology/Hydrogeology

The bedrock in Johnson County consists of thin units of limestone and sandstone separated by thicker units of shale. The thickness of typical limestone units ranges from 0.5 to 20 feet, while the shale units range in thickness from 5 to 100 or more feet. Sandstone, if present, typically ranges from 5 to 25 feet in thickness. The bedrock generally dips gently to the northwest at about 12 feet per mile.

Bedrock beneath the CCI facility is reported to be the Stanton Formation. However, residual remnants of the Weston Shale may overlie the Stanton Formation. The Stanton Formation consists of three limestone units and two shale units. The Stanton Formation lies at or near the surface in much of the upland area in central Johnson County. In Johnson County, the thickness of the Stanton Formation ranges from 26 to 58 feet.

The uppermost unit of the Stanton Formation is the South Bend Limestone. The South Bend Limestone is a medium- to thick-bedded, dense, fine-grained limestone, ranging from 1.5 to 5 feet thick in Johnson County.

Aquifers with specific characteristics occur in each rock type. In general, limestone aquifers in the region are relatively impermeable and yield little or no water to wells. At or near the surface, however, weathering can enlarge joints and fractures. This is especially true in the vadose zone within the zone of fluctuating water table. There are few significant limestone aquifers below depths of 30 to 50 feet.

The sandstones in the area typically yield 3 to 5 gallons per minute (gpm). Wells in the sandstone are used for domestic and livestock supply at some locations. The shales in the area have extremely low permeability and do not produce useful flow to wells (O'Connor 1971). Based on the information presented, groundwater at the site is not assumed to be a source of drinking water.

The City of Olathe obtains water from two surface reservoirs, one about 3 miles west and the other about 2½ miles south of the site. Four wells are also used for city water. These wells are located in the Kansas River Valley near the mouth of Cedar Creek, approximately 10 miles northwest of the site. The well yield of each is between 500 and 1,000 gpm (O'Connor 1971).

O'Connor (1971) indicates that most irrigation supply wells are limited to the Kansas River valley at least 10 miles from the CCI site. The nearest well identified by O'Connor (1971) is a public or commercial well approximately 2 miles northeast of the site. The nearest stock wells are approximately 3 miles southwest of the site. Mr. David Breeze, the chief of technical support for the City of Olathe, Kansas, is the local regulator most familiar with local wells. He indicated that there are no municipal water supply wells near the site (Breeze 1995). He further indicated that he was not aware of any domestic or stock wells within 1 mile of the site.

The surface of the region is predominantly covered by glacial, fluvial deposits where alluvium is not present. Because of the wide range in lithology and saturated thickness of these deposits, the amount of groundwater obtained from wells varies greatly from place to place (O'Connor 1971).

Large volumes of groundwater are produced from wells in alluvium of the Kansas River valley. Well yields of 150 to 1,000 gpm are common. Alluvial material in tributaries to the major rivers is derived from the surrounding shale, fine sand, and loess deposits and is primarily clay and silt. Well yields of 1 to 10 gpm are typical for these locations.

The CCI site is underlain by an unconsolidated clay aquifer with a total thickness near 20 feet. The origin of the clay was not determined in the site characterization investigations. It is common for clay aquifers to have very low or no flow (<1 gpm) and this is consistent with what is observed at the site.

Kansas State Geological Survey reported the total hardness of 45 groundwater samples from Johnson County to be within the range of 14 to 581 milligrams per liter (mg/L). These values correspond to soft to very hard water. Nitrate concentration in 45 samples ranged from 0.4 mg/L to 133 mg/L. The maximum recommended concentration of nitrate in drinking water is 10 mg/L. Three of the 45 groundwater samples collected from the shallow aquifer at the CCI site contained nitrate in concentrations greater than 10 mg/L.

A.3 References:

Breeze, David, City of Olathe, Kansas. 1995. Personal communication to Fluor Daniel GTI regarding Chemical Commodities, Inc. site.

Groundwater Technology, Inc. February 26, 1996. *Site Characterization Report*. Former Chemical Commodities, Inc. site, 320 South Blake Street, Olathe, Johnson County, Kansas.

O'Connor, H.G. 1971. *Geology and Ground-Water Resources of Johnson County, Northeastern Kansas, Bulletin 203.* State Geological Survey. University of Kansas. Lawrence, Kansas.

APPENDIX B

SUMMARY OF SITE CHARACTERIZATION

APPENDIX B

Summary of Site Characterization

A summary of the site characterization conducted by Groundwater Technology, Inc., at the former Chemical Commodities, Inc. (CCI) site is presented here as supporting information.

Demography and Land Use

Land located north, south, and west of the site is developed for residential use. A railroad line operated by Burlington Northern is located along the eastern perimeter of the site. East of the railroad is a commercial/industrial property. Properties northeast of the site and adjacent to the railroad are used for commercial purposes.

Nature and Extent of Contamination

This section summarizes the chemical distribution in each of the environmental media sampled during field activities conducted during the site characterization performed in 1995. The *Site Characterization Report* (SCR) contains all the analytical data, isopleth maps and summary tables that were generated for samples collected from the site.

Chemical Distribution in Soils

Four indicators were used to evaluate the spatial distribution of chemicals in soil. The four indicators are listed below:

- perchloroethylene (PCE)
- trichloroethylene (TCE)
- Total chlorinated organics
- Dichlorodiphenyltrichloroethane (DDT) and daughter compounds

These indicators were selected because they are widespread and are representative of chemicals being evaluated.

