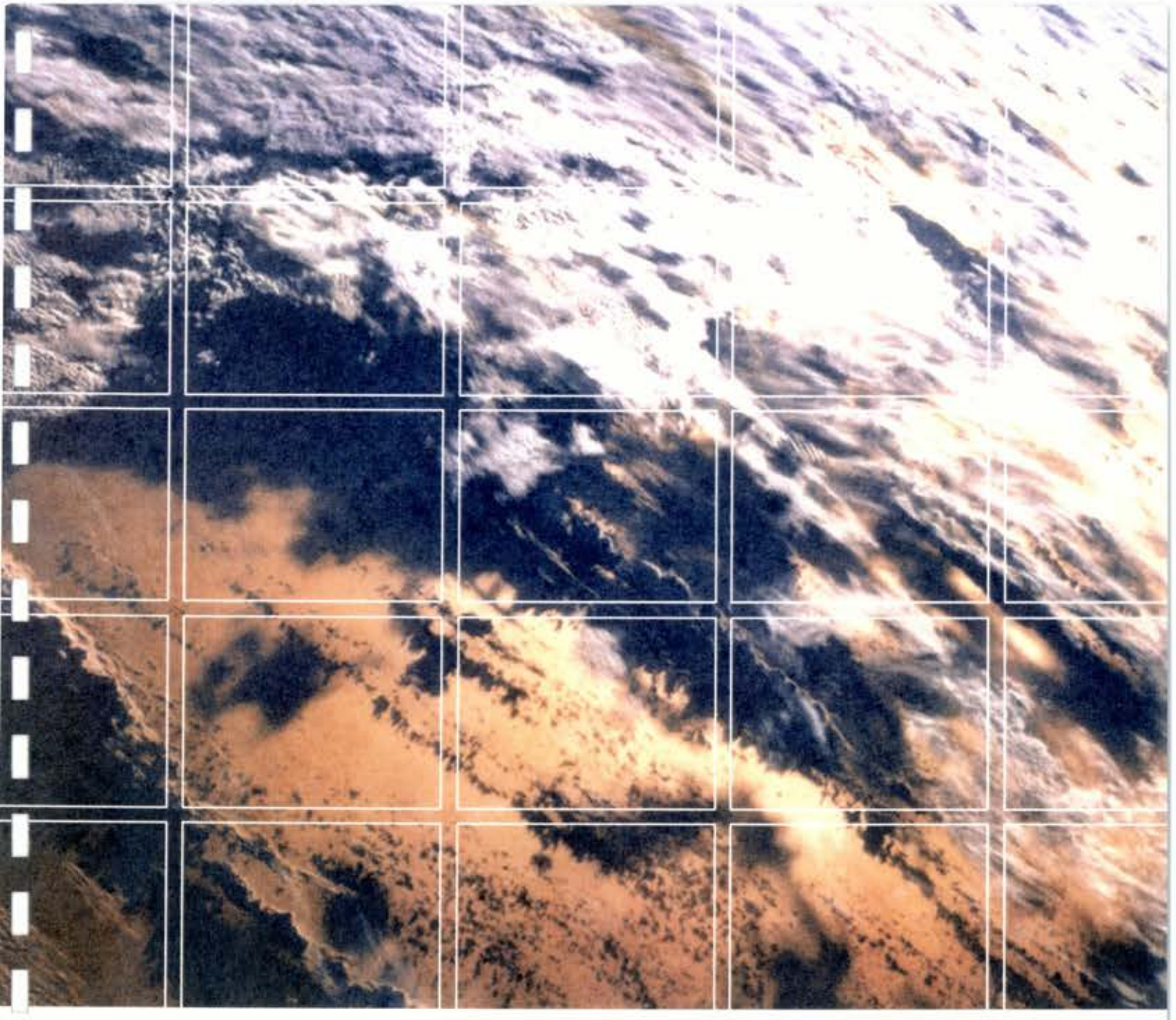

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FINAL

Revised Feasibility Study Report

Presented to:
Univar
4106 Fairfax Drive
Upper Arlington, OH 43220

North Mosley Site
Wichita, Kansas

April 2014

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FEASIBILITY STUDY REPORT

Univar
4106 Fairfax Drive
Upper Arlington, OH 43220

Revised Feasibility Study Report

North Mosley Site
Wichita, Kansas

April 2014

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BACKGROUND 3

2.1 SITE DESCRIPTION AND HISTORY 3

2.2 NIC STATUS 5

2.3 SETTING 5

2.4 REMEDIAL INVESTIGATION SUMMARY 6
2.4.1 Soil Investigation Activities 7
2.4.2 Groundwater Investigation Activities 8

2.5 IDENTIFIED CONSTITUENTS OF CONCERN 11

2.6 CONCEPTUAL SITE MODEL AND POTENTIAL EXPOSURE PATHWAYS 11

3.0 IDENTIFICATION OF REMEDIAL NEEDS AND RESPONSE ACTION OBJECTIVES 15

3.1 REMEDIAL NEEDS 15

3.2 VAPOR INTRUSION EVALUATION 15
3.2.1 Vapor Intrusion Modeling 16
3.2.2 Vapor Intrusion Screening 17

3.3 RESPONSE ACTION OBJECTIVES AND GOALS 19

4.0 IDENTIFICATION OF POTENTIAL RESPONSE ACTION ALTERNATIVES 20

4.1 POTENTIAL RESPONSE ACTION ALTERNATIVES 20
4.1.1 No Action 20
4.1.2 Environmental Use Controls 20
4.1.3 Vapor Intrusion Mitigation 21
4.1.4 Long Term Monitoring 21
4.1.5 Enhanced Bioremediation 22
4.1.6 Groundwater Extraction and Treatment 23
4.1.7 Air Sparging 23
4.1.8 Insitu Oxidation and Thermal Methods 24

4.2 INITIAL SCREENING OF POTENTIAL RESPONSE ACTION ALTERNATIVES 25

4.2.1 Technical Implementability and Feasibility 25
4.2.2 Effectiveness and Cost 25
4.2.3 Secondary Criteria 26

4.3 RETAINED RESPONSE ACTION ALTERNATIVES FOR FURTHER CONSIDERATION **26**
4.3.1 No Action 27
4.3.2 Environmental Use Controls 27
4.3.3 Long Term Monitoring 28
4.3.4 Groundwater Extraction and Treatment 28

5.0 DETAILED SCREENING AND ANALYSIS OF RESPONSE ACTION ALTERNATIVES **30**

5.1 CRITERIA FOR DETAILED SCREENING AND ANALYSIS OF ALTERNATIVES **30**
5.1.1 Overall Protectiveness of Human Health and the Environment 30
5.1.2 Compliance with Applicable Relevant and Appropriate Requirements 31
5.1.3 Short- and Long-Term Effectiveness 32
5.1.4 Reduction of Toxicity, Mobility, or Volume of Contaminant 32
5.1.5 Implementability 32
5.1.6 Cost 32
5.1.7 Agency Acceptance 33
5.1.8 Public and Community Acceptance 33

5.2 ANALYSIS OF ALTERNATIVE 1: NO ACTION **33**
5.2.1 Application of Criteria 33
5.2.2 Summary 35

5.3 ANALYSIS OF ALTERNATIVE 1: ENVIRONMENTAL USE CONTROLS **35**
5.3.1 Application of Criteria 36
5.3.2 Summary 38

5.4 ANALYSIS OF ALTERNATIVE 3: LONG TERM MONITORING **38**
5.4.1 Application of Criteria 38
5.4.2 Summary 40

5.5 ANALYSIS OF ALTERNATIVE 4: GROUNDWATER EXTRACTION AND TREATMENT **42**
5.5.1 Application of Criteria 42
5.5.2 Summary 45

6.0 SUMMARY AND RECOMMENDED ALTERNATIVE **46**

LIST OF TABLES

Table 1 *Soil Analytical Data*
Table 2 *Historic and Current Groundwater Analytical Data*
Table 3 *NIC Groundwater VOC Data Near Univar*
Table 4 *Vapor Intrusion Model Screening Concentrations for Groundwater*
Table 5 *Vapor Intrusion Screening Calculations*
Table 6 *Initial Screening of Potential Response Action Alternatives*
Table 7 *Detailed Screening Summary for Response Action Alternatives*
Table 8 *Cost Analysis*

LIST OF FIGURES

Figure 1 *Facility Layout Map*
Figure 2 *TCE in Groundwater and ACLs / MCLs*
Figure 3 *Shallow Average Groundwater Data – Combined VOCs*
Figure 4 *Shallow Average Groundwater Data – TCE*
Figure 5 *Deep Average Groundwater Data – Combined VOCs*
Figure 6 *Deep Average Groundwater Data - TCE*
Figure 7 *NIC Area Map Near Univar*

1.0 *INTRODUCTION*

This revised Feasibility Study (FS) Report has been prepared for the Univar USA Inc. (Univar) facility located at 2041 North Mosley Avenue, Wichita, Kansas. This facility, formerly known as Van Waters & Rogers Inc. (VW&R), is under Kansas Department of Health and Environment (KDHE) Consent Order Case No. 98-E-0096. This revised FS Report has been prepared consistent with the United States Environmental Protection Agency (US EPA) Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (1988), as well as applicable KDHE guidance. The revisions to this document were completed to reflect comments submitted by the KDHE upon the review of the Monitoring Natural Attenuation Report submitted on July 30, 2013.

The original FS Report was issued to KDHE in April 2011 by Environmental Project Management, LLC. However, this project was transitioned to Environmental Resources Management (ERM) during 2013 and based on conversations with KDHE on November 11, 2013, the initial FS Report was revised to address KDHE comments. This revised FS Report incorporates the data provided in the April 2011 FS Report while addressing KDHE comments, as applicable.

Under the Consent Order for this facility, Univar has completed a Remedial Investigation (RI) and several subsequent investigative activities. Previous activities at the Univar facility have consisted of extensive soil and groundwater investigation under the direction of the KDHE and US EPA, the preparation and submittal of numerous Remedial Investigation Reports and Revised Reports, as well as Technical Memorandums providing updates to the remedial investigation activities.

The purpose of this revised FS Report is to identify remediation needs and response action objectives for the Univar facility. Initial tasks involved the identification of any potential exposure pathways, determining corrective action needs and response action objectives, and then identifying potential response action alternatives. A detailed analysis of the response action alternatives using the US EPA specified criteria, in addition to KDHE requirements, was then performed.

The following section of this report presents the facility and area-wide background and history for this project including the environmental setting, as well as the remedial investigation activities completed to date.

The remedial needs and response action objectives for this project are presented in Section 3.0. Section 4.0 identifies potential response action

alternatives, while providing initial screening of potential response action alternatives. A detailed screening and analysis of the retained response actions alternatives is provided in Section 5.0, and the recommended alternative is presented in Section 6.0 of this report.

2.0 *BACKGROUND*

2.1 *SITE DESCRIPTION AND HISTORY*

The Univar facility is located at 2041 North Mosley Avenue (latitude 37° 43'15" North, longitude 97° 19'38" West) in the central portion of the City of Wichita, Sedgwick County, Kansas. The facility occupies a square-shaped lot, approximately two acres in size, with a 20,200 square foot warehouse building. The facility layout is shown in Figure 1.

The Univar facility is located within an area of Wichita that has been identified as part of the North Industrial Corridor (NIC). The NIC is an approximately ten square mile site containing pervasive groundwater contamination, and it has been the subject of ongoing investigations concerning the occurrence and distribution of volatile organic compounds (VOCs) in groundwater and soil for many years. The NIC is divided into several groundwater units, and the Univar facility is located in Groundwater Unit #2 (GWU-2), in the approximate center of the NIC groundwater contamination. Groundwater monitoring points associated with the NIC are located hydraulically upgradient and side-gradient of the Univar facility and all demonstrate, both currently and historically, the presence of varying degrees of groundwater contamination.

Univar has owned and operated the facility as a chemical distribution center since 1986. Environmental impacts to the NIC area pre-date Univar's operation at this location. Univar does not manufacture or blend any chemicals at the facility. All products are currently received directly from the manufacturers and are stored in their original containers at the facility prior to sale and shipment to local customers. Univar handles a wide variety of commercial and industrial chemicals in both liquid and dry form. In addition, the facility handles a limited number of pest control products that arrive containerized in bags or boxes and are stored on shelves in the warehouse. Drummed solvents and corrosives are stored inside the warehouse and in designated paved areas outside the warehouse. Empty drums are stored on the southeast corner of the facility, which is adjacent to the former location of a diesel underground storage tank (UST). Univar does not wash or rinse any drums at the facility.

Historically, before Univar's acquisition of VW&R, the facility had been utilized for chemical distribution and intermittent chemical repackaging since 1952. The specific operations conducted by VW&R included repackaging of mineral acids, caustics and solvents. In 1977, two above ground bulk storage tanks (ASTs) were installed adjacent to a small

concrete building (containing a repackaging module) in the southeast quarter of the property (Figure 1). The ASTs were situated on a concrete pad surrounded by a concrete dike wall. Bulk liquid chemicals were repackaged from either of the two ASTs containing various solvents and hydrochloric acid (HCl), or from tanker trucks, and transferred into drums through fixed piping from the two ASTs and through hoses from railroad tanker cars and tanker trucks. In 1990, all repackaging of solvents was ceased and in 1992 repackaging of corrosives ended. The ASTs and the repackaging module were removed by 1992, and the dike wall and pads were also removed.

VW&R operated a 10,000-gallon UST used for storage of diesel fuel. This tank was located at the southeast corner of the property, south of the Mosley Avenue entrance gate. The tank was used to fuel facility trucks. This UST was installed in 1981 and removed in 1986. Reportedly, the tank was inspected during its removal and no leaks or damage was noted.

The small repack building located next to the ASTs also contained a drum wash area for the washing of poly drums that previously contained corrosive materials. The drum rinse water drained into a 1,500-gallon in-ground concrete, PVC-lined, neutralization tank located a few feet outside the repack module. During operation, approximately 900 gallons of drum wash rinse water was discharged to the municipal sanitary sewer system every two weeks after pH adjustments were completed.

A release of approximately 375 gallons of trichloroethylene (TCE) into the diked area around the TCE AST was reported on July 16, 1984. The release was reportedly caused by overfilling of the tank during transfer of the material from a rail car. The released material was reportedly fully contained within the diked area and completely recovered and no volume was reported to be lost. Two soil samples were collected outside the diked area to determine whether any of the material had escaped into the underlying soils.

On July 15, 1986, a release of approximately 75 gallons of TCE into the diked area around the TCE bulk storage tank was reported. The release occurred due to a hose rupture during the transfer of the material from a rail car into the TCE bulk storage tank. All of the released material was reportedly contained within the dike area and removed for disposal.

To date, there have been no additional reported releases of solvents or related materials at the facility. Other releases of minor amounts of acids, caustics, and sulfur dioxide have been reported at the facility.

2.2 *NIC STATUS*

The NIC contains pervasive groundwater contamination and has been the subject of ongoing environmental investigations for many years. For over 17 years, the investigation and related activities have been conducted under a settlement Agreement between the City of Wichita and the KDHE. Numerous industrial and commercial sources of VOC impacts to groundwater have been identified throughout this process. Many of these source facilities have undertaken their own investigations; those with identified impacts are required to complete remedial activities. Univar, having had two documented releases, entered into a Consent Order to conduct investigative activities. In addition to individual facility investigations, various NIC-wide groundwater investigative activities led by the City of Wichita have been implemented. The NIC compiled a separate Remedial Investigation (RI) report approximately 12 years ago that was reviewed by both KDHE and US EPA.

A Baseline Risk Assessment (BRA) was also prepared by the City of Wichita for the NIC, and a draft version was submitted to the KDHE in 2003. Various revisions to the BRA were performed and the BRA was subsequently accepted in 2007.

An area wide FS for the NIC was also completed and previously submitted to the KDHE in July 2009. Additional sections of this area wide FS for a specific groundwater unit were submitted to the KDHE in July 2010. The KDHE provided comments on the NIC FS in October 2010.

2.3 *SETTING*

The Univar facility is surrounded by primarily industrial and commercial properties. The adjacent properties include a commercial building with associated open storage to the north, a warehouse/open storage area across Mosley Avenue to the east, a farm/ranch feed supply company is adjacent to the property to the south, and railroad tracks with adjacent open fields and/or storage to the west. Open storage areas present on properties to the immediate north, east, and west are predominantly empty, with some metal scrap, vehicles, and general debris present.

Nearly all of the surrounding area is located within the Arkansas River Lowlands section of the central Lowlands physiographic province. The topography of the area is broad and flat in the river valley, and rolling in the adjacent and more distant uplands. The elevation of the facility is approximately 1,310 feet above mean sea level. Within a one-mile radius of the facility, the topography is relatively flat with relief of less than 20 feet.

The facility topography is flat, with the asphalt and concrete surfaces associated with the facility sloped toward the south-central portion of the facility. Surface-water drainage from the paved areas is toward the south-central portion of the facility. Surface-water drainage exits the facility along its southern property boundary by flowing to the south over the asphalt alley-way (center of the property) to the 19th Street curb and gutter system, then easterly within the curb and gutter system to Mosley Avenue. This surface-water drainage then flows southerly within the curb and gutter system to a storm sewer inlet located at 17th Street and Mosley Avenue. The storm sewer ultimately discharges to Chisholm Creek located beneath the elevated freeway. On a regional basis, surface water drainage patterns trend toward the south, as does the groundwater flow regime. Chisholm Creek flows primarily from the north to the south through the northern area of Wichita with a section of Chisholm Creek flowing to the east approximately one block north of the facility. The Little Arkansas River and the Arkansas River are both located approximately three miles to the west of the facility. The Little Arkansas River and Chisholm Creek are tributaries of the Arkansas River.

Geology in the general vicinity of the facility and NIC consists of 10 to 15 feet of silts and clays underlain by sand and gravelly deposits which exhibit a fining upward sequence. These alluvial deposits average 45 feet in thickness and form the primary upper water-bearing unit in the area which overlies the bedrock. The bedrock (shale) underlying these alluvial deposits is associated with the Wellington Formation.

The groundwater table in the Arkansas Valley exhibits a generally uniform southeasterly slope of about 7 feet per mile. Within proximity to the facility, the slope appears to vary from 5 to 10 feet per mile. Groundwater flow is observed to mirror the surrounding topography. In the Arkansas Valley, the groundwater reportedly moves toward the Little Arkansas River and toward the Arkansas River downstream of the confluence of these two rivers. The overall direction of groundwater flow is to the southeast.

Climatic conditions are characteristic of a Temperate Zone. Temperatures are reported to vary from a January mean of 29.6 degrees (F), to a July mean of 81.4 degrees. The area receives an average annual rainfall of 28.6 inches, and an average annual snowfall of 15.3 inches per year.

2.4 *REMEDIAL INVESTIGATION SUMMARY*

Several different phases of RI activities were conducted at the Univar facility and various reports and submittals were made to the KDHE and

US EPA. A summary of the various investigation activities conducted by Univar and the findings are presented below.

2.4.1 *Soil Investigation Activities*

The RI activities indicate that the Univar facility is underlain by alluvial sediments that have been characterized as a shallow and a deep zone. The shallow zone typically consists of silty-sands, sandy-silts, and fine sands that extend to depths of approximately 20 to 25 feet below ground surface (bgs). The deep zone typically consists of a general coarsening downward sequence of silty-sand to fine-gravel, and have been documented beginning at depths of approximately 20 to 30 feet bgs. The deep zone extends to the underlying bedrock interface (depths of approximately 40 to 45 feet bgs). Laterally discontinuous lenses of silt and clay of various thicknesses were encountered beneath much of the facility. These discontinuous lenses were typically encountered at depths ranging from approximately 20 to 28 feet bgs. Where present, these discontinuous lenses correspond to the transition from the shallow to the deep zones of the alluvial sediments. In the absence of the lenses, the shallow to deep zone transition was typically identified by a noticeable change in sediments (a sequence of sandy-silts and silts overlying coarse sands to fine gravels). A detailed description of the observed geologic conditions is presented in the RI report.

The soil analytical data collected during the initial Univar RI activities found that of the 40 soil samples collected , only two contained any detectable VOC concentrations of target constituents (chlorinated VOCs including TCE, tetrachloroethene, and related daughter breakdown products). The soil quality data are provided in Table 1. One additional soil sample also contained a very low concentration of methylene chloride, which is a common laboratory contaminant. The limited detections in the soil samples were all below the KDHE Residential Tier 2 Risk Based Cleanup Values (for both the soil pathway and soil to groundwater pathway). The two soil samples with detections of target constituents were from shallow depths (2 to 4 feet bgs). These two sampling locations were underlain by at least two consecutive discrete sampling intervals that reported no detectable VOCs concentrations above laboratory reporting limits, representing the lack of downward migration at those locations.

Although the initial RI data found no evidence of impacted soils exceeding any cleanup criteria, the KDHE requested that additional soil quality data be collected by Univar as part of additional RI activities in an effort to verify the lack of any potential impacts from facility operations. The KDHE specified the locations for the additional sampling with the

sampling locations biased toward areas which were presumed to have the greatest potential for impacts. The data from these additional sampling locations are also included in Table 1 and only a few samples contained detectable constituents of concern with detections occurring from shallow near surface soil samples (0 to 3 ft bgs). This additional soil quality data showed that while there may have been de minimus releases from historic facility operations to shallow soils, the absence of any VOCs in soils from greater depths at these locations, and at the earlier RI locations, indicates that these releases did not migrate vertically to the water table (which is present at depths of 11 to 16 ft bgs). As with the previously collected soil samples, soil samples containing detectable concentrations were at levels below the KDHE's Residential Tier 2 Risk Based Cleanup Values which includes the migration to groundwater pathway. The RI borings and soil samples were located in areas which were presumed to have the highest potential for impacts at the facility.

