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**Kansas Department of Health and Environment**

**Final  
Corrective Action Decision**



BER SCANNED  
APR 11 2011

**Former Research Products Site  
411 N. Seventh Street  
Salina, Kansas**

**April 2011**

**Bureau of Environmental Remediation**

**KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT  
FINAL CORRECTIVE DECISION  
FORMER RESEARCH PRODUCTS SITE**

**DECLARATION OF REMEDIAL ACTION SELECTION**

**SITE NAME AND LOCATION**

**Research Products Site  
Salina, Kansas**

**STATEMENT OF BASIS AND PURPOSE**

**This final Corrective Action Decision (CAD) document presents the remedy selected to address contamination at the Research Products Site located at 411 N. Seventh Street, in Salina, Kansas. Contaminants of concern (COCs) for the Site are volatile organic compounds (VOCs), specifically, carbon tetrachloride and chloroform. The selected remedy was developed in accordance with guidelines of the State Cooperative Program of the Kansas Department of Health and Environment (KDHE). The Research Products Site is a State-lead site managed under State authority. The selection of the remedy was based on documents and information contained in the Administrative Record file for the Site. The Administrative Records file is available for public review at the KDHE central office in Topeka, Kansas.**

**DESCRIPTION OF THE SELECTED REMEDY**

**KDHE has determined the selected remedy, described and evaluated in the draft CAD, satisfies or meets the criteria established by both the State and Federal programs. The selected remedy will be protective of human health and the environment. The selected remedy for groundwater is Plume Stability Monitoring and establishing Environmental Use Controls (EUCs) with the contingency remedy of Enhanced Anaerobic Bioremediation. The selected remedy is summarized below.**

**Plume Stability Monitoring - A groundwater monitoring program will be established using the existing monitoring well network and expanding the analytical parameter list to include geochemical data (i.e., dissolved oxygen, pH, oxidation/reduction potential, alkalinity, specific conductance, etc.). If necessary, additional monitoring wells will be installed to monitor changes in the contaminant plume. The groundwater monitoring program will continue until conditions at the Site meet the requirements of KDHE BER's Reclassification Plan (Policy #BER-RS-024).**

**EUCs – The EUCs described below will be established through the EUC program administered by KDHE-BER.**

- Restricting future use of the Site to non-residential uses.**
- Preventing the installation of a consumptive use water well(s) on-site.**
- Future characterization of unassessed areas if/when the structural impediment (e.g., former product storage concrete pad) is removed.**

- Identifying the need for future evaluation/mitigation of contamination if land use at the Site changes.

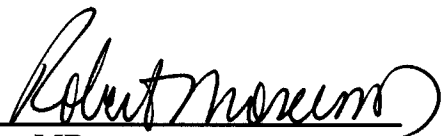
Should KDHE determine that the selected remedy is not effective and will not achieve the cleanup levels, implementation of the Enhanced Anaerobic Bioremediation contingency remedy may be required.

**DECLARATION:**

The selected remedy will be protective of human health and the environment and attain State, Federal, and local requirements that are applicable or relevant and appropriate. The selected remedy also actively reduces the toxicity, mobility, and volume of contamination identified at the Site. In selecting and declaring this remedy, KDHE believes implementation of this remedy will have a beneficial effect by reducing the toxicity, mobility, and volume of contaminants.

4/15/11

\_\_\_\_\_  
Date



\_\_\_\_\_  
Robert Moser, MD

Secretary of Kansas Department of Health and Environment

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## **1.0 PURPOSE OF THE CORRECTIVE ACTION DECISION**

The primary purposes of the final Corrective Action Decision (CAD) are to: 1) summarize information from the key site documents including the Comprehensive Investigation (CI) and Corrective Action Study (CAS) reports; 2) briefly describe the alternatives for site remediation detailed in the CAS report; 3) identify and describe the Kansas Department of Health and Environment's (KDHE) selected remedy for the soil and groundwater contamination at the Former Research Products Site (the Site); and, 4) document comments and KDHE's responses to the public comments received regarding the draft CAD. The public was encouraged to review and comment on the preferred remedy presented in the draft CAD during the public comment period held from January 24 to February 23, 2011.

iSi Environmental Services (iSi), the consultant for McShares, Inc. (McShares), prepared the key documents for the Site. Work performed during the CI and CAS process followed the terms outlined in a May 30, 2003 Consent Agreement between McShares and KDHE. The public was encouraged to review and comment on the technical information presented in the CI and CAS reports, the draft CAD, and other documents contained in the Administrative Record file. The Administrative Record file includes all pertinent documents and site information that form the basis and rationale for selecting the final remedy. The Administrative Record file was made available for public review during normal business hours at the following location:

Kansas Department of Health and Environment  
Bureau of Environmental Remediation  
1000 SW Jackson St., Suite 410  
Topeka, Kansas 66612-1367  
CONTACT: Maggie Weiser, Environmental Scientist  
Telephone Number: (785) 296-5555  
E-mail: mweiser@kdheks.gov

For convenience to interested members of the public, copies of the CI and CAS reports, as well as the draft CAD, were also available for review during normal business hours at the following location:

Salina Public Library  
301 W. Elm  
Salina, Kansas 67401  
CONTACT: Reference Desk  
Telephone Number: (785) 825-4624

## **2.0 SITE BACKGROUND**

### **2.1 Site Location**

The former Research Products facility is located at 411 N. Seventh Street, Salina, in the SE ¼, NW ¼, NW ¼, SW ¼ of Section 12, Township 14 South, Range 3 West, Saline County, Kansas. The general location of the Site and approximate property boundaries are illustrated on Figures 1 and 2. The former Research Products property is zoned for light industrial use; however, surrounding properties are zoned for heavy industrial and central business district use. The nearest residential property is located approximately 850 feet to the southwest (sidegradient) and approximately 2,200 feet southeast (downgradient) of the Site.

### **2.2 Site History**

Research Products leased the property from 1965 to 1968 until it acquired the property via a Kansas Quitclaim Deed on July 12, 1968. Research Products operated at the facility from 1965 to 1969. As part of facility operations, Research Products handled bulk quantities of grain fumigants composed primarily of carbon tetrachloride, carbon disulfide, and/or 1,2-dibromoethane (a.k.a. ethylene dibromide (EDB)). The grain fumigants were delivered either in bulk or in drums. The bulk product was received by tanker and stored in aboveground storage tanks (ASTs) located along the northern edge of the property. A former product storage tank was also located on a concrete pad at the southwest corner of the building. No other lessees/owners handled grain fumigants on the property according to available resources.