Laboratory analyses for PCE in soil were performed on all on-property and many near-property samples. PCE was detected between the surface and 1 foot below grade over much of the property. Highest concentrations, 18 milligrams per kilogram (mg/kg) (SB037) and 7.9 mg/kg (SB022 [TMW007]), are near the northern and southern portions of the property, respectively. Between 1 and 8 feet below grade, concentrations are highest, 47 mg/kg (SB037) and 300 mg/kg (HB005), near the northern and southern portions of the property, respectively. Between 8 and 15 feet below grade, concentrations are highest, 43 mg/kg (SB002) and 4.0 mg/kg (SB024), near the northern and southern portions of the property, respectively. Below 15 feet the highest concentration is 1.8 mg/kg (SB018 [TMW006]) which occurs in the north-central portion of the property.

Laboratory analyses for TCE in soil were performed on all on-property and many near-property samples. TCE was detected between the surface and 1 foot below grade over much of the property. Highest concentrations, 140 mg/kg (SB022 [TMW007]) and 110 mg/kg (SB006), are near the central and southeastern portions of the property, respectively. Between 1 and 8 feet below grade, concentrations are highest, 1,200 mg/kg (SB024) and 58 mg/kg (SB020), near the northeastern and southern portions of the property, respectively. Between 8 and 15 feet below grade, concentrations are highest, 260 mg/kg (SB022 [TMW007]) and 58 mg/kg (SB020), near the northeastern and southern portions of the property, respectively. Below 15 feet the highest concentration is 66 mg/kg (SB022 [TMW007]) which occurs in the southeastern portion of the property.

Total chlorinated organic compounds were detected between the surface and 1 foot below grade over much of the property. Highest concentrations, 213.23 mg/kg (SB008), 735.60 mg/kg (SB006), and 164.60 mg/kg, occur in the east-central, west-central, and southern portions of the property, respectively. Between 1 foot and 8 feet below grade the single highest concentration is 6,413.27 mg/kg (SB008). There are 12 locations with concentrations greater than 100.0 mg/kg. Between 8 feet and 15 feet below grade the highest concentrations, 338.79 mg/kg (SB002) and 348.40 (SB022 [TMW007]), are in the north and south portions of the property, respectively. Below 15 feet the highest concentration is 101.19 mg/kg (SB022 [TMW007]). At this depth, total chlorinated organic compounds were detected over much of the property.

Laboratory analyses for DDT and daughter products in soil were performed on all on-property and many near-property samples. DDT and daughter products were detected between the surface and 1 foot below grade over much of the property. Highest concentrations, 18.73 mg/kg (SB024) and 12.25 mg/kg (SB003), are near the north-central and central portions of the property, respectively. Between 1 and 8 feet below grade, concentrations are highest, 4.53 mg/kg (HB004) and 3.56 mg/kg (HB005), near the central portion of the property.

There is a decrease in mean DDT concentration and distribution with depth. DDT was detected in 27 samples in the shallow interval, where the mean detected concentration was 1.16 mg/kg. In the deeper interval it was detected in 16 samples, and the mean detected concentration was 0.54 mg/kg. This indicates a reduction in frequency of detection and chemical concentration with depth.

Chemical Distribution in Groundwater

Five indicators were used to evaluate the spatial distribution of contaminants in groundwater. The five indicators are listed below:

- Carbon tetrachloride
- Chloroform
- PCE
- TCE
- Total chlorinated organics

Groundwater samples were collected from 16 monitoring wells on November 29 through December 1, 1995, following well development. Wells TMW005, TMW007, and TMW015 contain DNAPL and were not sampled. The sampled wells were CCI 101, EPA 2, EPA 3, ERT 1, KDHE 2, KDHE 3, KDHE 4, TWM001-OP, TMW003-OP, TMW006-OP, TMW008-NP, TMW009-NP, TMW011-NP, TMW012-NP, TMW013-NP, TMW014-NP. The OP/NP designation indicates whether the well is on-property (OP) or near-property (NP).

Carbon tetrachloride was detected in 15 (94 percent) of the wells (including J-coded detections). Groundwater with carbon tetrachloride in concentrations greater than 100 µg/L underlies much of the facility. An area with concentrations greater than 100,000 micrograms per liter (µg/L) underlies the southeast corner of the facility (beneath the warehouse and to its east boundary). The 100,000 µg/L contour is roughly circular and is approximately 100 feet across. An isolated area with concentrations greater than 10,000 µg/L occurs at the southwest corner of the facility. The maximum measured carbon tetrachloride concentration is 160,000 µg/L (ERT 1). DNAPL is present in several wells. Data are not available from these wells. Dissolved carbon tetrachloride concentrations may be higher than mapped in the wells containing DNAPL. The plume extent is not well defined to the north, south, and west. Carbon tetrachloride was not detected in well EPA 3, which has a significant portion of screen in the limestone.

Chloroform was detected in 13 (81 percent) of the wells. Groundwater with chloroform in concentrations greater than 100 µg/L underlies the entire facility. Two areas with measured concentrations greater than 1,000 µg/L occur near the northwest and southeast portions of the facility. The maximum measured concentration is 4,600 µg/L (ERT 1). DNAPL is present in several wells and data on the concentration of chloroform is not available. Dissolved chloroform concentrations may be higher than mapped in the wells containing DNAPL. The plume extent is not well defined to the north, south, and west. Chloroform was not detected in well EPA 3, which has a significant portion of screen in the limestone.