The RI soil sample data is summarized in Table 1 along with the residential Tier 2 KDHE Risk-Based cleanup values for both the soil pathway and the soil to groundwater pathway. As a comparison of the RI soil data to the Tier 2 residential cleanup values, the soil quality data from these target areas are generally several orders of magnitude lower than the KDHE residential cleanup values.

2.4.2 *Groundwater Investigation Activities*

The groundwater investigation undertaken on the Univar property as part of the RI activities includes the sampling of 10 monitoring well nests, each containing a shallow and a deep groundwater monitoring well (total of 20 wells). Groundwater is present at depths of 11 to 14 feet bgs in both the shallow and the deep monitoring wells. During the installation of the deep monitoring wells, several relatively thin and laterally discontinuous lenses of silty-clay to clay were encountered at approximately 20 to 28 feet bgs. Groundwater measurements for the shallow and deep zone monitoring wells exhibit relatively similar potentiometric surface elevations, indicating that the laterally discontinuous silty-clay to clay lenses do not cause a hydraulic separation between the shallow and deep zones of the aquifer underlying the facility. Groundwater flow at the Univar facility, as observed within the NIC, is generally to the south and southeast.

VOCs were detected in the groundwater beneath the Univar property. However, concentrations and constituents observed were found to be similar to those detected in the surrounding NIC in groundwater, both upgradient, side-gradient and downgradient of Univar. The VOC concentrations in the groundwater underlying the Univar facility, as well

as the surrounding NIC area, have significantly decreased since the identification of the NIC and are presumed to have naturally attenuated over time. As observed at the facility, groundwater samples from five of the Univar monitoring wells do not exceed drinking water standards (MCLs and KDHE Tier 2 Risk Based Cleanup Values), while the remaining wells have been observed to have VOC concentrations that are within 1 to 28 parts per billion (ppb) of meeting drinking water standards. Because the shallow monitoring wells at the Univar facility all have lower groundwater VOC concentrations when compared to the deep wells at the same location, the Univar facility does not appear to be a source of these VOC impacts to groundwater.

A summary of the groundwater data collected over time by Univar, and the NIC group from the Univar facility, is provided in Table 2. The data from Univar's most recent groundwater sampling event (February 2013) is included in Table 2. A comparison of the MCL and TCE (most commonly detected VOC at the facility) concentrations in all of the Univar monitoring wells is graphically shown in Figure 2. In addition to the data, Figure 2 illustrates that three additional monitoring wells produced samples that are within 1 ppb of meeting drinking water criteria such that nearly half of the Univar monitoring wells are at the drinking water limits established by the US EPA.

The investigation activities from the NIC area surrounding Univar conducted by others, indicates that the groundwater VOC concentrations located hydraulically upgradient from Univar, in both the shallow and deep zones, have higher concentrations than the groundwater concentrations observed on the Univar facility. This data is summarized in Table 3 and also graphically presented in Figures 3 through 6 for both combined VOCs and TCE. Figures 3 and 4 show graphs of the average shallow combined VOC data (Figure 3) and TCE (Figure 4) on four different dates over time for offsite upgradient groundwater sampling locations, Univar's onsite locations, and then also offsite downgradient locations. Figures 5 and 6 show the same data for the average deep combined VOC data and TCE. The x-axis of the graphs in Figures 3 through 6 represents different sampling events from 1997-1998 up through 2010. The locations of the sampling points utilized in the above described figures and Table 3 are shown in Figure 7.

The red line on Figures 3 through 6 represents the average groundwater quality (VOC concentrations) in the groundwater upgradient of Univar at four different times several years apart. The blue line represents the average groundwater quality results from the Univar wells, while the green line represents the average groundwater quality in the groundwater downgradient of Univar, over the same time frame. This data indicates

that the Univar groundwater has contained VOCs at lower concentrations, or about the same, as the groundwater upgradient of the Univar facility. In addition, the figures demonstrate a significant decreasing trend in VOC and TCE concentrations in groundwater which indicates attenuation of VOCs is occurring in groundwater at and near the Univar facility.

Univar also points out that the data from the monitoring well MW-8 and MW-9 nests (immediately hydraulically downgradient of the former Univar above ground storage tanks) do not clearly suggest a source of VOCs from the Univar facility. Univar notes that, historically, the VOC concentrations flowing on to the Univar property at the most upgradient location (MW-1 nest) has always had higher, or the same, VOC concentrations as that at monitoring well nest MW-8. Further, as shown in Figure 1 and Table 1, soil samples from in and around the former storage tank area reported almost no VOCs. Soil Borings SB-1 through SB-8 were advanced in the tank area and the soil borings for Monitoring Well nests MW-6, MW-10, MW-8, and MW-9 were also completed in the tank area. Only one soil sample from these locations contained any detectable VOCs (MW-8, see Table 1). The one VOC detected was present at a concentration two orders of magnitude lower than the residential Tier 2 KDHE Risk-Based cleanup values for both the soil pathway and the soil to groundwater pathway.

Based on the previous investigation results, the various soil and groundwater data from the Univar facility and surrounding NIC area do not indicate that Univar is a contributing source of VOCs to groundwater. While Univar has had self-reported, documented releases at this facility, the investigation data do not indicate that Univar is a source for groundwater impacts. The data demonstrates that the shallow and deep groundwater VOC data from upgradient offsite locations has typically been higher than across the Univar facility over time, and that the downgradient offsite groundwater has typically been lower. If the Univar facility was a source area for VOCs, the VOC concentrations on the Univar property would be consistently or historically higher, and any contributing sources in the shallow zone would have resulted in higher VOC concentrations in the shallow zone as compared to the deep zone. The data further suggests that the VOC concentrations observed in the groundwater underlying the Univar facility are not the result of onsite releases at the Univar facility, and that the concentrations present appear to primarily be the result of up-gradient sources which have impacted groundwater migrating onto the Univar facility and the surrounding areas.

2.5 *IDENTIFIED CONSTITUENTS OF CONCERN*

The RI activities at the Univar facility focused on evaluating impacts related to constituents handled, or formerly handled, at the facility. This was done through various phases of investigative activities including both facility-wide locations as well as many focused locations in areas most likely to have impacts. An extensive list of VOCs was analyzed for during the various sampling events. The soil analytical results found that only TCE was present in any samples (Table 1), while the groundwater analytical results found that several VOCs were detected (Table 2). The VOCs detected in the groundwater samples include those present in the upgradient impacted groundwater from the NIC, such that none of the VOCs detected in groundwater samples from the Univar facility actually identify the facility as a source. The VOCs detected in the soil and groundwater are therefore defined as the identified constituents of concern (COCs) and are listed below. This list includes both the parent VOCs as well as breakdown daughter product VOCs created through natural degradation of the parent VOCs. The list includes:

- Trichloroethene (TCE);
- Tetrachloroethene;
- 1,1-Dichloroethane;
- 1,1-Dichloroethene;
- cis-1,2-Dichloroethene;
- trans-1,2-Dichloroethene; and
- Vinyl Chloride.

Other VOCs have been detected in collected samples on an infrequent basis and therefore these are not included as COCs. The groundwater VOC detections are identified in Table 2.

2.6 *CONCEPTUAL SITE MODEL AND POTENTIAL EXPOSURE PATHWAYS*

A conceptual site model for the Univar facility can be developed based on historical facility operations and property usage, and the findings from the various RI activities conducted at the facility. In addition, the data from the NIC-wide investigation activities can be incorporated into this model. With this model, impacts to soil and groundwater occurred at

different source areas within the NIC, and possibly to soils at the Univar facility due to historical chemical handling and repackaging processes at the facility. Univar may be a de minimus source area; however, in either case the groundwater impacts present throughout the NIC have created potential exposure pathways and this impacted groundwater is migrating to the south-southeast.

The RI data collected from the Univar facility, as well as the data collected from the NIC RI activities, were evaluated for potential exposure pathways. In addition, the NIC completed an extensive BRA, approved by the KDHE, which included evaluations of the entire NIC area and each Operating Unit (OU), including the area of the Univar facility. Utilizing the site-specific data from the Univar facility, in concert with the findings from the NIC BRA which encompassed the Univar facility, this section identifies various potential exposure pathways related to the environmental impacts present.

The BRA evaluated various conditions and factors to develop a comprehensive assessment of the risk associated with the impacts within the NIC. These factors were also considered in the development of a conceptual site model and in evaluating potential exposure pathways. These conditions and factors, among others, that were included in the BRA and site-specific Univar facility evaluation consisted of:

- Groundwater impacts and usage;
- Surface water impacts and usage;
- Depth to subsurface impacts;
- Human receptors;
- Ecological receptors and habitat;
- Demography and property usage;
- Exposure and toxicity assessment; and
- Sensitive receptors.

Based on these factors, the potential human health exposure pathways for the Univar facility could be identified and are presented in the following table. The table lists the possible source or mechanism for the contaminants identified (VOC impacted soil and VOC impacted groundwater) to enter an exposure media. The table then identifies

potential exposure routes for each exposure media and source. The last column indicates if that exposure route may be a potentially completed exposure pathway given the documented facility conditions and NIC area-wide conditions.

Exposure Route and Pathway Evaluation Summary

Source/Mechanism/ Activity Pathway	*Exposure Media*	*Exposure Route*	*Potentially Completed*
Volatilization from Surface and Subsurface Soils	Air	Inhalation (vapor intrusion)	No
Volatilization from Subsurface Groundwater	Air	Inhalation (vapor intrusion)	Yes
Groundwater Usage	Water	Ingestion	No
		Dermal Contact	No
	Air	Inhalation	No

Based on the available site-specific data along with the BRA findings, the only potentially completed exposure pathway at the Univar facility and surrounding area is vapor intrusion from impacted groundwater. Most of the potential exposure pathways identified above can be readily eliminated. Volatilization from soils at the Univar facility can be ruled out due to the very limited presence of any detectable VOCs which, where present, are very low and are significantly below the KDHE's Residential Tier 2 Risk Based Cleanup Values (for both the soil pathway and soil to groundwater pathway).

The groundwater usage pathway can be readily ruled out because groundwater is not used on the Univar property or in the vicinity of the Univar property for potable or other purposes. The Univar facility and surrounding properties, rely on the City of Wichita's municipal water supply. Due to this, the various groundwater usage pathways and all related exposure routes can be ruled out. Future groundwater usage on the property can also be readily ruled out through various means such as institutional controls. The potential for future construction worker exposure on the Univar property can also be readily ruled out by institutional controls.

Vapor intrusion from groundwater is therefore the only potentially completed exposure pathway at the Univar facility. This corroborates the findings from the NIC BRA for the entire NIC and NIC defined

groundwater unit GWU-2. However, the BRA found that vapor intrusion is not a potentially completed pathway other than in some residential portions of the NIC. The NIC BRA carefully and thoroughly evaluated this pathway by evaluating worst-case conditions. This evaluation included conducting air sampling in schools and basements of residences containing earthen floors over the most impacted portions of the groundwater plume within the NIC. To summarize the BRA, the assessment evaluated vapor intrusion along with other potential exposure pathways and found that the potential risks from vapor intrusion are within the acceptable range by the US EPA and KDHE, and are an order of magnitude lower than one in a million. The BRA also found that the risk to subsurface construction workers is negligible. The only identified risk within the NIC was found to be for actual usage of the groundwater for potable purposes, which is not occurring at or near the Univar facility. Univar notes that the groundwater VOC concentrations utilized in the BRA calculations for the vapor intrusion evaluation are approximately one order of magnitude higher than the concentrations detected in groundwater underlying the Univar property, such that the groundwater in the vicinity of the Univar facility presents even less risk.

Univar also notes that the vapor intrusion pathway from groundwater has a greater potential to be completed at locations hydraulically upgradient and side-gradient from Univar within the NIC area where higher VOC concentrations have been reported in the groundwater. Utilizing groundwater VOC concentration data, the BRA indicated VOC concentrations are higher in the NIC area then the concentrations detected at the Univar facility. As a conservative environmental risk measure, vapor intrusion is retained as a potentially completed exposure pathway at the Univar facility.

Based on the site-specific findings regarding potentially completed exposure pathways, and the findings from the NIC BRA that included the area of the Univar facility, there is no need to prepare a BRA specific to the Univar facility in conjunction with this FS for the Univar facility.

3.0 *IDENTIFICATION OF REMEDIAL NEEDS AND RESPONSE ACTION OBJECTIVES*

The remediation needs for the Univar Wichita facility and the applicable response action objectives are described in this section. The National Contingency Plan and FS Guidance materials indicate that the objective of the remedy selection process is to select a remedy that is protective of human health and the environment while also minimizing untreated waste. The remediation needs are a description of what remedial or response actions are necessary to address the identified potentially completed exposure pathways as well as the associated exposure routes and exposure media. The response action objectives are goals to be accomplished through response actions that are protective of human health and the environment.

3.1 *REMEDIAL NEEDS*

Nearly half of the Univar monitoring wells are at or below drinking water standards (MCLs and KDHE Tier 2 Risk Based Cleanup Values), and the remaining wells all produce data that is within 1 to 28 ppb of meeting drinking water standards. Given this data and the site conceptual model, the only potentially completed exposure pathway identified for the Univar facility consists of vapor intrusion from impacted groundwater. The primary remedial needs includes evaluating and addressing this potentially completed exposure pathway to be protective of human health, while also addressing the impacted groundwater to be protective of the environment. Although the vapor intrusion pathway does not appear to be completed, this primary remedial need is still further evaluated and addressed in this FS Report to be protective of human health.

3.2 *VAPOR INTRUSION EVALUATION*

Vapor intrusion is a potentially completed exposure pathway at the Univar Wichita facility and requires further evaluation even if Univar may not be the source of the contributing source of groundwater impacts. Consistent with Univar's discussions for evaluating vapor intrusion with the KDHE and the US EPA, this evaluation involved modeling the site conditions along with a separate comparison of data to applicable criteria. The criteria utilized for the comparison included both the US Occupational Safety and Health Administration (OSHA) exposure limit values, and the KDHE's Tier 2 Risk-Based Indoor Air Values (Risk Based Standards for Kansas, RSK Manual - 5th Version, October 2010), using agency-accepted methods to apply the site data to the criteria. A

description of the modeling and screening activities is provided in the following sections as two separate lines of evidence.

3.2.1 *Vapor Intrusion Modeling*

The model employed for this evaluation consists of the Johnson and Ettinger model that is provided and distributed by the US EPA. The model input includes various site-specific conditions (depth to water, water table soil type, vadose zone soil type, depth of foundation, etc.), which are used to calculate protective groundwater VOC concentrations which can then be used as risk-based screening levels for a target risk level. One feature of the model output is a groundwater VOC concentration which is a screening value. The model can be run for each particular constituent of concern to develop a comprehensive set of screening values. The groundwater VOC concentration generated by the model would be considered an acceptable and protective VOC concentration in the groundwater which would not create exposure to the VOCs via vapor intrusion into a building at the specified target risk value. In addition, the model can be utilized to calculate the incremental risk for each individual VOC in the vapor intrusion exposure pathway, both for carcinogens and non-carcinogens, when multiple VOCs are present.

The results from the site-specific modeling for the Univar Wichita facility are presented in Table 4 along with the inputs and assumptions utilized with the model runs to arrive at the screening levels. As per the KDHE RSK Manual, a target risk of 10^{-5} was utilized in the Johnson & Ettinger model. The KDHE Tier 2 indoor air values, which are for residential scenarios, also utilize 10^{-5} target risk values for carcinogens. The assumptions utilized in the model runs follow the KDHE RSK Manual guidelines for non-residential exposures (exposure duration, frequency, averaging time, etc.), which are consistent with the US EPA recommended assumptions.

A comparison and screening of the vapor intrusion model results in Table 4 to the actual site groundwater quality data (Table 2). With the exception of vinyl chloride in MW-2S, groundwater VOC concentrations are below the levels generated by the model, indicating that vapor intrusion is not a potentially completed exposure pathway. In addition, incremental risk was calculated for each individual VOC and is included in Table 4 due to the presence of multiple VOCs. The total additive risk from the individual VOCs together meets typical risk scenarios for both carcinogens and non-carcinogens. Note that for determining the incremental risk for each constituent of concern, the highest recent VOC concentration detected anywhere on the facility was utilized for the model input which

conservatively assumes that this worst-case scenario exists across the entire facility.

The comparison of the site data and the vapor intrusion model results from Table 4 indicates that the only site data at or near target levels is the vinyl chloride concentration at Monitoring Wells MW-2S.

Monitoring well nest MW-2 is located on the hydraulically upgradient boundary of the Univar facility and is representative of groundwater flowing onto the Univar facility from upgradient sources. Therefore, this data indicates that the Univar facility is not at risk from the original source of these VOCs which could potentially cause vapor intrusion issues.

In summary of these screening and modeling activities for vapor intrusion at the facility, the groundwater VOC concentrations underlying the Univar facility are all below the screening levels generated by this US EPA model. This evaluation and resulting data indicates that vapor intrusion is not a potentially completed exposure pathway at this facility using this line of evidence.

3.2.2 *Vapor Intrusion Screening*

In addition to the site-specific vapor intrusion modeling described in Section 3.2.1, Univar completed an additional vapor intrusion evaluation to develop more than one line of evidence for this potential exposure pathway. This additional evaluation involved calculating screening values using a different methodology which is accepted by the US EPA and the KDHE. This methodology takes target indoor air values, and derives acceptable groundwater VOC concentrations using certain assumptions and calculations. US EPA Region 7 risk assessment staff recommend the application of this method and have been consulted regarding application of this methodology.

Various target indoor air values can be used for this screening exercise. As specified by the KDHE and the US EPA, Univar is utilizing OSHA workplace exposure values as one set of target values. These values are more applicable for evaluating actual exposures at industrial sites such as the Univar facility. However, as a comparison, the KDHE's Tier 2 indoor air values (KDHE RSK Manual, October 2010) were also utilized as secondary target indoor air values, even though these are residential values that are not directly applicable due to the industrial nature of the property. These residential indoor air values are included in the evaluation as a conservative reference point for comparison.

This methodology for evaluating vapor intrusion utilizes accepted, conservative dilution factors to account for the attenuation of VOC vapors that may be emitted from impacted groundwater that can then potentially migrate into buildings. The KDHE Vapor Intrusion Guidance (June 2007) specifies use of a 0.001 attenuation factor for the groundwater to indoor air pathway. Likewise, both the US EPA (OSWER Draft Guidance for Evaluating Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002) and the Interstate Technology Regulatory Council (ITRC; Vapor Intrusion Pathway: A Practical Guideline, January 2007) use the same groundwater attenuation factor as the KDHE in their vapor intrusion evaluations. The US EPA has noted that this attenuation factor may result in a ten-fold over prediction of the indoor air values at some sites and, further, that the actual range of attenuation factors for VOCs is from 0.0007 to 0.0008, with 0.001 used for conservative residential applications.

To calculate the vapor intrusion screening levels, the indoor air criteria were first selected as the target indoor values, as described above. The indoor air criteria consisted of the following:

- OSHA Permissible Exposure Levels (PELs); and
- KDHE Tier 2 Indoor Air Values (residential).

Using the above criteria along with the Henry's Law coefficient for each VOC of concern and the accepted attenuation factor, calculations were made to arrive at screening levels. The screening levels resulting from this methodology are provided in Table 5 along with the calculations, constants, and assumption criteria utilized. Univar notes that the guidance for this methodology does not include a temperature correction (for Henry's Law coefficient application) and therefore none was made which results in screening values that are biased slightly lower (more conservative) than they would be with a temperature correction. The vapor intrusion model described above in Section 3.2.1 does include a temperature variable that adjusts the output accordingly.

A comparison of the vapor intrusion screening results in Table 5 to the actual Univar facility groundwater analytical data (Table 2) indicates that none of the recent site data exceeds, or is anywhere close to exceeding, the screening levels based on the OSHA standards. Further, comparison of the site groundwater data in Table 2 to the Tier 2 Residential screening results in Table 5 indicates that recent data from only one monitoring well (MW-5S) very slightly exceeds these more conservative residential values for one VOC (TCE). However, it should be noted that the groundwater

quality data from the previous sampling round at this monitoring well did not exceed the residential values.

In summary of this second methodology employed to screen for potential vapor intrusion issues, the groundwater VOC concentrations present at the Univar facility are below the screening levels generated by agency-accepted methods. This data and the findings indicate that vapor intrusion is not a potentially completed exposure pathway at this facility, consistent with the findings presented in Section 3.2.1 above using a different line of evidence.

3.3 *RESPONSE ACTION OBJECTIVES AND GOALS*

The response action objectives and goals at the Univar facility consist of addressing the potential for the vapor intrusion pathway to be completed should groundwater VOC concentrations increase to levels which may create potential completion of this exposure pathway. The ultimate attenuation of impacts to groundwater is also an overall remedial need and objective to be protective of the environment, but clearly must be applied on a larger scale such as the entire NIC and GWU-2. Remedial decisions at the facility are directly linked to the NIC and GWU-2 since groundwater flowing on to the Univar facility from the NIC and GWU-2 is impacted at the same general levels or higher than the VOC concentrations observed at the Univar facility. Therefore any attempted remediation of groundwater at the Univar facility would not produce a reduction in the potential exposure pathway due to the continual flow of similar or more impacted groundwater onto the facility.