### **2.3 Site Discovery**

In 1993, KDHE sampled the monitoring wells at the Long-McArthur underground storage tank (UST) Site, 330 N. Fifth Street, Salina, as part of the Preliminary Assessment (PA)/Site Inspection (SI) for the Salina PWS Well #11 Site. The laboratory results for the groundwater samples indicated the presence of volatile organic compounds (VOCs), unrelated to the UST site. The VOCs detected in the groundwater included carbon tetrachloride, chloroform, 1,2-dichloroethane (1,2-DCA), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and tetrachloroethene (PCE).

From 1994 to 1996, KDHE conducted a CI for the Salina North Site to identify the source(s) of the VOCs in groundwater and determine if further investigation was necessary. The CI included sampling and analysis of soil gas, subsurface soil, and groundwater collected by direct-push methods and from existing and newly installed monitoring wells. The results of the Salina North Site CI identified a carbon tetrachloride/chloroform groundwater contaminant plume emanating from the former Research Products facility. Concentrations of carbon tetrachloride and chloroform were identified on-site in monitoring well SN-3S at concentrations exceeding the maximum contaminant level (MCL) of 5 micrograms per liter ( $\mu\text{g/L}$ ) and 80  $\mu\text{g/L}$ , respectively. The U. S. Environmental Protection Agency (EPA) has established MCLs for certain substances in drinking water supplies. The maximum concentrations detected and corresponding MCLs or Tier 2 Levels, as established in KDHE's *Risk-Based Standards for Kansas RSK Manual*, for the contaminants of concern (COCs) are shown in Table 1.

Results from an Expanded Site Investigation (ESI) of the Salina PWS Well #11 Site, conducted by KDHE in early 2002, confirmed the VOC contaminant plume associated with the former Research Products facility and identified several additional groundwater contaminant plumes from other unrelated sources.

Based on the contamination detected during the Salina North Site CI and the Salina PWS #11 PA/SI and ESI, KDHE requested McShares, successor to Research Products Inc., perform a CI/CAS at the Site. A Consent Agreement (Case No. 02-E-0300) was executed between McShares and KDHE on May 30, 2003, setting the requirements for the investigation and evaluation of cleanup alternatives as part of the CI/CAS process.

Additional information concerning the site background is described in the October 2008 *Comprehensive Investigation Report, Revised, Former Research Products Site*.

### **3.0 COMPREHENSIVE INVESTIGATION**

McShares contracted iSi to perform the CI/CAS at the Site. A CI Work Plan was approved by KDHE in July 2004. The objectives of the CI process include:

- identification and characterization of all potential source areas, including identification of COCs, the mechanisms of release, estimating the quantities of release, and determining whether these releases are ongoing or inactive;
- delineation of the extent of contamination for each of the impacted environmental media at the site;
- characterization of the environmental setting, including regional and local geology, hydrogeology, and hydrology;
- characterization of the physical and chemical properties for each COC, their mobility and persistence in the environment, and their important fate and transport mechanisms;
- identification of human and environmental targets that may be threatened or affected by the site; and
- development of an initial list of remedial alternatives.

#### **3.1 Results of the Comprehensive Investigation**

The CI included evaluation of the geology and hydrogeology for assessing pathways of contaminant migration. The observed lithology in the area of the Site consists of 40 feet of silty clay intermittent sand underlain by fine- to coarse-grained sand to a depth of 55 to 70 feet. The underlying bedrock consists of the Wellington Shale. A single unconfined aquifer is present at the Site, with a water table approximately 30 to 40 feet below ground surface. The groundwater flow in the area is to the east to southeast. It is worthy to note that several of the City of Salina's public water supply (PWS) wells are located east of the Site and the pumping influences in the area may slightly alter the regional groundwater flow direction.

##### **3.1.1 Soil Contamination**

Previous investigations conducted by KDHE indicated a source of VOC contamination in groundwater was present in the area of the former Research Products facility. As part of the

2004 CI activities, soil samples were collected from multiple depths at 10 different boring locations and submitted to the laboratory for analysis. The laboratory results indicated carbon tetrachloride was present in the soil at concentrations ranging from 7.3 to 510 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) (Table 2), exceeding the KDHE Tier 2 soil-to-groundwater pathway of 73.4  $\mu\text{g}/\text{kg}$  at three locations (Figure 3). Chloroform was also present in the soil but at concentrations below the KDHE Tier 2 Levels. EDB, another potential COC associated with grain fumigant chemicals was not detected in any soil sample collected on-site. It is worthy to note, the slight exceedences, 74  $\mu\text{g}/\text{kg}$  and 79  $\mu\text{g}/\text{kg}$ , identified at boring locations SS02 and SS05, respectively, were observed at depth likely within the capillary fringe and the elevated concentration (510  $\mu\text{g}/\text{kg}$ ) detected at boring location SS06 was observed within the saturated or smear zone. These elevated concentrations observed at depth are likely the result of fluctuations in the groundwater table rather than indicative of a soil source area(s). Notwithstanding, additional soil samples were collected in August 2008 to further define the extent of soil impacts previously identified during the 2004 field activities. Carbon tetrachloride and chloroform were not detected in any of the soil samples collected during the 2008 field activities. Figure 3 shows the sample locations and Table 2 summarizes the highest concentration of contaminants detected in soil during the CI investigation and the corresponding non-residential and residential Tier 2 Levels for each contaminant.

### **3.1.2 Groundwater Contamination**

Groundwater samples obtained during the CI activities were collected using direct-push technology and from existing monitoring wells to delineate the vertical and horizontal extent of groundwater contamination. Groundwater samples collected in the shallow portion of the aquifer contained carbon tetrachloride and chloroform at concentrations above the MCL of 5 and 80  $\mu\text{g}/\text{L}$ , respectively. Carbon tetrachloride was not detected in any groundwater sample collected from the intermediate or deep portions of the aquifer. Chloroform was detected at one sample location in the intermediate zone, but was below the MCL and was not detected in the deep zone. Groundwater samples collected from downgradient monitoring wells indicated that the contaminant plume historically extended from the former Research Products property to approximately 400 feet to the southeast in between Seventh Street and Santa Fe Avenue (Figure 5). Subsequent quarterly groundwater sampling events conducted from 2005 to 2007 indicated the concentrations of VOCs across the plume, including the “hot spot” area, were declining. Table 1 summarizes the highest concentration of contaminants detected in groundwater during the CI investigation and the corresponding MCLs and Tier 2 Levels for each contaminant.