PCE was detected in 15 (94 percent) of the wells. PCE in concentrations greater than 100 µg/L underlies much of the facility. An area with concentrations greater than 10,000 µg/L extends from beneath the warehouse northward approximately 180 feet. The maximum measured concentration is 15,000 µg/L (TMW006). DNAPL is present in several wells. Dissolved PCE concentrations may be higher than mapped near the wells containing DNAPL. The plume extent is not well defined to the east, south, and west. PCE was not detected in well EPA 3, which has a significant portion of screen within the limestone.

TCE was detected in 16 (100 percent) of the wells. TCE in concentrations greater than 10,000 μg/L underlies much of the facility. TCE in concentrations exceeding 100,000 μg/L underlies the southern portion of the facility. The plume with concentrations greater than 100,000 μg/L measures more than 300 feet east to west and 90 feet north to south. The maximum measured concentration is 290,000 μg/L (ERT 1). DNAPL is present in several wells. Dissolved TCE concentrations may be higher than mapped near the wells containing DNAPL. The plume extent is not well defined in any direction.

Total chlorinated organic compounds, as defined in Appendix G of the SCR, were detected in 16 (100 percent) of the wells. Dissolved total chlorinated organic compounds in concentrations exceeding 10,000 μg/L underlie much of the facility. Plume areas with concentrations greater than 100,000 μg/L underlie the southern portion of the facility and the northwest portion of the facility. The southern 100,000 μg/L plume measures approximately 330 feet east to west and 140 feet north to south. The northern 100,000 μg/L is roughly circular and 90 feet across.

Chemical Vapor Distribution in Soil

Soil vapor samples were collected near SB014 (TMW002); SB016 (TMW004); and SB030 (TMW012) as shown on Plate -1 of the Engineering Evaluation/Cost Analysis (EE/CA). Of the eight analytes, five were detected. The analytes detected were 1,1,1-tetrachloroethane (1,1,1-TCA); cis 1,2-dichloroethene (cis 1,2-DCE); trans 1,2-DCE; PCE; and TCE. Near SB014 (TMW002) and SB016 (TMW004) analyte concentrations are generally highest at 4 feet below ground surface (bgs). However, analyte concentrations decrease significantly at 8 feet bgs and increase at 12 feet. In contrast, concentrations decreased with depth near SB030 (TMW012), south of the facility.

Chemical Vapor Flux

Volatile organic vapor flux was measured at six locations. The locations and corresponding temporary monitoring wells are SB013 (TMW001); SB014 (TMW002); SB015 (TMW003); SB016 (TMW004); SB018 (TMW006); and SB030 (TMW012) (Plate B-1). The data was used to evaluate the distribution of total volatile organic vapor flux. The highest total flux (282 micrograms per square meter per minute [$\mu gm^{-2}min^{-1}$]) was observed near SB014 (TMW002). This is in the west-central portion of the facility. The next highest flux (183 $\mu gm^{-2}min^{-1}$) was observed at SB016 (TMW004), near the north fence line of the facility. At all other locations, total flux was 15 or fewer $\mu gm^{-2}min^{-1}$. In the areas of highest flux, TCE and PCE are the major components.

Summary of Data Collected

This section summarizes the analytical results for samples collected from each of the media sampled during field activities. The SCR contains all the analytical data and summary tables that were generated for samples collected from the site.

Laboratory Analytical Results for Soil

Soil samples were collected from 39 hollow-stem-auger drill rig borings and 12 hand-auger borings between October 31 and November 9, 1995. The analytical results for soil are summarized in Tables 2, 3, 4, 5, and 6 in the SCR.

For soil, four compounds were selected as indicators of plume characteristics. The criteria for selecting the indicator compounds are prevalence, toxicity, and persistence. These indicators are listed below:

- PCE
- TCE
- Total Chlorinated Organics
- 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane (DDT) and daughter compounds

Tetrachloroethene concentrations in soil ranged from not detected to 300 mg/kg. The highest concentration occurred in HB-005 at approximately 2 feet bgs. PCE was detected (including J-coded estimations) in 102 (71 percent) of the 143 samples analyzed. The mean of detected concentrations (102 samples) for PCE was approximately 9.0 mg/kg.

Trichloroethene concentrations in soil ranged from not detected to 2,100 mg/kg. The highest concentration occurred in SB-014 at approximately 2 feet bgs. TCE was detected in 130 (91 percent) of the 143 samples analyzed. The mean of detected concentrations (130 samples) for trichloroethane was approximately 61 mg/kg.

Total chlorinated organic compound concentrations ranged from not detected to 6,413.27 mg/kg. The highest concentration occurred in SB-008 at approximately 3 feet bgs.

In addition to the indicator chemicals, other chemicals were detected. EPA Method 8260 was used to analyze for volatile organic compounds (VOCs) One hundred percent of the samples analyzed contained VOCs. The mean concentration for all detected VOCs was 3.90 mg/kg. The highest concentration of any single VOC was 5,700 mg/kg for 1,1,2,2-TCA.

EPA Method 8080 was used to analyze for pesticides and polychlorinated biphenyls (PCBs). These compounds were detected in 84 percent of the samples. The mean detected concentration was 1.86 mg/kg. The highest concentration of a single pesticide was 140 mg/kg for 4,4-DDT. The highest concentration of a single PCB was 3.4 mg/kg for Aroclor 1254. DDT and daughter compounds 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane (DDD) and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene (DDE) concentrations ranged from not detected to 18.7 mg/kg. The highest concentration occurred in SB-024 between the surface and 1 foot bgs.