As described in Section 2.4.2, Univar may potentially be a de minimus contributor to the groundwater impacts; however, there is no clear and definitive site-specific technical evidence demonstrating that Univar has impacted the groundwater. This is corroborated by observations that impacted groundwater is flowing onto the Univar property from hydraulically upgradient sources within the NIC. Due to these observations, it would not be practical for Univar to address the source of this pathway (impacted groundwater) as impacted groundwater continues to flow onto the Univar property without upgradient hydraulic control.

Since groundwater VOC concentrations on the Univar facility are already very close to meeting drinking water standards, the appropriate overall response action goals for this facility, and the NIC in general, is for all groundwater to ultimately meet drinking water standards.

4.0 *IDENTIFICATION OF POTENTIAL RESPONSE ACTION ALTERNATIVES*

This section of the FS Report identifies various process options and technologies which may be applicable for the facility. The process options and technologies are then assembled into associated prospective response action alternatives. A description of each response action alternative is provided along with the inherent process options. The process options considered along with the response action alternatives are all standard technologies and processes commonly applied at these types of sites. An initial screening of the response action alternatives is also completed and described in this section, while three potential response actions are selected and retained for further detailed evaluation.

4.1 *POTENTIAL RESPONSE ACTION ALTERNATIVES*

The potential response action alternatives for the Univar facility are presented below.

4.1.1 *No Action*

The no action alternative is required to be evaluated in the FS by both US EPA/Federal guidelines and the KDHE requirements for this facility. The no action alternative can then be compared as a baseline to other potential response action alternatives. With this alternative, there is no specific, direct, or indirect response action taken to address the identified impacts and there is no associated process option. This response is retained for further evaluation, as per the KDHE and Federal requirements.

4.1.2 *Environmental Use Controls*

Environmental Use Controls (EUCs), commonly referred to as institutional controls and deed restrictions are a legal control device intended to restrict or prohibit human activities and property use in such a way as to prevent or reduce exposures to contamination. This response action would involve preventing the disturbance of soil caps, covers, pavements, or berms. Additionally, the EUC would prohibit the drilling of water wells for domestic or other purposes; restrict and provide notification prior to excavation activities or subsurface utility work at the site; restrict the site for residential purposes; and restrict access to the site.

4.1.3 *Vapor Intrusion Mitigation*

The vapor intrusion mitigation response action involves taking applicable measures to limit, reduce, or eliminate vapor intrusion into buildings. This potential response action obviously does not address the reduction or elimination of the actual groundwater impacts identified, but rather addresses the potential effects from the underlying impacts. This response action can, however, reduce or eliminate the potential for the vapor intrusion exposure route pathway from being completed. This pathway can therefore be protective of human health if the pathway is completed or develops a greater potential to be completed.

Vapor mitigation can be implemented through several process options and technologies, including those for new construction and those for existing construction. New construction vapor mitigation can be implemented by the incorporation of various impermeable membranes in the construction of the building foundation and/or by physical means of extracting subsurface and/or foundation vapors. Existing construction vapor mitigation most typically consists of the installation of subslab depressurization systems which actively vent (depressurize) vapors from under building foundations to the atmosphere. The venting is most often conducted with relatively small blowers that remove vapors from below the foundation such that they do not migrate into the building, although other ventilation systems are available. At the residential level, the depressurization systems are similar to radon mitigation systems.

4.1.4 *Long Term Monitoring*

The long term monitoring response action alternative involves monitoring the groundwater quality over time to document declining concentrations of VOCs. Other parameters specific to evaluating attenuation are also monitored to be consistent with industry standards, KDHE policy, and US EPA protocols.

At the Univar facility, the VOC concentrations in the groundwater have clearly been documented to be decreasing based on several years of monitoring data. This decrease is passively occurring over time even though no active remediation is occurring in the immediate vicinity of the Univar facility or in this portion of the GWU-2 of the NIC. While specific source areas within the NIC are part of various groundwater remediation activities in other areas, this would have no current or immediate bearing on the impacted groundwater migrating on to the Univar facility at this time. Thus the decreasing concentrations are attributable to natural attenuations. This decreasing trend is likely attributable to the combination of dilution, dispersion and diffusion.

The VOC data generated from implementation of this alternative can be used to document the naturally declining concentrations, and also be used to evaluate if additional corrective measures should be implemented if an increase in VOC concentration occurs. Following the collection of data under this response action, periodic reports presenting the groundwater quality data and corresponding trends will be submitted to the regulatory agencies along with a summary of the continued applicability of this alternative.

If long term monitoring appears to no longer be applicable (based on VOC concentrations and/or other conditions), then the periodic reports would provide recommendations for alternate response actions. The monitoring and evaluation of the data from this response action, in conjunction with periodic reporting, differentiates this response action alternative from the no action alternative described above. However, since VOC concentrations are currently above applicable cleanup values at the facility, institutional controls will be required at the facility to ensure that no onsite usage of groundwater occurs until the cleanup levels are achieved.

4.1.5 *Enhanced Bioremediation*

Enhanced bioremediation is a process option that involves actively enhancing or stimulating naturally occurring degradation of the contaminants. Application of this option as a response action involves stimulating biodegradation already occurring in the subsurface, and/or by inoculating the subsurface with microbes not present and stimulating those microbes to naturally degrade the contaminants. Depending on the nature of the contaminants present, enhanced bioremediation can be completed in an aerobic or anaerobic subsurface environment, or a combination thereof. Certain contaminants, such as the chlorinated VOCs present at the Univar facility and throughout the NIC, can generally be biodegraded or bioremediated to a greater degree initially in an anaerobic environment that is either present naturally (or artificially due to the presence of the contaminants) or in an anaerobic environment which is created as part of the response action.

Implementation of this response action can be carried out in several formats. The most common applications for chlorinated VOCs use injection of hydrogen release compounds into multiple direct push borings, or use groundwater recirculation with amendment delivery (extracting groundwater, adding amendments, and returning the groundwater to the subsurface typically in an upgradient area). The hydrogen release compound or other amendments employed provide

electron donor materials that stimulate and enhance the degradation reactions that are occurring.

The subsurface conditions at the Univar facility are generally more aerobic than anaerobic, generally lack a sufficient quantity of natural organic materials, and have relatively low CVOC concentrations to be considered an optimal candidate for enhanced bioremediation.

4.1.6 *Groundwater Extraction and Treatment*

This potential response action alternative for the Univar facility involves extracting groundwater from one or more recovery wells and then treating the water prior to discharge. The purpose of this type of response action is to capture the impacted groundwater and remove the VOCs from the water, while controlling offsite groundwater migration. Because offsite groundwater in the area of this site is already impacted with similar concentrations of contaminants, the prevention of offsite migration from the Univar site has less practical applicability.

This response action can be implemented by the installation of one or more extraction wells on the downgradient side of the source area of impacted groundwater. The groundwater that is captured can then be treated by various process options in an onsite treatment system or discharged directly to the local wastewater treatment plant for treatment. Off-the-shelf process options for onsite treatment of groundwater typically involve some type of stripper or diffuser which operates by blowing air through the water and stripping or transferring the VOCs from the water to the air, while another common treatment process option employs pumping the groundwater through a vessel(s) of granular activated carbon. With the stripper treatment, the contaminants are simply transferred from the groundwater to the air with that process option, and then either discharged to the atmosphere under most scenarios, or the air is treated using granular activated carbon if concentrations are high enough to warrant.

4.1.7 *Air Sparging*

Air sparging is an insitu process option that involves the injection or "sparging" of air into the subsurface via specially designed wells. If applied properly, the air can strip the VOCs from the groundwater as the air bubbles flow up to the surface of the water table around the injection point. Sparging can be applied as a response action over an area to address groundwater impacted by VOCs, or it can be applied as a sparge curtain (or trench) treating impacted groundwater along a curtain or line of wells as it flows by. Most typically, soil vapor extraction is applied to

the area of air sparging to collect the VOC-laden vapors generated by the sparging. The vapors can then be discharged to the atmosphere, or treated prior to discharge if concentrations are sufficiently elevated. While air sparging is an insitu treatment technology, there can be drawbacks with this form of remediation such as the creation of a groundwater mound in the area of sparging, VOC-laden soil vapors being pushed into areas where they would not have been located without sparging, and limited effectiveness in treating groundwater impacted by very low concentrations of VOCs.

4.1.8 *Insitu Oxidation and Thermal Methods*

These potential response action alternatives are also insitu methods. Oxidation is a broad process option term describing the oxidation of contaminants in the subsurface via delivery of various oxidants to the contaminants. The oxidants are often injected into multiple borings and can include a wide variety of specifically designed products for this ranging from hydrogen peroxide to zero-valent iron particles. These materials can, in some design applications, be emplaced in a flow-through trench rather than injected into the subsurface such that the groundwater flows through the treatment zone rather than the materials being dispersed throughout the treatment zone.

Another insitu process option involves thermally heating the impacted soils and groundwater using an electrode array, and applying electrical current to heat the subsurface materials to drive off the VOCs.

These insitu methods have several advantages including the treatment of the impacted materials in the subsurface, the general destruction of the contaminants (with some of these methods) rather than simply transferring the contaminants to another media such as air, and under ideal conditions application of these methods can be completed relatively quickly.

Drawbacks for these methods can include the handling of relatively dangerous materials (hydrogen peroxide) under pressure, inconsistent application not adequate to make contact with all contaminants or contaminated media due to the application methodology and/or heterogeneous subsurface materials, limited effectiveness in treating groundwater impacted by very low concentrations of VOCs, and high cost. Additionally, these methods do no address onsite migration of impacted materials from off-site source areas.

4.2 *INITIAL SCREENING OF POTENTIAL RESPONSE ACTION ALTERNATIVES*

The above discussion has identified process options and potential response action alternatives that could potentially be applicable for the Univar Wichita facility. This section provides an initial screening of the response action alternatives to narrow down the list of alternatives which will then undergo a more detailed analyses and evaluation.

The following discussion in this section provides a screening analysis of the identified process options and potential response action alternatives. The screening is based on the technical implementability of the alternative relative to the others, as well as the feasibility of the alternative for this facility. The effectiveness and cost are also part of this initial screening analysis.

The results from applying the initial screening criteria to the potential response action alternatives are summarized in tabular format in Table 6. A discussion of each of the primary criteria utilized in the initial screening is presented below along with the secondary criteria also utilized. Following this screening, the alternatives that are retained for further in-depth analyses are identified in Section 4.3.

4.2.1 *Technical Implementability and Feasibility*

The technical implementability of the potential response action alternatives is a measure of the ability for each response action to be constructed, operated, and maintained over time. This includes both the implementability related to technical aspects of the engineering or construction/installation (from design through equipment selection and personnel availability), as well as the administrative feasibility. The ability to obtain needed local, state, or federal permits, as well as various approvals, for the alternative is a part of the administrative feasibility.

Implementability and feasibility are rated from none, low (more difficult implementability and feasibility), moderate, to high (easy implementability and feasibility) in Table 6.

4.2.2 *Effectiveness and Cost*

The effectiveness and cost of the potential response action alternatives are also initial screening criteria. The effectiveness is a subjective measure of the ability of the response action to achieve the needs of the specific project which include both short-term and long-term effectiveness, protection of human health and the environment, compliance with the

applicable relevant and appropriate requirements (discussed later), and the reduction of contaminant mass, toxicity, and or mobility. Effectiveness is also rated from none, low (minimal effectiveness), moderate, to high (highly effective) in Table 6.

A screening of relative costs for the response action alternatives is a critical measure as well because some alternatives could be cost-prohibitive due to the nature of the engineering design, materials and equipment required, energy consumption over time, maintenance and operational demands, as well as personnel to install and maintain the alternatives. Cost (present value) is defined here as none, low (under $350,000 total), moderate ($350,000 to $1,000,000), and high (>$1,000,000).

4.2.3 *Secondary Criteria*

In addition to the primary screening criteria identified and described above, various secondary criteria are also utilized in the screening. Although these criteria are not all necessarily required by the US EPA and/or KDHE, based on experience they are readily applicable to the screening process. The response action alternatives do not receive low, moderate, or high ratings for the secondary criteria, but simply an indication if this criterion is satisfied or not. These criteria are applied on a site-specific basis, such that the criteria may be met for application of this response action at some sites, but not at others. The secondary criteria include: does the response action provide source control, can it attain objectives, can it be safely implemented (or does it have inherent health and safety ramifications), is it protective of human health and the environment and, is it reliable. The secondary criteria have some inherent overlap with the primary criteria, but are a more detailed means of evaluating the response action alternatives at this phase.

4.3 *RETAINED RESPONSE ACTION ALTERNATIVES FOR FURTHER CONSIDERATION*

The initial screening criteria for the potential response action alternatives are described above and the qualitative ratings for each criteria are presented in Table 6. Two alternatives were identified as passing or best meeting the screening criteria (Table 6), while the no action alternative is required to be retained for further evaluation. The alternatives retained for further action include the no action alternative, long term monitoring, and groundwater extraction and treatment. Each of these is further described below.

4.3.1 *No Action*

As described above, the no action alternative is required to be evaluated by both US EPA/Federal guidelines and the KDHE requirements for this facility. The no action alternative can then be compared as a baseline to other potential response action alternatives. With this alternative, there is no specific, direct, or indirect response action taken to address the identified impacts.

The no action alternative was rated as having a high level of technical implementability and feasibility in Table 6 since it obviously does not involve any response and can therefore be easily implemented. The effectiveness and cost for this alternative were both rated as 'none' as no response would not be effective and would have no short-term or long-term cost associated with it.

4.3.2 *Environmental Use Controls*

The EUC response action alternative would provide long term legal control over the types of land use and subsurface activities that occur at the site. While the EUC does not actively reduce VOC concentrations in groundwater, the long term stewardship of the site is defined in a legal document that would be conveyed to any potential future owners of the property. The feasibility of this alternative is high with a KDHE issued permit required to be secured in order to place the site into the EUC program. The effectiveness of this alternative is rated as moderate because while it is not actively reducing the concentration or degree of groundwater impacts, there are institution controls in place to restrict public exposure risks to impacted groundwater. This alternative would most likely have to be paired with another alternative such as long term monitoring to confirm that VOC concentrations are decreasing and not posing a risk to the public and environment. Generally, EUCs enacted on a property define protective measures, define groundwater monitoring programs (if needed), frequency of inspection of the protective measures, and define frequency of inspections of the site to ensure that no changes in conditions could harm human health and environment.

This response action also meets many of the secondary criteria as shown in Table 6. None of the alternatives are capable of addressing source control as there is no identified source onsite. However, this alternative does generally meet the remaining secondary criteria.

4.3.3 *Long Term Monitoring*

The long term monitoring response action alternative involves monitoring the groundwater quality over time to document changes/trends in VOC concentrations. In addition, other parameters indicative of critical natural degradation of these VOCs are monitored. The VOC concentrations in groundwater have clearly been documented to be decreasing at the Univar facility and in the surrounding NIC area (see Table 2; Figures 3 through 6). The data generated from implementation of this alternative can be used to document the naturally declining concentrations and also used to determine if corrective actions are necessary in the event concentrations begin to steadily increase in the future.

The long term monitoring response action alternative was rated as having a high level of technical implementability and feasibility (Table 6). This is due to the fact that implementation of this response action can be readily initiated by utilizing the existing monitoring well network. The feasibility of this alternative is also high as there are no permits required to implement this alternative. The effectiveness of this alternative is rated at moderate because while it is not actively reducing VOC concentrations or degree of groundwater impacts, it is documenting the groundwater quality over time such that the likelihood for the potential exposure pathway (vapor intrusion) to be completed can be evaluated and monitored. The cost of this alternative is anticipated to be relatively low and consists of multiple sampling events over several years along with data evaluation and report preparation on at least an annual basis.

During the long term monitoring process, institutional controls can be implemented at the site to ensure that extraction and usage of groundwater is restricted. The management of this restriction will be conducted as part of the facility's participation in the KDHE's long-term stewardship program. As part of the (EUC) program, the frequency of groundwater monitoring will be defined as well as requirements for periodic inspection of the site.

This response action also meets many of the secondary criteria as shown in Table 6. None of the alternatives are capable of addressing source control as there is no identified source onsite. However, this alternative does generally meet the remaining secondary criteria.

4.3.4 *Groundwater Extraction and Treatment*

This response action alternative involves extracting and capturing impacted groundwater from one or more recovery wells and then treating the water prior to discharge. This alternative is implemented by installing

an extraction well(s) to capture impacted groundwater. The captured groundwater can then be treated by an onsite treatment system or discharged directly to the local wastewater plant for treatment.

This alternative was rated as having a high level of technical implementability and moderate feasibility (Table 6). Technical implementation is high because the process of designing, installing, and implementing this response action at the Univar facility (given the site-specific subsurface conditions) can be readily done. The feasibility of this alternative is moderate as there are various permits and approvals which would be required to implement this alternative. The effectiveness of this alternative, however, is rated at low because it would not actively reduce the concentration or degree of groundwater impacts or reduce the potential for the potentially completed exposure pathway (vapor intrusion) to be completed. The cost of this alternative is anticipated to likely be in the high to moderate range, dependent upon the need for an onsite dedicated treatment system (more costly) as opposed to being able to discharge the groundwater to the sanitary sewer line for offsite treatment by the POTW (less costly), or to a dedicated forced-main discharge to the closest treatment facility line (more costly than sanitary sewer discharge).

This response action met some of the secondary criteria as shown in Table 6. This response action did not meet the source control secondary criteria or the protective of human health criteria. This is because it would not be addressing the source of VOCs impacts, and since it would be continuing to draw impacted groundwater toward the facility due to the capture zone which would be created. In addition, this method would not reduce the possibility of eliminating the potentially completed exposure pathway. This alternative is reliable but has a relatively high level of required maintenance and upkeep when a dedicated treatment system is utilized with it.

5.0 *DETAILED SCREENING AND ANALYSIS OF RESPONSE ACTION ALTERNATIVES*

The previous section of this FS Report identified various potential response action alternatives based on the findings from earlier sections of this FS Report which presented response action objectives and goals given the potentially completed exposure pathway. In addition to identifying various potential response action alternatives for the Univar Wichita facility, the previous section of this FS Report also described the initial screening process for these response action alternatives. That screening process eliminated several response action alternatives and retained three alternatives for more detailed screening and analysis.

This section of the FS Report describes and presents the detailed screening and analysis that was completed for the retained alternatives. First, each of the criteria used in the detailed screening of alternatives is presented and described below. Following that, the next section evaluates each alternative retained from the initial screening to a more detailed analysis and criteria. The criteria are qualitatively applied to the alternatives and the results of meeting or not meeting the specific criteria are summarized. A key assumption made in applying these criteria to each potential response action alternative is that source control is being done at hydraulically upgradient locations which are defined sources for the impacted groundwater that is flowing on to the Univar facility.

5.1 *CRITERIA FOR DETAILED SCREENING AND ANALYSIS OF ALTERNATIVES*

The criteria utilized for more detailed screening and analysis of the potential response action alternatives for the Univar Wichita facility are described herein. This section identifies the specified nine criteria and describes the intent of each. The later sections then describe the application of each to the retained response action criteria.

5.1.1 *Overall Protectiveness of Human Health and the Environment*

This criterion is an assessment of the potential response action alternatives to provide adequate protectiveness of human health and the environment from unacceptable risks posed by the impacted groundwater. It assesses how the risks associated with the impacted groundwater can be eliminated, reduced, or controlled thereby protecting human health and/or the environment.

5.1.2 *Compliance with Applicable Relevant and Appropriate Requirements*

This criterion assesses if the potential response action alternative complies with applicable relevant and appropriate requirements (ARARs) in environmental and health laws, as well as regulations. US EPA guidance indicates that ARARs are designated as either applicable, or relevant and appropriate. Professional judgment is utilized to determine if a regulation or law may be applicable. Various waivers can be applied if an ARAR is not met. Applicable federal and state ARARs for this project are identified below.

Requirement	*Details*
Safe Drinking Water Act, National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141 and 142	MCL's developed under the SDWA generally are ARARs for current or potential drinking water sources.
Clean Water Act 40 CFR Part 421	Applicable if groundwater is discharged to a POTW under the response action.
Federal Water Pollution Control Act 40 CFR Part 122.2, 129, 131	Applicable if treated water discharged into surface water from treatment facility.
Occupational Safety and Health 29 U.S.C., 29 CFR 1910	Regulates worker health and safety. Permissible exposure limits for workers.
Kansas Environmental Use Controls K.S.A. 65-1,221-235	Institutional controls to mitigate risk from impacts as part of response action.
KDHE Tier 2 Risk-Based Standards (guidance rather than regulation)	KDHE's guidelines for the evaluation of impacts and response actions.
Kansas Water Well Contractor's License KAR Title 28-30	Wells must be installed by a licensed water well contractor.
Kansas Surface Water Quality Standards KAR Title 28-16	Applicable if treated water discharged into surface water from treatment facility.
Kansas Board of Technical Professions KAR Title 66	Applicable for certain engineering and/or geologic data interpretation and certification.
Water Well Construction and Abandonment Rules and Regulations KAR Title 28-30	Wells must meet these requirements for investigation and/or response action.
Kansas Water Appropriations Act KSA82a-701 et. Seq.	Permit must be obtained for certain pump and treat response action.

5.1.3 *Short- and Long-Term Effectiveness*

For FS applications, short-term effectiveness generally applies to the time during construction and implementation of the response action. This can also apply during the time in which the response action is being carried out and until achievement of the response action goals. This includes any short-term risks or adverse effects associated with implementation of the response action.

Long-term effectiveness is generally the permanence of the response action. This includes the amount of risk left after the response action if fully implemented and completed. Reliability of the response action for achieving long-term effectiveness is also considered.