For more information on the results of the CI, refer to the October 2008 *Comprehensive Investigation Report, Revised, Former Research Products Site*.

### **3.1.3 Post-CI Investigations and Activities**

Subsequent to the CI, groundwater monitoring events have continued on a semi-annual basis. Results from the most recent sampling event conducted in February 2011 indicate carbon tetrachloride is the only remaining contaminant present in groundwater at concentrations (5.2  $\mu\text{g}/\text{L}$ ) barely exceeding to the MCL. Concentrations of VOCs in groundwater continue to decline and the overall size of the plume has decreased. The highest concentration of each COC detected in groundwater during 2008 through 2011 are illustrated in Figure 5.

Results of all the investigations conducted at the Site were used to identify the selected remedy, which will be described in Section 7.0.

#### **4.0 SITE RISKS**

The primary route of exposure to contaminants at the Site is through use of groundwater contaminated with VOCs. The properties in the vicinity of the Site are connected to the public water supply system to reduce the potential for exposure to contaminated groundwater. Although a few of the City's PWS wells are located more than a quarter mile downgradient of the contaminant plume, results of continued monitoring indicate none of the wells have historically been or are currently impacted by the COCs associated with the Site. The site-related contaminant plume does not extend off-site to any residential properties and no potential targets for the vapor intrusion pathway have been identified.

#### **5.0 REMEDIAL ACTION OBJECTIVES**

Based on the information collected during the CI, the following remedial action objectives (RAOs) were developed:

- Prevent human exposure to contaminated groundwater;
- Prevent further degradation of the aquifer; and
- Restore the aquifer to its most beneficial use.

#### **5.1 Cleanup Levels**

For groundwater remediation being conducted at sites with drinking water aquifers, federally promulgated MCLs are used as the default cleanup levels. If no MCL is established for a particular contaminant, comparison is made to the KDHE Tier 2 Levels.

The results of the CI indicate that soil contaminated with VOCs does not exceed KDHE's Tier 2 Level for the soil pathway, and, therefore, does not present a direct contact human health risk. Although exceedences of the KDHE Tier 2 soil-to-groundwater pathway were identified at depth, these concentrations were observed within the capillary fringe and saturated zone, and, therefore, it is unlikely that the soil contamination would pose an indirect human health risk by being a potential continuous source of contamination for the groundwater. KDHE has calculated risk-based Tier 2 Levels for soil and soil-to-groundwater pathway for the protection of human health. The risk-based Tier 2 Levels and methods of calculation are identified in KDHE's *Risk-Based Standards for Kansas, RSK Manual*.

The conclusions of the CI, the formulation of RAOs, and the determination of MCLs as the cleanup levels for groundwater and Tier 2 Levels as the cleanup levels for soil provide the basis for selecting a preferred remedial alternative. The MCLs and Tier 2 Levels for contaminants in soil and groundwater are provided in Tables 1 and 2. The selected remedy, as well as the contingency remedy, for groundwater is expected to eventually lead to unrestricted use of the aquifer.

## **6.0 SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED**

In accordance with KDHE's CI/CAS Scope of Work, several remedial action alternatives were assembled and evaluated in detail. Each remedial alternative was evaluated using the following criteria: 1) overall protection of human health and the environment; 2) compliance with Federal and State applicable or relevant and appropriate requirements (ARARs); 3) long-term effectiveness and permanence; 4) overall reduction of toxicity, mobility and volume through treatment; 5) short-term effectiveness; 6) implementability, 7) cost; and 8) community acceptance. A detailed description of each remedial alternative is presented in the CAS Report.

### **6.1 Soil Remedial Alternatives**

Although concentrations of carbon tetrachloride exceeded the KDHE Tier 2 Level for the soil-to-groundwater pathway in three soil samples collected during the 2004 CI activities, the elevated concentrations of carbon tetrachloride were observed at depth and are likely the result of fluctuations in the groundwater table rather than indicative of a soil source area. The analytical results from the soil samples collected in 2008 along with the continued decrease in carbon tetrachloride and chloroform concentrations in groundwater provides further evidence that a continuing source for the COCs is not present in the vadose zone. Therefore, soil remedial alternatives were not evaluated as part of the CAS for the Site.

### **6.2 Groundwater Remedial Alternatives**

#### Remedial Alternative 1 – No Action

The No Action alternative provides a baseline for evaluating all other remedial alternatives. Since no action is taken, risks to human health and environment may not be addressed.

#### Remedial Alternative 2 – Plume Stability Monitoring

Implementing the Plume Stability Monitoring alternative would consist of long-term monitoring using the current monitoring well network at the Site. The analytical parameters list would be expanded to include geochemical parameters (i.e., dissolved oxygen, pH, oxidation/reduction potential, alkalinity, specific conductance, etc.) to monitor the natural attenuation processes. Results of a first-order decay model predicted the RAOs would be achieved in two to four years with plume stability monitoring. A review of the historical data collected to date, indicates that the site-related groundwater contaminant plume has decreased overtime. Monitoring would continue until conditions at the Site meet the criteria set in KDHE's Reclassification Plan (Policy #BER-RS-024).

#### Remedial Alternative 3 – Enhanced Anaerobic Bioremediation

Implementing the Enhanced Anaerobic Bioremediation (EAB) alternative would consist of the installation of one injection well with periodic nutrient injections combined with groundwater monitoring. The injection well would be installed upgradient of monitoring well GWS. The EAB alternative would enhance the reductive dechlorination of the COCs. Groundwater monitoring

would be conducted to determine the effectiveness of the remedy and migration of the contaminant plume. Implementation of this alternative would require obtaining an Underground Injection Control (UIC) permit. The RAOs would be achieved in approximately two to four years with the EAB alternative.

