

Supplemental Investigation Report for the Former Refinery at Neodesha, Kansas



Kansas Department of Health and Environment

**KDHE Neodesha Refinery
Project No. 80435**

03/18/2015

Supplemental Investigation Report for the Former Refinery at Neodesha, Kansas

prepared for

**Kansas Department of Health and Environment
KDHE Neodesha Refinery
Neodesha, Kansas**

Project No. 80435

03/18/2015

prepared by

**Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri**

INDEX AND CERTIFICATION

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Certification

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Date: March 18, 2015

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LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term/Phrase/Name</u>
1,2-DCE	1,2-Dichloroethene
AECOM	AECOM Technology Corporation
amsl	above mean sea level
bgs	below ground surface
BP	British Petroleum Products North America, Inc.
BTEX	benzene, toluene, ethylbenzene, and xylenes
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
cis-1,2-DCE	cis-1,2-Dichloroethene
City	City of Neodesha, Kansas
cm/sec	centimeters per second
CO	carbon monoxide
CPT	Cone Penetrometer Test
DF	dilution factor
DO	dissolved oxygen
DRO	diesel range organics
GRO	gasoline range organics
H ₂ S	hydrogen sulfide
HSA	hollow-stem auger
ID	inside diameter
IDW	investigation-derived waste
KDHE	Kansas Department of Health and Environment

<u>Abbreviation</u>	<u>Term/Phrase/Name</u>
LEL	lower explosive limit
LIF	Laser Induced Fluorescence
LNAPL	Light Non-Aqueous Phase Liquids
MSL	mean sea level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NAVD 88	North American Vertical Datum 88
O ₂	oxygen
OD	outside diameter
ORP	oxidation-reduction potential
PACE	PACE Analytical Services, Inc. of Lenexa, Kansas
PAH	Polynuclear aromatic hydrocarbon
PG	Professional Geologist
PID	photoionization detector
PVC	polyvinyl chloride
QC	quality control
RAZEK	RAZEK Environmental, LLC of Louisburg, Kansas
RCRA	Resource Conservation and Recovery Act
RE	reference emitter
RPD	relative percent difference
RSK	Risk-Based Standards for Kansas (KDHE screening levels)
SI	Supplemental Investigation

<u>Abbreviation</u>	<u>Term/Phrase/Name</u>
Site	Former Amoco Refinery Facility in Neodesha, Kansas
SVOC	Semivolatile organic compound
TEH	Total Extractable Hydrocarbon
TOC	top of casing
TPH	Total Petroleum Hydrocarbon
1,2-trans-DCE	trans-1,2-Dichloroethene
USCS	Unified Soils Classification System
USEPA	United States Environmental Protection Agency
UV	ultraviolet
UVOST®	UltraViolet Optical Screening Tool
VOCs	volatile organic compounds
WP	Work Plan
WWC-5	KDHE Water Well Completion Form
WWC-5P	KDHE Water Well Plugging Form

1.0 INTRODUCTION

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell), on behalf of the Kansas Department of Health and Environment (KDHE), presents the following Supplemental Investigation (SI) report for the Former Amoco Refinery Facility in Neodesha, Kansas (Site). The investigation activities performed were completed in accordance with the KDHE approved *Supplemental Investigation Work Plan* (WP) prepared by AECOM Technology Corporation (AECOM) dated March 21, 2013 (AECOM, 2013) and Burns & McDonnell's prepared *Proposal for Supplemental Investigation Activities* dated June 6, 2014 (Burns & McDonnell, 2014).

1.1 Rationale

Previous environmental assessments completed by BP have documented groundwater contamination caused by oil byproducts released beneath the Site (associated with the former refinery) and migrating through the subsurface to off-Site areas east of the former refinery property. Based on the results of previous environmental assessments, additional sampling was agreed upon by BP and KDHE to focus on filling the following data gaps:

- Subsurface soil conditions
- Presence of Light Non-Aqueous Phase Liquids (LNAPL)
- Groundwater quality within the former refinery property
- Groundwater quality at off-Site areas

1.2 Scope of Work

In order to fill these data gaps, this investigation was performed in three parts to include:

1. Subsurface soil investigation
2. Installation of groundwater monitoring wells
3. Groundwater sampling

The subsurface soil investigation was conducted using cone penetrometer testing (CPT) methods combined with an in-line laser induced fluorescence (LIF) tool for evaluating the presence of LNAPL and its potential migration pathways in the subsurface. The CPT/LIF borings were advanced to the bedrock surface (refusal).

Following completion of the CPT/LIF soil investigation, CPT/LIF soil confirmation borings and well installation activities were performed. In the vicinity of select CPT/LIF boring locations, direct-push borings were advanced to collect continuous soil samples for comparative logging purposes.

Groundwater monitoring wells were installed using hollow-stem auger (HSA) drilling techniques. Prior to advancing the HSA borings, continuous soil samples were collected using direct-push techniques for logging purposes. Limited soil samples were collected using direct-push methods from select monitoring well locations for laboratory analysis. Monitoring well borings using both direct-push and HSA techniques were advanced to the bedrock surface (refusal). Newly installed monitoring wells were then developed using standard surge/pumping techniques.

In addition to the installation and completion of new groundwater monitoring wells, existing Monitoring Well MW-40 was abandoned. Monitoring Well MW-40 was screened within the bedrock; however, the filter pack extended two feet into the overburden allowing groundwater from the overburden to come into contact with groundwater from the bedrock.

Following well development activities, groundwater samples were collected from the newly installed monitoring wells for laboratory analysis.

Field activities associated with this SI included the following:

- Advanced 60 CPT/LIF soil borings
- Advanced eight (8) direct-push soil confirmation borings for CPT/LIF logging comparison purposes
- Collected soil samples for laboratory analysis at five (5) monitoring well locations
- Drilled, installed, constructed, and developed 30 groundwater monitoring wells
- Abandoned existing Monitoring Well MW-40
- Collected groundwater samples from the 30 newly installed groundwater monitoring wells
- Surveyed of CPT/LIF soil borings and newly installed groundwater monitoring wells
- Managed investigation-derived waste (IDW)

This report provides a summary of the field activities and results obtained during the SI at the Site. Follow up groundwater sampling, reporting, and detailed impact assessment/interpretation is outside the scope of this report.

1.3 Site Location

The Site is located in Neodesha, Kansas (City), which is in southeastern Kansas, approximately 100 miles east of Wichita, Kansas, and approximately 125 miles south of Topeka, Kansas. The Site is situated in Wilson County, Kansas, and is located in portions of the SE ¼ of Section 18, E ¼ of Section 19, and NE ¼ of Section 30, Township 30 South, Range 16 East. An aerial photographic and topographic Site map is provided in Figures 1-1 and 1-2, respectively.

1.4 Land Use Areas

Land use area information summarized herein was taken from the AECOM WP. Based on previous refinery operations, the former refinery property is subdivided into the following five separate areas:

1. North Site
2. Former Tank Site
3. Industrial Site
4. Former Oil Separator Pond Site
5. South Site (former Settling Basins)

The northern portion of the former refinery property is identified as the North Site and Former Tank Site. The North Site area is bound to the south by Granby Avenue, to the west by Ottawa Road, to the east by commercial properties and 12th Street, and to the north by undeveloped land. With the exception of the southwest corner previously used as a product storage area, the North Site was primarily a non-operational area or not a part of the refinery. A majority of the North Site is currently owned by the City with a few areas privately owned for industrial/commercial use. The Former Tank Site area is located directly south of the North Site area and is bound to the north by Granby Avenue, to the south by Tank Avenue, to the west by 14th Street, and to the east by 12th Street. A majority of the Former Tank Site area was previously used for refined product storage and some crude storage. The Former Tank Site area currently consists of undeveloped land with the southern half owned by the City and northern half owned by Williams Pipeline (per AECOM WP). As an interim corrective measure, an active remediation treatment system comprised of a petroleum recovery trench and several dual phase extraction wells is currently operating along the eastern edge of this area.

The central portion of the former refinery property is currently an industrial park (Twin Rivers Industrial Park). The industrial park is bound to the east by both railroad tracks and 11th Street, to the north by Tank Road, and to the west and south by railroad tracks. The entire industrial park area was previously used by the former refinery for processing areas, product storage, water treatment areas, cooling towers,

maintenance facilities, material storage, and non-operational areas. Currently much of the industrial park is privately owned with some property owned by the City.

The Former Separator Pond Area was located to the west of the current industrial park. The pond was downstream of an oil/water separator box and acted as a secondary oil/water separator basin. This area is currently undeveloped and is overgrown with vegetation. Storm water may flow through the former pond into a small meandering drainage ditch which discharges to the Fall River.

The Former South Settling Basins for the former refinery were located to the south of the current industrial park.

The former refinery use areas and current property ownership are provided in Figures 1-3 and 1-4, respectively.

1.5 Work Plan Modifications

Access agreements onto private property could not be obtained from Neodesha Plastics and New Beginnings. This required relocating planned CPT/LIF Borings LIF-27, LIF-33, LIF-34, and LIF-35 by moving them onto adjacent properties with approved property access agreements. These CPT/LIF location changes are illustrated on Figure 2-1.

The location of Monitoring Well MW-172 was changed based on access issues. The planned location for Monitoring Well MW-172 was on the west side of 14th Street, but due to a deep ditch and private property (without an access agreement); Monitoring Well MW-172 was moved to the east side of 14th Street within the City right of way (with approved access agreement). This location change is illustrated on Figure 2-2.

The location of Monitoring Well MW-171 was adjusted based on results of the LIF investigation and moved in the vicinity of Boring LIF-58 (see Figure 2-2).

* * * * *

2.0 FIELD ACTIVITIES AND RESULTS

The following sections provide a description of the field activities conducted as part of the SI activities from September 22 through November 7, 2014. Field activities included CPT/LIF soil borings, installation and construction of groundwater monitoring wells, well development, abandonment of existing Monitoring Well MW-40, and groundwater sampling of newly installed wells. Additional field activities included surveying, fluid level measurements, and management of IDW. Field activities were recorded in the field logbook, photocopies of which are provided in Appendix A. Photographs of investigation field activities are provided in Appendix B.

The schedule of field activities completed during this investigation was as follows:

- CPT/LIF borings – September 22 through October 2, 2014
- Direct-push confirmation soil borings – October 13 and 14, 2014
- Monitoring well installation – October 14 through 24, 2014
- Well development – October 29 through 31, 2014
- Groundwater sampling – November 3 through 7, 2014
- Surveying – November 2014

All field work was performed in general accordance with procedures outlined in the AECOM WP (2013) and Burns and McDonnell's *Proposal for Supplemental Investigation Activities* (2014), which were both approved by KDHE.

2.1 Utility Clearance and Access

Prior to the initiation of any fieldwork involving subsurface activities, a utility clearance was obtained. Utilities were located with the aid of Kansas One-Call, City of Neodesha Public Works personnel, and ASAP Utility Locating of Topeka, Kansas, prior to commencing intrusive activities.

Prior to advancing CPT/LIF soil borings and drilling groundwater monitoring wells, approved property access agreements were obtained by KDHE (where necessary) from City of Neodesha, Williams Pipeline, GBW Railcar Services, LLC. (formerly WATCO; Millennium Rail), Cobalt Boats, Airosol Company, Inc., Quality Machining, and M-E-C Company. Access agreements could not be obtained from Neodesha Plastics and New Beginnings; this required relocating planned CPT/LIF Borings LIF-27, LIF-33, LIF-34, and LIF-35 by moving them onto adjacent properties with approved property access agreements.

2.2 LIF and CPT Soil Boring Activities

Burns and McDonnell subcontracted Geotechnology, Inc. to perform CPT services and Matrix Environmental, LLC to conduct LIF activities (in line with CPT tooling). CPT and LIF field activities were performed September 22 through October 2, 2014.

The CPT technology provides an in-situ method of assessing the subsurface stratigraphy. During this investigation a specialized track-mounted CPT rig (remote operated) was used to push a 1.41-inch diameter cone through the subsurface at a rate of 1 to 2 centimeters per second (cm/sec). The CPT tool was equipped with electronic devices that continuously measure cone tip resistance, sleeve/skin (local) friction, and pore water pressure with depth to determine geotechnical properties of soils and provide an interpretation of subsurface stratigraphy. These recording devices produced a computerized log of cone tip resistance, sleeve friction, friction ratio, pore pressure, pore pressure ratio (differential pore pressure), and soil behavior type. The basis of the soil behavior type relied upon an interpretive software program that evaluated all measured properties collected from the CPT tool and classified the soil horizon based on its behavior (lithologic interpretation).

In addition to the in-situ soil data logging obtained using CPT, LIF data was also collected during the investigation in conjunction with the CPT tool. LIF uses pulsed ultraviolet (UV) light from a laser to stimulate the fluorescence of aromatic hydrocarbons found in LNAPL. The LIF instrument used to measure and record wavelengths and relative intensity of the LNAPL fluorescence in soil during this investigation was the UltraViolet Optical Screening Tool (UVOST®) developed by Dakota Technologies. Because different aromatic hydrocarbons fluoresce at characteristic wavelengths, the composition of the LNAPL can be estimated by measuring the wavelength and relative intensity over which LNAPL fluoresces in soil, making it possible to identify LNAPL type (e.g., gasoline, diesel fuel, crude oils, and coal tar). Low molecular weight aromatic hydrocarbons such as benzene fluoresce at shorter wavelengths whereas high molecular weight aromatic hydrocarbons fluoresce at longer wavelengths. Since the fluorescence intensity of LNAPL measured by LIF is proportional to the LNAPL concentration in soil, it is also possible to calibrate LIF fluorescence measurements to in-situ LNAPL soil saturations. Prior to deployment, a reference emitter (a standard proprietary NAPL mixture called the reference emitter [RE]) is placed on the sapphire window in the side of the probe to determine the qualitative and semi-qualitative properties of the laser system. This is to assure that the RE response has the correct shape and intensity and that the UVOST system is ready to log. The calibration of the system is not to a concentration value, but to a known fluorescence signature. It is important to note, that due to the equipment configuration of the CPT and LIF tooling during this investigation, there was a 2.70 feet vertical offset from CPT data to

LIF data. This offset was measured from the tip of the cone to the center of the LIF sapphire window. For this reason, LIF data logging was limited to 2.70 feet above refusal.

2.3 LIF and CPT Results

A total of 60 CPT/LIF boring locations were completed during this investigation and identified as LIF-1 through LIF-60. The locations of these CPT/LIF borings are presented in Figure 2-1. With the exception of Boring LIF-12, refusal was encountered at all CPT/LIF boring locations ranging from 10.52 feet below ground surface (bgs) [Boring LIF-27] to 32.03 feet bgs (Boring LIF-20). During this investigation, positive LIF signals from the downhole UVOST® system (indicating the presence of hydrocarbons in the subsurface) were detected at 51 of 60 CPT/LIF boring locations. Based on the results of the UVOST® system logging, no significant LIF signals were detected at Borings LIF-12, LIF-18, LIF-19, LIF-21, LIF-22, LIF-23, LIF-56, LIF-57, and LIF-59. The highest LIF signal detected during this investigation was at Boring LIF-23 with 668.1% RE. The results of the LIF and CPT are summarized in Table 2-1. The LIF and CTP logs are provided in Appendix C and D, respectively.

2.4 Direct-Push and HSA Drilling Activities

Burns & McDonnell subcontracted RAZEK Environmental, LLC (RAZEK) of Louisburg, Kansas for both direct-push and HSA drilling activities to include borehole advancement, continuous soil sampling, well installation and construction, and well surface completions. RAZEK personnel conducted all direct-push and HSA drilling activities during this investigation using a GeoProbe® 6620 DT track-mounted rig. Drilling and well installation activities were performed from October 14 through 24, 2014.

Continuous soil sampling was performed at borehole locations using direct-push techniques for geologic logging purposes (see Section 2.6). Direct-push borings were advanced using a 5-foot Marco-Core® soil sampler (2.25-inch outside diameter [OD]) to sample continuously from ground surface to the surface of bedrock (refusal). After encountering refusal, 8.25-inch OD HSAs were advanced downhole to refusal, to allow for well installation and construction activities. Soil cuttings generated during continuous soil sampling and HSA drilling were managed as described in Section 2.16.

2.5 Direct-Push and HSA Drilling Results

A total of eight (8) direct-push soil confirmation borings were completed in the immediate vicinity of CPT/LIF Borings LIF-3, LIF-11, LIF-19, LIF-30, LIF-44, LIF-47, LIF-54, and LIF-56 for comparative logging purposes. The locations of these soil confirmation borings are illustrated on Figure 2-1. Refusal was encountered at all soil confirmation boring locations with depths ranging from 18.0 (Boring LIF-56) to 28.5 feet bgs (Borings LIF-19 and LIF-44).

A total of 30 direct-push/HSA borings were completed for both geologic logging and groundwater monitoring well installation and construction activities. These 30 monitoring wells included MW-144 through MW-173 with locations illustrated on Figure 2-2. Refusal was encountered at all monitoring well boring locations with depths ranging from 10.5 feet bgs (Monitoring Well MW-171) to 30.0 feet bgs (Monitoring Well MW-149). A summary of drilling details is provided in Table 2-2.

2.6 Field Logging

All soil samples were visually inspected and described by a Burns & McDonnell professional geologist (PG), licensed in Kansas. The Burns & McDonnell PG recorded the description of the subsurface materials on boring logs per the criteria described in the WP (AECOM, 2013). All subsurface materials were described following the Unified Soil Classification System (USCS) and recorded on the field drilling logs, copies of which are provided in Appendix E. Recovered soil samples were screened in the field for volatile organic compounds (VOCs) using a photoionization detector (PID), equipped with a 10.6 electron-volt lamp, with results provided on the field drilling logs (see Appendix E). During drilling activities, air quality near the borehole was monitored using a five-gas meter that recorded percent lower explosive limit (LEL), oxygen (O₂), hydrogen sulfide (H₂S), carbon monoxide (CO), and VOCs. All air monitoring results are provided on the field drilling logs (see Appendix E). All soil cuttings were managed as discussed in Section 2.16 of this report.

Based on the recovered subsurface materials encountered during this SI, in general, the subsurface materials at the Site are generally composed of the following (from top to bottom):

- Fill (at localized areas) – approximately 0.25 feet to 5.5 feet thick
- Clay to Silty/Sandy Clay – approximately 8.0 feet to 29.0 feet thick
- Sandy Gravel to Sand/Silt – approximately 0.5 feet to 16.5 feet thick
- Refusal was interpreted to be composed of shale (based on limited recovery in the field) encountered at depths ranging from 10.5 to 30 feet bgs.

2.7 Soil Sampling and Laboratory Analysis

Limited subsurface soil sampling was performed at select newly installed monitoring well locations during this SI. Soil samples for laboratory analysis were collected on October 17, 2014 from five monitoring well locations (MW-148, MW-152, MW-166, MW-170, and MW-171) using direct-push sampling techniques. These subsurface soil sampling locations are illustrated on Figure 2-2. Two soil samples were planned from each of the five monitoring well borings at depths of 0 to 5 and 5 to 10 feet bgs; however, due to surface material consisting of fill at two of five monitoring well locations, the

planned soil sample depth intervals were increased in order to collect native overburden materials for laboratory analysis. Samples were delivered to PACE Analytical Services, Inc. (PACE) of Lenexa, Kansas, for laboratory analysis. Analyses of soil samples included the following:

- VOCs using United States Environmental Protection Agency (USEPA) Method 8260, collected via SW-846 Method 5035 (USEPA, 1996).
- Semivolatile organic compounds (SVOCs) using USEPA Method 8270.
- Polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270C by Simultaneous Ion Monitoring (SIM)
- Total Petroleum Hydrocarbons (TPH) using Iowa Methods OA-1 and OA-2
- Resource Conservation and Recovery Act (RCRA) metals using USEPA Method 6010/7471
- pH using Method 150.1

It should be noted that PAHs are a subset of SVOCs and can be analyzed using USEPA Method 8270. However, in order to obtain lower detection limits for PAH constituents during this investigation, PAHs were analyzed using USEPA 8270C SIM method. Therefore, PAH and SVOC results were reported separately by the laboratory and are presented as such in this report.

For quality control (QC) purposes, one duplicate soil sample and one equipment rinsate sample were collected for laboratory analysis (same constituents listed above for soil). Trip blanks accompanied each sample cooler for VOC analysis. The duplicate soil sample (identified as DUP-1) was collected as a split from Soil Sample MW-171 SS2 (5-10 feet bgs). The equipment rinsate sample was collected from the direct-push cutting/sampling shoe, following decontamination, for laboratory analysis (same constituents listed above for soil).

2.8 Soil Sampling Results

For the purposes of evaluating soil sample results relative to screening levels, soil analytical results were reviewed and compared to specific KDHE Tier 2 Risk-Based Standards for Kansas (RSK). A summary of the soil sampling results and copies of the laboratory reports are provided in Table 2-3 and Appendix F, respectively.

2.8.1 TPH OA-1 (GRO)

Soil Sample MW-171 SS2 (5-10 feet bgs) and its duplicate (Soil Sample DUP-1) were the only samples with TPH OA-1 (for gasoline range organics [GRO]) detections at concentrations of 4.1 and 14.4 milligrams per kilogram (mg/kg), respectively. These concentrations are below the KDHE Tier 2 RSK

screening levels of 79.3 mg/kg for the soil to groundwater residential pathway and 220 mg/kg for the soil residential pathway.

2.8.2 TPH OA-2 (DRO)

Total Extractable Hydrocarbon (TEH) as Diesel No. 2 was the only TPH OA-2 (for diesel range organics [DRO]) constituent detected in the soil samples. TEH as Diesel No. 2 was detected in each soil sample with the exception of the two samples collected from Boring MW-152. Concentrations of TEH as Diesel No. 2 ranged from 21.7 mg/kg (Soil Sample MW-148 SS2 [5-10 feet bgs]) to 197 mg/kg (Soil Sample MW-170 SS1 [6-6.5 feet bgs] and SS2 [12-14 feet bgs]). All detected concentrations were below the KDHE Tier 2 RSK soil screening levels for both soil and soil to groundwater pathways in both residential and non-residential scenarios.

2.8.3 VOCs

Acetone and benzene were the only VOC constituents detected in the soil samples. Acetone is a common laboratory contaminant and was detected in four (4) samples. Benzene was only detected in the duplicate (DUP-1) of Soil Sample MW-171 SS2 (5-10 feet bgs) at a concentration of 6.9 µg/kg. Acetone was also detected in boring MW-170 at 37.2 µg/kg. These VOC concentrations were below the KDHE Tier 2 RSK soil screening levels for both soil and soil to groundwater pathways in both residential and non-residential scenarios.

2.8.4 SVOCs

SVOCs were not detected in any of the soil samples analyzed.

2.8.5 PAHs

As mentioned previously, PAHs are a subset of SVOCs. At least one PAH constituent was detected in each soil sample collected during the SI. PAH concentrations did not exceed the KDHE Tier 2 RSK soil screening levels for both soil and soil to groundwater pathways in both residential and non-residential scenarios.

2.8.6 Metals

Of the eight (8) metals analyzed, only arsenic, barium, chromium, and lead were detected in all analyzed soil samples. Cadmium was only detected in Soil Sample MW-148 SS1 (1.0-1.5 feet bgs) at a concentration of 11.9 mg/kg. With the exception of chromium, metals were not detected above the KDHE Tier 2 RSK screening levels. Chromium was detected at concentrations of 35.2 mg/kg (Soil Sample MW-166 SS2 [12-15 feet bgs]) and 43.5 mg/kg (Soil Sample MW-171 SS2 [5-10 feet bgs]),

exceeding the KDHE Tier 2 RSK soil pathway screening level for a residential scenario (33.6 mg/kg). None of the chromium detections exceeded the KDHE Tier 2 RSK soil pathway screening level of 111 mg/kg for the non-residential scenario.

2.8.7 pH

The pH in soil samples ranged between 5.7 (Soil Sample MW-166 SS2 [12-15 feet bgs]) and 8.2 standard units (Soil Sample MW-148 SS2 [5-10 feet bgs]).

2.8.8 Quality Control

The laboratory analytical results of Soil Sample MW-171 SS2 (5-10 feet bgs) and its duplicate (Soil Sample DUP-1) are summarized in Table 2-3. Table 2-4 summarizes the analyte detections in the original versus duplicate samples and the relative percent difference (RPD) calculations. Differences in analytical results between the original and split duplicate soil samples collected from the same location and depth may be due to the heterogeneity of the subsurface soil at this location. A copy of the laboratory report for soil samples is provided in Appendix F.

The equipment rinsate results indicated VOCs, SVOCs, PAHs, TPH OA-1, TPH OA-2, and metals were not detected. The rinsate sample had a laboratory pH of 6.9 standard units. A copy of the laboratory report for the rinsate sample is provided in Appendix G.

Trip blank results representative of associated soil and rinsate sample coolers were non-detect for VOCs. A copy of the laboratory reports for the soil and rinsate trip blank samples are provided in Appendix F and G, respectively.

2.9 Groundwater Monitoring Well Installation and Completion

Groundwater monitoring well drilling and installation activities began October 14, 2014, and concluded on October 24, 2014 with the well surface completions. A total of 30 new groundwater monitoring wells (named MW-144 through MW-173) were installed on both former refinery property and at off-Site locations.

On-Site Areas

- North Site – one Monitoring Well (MW-148)
- Former Tank Site – one Monitoring Well (MW-172)
- Former Processing and Storage Site (Industrial Park) – eleven Monitoring Wells (MW-160, MW-161, MW-164 through MW-171, and MW-173)

- South Former Settling Basins – four Monitoring Wells (MW-144 through MW-147)

Off-Site Areas

- Residential Areas – eleven Monitoring Wells (MW-149 through MW-159)
- Industrial Area – two Monitoring Wells (MW-162 and MW-163)

A map showing the newly installed monitoring well locations, along with the expanded Site-wide groundwater monitoring network, is included as Figure 2-2.

Monitoring wells were constructed of 2-inch inside diameter (ID), Schedule 40 polyvinyl chloride (PVC), flush-threaded riser pipe and between 8.90 feet to 22.96 feet of 0.020-inch, machine slotted screen. The well screen, riser pipe and end cap were assembled at the ground surface and lowered into the borehole. Following installation of the well screen/casing, filter pack sand was placed into the annular space between the well casing and the borehole wall. The filter pack material consisted of clean 10/20 silica sand. A weighted tape was used to monitor the elevation of the filter pack as it was installed and to detect possible sand bridging. The sand filter pack extended from the bottom of the borehole to a point approximately 1- to 3-feet above the top of the well screen. A bentonite seal, ranging between approximately 3-feet to 11-feet thick, was placed above the filter pack in the annular space and consisted of 3/8-inch bentonite chips which were hydrated in 2-foot lifts. The remaining annulus above the bentonite seal was filled with more 3/8-inch bentonite chips to within approximately 2- to 3-feet below bgs. Monitoring well construction details for the newly installed monitoring wells are summarized in Table 2-2. The well construction diagrams are provided in Appendix H.

Based on location, monitoring wells installed were completed as either above-ground stick-up or flush-mount surface completions. Monitoring wells with above-ground stick-ups were completed with 3-foot steel protective casing (with lockable lid) covering the PVC well casing. Monitoring wells with flush-mounts were completed with a well vault containing a bolted cover to allow access to the well. At all locations, a concrete pad was poured for surface completion. A locking, expandable, water-tight plug was then installed in the top of the well casing.

KDHE Water Well Completion Records (Form WWC-5) were completed by the driller and submitted to the KDHE Bureau of Water Geology Section. Copies of the WWC-5 forms are provided in Appendix I. Field photographs of typical drilling and well installation and completion activities are in Appendix B.

2.10 Well Development

Newly installed groundwater monitoring wells were developed using surging and pumping techniques with a 12-volt submersible pump. Well development activities were performed from October 29 through 31, 2014, by Burns & McDonnell personnel.

The submersible pump was used for surging and pumping to remove approximately 5 saturated well borehole volumes of groundwater for well development. Based on the measured depth to water, total depth of the monitoring well, diameter of the borehole and monitoring well casing, thickness of saturated filter pack, and assuming a porosity of 30 percent (%) for the filter pack, the volume of water in the well/borehole was calculated using the following equations:

$$5 \text{ Bail Volume (gallons)} = 5 \times [(0.163 \times \text{Water Column}(ft)) \\ + (0.784 \times \text{Saturated filter pack Thickness}(ft))]$$

* 2-inch ID well; 8.25-inch borehole diameter; and assuming 30% filter pack porosity.

Water quality parameters, including pH, temperature, and specific conductivity were measured periodically during well development and recorded on a Well Development Form (see Appendix J) and in the field logbook (Appendix A), along with the volume of water removed. The pH, temperature, and conductivity meters were calibrated prior to well development activities using manufacturer supplied standards. The minimum five saturated well borehole volumes could not be removed from all newly installed groundwater monitoring wells due to some wells being pumped dry. A summary of well development is provided in Table 2-5. All development water was managed as discussed in Section 2.16.

2.11 Groundwater Level Measurements

Water levels were measured at the newly installed groundwater monitoring wells throughout the investigation. A summary of the groundwater elevations from the newly installed monitoring wells is provided in Table 2-6. The depth to groundwater at the Site ranged from 3.38 feet from top of casing (TOC) at Monitoring Well MW-169 to 25.25 feet from TOC at Monitoring Well 149. The groundwater elevations at the Site ranged from 822.97 feet above mean sea level (amsl) at Monitoring Well MW-148 to 781.68 feet amsl at Monitoring Well MW-145 in the overburden aquifer (above the bedrock surface [refusal]). Based on previous groundwater monitoring events from the existing network of wells, the approximate groundwater flow direction beneath the Site is generally south and east in the overburden aquifer. A summary of groundwater elevations are illustrated on Figure 2-3.

2.12 Product Level Measurements

During water level gauging prior to well development activities, five newly installed monitoring wells (MW-152, MW-160, MW-161, MW-163, and MW-164) were observed to have measurable LNAPL thickness as indicated by an oil/water interface probe. An additional five newly installed monitoring wells (MW-149, MW-156, MW-165, MW-167, and MW-169) were identified as having a sheen based on visual observation of LNAPL on the interface probe, but the interface probe did not detect for measurable LNAPL during soundings.

Following well development activities and prior to groundwater sampling activities, none of the newly installed monitoring wells had detectable LNAPL as indicated by the interface probe on November 3, 2014; however, four newly installed monitoring wells (MW-161, MW-163, MW-164, and MW-169) were identified as having a sheen based on visual presence of LNAPL on the interface probe on November 3, 2014, but the probe did not sound for detectable LNAPL. During groundwater sampling activities conducted from November 3 through November 7, 2014, petroleum sheen was observed on the sampling bailer and rope at Monitoring Wells MW-156, MW-161, MW-163, MW-164, and MW-169.

2.13 Groundwater Sampling and Laboratory Analysis

Following well development, groundwater samples were collected from the newly installed monitoring wells by Burns & McDonnell personnel from November 3 through 7, 2014. Prior to sample collection, newly installed monitoring wells were purged using a peristaltic pump until a total of three saturated well casing volumes of groundwater were removed and field parameters stabilized. Field stabilization parameters recorded during purging and sampling were as follows:

- pH (+/- 0.2 standard units)
- Dissolved oxygen (DO) [+/- 10%]
- Oxidation-reduction potential (ORP) [+/- 20 millivolts]
- Conductivity (+/- 3%)
- Turbidity (+/- 10 %)

After purging was complete, groundwater samples were collected from the newly installed monitoring wells and shipped to PACE for laboratory analysis of VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), PAHs (USEPA Method 8270C SIM), TPH (Iowa Methods OA-1 and OA-2), and RCRA metals (total and dissolved) [USEPA Method 6010/7470A].