5.1.4 *Reduction of Toxicity, Mobility, or Volume of Contaminant*

This criterion is an assessment of how the response action actually reduces the toxicity of the contaminant, and/or reduces the mobility of the contaminant, and/or reduces the volume of the contaminant through treatment. This includes an evaluation of contaminant reduction versus simply transferring of the contaminant from one media (such as groundwater) to another media (such as air), and the volume of residual contaminant which may be left at the conclusion of treatment.

5.1.5 *Implementability*

This criterion is a measure of various factors related to how the response action can be implemented. The factors include the administrative feasibility of the response action as it applies to obtaining permits or approvals from various governmental agencies, and the time required to accomplish this. The technical implementability is another factor which can include issues related to the ease or difficulty of implementing the response action, engineering and technical drawbacks which can limit the completion of the response action, as well as the ability to monitor the progression of the response action over time. Technical feasibility can also include the ability to install or implement the response action given limitations and availability of personnel and equipment.

5.1.6 *Cost*

The costs associated with each of the potential response action alternatives are also a criterion that is considered in the detailed screening and analysis process. This includes the capital costs that may be associated with installation and implementation of a response action alternative, as well as any annual or periodic costs that accompany each alternative,

including reporting, permitting, and fees. Calculating costs for response action alternatives can includes present value cost analysis and the use of discount rates for future costs.

5.1.7 *Agency Acceptance*

The acceptance of the response action alternatives, particularly the proposed alternative, by the various regulating agencies is another criteria used in the detailed screening. The state and/or federal regulatory agencies technical and administrative concerns regarding the alternative(s) must be considered and, often times, local city and county government acceptance must be considered.

5.1.8 *Public and Community Acceptance*

The public and local community acceptance of the response action alternatives, particularly the proposed alternative, should also be considered as a criterion in the FS process. If the regulating agencies accept and endorse the proposed response action alternative, often public education regarding the alternative is all that is needed to gain the community acceptance if it is not initially accepted. A factor in public and community acceptance is the cost of the proposed alternative if that alternative is funded by tax dollars. Likewise, another factor in community acceptance relates to whether the alternative may have a net decrease or increase in local jobs, as well as how it will have an effect on the local economy. Public acceptance can be further evaluated, as needed, after any applicable public comment period.

5.2 *ANALYSIS OF ALTERNATIVE 1: NO ACTION*

The no action response alternative is required to be included in the detailed screening and analysis by both the applicable state and federal agencies, as previously described. This alternative can be used as a baseline for comparison relative to the other alternatives. The initial screening completed for this alternative is described in Section 4.2, while a more detailed application of the various criteria are described below.

5.2.1 *Application of Criteria*

Each of the criterion described in Section 5.1 are applied and compared to this alternative.

Overall Protectiveness of Human Health and the Environment

The no action alternative does not address risks posed by the groundwater through the vapor intrusion pathway, therefore the

protection of human health criterion is not achieved. The no action alternative also does not address the risks posed by the groundwater to the environment, therefore protection of the environment is not achieved.

Univar notes that the groundwater impacts to the Univar facility have been documented to be attenuating; however, this alternative does not provide for any evaluation if VOC concentrations increase. If VOC concentrations become elevated this alternative does not take into account the change in potential for the exposure pathway (vapor intrusion) to be completed.

Compliance with ARARs

The no action alternative generally does not comply with several of the identified ARARs. Certain other ARARs would not be applicable since groundwater is not being treated, wells are not being installed, and permits are not necessary, etc. Overall this alternative does not meet this criterion.

Short and Long-Term Effectiveness

Since there are no actions taken for this alternative, there is no change in the short or long- term effectiveness criteria associated with this alternative. This alternative does not meet this criterion.

Reduction of Contaminant

The no action alternative does not reduce the volume of the contaminants or in any way change the toxicity or mobility of the contaminants; therefore, the no action alternative does not meet this criterion.

Implementability

Implementability was one of the initial screening criteria and is evaluated in slightly more depth here. Since this alternative does not involve any direct or indirect actions, its implementability is considered to be easy giving it a high rating for this criterion. The no action alternative, therefore, meets the implementatibility criterion.

Cost

Cost was also one of the initial screening criteria from Section 4.2.2. This alternative does not involve any direct or indirect actions or costs and, therefore, it receives a high rating for this criterion and is considered to meet this criterion. As indicated in Table 6, there is no cost to implement this alternative.

Agency Acceptance

While the various state and federal agencies require the no action alternative to be considered, thisalternative typically does not comply with agency acceptance criteria since no actions are being taken. However, since there is no identifiable source located on the Univar facility property, then taking no actions on the property will clearly not make conditions worse or increase the likelihood of completing the potential exposure pathway and, due to this, agency acceptance of this alternative is a possibility. The no action alternative within all non-source areas of GWU-2 is basically employed at this time as there are no area-wide response actions and the properties within GWU-2 (other than identified source areas) have no current response action to address the impacted groundwater migrating on to the property from upgradient sources.

Public and Community Acceptance

The no action alternative can be accepted by the public and community under some conditions, such as described above for agency acceptance. If a property is not a source and is not actively contributing to the problem (groundwater impacts) the public and community can be accepting of the no action alternative. At sites where the property is contributing to groundwater impacts, this is less likely to be acceptable to the public.

5.2.2 *Summary*

At most sites which are active VOC source areas or that have contamination that could be removed, the no action alternative typically cannot meet several of the defined criteria. However, at the Univar facility the property is not a VOC source area and therefore the no action alternative could actually meet some of these criteria and could be considered a viable option. Due to this, this alternative can be considered as a possible viable alternative given the site-specific conditions. A summary of the screening and analysis of this and the other response actions is provided in Table 7.

5.3 *ANALYSIS OF ALTERNATIVE 1: ENVIRONMENTAL USE CONTROLS*

The EUC alternative passed the initial screening activities and is further evaluated here. This alternative involves the securing of a KDHE issued permit from the long term stewardship program that would provide legal restriction to future usage and activities at the Univar facility. This alternative would most likely be paired with one of the other Alternatives while VOC concentrations in groundwater remain over established cleanup goals.

5.3.1 *Application of Criteria*

Each of the criterion described in Section 5.1 are applied and compared to the long term monitoring alternative.

Overall Protectiveness of Human Health and the Environment

The EUC alternative will be protective of human health by preventing potential exposure to the only exposure pathway at the Univar facility, the vapor intrusion pathway. At this time, VOC concentrations do not exceed vapor intrusion criteria. However, groundwater quality will be monitored to verify these conditions do not change since the source of the VOCs is situated upgradient of the Univar facility. As such, the EUC response action can be protective of human health.

Since this alternative in itself does not reduce the risks posed by VOCs in groundwater, this alternative would need to be paired with some sort of active site monitoring, such as Alternative 3, to document if changes in VOC concentrations are occurring, which could have detrimental effects on the environment. This data can be used to determine if other response actions need to be implemented should this occur including alternatives presented in this revised FS.

Compliance with ARARs

EUCs can generally meet many of the ARARs and be compliant with the requirements over time. Some ARARs would not be applicable since groundwater is not being treated and no wells are being installed. However, the EUC permit is necessary. Overall this alternative is considered to meet this criterion.

Short and Long-Term Effectiveness

The EUC alternative can ultimately meet the long-term effectiveness criteria as contaminants will eventually decrease to acceptable levels for the protection of human health and the environment. The defined institutional controls would ensure that changes in VOC concentrations would be monitored, evaluated, and reported for the effectiveness of the long term monitoring. Short-term effectiveness is more difficult to evaluate as the changes in VOC concentration remain relatively unchanged. Based on this trend, this alternative is considered to moderately meet the effectiveness criterion.

Reduction of Contaminant

While the EUC alternative does not provide an anthropogenic reduction of contaminants, the contaminants are naturally reduced over time

following this alternative. Since the reduction of contaminants is accomplished over time, this criterion can be considered to be moderately met. This is different from the no action alternative because that alternative does not provide institutional controls to limit human exposure to contaminants.

Implementability

The EUC alternative can be readily implemented. Given the established impermeable surfaces currently being maintained at the site (asphalt parking lots, buildings) and Univar's commitment to continued operation at the site, implementability is considered high. In addition, the administrative feasibility of this alternative is high since only one permit from KDHE is necessary.

The EUC alternative, therefore, receives a high rating for meeting this particular criterion.

Cost

Cost to enact this alternative consists of a one-time fee, payable to KDHE of $10,000. Due to the relatively low cost of this potential response action, it receives a high rating and meets this criterion.

Agency Acceptance

Under the proper site conditions, the EUC alternative has been readily accepted by various state and federal agencies. The site conditions must generally include the lack of source contaminants being released, or having the potential to be released, to the environment (surface water, groundwater, etc.), and documented changes in VOC concentrations to demonstrate that risk pathways are protected. Many state and federal agencies have guidance on implementing long term monitoring with the addition of institutional controls, so this alternative is considered to meet this criteria with a high rating.

Public and Community Acceptance

The EUC alternative is also readily accepted by the public and community under the proper site conditions. As described above for agency acceptance, when the contaminant concentrations are documented to be declining and pose no immediate risk to human health or the environment, this alternative can be readily accepted by the public and local community. The EUC alternative therefore also meets this criterion with a high rating.

5.3.2 *Summary*

A summary of the above-described screening and analysis of the EUC alternative and the other response action alternatives is provided in Table 7. The EUC alternative generally meets each of the screening criteria based on the site-specific conditions at the Univar facility. This alternative meets the various individual criterion with ratings (where applicable) from moderate to high (Table 7). The EUC alternative can therefore be considered as a viable alternative for the Univar facility, but should be paired with another alternative to ensure that long term changes are monitored (e.g. Alternative 3).

5.4 *ANALYSIS OF ALTERNATIVE 3: LONG TERM MONITORING*

The long term monitoring alternative passed the initial screening activities and is further evaluated here. This alternative involves actively monitoring the groundwater and documenting changes in the VOC concentrations over time at the Univar facility. This alternative is a proactive alternative to preventing the completion of exposure pathways since VOC concentrations and decreasing trends can be evaluated over time.

5.4.1 *Application of Criteria*

Each of the criterion described in Section 5.1 are applied and compared to the long term monitoring alternative.

Overall Protectiveness of Human Health and the Environment

The long term monitoring alternative will be protective of human health by preventing the potential completion of the only exposure pathway at the Univar facility, the vapor intrusion pathway. At this time the concentrations do not exceed vapor intrusion criteria. However, groundwater quality will be monitored to verify these conditions do not change since the source of VOCs is situated upgradient of the Univar facility. As such, the long term monitoring response action can be protective of human health.

Since this alternative in itself does not reduce the risks posed by the groundwater to the environment, the environment can be protected similarly to human health with this alternative. The active monitoring can document if groundwater concentrations are increasing, which could have detrimental effects on the environment, and this data can be used to determine if other response actions need to be implemented should this occur including alternatives presented in this revised FS.

Since this alternative can be protective of human health and the environment to some degree, as it documents the decreasing concentration trends, it is considered to moderately meet this criterion.

Compliance with ARARs

Long term monitoring can generally meet many of the ARARs and be compliant with the requirements over time. Some ARARs would not be applicable since groundwater is not being treated and no wells are being installed, and installation permits are not necessary. However, with the enforcement of institutional controls, usage of groundwater at this site would be restricted. Overall this alternative is considered to meet this criterion.

Short and Long-Term Effectiveness

The long term monitoring alternative can ultimately meet the long-term effectiveness criteria as contaminants will eventually decrease to acceptable levels for the protection of human health and the environment. The defined institutional controls would ensure that changes in VOC concentrations would be monitored, evaluated, and reported for the effectiveness of the long term monitoring. Short-term effectiveness is more difficult to evaluate as the changes in VOC concentration trends require more time to document. Based on this trend, this alternative is considered to moderately meet the effectiveness criterion.

Reduction of Contaminant

While the long term monitoring alternative does not provide an anthropogenic reduction of contaminants, the contaminants are reduced over time following this alternative. Since the reduction of contaminants is accomplished over time, this criterion can be considered to be moderately met. This is different from the no action alternative because that alternative does not provide detailed monitoring data to document the reduction of VOC concentrations over time.

Implementability

The long term monitoring alternative can be readily implemented. Given the extensive network of current onsite monitoring wells at the Univar facility, the network of NIC offsite monitoring wells, and the relative ease of installation of additional wells should they become necessary, implementability is considered high. In addition, the administrative feasibility of this alternative is rather simplistic as no permits and limited local approvals are necessary.

The long term monitoring alternative, therefore, receives a high rating for meeting this particular criterion.

Cost

Cost was also one of the initial screening criteria. As indicated in Table 8 and the description of the initial screening in Section 4.2.2, the long term monitoring alternative was estimated to have a total cost of slightly under $318,000. This cost was further refined, as were the costs of the other alternatives which passed the initial screening activities, and the overall, general costs are summarized in Table 8. The present value estimated cost for this alternative is $317,400. Due to the relatively low cost of this potential response action, it receives a high rating and is considered to meet this criterion.

Agency Acceptance

Under the proper site conditions, the long term monitoring alternative has been readily accepted by various state and federal agencies. The site conditions must generally include the lack of source contaminants being released, or having the potential to be released, to the environment (surface water, groundwater, etc.), and documented changes of contaminant concentrations to demonstrate risk pathways are protected. Many state and federal agencies have guidance on implementing long term monitoring with the addition of institutional controls, so this alternative is considered to meet this criterion with a high rating.

Public and Community Acceptance

The long term monitoring alternative is also readily accepted by the public and community under the proper site conditions. As described above for agency acceptance, when the contaminant concentrations are documented to be declining and pose no immediate risk to human health or the environment, this alternative can be readily accepted by the public and local community. The long term monitoring alternative therefore also meets this criterion with a high rating.

5.4.2 *Summary*

A summary of the above-described screening and analysis of the long term monitoring alternative and the other response action alternatives is provided in Table 7. The long term monitoring alternative generally meets each of the screening criteria, given the site-specific conditions at the Univar facility. This alternative meets the various individual criterion with ratings (where applicable) from moderate to high (Table 7). Long term monitoring can therefore be considered as a viable alternative for the

Univar facility. Other factors involved in the detailed evaluation are described below.

In addition to monitoring the groundwater quality and changes in VOC concentrations over time, this alternative would involve collecting additional specific groundwater quality data to evaluate the conditions for anaerobic degradation and other biotic and abiotic degradation pathways. The additional monitoring data that would be collected is consistent with industry standards for this alternative, as well as both KDHE policy and US EPA protocols. These other parameters may include field parameters and laboratory parameters. The field parameters may consist of oxygen content, oxidation-reduction potential, conductivity, pH, temperature, and others; while the laboratory analyses can include total organic carbon, sulfate, nitrate, chloride, iron, multiple organic acids, alkalinity, as well as dissolved gases such as ethene, ethane, hydrogen, and methane. While these and other various parameters can then be used to attribute a score (following US EPA Monitored Natural Attenuation Screening protocol for chlorinated organics) representing evidence for anaerobic degradation, these analyses and scoring are more applicable for a source area and downgradient plume rather than a facility such as Univar which has impacts migrating onto the site from upgradient source(s). The degradation (accounting for the significant chlorinated VOC reductions over time as documented at the Univar facility and nearby NIC wells) may be occurring and/or proceeding to a certain degree at locations upgradient of the Univar site. Thus, collection of these data is not necessary at the Univar facility.

The anaerobic degradation pathway for chlorinated VOCs produces vinyl chloride as a near end-product, and vinyl chloride is favorably degraded aerobically. The only vinyl chloride exceedance of MCLs at the Univar facility (MW-2S; Table 2) is from one of the two well nests which are the most hydraulically upgradient locations (MW-1S/D and MW-2S/D) and representative of groundwater flowing on to the Univar facility. In addition, the highest vinyl chloride concentrations historically detected on the Univar facility are also from these upgradient well nests. Since the vinyl chloride concentrations are higher on the upgradient portion of the facility, this data suggests that vinyl chloride flowing on to the Univar facility is being degraded to some degree on the Univar facility. A primary condition under which this can occur (aerobic conditions) is not represented (but is noted) in the US EPA scoring protocol, as that protocol is geared toward earlier reactions in the anaerobic degradation pathway from parent chlorinated VOCs. This suggests that the site-specific resultant US EPA scoring protocol may not be indicative of actual monitored natural attenuation conditions at this facility even though the

VOC data indicates that some degree of attenuation is occurring at this site.

5.5 *ANALYSIS OF ALTERNATIVE 4: GROUNDWATER EXTRACTION AND TREATMENT*

This response action alternative involves extracting and capturing impacted groundwater from one or more recovery wells and then treating the water to remove contaminants prior to discharge of the water. This alternative is implemented by installing an extraction well(s) to capture the impacted groundwater. Once captured, the groundwater can then be treated by either an onsite treatment system or discharged directly to the local wastewater treatment plant for treatment. Ultimate discharge of the water is then typically to surface water. The various process options previously described for treatment of impacted groundwater are all common, off-the-shelf accepted technologies that are routinely employed, and therefore do not need further evaluation independently of this alternative.

5.5.1 *Application of Criteria*

Each of the criteria described in Section 5.1 are applied and compared to the groundwater extraction and treatment alternative.

Overall Protectiveness of Human Health and the Environment

The groundwater extraction and treatment alternative can be protective of human health in that it can prevent the further migration of impacted groundwater beyond a certain point or from a source area to other areas. In that manner, this alternative would be protective of human health at locations, or exposure points, downgradient of the impacts which are being captured by the groundwater extraction such that the contaminants are not reaching the exposure points and therefore the exposure pathways cannot be completed. However, in some settings this alternative may not be that protective of human health if the groundwater is already impacted at the exposure points. While in other settings, such as one where the groundwater extraction is pulling impacted groundwater to areas of little or no prior impact, this alternative could potentially be detrimental to human health.

This alternative can also be protective of the environment under the situation described above. The groundwater capture can prevent the migration of impacted groundwater to areas where the impacts may harm the environment, and can be protective of environmental exposure at points located hydraulically downgradient beyond the point of capture. As with human health protectiveness, this alternative can generally not be

protective of the environment if groundwater is already impacted at the point of environmental exposure, and under some conditions may actually worsen the protective benefit if it is drawing groundwater with more elevated impacts to areas of lesser impacts.

Overall, this response action alternative can be very protective of human health and the environment under many conditions. Due to the site specific conditions at the Univar facility and general NIC GWU-2 conditions consisting of pervasive groundwater impacts, the groundwater extraction and treatment alternative is considered to only have a low ability to meet this criteria as it will not prevent impacted groundwater from migrating to the exposure points for the Univar facility and surrounding properties.

Compliance with ARARs

The groundwater extraction and treatment alternative can generally meet many if not all of the ARARs under certain conditions. Many of the ARARs would be applicable to this alternative. Overall, this alternative is considered to meet this criterion for the Univar facility given the site background and conditions.

Short and Long-Term Effectiveness

The groundwater extraction and treatment alternative can often meet both short-term and long-term effectiveness criteria at many sites as contaminants are being captured, and groundwater will eventually be remediated to acceptable levels for the protection of human health and the environment. However, implementation of this alternative at the Univar facility would not necessarily provide substantial long-term benefit if it were to pull in groundwater impacted to a greater degree than is already present at the Univar facility which would not make it effective at minimizing long-term exposure potential. Based on this, the groundwater extraction and treatment alternative is considered to moderately meet the effectiveness criteria.

Reduction of Contaminant

The groundwater extraction and treatment alternative can provide a direct means of reducing the contaminants present in the groundwater. While it is most typically not a destructive technology (does not destroy the contaminants), treatment most often simply transfers VOC contaminants from the dissolved phase in the groundwater to the gaseous phase in air, removing them from the groundwater. This alternative can reduce the amount of overall contaminants in the groundwater, but it will not ease the potential for the vapor intrusion pathway to be completed at the Univar facility as it will continue to pull in impacted groundwater for

many years, possibly at concentrations greater than would naturally flow across the facility without the active extraction. Due to this, this alternative is considered to only moderately meet this criterion.

Implementability

The groundwater extraction and treatment alternative can generally be readily implemented with regards to technological requirements. Groundwater extraction, whether for domestic or municipal water supply systems, or remediation systems, is a relatively common and widespread technology such that it would not be overly difficult to obtain the required equipment and materials or retain experienced contractors for installation. Depending on the treatment methodology consisting of onsite or offsite treatment, various other technologies would be involved (construction of an onsite treatment system or construction of a forced- main water line to deliver the captured groundwater), but are generally not overly difficult, although expensive. Administratively, the implementability is not quite as straight-forward because multiple permits and approvals are most typically required at the state and sometimes local levels, with often different departments within agencies being involved (such as one department for groundwater extraction, another for surface water discharge, and yet another for air emissions). However, overall the groundwater extraction and treatment alternative is considered to meet this criteria and receives a moderate rating for achieving this particular criterion.

Cost

Cost was described as an initial screening criterion. The groundwater extraction and treatment alternative was estimated to have a high total cost as indicated in the initial screening in Section 4.2.2 (and Table 6), and the more detailed estimate provided in Table 8. As indicated in Table 8, the refined cost (present value) for this alternative is estimated to be between $1,945,500 and $3,505,500. The cost of this alternative is relatively high due to the capital needed for initial installation and construction of a treatment system, as well as relatively high ongoing operation and maintenance costs inherent to this type of treatment system. Contributing to the relatively high cost of this alternative is the high pumping rate which would need to be maintained given the area geology.

In addition, implementation of this alternative would not necessarily bring the groundwater VOC concentrations into compliance any sooner (and possibly take longer) than long term monitoring, since VOCs are migrating onto the Univar property from upgradient sources. A potential alternative to an onsite treatment system may be offsite treatment at an existing treatment system, however, this option would likely require

construction of a forced-main to deliver the water to the treatment system rather than being able to use the existing sanitary sewer lines. Due to the relatively high cost of this potential response action, it receives a low rating for this criterion.