## **7.0 DESCRIPTION OF THE SELECTED REMEDY**

KDHE has determined the selected remedy for the Site, outlined below, satisfies or meets the criteria established by both State and Federal programs and will be protective of human health and the environment.

The remedial alternatives were evaluated based on the eight criteria discussed in Section 6.0. KDHE has identified **Groundwater Remedial Alternative 2** as the selected remedy for addressing the groundwater contamination at the Site.

KDHE proposes to modify the selected groundwater remedy to include institutional controls established under the framework of KDHE's Environmental Use Control (EUC) Program. Since residual groundwater contamination would remain in place under this alternative, identified EUCs would minimally include: restricting future use of the property to non-residential uses; preventing the installation of a consumptive use water well(s) on-site; future characterization of unassessed areas if/when the structural impediment (e.g., former product storage concrete pad) is removed; and identifying the need for future evaluation/mitigation of contamination at the Site if land use at the Site changes. The EUC will be formally established through the EUC Program administered by the KDHE-Bureau of Environmental Remediation (BER).

### **7.1 Selected Remedy for Groundwater**

Remedial Alternative 2, Plume Stability Monitoring, as modified below - The selected remedy for the groundwater consists of a groundwater monitoring program using the existing monitoring well network and expanding the analytical parameter list to include geochemical parameters (i.e., dissolved oxygen, pH, oxidation/reduction potential, alkalinity, specific conductance, etc.), and establishing EUCs as described below.

- Restricting future use of the Site to non-residential uses.
- Preventing the installation of a consumptive use water well(s) on-site.
- Future characterization of unassessed areas if/when the structural impediment (e.g., former product storage concrete pad) is removed.
- Identifying the need for future evaluation/mitigation of contamination if land use at the Site changes.

The EUC would be established through the EUC Program administered by KDHE-BER. If necessary, additional monitoring wells would be installed to monitor changes in the contaminant plume. The groundwater monitoring program would continue until conditions at the Site meet the requirements of KDHE BER's Reclassification Plan (Policy #BER-RS-024). All RAOs for the Site must be met to achieve reclassification status at the point groundwater monitoring indicates the Site may be eligible for reclassification. The cost of implementing the Plume Stability Monitoring alternative as described in the CAS is approximately \$64,000 plus additional costs for establishing EUCs.

Evaluation of the performance of the remedial action for groundwater will be based on analytical results. KDHE may re-evaluate the remedial options, specifically if analytical data demonstrate the persistence or increasing concentrations of contaminants in groundwater. Should KDHE determine that Plume Stability Monitoring is not effective and will not achieve the cleanup levels, implementation of the contingency remedy Enhanced Anaerobic Bioremediation may be required.

## **8.0 COMMUNITY INVOLVEMENT**

A Public Information Plan for the Site was developed by KDHE. Public input and comment has been encouraged by KDHE throughout the process. On January 24, 2011, KDHE issued a news release announcing the availability of the draft CAD and the public comment period offered from January 24 to February 23, 2011. Public notice of the availability of the draft CAD, the Administrative Record file, and the public comment period was published in the *Salina Journal* on January 24, 2011.

## **9.0 DOCUMENTATION OF SIGNIFICANT CHANGES**

No written or verbal comments on the draft CAD were submitted to KDHE during the public comment period. No significant changes have been made to the final CAD

## **10.0 RESPONSIVENESS SUMMARY**

The purpose of the Responsiveness Summary is to summarize the comments made by private citizens and other interested parties during the public comment period for the draft CAD. A public comment period was offered from January 24 to February 23, 2011. No comments were received by KDHE during the public comment period.

Table 1  
 Site-Related Contaminants of Concern in Groundwater  
 Former Research Products Site  
 micrograms per liter (µg/L)

MCL and/or KDHE Tier 2 Levels	Carbon Tetrachloride			Chloroform													
	5			80													
	GW01-35	GW02-35	GW03-35	GW04-40	GW05-40	GW06-40	GW07-40	GW08-35	GW09-40	GW10-40	A01-32	A01-44	A01-60	A02-32	A02-44	A02-45	
	21-Sep-04	22-Sep-04	21-Sep-04	22-Sep-04	22-Sep-04	22-Sep-04	22-Sep-04	22-Sep-04	22-Sep-04	22-Sep-04	19-Aug-08	19-Aug-08	19-Aug-08	20-Aug-08	20-Aug-08	21-Aug-08	
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0	<b>26</b>	<b>4.2</b>	<1.0	<1.0	<b>1.8</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.1	
Chloroform	<1.0	<1.0	<b>3.1</b>	<1.0	<b>51</b>	<b>1.1</b>	<1.0	<1.0	<b>1.4</b>	<1.0	<b>4.1</b>	<1.0	<1.0	<b>2.4</b>	<b>1.4</b>	<b>2.4</b>	
	<b>A02-60</b>	<b>A03-32</b>	<b>A03-44</b>	<b>A03-60</b>	<b>SN-1S</b>	<b>SN-1D</b>											
Carbon Tetrachloride	20-Aug-08	20-Aug-08	20-Aug-08	20-Sep-08	11-Feb-08	11-Feb-08											
Chloroform	<1.0	<b>19</b>	<1.0	<1.0	<1.0	<1.0											
	<1.0	<b>129</b>	<1.0	<1.0	<1.0	<1.0											
	<b>SN-2S</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	25-Feb-09	26-Aug-09	24-Feb-10	3-Aug-10	17-Feb-11	
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<b>1.1</b>	<b>3.2</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	<b>1.3</b>	<b>1.2</b>	<1.0	<1.0	<b>1.6</b>	<b>2</b>	<b>3.6</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	<b>SN-3S</b>																
	<b>GWS*</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	11-Feb-08	25-Feb-09	27-Aug-09	25-Feb-10	4-Aug-10	17-Feb-11	
Chloroform	<1.0	<b>35.7</b>	<b>35.5</b>	<b>37.4</b>	<b>32</b>	NS	NS	<b>22.5</b>	<b>21.1</b>	<b>22.6</b>	<b>31.5</b>	<b>18.7</b>	<b>14.1</b>	<b>12.3</b>	<b>15.1</b>	<b>5.2</b>	
	<1.0	<b>39.8</b>	<b>51.4</b>	<b>50.2</b>	<b>42.8</b>	NS	NS	<b>43.2</b>	<b>99.3</b>	<b>111</b>	<b>117</b>	<b>70.7</b>	<b>70.3</b>	<b>54.3</b>	<b>68.6</b>	<b>18.3</b>	
	<b>SN-3D</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	11-Feb-08	25-Feb-09	27-Aug-09	25-Feb-10	4-Aug-10	17-Feb-11	
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	<1.0	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.0	<1.0	
	<b>SN-4S</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	25-Feb-09	26-Aug-09	24-Feb-10	4-Aug-10	17-Feb-11	
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	
	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	
	<b>SN-4D</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	25-Feb-09	26-Aug-09	24-Feb-10	4-Aug-10	17-Feb-11	
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	
	<1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	
	<b>SN-7S</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	19-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	11-Feb-08	25-Feb-09	26-Aug-09	24-Feb-10	3-Aug-10	17-Feb-11	
Chloroform	<b>1.5</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	
	<b>4.1</b>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	
	<b>SN-7D</b>																
Carbon Tetrachloride	23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	11-Feb-08	25-Feb-09	26-Aug-09	24-Feb-10	3-Aug-10	17-Feb-11	
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	
	<1.1	<1.0	<1.0	<1.0	<1.0	<1.0	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	