Groundwater was collected directly from the peristaltic pump tubing to fill sample containers for SVOCs, PAHs, TPH (OA-2), and 8 RCRA metals analysis. Samples for 8 RCRA metals were collected for analysis of both total and dissolved metals. Groundwater samples for dissolved metals analysis were field filtered using a 0.45 micron filter prior to placement into the sample container. Groundwater samples collected in containers for VOCs and TPH (OA-1) analysis were filled by removing the peristaltic pump tubing from the well and deploying a polyethylene bailer tied with a rope to collect samples.

Similar to the soil laboratory analysis, groundwater samples collected for PAHs were analyzed using USEPA Method 8270C SIM in order to obtain lower detection limits during this investigation; therefore, PAH and SVOC results were reported separately by the laboratory using USEPA Method 8270C SIM and USEPA Method 8270, respectively; and are presented as such in this report.

For quality control (QC) purposes, three duplicate groundwater samples were collected at Monitoring Wells MW-155 (DUP-1), MW-145 (DUP-2), and MW-161 (DUP-3); two MS/MSDs were sampled at Monitoring Wells MW-148 and MW-152; and three field blanks were obtained from MW-171 (Field Blank-01), MW-152 (Field Blank-02), MW-172 (Field Blank -03). The MS/MSD collected at Monitoring Well MW-152 was not analyzed by the laboratory due to insufficient sample volume, so instead the laboratory analyzed this sample as a duplicate identified as Groundwater Sample MW-152. Groundwater split samples were collected by KDHE on November 11, 2014 at Monitoring Wells MW-154 and MW-155 for VOC analysis (USEPA Method 8260).

2.14 Groundwater Sampling Results

For the purposes of evaluating groundwater sample results relative to screening levels, groundwater analytical results were reviewed and compared to specific KDHE Tier 2 RSK. A summary of the groundwater analytical results compared to the KDHE Tier 2 RSK values (both residential and non-residential) is provided in Table 2-7. Groundwater exceedances are summarized in Table 2-8. Copies of groundwater sampling forms are provided in Appendix K and copies of the groundwater laboratory reports are provided in Appendix L.

2.14.1 Metals

Three (3) of the eight (8) RCRA metals (arsenic, barium, and lead) were detected (at least once) in groundwater samples above their specific KDHE Tier 2 RSK screening level. KDHE RSK exceedances of arsenic were detected in both total and dissolved phase samples. Barium and lead concentrations exceeding the KDHE RSK values were detected in dissolved and total metals analyses, respectively.

Dissolved metal exceedances are illustrated on Figure 2-4. Both total and dissolved metal results and exceedances are summarized on Tables 2-7 and 2-8.

Arsenic in groundwater was detected in approximately half of the groundwater samples at concentrations above the 10 micrograms per liter ($\mu\text{g/L}$) KDHE Tier 2 groundwater screening levels for both residential and non-residential pathways. The total arsenic detections ranged from 10.4 $\mu\text{g/L}$ (Groundwater Sample MW-147) to 71.2 $\mu\text{g/L}$ (Groundwater Sample MW-164). The dissolved arsenic detections ranged from 11.3 $\mu\text{g/L}$ (Groundwater Sample MW-147) to 70.5 $\mu\text{g/L}$ (Groundwater Sample MW-164). Dissolved arsenic concentrations were detected at higher concentrations than total arsenic for representative groundwater samples collected from Monitoring Wells MW-147, MW-150, MW-158, MW-160, MW-161, MW-163, and MW-168. The laboratory qualified these dissolved arsenic results with a “D9” flag and results were within laboratory control limits. Below is a comparative summary between those groundwater samples with total arsenic concentrations less than dissolved arsenic concentrations.

Well ID	Total Arsenic Concentration ($\mu\text{g/L}$)	Dissolved Arsenic Concentration ($\mu\text{g/L}$)
MW-147	10.4	11.3
MW-150	10.5	14.1
MW-158	24.2	27.0
MW-160	34.1	36.0
MW-161	36.1	42.5
MW-163	19.7	25.7
MW-168	22.5	26.4

Note: Above listed arsenic concentrations all exceeded the KDHE Tier 2 RSK levels for both residential and non-residential pathways (highlighted orange).

Groundwater samples collected from each newly installed monitoring well exhibited detections of barium, with only one exceedance in Groundwater Sample MW-163 (2,040 $\mu\text{g/L}$) above the KDHE Tier 2 groundwater screening level of 2,000 $\mu\text{g/L}$ for both residential and non-residential pathways. The total barium detections ranged from 29.4 $\mu\text{g/L}$ (MW-162) to 2,000 $\mu\text{g/L}$ (MW-163), while the dissolved concentrations ranged from 28.0 $\mu\text{g/L}$ (MW-162) to 2,040 $\mu\text{g/L}$ (MW-163). Dissolved barium concentrations were detected at higher concentrations than total barium for representative groundwater samples collected from Monitoring Wells MW-152 (duplicate), MW-153, MW-157, MW-160, MW-161 (and DUP-3), MW-163, MW-165, and MW-173. The laboratory qualified these dissolved barium results with a “D9” flag and results were within laboratory control limits. Below is a comparative summary

between those groundwater samples with total barium concentrations less than dissolved arsenic concentrations.

Well ID	Total Barium Concentration (µg/L)	Dissolved Barium Concentration (µg/L)
MW-152 duplicate	500	551
MW-153	83	100
MW-157	194	195
MW-160	766	772
MW-161	673	688
DUP-3	678	690
MW-163	2,000	2,040
MW-165	206	212
MW-173	584	602

Note: Highlighted barium concentrations listed above exceeded the KDHE Tier 2 RSK levels for both residential and non-residential pathways (highlighted orange).

Total lead was only detected in groundwater samples collected from Monitoring Wells MW-166 (22.4 µg/L) and MW-167 (10.9 µg/L), with Sample MW-166 exceeding the 15 µg/L KDHE RSK value for both residential and non-residential pathways. Dissolved lead was not detected in the groundwater samples collected from these wells.

2.14.2 TPH OA-1 (GRO)

Groundwater samples collected from 14 monitoring wells had concentrations of TPH OA-1 (GRO) above the 0.5 mg/L KDHE RSK value for both residential and non-residential pathways. The TPH OA-1 concentrations ranged from 0.83 mg/L (Groundwater Sample MW-173) to 92.9 mg/L (Groundwater Sample MW-152). TPH GRO exceedances are shown on Figure 2-5 and summarized on Tables 2-7 and 2-8.

2.14.3 TPH OA-2 (DRO)

Of the TPH DRO parameters analyzed, both diesel fuel and TEH as Diesel No. 2 were the only constituents detected in groundwater samples during this investigation. Diesel fuel was detected in Groundwater Sample MW-171 (2.0 mg/L; with H2 lab qualifier for extraction/preparation outside USEPA holding time) and Groundwater Sample MW-151 (1.8 mg/L; H2 lab qualifier) with concentrations exceeding both KDHE RSK values of 0.5 mg/L (residential pathway) and 0.72 mg/L (non-residential pathway). Most detections of TEH as Diesel No. 2 exceeded the KDHE RSK values of 0.5 mg/L (residential pathway) and 0.75 mg/L (non-residential pathway) with concentrations ranging from

0.44 mg/L (Groundwater Samples MW-146 and MW-147) to 7.8 mg/L (Groundwater Sample MW-161). All groundwater samples were non-detect (not detected at the laboratory reporting limit) for fuel oil, jet fuel, kerosene, mineral spirits, and motor oil. TPH DRO exceedances are illustrated on Figure 2-5 and summarized on Tables 2-7 and 2-8.

2.14.4 VOCs

During this investigation, VOCs were detected (at least once) in groundwater above specified residential KDHE RSK values in 22 of 36 groundwater samples from 17 of 30 monitoring wells and included the following parameter exceedances: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, isopropylbenzene (cumene), methylene chloride, n-propylbenzene, tert-butyl alcohol, tetrachloroethene, trichloroethene, vinyl chloride, and total xylenes. Screening using non-residential KDHE RSK values resulted in VOC detections (at least once) in groundwater that included the same constituent list presented above for residential exceedances, with the exception of isopropylbenzene (cumene) and tert-butyl alcohol. Of the VOC exceedances, benzene was detected in groundwater at the highest frequency during this investigation and ranged from 1.1 µg/L (MW-155) to 8,930 µg/L (MW-151). VOC exceedances in groundwater monitoring wells are generalized below and also illustrated on Figure 2-7A through 2-7C and summarized in Tables 2-7 and 2-8.

VOC Exceedance Parameters	Monitoring Wells with VOC Exceedances																
	MW-144	MW-150	MW-151	MW-152	MW-154	MW-155	MW-156	MW-159	MW-160	MW-161	MW-163	MW-164	MW-165	MW-167	MW-169	MW-171	MW-172
1,2,4-Trimethylbenzene	X			X	X					X					X		X
1,3,5-Trimethylbenzene				X													X
Benzene		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
1,2-DCE/cis-1,2-DCE					X	X											
Ethylbenzene				X													
Isopropylbenzene (Cumene)				X													
Methylene chloride								X		X	X	X					
n-Propylbenzene				X													
tert-Butyl Alcohol											X	X					
Tetrachloroethene					X	X											
Trichloroethene					X	X											
Vinyl chloride					X	X											
Xylene (Total)				X													

VOCs were not detected in groundwater samples collected from Monitoring Wells MW-145, MW-146, MW-147, MW-148, MW-158, MW-162, MW-166, and MW-170.

2.14.5 SVOCs

Only three (3) SVOC parameters were detected during this investigation and included 1,2-dichlorobenzene, pyridine, and phenol. Each individual SVOC constituent was detected in three separate groundwater samples as follows: MW-151 (phenol), MW-154 (1,2-dichlorobenzene), and DUP-3 (duplicate at MW-161, phenol). These SVOCs were not detected above the respective KDHE RSK values for either residential or non-residential scenarios. SVOC results are summarized in Table 2-7.

2.14.6 PAH

PAHs were detected in 28 of 34 groundwater samples collected during this investigation, with detections from 25 of 30 monitoring wells. Select PAH compounds were detected (at least once) in groundwater above specified residential and non-residential KDHE RSK values and included 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, naphthalene. Of the PAH compounds exceeding the KDHE RSK in groundwater, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected at the highest frequency during this investigation. Detections of Benzo(a)anthracene (0.33 ug/L) and Benzo(a)pyrene (0.26 ug/L) at Monitoring Well MW-166 exceeded KDHE Tier 2 RSK levels (see Table 2-7). PAH exceedances are illustrated on Figures 2-6A and 2-6B and summarized in Tables 2-6 and 2-7. Below is a summary of PAH parameters with exceedances and a range of detected concentrations.

PAH Exceedance Parameters	PAH Concentration Range (µg/L)
1-Methylnaphthalene	5.5 (MW-172) – 139 (MW-169)
2-Methylnaphthalene	2.6 (MW-172) – 215 (MW-169)
Benzo(a)anthracene	0.33 (MW-166; one detection)
Benzo(a)pyrene	0.26 (MW-166; one detection)
Naphthalene	0.54 (MW-155) – 490 (MW-152)

2.14.7 pH

The pH in groundwater samples ranged between 6.8 (Groundwater Samples MW-148 and MW-155) and 7.7 standard units (Groundwater Sample MW-166). All pH results were qualified by the laboratory with an “H6” due to analysis initiated outside of the USEPA recommended holding time of 15 minutes.

2.14.8 Quality Control

The laboratory analytical results of the original and duplicate samples are summarized in Table 2-7. The following table summarizes the original groundwater samples and their duplicates.

Original Groundwater Sample	Duplicate Groundwater Sample
MW-152/GW-01	MW-152 duplicate
MW-155	DUP-1
MW-145	DUP-2
MW-161	DUP-3

The laboratory analytical results between the original and duplicate groundwater samples were adequately replicated at each representative monitoring well location.

Additional split duplicate groundwater samples were collected by KDHE at Monitoring Wells MW-154 and MW-155 for VOCs with results summarized in Table 2-7. Analyte detections in the original and duplicate samples including RPD calculations are summarized Table 2-9. Differences in analytical results between the original samples compared to the KDHE split duplicates, collected from the same location and depth, included:

- 1,2-Dichlorobenze, 1,3-Dichlorobenze, and 1,4-Dichlorobenze were analyzed by the laboratory as SVOCs (using USEPA 8270) for the original samples, while these same constituents were analyzed by KDHE as VOCs (using USEPA 8260) for the associated split duplicate samples.
- Total 1,2-Dichloroethene (1,2-DCE) exists as a mixture of two isomers, cis-1,2-DCE or trans-1,2-DCE. The original groundwater samples collected were analyzed by the laboratory for total 1,2-DCE, while KDHE analyzed their representative split duplicate samples for both cis-DCE and trans-1,2-DCE. A comparison of the analytical results for these constituents (1,2-DCE vs. cis- and trans-1,2-DCE) show similar concentrations between the original samples and the associated KDHE duplicates. It appears, the total 1,2-DCE results from the original samples are primarily comprised of cis-1,2-DCE based on the KDHE split sample data exhibiting much higher cis-1,2-DCE concentrations than trans-1,2-DCE.
- The original sample collected from Monitoring Well MW-154 was analyzed by the laboratory for VOCs using higher dilution factors (resulting in higher reporting limits) compared to the representative KDHE split duplicate intended for replication. Monitoring Well MW-154 had dilution factors of 50 causing higher reporting limits. These higher reporting limits resulted in the following VOC constituents being not detected while they were detected in KDHE split samples

at lower reporting limits (dilution factor of 10): 1,3,5-trimethylbenzene, benzene, chlorobenzene, isopropylbenzene (Cumene), tetrachloroethene, and trichloroethene.

The results of Field Blanks-01, -02, and -03 indicated TPH-GRO, VOCs, and SVOCs were not detected. Field Blank-02 had low level detections of TEH as Diesel No. 2 (0.46 mg/L, just above laboratory reporting limit of 0.40 mg/L), four RCRA 8 metals (all metal detections lab qualified as estimated [J-flagged] by laboratory for being below laboratory reporting limit) and, and four PAHs (all detections J-flagged by lab for being below laboratory reporting limit). With the exception of mercury, selenium, and silver, all detected constituents in Field Blank-02 were also detected in associated groundwater samples within the same sample cooler. Mercury, selenium, and silver were not detected in any groundwater samples during this investigation. Field Blanks-01 and -03 had low level detections of a few PAHs (detections just above the laboratory reporting limits). The PAH constituents detected in Field Blanks-01 and -03 were also detected in associated groundwater samples within the same sample cooler. These field blank detections may be a result of either field conditions and/or techniques during sample collection, potential cross-contamination during sample shipment, or carryover during laboratory preparation and/or analysis.

Trip blanks were supplied by the laboratory and sent to the field with the sample containers to evaluate potential cross-contamination during sample shipment of VOCs. VOCs were not detected in 15 of 16 trip blanks. Trip Blank TB-06 had a single VOC detection of tert-Butyl Alcohol at a concentration of 12.7 µg/L. This VOC in Trip Blank TB-06 was also detected in in associated Groundwater Sample MW-169 (within the same sample cooler) at a concentration of 128 µg/L. Copies of the laboratory analytical reports for the groundwater/trip blank samples are provided in Appendix L.

It is important to note, that 13 of 36 groundwater samples were analyzed by the lab for VOCs at elevated reporting limits with DF > 1.0. Because of this, select constituents may be reported as non-detect with a laboratory reporting limit above the representative screening level. Those sample results with reporting limits above KDHE RSK screening levels are identified in Table 2-7. The laboratory was contacted regarding elevated reporting limits and said increased dilutions resulting in elevated reporting limits were performed to avoid blasting their instruments and prevent carryover.

2.15 Surveying

In November 2014, personnel from Garber Surveying of Hutchinson, Kansas, surveyed the locations, ground surface elevations, and TOC elevations for the newly installed monitoring wells. In addition to the newly installed monitoring wells, the CPT/LIF borings were also surveyed for location and ground

surface elevation. Groundwater monitoring wells were surveyed to provide control for the determination of groundwater elevations and flow direction at the Site. The well and CPT/LIF locations were surveyed horizontally to the nearest 0.001 foot and tied into the Kansas State Plane coordinate system (South Zone). The ground surface elevations of the well locations were measured to the nearest 0.01 foot relative to amsl and reported using North American Vertical Datum 88 (NAVD 88). For all new monitoring wells, the top of the riser pipe (or north edge of TOC) was surveyed to the nearest 0.01 foot relative to amsl NAVD 88. A summary of the monitoring well survey data is provided in Appendix M.

2.16 Management of Investigative Derived Waste

Soil cuttings generated during direct-push and HSA drilling activities were containerized in 55-gallon drums and staged at the on-Site groundwater treatment building (1100 N. 12th Street). Soil cuttings were not generated during the CPT/LIF portion of the investigation. Staged soil drums will be managed and disposed by AECOM personnel, on behalf of BP.

Decontamination, development, and purge water were temporarily stored in a truck-mounted polytank and transported to BP's wastewater treatment facility where it was transferred by AECOM personnel for temporary storage and future disposal through the existing groundwater treatment system.

All other IDW generated, including personal protective equipment (PPE), paper towels, empty water bottles, etc., were placed in trash bags and left in an appropriate trash receptacle at the Site.

2.17 Monitoring Well Abandonment

Existing Monitoring Well MW-40, located in the southern portion of the industrial park, was abandoned by RAZEK personnel. Monitoring Well MW-40 was abandoned because it was screened within the bedrock; however, the filter pack extended 2-feet into the overburden (alluvial aquifer) allowing groundwater from the overburden to come into contact with groundwater from the bedrock. Therefore, MW-40 could not exclusively monitor the groundwater in either the bedrock or the overburden.

Monitoring Well MW-40 was abandoned in accordance with procedures described in the AECOM WP by removing three bollards, one steel protective casing, concrete pad, and the upper 5 feet of the PVC well casing (attempts at pulling well casing out were unsuccessful). Bentonite chips were placed inside the well to plug the casing and the ground surface was restored to match the surrounding area. Prior to abandonment, the measured water level and total depth were 12.96 feet below TOC and 32.74 feet below TOC, respectively. A KDHE Water Well Plugging Record (Form WWC-5P) was completed by the driller and submitted to KDHE Bureau of Water Geology Section. A copy of the WWC-5P form along

with the representative drill log and well construction information is provided in Appendix N. Field photographs of Monitoring Well MW-40 both pre- and post-abandonment are provided in Appendix B.

* * * * *

3.0 REFERENCES

AECOM Technology Corporation (AECOM), 2013, *Supplemental Investigation Work Plan*, March 21, 2013.

Burns & McDonnell Engineering Company, Inc., 2014, *Proposal for Supplemental Investigation Activities*, June 6, 2014.

United States Environmental Protection Agency (USEPA), 1996, Method 5035: Closed-System Purge-And-Trap and Extraction for Volatile Organics in Soil and Waste Samples. December, 1996.
<http://www.epa.gov/epaoswer/hazwaste/test/pdfs/5035.pdf>

* * * * *

TABLES

TABLE 2-1
Summary of CPT and LIF Field Results
Former Amoco Refinery
Neodesha, Kansas

Boring ID	Date	CPT TD (ft bgs)	LIF TD (ft bgs)	delta TD (ft)	LIF Signatures (ft bgs)	Maximum LIF Signal		Refusal Encountered
						(%RE)	(ft bgs)	
Field West of Remediation Building								
LIF-1	9/23/2014	21.6	18.9	2.7	16.8 - 18.9	41.3	17.71	YES
LIF-2	9/23/2014	20.03	17.37	2.66	11.1 - 17.37	532.5	13.53	YES
LIF-3	9/23/2014	20.74	18.08	2.66	11.6 - 18.08	659.6	15.91	YES
LIF-4	9/23/2014	--	--	--	-- -- --	659.6	15.91	YES
LIF-4A	9/23/2014	17.52	14.94	2.58	8.4 - 14.94	503.7	12.68	YES
LIF-5	9/23/2014	17.66	15.47	2.19	0.3 - 7.2	9.4	5.26	YES
					11.8 - 14.4			
					15.47			
LIF-6B	9/23/2014	19.35	16.77	2.58	11.1 - 16.77	7.9	16.40	YES
LIF-7	9/23/2014	21.31	18.76	2.55	8.4 - 18.76	612.3	18.12	YES
LIF-8	9/24/2014	23.63	21.06	2.57	12.4 - 21.06	11.5	17.03	YES
LIF-9	9/24/2014	24.23	21.67	2.56	12.6 - 21.67	19.2	16.97	YES
LIF-10	9/24/2014	21.59	19.04	2.55	11.0 - 19.04	353.6	18.62	YES
LIF-11A	9/24/2014	23.66	21.15	2.51	15.8 - 21.15	175.0	17.31	YES
LIF-12	9/24/2014	25.46	22.89	2.57	No Fluorescence	4.6	0.06	NO
LIF-13	9/24/2014	26.51	24.03	2.48	13.4 - 24.03	291.7	21.28	YES
LIF-14	9/24/2014	23.59	21.07	2.52	7.1 - 18.8	271.8	20.56	YES
					18.8 - 21.07			
Field North of Remediation Building								
LIF-15	9/24/2014	20.99	18.44	2.55	16.94 - 18.44	77.5	18.42	YES
LIF-16	9/24/2014	22.8	20.26	2.54	15.9 - 20.26	172.1	19.35	YES
LIF-17	9/24/2014	23.97	21.61	2.36	19.8 - 21.61	36.5	21.59	YES
LIF-18	9/25/2014	26.82	24.3	2.52	No Fluorescence	3.7	0.07	YES
LIF-19	9/25/2014	28.79	26.26	2.53	No Fluorescence	2.0	0.08	YES
LIF-20	9/25/2014	32.03	29.4	2.63	24.00 - 27.20	5.0	0.06	YES
LIF-21	9/25/2014	22.30	19.75	2.55	No Fluorescence	5.7	0.05	YES
LIF-22	9/25/2014	30.70	28.25	2.45	No Fluorescence	5.5	0.04	YES
LIF-23	9/25/2014	31.44	28.96	2.48	No Fluorescence	3.3	0.06	YES
LIF-24	9/25/2014	27.56	25.07	2.49	17.50 - 17.80	127.8	22.06	YES
					21.70 - 25.07			
LIF-25	9/25/2014	21.92	19.42	2.5	7.70 - 19.42	668.1	16.45	YES
LIF-26	9/25/2014	29.04	26.61	2.43	No Fluorescence	6.9	0.04	YES

TABLE 2-1 (continued)
Summary of CPT and LIF Field Results
Former Amoco Refinery
Neodesha, Kansas

Boring ID	Date	CPT TD (ft bgs)	LIF TD (ft bgs)	delta TD (ft)	LIF Signatures (ft bgs)	Maximum LIF Signal		Refusal Encountered
						(%RE)	(ft bgs)	
Industrial Area South of Remediation Building								
LIF-27	9/25/2014	10.52	7.94	2.58	3.00 - 7.94	345.5	7.93	YES
LIF-28	9/26/2014	17.91	15.31	2.6	4.80 - 13.4	239.4	10.98	YES
LIF-29	9/26/2014	17.35	14.77	2.58	4.10 - 14.77	98.1	10.09	YES
LIF-30	9/26/2014	24.81	22.19	2.62	9.50 - 20.3	390.2	16.53	YES
LIF-31	9/26/2014	20.51	17.96	2.55	9.00 - 17.96	26.8	14.10	YES
LIF-32	9/26/2014	15.18	12.62	2.56	4.60 - 12.62	7.4	6.68	YES
LIF-33	9/29/2014	17.15	14.59	2.56	4.30 - 14.59	219	14.42	YES
LIF-34	9/29/2014	22.06	19.48	2.58	8.40 - 19.48	40.7	16.50	YES
LIF-35	9/30/2014	22.59	20.02	2.57	8.00 - 20.02	105.5	15.72	YES
LIF-36	9/30/2014	19.52	16.91	2.61	8.50 - 16.6	25.3	13.68	YES
Residential Area East of Remediation Building								
LIF-37	9/30/2014	23.73	21.13	2.6	8.00 - 13.00	526.5	19.48	YES
					16.40 - 21.13			
LIF-38	9/30/2014	24.22	21.61	2.61	9.80 - 11.40	328.8	20.44	YES
					17.10 - 21.61			
LIF-39	9/30/2014	22.71	20.14	2.57	3.80 - 9.7	368.2	19.54	YES
					15.90 - 20.14			
LIF-40A	10/1/2014	22.93	20.3	2.63	No Fluorescence	6.4	0.39	YES
LIF-41	9/30/2014	28.59	26.03	2.56	22.10 - 26.03	101.1	26.03	YES
LIF-42	9/30/2014	26.05	23.49	2.56	3.50 - 7.30	90.1	23.47	YES
					19.80 - 23.49			
LIF-43	9/30/2014	24.81	22.25	2.56	18.30 - 22.25	81.6	21.78	YES
LIF-44	10/1/2014	28.15	25.53	2.62	22.20 - 24.8	34.6	22.77	YES
LIF-45	10/1/2014	25.67	23.1	2.57	22.9	13.9	23.01	YES
Residential Area East of WATCO								
LIF-46	10/1/2014	25.6	23.03	2.57	16.20 - 21.8	19.7	18.95	YES
LIF-47	10/1/2014	28.07	25.49	2.58	13.90 - 25.49	518.4	22.10	YES
LIF-48	10/1/2014	26.85	24.17	2.68	5.90 - 10.6	71.9	20.89	YES
					16.10 - 24.17			
LIF-49	10/1/2014	19.72	17.13	2.59	12.40 - 15.4	95.0	13.36	YES
LIF-50	10/1/2014	27.53	24.96	2.57	17.90 - 23.00	44.8	20.66	YES
LIF-51	10/1/2014	29.19	26.64	2.55	19.40 - 26.64	242.7	24.05	YES
LIF-52	10/2/2014	24.13	21.56	2.57	16.20 - 21.56	118.5	18.51	YES
LIF-53	10/2/2014	29.61	27.06	2.55	18.50 - 25.70	320.6	24.11	YES
LIF-54	10/2/2014	26.48	23.88	2.60	16.30 - 23.88	388.2	21.63	YES
LIF-55	10/2/2014	28.65	26.11	2.54	21.50 - 26.11	3.9	0.26	YES

TABLE 2-1 (continued)
Summary of CPT and LIF Field Results
Former Amoco Refinery
Neodesha, Kansas

Boring ID	Date	CPT TD (ft bgs)	LIF TD (ft bgs)	delta TD (ft)	LIF Signatures (ft bgs)	Maximum LIF Signal		Refusal Encountered
						(%RE)	(ft bgs)	
Open Field South of Tank and 15th St.								
LIF-56	10/2/2014	17.96	15.36	2.60	No Fluorescence	18.5	0.29	YES
LIF-57	10/2/2014	12.95	10.33	2.62	No Fluorescence	3.1	0.06	YES
LIF-58	10/2/2014	10.73	8.08	2.65	7.40 - 8.08	42.2	8.07	YES
LIF-59	10/2/2014	14.62	11.98	2.64	No Fluorescence	1.5	0.05	YES
LIF-60	10/2/2014	13.84	11.21	2.63	8.20 - 11.21	3.7	8.60	YES

No Fluorescence Detected at Borehole (based on LIF log interpretation by Matrix)

Low LIF Signal Detected (<8% RE) at Borehole

- LIF-4, LIF-6, and LIF-11 locations had data collection errors. Off-sets advanced at LIF-4A, 6B, and 11A to within approximately 2 feet of original boreholes.
- LIF-40 location was an obstructed hole (off-set to LIF-40A)

bgs below ground surface
CPT Cone Penetration Testing
ft feet
GPS global positioning system
LIF Laser Induced Fluorescence
RE reference emitter
TD total depth

TABLE 2-2
Drilling and Well Construction Details
Former Amoco Refinery
Neodesha, Kansas

Well ID	Date Drilled	Date Installed	Well Completion		Boring TD (feet)	Hit Refusal (Yes/No)	Well TD (ft bgs)	Well TD (ft TOC)	End Cap (ft)	Screen			Riser/Casing (ft)	Stick-up (ft)	10/20 Filter Pack Sand		Bentonite Annulus Seal (ft bgs)	Concrete (ft thick)
			Date	Type						Thickness (ft)	Top (ft bgs)	Bottom (ft bgs)			(ft bgs)	Length (ft)		
MW-144	10/21/2014	10/21/2014	10/23/2014	Stick-up	23.0	Yes	23.01	25.55	0.15	17.94	4.92	22.86	7.46	2.54	4.0	19.0	2.0	2
MW-145	10/16/2014	10/16/2014	10/17/2014	Stick-up	28.0	Yes	27.84	30.70	0.15	22.96	4.73	27.69	7.59	2.86	4.0	23.8	2.0	2
MW-146	10/16/2014	10/16/2014	10/17/2014	Stick-up	24.5	Yes	23.36	25.96	0.15	18.90	4.31	23.21	6.91	2.6	4.5	18.9	2.0	2
MW-147	10/21/2014	10/21/2014	10/23/2014	Stick-up	26.5	Yes	26.98	29.06	0.46	20.00	6.52	26.52	8.60	2.08	4.5	22.5	2.0	2
MW-148	10/20/2014	10/20/2014	10/23/2014	Stick-up	27.5	Yes	27.58	30.75	0.15	22.41	5.02	27.43	8.19	3.17	4.0	23.6	2.0	2
MW-149	10/22/2014	10/22/2014	10/23/2014	Flush-mount	30.0	Yes	28.81	28.46	0.15	14.96	13.70	28.66	13.35	-0.35	13.0	15.8	2.0	2
MW-150	10/22/2014	10/22/2014	10/23/2014	Flush-mount	28.0	Yes	28.40	28.20	0.15	14.92	13.33	28.25	13.13	-0.2	11.0	17.4	2.0	2
MW-151	10/22/2014	10/22/2014	10/23/2014	Flush-mount	29.5	Yes	29.55	29.10	0.15	14.86	14.54	29.40	14.09	-0.45	12.5	17.1	2.0	2
MW-152	10/17/2014	10/17/2014	10/23/2014	Flush-mount	23.0	Yes	23.08	22.78	0.15	12.88	10.05	22.93	9.75	-0.3	8.0	15.1	2.0	2
MW-153	10/24/2014	10/24/2014	10/24/2014	Flush-mount	18.0	Yes	17.71	18.01	0.15	11.90	5.66	17.56	5.96	0.3	4.0	13.7	2.0	2
MW-154	10/23/2014	10/23/2014	10/23/2014	Flush-mount	20.0	Yes	20.22	19.82	0.15	14.92	5.15	20.07	4.75	-0.4	4.0	16.2	2.0	2
MW-155	10/23/2014	10/23/2014	10/24/2014	Flush-mount	24.5	Yes	24.80	24.40	0.15	14.46	10.19	24.65	9.79	-0.4	8.0	16.8	2.0	2
MW-156	10/23/2014	10/23/2014	10/23/2014	Flush-mount	22.5	Yes	22.23	21.85	0.15	12.40	9.68	22.08	9.30	-0.38	7.5	14.7	2.0	2
MW-157	10/23/2014	10/23/2014	10/23/2014	Flush-mount	24.75	Yes	24.73	24.33	0.15	14.92	9.66	24.58	9.26	-0.4	9.0	15.7	2.0	2
MW-158	10/23/2014	10/23/2014	10/24/2014	Flush-mount	26.5	Yes	26.36	26.06	0.15	14.90	11.31	26.21	11.01	-0.3	8.0	18.4	2.0	2
MW-159	10/24/2014	10/24/2014	10/24/2014	Flush-mount	19.8	Yes	19.90	19.65	0.46	10.00	9.44	19.44	9.19	-0.25	7.5	12.4	3.0	2
MW-160	10/15/2014	10/15/2014	10/17/2014	Stick-up	21.0	Yes	20.58	23.38	0.15	14.88	5.55	20.43	8.35	2.8	4.0	16.6	2.0	2
MW-161	10/15/2014	10/15/2014	10/17/2014	Stick-up	20.4	Yes	19.76	22.01	0.15	14.90	4.71	19.61	6.96	2.25	4.0	15.8	2.0	2
MW-162	10/21/2014	10/21/2014	10/24/2014	Flush-mount	16.5	Yes	16.23	15.78	0.15	11.40	4.68	16.08	4.23	-0.45	4.0	12.2	2.0	2
MW-163	10/21/2014	10/21/2014	10/23/2014	Flush-mount	16.5	Yes	16.41	16.21	0.15	10.80	5.46	16.26	5.26	-0.2	4.0	12.4	2.0	2
MW-164	10/15/2014	10/15/2014	10/17/2014	Stick-up	19.5	Yes	18.26	20.61	0.15	12.90	5.21	18.11	7.56	2.35	4.5	13.8	2.0	2
MW-165	10/15/2014	10/15/2014	10/17/2014	Stick-up	22.0	Yes	22.12	24.37	0.15	14.92	7.05	21.97	9.30	2.25	5.0	17.1	2.0	2
MW-166	10/20/2014	10/20/2014	10/24/2014	Flush-mount	19.0	Yes	19.00	18.60	0.15	13.94	4.91	18.85	4.51	-0.4	4.0	15.0	2.0	2
MW-167	10/16/2014	10/16/2014	10/17/2014	Stick-up	14	Yes	14.29	16.85	0.15	8.90	5.24	14.14	7.80	2.56	4.0	10.3	2.0	2
MW-168	10/14/2014	10/14/2014	10/17/2014	Flush-mount	17.0	Yes	16.38	16.18	0.45	10.00	5.93	15.93	5.73	-0.20	5.0	11.4	2.0	2
MW-169	10/20/2014	10/20/2014	10/24/2014	Flush-mount	14.5	Yes	14.60	14.35	0.15	9.50	4.95	14.45	4.70	-0.25	4.0	10.6	2.0	2
MW-170	10/20/2014	10/20/2014	10/24/2014	Stick-up	14.5	Yes	14.82	17.28	0.15	9.45	5.22	14.67	7.68	2.46	4.0	10.8	2.0	2
MW-171	10/21/2014	10/21/2014	10/24/2014	Stick-up	10.5	Yes	10.41	12.89	0.15	5.41	4.85	10.26	7.33	2.48	4.0	6.4	2.0	2
MW-172	10/20/2014	10/20/2014	10/23/2014	Flush-mount	23.0	Yes	23.17	22.93	0.15	17.91	5.11	23.02	4.87	-0.24	4.0	19.2	2.0	2
MW-173	10/16/2014	10/16/2014	10/17/2014	Stick-up	19.0	Yes	19.49	22.00	0.15	12.75	6.59	19.34	9.10	2.51	4.0	15.5	2.0	2

bgs - below ground surface
ft - feet
TD - total depth
TOC - top of casing

Notes:

1. Wells constructed with Schedule 40 PVC riser and screen.
2. Well screens consists of 0.02-inch (#20 slot) machine slots

TABLE 2-3
Summary of Soil Analytical Results
Former Amaco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels				Sample Identification: Date Sampled: Comment:	North Site		Residential Area		Industrial Park						
	Soil to GW Non-Residential Pathway	Soil to GW Residential Pathway	Soil Non-Residential Pathway	Soil Residential Pathway		MW-148 10/17/2014 Soil SS1 1.0-1.5 ft bgs	MW-148 10/17/2014 Soil SS2 5-10 ft bgs	MW-152 10/17/2014 Soil SS1 1.0-1.5 ft bgs	MW-152 10/17/2014 Soil SS2 6-10 ft bgs	MW-166 10/17/2014 Soil SS1 6.0-6.5 ft bgs	MW-166 10/17/2014 Soil SS2 12-15 ft bgs	MW-170 10/17/2014 Soil SS1 6.0-6.5 ft bgs	MW-170 10/17/2014 Soil SS2 12-14 ft bgs	MW-171 10/17/2014 Soil SS1 0-0.5 ft bgs	MW-171 10/17/2014 Soil SS2 5-10 ft bgs	DUP-1 10/17/2014 Soil Duplicate of MW-171 SS2 5-10 ft bgs
						Units										
Soil Quality Parameters																
pH	--	--	--	--	%	7.4 H1	8.2 H1	7.6 H1	7.5 H1	5.7 H1	8.1 H1	7.4 H3	7.4 H3	7.7 H1	7.6 H1	6.7 H3
Moisture	--	--	--	--	Standard Units (s.u.)	22.2	22.9	23.6	17	23.4	13.4	23	18.2	22.7	21.4	15.8
TPH OA1 GRO																
Gasoline Range Organics	79.3	79.3	450	220	mg/kg	1.1 U	1.6 U	1.1 U	1.0 U	1.1 U	0.94 U	1.2 U	1.1 U	1.2 U	4.1	14.4
TPH OA2 DRO																
	7,830	5,440	20,000	2,000												
Diesel Fuel	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U, M1, R1	12.1 U	12.8 U	12.5 U	11.7 U
Fuel Oil	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U	12.1 U	12.8 U	12.5 U	11.7 U
Jet Fuel	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U	12.1 U	12.8 U	12.5 U	11.7 U
Kerosene	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U	12.1 U	12.8 U	12.5 U	11.7 U
Mineral Spirits	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U	12.1 U	12.8 U	12.5 U	11.7 U
Motor Oil	--	--	--	--	mg/kg	12.4 U	12.9 U	13.1 U	12.0 U	13.0 U	11.5 U	12.7 U	12.1 U, 5e	12.8 U	12.5 U	11.7 U
THE as Diesel No. 2	--	--	--	--	mg/kg	38.3 5e	21.7 5e	13.1 U	12.0 U	64.7 5e	119 5e	197 5e	197	49.9 5e	74.8 5e	86.1 5e
Metals																
Arsenic	--	--	63.2	18.9	mg/kg	2.8	3.7	7.0	3.7	12.9	11.2	3.9	4.3	4.0	12.9	5.6
Barium	--	--	277,000	15,300	mg/kg	88.5	175	189	139	869	258	185 2e, M1	104	111	145	203
Cadmium	--	--	965	39	mg/kg	11.9	0.49 U	0.54 U	0.5 U	0.58 U	1.0 U, D3	0.61 U	0.59 U	3.8	0.47 U	0.41 U
Chromium	--	--	111	33.6	mg/kg	10.0	25.5	24.9	21.9	31.5	35.2	15.6	15.0	15.3	43.5	20.9
Lead	--	--	1,000	400	mg/kg	130	19.7	16.3	15.9	33.0	15.1	17.2	15.0	21.1	15.7	12.3
Mercury	--	--	20	2.0	mg/kg	0.057 U	0.063 U	0.06 U	0.049 U	0.053 U	0.058 U	0.05 U	0.059 U	0.05 U	0.055 U	0.051 U
Selenium	--	--	10,200	391	mg/kg	1.7 U	1.5 U	1.6 U	1.5 U	1.7 U	3.1 U, D3	1.8 U	1.8 U	1.3 U	1.4 U	1.2 U
Silver	--	--	10,200	391	mg/kg	0.78 U	0.69 U	0.75 U	0.7 U	0.82 U	1.5 U, D3	0.86 U	0.82 U	0.6 U	0.66 U	0.58 U
PAH																
1-Methylnaphthalene	4,250	2,190	310,000	141,000	ug/kg	25.3 M1	4.2 U	7.3	4.0 U	23.5	5.7	208	182	28.7	272	91.6
2-Methylnaphthalene	17,300	8,340	1,280,000	209,000	ug/kg	48.0	4.2 U	14.5	4.0 U	42.6	10.4	531	490	62.8	292	77.0
Acenaphthene	526,000	255,000	30,600,000	3,420,000	ug/kg	7.5	4.2 U	4.2 U	4.0 U	4.4	3.8 U	51.1	45.8	4.2 U	9.3	3.9
Acenaphthylene	--	--	--	--	ug/kg	6.7	4.2 U	4.2 U	4.0 U	4.2 U	3.8 U	7.7	7.5	4.2 U	4.1 U	3.8 U
Anthracene	8,180,000	3,770,000	221,000,000	18,000,000	ug/kg	14.4	4.2 U	4.2 U	4.0 U	10.9	4.7	202	179	13.4	11.1	4.8
Benzo(a)anthracene	26,500	7,890	33,800	10,900	ug/kg	4.2 U, R1	4.2 U	4.2 U	4.0 U	66.6	18.0	151	169	25.1	5.5	3.8 U
Benzo(a)pyrene	23,500	23,500	3,380	1,090	ug/kg	4.2 U	4.2 U	4.2 U	4.0 U	36.5	14.3	104	127	25.8	4.1 U	3.8 U
Benzo(b)fluoranthene	64,400	19,200	33,800	10,900	ug/kg	4.4	4.2 U	4.2 U	4.0 U	30.7	9.2	34.4	40.1	31.4	4.1 U	3.8 U
Benzo(g,h,i)perylene	--	--	--	--	ug/kg	4.2 U, R1	4.2 U	4.6	4.0 U	172	17.0	66.7	83.4	29.7	4.1 U	3.8 U
Benzo(k)fluoranthene	638,000	190,000	338,000	109,000	ug/kg	4.2 U	4.2 U	4.2 U	4.0 U	13.9	3.8 U	16.7	16.9	15.5	4.1 U	3.8 U
Chrysene	2,710,000	805,000	3,380,000	1,090,000	ug/kg	7.0	4.2 U	4.5	4.0 U	109	35.8	226	253	47.2	9.3	3.9
Dibenz(a,h)anthracene	10,300	3,080	3,380	1,090	ug/kg	4.2 U, R1	4.2 U	4.2 U	4.0 U	25.6	4.8	17.4	20.4	10.3	4.1 U	3.8 U
Fluoranthene	15,200,000	2,830,000	35,200,000	2,440,000	ug/kg	32.5	4.2 U	4.2 U	4.0 U	17.3	5.9	58.1	56.6	27.6	4.1 U	3.8 U
Fluorene	626,000	297,000	25,900,000	2,360,000	ug/kg	15.9	4.2 U	4.2 U	4.0 U	4.2 U	3.8 U	134	101	4.2 U	18.6	7.2
Indeno(1,2,3-cd)pyrene	153,000	45,500	33,800	10,900	ug/kg	4.2 U, R1	4.2 U	4.2 U	4.0 U	32.6	5.0	20.1	23.2	13.2	4.1 U	3.8 U
Naphthalene	659	349	64,700	30,500	ug/kg	113 M1	4.2 U	4.2 U	4.0 U	4.2 U	3.8 U	80.3	60.7	15.8	98.6	30.8
Phenanthrene	--	--	--	--	ug/kg	78.3 M1	4.5	15.1	4.6	175	25.4	643	727	126	53.8	21.4
Pyrene	11,900,000	2,190,000	26,400,000	1,830,000	ug/kg	24.4	4.2 U	5.3	4.0 U	107	27.9	463	497	54.7	15.2	6.4

TABLE 2-3 (continued)
Summary of Soil Analytical Results
Former Amaco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels				Sample Identification: Date Sampled: Comment:	North Site		Residential Area		Industrial Park						
	Soil to GW Non-Residential Pathway	Soil to GW Residential Pathway	Soil Non-Residential Pathway	Soil Residential Pathway		MW-148	MW-148	MW-152	MW-152	MW-166	MW-166	MW-170	MW-170	MW-171	MW-171	DUP-1
						10/17/2014 Soil SS1 1.0-1.5 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs	10/17/2014 Soil SS1 1.0-1.5 ft bgs	10/17/2014 Soil SS2 6-10 ft bgs	10/17/2014 Soil SS1 6.0-6.5 ft bgs	10/17/2014 Soil SS2 12-15 ft bgs	10/17/2014 Soil SS1 6.0-6.5 ft bgs	10/17/2014 Soil SS2 12-14 ft bgs	10/17/2014 Soil SS1 0-0.5 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs
VOCs					Units											
1,1,1-Trichloroethane	2,800	2,800	18,100,000	11,800,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,1,2,2-Tetrachloroethane	29.4	16	15,200	8,210	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,1-Dichloroethane	496	269	79,900	46,800	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,1-Dichloroethene	85.9	85.9	484,000	313,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,2,4-Trimethylbenzene	2,210	1,070	126,000	54,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,2-Dibromoethane (EDB)	0.598	0.598	859	483	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,2-Dichloroethane	60	60	10,900	6,270	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,2-Dichloroethene (Total)	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,2-Dichloropropane	81.7	81.7	22,300	12,900	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,3,5-Trimethylbenzene	11,100	5,510	530,000	243,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
1,4-Dioxane (p-Dioxane)	129	38.4	247,000	79,600	ug/kg	113 U	158 U	112 U	100 U	108 U	94.4 U	119 U	105 U	122 U	101 U	80.1 U
2-Butanone (MEK)	57,800	24,200	101,000,000	26,000,000	ug/kg	11.3 U	15.8 U	11.2 U	10 U	10.8 U	9.4 U	11.9 U	10.5 U	12.2 U	10.1 U	8 U
2-Hexanone	--	--	--	--	ug/kg	22.5 U	31.6 U	22.3 U	20 U	21.6 U	18.9 U	23.8 U	21 U	24.3 U	20.3 U	16 U
4-Methyl-2-pentanone (MIBK)	27,200	6,690	34,800,000	4,450,000	ug/kg	11.3 U	15.8 U	11.2 U	10 U	10.8 U	9.4 U	11.9 U	10.5 U	12.2 U	10.1 U	8 U
Acetone	204,000	51,600	406,000,000	50,300,000	ug/kg	22.5 U	31.6 U	22.3 U	20 U	21.6 U	18.9 U	37.2	21 U	98.1	27.5	25.1
Acrylonitrile	5.59	2.8	5,930	3,180	ug/kg	113 U	158 U	112 U	100 U	108 U	94.4 U	119 U	105 U	122 U	101 U	80.1 U
Benzene	168	168	28,200	15,900	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	6.9
Bromodichloromethane	841	841	6,690	3,930	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Carbon disulfide	15,600	6,710	1,680,000	1,020,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Chlorobenzene	5,100	5,100	740,000	380,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Chloroethane	241,000	128,000	28,100,000	18,200,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Chloroform	850	850	7,140	4,220	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Chloromethane	1,730	924	223,000	146,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Dibromochloromethane	834	834	294,000	94,700	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Dibromomethane	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Diisopropyl ether	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Ethanol	--	--	--	--	ug/kg	476 U, 1e	486 U, 1e	511 U, H1	444 U, H1	479 U, 1e	423 U, 1e	518 U, 1e	487 U, 1e	487 U, 1e	493 U, 1e	470 U, 1e
Ethylbenzene	65,600	65,600	145,000	82,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Ethyl-tert-butyl ether	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Isopropylbenzene (Cumene)	140,000	65,100	5,680,000	2,540,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Methylene chloride	42.9	42.9	1,880,000	312,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Methyl-tert-butyl ether	1,660	848	1,050,000	585,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
n-Butylbenzene	118,000	50,900	3,440,000	1,420,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
n-Propylbenzene	320,000	110,000	14,300,000	4,070,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
p-Isopropyltoluene	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
sec-Butylbenzene	202,000	82,700	6,540,000	2,760,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Styrene	9,340	9,340	20,400,000	7,020,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
tert-Amylmethyl ether	--	--	--	--	ug/kg	11.3 U	15.8 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	12.2 U	10.1 U	8.0 U
tert-Butyl Alcohol	3,800	1,130	7,470,000	2,410,000	ug/kg	5.6 U	7.9 U	11.2 U	10 U	10.8 U	9.4 U	11.9 U	10.5 U	6.1 U	5.1 U	4.0 U
Tetrachloroethene	121	121	210,000	109,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Toluene	51,200	51,200	29,800,000	4,320,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
trans-1,4-Dichloro-2-butene	--	--	--	--	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Trichloroethene	84.2	84.2	9,910	5,850	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Trichlorofluoromethane	37,500	21,500	1,470,000	1,000,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U
Vinyl acetate	2,990	2,090	1,800,000	1,260,000	ug/kg	5.6 U	7.9 U	11.2 U	10 U	10.8 U	9.4 U	11.9 U	10.5 U	6.1 U	5.1 U	4.0 U
Vinyl chloride	20.5	20.5	9,210	4,470	ug/kg	11.3 U	15.8 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	12.2 U	10.1 U	8.0 U
Xylene (Total)	809,000	809,000	1,410,000	936,000	ug/kg	5.6 U	7.9 U	5.6 U	5.0 U	5.4 U	4.7 U	6.0 U	5.3 U	6.1 U	5.1 U	4.0 U

TABLE 2-3 (continued)
Summary of Soil Analytical Results
Former Amaco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels				Sample Identification: Date Sampled: Comment:	North Site		Residential Area		Industrial Park						
	Soil to GW Non-Residential Pathway	Soil to GW Residential Pathway	Soil Non-Residential Pathway	Soil Residential Pathway		MW-148	MW-148	MW-152	MW-152	MW-166	MW-166	MW-170	MW-170	MW-171	MW-171	DUP-1
						10/17/2014 Soil SS1 1.0-1.5 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs	10/17/2014 Soil SS1 1.0-1.5 ft bgs	10/17/2014 Soil SS2 6-10 ft bgs	10/17/2014 Soil SS1 6.0-6.5 ft bgs	10/17/2014 Soil SS2 12-15 ft bgs	10/17/2014 Soil SS1 6.0-6.5 ft bgs	10/17/2014 Soil SS2 12-14 ft bgs	10/17/2014 Soil SS1 0-0.5 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs	10/17/2014 Soil SS2 5-10 ft bgs
Units																
SVOCs																
1,2-Dichlorobenzene	48,400	48,400	5,340,000	2,340,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
1,3-Dichlorobenzene	--	--	--	--	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
1,4-Dichlorobenzene	5,940	5,940	63,700	37,500	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
2,4-Dimethylphenol	190,000	29,900	17,600,000	1,220,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
2,4-Dinitrophenol	19,400	2,980	1,760,000	122,000	ug/kg	2130 U	2140 U	2180 U	2000 U	2130 U	1930 U	2140 U	2020 U, M1	2140 U	2080 U	1930 U
2-Methylphenol(o-Cresol)	312,000	48,600	44,000,000	3,060,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
3&4-Methylphenol(m&p Cresol)	306,000	47,700	44,000,000	3,060,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
4-Nitrophenol	--	--	--	--	ug/kg	2130 U	2140 U	2180 U	2000 U	2130 U	1930 U	2140 U	2020 U	2140 U	2080 U	1930 U
Di-n-butylphthalate	1,980,000	318,000	88,100,000	6,110,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
Diethylphthalate	1,970,000	305,000	705,000,000	48,900,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
Dimethylphthalate	--	--	--	--	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
Phenol	1,220,000	189,000	264,000,000	18,300,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
Pyridine	170	91	301,000	51,500	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
Quinoline	--	--	--	--	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U
bis(2-Ethylhexyl)phthalate	144,000	144,000	1,760,000	569,000	ug/kg	421 U	423 U	431 U	396 U	421 U	381 U	424 U	399 U	422 U	411 U	382 U

Bold = Compound was detected

Highlighted = Compound detected above KDHE RSK Screening Level

KDHE = Kansas Department of Health and Environment

RSK = Risk-Based Screening Levels

GW = Groundwater

-- = not sampled/analyzed/applicable

% = percent

mg/kg = milligram per kilogram

ug/kg = microgram per kilogram

s.u. = standard units

U = Compound was not detected (BMCD qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

1e - Data for Ethanol by 8260 is reported after an initial calibration verification with low recovery. Sample was re-analyzed outside of hold under compliant QC conditions and the data has been confirmed.

2e - Post Digestion Spike Performed - 87% Recovery.

4e - Sample preserved in lab; results are from sample aliquot taken from a glass jar with headspace.

5e - The sample does not match a profile of laboratory standards. Hydrocarbon fractions are present from the mid diesel fuel to late motor oil range. Quantitation achieved using diesel fuel as a reference standard.

D3 - Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

H1 - Analysis conducted outside the EPA method holding time.

H3 - Sample was received or analysis requested beyond the recognized method holding time.

M1 - Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

R1 - RPD value was outside control limits.

Notes:

1) KDHE Risk-Based Standards for Kansas, RSK Manual, 5th Version, October 2010, Appendix A Tier 2 RSK-Based Summary Tables updated March 2014. http://www.kdheks.gov/remedial/download/RSK_Manual_14.pdf

TABLE 2-4
Field Duplicate Soil Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	Sample Identification: Date Sampled: Comment:	MW-171 10/17/2014 Soil SS2 5-10 ft bgs	DUP-1 10/17/2014 Soil Duplicate of MW-171 SS2 5-10 ft bgs	Meets QC Criteria
	Units			
Soil Quality Parameters				
pH	%	7.6 H1	6.7 H3	Yes
Moisture	Standard Units (s.u.)	21.4	15.8	STF
TPH OA1 GRO				
Gasoline Range Organics	mg/kg	4.1	14.4	No, RPD 111%
TPH OA2 DRO				
THE as Diesel No. 2	mg/kg	74.8 5e	86.1 5e	Yes
All other Analyzed TPH DRO	mg/kg	Non-Detect	Non-Detect	Yes
Metals				
Arsenic	mg/kg	12.9	5.6	No, RPD 79%
Barium	mg/kg	145	203	Yes
Chromium	mg/kg	43.5	20.9	No, RPD 70%
Lead	mg/kg	15.7	12.3	Yes
All other Analyzed Metals	mg/kg	Non-Detect	Non-Detect	Yes
PAH				
1-Methylnaphthalene	ug/kg	272	91.6	No, RPD 99%
2-Methylnaphthalene	ug/kg	292	77.0	No, RPD 117%
Acenaphthene	ug/kg	9.3	3.9	Yes
Anthracene	ug/kg	11.1	4.8	Yes
Benzo(a)anthracene	ug/kg	5.5	3.8 U	Yes
Chrysene	ug/kg	9.3	3.9	Yes
Fluorene	ug/kg	18.6	7.2	STF
Naphthalene	ug/kg	98.6	30.8	No, RPD 104%
Phenanthrene	ug/kg	53.8	21.4	No, RPD 86%
Pyrene	ug/kg	15.2	6.4	STF
All other Analyzed PAHs	ug/kg	Non-Detect	Non-Detect	Yes
VOCs				
Acetone	ug/kg	27.5	25.1	Yes
Acrylonitrile	ug/kg	101 U	80.1 U	Yes
Benzene	ug/kg	5.1 U	6.9	Yes
All other Analyzed VOCs	ug/kg	Non-Detect	Non-Detect	Yes
SVOCs				
All Analyzed SVOCs	ug/kg	Non-Detect	Non-Detect	Yes

Bold = Compound was detected

QC = Quality Control

RPD = Relative Percent Difference

STF = Sensitivity Test Failure

-- = not sampled/analyzed/applicable

% = percent

mg/kg = milligram per kilogram

ug/kg = microgram per kilogram

s.u. = standard units

U = Compound was not detected (BMCD qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

5e - The sample does not match a profile of laboratory standards.

Hydrocarbon fractions are present from the mid diesel fuel to late motor oil range. Quantitation achieved using diesel fuel as a reference standard.

H1 - Analysis conducted outside the EPA method holding time.

H3 - Sample was received or analysis requested beyond the recognized method holding time.

Notes:

If sample concentrations are greater than 5 times the detection limit, then the maximum allowable RPD is 35% for soil samples.

If sample concentrations are less than 5 times the detection limit, then a sensitivity test is applied. For the sensitivity test, the sample concentrations must agree within plus or minus (±) two times the lower detection limit for soil samples.

RPD Calculation:

$$\%RPD = \left(\frac{|X_1 - X_2|}{X} \right) \times 100\%$$

X₁ = 1st Measurement

X₂ = Duplicate

X = Mean Value of X₁+X₂

TABLE 2-5
Summary of Well Development
Former Amoco Refinery
Neodesha, Kansas

Well ID	Date Installed	Well Development			Well TD (ft TOC)	Water Level 10/29/2014 (ft bTOC)	Saturated Filter Pack (ft)	Well Development Calculations	
		Date	Gallons Purged	Purged Dry?				Saturated Well Casing and Borehole Volume (gallons)	5 Saturated Well Casing and Borehole Volume (gallons)
MW-144	10/21/2014	10/30/2014	95.0	NO	25.55	4.18	19.01	18.39	91.94
MW-145	10/16/2014	10/30/2014	80.0	NO	30.70	13.72	16.98	16.08	80.40
MW-146	10/16/2014	10/30/2014	70.0	NO	25.96	12.77	13.19	12.49	62.45
MW-147	10/21/2014	10/30/2014	80.0	NO	29.06	12.46	16.6	15.72	78.60
MW-148	10/20/2014	10/29/2014	110.0	NO	30.75	8.72	22.03	20.86	104.31
MW-149	10/22/2014	10/29/2014	20.0	NO	28.46	25.33	3.13	2.96	14.82
MW-150	10/22/2014	10/30/2014	32.0	NO	28.20	21.62	6.58	6.23	31.16
MW-151	10/22/2014	10/30/2014	30.0	NO	29.10	23.06	6.04	5.72	28.60
MW-152	10/17/2014	10/31/2014	25.0	NO	22.78	17.66	5.12	4.85	24.24
MW-153	10/24/2014	10/30/2014	10.0	YES	18.01	8.57	9.44	8.94	44.70
MW-154	10/23/2014	10/30/2014	4.0	YES	19.82	14.36	5.46	5.17	25.85
MW-155	10/23/2014	10/30/2014	12.0	YES	24.40	18.45	5.95	5.63	28.17
MW-156	10/23/2014	10/30/2014	7.5	YES	21.85	15.98	5.87	5.56	27.79
MW-157	10/23/2014	10/31/2014	23.0	NO	24.33	19.70	4.63	4.38	21.92
MW-158	10/23/2014	10/31/2014	33.0	NO	26.06	19.54	6.52	6.17	30.87
MW-159	10/24/2014	10/31/2014	23.0	NO	19.65	15.08	4.57	4.33	21.64
MW-160	10/15/2014	10/31/2014	45.0	NO	23.38	14.69	8.69	8.23	41.15
MW-161	10/15/2014	10/31/2014	45.0	NO	22.01	13.77	8.24	7.80	39.02
MW-162	10/21/2014	10/30/2014	7.0	YES	15.78	9.33	6.45	6.11	30.54
MW-163	10/21/2014	10/31/2014	35.0	NO	16.21	9.24	6.97	6.60	33.00
MW-164	10/15/2014	10/31/2014	35.0	NO	20.61	14.01	6.6	6.25	31.25
MW-165	10/15/2014	10/30/2014	17.5	YES	24.37	15.10	9.27	8.78	43.89
MW-166	10/20/2014	10/30/2014	17.0	YES	18.60	10.83	7.77	7.36	36.79
MW-167	10/16/2014	10/30/2014	8.0	YES	16.85	7.00	9.85	9.33	46.64
MW-168	10/14/2014	10/30/2014	20.0	YES	16.18	7.19	8.99	8.51	42.57
MW-169	10/20/2014	10/30/2014	25.0	YES	14.35	3.29	10.6	10.11	50.57
MW-170	10/20/2014	10/30/2014	25.0	YES	17.28	5.40	10.82	10.42	52.10
MW-171	10/21/2014	10/29/2014	10.0	YES	12.89	5.00	6.41	6.31	31.56
MW-172	10/20/2014	10/29/2014	18.0	YES	22.93	4.55	18.38	17.41	87.03
MW-173	10/16/2014	10/30/2014	13.0	YES	22.00	13.19	8.81	8.34	41.72
Actual Development Total			975.0		Calculated Development Total			265.1	1325.3

bgs - below ground surface

bTOC - below top of casing

ft - feet

TD - total depth

TOC - top of casing

Well Development Calculation:

5 Borehole Volumes (gallons) = 5 x [(0.163 x Water Colum (ft)) + (0.784 x Saturated Filter Pack Thickness (ft))]

*Assumes 2-inch inside diameter well, 8.25-inch borehole diameter, and 30% filter pack porosity.