EPA Method 8270 was used to analyze for semivolatiles. Semivolatiles were detected in 43 percent of the samples analyzed. The mean detected concentration for detected semi-volatile organic compounds (SVOCs) was 2.63 mg/kg. The highest concentration of any single SVOC was 1,900 mg/kg for 1,2- dichlorobenzene.

Polynuclear aromatic hydrocarbons (PAHs), as analyzed with EPA Method 8310, were present in 80 percent of the samples analyzed, and had a mean detected concentration of 0.88 mg/kg. The highest concentration for any single PAH was 300 mg/kg for naphthalene.

Soil samples collected from surface to 7 feet bgs were analyzed for metals using EPA Method 6010/7000. Detected concentrations were compared to background concentrations and arsenic, barium, cadmium, chromium, and mercury were found at levels exceeding background. The maximum concentrations of each of these constituents are 300 mg/kg (arsenic), 870 mg/kg (barium), 36 mg/kg (cadmium), 530 mg/kg (chromium), and 5.8 mg/kg (mercury).

Laboratory Analytical Results for Groundwater

Groundwater samples were collected from 16 wells between November 29 and December 1, 1995. Well locations are illustrated on Plate B-1. All samples were analyzed for VOCs using EPA Method 8260 (VOCs). Three wells, TMW005, TMW007, and TMW015 contained DNAPLs and were not sampled. Three other wells, TMW002, TMW004, and TMW010, were dry and were not sampled. The analytical results for groundwater are summarized in Table 8 of the SCR. Thirty-eight analytes were detected.

On a later date, a sample of the DNAPL was obtained and analyzed to determine its chemical makeup. The DNAPL is comprised primarily of TCE and PCE.

For groundwater, five compounds were selected as indicators of plume characteristics. The criteria for selecting the indicator compounds in groundwater are identical to those used for selecting the indicator compounds in soil, namely, prevalence, toxicity, and persistence. These indicators are listed below:

- Carbon tetrachloride
- Chloroform
- PCE
- TCE
- Total chlorinated organics

In the 16 wells without DNAPLs, carbon tetrachloride concentrations in groundwater ranged from not detected to 160,000 µg/L. The highest concentration occurred in ERT1. Carbon tetrachloride was detected (including J-coded estimations) in 15 (94 percent) of the 16 samples analyzed. The mean of detected concentrations (15 samples) for DNAPL was approximately 14,900 µg/L.

Chloroform concentrations in groundwater ranged from not detected to 4,600 µg/L. The highest concentration occurred in ERT 1. Chloroform was detected in 13 (81 percent) of the 16 samples analyzed. The mean of detected concentrations (13 samples) for chloroform was approximately 564 µg/L.

PCE concentrations in groundwater ranged from not detected to 15,000 µg/L. The highest concentrations occurred in TMW006. PCE was detected in 15 (94 percent) of the 16 samples analyzed. The mean of detected concentrations (16 samples) for PCE was approximately 2,040 µg/L.

TCE was detected in all groundwater samples from wells screened above the bedrock. Detected concentrations ranged from 5 µg/L to 290,000 µg/L. The highest concentration occurred in ERT 1. The mean of detected concentrations for TCE was 51,763 µg/L. A TCE concentration of 5 µg/L (approximately 3 orders of magnitude lower than surrounding wells) was detected in EPA 3, which is screened in the underlying bedrock.

Total chlorinated organic compounds concentrations in groundwater ranged from not detected to 552,500 µg/L. The highest concentration occurred in ERT 1. All of the 16 samples analyzed (100 percent) contained dissolved concentrations of chlorinated organic compounds. The mean of detected concentrations (16 samples) for total chlorinated organic compounds was 84,321 µg/L.

Soil Vapor Field Study Results

A push-type soil vapor sampling device was used to collect soil vapor samples at three locations (SB014 [TMW002], SB016 [TMW004], and SB030 [TMW012]) on November 9 and 29, 1995. See Plate B-1 for sample locations. At each location, samples were collected at 4, 8, and 12 feet bgs. Soil vapor was analyzed in the field using a gas chromatograph. The analytical results are provided in Table 9 of the SCR. Soil vapor flux data and soil samples were also collected at these locations.

Analytes detected included 1,1,1-TCA, TCE, PCE, DCE, and cis 1,2-DCE. Vinyl chloride, benzene, toluene, ethylbenzene, xylenes, and 1,1-DCE were not detected. The maximum concentration of 1,1,1-TCA was 339 µg/L in SB014 (TMW002) at 4 feet bgs. The maximum concentration of TCE was 639 µg/L in SB016 (TMW004) at 4 feet bgs. The maximum concentration of PCE was 79 µg/L in SB014 (TMW002) at 4 feet bgs. The maximum concentration of trans 1,2-DCE was 10.3 µg/L in SB014 (TMW002) at 4 feet bgs. The maximum concentration of cis 1,2-DCE was 567 µg/L in SB014 (TMW002) at 4 feet bgs.

Soil Vapor Flux Field Study Results

Surface air emissions of VOCs were measured at six locations near previously drilled soil borings SB013 (TMW001); SB014 (TMW002); SB015 (TMW003); SB016 (TMW004); SB018 (TMW006); and

SB030 (TMW012) on November 20, 1995. See Plate B-1 for locations. EPA-recommended protocols and equipment were used. Samples collected were analyzed using EPA Method TO-14 (VOCs). The field activities and analytical results, including tabulated surface flux rates, are summarized in the technical memorandum in Appendix J of the SCR. Of the 28 analytes evaluated 27 were detected.