Table 1  
 Site-Related Contaminants of Concern in Groundwater  
 Former Research Products Site  
 micrograms per liter (µg/L)

MCL and/or KDHE Tier 2 Levels		Carbon Tetrachloride		Chloroform													
		5		80													
<b>** FRP-1S</b>		23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	25-Feb-09	27-Aug-09	24-Feb-10	4-Aug-10	17-Feb-11
Carbon Tetrachloride	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<b>2.9</b>	<b>2.9</b>	<1.0	<1.0	<1.0
<b>** FRP-1I</b>		23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	26-Feb-09	27-Aug-09	24-Feb-10	4-Aug-10	17-Feb-11
Carbon Tetrachloride	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<b>1.2</b>	<b>1.2</b>	<1.0	<1.0	<1.0
<b>** FRP-1D</b>		23-Sep-04	28-Sep-05	13-Jan-06	5-Apr-06	11-Jul-06	11-Oct-06	4-Jan-07	5-Apr-07	19-Jul-07	24-Oct-07	12-Feb-08	26-Feb-09	27-Aug-09	24-Feb-10	4-Aug-10	17-Feb-11
Carbon Tetrachloride	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<1.0	<1.0	<1.0	<1.0	<1.0
Notes:																	
MCL - Maximum contaminant level																	
NS - Not sampled																	
NA - Not Analyzed																	
Detections in bold																	
Values shaded in yellow exceed the MCL and/or KDHE Tier 2 Level																	
< not detected above reporting limit shown																	
* - Geoprobe installed monitoring well; replaced sampling of monitoring well SN-3S when SN-3S became damaged and could not be located.																	
** - Monitoring wells FRP-1S, I, & -D were installed in February 2009																	
Data obtained from the <i>Comprehensive Investigation Report; Former Research Products Site</i> , October 2008 and the <i>February 2011 Laboratory Analytical Report</i> submittal dated March 2011																	

Table 2  
 Site-Related Contaminants of Concern in Soil  
 Former Research Products Site  
 micrograms per kilogram (µg/kg)

Sample ID	Sample Date	Sample Depth (ft)	Laboratory Analytical Results			
			Carbon Tetrachloride		Chloroform	
			Soil	Soil to GW	Soil	Soil to GW
<i>KDHE Tier 2 Residential Levels</i>			8440	73.4	4220	850
<i>KDHE Tier 2 Non-Residential Levels</i>			14,700	73.4	7140	850
SS01-20-24	9/21/2004	20-24	8.5		11	
SS01-28-32	9/21/2004	28-32	7.3		8.6	
SS02-14-19	9/22/2004	14-19	24		12	
SS02-26-31	9/22/2004	26-31	74		18	
SS03-17-22	9/21/2004	17-22	<5.2		12	
SS03-28-32	9/21/2004	28-32	9.2		20	
SS04-1-6	9/22/2004	1-6	<4.5		5.9	
SS04-22-27	9/22/2004	22-27	12		31	
SS05-24-29	9/22/2004	24-29	63		51	
SS05-29-34	9/22/2004	29-34	79		52	
SS06-18-23	9/22/2004	18-23	13		32	
SS06-30-35	9/22/2004	30-35	<b>510</b>		150	
SS07-16-21	9/22/2004	16-21	<5.1		5.8	
SS07-29-34	9/22/2004	29-34	11		30	
SS08-28-33	9/22/2004	28-33	<5.7		19	
SS08-33-38	9/22/2004	33-38	<5.3		<5.3	
SS09-0-5	9/22/2004	0-5	<5.3		<5.3	
SS09-28-33	9/22/2004	28-33	32		24	
SS10-22-27	9/22/2004	22-27	<5.3		15	
SS10-27-32	9/22/2004	27-32	21		25	
A01-8-9	8/20/2008	8-9	<6.0		<6.0	
A01-28-29	8/20/2008	28-29	<6.0		<6.0	
A02-5-6	8/20/2008	5-6	<6.0		<6.0	
A02-27-28	8/20/2008	27-28	<6.0		<6.0	
A03-11.5-12	8/19/2008	11.5-12	<6.0		<6.0	
A03-23-24	8/19/2008	23-24	<6.0		<6.0	
A03-27.5-28	8/19/2008	27.5-28	<6.0		<6.0	