Agency Acceptance

Under many typical site conditions, the groundwater extraction and treatment alternative is accepted by state and federal agencies. This alternative is often not favorable due to the typical long-time frames required to meet cleanup limits, but is much more highly favorable and accepted when used for containment to prevent plume migration rather than only for remediation. Overall this alternative has a relatively high agency acceptance and meets this criterion.

Public and Community Acceptance

As with the agency acceptance described above, the groundwater extraction and treatment alternative is typically readily accepted by the public and local community. This alternative therefore meets the public and community acceptance criteria with a high rating as it also meets the agency acceptance criteria.

5.5.2 *Summary*

The screening and analysis of the groundwater extraction and treatment alternative is summarized in Table 7 along with the other retained response action alternatives. Groundwater extraction and treatment is an alternative that generally meets several of the screening criteria given the site-specific conditions at the Univar facility. A primary drawback of this alternative is the pervasive groundwater impacts in the NIC and the potential to draw groundwater to the Univar facility which is already impacted (or more impacted) than groundwater already present at the facility. In addition, another drawback is the overall cost and resource usage for this alternative which does not generally shorten the time required to complete remediation relative to other less resource-consumptive technologies.

6.0 *SUMMARY AND RECOMMENDED ALTERNATIVE*

This revised FS Report has been prepared for the Univar facility located at 2041 North Mosley Avenue, Wichita, Kansas, and has been prepared consistent with Kansas and US EPA guidance as well as from comments and suggestions by both agencies. The facility is operating under a KDHE Consent Order and Univar has completed a Remedial Investigation and related investigative activities under the direction of the KDHE and US EPA. This revised FS Report, after briefly summarizing the findings from the investigation activities, has identified potential exposure pathways, determined corrective action needs and response action objectives, and identified potential response action alternatives. The FS included an initial screening of several potential response action alternatives, along with a more detailed analysis of the three retained response action alternatives using the US EPA specified criteria in addition to KDHE requirements.

The data collected during the RI activities, in association with the findings from the NIC investigation activities in the area, have demonstrated that the Univar facility is not an identifiable source contributing to the known environmental and groundwater impacts within this portion of the NIC area. While Univar may have had historical de minimus releases, none of the detections observed in the soil exceed KDHE residential standards for the soil pathway or soil to groundwater pathway. In addition, groundwater quality data from the Univar facility is consistent with the groundwater quality in the upgradient and side gradient portions of the NIC area surrounding the Univar site which demonstrated the facility is not a source area of VOC impacts to groundwater. In addition, groundwater quality in some areas of the facility currently meets drinking water standards and poses no risk to human health or the environment.

Utilizing the conceptual site model and available data, potentially completed exposure pathways were evaluated. Based on the available site-specific data along with the comprehensive NIC BRA findings, the only potentially completed exposure pathway at the Univar facility and surrounding area is vapor intrusion from impacted groundwater. This pathway was evaluated as part of the FS, and various vapor intrusion modeling and screening was performed regarding this potentially completed pathway.

The results from the vapor intrusion screening and modeling activities found that the groundwater VOC concentrations present at the Univar facility are below applicable risk- based levels generated by agency-accepted methods. These findings indicate that vapor intrusion is not a

currently completed exposure pathway at the Univar property, based on multiple lines of evidence. These findings agree with those of the NIC BRA findings which also concluded that the vapor intrusion pathway is not completed.

The FS activities described in preceding sections identified various potential response action alternatives and then provided an initial screening of these alternatives. The possible response action alternatives identified were geared toward preventing the completion of potential exposure pathways in the future, since it is not currently completed. Based on the initial screening, four response action alternatives (no action, EUCs, long term monitoring, and groundwater extraction with treatment) were retained for further consideration as shown in Table 6. A detailed screening utilizing the following criteria was then completed: overall protectiveness of human health and the environment, ARARs, short and long-term effectiveness, reduction of contaminants, implementability, cost, agency acceptance, and public and community acceptance.

The evaluation of the retained response action alternatives is presented in Section 5.0 along with the various criteria applied to each alternative. A description of the application of the criteria to each of the four alternatives is provided along with narrative on how each alternative meets, does not meet, or meets under certain conditions, the particular criteria. A summary of this screening is provided in Table 7.

Based on the screening of alternatives, the highest rated alternatives for the Univar facility include EUC and long term monitoring (Table 7). The lowest rated alternative is no action. The EUC and long term monitoring alternative have a moderate to high ability to meet the various criteria. Although these alternatives do not involve active treatment or containment of the impacted groundwater, the alternatives do provide a reduction of contaminants in the groundwater over time through natural processes. Further, the monitoring activities will document the change in usage of the site and document the decline in VOC concentrations in groundwater. Should VOC concentrations increase in groundwater, the monitoring data can be used to further evaluate and ensure that exposure pathways are not completed. These alternatives are particularly applicable to the Univar facility since the site is not the source of VOC impacts to groundwater in the area. Therefore, this FS recommends that both EUC and long term monitoring be implemented as the preferred response action alternative.

This FS document has addressed the KDHE criteria for implementation of EUC and long term monitoring. More specifically, these recommended alternatives do not pose a threat to human health or lead to further

degradation of the groundwater or surface water quality, or impacts to any other potential receptors. In addition, historical data indicated VOC concentrations are already declining at the Univar site. In addition, groundwater quality in several monitoring wells at the site already meets drinking water standards. Thus, the time frame for achieving groundwater cleanup goals is not anticipated to be long term. A draft groundwater monitoring plan has been prepared and submitted to the KDHE for review. Finalization of the groundwater monitoring plan and development of a contingency plan will be submitted to KDHE and US EPA following agency approval of this FS Report and concurrence with the selection of the response action alternative.

TABLE 1
Soil Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Soil Boring Location	Depth (ft)	Trichloroethene (TCE) (µg/kg)	Tier 2 TCE [1] Risk Value (µg/kg)	Methylene Chloride (MC) (µg/kg)	Tier 2 MC [1] Risk Value (µg/kg)
MW-1	7.5-8.5	ND	5,850 / 84.2	ND	312,000 / 49.2
	12.5-13.5	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-2	4-5	ND	5,850 / 84.2	ND	312,000 / 49.2
	14-15	ND	5,850 / 84.2	ND	312,000 / 49.2
	18-19	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-3	4-5	5.2	5,850 / 84.2	ND	312,000 / 49.2
	13-14	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-3D	1-3	150	5,850 / 84.2	ND	312,000 / 49.2
	10-12	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-4	4-5	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
	12-5-13.5	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-5	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
	25-26	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-6	4-5	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-6D	1-3	ND	5,850 / 84.2	ND	312,000 / 49.2
	10-12	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-7	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
	20-22	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-8	2-3	12.0	5,850 / 84.2	ND	312,000 / 49.2
	7-8	ND	5,850 / 84.2	ND	312,000 / 49.2
	13-14	ND	5,850 / 84.2	ND	312,000 / 49.2
	27-29	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-9	3-5	ND	5,850 / 84.2	ND	312,000 / 49.2
	7-9	ND	5,850 / 84.2	ND	312,000 / 49.2
MW-9D	12-13	ND	5,850 / 84.2	ND	312,000 / 49.2
	17-18	ND	5,850 / 84.2	5.5	312,000 / 49.2
MW-10	7-8	ND	5,850 / 84.2	ND	312,000 / 49.2
	17-18	ND	5,850 / 84.2	ND	312,000 / 49.2

Notes:
1) Residential Tier 2 KDHE Risk-Based Values (first is soil pathway, second is soil to groundwater pathway)
µg/kg = micrograms per kilogram; equivalent to parts per billion
TCE = trichloroethylene; MC = methylene chloride
ND = not detected above the laboratory analytical detection limit
Complete VOC list analyzed, only TCE and MC detected in any samples

TABLE 1
Soil Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Soil Boring Location	Depth (ft)	Trichloroethene (TCE) (µg/kg)	Tier 2 TCE [1] Risk Value (µg/kg)	Methylene Chloride (MC) (µg/kg)	Tier 2 MC [1] Risk Value (µg/kg)
SB-1	4-5	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-2	3-4	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-4	6-7	ND	5,850 / 84.2	ND	312,000 / 49.2
	11-12	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-5	7-8	ND	5,850 / 84.2	ND	312,000 / 49.2
	11-12	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-6	7-8	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-10	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-7	5-6	ND	5,850 / 84.2	ND	312,000 / 49.2
	12-13	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-8	6-7	ND	5,850 / 84.2	ND	312,000 / 49.2
	12-13	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-9	0-3	5.7	5,850 / 84.2	ND	312,000 / 49.2
	9-11	5.2	5,850 / 84.2	ND	312,000 / 49.2
SB-10	0-3	ND	5,850 / 84.2	ND	312,000 / 49.2
	9-11	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-11	0-3	15	5,850 / 84.2	ND	312,000 / 49.2
	7-9	ND	5,850 / 84.2	ND	312,000 / 49.2
SB-12	0-3	77	5,850 / 84.2	ND	312,000 / 49.2
	9-11	ND	5,850 / 84.2	ND	312,000 / 49.2

Notes:
1) Residential Tier 2 KDHE Risk-Based Values (first is soil pathway, second is soil to groundwater pathway)
mg/kg = milligrams per kilogram; equivalent to parts per million
TCE = trichloroethylene; MC = methylene chloride
ND = not detected above the laboratory analytical detection limit
Complete VOC list analyzed, only TCE and MC detected in any samples

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	---	---
MW-1S	6/16/1998	5.7	13.0	78	ND	ND	140	12	ND	ND	ND	ND	ND	6.9	248.7
	10/13/1998	5.7	13.0	130	2.9	ND	150	22	ND	ND	ND	ND	ND	---	323.6
	5/23/2001	ND	ND	50	ND	ND	25	ND	ND	ND	ND	ND	ND	---	75
	12/29/2004	10.0	ND	ND	ND	1.2	3.2	ND	ND	ND	ND	ND	ND	---	14.4
	10/20/2005	ND	ND	5.1	ND	ND	2.3	ND	ND	ND	ND	ND	ND	6.7	7.4
	4/20/2009	ND	ND	15.1	ND	ND	2.2	ND	ND	ND	ND	ND	ND	---	17.3
	9/14/2010	ND	ND	9.8	ND	ND	1.6	ND	ND	ND	ND	ND	ND	---	11.4
	5/17/2011	1.5	ND	5.8	1.9	1.1	2.1	1.9	ND	ND	ND	ND	ND	8**	22.3
	1/25/2012	ND	ND	8.4	ND	ND	2.7	ND	ND	ND	ND	ND	ND	1.1***	12.2
	4/25/2012	ND	ND	4.7	ND	ND	1.9	ND	ND	ND	ND	ND	ND	1.5**	8.1
	7/9/2012	ND	ND	6.8	ND	2.2	2.5	1.2	ND	ND	ND	ND	ND	---	12.7
	10/23/2012	2.6	ND	13	ND	ND	2.7	2.0	ND	ND	ND	ND	ND	5.2**/1**	26.5
	02/12/2013	1.6	ND	10.6	ND	ND	4.6	1.1	ND	ND	ND	ND	ND	---	17.9
MW-1D	6/16/1998	ND	55	180	ND	ND	760	82	ND	ND	ND	ND	ND	7.2	1077
	10/13/1998	ND	34	190	ND	ND	530	86	ND	ND	ND	ND	ND	---	840
	5/23/2001	6.1	7.2	100	3.4	ND	94	26	ND	ND	ND	ND	ND	---	236.7
	12/29/2004	2.0	1.2	48	2.5	ND	28	3.8	ND	ND	ND	ND	ND	---	85.5
	10/20/2005	2.4	1.6	45	7.5	ND	12	6.9	ND	ND	ND	0.35	ND	7.0	75.75
	4/20/2009	ND	ND	29.8	ND	ND	6.96	ND	ND	ND	ND	ND	ND	---	36.8
	9/14/2010	ND	ND	12.3	ND	ND	3.2	1	ND	ND	ND	ND	ND	---	16.5
	5/17/2011	ND	ND	11.5	ND	ND	6.7	2.5	ND	ND	ND	ND	ND	---	20.7
	1/25/2012	ND	ND	10.6	ND	ND	5.8	ND	ND	ND	ND	ND	ND	---	16.4
	4/25/2012	ND	ND	8.9	ND	ND	3.3	1.3	ND	ND	ND	ND	ND	---	13.5
	7/9/2012	ND	ND	11	ND	ND	3.7	1.7	ND	ND	ND	ND	ND	---	16.4
	10/23/2012	ND	ND	13.1	ND	ND	3.0	ND	ND	ND	ND	ND	ND	---	16.1
	02/12/2013	ND	ND	13.9	ND	ND	4.4	1.1	ND	ND	ND	ND	ND	---	19.4
MW-2S	6/17/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.9	ND
	10/13/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND
	5/23/2001	ND	ND	9.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	9.7
	12/29/2004	ND	ND	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	1.8
	10/20/2005	0.84	8.7	ND	ND	ND	4.6	2.3	ND	ND	ND	ND	ND	6.8	16.44
>	12/17/2007	2.3	1.5	40.3	2	ND	23.6	8.0	ND	ND	ND	ND	ND	---	77.7
	4/20/2009	ND	ND	11.8	ND	ND	3.2	ND	ND	ND	ND	ND	ND	---	15.0
	9/14/2010	1.5	ND	9.6	2.8	1.9	3.3	3.6	ND	ND	ND	ND	ND	13.6**	36.3
	5/17/2011	ND	ND	12.6	ND	ND	5.7	1.5	ND	ND	ND	ND	ND	---	19.8
	1/25/2012	ND	ND	11.3	ND	ND	6.2	1.7	ND	ND	ND	ND	ND	1.1***	20.3
	4/25/2012	ND	ND	6.8	ND	ND	3.3	6.3	ND	ND	ND	ND	ND	---	16.4
	7/9/2012	ND	ND	6.6	ND	ND	3.3	5.7	ND	ND	ND	ND	ND	---	15.6
	10/23/2012	ND	ND	7.1	ND	ND	3.2	3.6	ND	ND	ND	ND	ND	---	13.9
	02/12/2013	ND	ND	5.7	ND	ND	3.0	5.1	ND	ND	ND	ND	ND	---	13.8

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	---	---
MW-2D	6/17/1998	ND	52	160	ND	ND	630	73	ND	ND	ND	ND	ND	7.1	915
	10/13/1998	ND	39	160	ND	ND	660	96	ND	ND	ND	ND	ND	---	955
	5/23/2001	5.0	5.4	63	3.4	ND	85	27	ND	ND	ND	ND	ND	---	188.8
	12/29/2004	2.1	1.2	43	1.3	ND	28.0	4.9	ND	ND	ND	ND	ND	---	80.5
	10/20/2005	2.9	2.5	50	1.8	ND	30	11	ND	ND	ND	0.41	ND	7.0	98.61
>	12/17/2007	4.1	4.1	65.9	2.4	ND	44	ND	ND	ND	ND	ND	ND	---	120.7
	4/20/2009	2.1	ND	33	ND	ND	9.06	ND	ND	ND	ND	ND	ND	---	44.1
	9/14/2010	ND	ND	12.8	ND	ND	5.9	2.2	ND	ND	ND	ND	ND	---	20.9
	5/17/2011	ND	ND	13.2	ND	ND	5.0	2.2	ND	ND	ND	ND	ND	---	20.4
	1/25/2012	ND	ND	8.7	ND	ND	2.8	ND	ND	ND	ND	ND	ND	---	11.5
	4/25/2012	ND	ND	11	ND	ND	4.5	ND	ND	ND	ND	ND	ND	---	15.5
	7/9/2012	ND	ND	13.5	ND	ND	7.9	ND	ND	ND	ND	ND	ND	---	21.4
	10/23/2012	ND	ND	9.7	ND	ND	1.5	1.4	ND	ND	ND	ND	ND	---	12.6
	02/12/2013	ND	ND	13.0	ND	ND	4.3	1.3	ND	ND	ND	ND	ND	---	18.6
MW-3S	6/16/1998	ND	ND	25	ND	ND	130	ND	ND	ND	ND	ND	ND	6.7	155
	10/13/1998	ND	ND	7.4	ND	ND	110	ND	ND	ND	ND	ND	ND	---	117.4
	5/24/2001	ND	ND	3.2	ND	ND	50	ND	5.4	ND	ND	ND	ND	---	58.6
	12/29/2004	ND	ND	2.0	ND	ND	52	ND	ND	ND	ND	ND	ND	---	54
	10/19/2005	ND	ND	ND	ND	ND	73	ND	ND	ND	ND	ND	ND	6.2	73
	4/21/2009	ND	ND	ND	ND	ND	9	ND	ND	ND	ND	ND	ND	---	8.6
	9/13/2010	ND	ND	ND	ND	ND	28.6	ND	ND	ND	ND	ND	ND	---	28.6
	5/17/2011	ND	ND	3.8	ND	ND	13.7	ND	ND	ND	ND	ND	ND	---	17.5
	1/24/2012	ND	ND	ND	ND	ND	36.7	ND	ND	ND	ND	ND	ND	---	36.7
	4/25/2012	ND	ND	ND	ND	ND	25.4	ND	ND	ND	ND	ND	ND	---	25.4
	7/9/2012	ND	ND	ND	ND	ND	33.3	ND	ND	ND	ND	ND	ND	---	33.3
	10/22/2012	ND	ND	ND	ND	ND	21.5	ND	ND	ND	ND	ND	ND	---	21.5
	02/12/2013	ND	ND	3.3	1.5	ND	10.7	1.2	ND	ND	ND	ND	ND	---	16.7
MW-3D	10/19/2005	2.1	3.7	46	ND	ND	19	1.9	ND	ND	ND	ND	ND	7.0	72.7
	4/21/2009	ND	ND	26.5	ND	ND	11.4	ND	ND	ND	ND	ND	ND	---	37.9
	9/13/2010	ND	ND	10.4	ND	ND	7.4	ND	ND	ND	ND	ND	ND	---	17.8
	5/17/2011	ND	ND	9.1	ND	ND	5.5	ND	ND	ND	ND	ND	ND	---	14.6
	1/24/2012	ND	ND	10.9	ND	ND	6.4	ND	ND	ND	ND	ND	ND	---	17.3
	4/25/2012	ND	ND	7.0	ND	ND	4.8	ND	ND	ND	ND	ND	ND	---	11.8
	7/9/2012	ND	ND	8.3	ND	ND	4.9	ND	ND	ND	ND	ND	ND	---	13.2
	10/22/2012	ND	ND	11.8	ND	ND	5.9	ND	ND	ND	ND	ND	ND	---	17.7
	02/12/2013	ND	ND	16.6	ND	ND	8.2	1.1	ND	ND	ND	ND	ND	---	25.9

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	----	---
MW-4S	6/16/1998	ND	ND	24	ND	6.0	63	ND	ND	ND	ND	ND	ND	7.1	93
	10/13/1998	ND	ND	27	ND	11	62	ND	ND	ND	ND	ND	ND	---	100
	5/23/2001	5.5	7.4	84	3.2	ND	82	16	ND	ND	ND	ND	ND	---	198.1
	12/29/2004	ND	ND	1.9	ND	4.0	5.7	ND	12	ND	ND	ND	ND	---	23.6
	10/19/2005	ND	2.6	7.1	ND	3.3	5.2	ND	1.9	ND	ND	ND	ND	6.6	20.1
	4/21/2009	ND	ND	12.6	ND	ND	4.29	ND	ND	ND	ND	ND	ND	---	16.89
	9/14/2010	ND	ND	9.2	ND	ND	2	ND	ND	ND	ND	ND	ND	---	11.20
	5/17/2011	ND	ND	5.7	ND	ND	1.6	1.0	ND	ND	ND	ND	ND	---	8.3
	1/24/2012	ND	ND	4.9	ND	1.7	2.5	ND	ND	ND	1.1	ND	ND	---	10.2
	4/25/2012	ND	ND	5.4	ND	1.0	2.3	ND	ND	ND	ND	ND	ND	1.4**	10.1
	7/9/2012	ND	ND	4.7	ND	ND	1.9	ND	ND	ND	ND	ND	ND	---	6.6
	10/22/2012	ND	ND	6.5	ND	1.3	2.5	1.1	ND	ND	ND	ND	ND	---	11.4
	02/12/2013	1.2	ND	8.2	ND	1.1	3.6	ND	ND	ND	ND	ND	ND	---	14.1
MW-4D	6/16/1998	ND	51	180	ND	ND	670	80	ND	ND	ND	ND	ND	6.9	981
	10/13/1998	ND	ND	150	ND	ND	440	63	ND	ND	ND	ND	ND	---	653
	5/23/2001	5.4	6.5	76	2.5	ND	110	29	ND	ND	ND	ND	ND	---	229.4
	12/29/2004	ND	1.0	56	ND	ND	25	ND	ND	ND	ND	ND	ND	---	82
	10/19/2005	ND	ND	5.9	ND	ND	5.5	0.59	ND	ND	ND	ND	ND	6.9	11.99
	4/21/2009	ND	ND	29.2	ND	ND	10.4	ND	ND	ND	ND	ND	ND	---	39.6
	9/14/2010	ND	ND	10.4	ND	ND	6	ND	ND	ND	ND	ND	ND	---	16.4
	5/17/2011	ND	ND	12.0	ND	ND	7.3	1.9	ND	ND	ND	ND	ND	---	21.2
	1/24/2012	ND	ND	10.5	ND	ND	8.7	ND	ND	ND	ND	ND	ND	---	19.2
	4/25/2012	ND	ND	9.4	ND	ND	4.3	1.1	ND	ND	ND	ND	ND	---	14.8
	7/9/2012	ND	ND	10.7	ND	ND	5.6	ND	ND	ND	ND	ND	ND	---	16.3
	10/22/2012	ND	ND	14.5	ND	ND	5.7	ND	ND	ND	ND	ND	ND	---	20.2
	02/12/2013	ND	ND	14.2	ND	ND	5.2	ND	ND	ND	ND	ND	ND	---	19.4
MW-5S	6/17/1998	ND	ND	18	ND	ND	110	ND	22	ND	ND	ND	ND	7.2	150
	10/13/1998	ND	ND	31	ND	ND	130	ND	17	ND	ND	ND	ND	---	178
	5/24/2001	ND	ND	33	ND	ND	77	ND	ND	ND	ND	ND	ND	---	110
	12/29/2004	ND	ND	14	ND	4.9	47	ND	11	ND	1.8	ND	ND	---	76.9
	10/18/2005	ND	2.7	8.1	ND	1.2	60	ND	1.7	ND	2.9	ND	ND	6.9	73.7
	4/21/2009	ND	ND	13.4	ND	ND	10.8	ND	ND	ND	ND	ND	ND	---	24.2
	9/14/2010	ND	ND	2	ND	ND	32.8	ND	ND	ND	ND	ND	ND	---	34.8
	5/17/2011	ND	ND	13.5	ND	ND	6.2	ND	ND	ND	ND	ND	ND	---	19.7
	1/24/2012	ND	ND	7.8	1.6	ND	3.6	2.5	ND	ND	ND	ND	ND	---	15.5
	4/24/2012	ND	ND	6.8	1.6	ND	5.5	1.6	ND	ND	ND	1.2	ND	6.4**	23.9
	7/9/2012	ND	ND	5.8	2	ND	3.4	1.6	ND	ND	ND	ND	ND	---	12.8
	10/22/2012	1.1	ND	5.1	1.6	ND	3.2	1.8	ND	ND	ND	ND	ND	1.9**	14.7
	02/12/2013	2.2	ND	5.8	1.3	ND	3.7	1.6	ND	ND	ND	ND	ND	---	14.6