TABLE 2-6
Groundwater and Product Depths and Elevations
Former Amoco Refinery
Neodesha, Kansas

Well ID	TOC Elev. (ft amsl)	Date	Groundwater Depth (ft bTOC)	Product Level (ft bTOC)	Product Thickness (ft)	Product Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Well Total Depth (ft bTOC)	PID (ppm)
MW-144	795.41	10/22/2014	3.97	ND	--	--	791.44	--	110
		10/24/2014	3.95	ND	--	--	791.46	--	51.3
		10/29/2014	4.18	ND	--	--	791.23	--	--
		11/3/2014	4.65	ND	--	--	790.76	25.55	--
MW-145	795.74	10/16/2014	11.81	ND	--	--	783.93	--	296
		10/21/2014	12.59	ND	--	--	783.15	--	0
		10/22/2014	12.80	ND	--	--	782.94	--	0
		10/24/2014	13.01	ND	--	--	782.73	--	0
		10/29/2014	13.72	ND	--	--	782.02	--	--
11/3/2014	14.06	ND	--	--	781.68	30.68	--		
MW-146	795.4	10/16/2014	10.33	ND	--	--	785.07	--	2.2
		10/21/2014	11.44	ND	--	--	783.96	--	0
		10/22/2014	11.68	ND	--	--	783.72	--	0
		10/24/2014	11.92	ND	--	--	783.48	--	0
		10/29/2014	12.77	ND	--	--	782.63	--	--
11/3/2014	13.16	ND	--	--	782.24	25.80	--		
MW-147	795.6	10/22/2014	11.35	ND	--	--	784.25	--	0
		10/24/2014	11.54	ND	--	--	784.06	--	0
		10/29/2014	12.46	ND	--	--	783.14	--	--
		11/3/2014	12.81	ND	--	--	782.79	28.98	--
MW-148	832.09	10/20/2014	8.47	ND	--	--	823.62	--	1.4
		10/22/2014	7.90	ND	--	--	824.19	--	0
		10/24/2014	8.13	ND	--	--	823.96	--	0
		10/29/2014	8.72	ND	--	--	823.37	--	--
		11/3/2014	9.12	ND	--	--	822.97	30.73	--
MW-149	822.49	10/22/2014	25.34	ND	--	--	797.15	--	25
		10/23/2014	25.33	ND	--	--	797.16	--	95.8
		10/24/2014	25.27	ND	--	--	797.22	--	128
		10/29/2014	25.33	sheen	--	--	797.16	--	--
		11/3/2014	25.25	ND	--	--	797.24	28.44	--
MW-150	818.41	10/23/2014	21.63	ND	--	--	796.78	--	21.8
		10/29/2014	21.62	ND	--	--	796.79	--	--
		11/3/2014	21.54	ND	--	--	796.87	28.20	--
MW-151	819.89	10/22/2014	23.00	ND	--	--	796.89	--	132
		10/23/2014	23.02	ND	--	--	796.87	--	149
		10/24/2014	22.93	ND	--	--	796.96	--	153
		10/29/2014	23.06	ND	--	--	796.83	--	--
		11/3/2014	22.92	ND	--	--	796.97	29.03	--
MW-152	814.83	10/22/2014	17.30	ND	--	--	797.53	--	213
		10/24/2014	17.28	ND	--	--	797.55	--	220
		10/29/2014	17.66	17.65	0.01	797.18	797.18	--	--
		11/3/2014	17.55	ND	--	--	797.28	22.74	--
MW-153	799.96	10/24/2014	8.33	ND	--	--	791.63	--	0
		10/29/2014	8.57	ND	--	--	791.39	--	--
		11/3/2014	8.58	ND	--	--	791.38	17.97	--

TABLE 2-6 (continued)
Groundwater and Product Depths and Elevations
Former Amoco Refinery
Neodesha, Kansas

Well ID	TOC Elev. (ft amsl)	Date	Groundwater Depth (ft bTOC)	Product Level (ft bTOC)	Product Thickness (ft)	Product Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Well Total Depth (ft bTOC)	PID (ppm)
MW-154	807.16	10/24/2014	14.34	ND	--	--	792.82	--	415
		10/29/2014	14.36	ND	--	--	792.80	--	--
		11/3/2014	14.35	ND	--	--	792.81	19.79	--
MW-155	810.94	10/29/2014	18.45	ND	--	--	792.49	--	--
		11/3/2014	18.41	ND	--	--	792.53	24.32	--
MW-156	808.49	10/24/2014	15.90	ND	--	--	792.59	--	542
		10/29/2014	15.98	sheen	--	--	792.51	--	--
		11/3/2014	15.90	ND	--	--	792.59	21.77	--
MW-157	811.96	10/24/2014	19.68	ND	--	--	792.28	--	0
		10/29/2014	19.70	ND	--	--	792.26	--	--
		11/3/2014	19.67	ND	--	--	792.29	24.33	--
MW-158	811.8	10/24/2014	19.52	ND	--	--	792.28	--	0
		10/29/2014	19.54	ND	--	--	792.26	--	--
		11/3/2014	19.52	ND	--	--	792.28	26.04	--
MW-159	807.65	10/24/2014	14.99	ND	--	--	792.66	--	645
		10/29/2014	15.08	ND	--	--	792.57	--	--
		11/3/2014	14.99	ND	--	--	792.66	19.62	--
MW-160	810.39	10/15/2014	13.62	ND	0.00	--	796.77	--	908
		10/16/2014	13.58	ND	0.00	--	796.81	--	1,039
		10/22/2014	13.94	13.93	0.01	796.46	796.46	--	424
		10/24/2014	13.99	13.98	0.01	796.41	796.41	--	296
		10/29/2014	14.69	14.67	0.02	795.72	795.72	--	--
		11/3/2014	14.76	ND	0.00	--	795.63	23.51	--
MW-161	809.83	10/15/2014	11.42	ND	0.00	--	798.41	--	236
		10/16/2014	11.96	sheen	0.00	--	797.87	--	367
		10/22/2014	12.77	12.73	0.04	797.10	797.09	--	656
		10/24/2014	12.96	12.92	0.04	796.91	796.90	--	494
		10/29/2014	13.77	13.73	0.04	796.10	796.09	--	--
		11/3/2014	13.96	sheen	0.00	--	795.87	--	22.01
MW-162	805.09	10/22/2014	8.12	ND	--	--	796.97	--	0.9
		10/29/2014	9.33	ND	--	--	795.76	--	--
		11/3/2014	9.66	ND	--	--	795.43	15.76	--
MW-163	804.96	10/21/2014	7.33	7.32	0.01	797.64	797.64	--	829
		10/22/2014	8.31	8.27	0.04	796.69	796.68	--	999
		10/24/2014	8.50	8.46	0.04	796.50	796.49	--	1,356
		10/29/2014	9.24	9.19	0.05	795.77	795.76	--	--
		11/3/2014	9.46	sheen	0.00	--	795.50	16.17	--
MW-164	809.91	10/15/2014	12.10	ND	0.00	--	797.81	--	220
		10/16/2014	12.20	ND	0.00	--	797.71	--	701
		10/22/2014	13.12	ND	0.00	--	796.79	--	522
		10/24/2014	13.27	ND	0.00	--	796.64	--	658
		10/29/2014	14.01	14.00	0.01	795.91	795.91	--	--
		11/3/2014	14.21	sheen	0.00	--	795.70	20.62	--

TABLE 2-6 (continued)
Groundwater and Product Depths and Elevations
Former Amoco Refinery
Neodesha, Kansas

Well ID	TOC Elev. (ft amsl)	Date	Groundwater Depth (ft bTOC)	Product Level (ft bTOC)	Product Thickness (ft)	Product Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Well Total Depth (ft bTOC)	PID (ppm)
MW-165	812.42	10/15/2014	15.31	ND	--	--	797.11	--	241
		10/16/2014	14.94	ND	--	--	797.48	--	129
		10/22/2014	14.82	ND	--	--	797.60	--	196
		10/24/2014	14.77	ND	--	--	797.65	--	248
		10/29/2014	15.10	sheen	--	--	797.32	--	--
		11/3/2014	15.20	ND	--	--	797.22	24.34	--
MW-166	808.69	10/20/2014	10.49	ND	--	--	798.20	--	194
		10/22/2014	10.60	ND	--	--	798.09	--	283
		10/24/2014	10.48	ND	--	--	798.21	--	213
		10/29/2014	10.83	ND	--	--	797.86	--	--
		11/3/2014	10.68	ND	--	--	798.01	18.54	--
MW-167	806.8	10/16/2014	15.78	ND	--	--	791.02	--	126
		10/22/2014	6.42	ND	--	--	800.38	--	197
		10/24/2014	6.39	ND	--	--	800.41	--	171
		10/29/2014	7.00	sheen	--	--	799.80	--	--
		11/3/2014	6.92	ND	--	--	799.88	17.81	--
MW-168	805.74	10/14/2014	4.00	ND	--	--	801.74	--	659
		10/15/2014	4.92	ND	--	--	800.82	--	1,111
		10/16/2014	5.01	ND	--	--	800.73	--	1,210
		10/22/2014	6.22	ND	--	--	799.52	--	1,136
		10/24/2014	6.21	ND	--	--	799.53	--	934
		10/29/2014	7.19	ND	--	--	798.55	--	--
		11/3/2014	7.69	ND	--	--	798.05	15.90	--
MW-169	803.6	10/20/2014	4.05	ND	--	--	799.55	--	1,145
		10/22/2014	2.96	ND	--	--	800.64	--	1,370
		10/29/2014	3.29	sheen	--	--	800.31	--	--
		11/3/2014	3.38	sheen	--	--	800.22	14.32	--
MW-170	807.63	10/20/2014	5.09	ND	--	--	802.54	--	16
		10/22/2014	5.11	ND	--	--	802.52	--	4.6
		10/29/2014	5.40	ND	--	--	802.23	--	--
		11/3/2014	5.66	ND	--	--	801.97	17.22	--
MW-171	807.02	10/21/2014	5.28	ND	--	--	801.74	--	178
		10/22/2014	4.32	ND	--	--	802.70	--	297
		10/24/2014	4.45	ND	--	--	802.57	--	258
		10/29/2014	5.00	ND	--	--	802.02	--	--
		11/3/2014	5.17	ND	--	--	801.85	12.86	--

TABLE 2-6 (continued)
Groundwater and Product Depths and Elevations
Former Amoco Refinery
Neodesha, Kansas

Well ID	TOC Elev. (ft amsl)	Date	Groundwater Depth (ft bTOC)	Product Level (ft bTOC)	Product Thickness (ft)	Product Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Well Total Depth (ft bTOC)	PID (ppm)
MW-172	821.1	10/20/2014	12.60	ND	--	--	808.50	--	257
		10/22/2014	3.80	ND	--	--	817.30	--	863
		10/24/2014	3.92	ND	--	--	817.18	--	752
		10/29/2014	4.55	ND	--	--	816.55	--	--
		11/3/2014	4.80	ND	--	--	816.30	22.92	--
MW-173	809.06	10/22/2014	9.65	ND	--	--	799.41	--	10
		10/24/2014	12.41	ND	--	--	796.65	--	43.5
		10/29/2014	13.19	ND	--	--	795.87	--	--
		11/3/2014	13.39	ND	--	--	795.67	21.99	--

amsl = above mean sea level

bTOC = below top of casing

ft = feet

ND = not detected

TD = total depth

TOC = top of casing

-- = no reading/measurement recorded

TABLE 2-7
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	On-Site Area													
	Groundwater Residential	Groundwater Non-Residential		North Site	Former Tank Site	Former Processing and Storage Site (Current Industrial Park)											
				MW-148 11/6/2014 Groundwater MS/MSD	MW-172 11/6/2014 Groundwater	MW-160 11/7/2014 Groundwater	MW-161 11/7/2014 Groundwater	DUP-3 11/7/2014 Groundwater Duplicate of MW-161	MW-164 11/7/2014 Groundwater	MW-165 11/6/2014 Groundwater	MW-166 11/4/2014 Groundwater	MW-167 11/6/2014 Groundwater	MW-168 11/5/2014 Groundwater	MW-169 11/5/2014 Groundwater	MW-170 11/5/2014 Groundwater	MW-171 11/3/2014 Groundwater	MW-173 11/7/2014 Groundwater
				Units													
Field Parameters																	
Conductivity	--	--	µmhos/cm	2033	760	880	1098	1098	952	868	735	658	599	848	1128	752	1454
Dissolved Oxygen	--	--	mg/L	26.70	29.70	12.90	15.10	15.10	14.90	27.40	46.80	19.40	12.50	9.80	5.30	27.40	16.60
Oxygen Reduction Potential [ORP]	--	--	mV	46.6	-36.2	-103.5	-128.4	-128.4	-128.7	-110.3	-24.9	-83.1	-140.9	-154.3	-203.7	-85.5	-121.4
pH	--	--	s.u.	6.67	7.0	7.07	7.14	7.14	7.10	7.01	7.83	6.78	7.13	7.27	7.03	6.72	6.98
Temperature	--	--	°C	16.25	15.54	17.38	16.59	16.59	16.36	17.20	18.43	17.84	18.81	19.41	19.10	16.74	17.33
Turbidity	--	--	NTU	4.93	2.95	31.00	8.97	8.97	7.73	3.81	898.0	299	34.60	2.59	3.51	5.64	18.60
Water Quality Parameters																	
pH	--	--	s.u.	6.8 H6	7.4 H6	7.2 H6	7.2 H6	7.4 H6	7.2 H6	7.2 H6	7.7 H6	7.0 H6	7.4 H6	7.3 H6	7.0 H6	6.9 H6	7.1 H6
Metals, Total																	
Arsenic	10	10	µg/L	10.0 U	10.0 U	34.1	36.1	38.9	71.2	64.5	10.0 U	10.0 U	22.5	34.9	10.0 U	21.2	10.0 U
Barium	2000	2000	µg/L	32.0	72.2	766	673	678	1,020	206	138	545	1070	488	95.0	407	584
Cadmium	5.0	5.0	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chromium	100	100	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	8.8	5.0 U					
Lead	15	15	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	22.4	10.9	5.0 U				
Mercury	2	2	µg/L	0.20 U,M1	0.20 U	0.20 U	0.20 U,M1	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U
Selenium	50	50	µg/L	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
Silver	77.9	508	µg/L	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U
Metals, Dissolved																	
Arsenic	10	10	µg/L	10.0 U	10.0 U	36.0 D9	42.5 D9	38.4	70.5	62.3	10.0 U	10.0 U	26.4 D9	33.5	10.0 U	19.4	10.0 U
Barium	2000	2000	µg/L	29.6	71.2	772 D9	688 D9	690 D9	1,010	212 D9	75.9	343	1,040	481	94.7	382	602 D9
Cadmium	5.0	5.0	µg/L	1.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chromium	100	100	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Lead	15	15	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Mercury	2	2	µg/L	0.20 U,M1	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U
Selenium	50	50	µg/L	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
Silver	77.9	508	µg/L	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U
TPH OA1 (GRO)																	
Gasoline Range Organics	0.5	0.5	mg/L	0.50 U	6.70	4.80	10.0 U	10.0 U	3.3	2.4	0.50 U	1.9	4.9	4.5	0.50 U	10.0 U	0.83
TPH OA2 (DRO)																	
Diesel Fuel	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U,L2	0.40 U	0.42 U	0.42 U,L2	0.42 U,L2	2 H2	0.40 U
Fuel Oil	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.42 U	0.42 U	0.42 U	0.40 U	0.40 U
Jet Fuel	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.42 U	0.42 U	0.42 U	0.40 U	0.40 U
Kerosene	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.42 U	0.42 U	0.42 U	1.0 U	0.40 U
Mineral Spirits	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.42 U	0.42 U	0.42 U	1.0 U	0.40 U
Motor Oil	0.5	0.72	mg/L	0.38 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.42 U	0.42 U	0.42 U	0.40 U	0.40 U
TEH as Diesel No. 2	0.5	0.72	mg/L	0.38 U	2.2 1e	5.0	7.8	7.6	5.0	3.6 B	1.7 1e	3.6 B	1.5 1e	3.3 1e	3.6 1e	2.7 1e,B	2.3 B

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	On-Site Area													
	Groundwater Residential	Groundwater Non-Residential		North Site	Former Tank Site	Former Processing and Storage Site (Current Industrial Park)											
				MW-148 11/6/2014 Groundwater MS/MSD	MW-172 11/6/2014 Groundwater	MW-160 11/7/2014 Groundwater	MW-161 11/7/2014 Groundwater	DUP-3 11/7/2014 Groundwater Duplicate of MW-161	MW-164 11/7/2014 Groundwater	MW-165 11/6/2014 Groundwater	MW-166 11/4/2014 Groundwater	MW-167 11/6/2014 Groundwater	MW-168 11/5/2014 Groundwater	MW-169 11/5/2014 Groundwater	MW-170 11/5/2014 Groundwater	MW-171 11/3/2014 Groundwater	MW-173 11/7/2014 Groundwater
				Units													
PAH																	
1-Methylnaphthalene	4.29	8.33	µg/L	0.53 U	5.5	91.2	123	109	108	80	0.50 U	12.3	25.9	139	0.50 U	12.8	49.2
2-Methylnaphthalene	16.7	34.6	µg/L	0.53 U	2.6	117	195	172	117	61.4	0.50 U	3.2	29.8	215	0.50 U	3.80	64.6
Acenaphthene	253	521	µg/L	0.11 U	0.24	1.9	3.6	3.3	3	1.6	0.10	1.2	1.0	5.8	1.4	0.58	1.9
Acenaphthylene	--	--	µg/L	0.11 U	0.11 U	0.6	0.81	0.75	0.77	0.4	0.10 U	0.14	0.21	1.0	0.10 U	0.19	0.57
Anthracene	1,150	2,500	µg/L	0.11 U	0.11 U	0.49 B	1.3 B	1.2 B,H2	1.3 H2	0.18 B	0.10 U	0.16	0.48	2.6	0.40	0.11 U	0.34 B
Benzo(a)anthracene	0.223	0.75	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.33	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Benzo(a)pyrene	0.2	0.2	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.26	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Benzo(b)fluoranthene	0.16	0.537	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.16	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Benzo(g,h,i)perylene	--	--	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.13	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Benzo(k)fluoranthene	1.62	5.43	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.10 U	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Chrysene	22.3	75	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.093	0.1 U	0.43	0.1 U	0.091 U	0.12 U	0.11	0.11 U	0.1 U
Dibenz(a,h)anthracene	8.05E-03	0.027	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.10 U	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Fluoranthene	255	1,370	µg/L	0.11 U	0.11 U	0.1 U	0.15 B	0.15 H2	0.21 H2	0.1 U	0.10 U	0.1 U	0.095	0.25	0.18	0.11 U	0.1 B
Fluorene	162	341	µg/L	0.11 U	0.2	3.1	5.4	5.1	3.8	3.1	0.11	1.0	1.2	9.20	1.5	0.93	2.5
Indeno(1,2,3-cd)pyrene	0.117	0.392	µg/L	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.091 U	0.1 U	0.10 U	0.1 U	0.091 U	0.12 U	0.10 U	0.11 U	0.1 U
Naphthalene	1.11	2.11	µg/L	0.53 U	35.6	65.6	241	220	24.2	44.0	0.50 U	30.6	51.2	39.0	0.50 U	8.20	32.1
Phenanthrene	--	--	µg/L	0.53 U	0.53 U	3.3	8.2	7.5	9.8	1.0	0.50 U	0.5 U	1.3	18.2	0.69	0.53 U	3.0
Pyrene	202	1,090	µg/L	0.11 U	0.11 U	0.16	0.45	0.4	0.48	0.1 U	1.40	0.46	0.3	1.20	1.0	0.11 U	0.11
Volatile Organic Compounds																	
1,1,1-Trichloroethane	200	200	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,1,1,2-Tetrachloroethane	5.35	9.91	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	5.0	5.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.694	1.28	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,1-Dichloroethane	25	46.1	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,1-Dichloroethene	70.0	70.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,1-Dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	70.0	70.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	8.44	17.4	µg/L	1.0 U	175	1.7	139	156	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	116	1.0 U	20.0 U	1.0 U
1,2-Dibromoethane (EDB)	0.05	0.05	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,2-Dichlorobenzene	600	600	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,2-Dichloroethene (Total)	70 ¹	70 ¹	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,2-Dichloropropane	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
1,2-Dibromo-3-chloropropane	0.2	0.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	0.00468	0.00862	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichloropropane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	44.0	88.4	µg/L	1.0 U	97	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.7	15	1.0 U	20.0 U	1.0 U
1,4-Dichlorobenzene	75.0	75.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane (p-Dioxane)	8.49	28.5	µg/L	100 U	100 U	100 U	2000 U	2000 U	500 U	100 U	100 U	100 U	100 U	500 U	100 U	2000 U	100.0 U
2,2-Dichloropropane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone (MEK)	4,920	11,800	µg/L	10.0 U	11.9	18.5	200 U	200 U	50.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	200 U	10.0 U
2-Hexanone	--	--	µg/L	10.0 U	10.0 U	10.0 U	200 U	200 U	50.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	200 U	10.0 U
2-Chlorotoluene	88.9	178	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	--	--	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	On-Site Area													
	Groundwater Residential	Groundwater Non-Residential		North Site	Former Tank Site	Former Processing and Storage Site (Current Industrial Park)											
				MW-148 11/6/2014 Groundwater MS/MSD	MW-172 11/6/2014 Groundwater	MW-160 11/7/2014 Groundwater	MW-161 11/7/2014 Groundwater	DUP-3 11/7/2014 Groundwater Duplicate of MW-161	MW-164 11/7/2014 Groundwater	MW-165 11/6/2014 Groundwater	MW-166 11/4/2014 Groundwater	MW-167 11/6/2014 Groundwater	MW-168 11/5/2014 Groundwater	MW-169 11/5/2014 Groundwater	MW-170 11/5/2014 Groundwater	MW-171 11/3/2014 Groundwater	MW-173 11/7/2014 Groundwater
				Units													
Volatile Organic Compounds (continued)																	
4-Methyl-2-pentanone (MIBK)	1,020	4,170	µg/L	10.0 U	10.0 U	10.0 U	200 U	200 U	50.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	200 U	10.0 U
Acetone	11,500	45,500	µg/L	10.0 U	20.1	29	200 U	200 U	50.0 U	16.4	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	200 U	13.7
Acrylonitrile	0.491	0.978	µg/L	20.0 U	20.0 U	20.0 U	400 U	400 U	100 U	20.0 U	20.0 U	20.0 U	20.0 U	100 U	20.0 U	400 U	20.0 U
Benzene	5.0	5.0	µg/L	1.0 U	187	193	1,660	1,710	344	185	1.0 U	12.2	2.9	962	1.0 U	82.2	3.3
Bromobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	80	80	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Bromoform	80	80	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	7.02	13.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon disulfide	716	1,660	µg/L	5.0 U	5.0 U	5.0 U	100 U	100 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25.0 U	5.0 U	100 U	5.0 U
Carbon Tetrachloride	5.0	5.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	100	100	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Chloroethane	14,000	26,400	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Chloroform	80	80	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Chloromethane	127	238	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
cis-1,2-Dichloroethene	70	70	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	80	80	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Dibromomethane	--	--	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Dichlorodifluoromethane	366	567	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloromethane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diisopropyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Ethylbenzene	700	700	µg/L	1.0 U	64.2	3.3	287	348	6.0	2.3	1.0 U	1.0	3.8	73.2	1.0 U	20.0 U	1.0 U
Ethyl-tert-butyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Hexachlorobutadiene	6.32	21.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	451	968	µg/L	1.0 U	17.6	49.2	47.4	62.5	33.1	19.1	1.0 U	17.7	85.6	39.8	1.0 U	20.0 U	10
m,p-Xylene	10,000	10,000	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	85.8	74.1	6.2	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Methyl-tert-butyl ether	133	262	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
n-Butylbenzene	169	392	µg/L	1.0 U	1.0 U	16.1	20.0 U	25.6	8.6	21.3	1.0 U	3.1	37.8	10.3	1.0 U	20.0 U	4.0
n-Propylbenzene	660	1,910	µg/L	1.0 U	20	45.5	58.5	75.4	35.4	31.1	1.0 U	16.7	195	29.8	1.0 U	20.0 U	10.8
o-Xylene	10,000	10,000	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Isopropyltoluene	--	--	µg/L	1.0 U	11.6	4.5	20.0 U	20.4	5.0 U	1.0 U	1.0 U	1.0 U	1.1	12.8	1.0 U	20.0 U	1.0 U
sec-Butylbenzene	305	745	µg/L	1.0 U	4.4	13.6	20.0 U	20.0 U	7.3	13.5	1.0 U	2.4	26.6	9.9	1.0 U	20.0 U	4.5
Styrene	100	100	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
tert-Amylmethyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
tert-Butylbenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tert-Butyl Alcohol	256	859	µg/L	10.0 U	132	48.8	200 U	200 U	596	154	10.0 U	10.0 U	10.0 U	128	10.0 U	200 U	10.0 U
Tetrachloroethene	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Toluene	1,000	1,000	µg/L	1.0 U	112	8.9	23.6	25.9	7.6	2.4	1.0 U	1.0 U	1.0 U	23.2	1.0 U	20.0 U	1.0 U
trans-1,2-Dichloroethene	100	100	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,4-Dichloro-2-butene	--	--	µg/L	5.0 U	5.0 U	5.0 U	100 U	100 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25.0 U	5.0 U	100 U	5.0 U
Trichloroethene	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Trichlorofluoromethane	1,090	1,900	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Vinyl acetate	406	581	µg/L	10.0 U	10.0 U	10.0 U	200 U	200 U	50.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	200 U	10.0 U
Vinyl chloride	2.0	2.0	µg/L	1.0 U	1.0 U	1.0 U	20.0 U	20.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	20.0 U	1.0 U
Xylene (Total)	10,000	10,000	µg/L	3.0 U	407	15.5	134	167	15.0 U	4.4	3.0 U	3.0 U	3.0 U	119	3.0 U	60.0 U	3.0 U

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	On-Site Area													
	Groundwater Residential	Groundwater Non-Residential		North Site	Former Tank Site	Former Processing and Storage Site (Current Industrial Park)											
				MW-148 11/6/2014 Groundwater MS/MSD	MW-172 11/6/2014 Groundwater	MW-160 11/7/2014 Groundwater	MW-161 11/7/2014 Groundwater	DUP-3 11/7/2014 Groundwater Duplicate of MW-161	MW-164 11/7/2014 Groundwater	MW-165 11/6/2014 Groundwater	MW-166 11/4/2014 Groundwater	MW-167 11/6/2014 Groundwater	MW-168 11/5/2014 Groundwater	MW-169 11/5/2014 Groundwater	MW-170 11/5/2014 Groundwater	MW-171 11/3/2014 Groundwater	MW-173 11/7/2014 Groundwater
Units																	
Semi-Volatile Organic Compounds																	
1,2-Dichlorobenzene	600	600	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
1,3-Dichlorobenzene	--	--	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
1,4-Dichlorobenzene	75	75	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
2,4-Dimethylphenol	292	1,860	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.5 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
2,4-Dinitrophenol	31	202	µg/L	52.1 U	53.2 U	53.8 U	53.8 U	53.8 U	53.8 U	53.8 U	55.6 U	53.8 U	57.5 U	54.9 U	58.8 U	51.0 U	53.8 U
2-Methylphenol(o-Cresol)	744	4,780	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
3&4-Methylphenol(m&p Cresol)	744	4,770	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
4-Nitrophenol	--	--	µg/L	52.1 U	53.2 U	53.8 U	53.8 U	53.8 U	53.8 U	53.8 U	56.6 U	53.8 U	57.5 U	54.9 U	58.8 U	51.0 U	53.8 U
Di-n-butylphthalate	1,350	8,400	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
Diethylphthalate	12,200	79,000	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
Dimethylphthalate	--	--	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
Phenol	4,560	29,500	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	11.4	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
Pyridine	4.96	9.28	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
Quinoline	--	--	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U
bis(2-Ethylhexyl)phthalate	6.0	6.0	µg/L	10.4 U	10.6 U	10.8 U	10.8 U	10.8 U	10.8 U	10.8 U	11.1 U	10.8 U	11.5 U	11.0 U	11.8 U	10.2 U	10.8 U

Bold, italics = Compound was detected

Highlighted = Compound detected above Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound detected above both Residential/Non-Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound laboratory reporting limit above KDHE RSK screening value (refer to page 2-17).

KDHE = Kansas Department of Health and Environment

RSK = Risk-Based Screening Levels

-- = not sampled/analyzed/applicable

*C = degrees Celsius

mg/L = milligrams per Liter

mV = millivolts

NTU = Nephelometric Turbidity Units

s.u. = standard units

ug/L = micrograms per Liter

µmhos/cm = micromhos per centimeter

U = Compound was not detected (Lab qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

1e - The sample does not match a profile of laboratory standards. Hydrocarbon fractions are present from the early diesel fuel to late motor oil range. Quantification achieved using diesel fuel as a reference standard.

B - Analyte was detected in the associated method blank.

D9 - Dissolved result is greater than the total. Data is within laboratory control limits.

H2 - Extraction or preparation outside EPA holding time.

H6 - Analysis initiated outside of the 15 minute EPA recommended holding time.

L2 - Analyte recovery in LCS was below QC limits. Results for this analyte in associated samples may be biased low.

M1 - Matrix spike recovery exceeded QC limits. Batch accepted based on LCS recovery.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit

Notes:

1) The KDHE Tier 2 RSK value of 70 ug/L for cis-1,2-DCE (VOC) was applied as the screening level for 1,2-DCE (total). 1,2-DCE (total) is comprised of two isomers cis-1,2-DCE and trans-1,2-DCE, with the former having the more conservative screening level.

2) KDHE Risk-Based Standards for Kansas, RSK Manual, 5th Version, October 2010, Appendix A Tier 2 RSK-Based Summary Tables updated March 2014. http://www.kdheks.gov/remedial/download/RSK_Manual_14.pdf

3) Monitoring wells with observed sheen/product on bailer/rope following sampling did not sound for LNAPL when measured with interface probe.