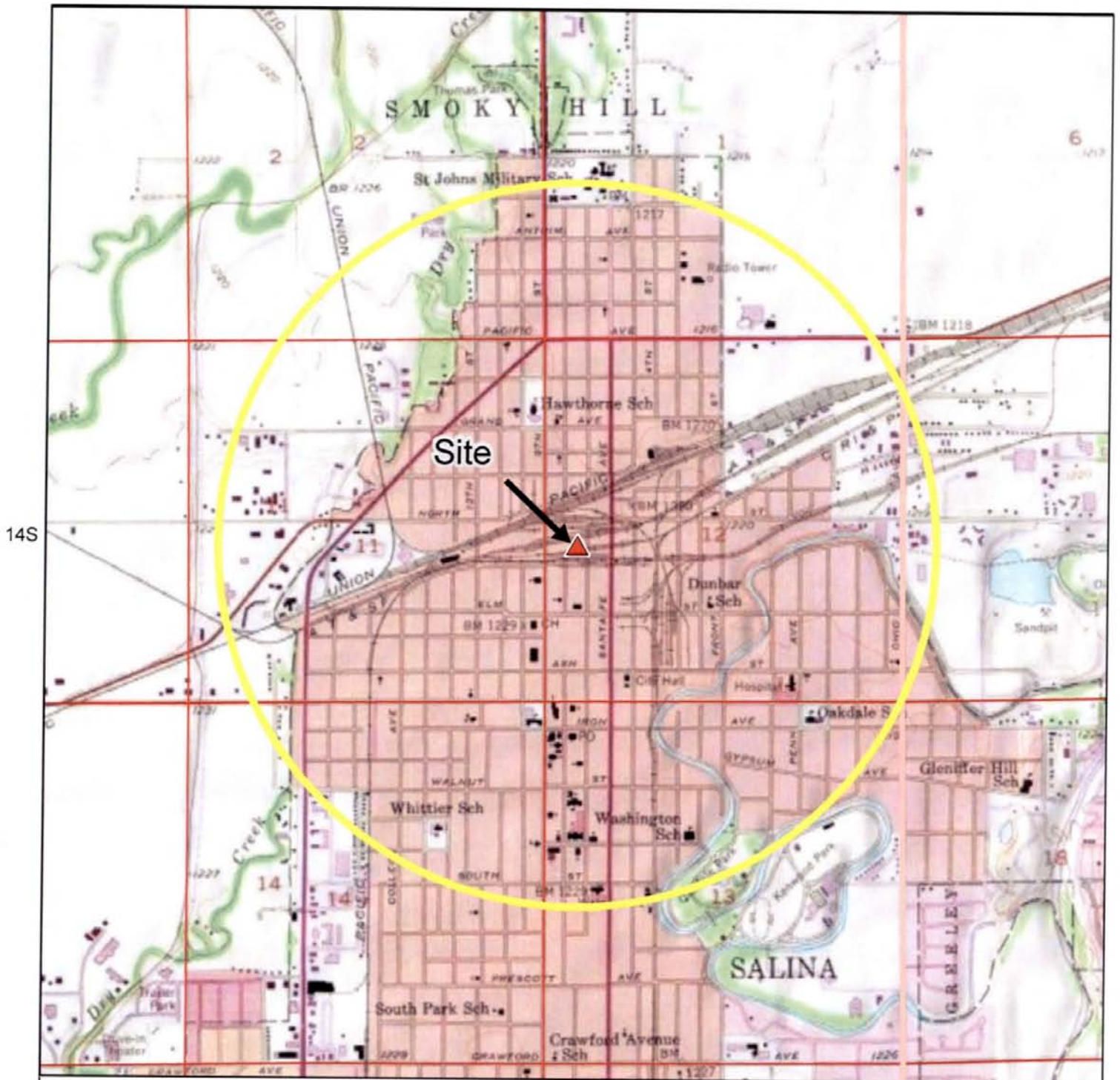
Notes:

GW - groundwater

Detections in bold exceed the KDHE Tier 2 Soil to Groundwater Pathway Level

< not detected above reporting limit shown

Data obtained from the *Comprehensive Investigation Report; Former Research Products Site* dated October 2008