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	----	---
MW-5D	6/17/1998	ND	40	130	ND	ND	510	65	ND	ND	ND	ND	ND	7.1	745
	10/13/1998	ND	19	88	ND	ND	350	40	ND	ND	ND	ND	ND	---	497
	5/24/2001	7.2	9.9	84	3.1	ND	170	28	ND	ND	ND	ND	ND	---	302.2
	12/29/2004	ND	ND	13	ND	ND	29	ND	ND	ND	ND	ND	5.7	---	47.7
	10/18/2005	0.83	2.9	12	ND	ND	26	ND	ND	ND	ND	ND	ND	7.0	41.73
	4/21/2009	ND	ND	25.3	ND	ND	11	ND	ND	ND	ND	ND	ND	---	36.3
	9/14/2010	ND	ND	17.1	ND	ND	10.7	ND	ND	ND	ND	ND	ND	---	27.8
	5/17/2011	ND	ND	10.6	ND	ND	7.5	ND	ND	ND	ND	ND	ND	---	18.1
	1/24/2012	ND	ND	8.3	ND	ND	6.3	1.3	ND	ND	ND	ND	ND	---	15.9
	4/24/2012	ND	ND	7.8	ND	ND	6.3	1.1	ND	ND	ND	ND	ND	---	15.2
	7/9/2012	ND	ND	8	ND	ND	6.1	ND	ND	ND	ND	ND	ND	---	14.1
	10/22/2012	ND	ND	11.3	ND	ND	5.8	1.6	ND	ND	ND	ND	ND	---	18.7
	02/12/2013	ND	ND	15.0	ND	ND	6.8	1.6	ND	ND	ND	ND	ND	---	23.4
MW-6S	6/16/1998	ND	ND	33	ND	6.9	92	ND	ND	ND	ND	ND	ND	6.7	131.9
	10/12/1998	ND	ND	30	ND	8.8	82	ND	ND	ND	ND	ND	ND	---	120.8
	5/24/2001	5.1	6.0	56	ND	ND	120	11	ND	ND	ND	ND	ND	---	198.1
	12/29/2004	ND	ND	16	1.2	8.8	14	ND	4.40	ND	1.40	ND	ND	---	44.4
	10/19/2005	0.75	ND	9.5	ND	5.0	8.1	0.91	1.1	ND	0.72	ND	ND	6.7	25.36
	4/21/2009	ND	ND	4.63	ND	ND	6.94	ND	ND	ND	ND	ND	ND	---	11.57
	9/14/2010	ND	ND	7.5	ND	2.8	5.1	ND	ND	ND	ND	ND	ND	---	15.4
	5/17/2011	ND	ND	8.1	ND	1.4	4.1	1.2	ND	ND	ND	ND	ND	---	14.8
	1/25/2012	ND	ND	8.8	1.1	2.2	5.6	ND	ND	ND	ND	ND	ND	---	17.7
	4/24/2012	ND	ND	8.2	ND	1.2	4.4	1.3	ND	ND	ND	ND	ND	1.8**	16.9
	7/9/2012	ND	ND	8.4	ND	1.7	4.3	ND	ND	ND	ND	ND	ND	---	14.4
	10/23/2012	ND	ND	8.6	ND	1.8	4.4	1	ND	ND	ND	ND	ND	---	15.8
	02/12/2013	ND	ND	7.7	ND	1.5	4.8	1.9	ND	ND	ND	ND	ND	---	15.9
MW-6D	10/19/2005	2.60	1.9	47	1.1	ND	26	12	ND	ND	ND	0.34	ND	7.0	90.94
	4/21/2009	ND	ND	29.5	ND	ND	8.85	ND	ND	ND	ND	ND	ND	---	38.35
	9/14/2010	ND	ND	12.1	ND	ND	4.8	ND	ND	ND	ND	ND	ND	---	16.9
	5/17/2011	ND	ND	13.6	ND	ND	6.7	ND	ND	ND	ND	ND	ND	---	20.3
	1/25/2012	ND	ND	10.0	ND	ND	3.3	ND	ND	ND	ND	ND	ND	---	13.3
	4/24/2012	ND	ND	7.3	ND	ND	2.6	ND	ND	ND	ND	ND	ND	---	9.9
	7/9/2012	ND	ND	13.4	ND	ND	6.2	ND	ND	ND	ND	ND	ND	---	19.6
	10/23/2012	ND	ND	10.1	ND	ND	3.8	ND	ND	ND	ND	ND	ND	---	13.9
	02/12/2013	ND	ND	14.3	ND	ND	6.9	ND	ND	ND	ND	ND	ND	---	21.2

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	----	---
MW-7S	6/17/1998	ND	7.8	29	ND	ND	120	ND	ND	ND	ND	ND	ND	7.2	156.8
	10/13/1998	ND	ND	22	ND	ND	100	ND	ND	ND	ND	ND	ND	---	122
	5/24/2001	ND	ND	20	ND	ND	46	ND	ND	ND	ND	ND	ND	---	66
	12/29/2004	ND	ND	3.7	ND	ND	5.1	ND	ND	ND	ND	ND	ND	---	8.8
	10/18/2005	ND	1.8	ND	ND	ND	4.5	ND	ND	ND	ND	ND	ND	6.9	6.3
>	12/17/2007	ND	ND	9.8	ND	ND	7.7	ND	ND	ND	ND	ND	ND	---	17.5
	4/21/2009	ND	ND	12.9	ND	ND	8.29	ND	ND	ND	ND	ND	ND	---	21.19
	9/14/2010	ND	ND	3.1	ND	ND	3.8	ND	ND	ND	ND	ND	ND	---	6.9
	5/17/2011	ND	ND	6.0	ND	ND	5.8	ND	ND	ND	ND	ND	ND	---	11.8
	1/24/2012	ND	ND	2.3	ND	ND	16.3	ND	ND	ND	ND	ND	ND	---	18.6
	4/25/2012	ND	ND	1.4	ND	ND	9.8	ND	ND	ND	ND	ND	ND	---	11.2
	7/9/2012	ND	ND	1.4	ND	ND	6.7	ND	ND	ND	ND	ND	ND	---	8.1
	10/22/2012	ND	ND	ND	ND	ND	9.8	ND	ND	ND	ND	ND	ND	---	9.8
	02/12/2013	ND	ND	1.7	ND	ND	23.1	ND	ND	ND	ND	ND	ND	---	24.8
MW-7D	6/17/1998	ND	43	140	ND	ND	550	76	ND	ND	ND	ND	ND	7.9	809
	10/13/1998	ND	ND	100	ND	ND	420	64	ND	ND	ND	ND	ND	---	584
	5/24/2001	ND	5.7	66	ND	ND	91	ND	ND	ND	ND	ND	ND	---	162.7
	12/29/2004	ND	ND	57	ND	ND	13	ND	ND	ND	ND	ND	ND	---	70
	10/18/2005	1.5	3.5	35	0.66	ND	37	1.2	ND	ND	ND	ND	ND	6.9	78.86
>	12/17/2007	2.7	1.6	41.5	ND	ND	21	ND	ND	ND	ND	ND	ND	---	66.8
	4/21/2009	ND	ND	28.1	ND	ND	16.6	ND	ND	ND	ND	ND	ND	---	44.7
	9/14/2010	ND	ND	20.3	ND	ND	10.4	ND	ND	ND	ND	ND	ND	---	30.7
	5/17/2011	ND	ND	13.6	ND	ND	12.8	ND	ND	ND	ND	ND	ND	---	26.4
	1/24/2012	ND	ND	10.3	ND	ND	7.5	ND	ND	ND	ND	ND	ND	---	17.8
	4/25/2012	ND	ND	8.8	ND	ND	7.2	ND	ND	ND	ND	ND	ND	---	16.0
	7/9/2012	ND	ND	8.3	ND	ND	7.4	ND	ND	ND	ND	ND	ND	---	15.7
	10/22/2012	ND	ND	8.5	ND	ND	9.4	ND	ND	ND	ND	ND	ND	1.1***	19.0
	02/12/2013	ND	ND	8.1	ND	ND	7.0	ND	ND	ND	ND	ND	ND	---	15.1
MW-8S	6/16/1998	5.2	8.5	52	ND	ND	190	ND	10	ND	ND	ND	ND	6.8	265.7
	10/13/1998	ND	ND	57	ND	ND	180	ND	ND	ND	ND	ND	ND	---	237
	5/24/2001	5.7	5.0	70	ND	ND	120	ND	ND	ND	ND	ND	ND	---	200.7
	12/28/2004	1.70	ND	22	ND	3.4	83	ND	12.0	ND	2.9	ND	ND	---	122.1
	10/20/2005	1.4	ND	17	0.48	ND	57	ND	2.7	ND	1.4	ND	ND	6.8	78.58
	4/21/2009	ND	ND	11.2	ND	ND	25.8	ND	ND	ND	ND	ND	ND	---	37
	9/15/2010	ND	ND	3.1	ND	ND	16	ND	ND	ND	ND	ND	ND	---	19.1
	5/17/2011	ND	ND	11.1	ND	ND	8.3	ND	ND	ND	ND	ND	ND	---	19.4
	1/25/2012	ND	ND	7.5	1.5	1.3	7.0	ND	ND	ND	ND	ND	ND	---	17.3
	4/24/2012	ND	ND	7.1	1.7	ND	4.3	1.8	ND	ND	ND	ND	ND	5.8**	20.7
	7/9/2012	1.1	ND	7.5	1.7	ND	4.8	1.1	ND	ND	ND	ND	ND	---	16.2
	10/23/2012	1.4	ND	5.6	1.4	1	3.9	1.2	ND	ND	ND	ND	ND	1.5**	16.0
	02/12/2013	1.1	ND	7.0	ND	1.5	4.4	1.0	ND	ND	ND	ND	ND	---	15.0

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	----	----
MW-8D	6/16/1998	ND	43	140	ND	ND	700	70	ND	ND	ND	ND	ND	8.1	953
	10/13/1998	ND	26	110	ND	ND	450	60	ND	ND	ND	ND	ND	----	646
	5/24/2001	7.4	10	86	3.4	ND	170	30	ND	ND	ND	ND	ND	----	306.8
	12/28/2004	ND	ND	40	ND	ND	27	ND	ND	ND	ND	ND	ND	----	67
	10/20/2005	2.2	0.68	41	0.74	ND	27	0.96	ND	ND	ND	ND	ND	6.9	72.58
	4/21/2009	2.08	ND	30	ND	ND	13.3	ND	ND	ND	ND	ND	ND	----	45.38
	9/15/2010	ND	ND	17.9	ND	ND	11	ND	ND	ND	ND	ND	ND	----	28.9
	5/17/2011	ND	ND	11.6	ND	ND	8.0	ND	ND	ND	ND	ND	ND	----	19.6
	1/25/2012	ND	ND	13.3	ND	ND	8.3	ND	ND	ND	ND	ND	ND	1.1***	22.7
	4/24/2012	ND	ND	10.9	ND	ND	8.1	ND	ND	ND	ND	ND	ND	---	19.0
	7/9/2012	ND	ND	10.2	ND	ND	5.7	ND	ND	ND	ND	ND	ND	---	15.9
	10/23/2012	ND	ND	13	ND	ND	5.9	ND	ND	ND	ND	ND	ND	---	18.9
	02/12/2013	ND	ND	14.2	ND	ND	6.4	1.3	ND	ND	ND	ND	ND	---	21.9
MW-9S	6/16/1998	9.5	20	87	2.7	ND	230	ND	ND	ND	ND	ND	ND	6.8	349.2
	10/12/1998	ND	13	92	ND	ND	270	ND	ND	ND	ND	ND	ND	----	375
	5/24/2001	ND	7.3	58	ND	ND	140	13	ND	ND	ND	ND	ND	----	218.3
	12/28/2004	ND	ND	34	ND	1.3	33	ND	ND	ND	ND	ND	ND	----	68.3
	10/19/2005	1.3	0.76	31	0.63	1.3	27	3.0	ND	ND	ND	ND	ND	6.8	64.99
>	12/17/2007	1.9	ND	24	1.4	2.9	18	1.4	ND	ND	ND	ND	ND	----	49.5
	4/21/2009	ND	ND	16.2	ND	ND	18.7	ND	ND	ND	ND	ND	ND	----	34.9
	9/15/2010	ND	ND	14.3	ND	ND	13.9	ND	ND	ND	ND	ND	ND	----	28.2
	5/17/2011	ND	ND	14.6	ND	ND	8.7	ND	ND	ND	ND	ND	ND	----	23.3
	1/25/2012	ND	ND	10.3	1.4	1.5	9.0	ND	ND	ND	ND	ND	ND	---	22.2
	4/24/2012	ND	ND	9.2	ND	ND	7.1	1.1	ND	ND	ND	ND	ND	2.3**	19.7
	7/9/2012	ND	ND	11.6	ND	1.3	10.3	1.1	ND	ND	ND	ND	ND	---	24.3
	10/23/2012	ND	ND	11.6	ND	1.3	6.6	1.2	ND	ND	ND	ND	ND	---	20.7
	02/11/2013	ND	ND	9.9	ND	1.1	6.4	1.2	ND	ND	ND	ND	ND	---	18.6
MW-9D	10/12/1998	ND	18	92	ND	ND	290	49	ND	ND	ND	ND	ND	----	449
	5/24/2001	5.6	7.7	67	2.6	ND	130	28	ND	ND	ND	ND	ND	----	240.9
	12/28/2004	1.4	ND	52	ND	ND	9.3	ND	ND	ND	ND	ND	ND	----	62.7
	10/19/2005	2.4	0.61	46	0.86	ND	30	ND	ND	ND	ND	ND	ND	7.0	79.87
>	12/17/2007	3.4	2.7	58	2.3	ND	27.4	ND	ND	ND	ND	ND	ND	----	93.8
	4/21/2009	2.0	ND	29.5	ND	ND	13.5	ND	ND	ND	ND	ND	ND	----	45.01
	9/15/2010	ND	ND	15.5	ND	ND	11	1	ND	ND	ND	ND	ND	----	27.5
	5/17/2011	ND	ND	13.3	ND	ND	7.5	ND	ND	ND	ND	ND	ND	----	20.8
	1/25/2012	ND	ND	5.9	ND	ND	2.2	ND	ND	ND	ND	ND	ND	---	8.1
	4/24/2012	ND	ND	10.5	ND	ND	5.6	ND	ND	ND	ND	ND	ND	---	16.1
	7/9/2012	ND	ND	13.5	ND	ND	8.2	ND	ND	ND	ND	ND	ND	---	21.7
	10/23/2012	ND	ND	13.2	ND	ND	6.8	ND	ND	ND	ND	ND	ND	---	20.0
	02/11/2013	ND	ND	9.9	ND	ND	5.2	ND	ND	ND	ND	ND	ND	---	15.1

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	---	---
MW-10S	10/12/1998	10	ND	62	ND	5.9	120	ND	ND	ND	ND	ND	ND	---	197.9
	12/29/2004	ND	ND	11	ND	4.7	17	ND	6.1	ND	1.4	ND	ND	---	38.8
	10/19/2005	0.70	ND	15	ND	ND	15	1.1	1.40	ND	0.86	ND	ND	6.8	33.2
	4/20/2009	ND	ND	10.1	ND	ND	11.6	ND	ND	ND	ND	ND	ND	---	21.7
	9/14/2010	ND	ND	8.9	ND	ND	8.5	ND	ND	ND	ND	ND	ND	---	17.4
	5/17/2011	ND	ND	8.7	ND	ND	4.7	2.0	ND	ND	ND	ND	ND	1**	16.4
	1/24/2011	ND	ND	7.5	ND	1.3	5.4	ND	ND	ND	ND	ND	ND	---	14.2
	4/24/2012	ND	ND	6.9	ND	1.7	4.7	ND	ND	ND	ND	ND	ND	1.3**	14.6
	7/9/2012	ND	ND	7.5	ND	1.3	4.6	ND	ND	ND	ND	ND	ND	---	13.4
	10/23/2012	ND	ND	9.4	ND	1.3	4.2	1.3	ND	ND	ND	ND	ND	---	16.2
	02/11/2013	ND	ND	9.6	ND	1.3	5.6	ND	ND	ND	ND	ND	ND	---	16.5
MW-10D	10/12/1998	ND	10	55	ND	ND	160	26	ND	ND	ND	ND	ND	---	251
	12/29/2004	3.1	1.8	74	ND	ND	29	ND	ND	ND	ND	ND	ND	---	107.9
	10/19/2005	2.4	2.4	44	1.2	ND	23	7.4	ND	ND	ND	0.35	ND	7.0	80.75
	4/20/2009	ND	ND	19.7	ND	ND	5.88	ND	ND	ND	ND	ND	ND	---	25.58
	9/14/2010	ND	ND	17	ND	ND	5.8	ND	ND	ND	ND	ND	ND	---	22.8
	5/17/2011	ND	ND	11.4	ND	ND	5.0	2.2	ND	ND	ND	ND	ND	---	18.6
	1/24/2011	ND	ND	13.1	ND	ND	3.9	ND	ND	ND	ND	ND	ND	1.4***	18.4
	4/24/2012	ND	ND	11.2	ND	ND	5.1	ND	ND	ND	ND	ND	ND	---	16.3
	7/9/2012	ND	ND	10.7	ND	ND	3.3	ND	ND	ND	ND	ND	ND	---	10.7
	10/23/2012	ND	ND	14.7	ND	ND	5.2	1.3	ND	ND	ND	ND	ND	---	21.2
	02/11/2013	ND	ND	10.5	ND	ND	4.6	1.0	ND	ND	ND	ND	ND	---	16.1

> : Sampled by NIC/City
** : Dichlorodifluoromethane detected.
*** : Methyl Tert Butyl Ether detected.
All concentrations in ug/L (micrograms per liter) or ppb (parts per billion).
ND : Not present at concentration exceeding detection limit.
--- : Not analyzed.
Tier 2 / MCLs = KDHE Tier 2 RSK (October 2010) values. MCLs = USEPA Maximum Contaminant Levels.
Shaded data exceeds Tier 2 Levels.