Analytes detected include benzene, carbon tetrachloride, chloroform, 1,1-DCE, tetrachloroethene, trichloroethene, and vinyl chloride. The flux rate is a measure of soil vapor mass emitted to the atmosphere by a unit area of soil over a unit of time. The maximum flux rate for benzene was 0.68 micrograms per square meter per minute ($\mu gm^{-2}min^{-1}$) at SB014 (TMW002). The maximum flux rate for vinyl chloride was 0.85 $\mu gm^{-2}min^{-1}$ at SB014 (TMW002). The maximum flux rate for 1,1-DCE was 9.0 $\mu gm^{-2}min^{-1}$ at SB014 (TMW002). The maximum flux rate for chloroform was 0.97 $\mu gm^{-2}min^{-1}$ at SB016 (TMW004). The maximum flux rate for carbon tetrachloride was 7.1 $\mu gm^{-2}min^{-1}$ at SB016 (TMW004). The maximum flux rate for TCE was 160 μgm^{-2},min^{-1} at SB016 (TMW004). The maximum flux rate for PCE was 23 $\mu gm^{-2}min^{-1}$ at SB014 (TMW002).

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APPENDIX C

EXECUTIVE SUMMARY FROM BASELINE HUMAN HEALTH RISK ASSESSMENT

APPENDIX C

Executive Summary from Baseline Human Health Risk Assessment

Rockwell International Corporation (Rockwell) contracted Fluor Daniel GTI, Inc. (Fluor Daniel GTI) to conduct a site characterization and baseline human health risk assessment (BHRA) at the former Chemical Commodities, Inc. (CCI) facility in Olathe, Kansas. The site characterization and BHRA were conducted in accordance with the Site Characterization Work Plan and Risk Assessment Technical Memorandum, respectively, as approved by the United States Environmental Protection Agency (US EPA) Region VII. The objectives of the site characterization were to define subsurface conditions at the site that control contaminant fate and transport, to define the nature and extent of soil and groundwater contamination, and to provide background data necessary for completion of the BHRA. Additionally, the site characterization will provide data for an Engineering Evaluation/Cost Analysis, an element of a non-time critical removal action under the Comprehensive Environmental Response, Compensation and Liability Action (CERCLA).

The former CCI facility began operations in 1951. The CCI facility was a chemical recycling operation that bought and sold used, off-specification, and surplus chemicals. A distillation unit for reclamation of spent solvents was also operated on-site. The plant is presently inactive, and there is no ongoing storage of hazardous materials at the site.

The soil and groundwater investigation consisted of 25 rig borings, 12 hand borings, surface and subsurface soil sampling, continuous sampling up to a depth of 23 feet below ground surface, installation of 15 temporary monitoring wells and collection of water level gauging data, 3 soil vapor sample borings, 6 vapor flux sample events, and groundwater sampling of 10 on-property and 6 near-property monitoring wells. Groundwater was encountered at depths of 15 to 20 feet below grade surface. General groundwater flow is to the southwest, at a gradient of 0.014 to 0.13 ft/ft. Soil, soil vapor, and groundwater investigations conducted both on the CCI site and on adjoining properties have indicated the presence of organic compounds, particularly chlorinated hydrocarbons. Concentration trends in the soil vapor, the soil -adsorbed phase, and the groundwater indicate on-property sources of these constituents. Active ongoing migration of vapor- and dissolved-phase chemicals in soil and groundwater underlying the CCI site is likely. Dense nonaqueous phase liquids (DNAPLs) consisting primarily of trichloroethene (TCE) and tetrachloroethene (PCE) were encountered in three temporary monitoring wells in two separate areas along the CCI facility's eastern property boundary. DNAPL represents a continuing source of impact to groundwater underlying the site.

The BHRA is based on soil vapor, surface and subsurface soil, and groundwater data collected during the site characterization activities described in this report. Data collected prior to the RI/FS activities guided removal actions conducted at the CCI facility in 1989 and 1991 and were not included in the BHRA. Forty-one soil and 34 groundwater chemicals of potential concern (COPC) were identified for evaluation in the BHRA. The assessment is premised on the baseline conditions of the site and on the current and projected land use of the site. Risks were evaluated quantitatively for the identified chemicals of potential concern in designated exposure areas referred to as near-property and on-property. On-property refers to areas where CCI operations took place. Near-property refers to adjacent areas that may have been impacted by CCI operations. The on-property and near-property areas together will be described as the CCI site.

Groundwater underlying the CCI site is not a current source of water supply and will not be a likely source of water supply in the future. Thus, the potential risks due to exposure to groundwater COPC through inhalation of volatiles that intrude into the homes or buildings are the only pathways evaluated for the on-property resident and the on-property commercial worker.

The potential receptors evaluated are the current and future near-property resident, the future on-property resident, the future on-property commercial worker, and current and future on-property recreational user/trespasser, and the future on-property construction worker.

Based on a deterministic estimation of risks, the estimated cancer and noncancer risks posed to the different receptors are as follows:

	Soil		Groundwater		Total	
Receptor	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index
Near-Property Resident	2E-04	0.87	NE	NE	2E-04	0.87
On-Property Resident	8E-03	0.52	4E-04	26	8.4E-	26.52
On-Property Commercial	8E-04	0.6	1E-05	2.0	8.1E-	2.6
On-Property Recreational User	1E-03	0.49	NE	NE	1E-03	0.49
On-Property Construction	6E-03	2.4	NE	NE	6E-03	2.4

NE = not evaluated

The baseline risk estimates demonstrate that the development of health-based cleanup levels is required. The proposed cleanup levels were calculated by using the same exposure assumptions and equations used to calculate risks.