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	On-Site					Off-Site Area							
	Groundwater Residential	Groundwater Non-Residential		South Former Settling Basins					Residential Area							
				MW-144 11/7/2014 Groundwater	MW-145 11/6/2014 Groundwater	DUP-2 11/6/2014 Groundwater Duplicate of MW-145	MW-146 11/6/2014 Groundwater	MW-147 11/6/2014 Groundwater	MW-149 11/4/2014 Groundwater	MW-150 11/4/2014 Groundwater	MW-151 11/4/2014 Groundwater	MW-152/GW-01 11/4/2014 Groundwater	MW-152 11/4/2014 Groundwater	MW-153 11/5/2014 Groundwater	MW-154 11/4/2014 Groundwater	MW-154 11/4/2014 Groundwater
Units																*KDHE Split
Field Parameters																
Conductivity	--	--	µmhos/cm	554	889	889	731	571	912	850	867	626	626	764	747	--
Dissolved Oxygen	--	--	mg/L	16.80	18.40	18.40	16.70	14.50	47.30	38.50	27.80	22.60	22.60	61.50	40.10	--
Oxygen Reduction Potential [ORP]	--	--	mV	36.7	-8.1	-8.1	-23.0	-71.9	-97.8	-84.7	-76.4	-80.5	-80.5	0.6	-102.8	--
pH	--	--	s.u.	7.17	6.85	6.85	6.96	7.09	7.02	6.98	6.77	6.97	6.97	7.43	7.03	--
Temperature	--	--	°C	14.77	15.57	15.57	14.61	14.69	16.29	16.01	16.23	15.85	15.85	19.68	18.39	--
Turbidity	--	--	NTU	34.10	12.9	12.9	33.20	33.9	1.66	61.4	9.03	2.41	2.41	2.31	2.46	--
Water Quality Parameters																
pH	--	--	s.u.	7.2 H6	7.0 H6	7.0 H6	7.1 H6	7.2 H6	7.1 H6	7.1 H6	6.9 H6	7.0 H6	7.1 H6	7.4 H6	7.1 H6	--
Metals, Total																
Arsenic	10	10	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.4	10.0 U	10.5	39.2	37.8	33.1	10.0 U	10.0 U	--
Barium	2000	2000	µg/L	75.1	128	124	106	125	272	222	328	576	500	83	841	--
Cadmium	5.0	5.0	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	--
Chromium	100	100	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	--
Lead	15	15	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	--
Mercury	2	2	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.2 U	0.2 U	0.2 U	0.2 U	--
Selenium	50	50	µg/L	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	--
Silver	77.9	508	µg/L	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	--
Metals, Dissolved																
Arsenic	10	10	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	11.3 D9	10.0 U	14.1 D9	34.9	33.8	32.4	10.0 U	10.0 U	--
Barium	2000	2000	µg/L	66.4	115	115	87.8	111	269	210	308	555	551 D9	100 D9	800	--
Cadmium	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	--
Chromium	100	100	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	--
Lead	15	15	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	--
Mercury	2	2	µg/L	0.20 U,M1	0.20 U	0.20 U	0.20 U	0.20 U	0.2 U	0.20 U,M1	0.20 U	0.20 U	0.2 U	0.2 U	0.2 U,M1	--
Selenium	50	50	µg/L	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	--
Silver	77.9	508	µg/L	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	--
TPH OA1 (GRO)																
Gasoline Range Organics	0.5	0.5	mg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.85	3.3	25.0 U	90.0	92.9	0.50 U	25.0 U	--
TPH OA2 (DRO)																
Diesel Fuel	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U,L2	0.40 U,L2	1.80 H2	0.40 U	0.40 U	0.40 U,L2	1.3 U	--
Fuel Oil	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	--
Jet Fuel	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	1.3 U	--
Kerosene	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	--
Mineral Spirits	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	--
Motor Oil	0.5	0.72	mg/L	0.40 U	0.40 U	0.42 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	--
TEH as Diesel No. 2	0.5	0.72	mg/L	0.71 B	0.40 U	0.47 1e	0.44 1e	0.44 1e	0.54 1e	1.7 1e	2.2 1e,B	6.50 1e	6.80 1e	0.40 U	0.82 1e,B	--

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment: Units	On-Site					Off-Site Area								
	Groundwater Residential	Groundwater Non-Residential		South Former Settling Basins					Residential Area								
				MW-144 11/7/2014 Groundwater	MW-145 11/6/2014 Groundwater	DUP-2 11/6/2014 Groundwater Duplicate of MW-145	MW-146 11/6/2014 Groundwater	MW-147 11/6/2014 Groundwater	MW-149 11/4/2014 Groundwater	MW-150 11/4/2014 Groundwater	MW-151 11/4/2014 Groundwater	MW-152/GW-01 11/4/2014 Groundwater	MW-152 11/4/2014 Groundwater	MW-153 11/5/2014 Groundwater	MW-154 11/4/2014 Groundwater	MW-154 11/4/2014 Groundwater	
												*Duplicate				*KDHE Split	
PAH																	
1-Methylnaphthalene	4.29	8.33	µg/L	0.5 U	0.5 U	0.53 U	0.50 U	0.50 U	0.50 U	0.50 U	48.6	57.7	82.40	85.4	0.50 U	14.3	--
2-Methylnaphthalene	16.7	34.6	µg/L	0.5 U	0.5 U	0.53 U	0.50 U	0.50 U	0.50 U	0.50 U	33.1	95.7	136	145	0.50 U	15.5	--
Acenaphthene	253	521	µg/L	0.1 U	0.12	0.11 U	0.10 U	0.10 U	0.76	0.83	0.54	0.87	0.86	0.10 U	1.8	--	
Acenaphthylene	--	--	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.11	0.17	0.11	0.28	0.29	0.10 U	0.28	--	
Anthracene	1,150	2,500	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.16	0.12 U	0.11 U	0.16	0.1 U	0.10 U	0.35	--	
Benzo(a)anthracene	0.223	0.75	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Benzo(a)pyrene	0.2	0.2	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Benzo(b)fluoranthene	0.16	0.537	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Benzo(g,h,i)perylene	--	--	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Benzo(k)fluoranthene	1.62	5.43	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Chrysene	22.3	75	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Dibenz(a,h)anthracene	8.05E-03	0.027	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Fluoranthene	255	1,370	µg/L	0.12 B	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Fluorene	162	341	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.30	0.74	0.31	0.74	0.68	0.10 U	1.3	--	
Indeno(1,2,3-cd)pyrene	0.117	0.392	µg/L	0.1 U	0.1 U	0.11 U	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.1 U	--	
Naphthalene	1.11	2.11	µg/L	0.5 U	0.5 U	0.53 U	0.50 U	0.50 U	0.50 U	35.4	293	468	490	0.50 U	8.4	15	
Phenanthrene	--	--	µg/L	0.5 U	0.5 U	0.53 U	0.50 U	0.50 U	0.50 U	0.58 U	0.53 U	0.94	0.74	0.50 U	1.0	--	
Pyrene	202	1,090	µg/L	0.1 U	0.27	0.26	0.10 U	0.10 U	0.10 U	0.12 U	0.11 U	0.10 U	0.1 U	0.10 U	0.32	--	
Volatile Organic Compounds																	
1,1,1-Trichloroethane	200	200	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
1,1,1,2-Tetrachloroethane	5.35	9.91	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,1,2-Trichloroethane	5.0	5.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,1,2,2-Tetrachloroethane	0.694	1.28	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U	
1,1-Dichloroethane	25	46.1	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U	
1,1-Dichloroethene	70.0	70.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U	
1,1-Dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,2,3-Trichlorobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,2,4-Trichlorobenzene	70.0	70.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,2,4-Trimethylbenzene	8.44	17.4	µg/L	19.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	4,690	4,450	1.0 U	142	140	
1,2-Dibromoethane (EDB)	0.05	0.05	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	--	
1,2-Dichlorobenzene	600	600	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	61
1,2-Dichloroethane	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U	
1,2-Dichloroethene (Total)	70 ¹	70 ¹	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	6.7	2,310	--	
1,2-Dichloropropane	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U	
1,2-Dibromo-3-chloropropane	0.2	0.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	0.4 U
1,2,3-Trichloropropane	0.00468	0.00862	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,3-Dichlorobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,3-Dichloropropane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,3,5-Trimethylbenzene	44.0	88.4	µg/L	5.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	1,250	1,160	1.0 U	50.0 U	26.0	
1,4-Dichlorobenzene	75.0	75.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
1,4-Dioxane (p-Dioxane)	8.49	28.5	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	500 U	5000 U	5000 U	5000 U	100 U	5000 U	--	
2,2-Dichloropropane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
2-Butanone (MEK)	4,920	11,800	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--	
2-Hexanone	--	--	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--	
2-Chlorotoluene	88.9	178	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
4-Chlorotoluene	--	--	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	--	--	1.0 U	--	10.0 U	

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment: Units	On-Site					Off-Site Area							
	Groundwater Residential	Groundwater Non-Residential		South Former Settling Basins					Residential Area							
				MW-144 11/7/2014 Groundwater	MW-145 11/6/2014 Groundwater	DUP-2 11/6/2014 Groundwater Duplicate of MW-145	MW-146 11/6/2014 Groundwater	MW-147 11/6/2014 Groundwater	MW-149 11/4/2014 Groundwater	MW-150 11/4/2014 Groundwater	MW-151 11/4/2014 Groundwater	MW-152/GW-01 11/4/2014 Groundwater	MW-152 11/4/2014 Groundwater	MW-153 11/5/2014 Groundwater	MW-154 11/4/2014 Groundwater	MW-154 11/4/2014 Groundwater
													*Duplicate			*KDHE Split
Volatile Organic Compounds (continued)																
4-Methyl-2-pentanone (MIBK)	1,020	4,170	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--
Acetone	11,500	45,500	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--
Acrylonitrile	0.491	0.978	µg/L	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	100 U	1000 U	1000 U	1000 U	20.0 U	1000 U	--
Benzene	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	22.2	8,930	4,380	4,230	1.0 U	50.0 U	11.0
Bromobenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Bromochloromethane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Bromodichloromethane	80	80	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
Bromoform	80	80	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Bromomethane	7.02	13.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Carbon disulfide	716	1,660	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25.0 U	250 U	250 U	250 U	5.0 U	250 U	--
Carbon Tetrachloride	5.0	5.0	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Chlorobenzene	100	100	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	21.0
Chloroethane	14,000	26,400	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
Chloroform	80	80	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
Chloromethane	127	238	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
cis-1,2-Dichloroethene	70	70	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	3,000
cis-1,3-dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Dibromochloromethane	80	80	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
Dibromomethane	--	--	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
Dichlorodifluoromethane	366	567	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Dichloromethane	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Diisopropyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	--
Ethylbenzene	700	700	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	11.4	95.4	8,290	8,050	1.0 U	52.8	37.0
Ethyl-tert-butyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	--
Hexachlorobutadiene	6.32	21.2	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
Isopropylbenzene (Cumene)	451	968	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.3	106	213	495	470	1.0 U	50.0 U	37.0
m,p-Xylene	10,000	10,000	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	14.0
Methylene chloride	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	--
Methyl-tert-butyl ether	133	262	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
n-Butylbenzene	169	392	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	17.4	50.0 U	152	112	1.0 U	50.0 U	10.0 U
n-Propylbenzene	660	1,910	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.2	182	346	1,140	1,080	1.0 U	81.9	94.0
o-Xylene	10,000	10,000	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
p-Isopropyltoluene	--	--	µg/L	1.8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
sec-Butylbenzene	305	745	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.6	19.1	50.0 U	60.9	67.1	1.0 U	50.0 U	10.0 U
Styrene	100	100	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	10.0 U
tert-Amylmethyl ether	--	--	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	50.0 U	--
tert-Butylbenzene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
tert-Butyl Alcohol	256	859	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--
Tetrachloroethene	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	2.5	50.0 U	21.0
Toluene	1,000	1,000	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	491	477	1.0 U	50.0 U	10.0 U
trans-1,2-Dichloroethene	100	100	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
trans-1,3-Dichloropropene	--	--	µg/L	--	--	--	--	--	--	--	--	--	--	--	--	10.0 U
trans-1,4-Dichloro-2-butene	--	--	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25.0 U	250 U	250 U	250 U	5.0 U	250 U	--
Trichloroethene	5.0	5.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.9	50.0 U	67.0
Trichlorofluoromethane	1,090	1,900	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	7.9	50.0 U	10.0 U
Vinyl acetate	406	581	µg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U	500 U	500 U	500 U	10.0 U	500 U	--
Vinyl chloride	2.0	2.0	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	50.0 U	50.0 U	50.0 U	1.0 U	1,330	1,900
Xylene (Total)	10,000	10,000	µg/L	12.4	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	15.0 U	150 U	24,200	23,600	3.0	150 U	20.0 U

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment: Units	On-Site					Off-Site Area								
	Groundwater Residential	Groundwater Non-Residential		South Former Settling Basins					Residential Area								
				MW-144 11/7/2014 Groundwater	MW-145 11/6/2014 Groundwater	DUP-2 11/6/2014 Groundwater Duplicate of MW-145	MW-146 11/6/2014 Groundwater	MW-147 11/6/2014 Groundwater	MW-149 11/4/2014 Groundwater	MW-150 11/4/2014 Groundwater	MW-151 11/4/2014 Groundwater	MW-152/GW-01 11/4/2014 Groundwater	MW-152 11/4/2014 Groundwater	MW-153 11/5/2014 Groundwater	MW-154 11/4/2014 Groundwater	MW-154 11/4/2014 Groundwater	
Semi-Volatile Organic Compounds																	
1,2-Dichlorobenzene	600	600	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	33.4	--	
1,3-Dichlorobenzene	--	--	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
1,4-Dichlorobenzene	75	75	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
2,4-Dimethylphenol	292	1,860	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
2,4-Dinitrophenol	31	202	µg/L	53.8 U	53.8 U	53.2 U	53.2 U	53.8 U	58.8 U	54.9 U	51.5 U	52.6 U	51.5 U	57.5 U	52.6 U	--	
2-Methylphenol(o-Cresol)	744	4,780	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
3&4-Methylphenol(m&p Cresol)	744	4,770	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
4-Nitrophenol	--	--	µg/L	53.8 U	53.8 U	53.2 U	53.2 U	53.8 U	58.8 U	54.9 U	51.5 U	52.6 U	51.5 U	57.5 U	52.6 U	--	
Di-n-butylphthalate	1,350	8,400	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
Diethylphthalate	12,200	79,000	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
Dimethylphthalate	--	--	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
Phenol	4,560	29,500	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	29.8	10.5 U	10.3 U	11.5 U	10.5 U	--	
Pyridine	4.96	9.28	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
Quinoline	--	--	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	
bis(2-Ethylhexyl)phthalate	6.0	6.0	µg/L	10.8 U	10.8 U	10.6 U	10.6 U	10.8 U	11.8 U	11.0 U	10.3 U	10.5 U	10.3 U	11.5 U	10.5 U	--	

Bold, italics = Compound was detected

Highlighted = Compound detected above Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound detected above both Residential/Non-Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound laboratory reporting limit above KDHE RSK screening value (refer to page 2-17).

KDHE = Kansas Department of Health and Environment

RSK = Risk-Based Screening Levels

-- = not sampled/analyzed/applicable

*C = degrees Celsius

mg/L = milligrams per Liter

mV = millivolts

NTU = Nephelometric Turbidity Units

s.u. = standard units

ug/L = micrograms per Liter

µmhos/cm = micromhos per centimeter

U = Compound was not detected (Lab qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

1e - The sample does not match a profile of laboratory standards. Hydrocarbon fractions are present from the early diesel fuel to late motor oil range. Quantification achieved using diesel fuel as a reference standard.

B - Analyte was detected in the associated method blank.

D9 - Dissolved result is greater than the total. Data is within laboratory control limits.

H2 - Extraction or preparation outside EPA holding time.

H6 - Analysis initiated outside of the 15 minute EPA recommended holding time.

L2 - Analyte recovery in LCS was below QC limits. Results for this analyte in associated samples may be biased low.

M1 - Matrix spike recovery exceeded QC limits. Batch accepted based on LCS recovery.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit

Notes:

1) The KDHE Tier 2 RSK value of 70 ug/L for cis-1,2-DCE (VOC) was applied as the screening level for 1,2-DCE (total). 1,2-DCE (total) is comprised of two isomers cis-1,2-DCE and trans-1,2-DCE, with the former having the more conservative screening level.

2) KDHE Risk-Based Standards for Kansas, RSK Manual, 5th Version, October 2010, Appendix A Tier 2 RSK-Based Summary Tables updated March 2014. http://www.kdheks.gov/remedial/download/RSK_Manual_14.pdf

3) Monitoring wells with observed sheen/product on bailer/rope following sampling did not sound for LNAPL when measured with interface probe.

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	Off-Site Area								Field Blanks			
	Groundwater Residential	Groundwater Non-Residential		Residential Area				Industrial Area				Field Blank-01 11/3/2014 Collected at MW-171	Field Blank-02 11/4/2014 Collected at MW-152	Field Blank-03 11/6/2014 Collected at MW-172	
				MW-155 11/4/2014 Groundwater	MW-155 11/4/2014 Groundwater *KDHE Split	DUP-1 11/4/2014 Groundwater Duplicate of MW-155	MW-156 11/5/2014 Groundwater	MW-157 11/5/2014 Groundwater	MW-158 11/5/2014 Groundwater	MW-159 11/5/2014 Groundwater	MW-162 11/5/2014 Groundwater				MW-163 11/7/2014 Groundwater
Field Parameters															
Conductivity	--	--	µmhos/cm	1045	--	1045	1047	1169	1292	1401	662	1027	--	--	--
Dissolved Oxygen	--	--	mg/L	64.30	--	64.30	34.50	19.90	16.90	15.60	18.30	16.80	--	--	--
Oxygen Reduction Potential [ORP]	--	--	mV	28.1	--	28.1	-115.4	-81.9	-123.2	-121.9	-60.6	-131.2	--	--	--
pH	--	--	s.u.	6.86	--	6.86	7.05	7.00	7.12	7.02	7.33	7.27	--	--	--
Temperature	--	--	°C	16.99	--	16.99	16.34	17.67	16.78	18.76	18.55	17.39	--	--	--
Turbidity	--	--	NTU	12.10	--	12.10	6.38	3.22	9.17	4.14	2.23	16.4	--	--	--
Water Quality Parameters															
pH	--	--	s.u.	6.8 H6	--	7.0 H6	7.1 H6	7.5 H6	7.4 H6	7.1 H6	7.4 H6	7.3 H6	6.2 H6	6.2 H6	6.4 H6
Metals, Total															
Arsenic	10	10	µg/L	10.0 U	--	10.0 U	34.7	10.0 U	24.2	34.3	10.0 U	19.7	10.0 U	10.0 U	10.0 U
Barium	2000	2000	µg/L	85.3	--	76.3	952	194	123	1,500	29.4	2,000	10.0 U	0.98 J	10.0 U
Cadmium	5.0	5.0	µg/L	5.0 U	--	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Chromium	100	100	µg/L	5.0 U	--	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Lead	15	15	µg/L	5.0 U	--	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Mercury	2	2	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.20 U	0.2 U	0.2 U	0.20 U
Selenium	50	50	µg/L	15.0 U	--	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	2.2 J	15.0 U
Silver	77.9	508	µg/L	7.0 U	--	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	2.4 J	7.0 U
Metals, Dissolved															
Arsenic	10	10	µg/L	10.0 U	--	10.0 U	32.2	10.0 U	27.0 D9	33.9	10.0 U	25.7 D9	10.0 U	10.0 U	10.0 U
Barium	2000	2000	µg/L	67.0	--	65.8	944	195 D9	116	1,420	28.0	2,040 D9	10.0 U	10.0 U	10.0 U
Cadmium	5.0	5.0	µg/L	1.0 U	--	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chromium	100	100	µg/L	5.0 U	--	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Lead	15	15	µg/L	5.0 U	--	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Mercury	2	2	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.20 U	0.2 U	0.062 J	0.2 U
Selenium	50	50	µg/L	15.0 U	--	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	3.4 J	15.0 U
Silver	77.9	508	µg/L	7.0 U	--	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U
TPH OA1 (GRO)															
Gasoline Range Organics	0.5	0.5	mg/L	2.5 U	--	2.5 U	6.1	0.50 U	0.50 U	6.5	0.50 U	25.0 U	0.50 U	0.50 U	0.50 U
TPH OA2 (DRO)															
Diesel Fuel	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U,L2	0.42 U	0.36 U	0.36 U	0.40 U,L2	0.40 U	0.40 U	1.2 U	0.40 U
Fuel Oil	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U	0.42 U	0.36 U	0.36 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Jet Fuel	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U	0.42 U	0.36 U	0.36 U	0.40 U	0.40 U	0.40 U	1.2 U	0.40 U
Kerosene	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U	0.42 U	0.36 U	0.36 U	0.40 U	0.40 U	0.40 U	1.2 U	0.40 U
Mineral Spirits	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U	0.42 U	0.36 U	0.36 U	0.40 U	0.40 U	0.40 U	1.2 U	0.40 U
Motor Oil	0.5	0.72	mg/L	0.40 U	--	0.40 U	0.40 U	0.42 U	0.36 U	0.36 U	0.40 U	0.40 U	0.40 U	1.2 U	0.40 U
TEH as Diesel No. 2	0.5	0.72	mg/L	0.46 1e,B	--	0.57 1e,B	3.0 1e	0.69 1e	0.36 U	3.0 1e	0.45 1e	4.3	0.40 U	0.46 1e,B	0.40 U

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	Off-Site Area										Field Blanks		
	Groundwater Residential	Groundwater Non-Residential		Residential Area								Industrial Area		Field Blank-01 11/3/2014 Collected at MW-171	Field Blank-02 11/4/2014 Collected at MW-152	Field Blank-03 11/6/2014 Collected at MW-172
				MW-155 11/4/2014 Groundwater	MW-155 11/4/2014 Groundwater	DUP-1 11/4/2014 Groundwater Duplicate of MW-155	MW-156 11/5/2014 Groundwater	MW-157 11/5/2014 Groundwater	MW-158 11/5/2014 Groundwater	MW-159 11/5/2014 Groundwater	MW-162 11/5/2014 Groundwater	MW-163 11/7/2014 Groundwater				
				Units		*KDHE Split										
PAH																
1-Methylnaphthalene	4.29	8.33	µg/L	0.50 U	--	0.50 U	87.9	0.53 U	0.45 U	106	0.50 U	52.4	0.48 U	0.083 J	0.45 U	
2-Methylnaphthalene	16.7	34.6	µg/L	0.50 U	--	0.50 U	164.0	0.53 U	0.45 U	191	0.50 U	71.9	0.48 U	0.17 J	0.45 U	
Acenaphthene	253	521	µg/L	0.10 U	--	0.10 U	0.88	0.7	0.35	1.9	0.10 U	2.0	0.095 U	0.1 U	0.096	
Acenaphthylene	--	--	µg/L	0.10 U	--	0.10 U	0.28	0.13	0.091 U	0.32	0.10 U	1.1	0.095 U	0.1 U	0.091 U	
Anthracene	1,150	2,500	µg/L	0.10 U	--	0.10 U	0.14	0.11 U	0.091 U	0.3	0.10 U	1.1	0.095 U	0.1 U	0.091 U	
Benzo(a)anthracene	0.223	0.75	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Benzo(a)pyrene	0.2	0.2	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Benzo(b)fluoranthene	0.16	0.537	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Benzo(g,h,i)perylene	--	--	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Benzo(k)fluoranthene	1.62	5.43	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Chrysene	22.3	75	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Dibenz(a,h)anthracene	8.05E-03	0.027	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Fluoranthene	255	1,370	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.18	0.095 U	0.1 U	0.091 U	
Fluorene	162	341	µg/L	0.10 U	--	0.10 U	1.2	0.11 U	0.091 U	2.0	0.10 U	2.8	0.29	0.1 U	0.097	
Indeno(1,2,3-cd)pyrene	0.117	0.392	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.1 U	0.095 U	0.1 U	0.091 U	
Naphthalene	1.11	2.11	µg/L	0.54	0.50 U	0.50 U	176	0.58	0.45 U	217	0.50 U	55.1	0.48 U	0.38 J	0.45 U	
Phenanthrene	--	--	µg/L	0.50 U	--	0.50 U	1.1	0.53 U	0.45 U	1.9	0.50 U	3.9	0.48 U	0.099 J	0.45 U	
Pyrene	202	1,090	µg/L	0.10 U	--	0.10 U	0.10 U	0.11 U	0.091 U	0.091 U	0.10 U	0.57	0.095 U	0.1 U	0.091 U	
Volatile Organic Compounds																
1,1,1-Trichloroethane	200	200	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,1,1,2-Tetrachloroethane	5.35	9.91	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,1,2-Trichloroethane	5.0	5.0	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,1,2,2-Tetrachloroethane	0.694	1.28	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,1-Dichloroethane	25	46.1	µg/L	6.6	6.3	6.8	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,1-Dichloroethene	70.0	70.0	µg/L	1.8	1.7	1.9	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,1-Dichloropropene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,2,3-Trichlorobenzene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,2,4-Trichlorobenzene	70.0	70.0	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,2,4-Trimethylbenzene	8.44	17.4	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,2-Dibromoethane (EDB)	0.05	0.05	µg/L	1.0 U	--	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,2-Dichlorobenzene	600	600	µg/L	--	3.5	--	--	--	--	--	--	--	--	--	--	
1,2-Dichloroethane	5.0	5.0	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,2-Dichloroethene (Total)	70 ¹	70 ¹	µg/L	201	--	197	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,2-Dichloropropane	5.0	5.0	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,2-Dibromo-3-chloropropane	0.2	0.2	µg/L	--	0.02 U	--	--	--	--	--	--	--	--	--	--	
1,2,3-Trichloropropane	0.00468	0.00862	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,3-Dichlorobenzene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,3-Dichloropropane	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,3,5-Trimethylbenzene	44.0	88.4	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U	
1,4-Dichlorobenzene	75.0	75.0	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
1,4-Dioxane (p-Dioxane)	8.49	28.5	µg/L	100 U	--	100 U	500 U	100 U	100 U	500 U	100 U	5000 U	100 U	100 U	100 U	
2,2-Dichloropropane	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
2-Butanone (MEK)	4,920	11,800	µg/L	10.0 U	--	10.0 U	50.0 U	10.0 U	10.0 U	50.0 U	10.0 U	500 U	10.0 U	10.0 U	10.0 U	
2-Hexanone	--	--	µg/L	10.0 U	--	10.0 U	50.0 U	10.0 U	10.0 U	50.0 U	10.0 U	500 U	10.0 U	10.0 U	10.0 U	
2-Chlorotoluene	88.9	178	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	
4-Chlorotoluene	--	--	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	--	1.0 U	

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	Off-Site Area										Field Blanks		
	Groundwater Residential	Groundwater Non-Residential		Residential Area								Industrial Area		Field Blank-01 11/3/2014 Collected at MW-171	Field Blank-02 11/4/2014 Collected at MW-152	Field Blank-03 11/6/2014 Collected at MW-172
				MW-155 11/4/2014 Groundwater	MW-155 11/4/2014 Groundwater *KDHE Split	DUP-1 11/4/2014 Groundwater Duplicate of MW-155	MW-156 11/5/2014 Groundwater	MW-157 11/5/2014 Groundwater	MW-158 11/5/2014 Groundwater	MW-159 11/5/2014 Groundwater	MW-162 11/5/2014 Groundwater	MW-163 11/7/2014 Groundwater				
	Units															
Volatile Organic Compounds (continued)																
4-Methyl-2-pentanone (MIBK)	1,020	4,170	µg/L	10.0 U	--	10.0 U	50.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	500 U	10.0 U	10.0 U	10.0 U
Acetone	11,500	45,500	µg/L	10.0 U	--	10.0 U	50.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	500 U	10.0 U	10.0 U	10.0 U
Acrylonitrile	0.491	0.978	µg/L	20.0 U	--	20.0 U	100 U	20.0 U	20.0 U	20.0 U	100 U	20.0 U	1000 U	20.0 U	20.0 U	20.0 U
Benzene	5.0	5.0	µg/L	1.1	0.99	1.1	89.0	1.0 U	1.0 U	1.0 U	103	1.0 U	152	1.0 U	1.0 U	1.0 U
Bromobenzene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	80	80	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Bromoform	80	80	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	7.02	13.2	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Carbon disulfide	716	1,660	µg/L	5.0 U	--	5.0 U	25.0 U	5.0 U	5.0 U	5.0 U	25.0 U	5.0 U	250 U	5.0 U	5.0 U	5.0 U
Carbon Tetrachloride	5.0	5.0	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	100	100	µg/L	1.1	1.2	1.2	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	14,000	26,400	µg/L	1.5	1.1	1.2	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Chloroform	80	80	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	127	238	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	70	70	µg/L	--	220	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-dichloropropene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	80	80	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	--	--	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	366	567	µg/L	--	4.7	--	--	--	--	--	--	--	--	--	--	--
Dichloromethane	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Diisopropyl ether	--	--	µg/L	1.0 U	--	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	700	700	µg/L	1.0 U	0.5 U	1.0 U	6.6	1.0 U	1.0 U	1.0 U	10.4	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Ethyl-tert-butyl ether	--	--	µg/L	1.0 U	--	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	6.32	21.2	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	451	968	µg/L	1.0 U	0.5 U	1.0 U	81.8	1.5	1.0 U	1.0 U	71.3	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
m,p-Xylene	10,000	10,000	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	5.0	5.0	µg/L	1.0 U	--	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	6.4	1.0 U	2,660	1.0 U	1.0 U	1.0 U
Methyl-tert-butyl ether	133	262	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	169	392	µg/L	1.0 U	0.5 U	1.0 U	15.7	1.0 U	1.0 U	1.0 U	20.9	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	660	1,910	µg/L	1.0 U	0.5 U	1.0 U	87	1.0 U	1.0 U	1.0 U	76.8	1.0 U	58.1	1.0 U	1.0 U	1.0 U
o-Xylene	10,000	10,000	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
p-Isopropyltoluene	--	--	µg/L	1.0 U	0.5 U	1.0 U	13.8	1.0 U	1.0 U	1.0 U	7.7	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
sec-Butylbenzene	305	745	µg/L	1.0 U	0.82	1.0 U	12.9	1.1	1.0 U	1.0 U	14.5	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Styrene	100	100	µg/L	1.0 U	0.5 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
tert-Amylmethyl ether	--	--	µg/L	1.0 U	--	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
tert-Butylbenzene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
tert-Butyl Alcohol	256	859	µg/L	10.0 U	--	10.0 U	53.5	41.6	10.0 U	10.0 U	50.0 U	10.0 U	685	10.0 U	10.0 U	10.0 U
Tetrachloroethene	5.0	5.0	µg/L	18.6	24	20.2	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Toluene	1,000	1,000	µg/L	1.0 U	0.5 U	1.0 U	11.8	1.0 U	1.0 U	1.0 U	10.3	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	100	100	µg/L	--	1.1	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	--	--	µg/L	--	0.5 U	--	--	--	--	--	--	--	--	--	--	--
trans-1,4-Dichloro-2-butene	--	--	µg/L	5.0 U	--	5.0 U	25.0 U	5.0 U	5.0 U	5.0 U	25.0 U	5.0 U	250 U	5.0 U	5.0 U	5.0 U
Trichloroethene	5.0	5.0	µg/L	19	20	19.8	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	1,090	1,900	µg/L	10.6	9.3	11.2	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Vinyl acetate	406	581	µg/L	10.0 U	--	10.0 U	50.0 U	10.0 U	10.0 U	10.0 U	50.0 U	10.0 U	500 U	10.0 U	10.0 U	10.0 U
Vinyl chloride	2.0	2.0	µg/L	52.4	64.0	53	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U	50.0 U	1.0 U	1.0 U	1.0 U
Xylene (Total)	10,000	10,000	µg/L	3.0 U	1.0 U	3.0 U	34.9	3.0 U	3.0 U	3.0 U	15.0 U	3.0 U	150 U	3.0 U	3.0 U	3.0 U

TABLE 2-7 (continued)
Summary of Groundwater Analytical Results
Former Amoco Refinery
Neodesha, Kansas

Parameters	KDHE Tier 2 RSK Screening Levels		Sample Identification: Date Sampled: Comment:	Off-Site Area								Field Blanks			
	Groundwater Residential	Groundwater Non-Residential		Residential Area						Industrial Area		Field Blank-01 11/3/2014 Collected at MW-171	Field Blank-02 11/4/2014 Collected at MW-152	Field Blank-03 11/6/2014 Collected at MW-172	
				MW-155 11/4/2014 Groundwater	MW-155 11/4/2014 Groundwater *KDHE Split	DUP-1 11/4/2014 Groundwater Duplicate of MW-155	MW-156 11/5/2014 Groundwater	MW-157 11/5/2014 Groundwater	MW-158 11/5/2014 Groundwater	MW-159 11/5/2014 Groundwater	MW-162 11/5/2014 Groundwater				MW-163 11/7/2014 Groundwater
Units															
Semi-Volatile Organic Compounds															
1,2-Dichlorobenzene	600	600	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
1,3-Dichlorobenzene	--	--	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
1,4-Dichlorobenzene	75	75	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
2,4-Dimethylphenol	292	1,860	µg/L	10.3 U	--	10.3 U	11.5 U	11.5 U	11.4 U	11.5 U	11.5 U	10.8 U	10.2 U	10.3 U	10.5 U
2,4-Dinitrophenol	31	202	µg/L	51.5 U	--	51.5 U	55.6 U	57.5 U	56.8 U	57.5 U	55.6 U	53.8 U	51.0 U	51.5 U	52.6 U
2-Methylphenol(o-Cresol)	744	4,780	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
3&4-Methylphenol(m&p Cresol)	744	4,770	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
4-Nitrophenol	--	--	µg/L	51.5 U	--	51.5 U	56.6 U	57.5 U	56.8 U	57.5 U	56.6 U	53.8 U	51.0 U	51.5 U	52.6 U
Di-n-butylphthalate	1,350	8,400	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
Diethylphthalate	12,200	79,000	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
Dimethylphthalate	--	--	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
Phenol	4,560	29,500	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
Pyridine	4.96	9.28	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
Quinoline	--	--	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U
bis(2-Ethylhexyl)phthalate	6.0	6.0	µg/L	10.3 U	--	10.3 U	11.1 U	11.5 U	11.4 U	11.5 U	11.1 U	10.8 U	10.2 U	10.3 U	10.5 U

Bold, italics = Compound was detected

Highlighted = Compound detected above Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound detected above both Residential/Non-Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound laboratory reporting limit above KDHE RSK screening value (refer to page 2-17).

KDHE = Kansas Department of Health and Environment

RSK = Risk-Based Screening Levels

-- = not sampled/analyzed/applicable

*C = degrees Celsius

mg/L = milligrams per Liter

mV = millivolts

NTU = Nephelometric Turbidity Units

s.u. = standard units

µg/L = micrograms per Liter

µmhos/cm = micromhos per centimeter

U = Compound was not detected (Lab qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

1e - The sample does not match a profile of laboratory standards. Hydrocarbon fractions are present from the early diesel fuel to late motor oil range. Quantification achieved using diesel fuel as a reference standard.

B - Analyte was detected in the associated method blank.

D9 - Dissolved result is greater than the total. Data is within laboratory control limits.

H2 - Extraction or preparation outside EPA holding time.

H6 - Analysis initiated outside of the 15 minute EPA recommended holding time.

L2 - Analyte recovery in LCS was below QC limits. Results for this analyte in associated samples may be biased low.

M1 - Matrix spike recovery exceeded QC limits. Batch accepted based on LCS recovery.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit

Notes:

1) The KDHE Tier 2 RSK value of 70 µg/L for cis-1,2-DCE (VOC) was applied as the screening level for 1,2-DCE (total). 1,2-DCE (total) is comprised of two isomers cis-1,2-DCE and trans-1,2-DCE, with the former having the more conservative screening level.