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	—	—
QA/QC SAMPLES	4/20/2009														
Duplicates															
MW-2D (BD-1)		**2.19**	ND	**35.1**	ND	ND	**9.86**	ND	ND	ND	ND	ND	ND	—	47.2
MW-6S (BD-2)		ND	ND	**4.47**	ND	ND	**6.87**	ND	ND	ND	ND	ND	ND	—	11.3
Field Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
QA/QC SAMPLES	9/14/2010														
Duplicates															
MW-3S (BD-1)		ND	ND	ND	ND	ND	**30.2**	ND	ND	ND	ND	ND	ND	—	30.2
MW-10S (BD-2)		ND	ND	**8.6**	ND	ND	**8.6**	ND	ND	ND	ND	ND	ND	—	17.2
Field Blank		ND	ND	**1.4**	ND	ND	ND	ND	ND	ND	ND	ND	ND	**24.3****	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
****Acetone detected in Field Blank 9/14/2010.**															
QA/QC SAMPLES	05/13/2011														
Duplicates															
MW-1D (BD-2)		ND	ND	**9.9**	ND	ND	**5.0**	**2.8**	ND	ND	ND	ND	ND	—	17.7
MW-3S (BD-1)		ND	ND	**4.2**	ND	ND	**13.8**	ND	ND	ND	ND	ND	ND	—	18
Equipment Blank		ND	ND	**2.4**	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	2.4
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
QA/QC SAMPLES	01/24/2012														
Duplicates															
MW-3S (BD-1)		ND	ND	ND	ND	ND	**33.1**	ND	ND	ND	ND	ND	ND	—	33.1
MW-10S (BD-2)		ND	ND	**10.2**	ND	ND	**7.5**	ND	ND	ND	ND	ND	ND	—	17.7
Equipment Blank		ND	ND	ND	ND	ND	ND	ND	**1.7**	ND	ND	ND	ND	—	1.7
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
QA/QC SAMPLES	04/25/2012														
Duplicates															
MW-3S (BD-1)		ND	ND	ND	ND	ND	**25.6**	ND	ND	ND	ND	ND	ND	—	25.6
MW-7S (BD-2)		ND	ND	**1.5**	ND	ND	**9.9**	ND	ND	ND	ND	ND	ND	—	11.4
Equipment Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
QA/QC SAMPLES	07/09/2012														
Duplicates															
MW-2S (BD-1)		ND	ND	**6.8**	ND	ND	**3.2**	**5.7**	ND	ND	ND	ND	ND	—	15.7
MW-4S (BD-2)		ND	ND	**5.7**	ND	**1.1**	**2.4**	**1.1**	ND	ND	ND	ND	ND	—	10.3
Equipment Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—	ND

Table 2
Historic and Current Groundwater Analytical Data
Univar - Mosley Avenue Facility, Wichita, Kansas

Monitoring Well Location	Date	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L	PCE (µg/L)	TCE (µg/L)	Vinyl Chloride (µg/L)	Chloroform (µg/L)	Methylene Chloride (µg/L)	1,1,1-Trichloroethane (µg/L)	Benzene (µg/L)	Toluene >	pH or Other in µg/L	Total VOCs (µg/L)
KDHETier 2 / MCLs		**25 / 5**	**7 / 7**	**70 / 70**	**100 / 100**	**5 / 5**	**5 / 5**	**2 / 2**	**80 / 100**	**5 / 5**	**200 / 200**	**5 / 5**	**1000 / 1000**	----	----
QA/QC SAMPLES	10/23/2012														
Duplicates															
MW-2D (BD-1)		ND	ND	**9.9**	ND	ND	**1.5**	**1.4**	ND	ND	ND	ND	ND	---	12.8
MW-9D (BD-2)		ND	ND	**12.6**	ND	ND	**6.6**	ND	ND	ND	ND	ND	ND	---	19.2
Equipment Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND
QA/QC SAMPLES	02/12/2013														
Duplicates															
MW-9S (BD-1)		ND	ND	**11.0**	ND	**1.2**	**7.2**	**1.0**	ND	ND	ND	ND	ND	---	20.4
MW-9D (BD-2)		ND	ND	**10.7**	ND	ND	**6.6**	ND	ND	ND	ND	ND	ND	---	16.1
Equipment Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND
Trip Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND

All concentrations in ug/L (micrograms per liter) or ppb (parts per billion).
ND : Not present at concentration exceeding detection limit.
--- : Not analyzed.
Tier 2 / MCLs = KDHE Tier 2 RSK (October 2010) values. MCLs = USEPA Maximum Contaminant Levels.
Shaded data exceeds Tier 2 Levels.

TABLE 3
NIC Groundwater VOC Data Near Univar, Univar USA Inc., Wichita, KS

1997-1998 NIC Data Near Univar

		Shallow		Deep	
		Combined[1]	TCE	Combined[1]	TCE
Offsite Upgradient Locations	GPA 12-8	466.1	350	806	520
	GPA 12-9	159.8	94	1125	790
	GP 35-4	716.7	490	1308	890
	GP 48-7	24	10	867	600
	Average:	342	236	1027	700
Univar Locations	MW-1	304.9	150	806	530
	MW-2	ND	ND	916	660
	MW-3	117.4	110	NA	NA
	MW-4	100	62	653	440
	MW-5	161	31	490	350
	MW-6	120.8	82	NA	NA
	MW-7	122	100	584	420
	MW-8	237	180	620	450
	MW-9	362	270	431	290
	MW-10	237	180	241	160
	Average:	196	129	593	413
Offsite Downgradient Locations	WND-39	54.4	7.4	787.7	610
	Average:	54	7	788	610
Offsite Sidegradient Locations	GP 47-1	57.7	70	761.7	550
	GP 47-2	275	190	919	710
	Average:	166	130	840	630

Note: The offsite upgradient GP locations are one-time geoprobe groundwater sampling locations only used for the applicable dates.

2001 NIC Data Near Univar

		Shallow		Deep	
		Combined[1]	TCE	Combined[1]	TCE
Offsite Upgradient Locations	NMW-40	302	190	228	150
	NMW-6	2.1	ND	153	80
	WND-21	59	2.9	340	230
	Average:	121	96	240	153
Univar Locations	MW-1	75	25	223	94
	MW-2	9.7	ND	178	85
	MW-3	53.2	50	NA	NA
	MW-4	185.2	82	218	110
	MW-5	110	77	285	170
	MW-6	187	120	NA	NA
	MW-7	66	46	157	91
	MW-8	217	130	289	170
	MW-9	211	140	228	130
	MW-10	NA	NA	NA	NA
	Average:	124	84	225	121
Offsite Downgradient Locations	WND-39	32	29	47	32
	Average:	32	29	47	32
Offsite Sidegradient Locations	NMW-08	217	130	385	230
	NMW-39	441	37	511	220
	Average:	329	84	448	225

1 = Combined TCE, PCE, total 1,2-DCE, and VC
All concentrations in micrograms per liter (ug/L) or parts per billion (ppb)
PCE=tetrachloroethene
TCE=trichloroethene
DCE=dichloroethene
VC=vinyl chloride
NA=not available, not sampled or well not installed at that time

TABLE 3
NIC Groundwater VOC Data Near Univar, Univar USA Inc., Wichita, KS

2004 NIC Data Near Univar

		Shallow		Deep	
		Combined[1]	TCE	Combined[1]	TCE
Offsite Upgradient Locations	NMW-40	122	73	197	110
	NMW-6	ND	ND	87	26
	WND-21	74	7	323	230
	Average:	98	40	202	122
Univar Onsite Locations	MW-1	4.4	3.2	82	28
	MW-2	1.8	ND	77	28
	MW-3	54	52	NA	NA
	MW-4	11.7	5.7	25	25
	MW-5	66	47	42	29
	MW-6	40	14	NA	NA
	MW-7	8.8	5.1	70	13
	MW-8	108.4	83	67	27
	MW-9	68.3	62	91	9.3
	MW-10	32.7	17	NA	NA
	Average:	49	36	59	21
Offsite Downgradient Locations	WND-39	65	50	108	64
	Average:	65	50	108	64
Offsite Sidegradient Locations	NMW-08	119	62	157	91
	NMW-39	128	6	210	110
	Average:	124	34	184	101

Recent NIC Data Near Univar (12/07 to 4/09)

		Shallow		Deep	
		Combined[1]	TCE	Combined[1]	TCE
Offsite Upgradient Locations	NMW-40	60	27	124	70
	NMW-6	ND	ND	98.3	38.5
	WND-21	64	11	187	139
	Average:	62	19	136	83
Univar Onsite Locations	MW-1	17.3	2.2	36.8	7
	MW-2	15	3.2	42.1	9.1
	MW-3	9	9	37.9	11.4
	MW-4	16.9	4.3	39.6	10.4
	MW-5	24.2	10.8	36.3	11
	MW-6	11.5	6.9	38.4	8.9
	MW-7	21.2	8.3	44.7	16.6
	MW-8	37	25.8	43.3	13.3
	MW-9	34.9	18.7	43	13.5
	MW-10	21.7	11.6	25.6	5.9
	Average:	22	12	39	11
Offsite Downgradient Locations	WND-39	25	21	70	27
	Average:	25	21	70	27
Offsite Sidegradient Locations	NMW-08	142	64	306	202
	NMW-39	97	1	79	37
	Average:	120	33	193	120

1 = Combined TCE, PCE, total 1,2-DCE, and VC
All concentrations in micrograms per liter (ug/L) or parts per billion (ppb)
PCE=tetrachloroethene
TCE=trichloroethene
DCE=dichloroethene
VC=vinyl chloride
NA=not available, not sampled or well not installed at that time

TABLE 4
Vapor Intrusion Model Screening Concentrations for Groundwater
Univar USA, Wichita, KS

Constituent of Concern	Vapor Intrusion Screening Value for Groundwater[1] (ug/L)	Incremental Risk[2]	
		Carcinogen (unitless)	Non-Carcinogen (unitless)
Trichloroethene	114	2.9E-06	0.19
Tetrachloroethene	216	1.3E-07	0.013
1,1-Dichloroethane	7,420	NA	0.00027
1,1-Dichloroethene	507	ND	ND
cis-1,2-Dichloroethene	735	NA	0.028
trans-1,2-Dichloroethene	634	NA	0.0044
Vinyl Chloride	5	7.0E-06	0.018
	Total Incremental Risk:	1.0E-05	0.25

1. Screening values for groundwater derived from the US EPA's Johnson & Ettinger Vapor Intrusion Model based on 10^{-5} target risk from KDHE RSK Manual (October 2010). Concentrations in micrograms per liter (ug/L) or parts per billion.

2. Cumulative Incremental risk by consituent of concern, from US EPA's Johnson & Ettinger Model. Total carcinogens $\leq 10^{-5}$ and non-carcinogens hazard quotient ≤ 1. Highest site-wide individual groundwater VOC detections utilized to generate the incremental risk.

NA = not carcinogen. ND = not detected in recent samples.

Site specific data used for modeling:

15 cm = depth below grade to bottom of enclosed space floor/slab.

402 cm = depth below grade to water table (average across the site).

Soil type directly above/at water table: sand. Soil type in vadose zone: silt.

Average soil/groundwater temp: 13 C.

Averaging time for carcinogens: 70 yrs. Exposure duration: 25 yrs. Exposure frequency: 250 days/yr.
(Averaging time, exposure duration and frequency from KDHE RSK Manual, October 2010)

TABLE 5
Vapor Intrusion Screening Calculations
Univar USA Inc., Wichita, KS

	OSHA Permissible Exposure Limits (PELs)		KDHE Tier 2 Residential Indoor Air Values			
	C_{ia} (ug/m^3)	C_{gw} (ug/L)	C_{ia}	C_{gw}	H	a
Trichloroethene	537,000	1,342,500	12.2	30.50	0.4	0.001
Tetrachloroethene	678,000	941,667	4.12	5.72	0.72	0.001
1,1-Dichloroethane	400,000	1,739,130	15.2	66.09	0.23	0.001
1,1-Dichloroethene	NV	NV	209	190	1.1	0.001
cis-1,2-Dichloroethene	790,000	4,647,059	36.5	215	0.17	0.001
trans-1,2-Dichlroethene	790,000	4,647,059	62.6	368	0.17	0.001
Vinyl Chloride	2,500	2,273	5.53	5.03	1.1	0.001

The screening values were calculated as follows:

$$Cgw = Cia / (H \times a \times 1000\ L/m3)$$

where C_{gw} = calculated vapor intrusion groundwater screening level (ug/L) for each indoor air value
C_{ia} =target indoor air (ug/m^3)
H =VOC-specific Henry's Law Coefficient
a =attenuation factor (from KDHE and US EPA guidance)
(a = 0.0007 - 0.0008 [chemical specific] to 0.001 for residential)
NV =no value established
ug/m^3 =micrograms per cubic meter of air
ug/L =micrograms per liter or parts per billion

Notes: OSHA PELs from 29CFR1910, based on 8-hour time weighted average exposure for worker protection. KDHE Tier 2 Residential Indoor air values from RSK Manual (October 2010).

TABLE 6

Initial Screening of Potential Response Action Alternatives, Univar USA Inc., Wichita, Kansas

Screening Criteria (Primary followed by Secondary)	Response Action Alternative							
	No Action	Vapor Intrusion Mitigation	Environmental Use Controls	Long Term Monitoring	E nhanced Bioremediation	Groundwater Extraction and Treatment	Air Sparging	In -Situ Oxidation and Thermal
Technical Implementability	High	Mod.	High	High	Low	High	Low	Low
Feasibility	High	High	High	High	Low	Mod.	Mod.	Low
Effectiveness	None	High	Mod.	Mod.	Mod.	Low	Low	Low
Relative Cost	None	Low	Mod.	Low	Mod.	High	Mod.	High
Attain Objectives		✓	✓	✓	✓	✓	✓	✓
Source Control								
Safety (of alternative)	✓	✓	✓	✓	✓	✓	✓	
Protective of Human Health		✓	✓	✓				✓
Protective of the Environment			✓	✓	✓	✓	✓	✓
Reliability	✓	✓	✓	✓		✓		
Summary	☆		☆	☆		☆		

✓ = Meet s secondary criteria for the media addressed by that technology. Mod.= Moderate.

☆ = Best meets the initial screening criteria given the site - specific conditions at the facility and warrants d/or is required to be included in further evaluations).

See section 4.2 for related details and explanations.

TABLE 7
Detailed Screening Summary for Response Action Alternatives, Univar USA Inc., Wichita, Kansas
See Section 5.0 for explanation of criteria and descriptive ratings.

Criteria for Detailed Screening	Initially Retained Response Action Alternatives Ability to Meet Various Criteria		
	No Action	**EUC/Long Term Monitoring**	**Groundwater Extraction and Treatment**
Overall Protectiveness of Human Health and the Environment	Low	Moderate	Low
Compliance with ARARs	No	Yes	Yes
Short and Long-Term Effectiveness	Low	Moderate	Moderate
Reduction of Contaminants	Low	Moderate	Moderate
Implementability	High	High	Moderate
Cost	High (low cost)	High (low cost)	Low (high cost)
Agency Acceptance	Low	High	High
Public and Community Acceptance	Low	High	High
Summary	Lowest Rated	Highest Rated	Middle Rated

TABLE 8
Cost Analysis
Univar USA Inc., Wichita, Kansas

Response Action Alternative

No Action Alternative

Total: $0

EUC/Long Term Monitoring

Assumes quarterly groundwater monitoring for 5 years followed by semi-annual monitoring for 5 years, annual monitoring for 10 years. One time EUC application fee of $10,000 to KDHE.

	Task	
Quarterly:	Annual Labor	$9,600
	Materials/Disposal	$3,000
	Lab Analysis	$11,000
	Data Evaluation	$2,640
	Annual Reporting	$2,750
	5 Year Total:	$144,950

	Task	
Semi-Annual:	Annual Labor	$4,800
	Materials/Disposal	$1,500
	Lab Analysis	$5,500
	Data Evaluation	$1,320
	Annual Reporting	$2,750
	5 Year Total:	$79,350

Annual:	Annual Labor	$2,400
	Materials/Disposal	$750
	Lab Analysis	$2,750
	Data Evaluation	$660
	Annual Reporting	$2,750
	10 Year Total:	$93,100

Total: $327,400

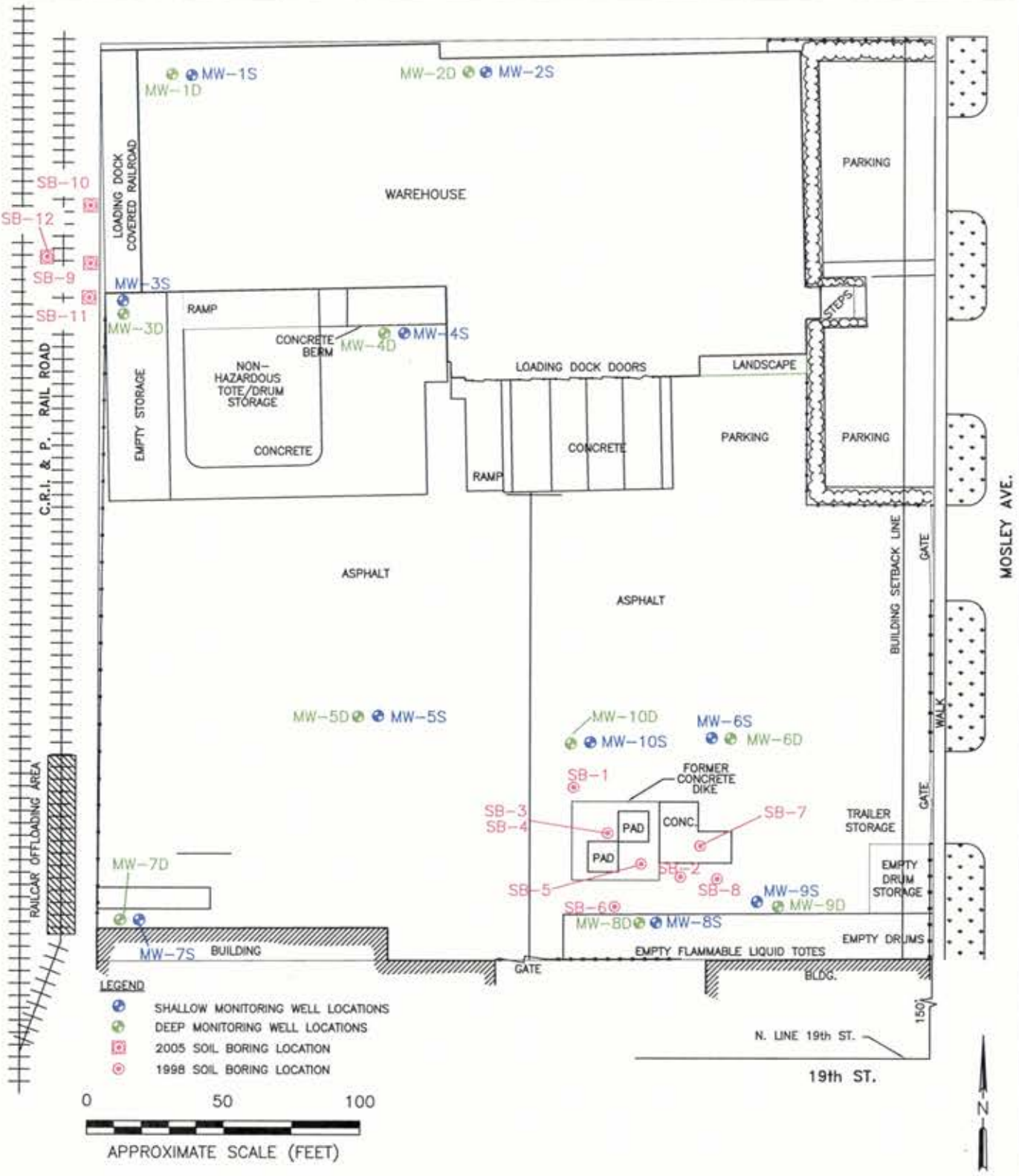
Groundwater Extraction and Treatment

Assumes installation of 2 recovery wells, pumping 75-100 gpm each, with separate costs for onsite treatment and offsite treatment, with 30 years of O&M and groundwater monitoring.

Item		
Well/Pump Equip. & Installation		$175,000
Treatment System		$760,000
Forced-Main		$400,000
Annual O&M (system)	30 yrs @ $72,000	$2,160,000
Annual O&M (no system)	30 yrs @ $32,000	$960,000
Monitoring		$410,500

Total With Onsite Treatment: $3,505,500
Total With Offsite Treatment: $1,945,500

Notes: Design, engineering, and permitting costs included. Assumes 5 years of quarterly groundwater monitoring, 5 years of semi-annual monitoring, and 20 years of annual monitoring. Utility costs included with O&M.