The cleanup levels that are specific to the site are dependent on the land use that will be established for the site. The proposed future end use and the remedial alternatives that will be screened to attain the corresponding cleanup level will be discussed in the EE/CA.

APPENDIX D

DISCUSSION OF POTENTIAL FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

APPENDIX D

Discussion of Potential Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements

A number of potential federal and state action-specificapplicable or relevant and appropriate requirements (ARARs) were identified for the removal action alternatives at the former Chemical Commodities, Inc. (CCI) site. Each of them is listed and described in this appendix.

D.1 Potential Federal Action-Specific Requirements

40 Code of Federal Regulations (CFR) Part 261 - Identification and Listing of Hazardous Waste
This Resource Conservation and Recovery Act (RCRA) regulation defines solid waste and hazardous waste, provides for certain exclusions from those definitions, and identifies the characteristics and listings of hazardous wastes. From these definitions come the "mixture rule," the "derived from rule," and the "contained-in policy." These regulations are applicable if any waste is generated during a removal action.

40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste
This RCRA regulation mandates that each generator who generates a solid waste must determine whether that waste is also a hazardous waste. It further specifies the need for an Environmental Protection Agency (EPA) ID number, manifesting of off-site shipments, compliance with relevant Department of Transportation (DOT) Hazardous Materials regulations and certain record keeping and reporting requirements. It is also this regulation which allows accumulation of hazardous waste at a generator's location, in tanks or containers, without a permit under certain conditions. If waste is generated during a removal action, this regulation is applicable.

40 Cfr Part 264 - Standards for Owners and Operators of Treatment, Storage and Disposal Facilities (TSDFs)
This RCRA regulation specifies the performance standards for owners and operators of TSDFs. For instance, when containers or tanks are used for storage, or shredders or thermal units are used to perform treatment, certain performance standards must be met to attain full compliance. Subpart S of this regulation also contains standards for management of remedial wastes, thus allowing use of Corrective Action Management Units and Temporary Units under certain conditions. This regulation is applicable to removal actions which generate and subsequently store, treat, or dispose of hazardous waste.

40 CFR Part 268 - Land Disposal Restrictions (LDR)

Part 268 of the RCRA regulations requires that wastes be treated prior to land disposal in order to fulfill congressional mandates to minimize the threat of harm due to hazardous waste management activities which place wastes in or on the land. These prohibitions and restrictions dictate management methods or treatment standards which must be met, thus affecting waste management decisions for characteristic and listed wastes. According to 40 CFR 268.30(c), F001-F005 solvent wastes which are contaminated soil resulting from a response action pursuant to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) are prohibited from land disposal, unless the wastes already meet the LDR standards, or a treatability variance or no-migration petition or ARAR waiver (for on-site actions) is approved. LDRs are not retrospective, thus do not apply to remediation wastes left in place (such as *in situ* treatment and disposal). LDRs also do not apply to waste moved within a waste management unit, but are triggered when wastes are removed and redisposed. Hence, movement of contained soils within a contaminated area (as is the case for regrading and contouring) does not trigger LDRs unless the waste is removed from the contaminated area for redisposal.

40 CFR Part 300.440 - Off-Site Response Actions

This CERCLA regulation sets standards for the off-site transfer of hazardous substances, pollutants or contaminants, when such transfer is fund-financed or otherwise pursuant to CERCLA authority. EPA Regional offices determine whether selected off-site TSDFs are acceptable for management of wastes in order to minimize the potential for continued mismanagement. This regulation will be applicable if waste is sent off-site.

49 CFR Parts 107, 171-177 - Transportation of Hazardous Materials

The Secretary of Transportation has determined that the transportation of certain wastes and materials pose a threat to human health and the environment. These DOT regulations specify the classification, description, packaging, marking, labeling and placarding standards for compliant movement of hazardous materials by many modes of transportation including rail and highway shipments. These requirements are applicable to all removal action alternatives that involve transport of regulated materials from the site.

40 CFR Part 122 - National Pollutant Discharge Elimination System (NPDES)

These Clean Water Act (CWA) regulations specify standards for the discharge of any pollutants from a point source to the waters of the United States. Thus, treated waters generated during a removal action which still retain some pollutants would be subject to NPDES standards prior to discharge to any lake, river, stream, wetland or tributary of such water of the United States.

Options considered for discharge of accumulated groundwater include treatment followed by discharge to the publicly owned treatment works (POTW) or to the storm sewer. Off-site discharges would need to comply with substantive and administrative legally applicable requirements. Technology-based requirements through effluent limitations guidelines may be developed case-by-case by EPA for pollutants that are regulated under the CWA. These effluent limitations would then be applied to the point source discharge to surface water. No specific effluent limitations currently exist for CERCLA sites.

40 CFR Part 129 - Toxic Pollutant Effluent Standards

Under the authority of the CWA, these regulations set specific analytical and effluent standards for certain toxic pollutants such as dieldrin, dichlorodiphenyltrichloroethane, endrin, and polychlorinated biphenyls for manufacturing facilities. These standards are not ARARs for the CCI site removal action, because it is not a manufacturing facility.