2) KDHE Risk-Based Standards for Kansas, RSK Manual, 5th Version, October 2010, Appendix A Tier 2 RSK-Based Summary Tables updated March 2014. http://www.kdheks.gov/remedial/download/RSK_Manual_14.pdf

3) Monitoring wells with observed sheen/product on bailer/rope following sampling did not sound for LNAPL when measured with interface probe.

TABLE 2-8
Summary of Groundwater Exceedances
Former Amoco Refinery
Neodesha, Kansas

Analytical Parameter Exceedances	Groundwater Sample Exceedances	Monitoring Well Exceedances	Percent Non-Detect	Detected VOC Concentration Range			
				Minimum (ug/L)	Minimum Well ID	Maximum (ug/L)	Maximum Well ID
pH Exceedances							
No pH Exceedances Detected							
Total Metal Exceedance Parameters							
Arsenic	17	15	50%	10.4	MW-147	71.2	MW-164
Lead	1	1	94%	10.9	MW-167	22.4	MW-166
Dissolved Metal Exceedance Parameters							
Arsenic	17	15	50%	11.3 D9	MW-147	70.5	MW-164
Barium	1	1	0%	28.0	MW-162	2,040 D9	MW-163
TPH GRO Exceedances (mg/L)							
GRO	14	13	59%	0.83	MW-173	92.9	MW-152
TPH DRO Exceedance Parameters (mg/L)							
Diesel Fuel	2	2	94%	1.8 H2	MW-151	2.0 H2	MW-171
TEH as Diesel No. 2	25	23	12%	0.44 1e	MW-146 MW-147	7.8	MW-161
VOC Exceedance Parameters							
1,2,4-Trimethylbenzene	9	6	72%	1.7	MW-160	4,690	MW-152
1,3,5-Trimethylbenzene	3	2	81%	1.7	MW-168	1,250	MW-152
Benzene	17	15	61%	0.99*	MW-155	8,930	MW-151
1,2-DCE/cis-1,2-DCE	3	2	83%	6.7	MW-153	3,000*	MW-154
Ethylbenzene	2	1	53%	1	MW-167	8,290	MW-152
Isopropylbenzene (Cumene)	2	1	47%	1.5	MW-157	495	MW-152
Methylene chloride	5	4	81%	6.2	MW-164	2,660	MW-163
n-Propylbenzene	1	1	44%	3.2	MW-149	1,140	MW-152
tert-Butyl Alcohol	2	2	72%	41.6	MW-157	685	MW-163
Tetrachloroethene	4	2	86%	2.5	MW-153	24*	MW-155
Trichloroethene	4	2	86%	1.9	MW-153	67*	MW-154
Vinyl chloride	5	2	86%	53	MW-155	1,900*	MW-154
Xylene (Total)	2	1	72%	4.4	MW-165	24,200	MW-152
SVOC Exceedance Parameters							
No SVOC Exceedances Detected							
PAH Exceedance Parameters							
1-Methylnaphthalene	19	17	44%	5.5	MW-172	139	MW-169
2-Methylnaphthalene	15	13	44%	2.6	MW-172	215	MW-169
Benzo(a)anthracene	1	1	97%	ND	--	0.33	MW-166
Benzo(a)pyrene	1	1	97%	ND	--	0.26	MW-166
Naphthalene	20	17	59%	0.54	MW-155	490	MW-152

*Result from KDHE split sample

Highlighted = Compound detected above Residential KDHE Tier 2 RSK Screening Level

Highlighted = Compound detected above both Residential/Non-Residential KDHE Tier 2 RSK Screening Level

mg/L = milligrams per liter

ug/L = micrograms per liter

Laboratory Qualifiers:

from the early

D9 - Dissolved result is greater than the total. Data is within laboratory control limits.

H2 - Extraction or preparation outside EPA holding time.

Notes:

1) For detailed summary of results and copies of the laboratory reports refer to Table 2-6 and Appendix L, respectively.

TABLE 2-9
Field Duplicate Groundwater Results
 Former Amoco Refinery
 Neodesha, Kansas

Sample ID:	MW-161	DUP-3		MW-145	DUP-2		MW-152/GW-01	MW-152		
Date:	11/7/2014	11/7/2014	Meets QC Criteria	11/6/2014	11/6/2014	Meets QC Criteria	11/4/2014	11/4/2014	Meets QC Criteria	
	Groundwater	Groundwater Duplicate of MW-161		Groundwater	Groundwater Duplicate of MW-145		Groundwater	Groundwater *Duplicate		
Units										
Water Quality Parameters										
pH	s.u.	7.2 H6	7.4 H6	Yes	7.0 H6	7.0 H6	Yes	7.0 H6	7.1 H6	Yes
Metals, Total										
Arsenic	µg/L	36.1	38.9	Yes	10.0 U	10.0 U	Yes	37.8	33.1	Yes
Barium	µg/L	673	678	Yes	128	124	Yes	576	500	Yes
All other Total Metals	µg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes
Metals, Dissolved										
Arsenic	µg/L	42.5 D9	38.4	Yes	10.0 U	10.0 U	Yes	33.8	32.4	Yes
Barium	µg/L	688 D9	690 D9	Yes	115	115	Yes	555	551 D9	Yes
All other Dissolved Metals	µg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes
TPH OA1 (GRO)										
Gasoline Range Organics	mg/L	10.0 U	10.0 U	Yes	0.50 U	0.50 U	Yes	90.0	92.9	Yes
TPH OA2 (DRO)										
TEH as Diesel No. 2	mg/L	7.8	7.6	Yes	0.40 U	0.47 1e	Yes	6.50 1e	6.80 1e	Yes
All other TPH DROs	mg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes
PAH										
1-Methylnaphthalene	µg/L	123	109	Yes	0.5 U	0.53 U	Yes	82.4	85.4	Yes
2-Methylnaphthalene	µg/L	195	172	Yes	0.5 U	0.53 U	Yes	136	145	Yes
Acenaphthene	µg/L	3.6	3.3	Yes	0.12	0.11 U	Yes	0.87	0.86	Yes
Acenaphthylene	µg/L	0.81	0.75	Yes	0.1 U	0.11 U	Yes	0.28	0.29	Yes
Anthracene	µg/L	1.3 B	1.2 B	Yes	0.1 U	0.11 U	Yes	0.16	0.1 U	Yes
Fluoranthene	µg/L	0.15 B	0.15 H2	Yes	0.1 U	0.11 U	Yes	0.10 U	0.1 U	Yes
Fluorene	µg/L	5.4	5.1	Yes	0.1 U	0.11 U	Yes	0.74	0.68	Yes
Naphthalene	µg/L	241	220	Yes	0.5 U	0.53 U	Yes	468	490	Yes
Phenanthrene	µg/L	8.2	7.5	Yes	0.5 U	0.53 U	Yes	0.94	0.74	Yes
Pyrene	µg/L	0.45	0.4	Yes	0.27	0.26	Yes	0.10 U	0.1 U	Yes
All other PAHs	µg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes
Volatile Organic Compounds										
1,1-Dichloroethane	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
1,1-Dichloroethene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
1,2,4-Trimethylbenzene	µg/L	139	156	Yes	1.0 U	1.0 U	Yes	4,690	4,450	Yes
1,2-Dichlorobenzene	µg/L	--	--	--	--	--	--	--	--	--
1,2-Dichloroethene (Total)	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
1,3,5-Trimethylbenzene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	1,250	1,160	Yes
Benzene	µg/L	1,660	1,710	Yes	1.0 U	1.0 U	Yes	4,380	4,230	Yes
Chlorobenzene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
Chloroethane	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
cis-1,2-Dichloroethene	µg/L	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	µg/L	--	--	--	--	--	--	--	--	--
Ethylbenzene	µg/L	287	348	Yes	1.0 U	1.0 U	Yes	8,290	8,050	Yes
Isopropylbenzene (Cumene)	µg/L	47.4	62.5	Yes	1.0 U	1.0 U	Yes	495	470	Yes
m,p-Xylene	µg/L	--	--	--	--	--	--	--	--	--
Methylene chloride	µg/L	85.8	74.1	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
n-Butylbenzene	µg/L	20.0 U	25.6	Yes	1.0 U	1.0 U	Yes	152	112	Yes
n-Propylbenzene	µg/L	58.5	75.4	Yes	1.0 U	1.0 U	Yes	1,140	1,080	Yes
p-Isopropyltoluene	µg/L	20.0 U	20.4	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
sec-Butylbenzene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	60.9	67.1	Yes
Tetrachloroethene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
Toluene	µg/L	23.6	25.9	Yes	1.0 U	1.0 U	Yes	491	477	Yes
trans-1,2-Dichloroethene	µg/L	--	--	--	--	--	--	--	--	--
Trichloroethene	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
Trichlorofluoromethane	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
Vinyl chloride	µg/L	20.0 U	20.0 U	Yes	1.0 U	1.0 U	Yes	50.0 U	50.0 U	Yes
Xylene (Total)	µg/L	134	167	Yes	3.0 U	3.0 U	Yes	24,200	23,600	Yes
All other VOCs	µg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes
Semi-Volatile Organic Compounds										
1,2-Dichlorobenzene	µg/L	10.8 U	10.8 U	Yes	10.8 U	10.6 U	Yes	10.5 U	10.3 U	Yes
Phenol	µg/L	10.8 U	11.4	Yes	10.8 U	10.6 U	Yes	10.5 U	10.3 U	Yes
All other SVOCs	µg/L	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes	Not Detected	Not Detected	Yes

Bold, italics = Compound was detected

STF = Sensitivity Test Failure
 QC = Quality Control
 RPD = Relative Percent Difference
 -- = not sampled/analyzed/applicable
 mg/L = milligrams per Liter
 s.u. = standard units
 µg/L = micrograms per Liter
 µmhos/cm = micromhos per centimeter
 U = Compound was not detected (Lab qualifier); value provided is lab reporting limit

RPD Calculation:

$$\%RPD = \left(\frac{|X_1 - X_2|}{X} \right) \times 100\%$$

X₁ = 1st Measurement
 X₂ = Duplicate
 X = Mean Value of X₁+X₂

Laboratory Qualifiers:

laboratory standards. Hydrocarbon fractions are present from the early
 B - Analyte was detected in the associated method blank.
 D9 - Dissolved result is greater than the total. Data is within laboratory control limits.
 H2 - Extraction or preparation outside EPA holding time.
 H6 - Analysis initiated outside of the 15 minute EPA recommended holding time.

Notes:

For field duplicates sampled at the same time and shipped to the lab for analysis by the same method; the following criteria were used:
 - If sample concentrations are greater than 5 times the detection limit, then the maximum allowable RPD is 20% for groundwater samples.
 - If sample concentrations are less than 5 times the detection limit, then a sensitivity test is applied. For the sensitivity test, the sample concentrations must agree with plus or minus (+) the lower detection limit for groundwater samples.
 For field splits with KDHE, data were reviewed to determine if the values were within a factor of 2 of each other.

TABLE 2-9 (continued)
Field Duplicate Groundwater Results
 Former Amoco Refinery
 Neodesha, Kansas

Sample ID: Date:	MW-154 11/4/2014 Groundwater	MW-154 11/4/2014 Groundwater	Meets QC Criteria	MW-155 11/4/2014 Groundwater	DUP-1 11/4/2014 Groundwater Duplicate of MW-155	Meets QC Criteria	MW-155 11/4/2014 Groundwater	MW-155 11/4/2014 Groundwater	Meets QC Criteria	
	Units	*KDHE Split					*KDHE Split			
Water Quality Parameters										
pH	s.u.	7.1 H6	--	Yes	6.8 H6	7.0 H6	Yes	6.8 H6	--	--
Metals, Total										
Arsenic	µg/L	10.0 U	--	--	10.0 U	10.0 U	Yes	10.0 U	--	--
Barium	µg/L	841	--	--	85.3	76.3	Yes	85.3	--	--
All other Total Metals	µg/L	Not Detected	Not Analyzed	--	Not Detected	Not Detected	--	Not Detected	Not Available	--
Metals, Dissolved										
Arsenic	µg/L	10.0 U	--	--	10.0 U	10.0 U	Yes	10.0 U	--	--
Barium	µg/L	800	--	--	67.0	65.8	Yes	67.0	--	--
All other Dissolved Metals	µg/L	Not Detected	Not Analyzed	--	Not Detected	Not Detected	--	Not Detected	Not Analyzed	--
TPH OA1 (GRO)										
Gasoline Range Organics	mg/L	25.0 U	--	--	2.5 U	2.5 U	Yes	2.5 U	--	--
TPH OA2 (DRO)										
TEH as Diesel No. 2	mg/L	0.82 1e,B	--	--	0.46 1e,B	0.57 1e,B	Yes	0.46 1e,B	--	--
All other TPH DROs	mg/L	Not Detected	Not Analyzed	--	Not Detected	Not Detected	--	Not Detected	Not Analyzed	--
PAH										
1-Methylnaphthalene	µg/L	14.3	--	--	0.50 U	0.50 U	Yes	0.50 U	--	--
2-Methylnaphthalene	µg/L	15.5	--	--	0.50 U	0.50 U	Yes	0.50 U	--	--
Acenaphthene	µg/L	1.8	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
Acenaphthylene	µg/L	0.28	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
Anthracene	µg/L	0.35	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
Fluoranthene	µg/L	0.1 U	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
Fluorene	µg/L	1.3	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
Naphthalene	µg/L	8.4	15	Yes	0.54	0.50 U	Yes	0.54	0.50 U	Yes
Phenanthrene	µg/L	1.0	--	--	0.50 U	0.50 U	Yes	0.50 U	--	--
Pyrene	µg/L	0.32	--	--	0.10 U	0.10 U	Yes	0.10 U	--	--
All other PAHs	µg/L	Not Detected	Not Analyzed	--	Not Detected	Not Detected	--	Not Detected	Not Analyzed	--
Volatile Organic Compounds										
1,1-Dichloroethane	µg/L	50.0 U	10.0 U	Yes	6.6	6.8	Yes	6.6	6.3	Yes
1,1-Dichloroethene	µg/L	50.0 U	10.0 U	Yes	1.8	1.9	Yes	1.8	1.7	Yes
1,2,4-Trimethylbenzene	µg/L	142	140	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
1,2-Dichlorobenzene	µg/L	--	61	--	--	--	--	--	3.5	--
1,2-Dichloroethene (Total)	µg/L	2,310	--	--	201	197	Yes	201	--	Yes
1,3,5-Trimethylbenzene	µg/L	50.0 U	26.0	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
Benzene	µg/L	50.0 U	11.0	Yes	1.1	1.1	Yes	1.1	0.99	Yes
Chlorobenzene	µg/L	50.0 U	21.0	Yes	1.1	1.2	Yes	1.1	1.2	Yes
Chloroethane	µg/L	50.0 U	10.0 U	Yes	1.5	1.2	Yes	1.5	1.1	Yes
cis-1,2-Dichloroethene	µg/L	--	3,000	--	--	--	--	--	220	--
Dichlorodifluoromethane	µg/L	--	10.0 U	--	--	--	--	--	4.7	--
Ethylbenzene	µg/L	52.8	37.0	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
Isopropylbenzene (Cumene)	µg/L	50.0 U	37.0	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
m,p-Xylene	µg/L	--	14.0	--	--	--	--	--	0.5 U	--
Methylene chloride	µg/L	50.0 U	--	--	1.0 U	1.0 U	Yes	1.0 U	--	--
n-Butylbenzene	µg/L	50.0 U	10.0 U	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
n-Propylbenzene	µg/L	81.9	94.0	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
p-Isopropyltoluene	µg/L	50.0 U	10.0 U	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
sec-Butylbenzene	µg/L	50.0 U	10.0 U	Yes	1.0 U	1.0 U	Yes	1.0 U	0.82	Yes
Tetrachloroethene	µg/L	50.0 U	21.0	Yes	18.6	20.2	Yes	18.6	24	Yes
Toluene	µg/L	50.0 U	10.0 U	Yes	1.0 U	1.0 U	Yes	1.0 U	0.5 U	Yes
trans-1,2-Dichloroethene	µg/L	--	10.0 U	--	--	--	--	--	1.1	--
Trichloroethene	µg/L	50.0 U	67.0	Yes	19	19.8	Yes	19	20	Yes
Trichlorofluoromethane	µg/L	50.0 U	10.0 U	Yes	10.6	11.2	Yes	10.6	9.3	Yes
Vinyl chloride	µg/L	1,330	1,900	Yes	52.4	53	Yes	52.4	64.0	Yes
Xylene (Total)	µg/L	150 U	20.0 U	Yes	3.0 U	3.0 U	Yes	3.0 U	1.0 U	Yes
All other VOCs	µg/L	Not Detected	Not Detected/Analyzed	--	Not Detected	Not Detected	Yes	Not Detected	Not Detected/Analyzed	--
Semi-Volatile Organic Compounds										
1,2-Dichlorobenzene	µg/L	33.4	--	--	10.3 U	10.3 U	Yes	10.3 U	--	--
Phenol	µg/L	10.5 U	--	--	10.3 U	10.3 U	Yes	10.3 U	--	--
All other SVOCs	µg/L	Not Detected	Not Analyzed	--	Not Detected	Not Detected	Yes	Not Detected	Not Analyzed	--

Bold, italics = Compound was detected

STF = Sensitivity Test Failure
 QC = Quality Control
 RPD = Relative Percent Difference
 -- = not sampled/analyzed/applicable
 mg/L = milligrams per Liter
 s.u. = standard units
 µg/L = micrograms per Liter
 µmhos/cm = micromhos per centimeter
 U = Compound was not detected (Lab qualifier); value provided is lab reporting limit

Laboratory Qualifiers:

laboratory standards. Hydrocarbon fractions are present from the early
 B - Analyte was detected in the associated method blank.
 D9 - Dissolved result is greater than the total. Data is within laboratory control limits.
 H2 - Extraction or preparation outside EPA holding time.
 H6 - Analysis initiated outside of the 15 minute EPA recommended holding time.

Notes:

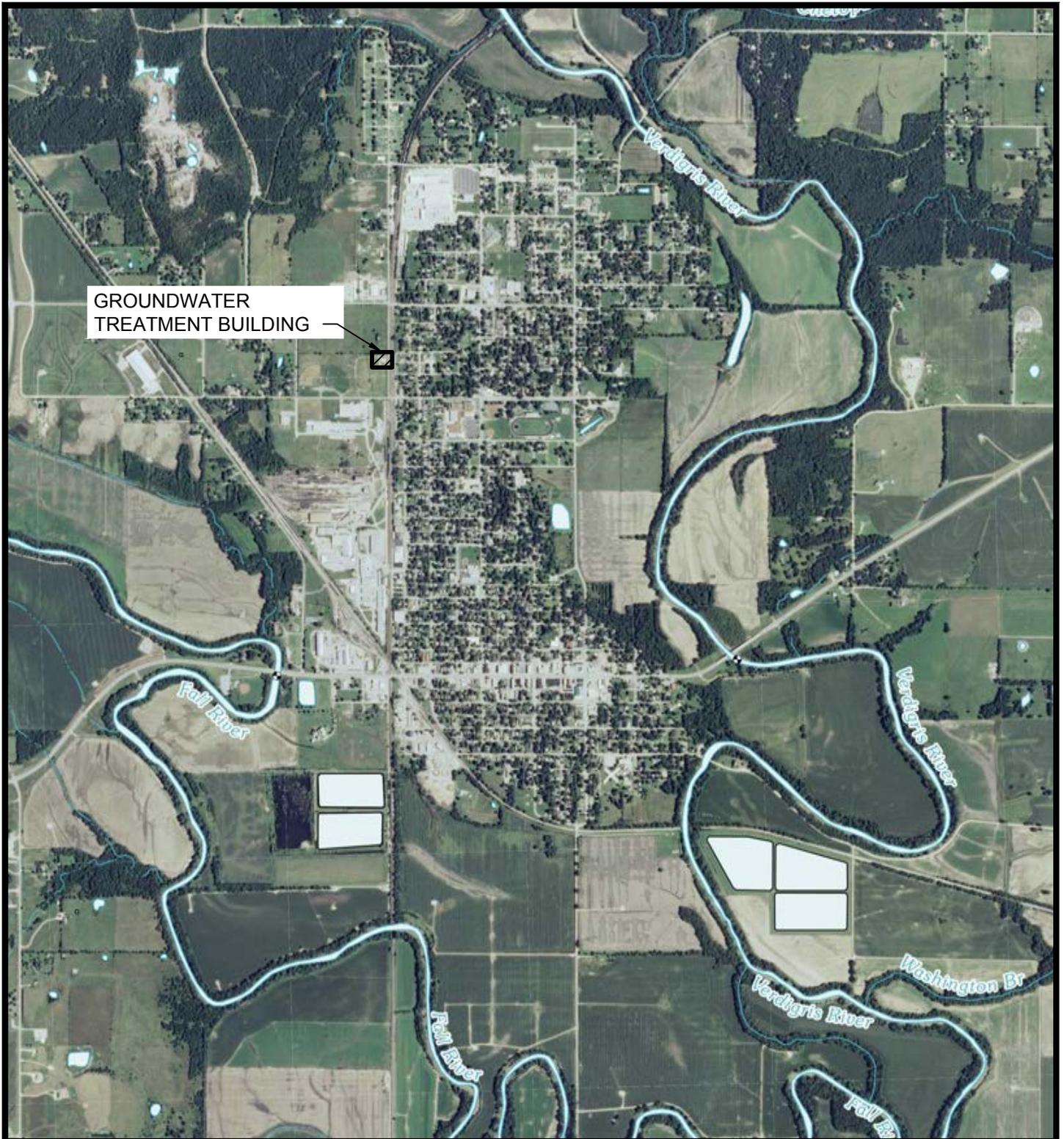
For field duplicates sampled at the same time and shipped to the lab for analysis by the same method; the following criteria were used:
 - If sample concentrations are greater than 5 times the detection limit, then the maximum allowable RPD is 20% for groundwater samples.
 - If sample concentrations are less than 5 times the detection limit, then a sensitivity test is applied. For the sensitivity test, the sample concentrations must agree with plus or minus (+) the lower detection limit for groundwater samples.
 For field splits with KDHE, data were reviewed to determine if the values were within a factor of 2 of each other.

RPD Calculation:

$$\%RPD = \left(\frac{|X_1 - X_2|}{X} \right) \times 100\%$$

X₁ = 1st Measurement
 X₂ = Duplicate
 X = Mean Value of X₁+X₂

FIGURES



NOTES:

- 1. SOURCE: 2012 USGS, NEODESHA, KS
7.5 MIN. NEODESHA QUADRANGLE

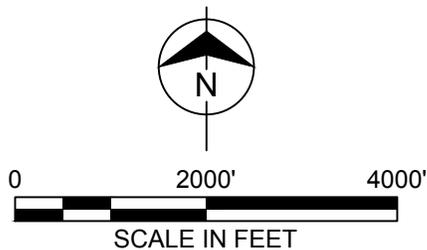
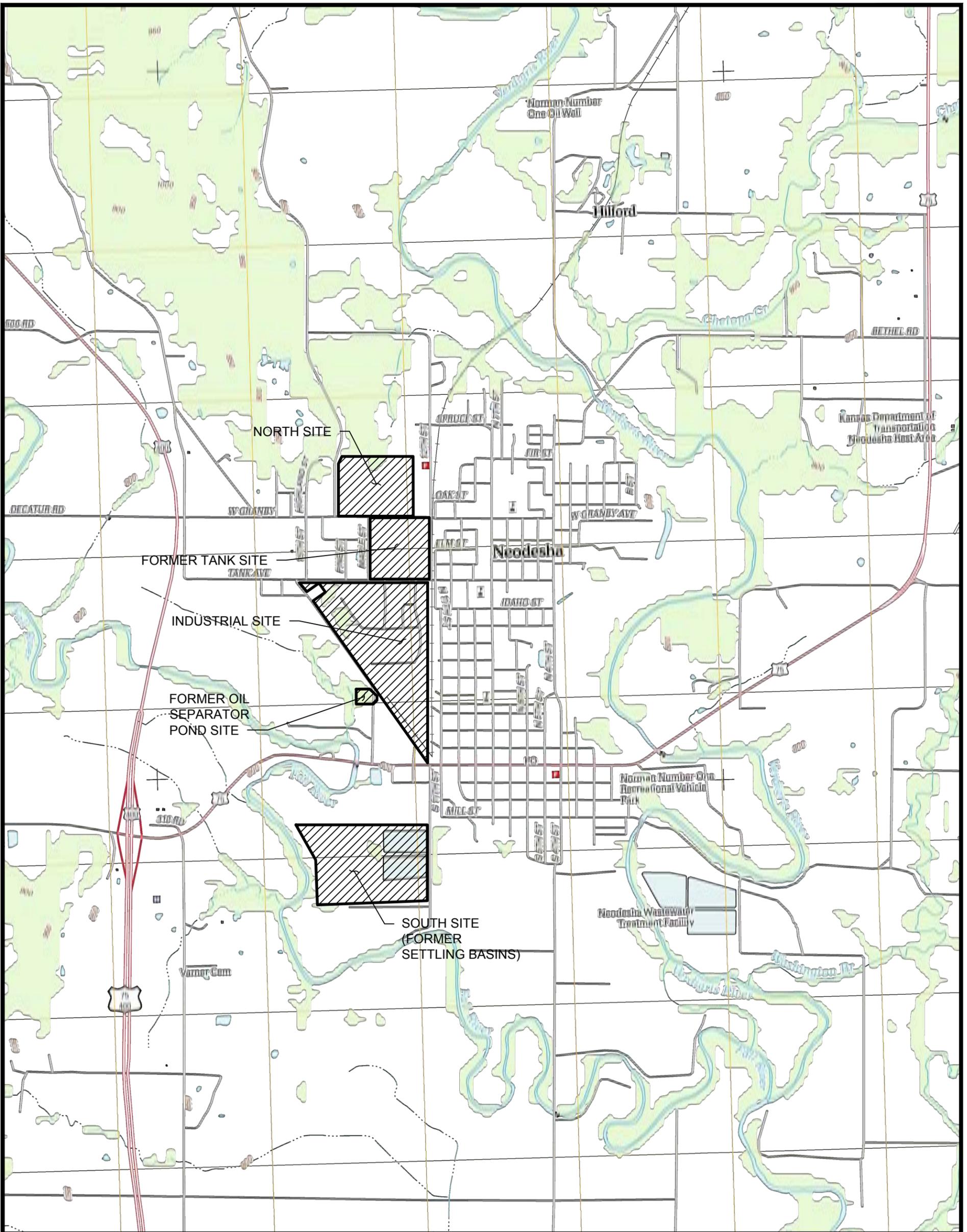


FIGURE 1-1
AERIAL SITE MAP
FORMER AMOCO REFINERY
NEODESHA, KS

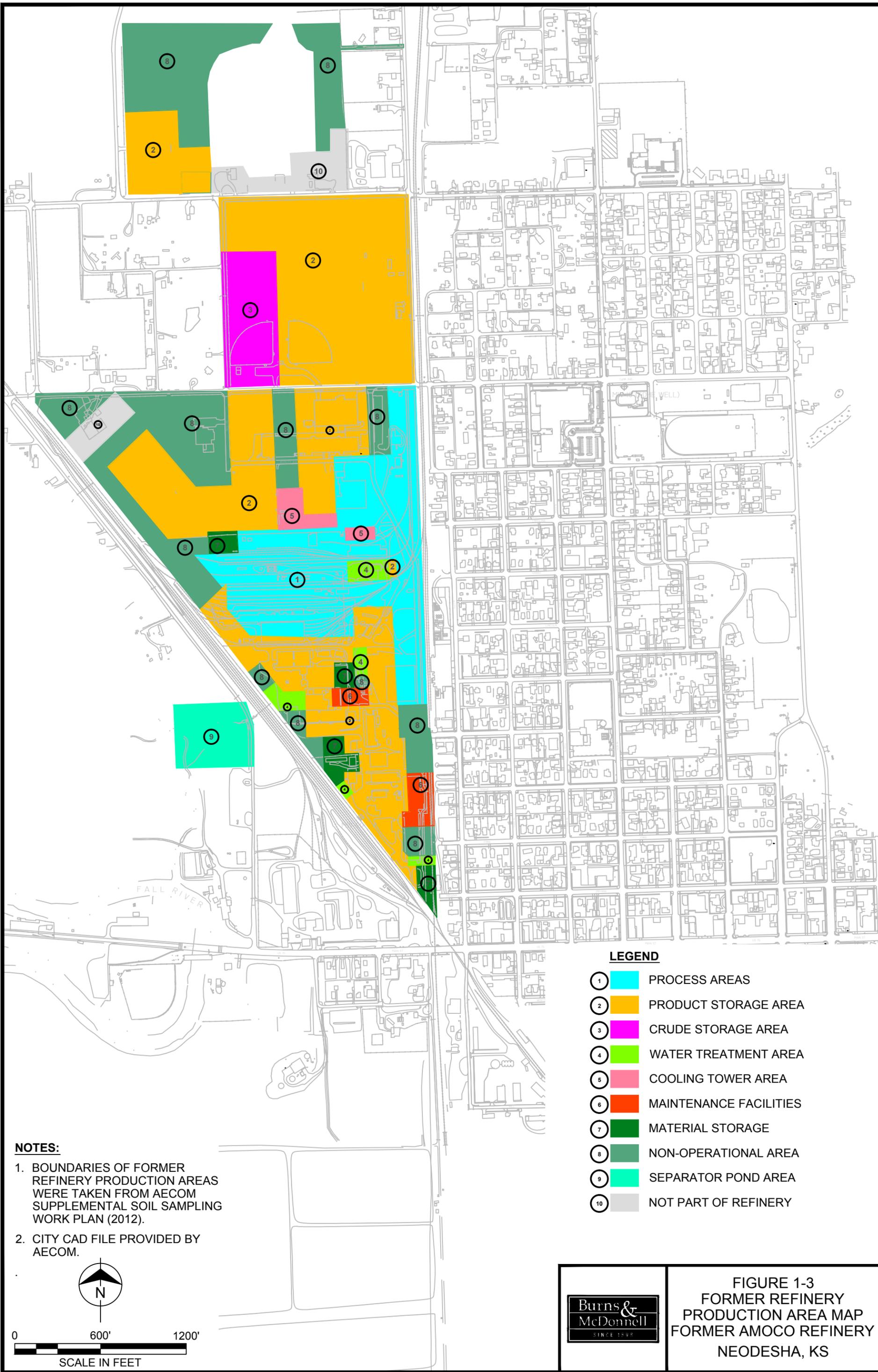


NOTES:

1. SOURCE: 2012 USGS, NEODESHA, KS 7.5 MIN. NEODESHA QUADRANGLE
2. FORMER REFINERY IS LOCATED IN PORTIONS OF THE SE 1/4 OF SECTION 18, E 1/4 OF SECTION 19, AND NE 1/4 OF SECTION 30, TOWNSHIP 30 SOUTH, RANGE 16 EAST.



**FIGURE 1-2
TOPOGRAPHIC SITE
MAP
FORMER AMOCO REFINERY
NEODESHA, KS**



NOTES:

1. BOUNDARIES OF FORMER REFINERY PRODUCTION AREAS WERE TAKEN FROM AECOM SUPPLEMENTAL SOIL SAMPLING WORK PLAN (2012).
2. CITY CAD FILE PROVIDED BY AECOM.