UNIVAR USA INC.
WICHITA KANSAS

FACILITY LAYOUT MAP

CHECKED T.SULLIVAN	DATE 9-29-10
FILENAME: Univar BaseMap 5-09	FIGURE 1

FIGURE 2.
TCE in Groundwater and MCLs
September 2010
Univar USA Inc., Wichita, KS

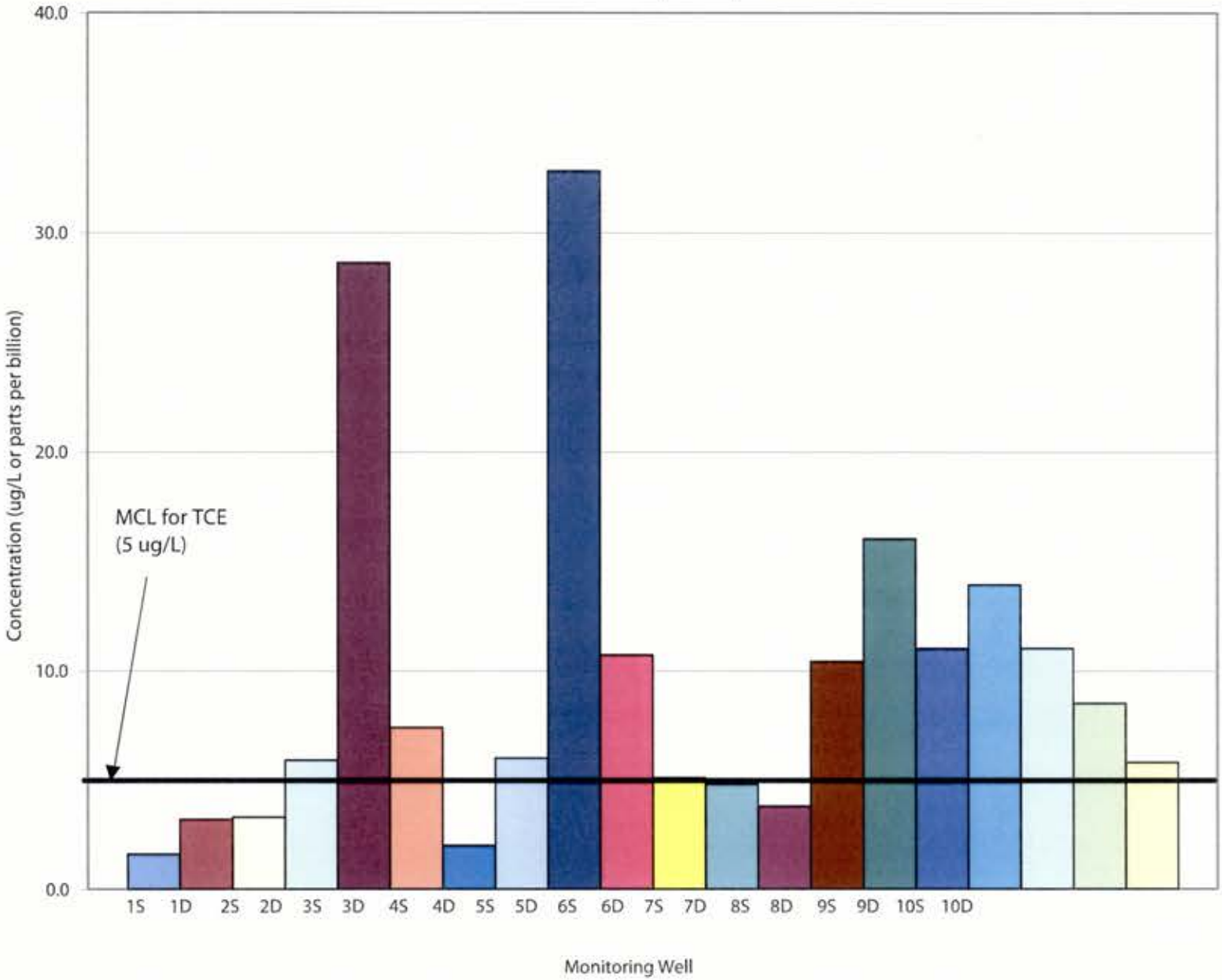
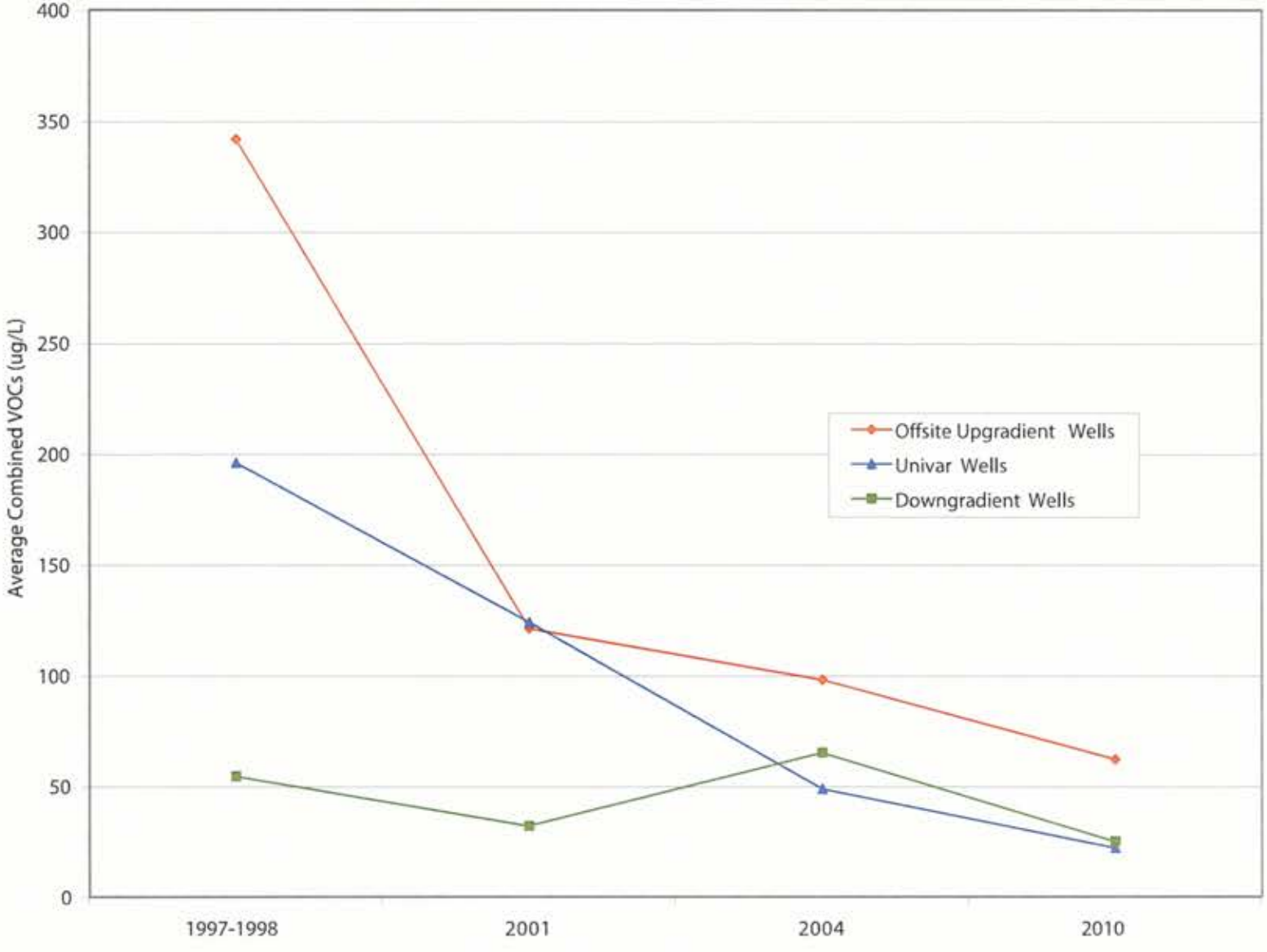
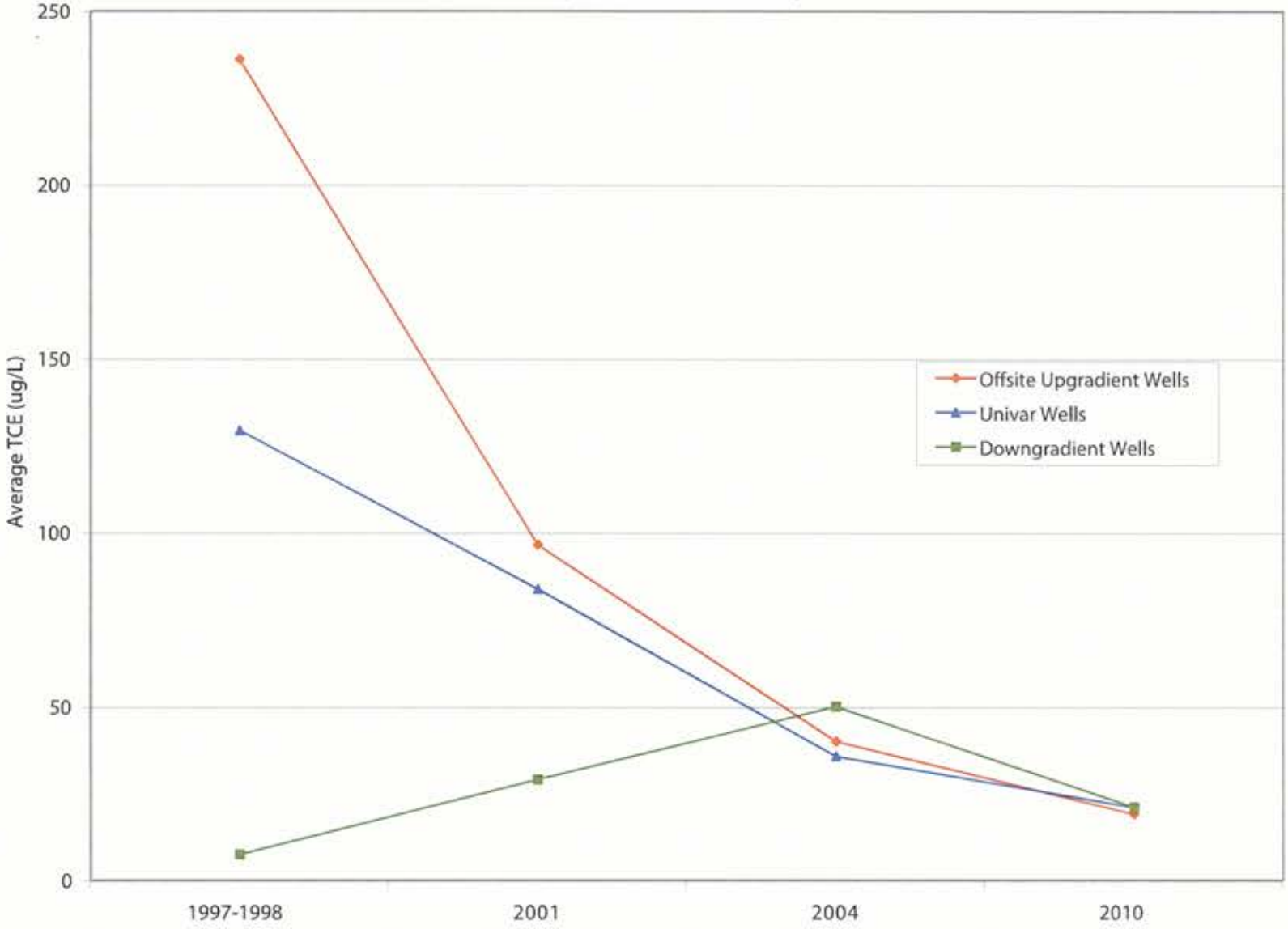


FIGURE 3
Shallow Average Groundwater Data - Combined VOCs
(1997-2001-2004-2010)



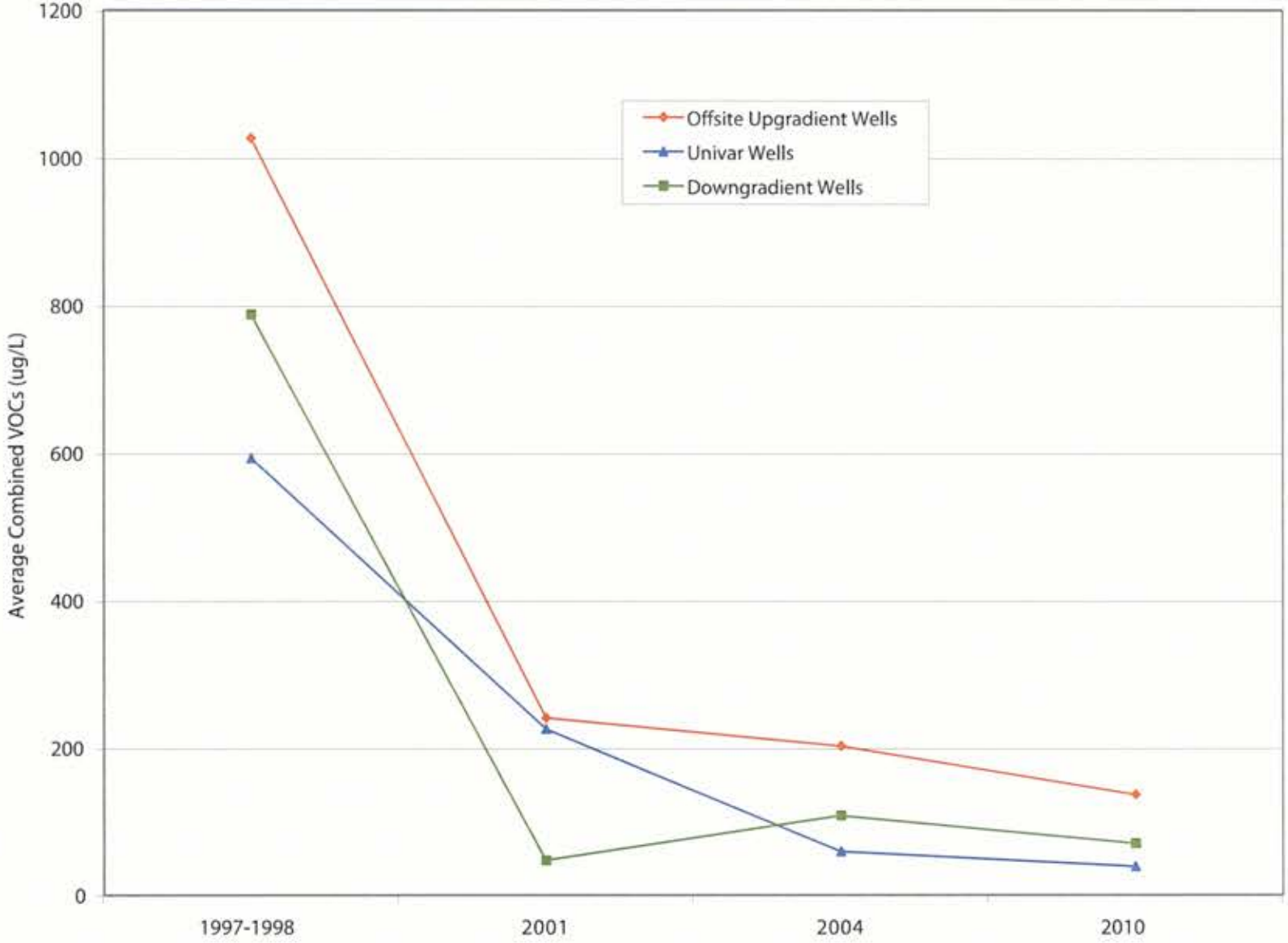
Univar USA Inc., Wichita, KS

FIGURE 4
Shallow Average Groundwater Data - TCE
(1997-2001-2004-2010)



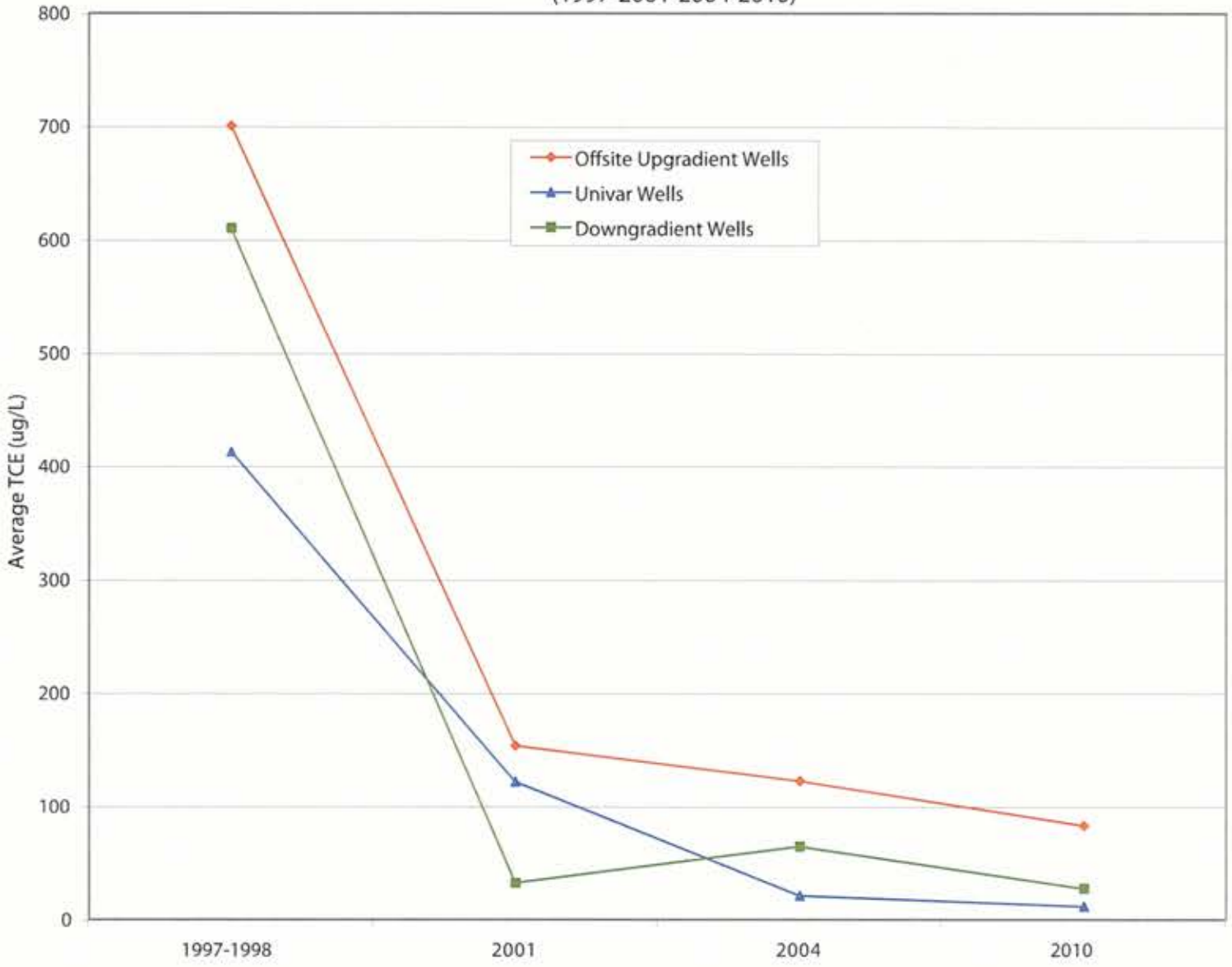
Univar USA Inc., Wichita, KS

FIGURE 5
Deep Average Groundwater Data - Combined VOCs
(1997-2001-2004-2010)



Univar USA Inc., Wichita, KS

FIGURE 6
Deep Average Groundwater Data - TCE
(1997-2001-2004-2010)



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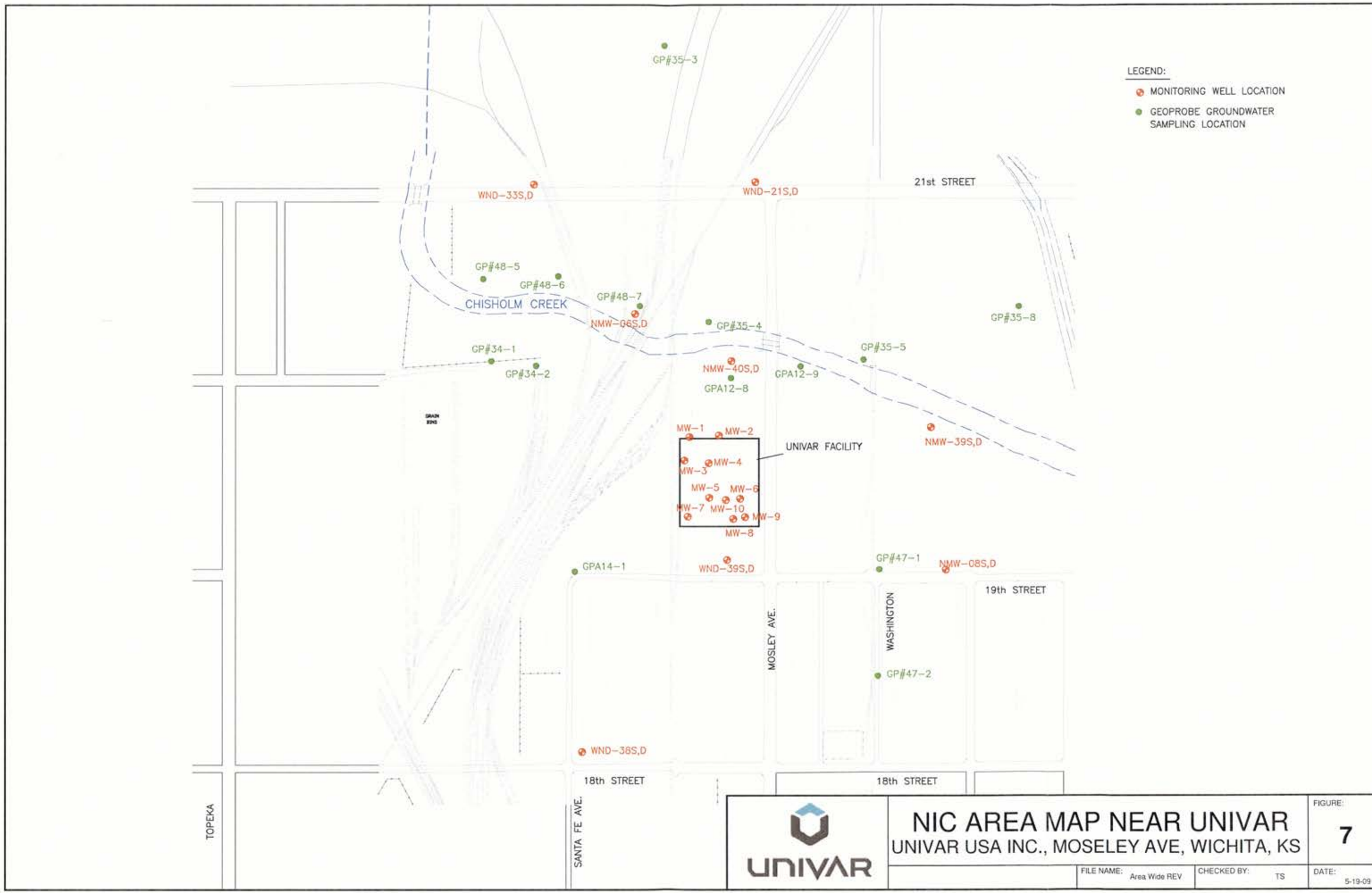

NIC AREA MAP NEAR UNIVAR

UNIVAR USA INC., MOSELEY AVE, WICHITA, KS

FIGURE: 7

FILE NAME: Area Wide REV

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