14S

03W 02W

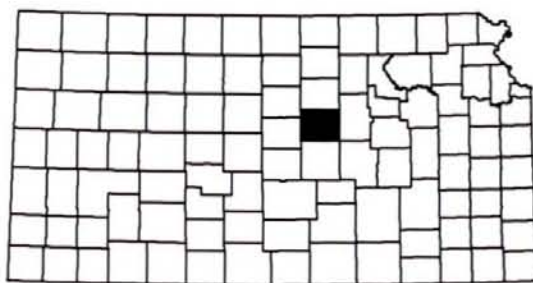
0 1,250 2,500 Feet




Scale of 1:24,000  
when printed at 8.5 x 11



Saline County



**Figure 1**  
Area Map  
Former Research Products  
Salina, KS

 1 Mile Radius



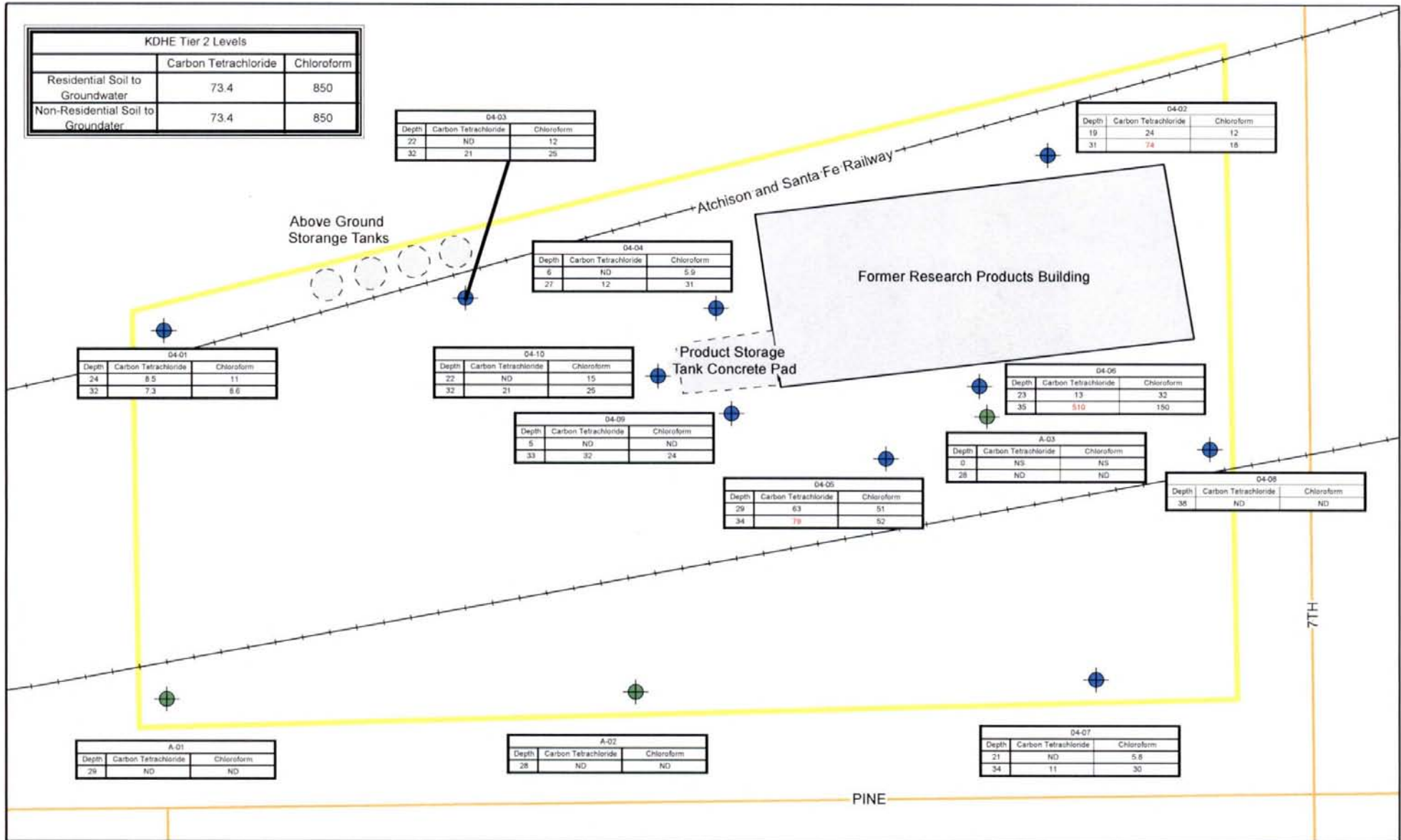
0 125 250 Feet



Approximate Former Research Products Property Boundary

**Figure 2**  
Former Property Boundary  
Former Research Products  
Salina, KS

KDHE Tier 2 Levels		
	Carbon Tetrachloride	Chloroform
Residential Soil to Groundwater	73.4	850
Non-Residential Soil to Groundwater	73.4	850



D4-01		
Depth	Carbon Tetrachloride	Chloroform
24	8.5	11
32	7.3	8.6

D4-03		
Depth	Carbon Tetrachloride	Chloroform
22	ND	12
32	21	25

D4-02		
Depth	Carbon Tetrachloride	Chloroform
19	24	12
31	74	16

D4-04		
Depth	Carbon Tetrachloride	Chloroform
6	ND	5.9
27	12	31

D4-10		
Depth	Carbon Tetrachloride	Chloroform
22	ND	15
32	21	25

D4-06		
Depth	Carbon Tetrachloride	Chloroform
23	13	32
35	510	150

D4-09		
Depth	Carbon Tetrachloride	Chloroform
5	ND	ND
33	32	24

A-03		
Depth	Carbon Tetrachloride	Chloroform
0	NS	NS
28	ND	ND

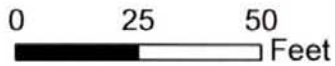
D4-05		
Depth	Carbon Tetrachloride	Chloroform
29	63	51
34	79	52

D4-08		
Depth	Carbon Tetrachloride	Chloroform
35	ND	ND

A-01		
Depth	Carbon Tetrachloride	Chloroform
29	ND	ND

A-02		
Depth	Carbon Tetrachloride	Chloroform
28	ND	ND

D4-07		
Depth	Carbon Tetrachloride	Chloroform
21	ND	5.8
34	11	30



Approximate Property Boundary

**Sampling Results**

- 2004
- 2008

**Structures**

- Existing
- Former

- Railroads
- Local Roads

All locations are approximate  
 Concentrations in red  
 indicate exceedence of RSK  
 ND indicates Non-Detect