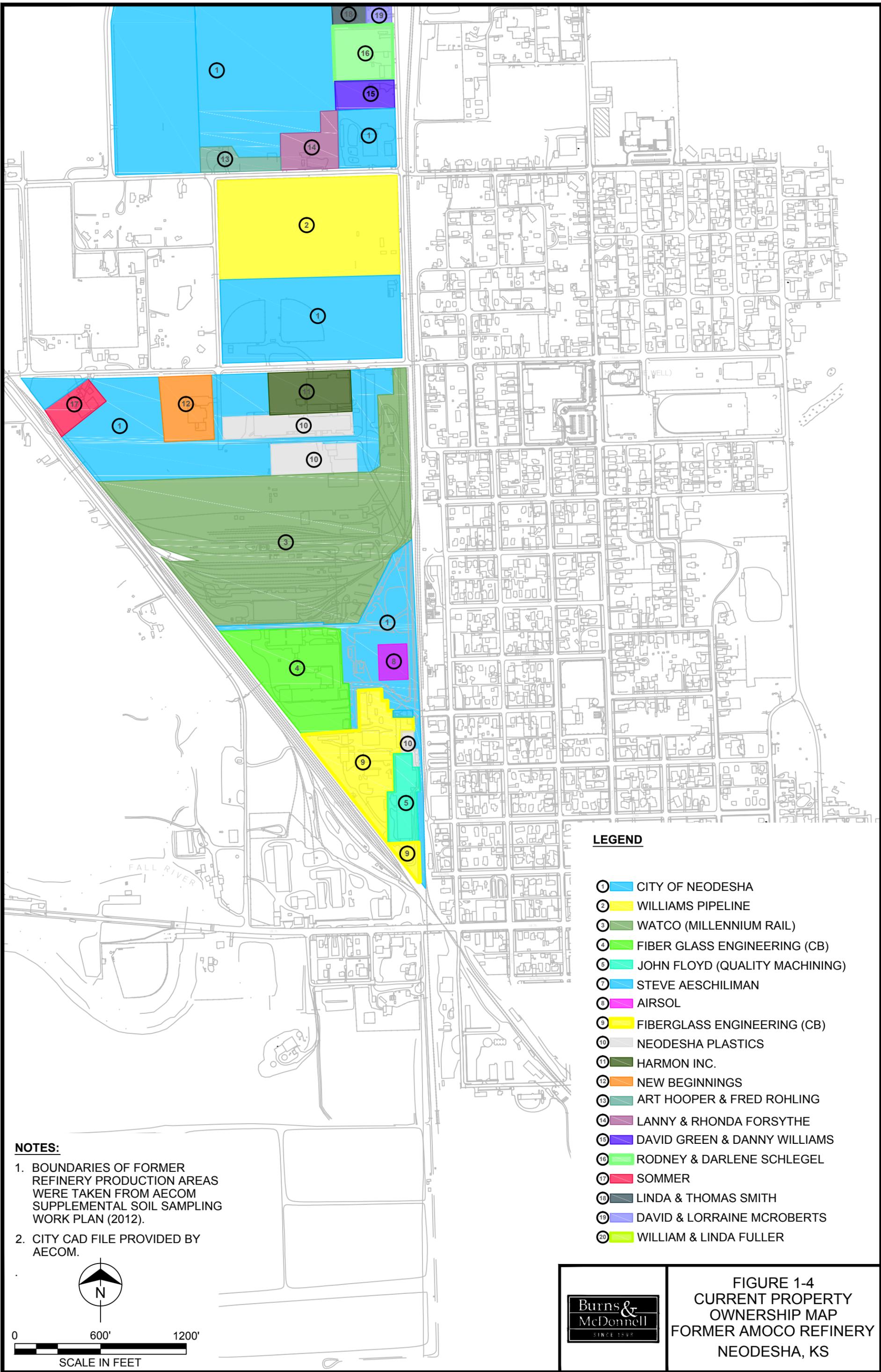


LEGEND

- ① PROCESS AREAS
- ② PRODUCT STORAGE AREA
- ③ CRUDE STORAGE AREA
- ④ WATER TREATMENT AREA
- ⑤ COOLING TOWER AREA
- ⑥ MAINTENANCE FACILITIES
- ⑦ MATERIAL STORAGE
- ⑧ NON-OPERATIONAL AREA
- ⑨ SEPARATOR POND AREA
- ⑩ NOT PART OF REFINERY



**FIGURE 1-3
FORMER REFINERY
PRODUCTION AREA MAP
FORMER AMOCO REFINERY
NEODESHA, KS**



LEGEND

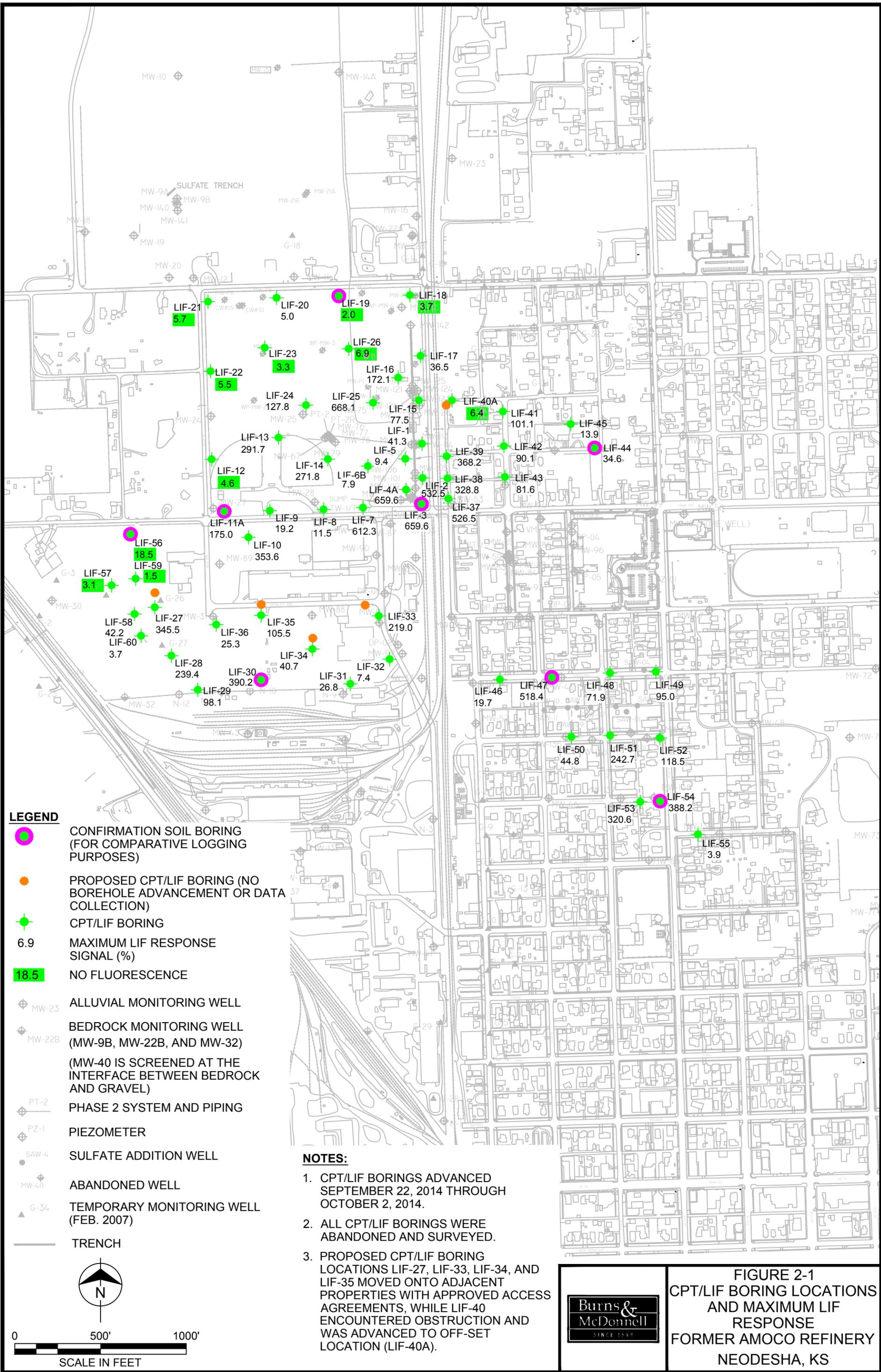
- ① CITY OF NEODESHA
- ② WILLIAMS PIPELINE
- ③ WATCO (MILLENNIUM RAIL)
- ④ FIBER GLASS ENGINEERING (CB)
- ⑤ JOHN FLOYD (QUALITY MACHINING)
- ⑦ STEVE AESCHILIMAN
- ⑧ AIRSOL
- ⑨ FIBERGLASS ENGINEERING (CB)
- ⑩ NEODESHA PLASTICS
- ⑪ HARMON INC.
- ⑫ NEW BEGINNINGS
- ⑬ ART HOOPER & FRED ROHLING
- ⑭ LANNY & RHONDA FORSYTHE
- ⑮ DAVID GREEN & DANNY WILLIAMS
- ⑯ RODNEY & DARLENE SCHLEGEL
- ⑰ SOMMER
- ⑱ LINDA & THOMAS SMITH
- ⑲ DAVID & LORRAINE MCROBERTS
- ⑳ WILLIAM & LINDA FULLER

NOTES:

1. BOUNDARIES OF FORMER REFINERY PRODUCTION AREAS WERE TAKEN FROM AECOM SUPPLEMENTAL SOIL SAMPLING WORK PLAN (2012).
2. CITY CAD FILE PROVIDED BY AECOM.



**FIGURE 1-4
CURRENT PROPERTY
OWNERSHIP MAP
FORMER AMOCO REFINERY
NEODESHA, KS**



LEGEND

- CONFIRMATION SOIL BORING (FOR COMPARATIVE LOGGING PURPOSES)
- PROPOSED CPT/LIF BORING (NO BOREHOLE ADVANCEMENT OR DATA COLLECTION)
- CPT/LIF BORING
- 6.9 MAXIMUM LIF RESPONSE SIGNAL (%)
- 18.5 NO FLUORESCENCE
- MW-23 ALLUVIAL MONITORING WELL
- MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
- PT-2 PHASE 2 SYSTEM AND PIPING
- PZ-1 PIEZOMETER
- SAW-4 SULFATE ADDITION WELL
- MW-40 ABANDONED WELL
- G-34 TEMPORARY MONITORING WELL (FEB. 2007)
- TRENCH

NOTES:

1. CPT/LIF BORINGS ADVANCED SEPTEMBER 22, 2014 THROUGH OCTOBER 2, 2014.
2. ALL CPT/LIF BORINGS WERE ABANDONED AND SURVEYED.
3. PROPOSED CPT/LIF BORING LOCATIONS LIF-27, LIF-33, LIF-34, AND LIF-35 MOVED ONTO ADJACENT PROPERTIES WITH APPROVED ACCESS AGREEMENTS, WHILE LIF-40 ENCOUNTERED OBSTRUCTION AND WAS ADVANCED TO OFF-SET LOCATION (LIF-40A).

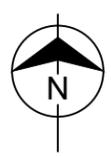
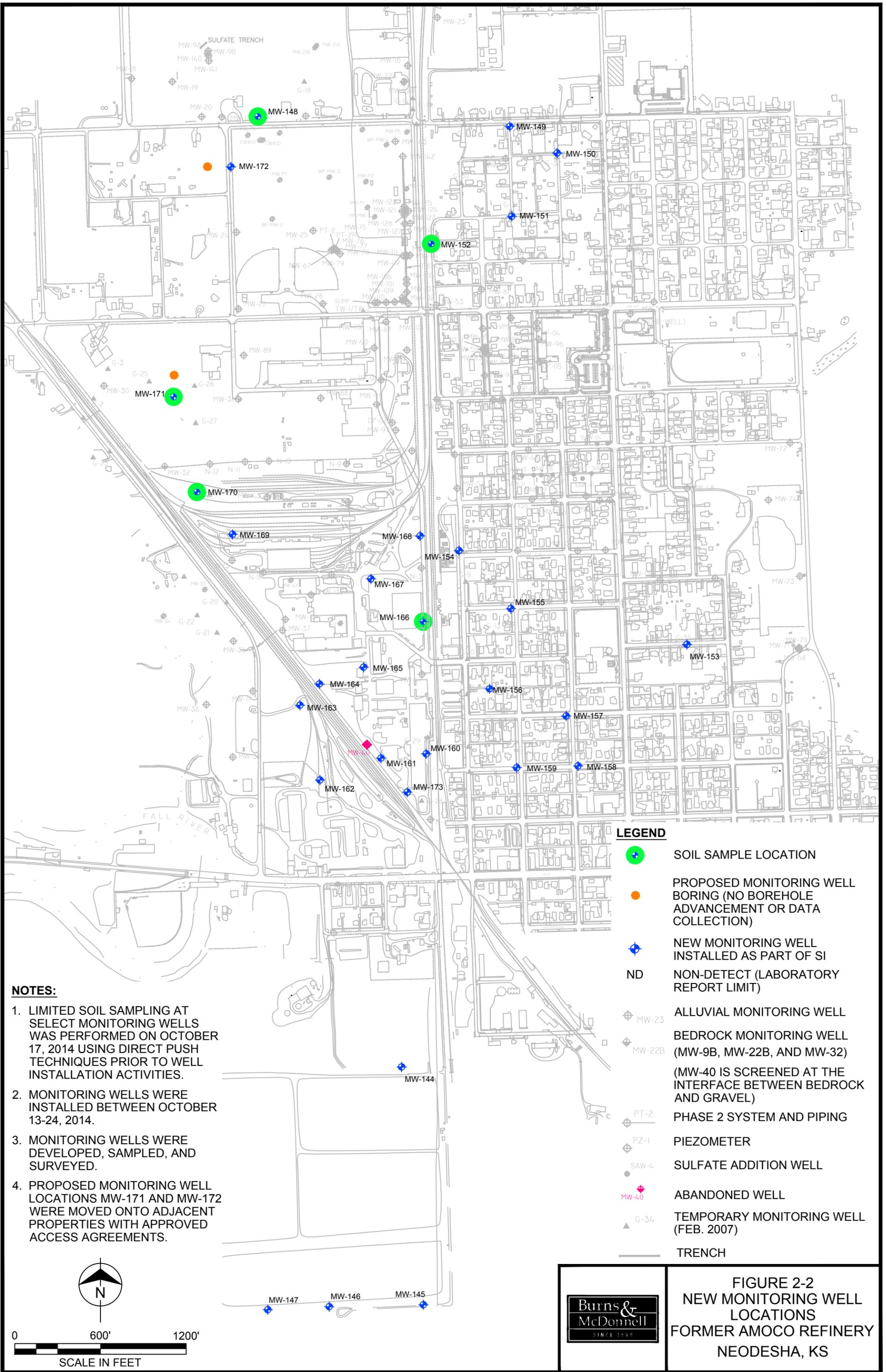


FIGURE 2-1
CPT/LIF BORING LOCATIONS
AND MAXIMUM LIF
RESPONSE
FORMER AMOCO REFINERY
NEODESHA, KS

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NOTES:

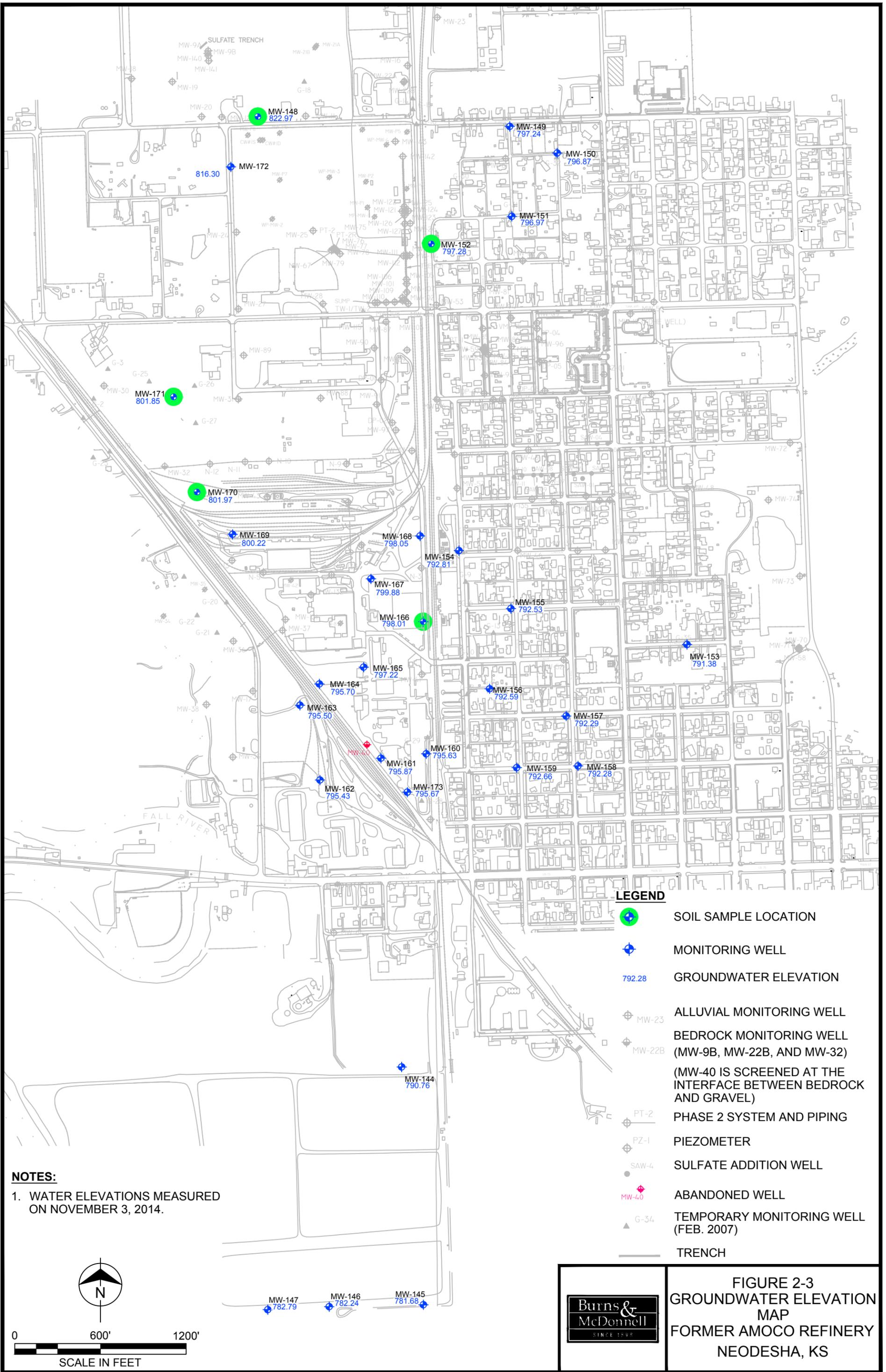
1. LIMITED SOIL SAMPLING AT SELECT MONITORING WELLS WAS PERFORMED ON OCTOBER 17, 2014 USING DIRECT PUSH TECHNIQUES PRIOR TO WELL INSTALLATION ACTIVITIES.
2. MONITORING WELLS WERE INSTALLED BETWEEN OCTOBER 13-24, 2014.
3. MONITORING WELLS WERE DEVELOPED, SAMPLED, AND SURVEYED.
4. PROPOSED MONITORING WELL LOCATIONS MW-171 AND MW-172 WERE MOVED ONTO ADJACENT PROPERTIES WITH APPROVED ACCESS AGREEMENTS.

LEGEND

- SOIL SAMPLE LOCATION
- PROPOSED MONITORING WELL BORING (NO BOREHOLE ADVANCEMENT OR DATA COLLECTION)
- NEW MONITORING WELL INSTALLED AS PART OF SI
- ND NON-DETECT (LABORATORY REPORT LIMIT)
- MW-23 ALLUVIAL MONITORING WELL
- MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
- PT-2 PHASE 2 SYSTEM AND PIPING
- PZ-1 PIEZOMETER
- SAW-4 SULFATE ADDITION WELL
- MW-40 ABANDONED WELL
- G-34 TEMPORARY MONITORING WELL (FEB. 2007)
- TRENCH



**FIGURE 2-2
NEW MONITORING WELL
LOCATIONS
FORMER AMOCO REFINERY
NEODESHA, KS**



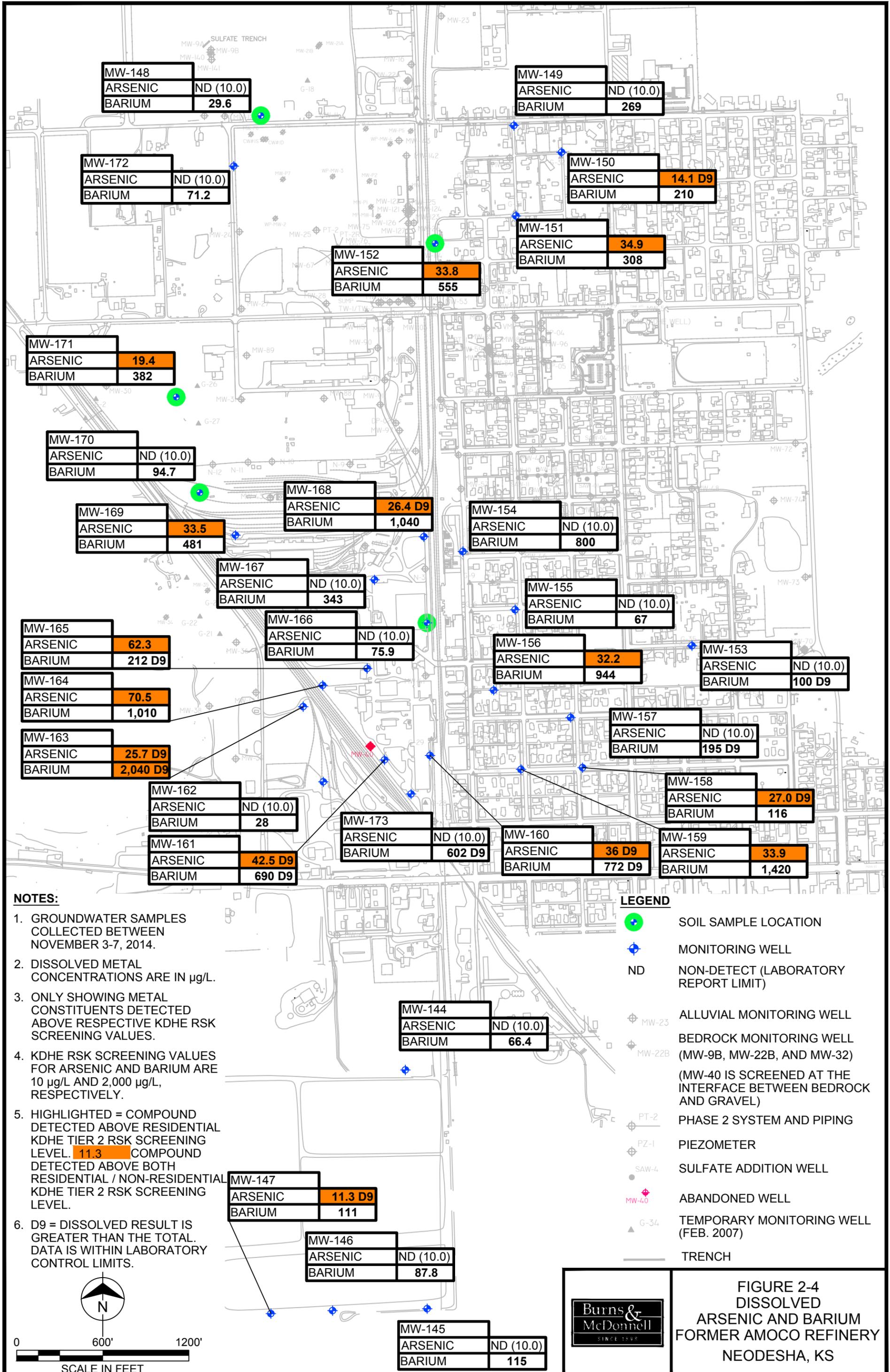


FIGURE 2-4
DISSOLVED
ARSENIC AND BARIUM
FORMER AMOCO REFINERY
NEODESHA, KS

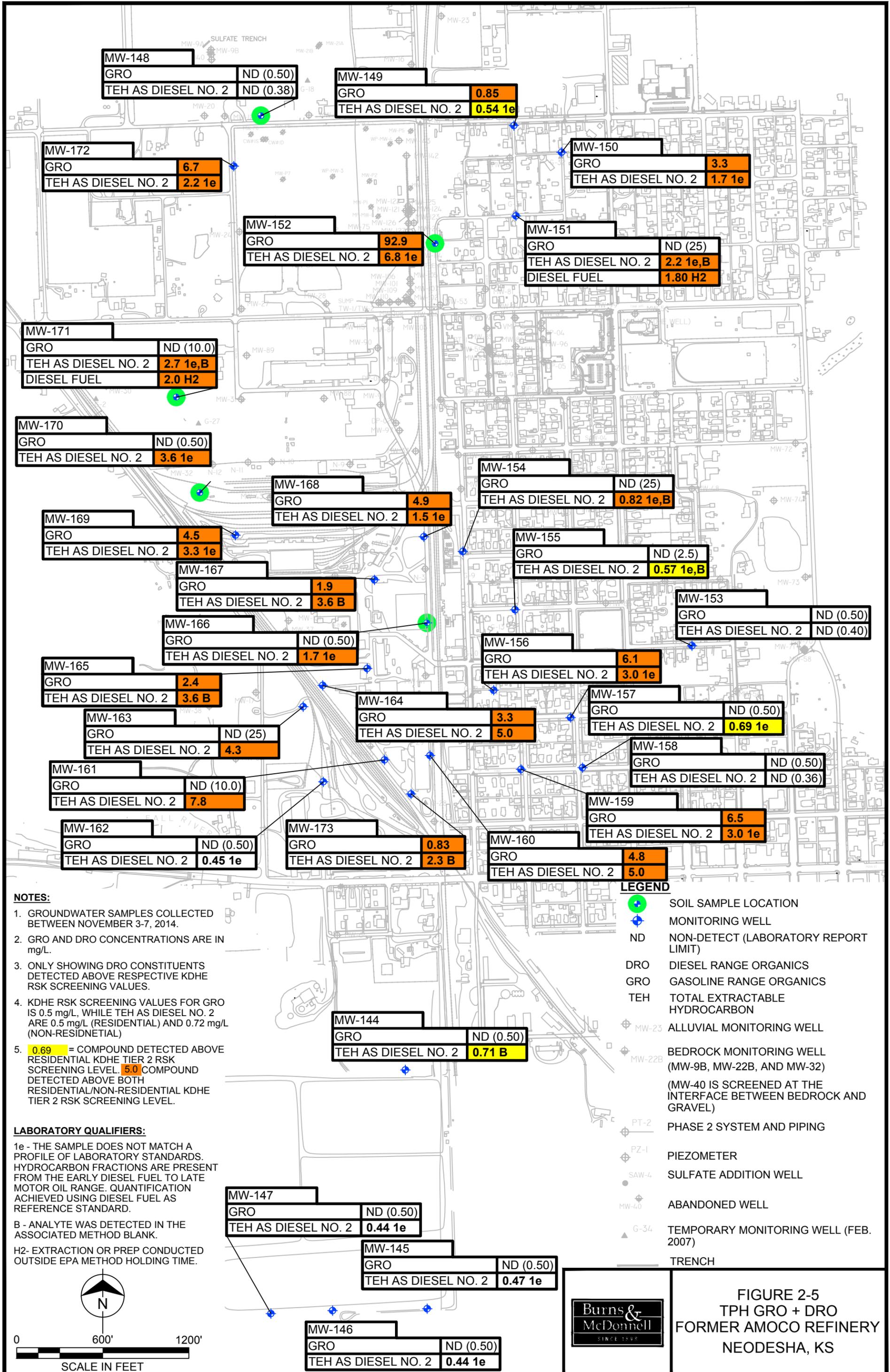
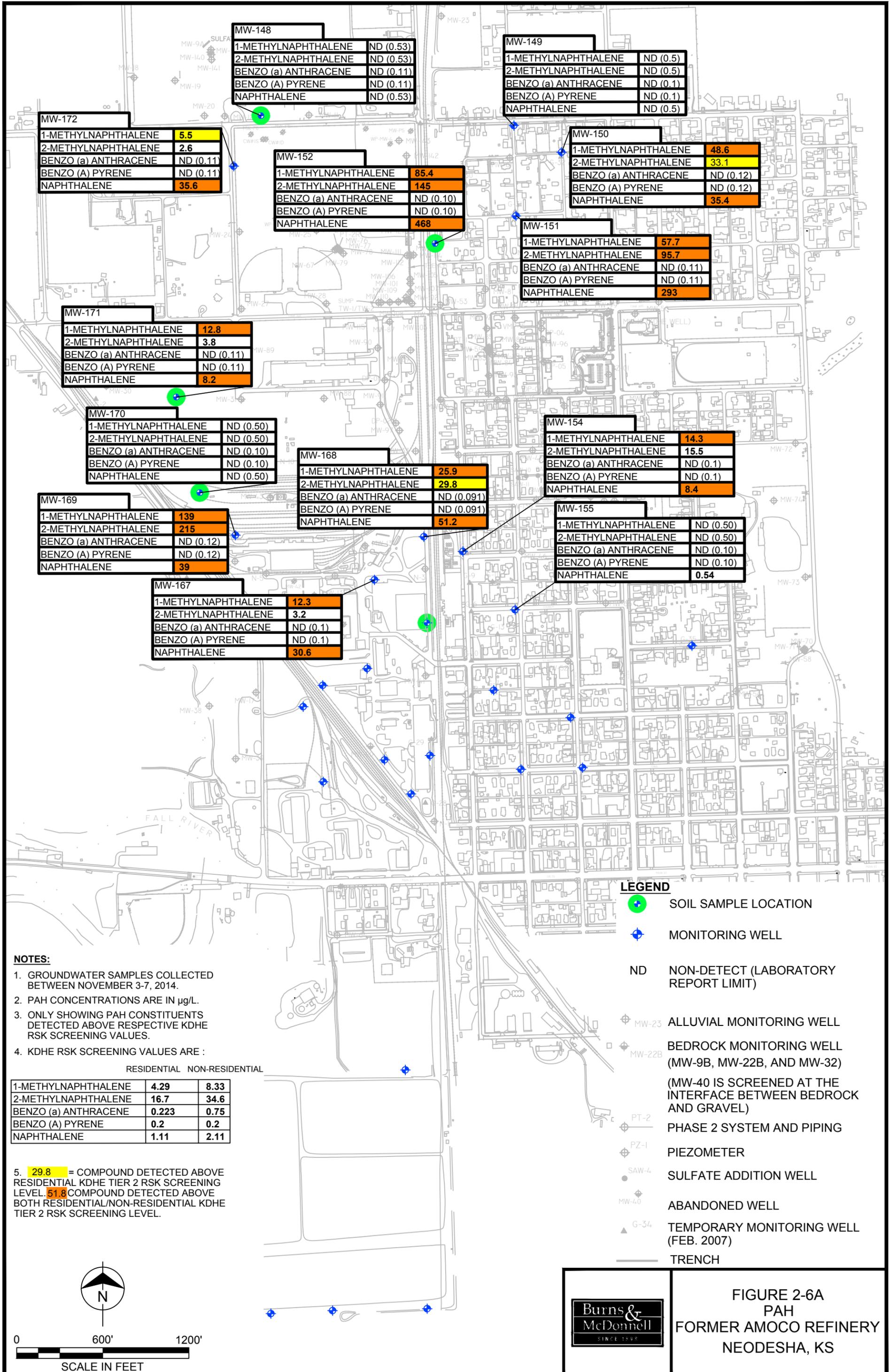


FIGURE 2-5
TPH GRO + DRO
FORMER AMOCO REFINERY
NEODESHA, KS



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MW-148

1-METHYLNAPHTHALENE	ND (0.53)
2-METHYLNAPHTHALENE	ND (0.53)
BENZO (a) ANTHRACENE	ND (0.11)
BENZO (A) PYRENE	ND (0.11)
NAPHTHALENE	ND (0.53)

MW-149

1-METHYLNAPHTHALENE	ND (0.5)
2-METHYLNAPHTHALENE	ND (0.5)
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	ND (0.5)

MW-172

1-METHYLNAPHTHALENE	5.5
2-METHYLNAPHTHALENE	2.6
BENZO (a) ANTHRACENE	ND (0.11)
BENZO (A) PYRENE	ND (0.11)
NAPHTHALENE	35.6

MW-152

1-METHYLNAPHTHALENE	85.4
2-METHYLNAPHTHALENE	145
BENZO (a) ANTHRACENE	ND (0.10)
BENZO (A) PYRENE	ND (0.10)
NAPHTHALENE	468

MW-150

1-METHYLNAPHTHALENE	48.6
2-METHYLNAPHTHALENE	33.1
BENZO (a) ANTHRACENE	ND (0.12)
BENZO (A) PYRENE	ND (0.12)
NAPHTHALENE	35.4

MW-151

1-METHYLNAPHTHALENE	57.7
2-METHYLNAPHTHALENE	95.7
BENZO (a) ANTHRACENE	ND (0.11)
BENZO (A) PYRENE	ND (0.11)
NAPHTHALENE	293

MW-171

1-METHYLNAPHTHALENE	12.8
2-METHYLNAPHTHALENE	3.8
BENZO (a) ANTHRACENE	ND (0.11)
BENZO (A) PYRENE	ND (0.11)
NAPHTHALENE	8.2

MW-170

1-METHYLNAPHTHALENE	ND (0.50)
2-METHYLNAPHTHALENE	ND (0.50)
BENZO (a) ANTHRACENE	ND (0.10)
BENZO (A) PYRENE	ND (0.10)
NAPHTHALENE	ND (0.50)

MW-168

1-METHYLNAPHTHALENE	25.9
2-METHYLNAPHTHALENE	29.8
BENZO (a) ANTHRACENE	ND (0.091)
BENZO (A) PYRENE	ND (0.091)
NAPHTHALENE	51.2

MW-154

1-METHYLNAPHTHALENE	14.3
2-METHYLNAPHTHALENE	15.5
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	8.4

MW-169

1-METHYLNAPHTHALENE	139
2-METHYLNAPHTHALENE	215
BENZO (a) ANTHRACENE	ND (0.12)
BENZO (A) PYRENE	ND (0.12)
NAPHTHALENE	39

MW-155

1-METHYLNAPHTHALENE	ND (0.50)
2-METHYLNAPHTHALENE	ND (0.50)
BENZO (a) ANTHRACENE	ND (0.10)
BENZO (A) PYRENE	ND (0.10)
NAPHTHALENE	0.54

MW-167

1-METHYLNAPHTHALENE	12.3
2-METHYLNAPHTHALENE	3.2
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	30.6

LEGEND

- SOIL SAMPLE LOCATION
- MONITORING WELL
- ND NON-DETECT (LABORATORY REPORT LIMIT)
- MW-23 ALLUVIAL MONITORING WELL
- MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
- PT-2 PHASE 2 SYSTEM AND PIPING
- PZ-1 PIEZOMETER
- SAW-4 SULFATE ADDITION WELL
- MW-40 ABANDONED WELL
- G-34 TEMPORARY MONITORING WELL (FEB. 2007)
- TRENCH

NOTES:

1. GROUNDWATER SAMPLES COLLECTED BETWEEN NOVEMBER 3-7, 2014.
2. PAH CONCENTRATIONS ARE IN µg/L.
3. ONLY SHOWING PAH CONSTITUENTS DETECTED ABOVE RESPECTIVE KDHE RSK SCREENING VALUES.
4. KDHE RSK SCREENING VALUES ARE :

RESIDENTIAL NON-RESIDENTIAL

1-METHYLNAPHTHALENE	4.29	8.33
2-METHYLNAPHTHALENE	16.7	34.6
BENZO (a) ANTHRACENE	0.223	0.75
BENZO (A) PYRENE	0.2	0.2
NAPHTHALENE	1.11	2.11

5. **29.8** = COMPOUND DETECTED ABOVE RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL. **51.8** COMPOUND DETECTED ABOVE BOTH RESIDENTIAL/NON-RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL.