40 CFR Part 144 - Underground Injection Control (UIC)

UIC regulations have been promulgated under the authority of the Safe Drinking Water Act. These regulations provide restrictions on the subsurface emplacement of fluids if it results in the movement of contaminants into an underground source of drinking water. Any adverse affect to human health or violation of a primary drinking water standard would be considered non-permitable. These regulations may be ARARs for ozone injection or for reinjection of treated groundwater.

40 CFR Part 403 - General Pretreatment Regulations

Pretreatment regulations have been developed under the CWA in order to prevent industrial dischargers from discharging pollutants which would pass through or interfere with the treatment processes at Publicly Owned Treatment Works. Thus discharges to municipal sewer systems or separate storm water systems would require pretreatment prior to discharge to protect the integrity of the receiving treatment facility. Discharge to a POTW, should it be selected, is considered an off-site activity and would be subject to both the substantive and administrative legally applicable requirements of the national pretreatment program (40 CFR Part 403).

40 CFR Part 50 - National Ambient Air Quality Standards

Certain levels of air quality, referred to as National Ambient Air Quality Standards, have been deemed necessary to protect public health. One such standard involves particulate matter which could reasonably be expected to be present under certain removal action alternatives.

40 CFR Part 60 - New Source Performance Standards

Stationary sources which emit or may emit air pollutants must be evaluated to determine whether an operating permit is necessary for the source(s). Under these CAA regulations, emission standards and guidelines are organized according to source type. These regulations may be applicable to removal actions which result in air emissions (thermal desorption, soil venting) from stationary sources.

40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAPS)

Also under the CAA, these regulations specify emission standards for designated hazardous air pollutants, such as benzene, arsenic, mercury and vinyl chloride. NESHAPs are not considered ARARs for the CCI site.

D.2 Potential Federal Action-Specific To Be Considered (TBC)

Ambient Water Quality Criteria: These criteria were developed for 64 pollutants in 1980 (40 CFR Part 231) pursuant to Section 304(a)(1) of the Clean Water Act. In 1983, the EPA revised nine criteria previously published in the "Red Book" in an article, *Quality Criteria for Water* (1976), and in 1980 criteria documents. In 1986, further revisions were incorporated into the "Gold Book", which is the most recent compilation to date. According to Proposed Revisions for the National Contingency Plan (NCP) (1992), if certain criteria are met, Ambient Water Quality Criteria can be site-specific potential ARARs. These may be relevant and appropriate for surface water discharges not addressed by the NPDES program.

Requirements for Management of Hazardous Contaminated Media: This proposed rule is commonly referred to as the Hazardous Waste Identification Rule for Contaminated Media (HWIR-Media). The proposal would establish modified LDR treatment requirements, disposal options, and permitting procedures for contaminated media which is subject to the hazardous waste regulations. It would also relieve much of the contaminated media of Minimum Technological Requirements and would give the EPA and authorized states the authority to exempt certain contaminated media from regulation as hazardous wastes under Subtitle C of RCRA. This rule would replace the Corrective Action Management Unit (CAMU) rule and would establish two new regulatory designations for contaminated media - "above the Bright Line" and "below the Bright Line." These designations would determine which media must remain in Subtitle C and which media are eligible for exemption from Subtitle C. The Bright Line levels are constituent-specific and based on the calculated health risk value for a simple residential exposure scenario using a 10^{-3} risk level for carcinogens and a hazard index of 10 for noncarcinogens.

D.3 Potential State Action-Specific Requirements

Kansas Administrative Regulations (KAR) 28-31-3 - Identification of Characteristics and Listing of Hazardous Waste

This Kansas regulation adopts 40 CFR Part 261, as in effect on July 1, 1992, by reference. Requirements for Conditionally Exempt Small Quantity Generators were not adopted. This regulation is applicable if hazardous waste is generated during a removal action.

KAR 28-31-4 - Standards for Generators of Hazardous Waste

This Kansas regulation adopts 40 CFR Part 262, as in effect on July 1, 1992, by reference. It is notable that the mixture rule is somewhat modified from the Federal standard; however, this regulation is also applicable if hazardous waste is generated during a removal action.

KAR 28-31-8 - Standards for TSDFs

This Kansas regulation adopts 40 CFR Part 264, as in effect on July 1, 1992, by reference. Certain standards for easements, restrictive covenants and title disclosures have been added to the Federal standard. The applicability of this regulation is the same as the federal standard.

KAR 28-31-14 - Land Disposal Restrictions

This Kansas regulation adopts 40 CFR Part 268, as in effect on July 1, 1992, by reference, and as such, is applicable to any land disposal of hazardous waste.

KAR 82-4-20 - Transportation of Hazardous Materials by Motor Vehicles

The Federal Hazardous Materials Regulations, effective October 1, 1993, are adopted by reference into the rules of the Kansas State Corporation Commission. If hazardous materials are transported off the site, this regulation is applicable.

KAR 28-16-28 - Surface Water Quality Standards

Sections 28b through 28f contain the State's antidegradation policy, discharge standards by water classification and adoption of CWA treatment requirements. This requirement is applicable to any surface water discharge which takes place during removal action implementation.

KAR 28 Article 46 - Underground Injection Control

Federal UIC standards, in effect on April 1, 1993, are adopted by reference. The State has added provisions for a specific duration on permits based upon well classification. If ozone injection or reinjection of treated water is performed, these standards are applicable.