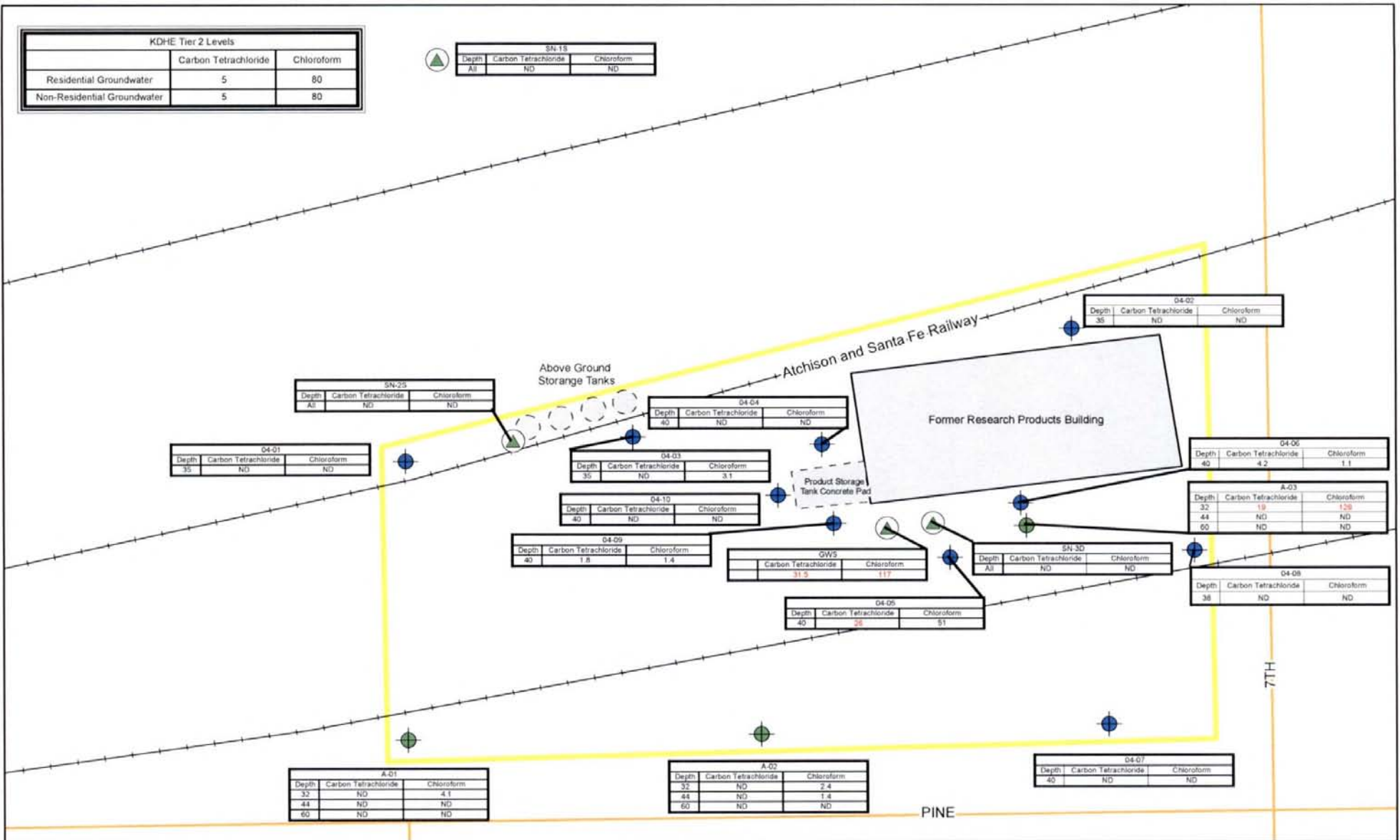
**Figure 3**

Contaminants of Concern in Soil  
 Former Research Products  
 Salina, KS

Concentrations in micrograms/kilogram

KDHE Tier 2 Levels		
	Carbon Tetrachloride	Chloroform
Residential Groundwater	5	80
Non-Residential Groundwater	5	80

SN-18		
Depth	Carbon Tetrachloride	Chloroform
All	ND	ND



0 25 50 Feet



Approximate Property Boundary

**Sampling Results**

**2004**

● Sampling Locations

**2008**

● Sampling Locations

▲ Monitoring Wells

**Structures**

Existing

Former

Railroads

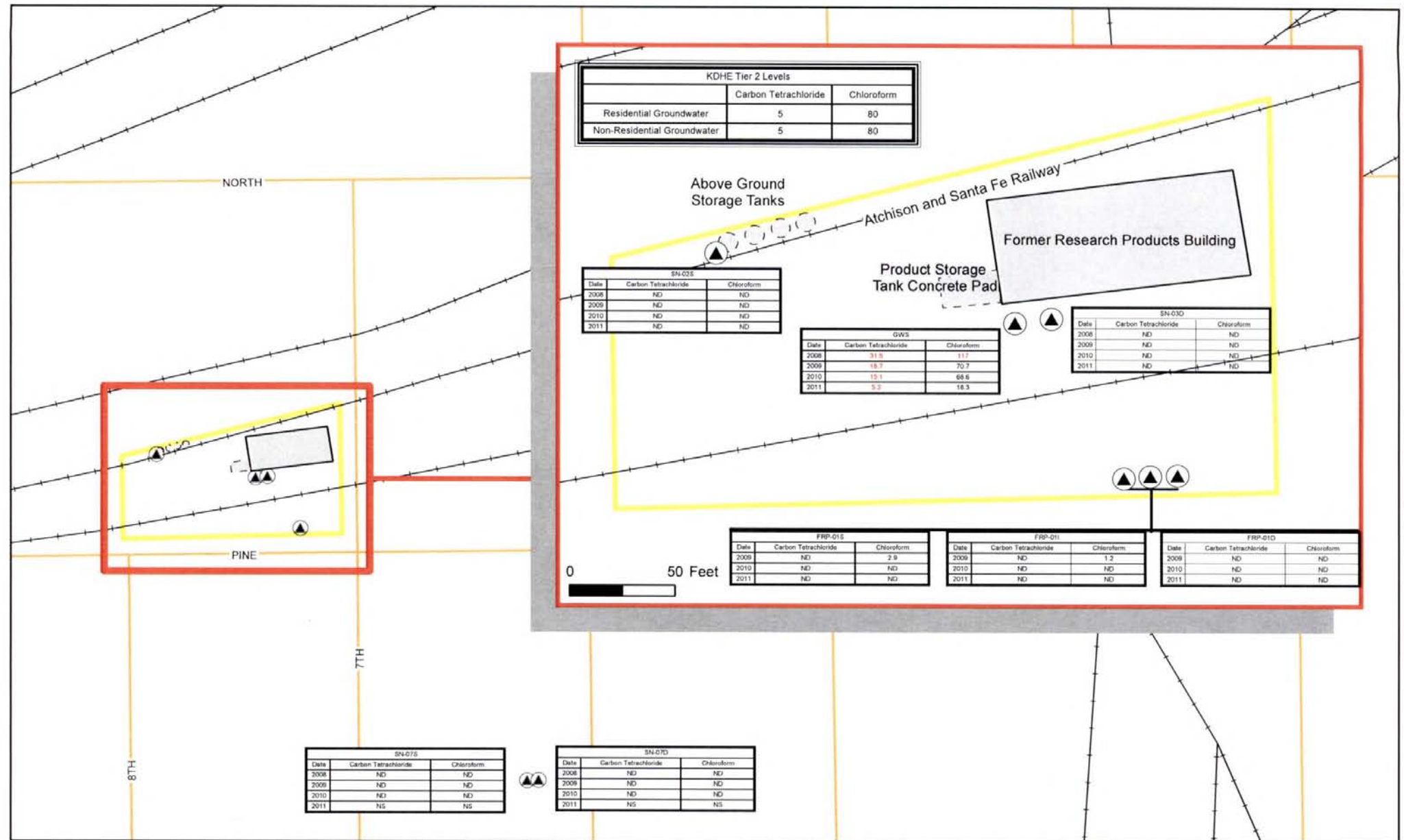
Local Roads

All locations are approximate  
Concentrations in red  
indicate exceedence of RSK  
ND indicates Non-Detect

**Figure 4**

Contaminants of Concern in Groundwater  
Former Research Products  
Salina, KS

Concentrations in micrograms/liter



0 100 200 Feet



Approximate Property Boundary

**Sampling Results**

Monitoring Wells

Concentrations in red indicate  
exceedence of RSK  
ND indicates Non-Detect  
NS indicates Not Sampled

**Structures**

Existing  
Former

Railroads  
Local Roads

All locations are approximate

**Figure 5**

2008 - 2011  
Contaminants of Concern in Groundwater  
Former Research Products  
Salina, KS

Concentrations in micrograms/liter