KAR 28-16-83 through 97 - Pretreatment

Pretreatment standards in effect in 40 CFR Part 403.2, as of July 1, 1986, are adopted by reference. These standards are applicable for removal action alternatives which result in a discharge to a POTW.

KAR 28 Article 19

State standards for new source performance standards are identified in this regulation along with state-specific CAA Title V permitting provisions. These are ARARs for possible emissions from soil or groundwater treatment systems.

KAR 28 Article 19

Emission Standards for Hazardous Air Pollutants under Article 19 are generally consistent with federal requirements which were in effect on July 1, 1986. These air emission reporting requirements apply to anyone who proposes to construct, alter, use or operate any processing machine, equipment, device or other article, or any combination thereof, that is capable of emitting any potential contaminant emissions equal to or in excess of levels specified in K.A.R. 28-19-8(b) of this regulation. NESHAP standards are not ARARs for any removal action alternatives under consideration.

APPENDIX E

DESCRIPTION OF COMPARATIVE ANALYSIS CATEGORIES AND CRITERIA FOR AN ENGINEERING EVALUATION/COST ANALYSIS

APPENDIX E

Description of Comparative Analysis Categories and Criteria for an Engineering Evaluation/Cost Analysis

The following contains a brief description of the categories and criteria for a comparative analysis of removal action alternatives that are identified during an Engineering Evaluation/Cost Analysis (EE/CA). Descriptions are provided below for effectiveness, implementability, and cost.

Effectiveness

The effectiveness of an alternative refers to its ability to meet the remedial action objective within the scope of the removal action. Each removal action alternative will be evaluated against the remedial action scope and objective. The objectives will be evaluated to address the following criteria:

- Overall Protection of Human Health and the Environment: This criterion provides a summary evaluation of whether the alternative reduces the risks for potential exposure pathways through treatment, engineering, or institutional controls.

- Compliance with applicable or relevant and appropriate requirement (ARARs): This criterion assesses whether a given alternative complies with applicable federal, state, or local laws and/or requirements, and addresses the factors that must be taken into account to ensure compliance with applicable ARARs.

- Long-Term Effectiveness and Permanence: This criterion assesses the degree to which a given alternative will provide a long-term solution to the contaminant at the site, and assesses the degree to which permanence can be assumed. Factors which will be evaluated include the risk posed from waste and residuals which will remain on-site following the removal action, and the reliability of the alternative to provide control until long-term solutions are implemented.

- Reduction of Toxicity, Mobility, and Volume: This criterion assesses the degree to which a given alternative reduces the toxicity, mobility, or volume of contaminants at the site. For example, containment would reduce contaminant mobility, but not their toxicity or volume. The degree to which an alternative affords reductions in these three categories can be influential in the selection of a preferred remedy.

- Short-Term Effectiveness: This criterion assesses the difficulties which could be posed through the implementation of an alternative. Factors such as potential risks to workers and residents, and potential risks to environmental receptors, are addressed. In addition, the time required to implement an alternative is addressed under this criteria.

Implementability

- Technical Feasibility: This criterion assesses the technical feasibility of an alternative to achieve the remedial objective of the EE/CA within the removal action project schedule. Factors such as site lithology, physical constraints of the site, site access, and potential future remedial actions will be evaluated in the assessment of technical feasibility.

- Administrative Feasibility: This criterion evaluates those activities needed to coordinate with other state or local agencies which are nonenvironmental related. Factors such as building permits, access permits, easements, zoning variances, and statutory limits will be evaluated for each alternative presented in this EE/CA.

- Availability of Services and Materials: This criterion evaluates if the necessary personnel, equipment, and facilities exist for the implementation of an alternative. Factors such as availability of personnel and technology, off-site treatment, storage, and disposal facilities will be evaluated for each alternative.

- State Acceptance: This criterion assesses the State's comments or positions relative to a given alternative. Factors such as technical and administrative concerns will be addressed in this section. Typically, this criterion is fully addressed following the review of the site investigation (SI), BHRA, and EE/CA allowing for comments from state and local authorities which can be incorporated in the final EE/CA submittal.

- Community Acceptance: This criterion assesses the community's concerns or support for the implementation of a given alternative. Typically, this criterion is fully addressed following the review of the SI, BRA, and EE/CA allowing for comments from local authorities which can be incorporated in the final EE/CA submittal.

Cost

The cost of implementing each alternative is estimated. Costs considered include capital construction costs (including direct and indirect expenses), and annual operation and maintenance (O&M) costs. The direct costs include construction labor, equipment, materials, and contingency costs. The indirect capital costs include such items as engineering designs, permit fees, legal fees, and startup costs. The annual post removal site costs (PRSCs) include the operational, maintenance, energy, monitoring, and support costs related to the alternative.

To provide an equivalent basis for cost evaluation, the net present value of the long-term O&M costs are calculated for the presumed lifetime of the project. As specified in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988), cost estimates should fall within the range of +50% to -30% of the estimated final cost of implementing an alternative.

For an EE/CA report, detailed cost estimates and quantity take-off estimates are typically not available. Therefore, it is acceptable to use realistic assumptions of cost items, standard unit cost from construction estimating guidelines, vendor quotations, or if necessary, best engineering judgment to derive cost estimates for the given alternatives. Where possible, preference is shown for using equivalent assumptions between alternatives for similar cost items, which allows for a comparison of the cost of one alternative versus another.

Reference

United States Environmental Protection Agency (EPA). March 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, Office of Solid Waste and Emergency Response Directive 9335.3-01.