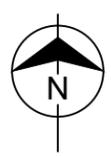
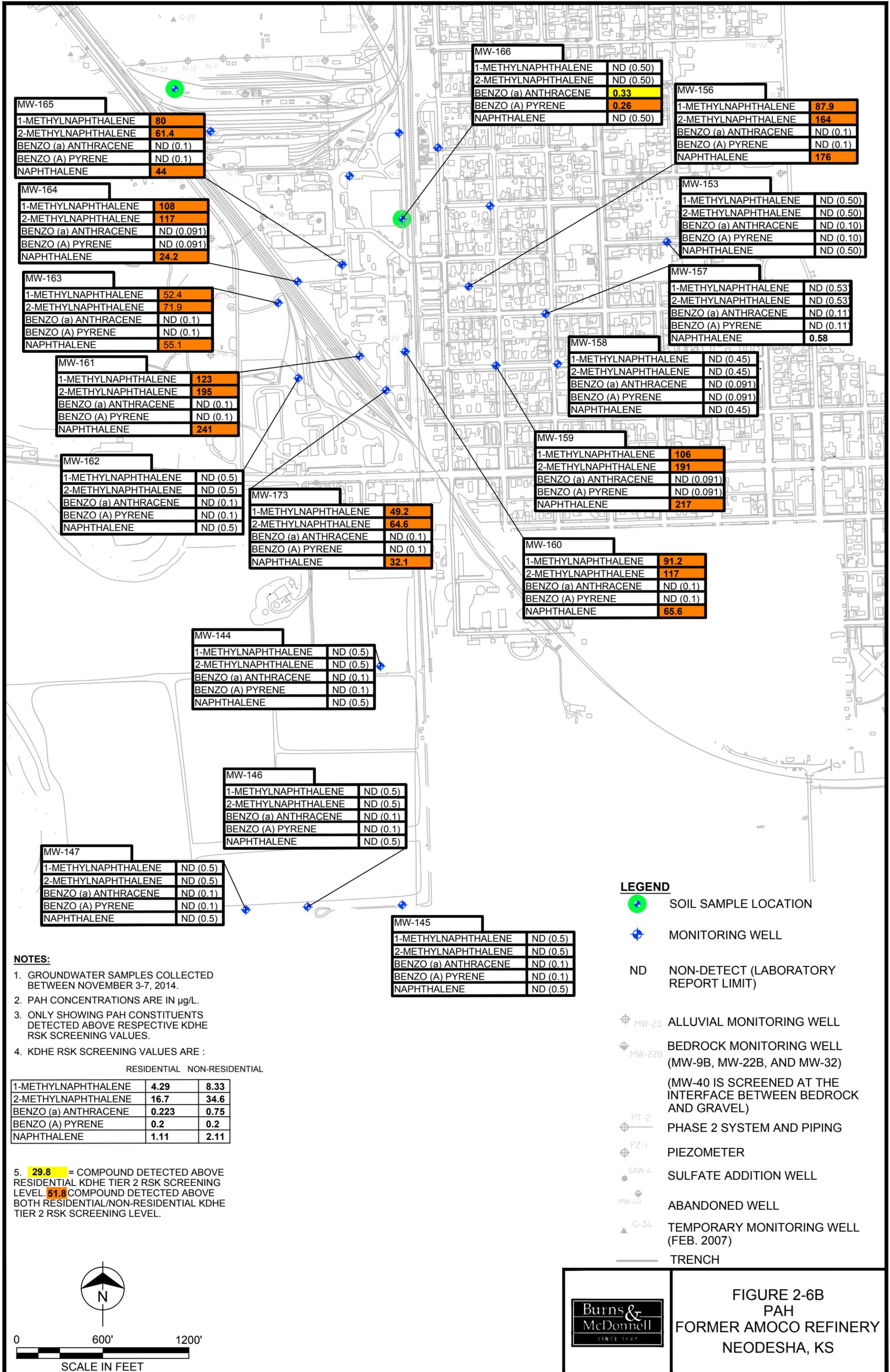


FIGURE 2-6A
PAH
FORMER AMOCO REFINERY
NEODESHA, KS



MW-165	
1-METHYLNAPHTHALENE	80
2-METHYLNAPHTHALENE	61.4
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	44

MW-164	
1-METHYLNAPHTHALENE	108
2-METHYLNAPHTHALENE	117
BENZO (a) ANTHRACENE	ND (0.091)
BENZO (A) PYRENE	ND (0.091)
NAPHTHALENE	24.2

MW-163	
1-METHYLNAPHTHALENE	52.4
2-METHYLNAPHTHALENE	71.9
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	55.1

MW-161	
1-METHYLNAPHTHALENE	123
2-METHYLNAPHTHALENE	195
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	241

MW-162	
1-METHYLNAPHTHALENE	ND (0.5)
2-METHYLNAPHTHALENE	ND (0.5)
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	ND (0.5)

MW-173	
1-METHYLNAPHTHALENE	49.2
2-METHYLNAPHTHALENE	64.6
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	32.1

MW-144	
1-METHYLNAPHTHALENE	ND (0.5)
2-METHYLNAPHTHALENE	ND (0.5)
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	ND (0.5)

MW-146	
1-METHYLNAPHTHALENE	ND (0.5)
2-METHYLNAPHTHALENE	ND (0.5)
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	ND (0.5)

MW-147	
1-METHYLNAPHTHALENE	ND (0.5)
2-METHYLNAPHTHALENE	ND (0.5)
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	ND (0.5)

MW-166	
1-METHYLNAPHTHALENE	ND (0.50)
2-METHYLNAPHTHALENE	ND (0.50)
BENZO (a) ANTHRACENE	0.33
BENZO (A) PYRENE	0.26
NAPHTHALENE	ND (0.50)

MW-156	
1-METHYLNAPHTHALENE	87.9
2-METHYLNAPHTHALENE	164
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	176

MW-153	
1-METHYLNAPHTHALENE	ND (0.50)
2-METHYLNAPHTHALENE	ND (0.50)
BENZO (a) ANTHRACENE	ND (0.10)
BENZO (A) PYRENE	ND (0.10)
NAPHTHALENE	ND (0.50)

MW-157	
1-METHYLNAPHTHALENE	ND (0.53)
2-METHYLNAPHTHALENE	ND (0.53)
BENZO (a) ANTHRACENE	ND (0.11)
BENZO (A) PYRENE	ND (0.11)
NAPHTHALENE	0.58

MW-158	
1-METHYLNAPHTHALENE	ND (0.45)
2-METHYLNAPHTHALENE	ND (0.45)
BENZO (a) ANTHRACENE	ND (0.091)
BENZO (A) PYRENE	ND (0.091)
NAPHTHALENE	ND (0.45)

MW-159	
1-METHYLNAPHTHALENE	106
2-METHYLNAPHTHALENE	191
BENZO (a) ANTHRACENE	ND (0.091)
BENZO (A) PYRENE	ND (0.091)
NAPHTHALENE	217

MW-160	
1-METHYLNAPHTHALENE	91.2
2-METHYLNAPHTHALENE	117
BENZO (a) ANTHRACENE	ND (0.1)
BENZO (A) PYRENE	ND (0.1)
NAPHTHALENE	65.6

- LEGEND**
- SOIL SAMPLE LOCATION
 - MONITORING WELL
 - ND NON-DETECT (LABORATORY REPORT LIMIT)
 - MW-23 ALLUVIAL MONITORING WELL
 - MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
 - PT-2 PHASE 2 SYSTEM AND PIPING
 - PZ-1 PIEZOMETER
 - SAW-4 SULFATE ADDITION WELL
 - MW-40 ABANDONED WELL
 - G-34 TEMPORARY MONITORING WELL (FEB. 2007)
 - TRENCH

- NOTES:**
- GROUNDWATER SAMPLES COLLECTED BETWEEN NOVEMBER 3-7, 2014.
 - PAH CONCENTRATIONS ARE IN µg/L.
 - ONLY SHOWING PAH CONSTITUENTS DETECTED ABOVE RESPECTIVE KDHE RSK SCREENING VALUES.
 - KDHE RSK SCREENING VALUES ARE :

	RESIDENTIAL	NON-RESIDENTIAL
1-METHYLNAPHTHALENE	4.29	8.33
2-METHYLNAPHTHALENE	16.7	34.6
BENZO (a) ANTHRACENE	0.223	0.75
BENZO (A) PYRENE	0.2	0.2
NAPHTHALENE	1.11	2.11

5. **29.8** = COMPOUND DETECTED ABOVE RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL. **51.8** COMPOUND DETECTED ABOVE BOTH RESIDENTIAL/NON-RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL.

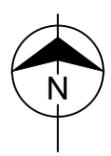
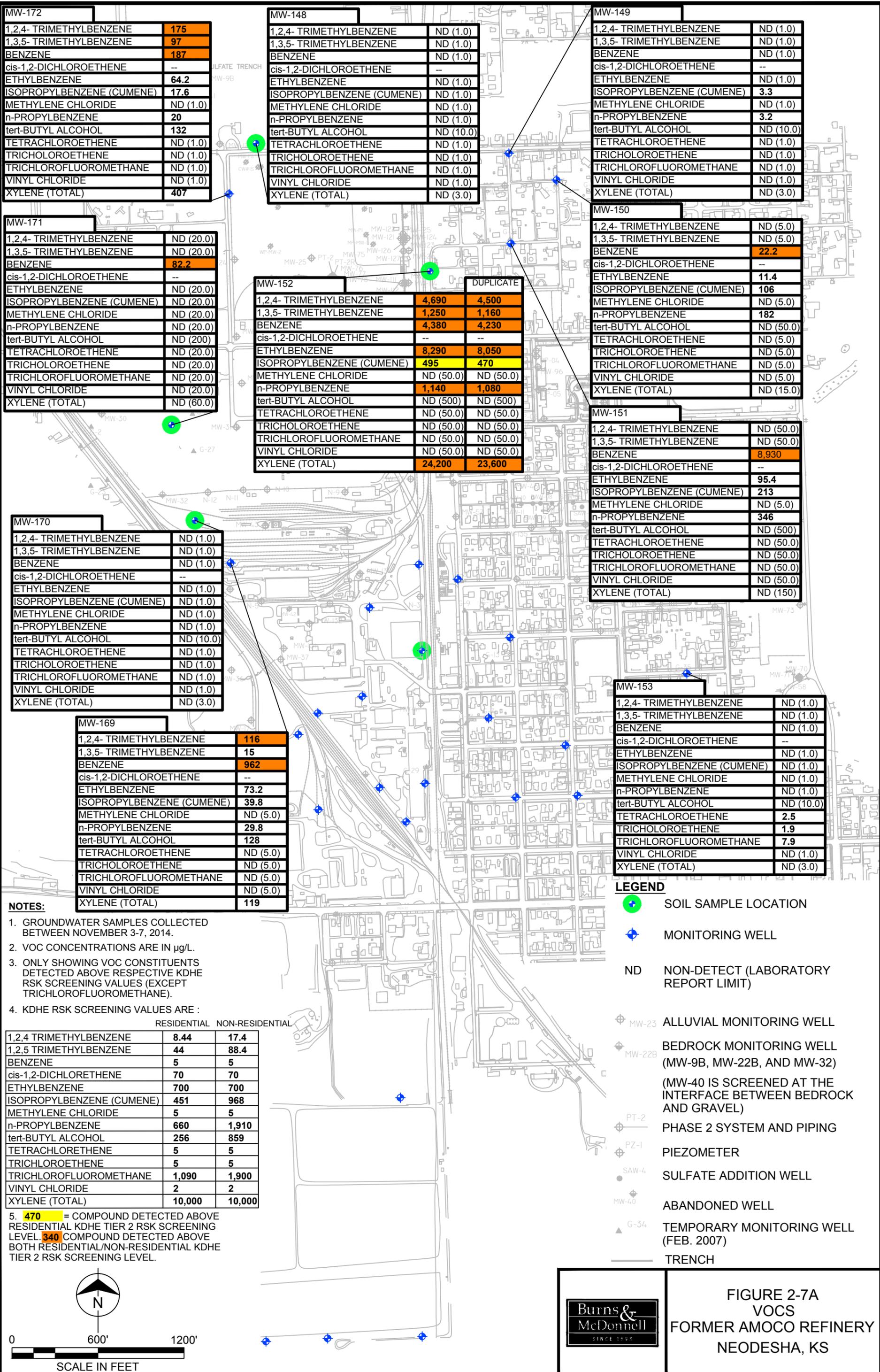


FIGURE 2-6B
PAH
FORMER AMOCO REFINERY
NEODESHA, KS

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MW-172	
1,2,4- TRIMETHYLBENZENE	175
1,3,5- TRIMETHYLBENZENE	97
BENZENE	187
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	64.2
ISOPROPYLBENZENE (CUMENE)	17.6
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	20
tert-BUTYL ALCOHOL	132
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	407

MW-148	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-149	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	3.3
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	3.2
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-171	
1,2,4- TRIMETHYLBENZENE	ND (20.0)
1,3,5- TRIMETHYLBENZENE	ND (20.0)
BENZENE	82.2
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (20.0)
ISOPROPYLBENZENE (CUMENE)	ND (20.0)
METHYLENE CHLORIDE	ND (20.0)
n-PROPYLBENZENE	ND (20.0)
tert-BUTYL ALCOHOL	ND (200)
TETRACHLOROETHENE	ND (20.0)
TRICHLOROETHENE	ND (20.0)
TRICHLOROFLUOROMETHANE	ND (20.0)
VINYL CHLORIDE	ND (20.0)
XYLENE (TOTAL)	ND (60.0)

MW-152		DUPLICATE
1,2,4- TRIMETHYLBENZENE	4,690	4,500
1,3,5- TRIMETHYLBENZENE	1,250	1,160
BENZENE	4,380	4,230
cis-1,2-DICHLOROETHENE	--	--
ETHYLBENZENE	8,290	8,050
ISOPROPYLBENZENE (CUMENE)	495	470
METHYLENE CHLORIDE	ND (50.0)	ND (50.0)
n-PROPYLBENZENE	1,140	1,080
tert-BUTYL ALCOHOL	ND (500)	ND (500)
TETRACHLOROETHENE	ND (50.0)	ND (50.0)
TRICHLOROETHENE	ND (50.0)	ND (50.0)
TRICHLOROFLUOROMETHANE	ND (50.0)	ND (50.0)
VINYL CHLORIDE	ND (50.0)	ND (50.0)
XYLENE (TOTAL)	24,200	23,600

MW-150	
1,2,4- TRIMETHYLBENZENE	ND (5.0)
1,3,5- TRIMETHYLBENZENE	ND (5.0)
BENZENE	22.2
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	11.4
ISOPROPYLBENZENE (CUMENE)	106
METHYLENE CHLORIDE	ND (5.0)
n-PROPYLBENZENE	182
tert-BUTYL ALCOHOL	ND (50.0)
TETRACHLOROETHENE	ND (5.0)
TRICHLOROETHENE	ND (5.0)
TRICHLOROFLUOROMETHANE	ND (5.0)
VINYL CHLORIDE	ND (5.0)
XYLENE (TOTAL)	ND (15.0)

MW-151	
1,2,4- TRIMETHYLBENZENE	ND (50.0)
1,3,5- TRIMETHYLBENZENE	ND (50.0)
BENZENE	8,930
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	95.4
ISOPROPYLBENZENE (CUMENE)	213
METHYLENE CHLORIDE	ND (5.0)
n-PROPYLBENZENE	346
tert-BUTYL ALCOHOL	ND (500)
TETRACHLOROETHENE	ND (50.0)
TRICHLOROETHENE	ND (50.0)
TRICHLOROFLUOROMETHANE	ND (50.0)
VINYL CHLORIDE	ND (50.0)
XYLENE (TOTAL)	ND (150)

MW-170	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-169	
1,2,4- TRIMETHYLBENZENE	116
1,3,5- TRIMETHYLBENZENE	15
BENZENE	962
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	73.2
ISOPROPYLBENZENE (CUMENE)	39.8
METHYLENE CHLORIDE	ND (5.0)
n-PROPYLBENZENE	29.8
tert-BUTYL ALCOHOL	128
TETRACHLOROETHENE	ND (5.0)
TRICHLOROETHENE	ND (5.0)
TRICHLOROFLUOROMETHANE	ND (5.0)
VINYL CHLORIDE	ND (5.0)
XYLENE (TOTAL)	119

MW-153	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	2.5
TRICHLOROETHENE	1.9
TRICHLOROFLUOROMETHANE	7.9
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

- NOTES:**
- GROUNDWATER SAMPLES COLLECTED BETWEEN NOVEMBER 3-7, 2014.
 - VOC CONCENTRATIONS ARE IN µg/L.
 - ONLY SHOWING VOC CONSTITUENTS DETECTED ABOVE RESPECTIVE KDHE RSK SCREENING VALUES (EXCEPT TRICHLOROFLUOROMETHANE).
 - KDHE RSK SCREENING VALUES ARE :

	RESIDENTIAL	NON-RESIDENTIAL
1,2,4 TRIMETHYLBENZENE	8.44	17.4
1,2,5 TRIMETHYLBENZENE	44	88.4
BENZENE	5	5
cis-1,2-DICHLOROETHENE	70	70
ETHYLBENZENE	700	700
ISOPROPYLBENZENE (CUMENE)	451	968
METHYLENE CHLORIDE	5	5
n-PROPYLBENZENE	660	1,910
tert-BUTYL ALCOHOL	256	859
TETRACHLOROETHENE	5	5
TRICHLOROETHENE	5	5
TRICHLOROFLUOROMETHANE	1,090	1,900
VINYL CHLORIDE	2	2
XYLENE (TOTAL)	10,000	10,000

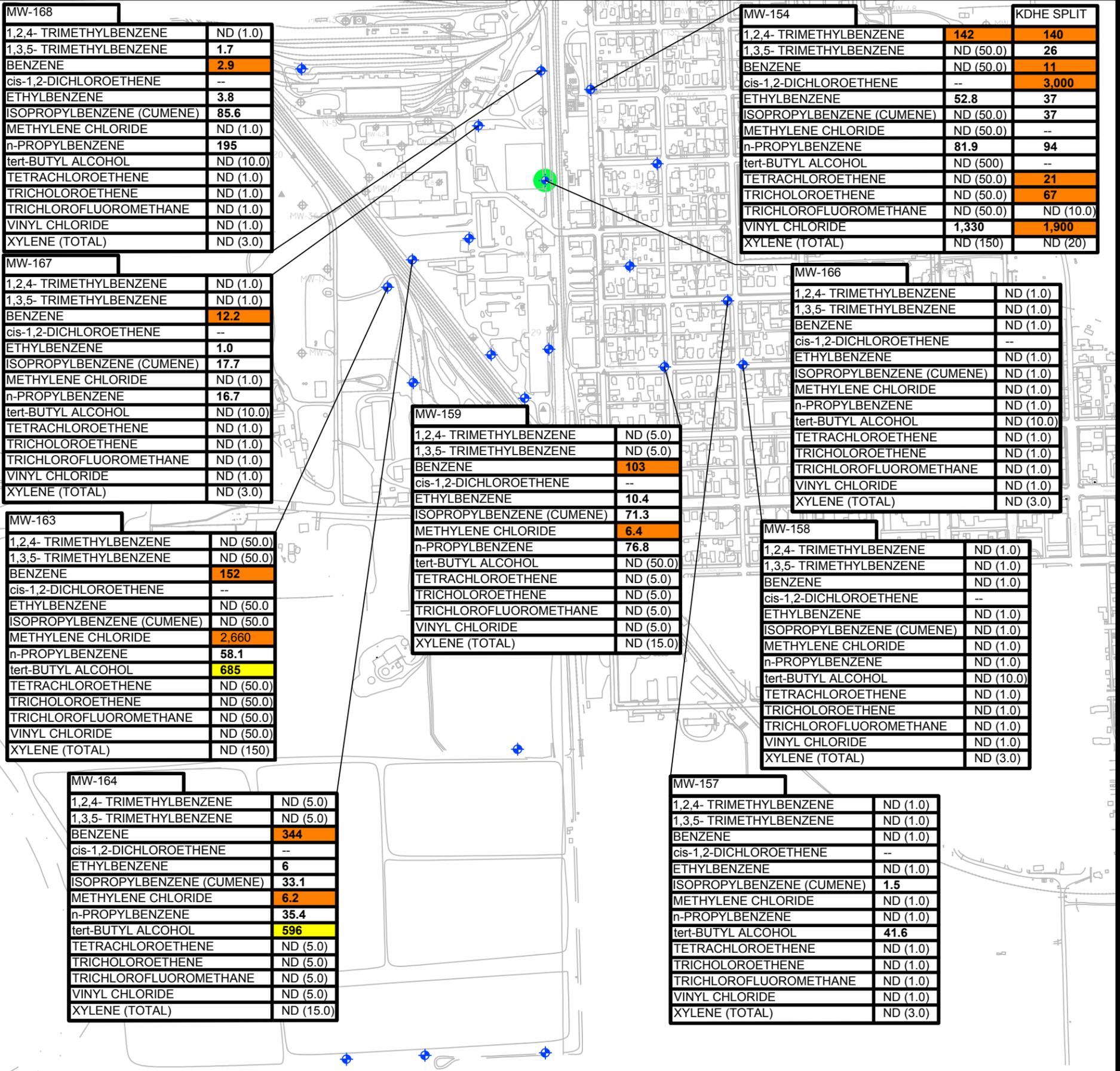
	RESIDENTIAL	NON-RESIDENTIAL
1,2,4 TRIMETHYLBENZENE	8.44	17.4
1,2,5 TRIMETHYLBENZENE	44	88.4
BENZENE	5	5
cis-1,2-DICHLOROETHENE	70	70
ETHYLBENZENE	700	700
ISOPROPYLBENZENE (CUMENE)	451	968
METHYLENE CHLORIDE	5	5
n-PROPYLBENZENE	660	1,910
tert-BUTYL ALCOHOL	256	859
TETRACHLOROETHENE	5	5
TRICHLOROETHENE	5	5
TRICHLOROFLUOROMETHANE	1,090	1,900
VINYL CHLORIDE	2	2
XYLENE (TOTAL)	10,000	10,000

5. **470** = COMPOUND DETECTED ABOVE RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL. **340** COMPOUND DETECTED ABOVE BOTH RESIDENTIAL/NON-RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL.

- LEGEND**
- SOIL SAMPLE LOCATION
 - MONITORING WELL
 - ND NON-DETECT (LABORATORY REPORT LIMIT)
 - MW-23 ALLUVIAL MONITORING WELL
 - MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
 - PT-2 PHASE 2 SYSTEM AND PIPING
 - PZ-1 PIEZOMETER
 - SAW-4 SULFATE ADDITION WELL
 - MW-40 ABANDONED WELL
 - G-34 TEMPORARY MONITORING WELL (FEB. 2007)
 - TRENCH



FIGURE 2-7A
VOCS
FORMER AMOCO REFINERY
NEODESHA, KS



NOTES:

- GROUNDWATER SAMPLES COLLECTED BETWEEN NOVEMBER 3-7, 2014.
- VOC CONCENTRATIONS ARE IN µg/L.
- ONLY SHOWING VOC CONSTITUENTS DETECTED ABOVE RESPECTIVE KDHE RSK SCREENING VALUES (EXCEPT TRICHLOROFLUOROMETHANE).
- KDHE RSK SCREENING VALUES ARE :

RESIDENTIAL NON-RESIDENTIAL

1,2,4 TRIMETHYLBENZENE	8.44	17.4
1,2,5 TRIMETHYLBENZENE	44	88.4
BENZENE	5	5
cis-1,2-DICHLOROETHENE	70	70
ETHYLBENZENE	700	700
ISOPROPYLBENZENE (CUMENE)	451	968
METHYLENE CHLORIDE	5	5
n-PROPYLBENZENE	660	1,910
tert-BUTYL ALCOHOL	256	859
TETRACHLOROETHENE	5	5
TRICHLOROETHENE	5	5
TRICHLOROFLUOROMETHANE	1,090	1,900
VINYL CHLORIDE	2	2
XYLENE (TOTAL)	10,000	10,000

- 470** = COMPOUND DETECTED ABOVE RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL. **340** COMPOUND DETECTED ABOVE BOTH RESIDENTIAL/NON-RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL.



LEGEND

- SOIL SAMPLE LOCATION
- MONITORING WELL
- ND NON-DETECT (LABORATORY REPORT LIMIT)
- MW-23 ALLUVIAL MONITORING WELL
- MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
- PT-2 PHASE 2 SYSTEM AND PIPING
- PZ-1 PIEZOMETER
- SAW-4 SULFATE ADDITION WELL
- MW-40 ABANDONED WELL
- G-34 TEMPORARY MONITORING WELL (FEB. 2007)
- TRENCH



FIGURE 2-7B
VOCS
FORMER AMOCO REFINERY
NEODESHA, KS

MW-165	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	185
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	2.3
ISOPROPYLBENZENE (CUMENE)	19.1
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	31.1
tert-BUTYL ALCOHOL	154
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	4.4

MW-155		DUPLICATE	KDHE SPLIT
1,2,4- TRIMETHYLBENZENE	ND (1.0)	ND (1.0)	ND (0.5)
1,3,5- TRIMETHYLBENZENE	ND (1.0)	ND (1.0)	ND (0.5)
BENZENE	1.1	1.1	0.99
cis-1,2-DICHLOROETHENE	--	--	220
ETHYLBENZENE	ND (1.0)	ND (1.0)	ND (0.5)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)	ND (1.0)	ND (0.5)
METHYLENE CHLORIDE	ND (1.0)	ND (1.0)	--
n-PROPYLBENZENE	ND (1.0)	ND (1.0)	ND (0.5)
tert-BUTYL ALCOHOL	ND (10.0)	ND (10.0)	--
TETRACHLOROETHENE	18.6	20.2	24
TRICHLOROETHENE	19.0	19.8	20
TRICHLOROFLUOROMETHANE	10.6	11.2	9.3
VINYL CHLORIDE	52.4	53	64
XYLENE (TOTAL)	ND (3.0)	ND (3.0)	ND (1.0)

MW-162	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-156	
1,2,4- TRIMETHYLBENZENE	ND (5.0)
1,3,5- TRIMETHYLBENZENE	ND (5.0)
BENZENE	89
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	6.6
ISOPROPYLBENZENE (CUMENE)	81.8
METHYLENE CHLORIDE	ND (5.0)
n-PROPYLBENZENE	87
tert-BUTYL ALCOHOL	53.5
TETRACHLOROETHENE	ND (5.0)
TRICHLOROETHENE	ND (5.0)
TRICHLOROFLUOROMETHANE	ND (5.0)
VINYL CHLORIDE	ND (5.0)
XYLENE (TOTAL)	.34.9

MW-173	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	3.3
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	10
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	10.8
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-160	
1,2,4- TRIMETHYLBENZENE	1.7
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	193
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	3.3
ISOPROPYLBENZENE (CUMENE)	49.2
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	45.5
tert-BUTYL ALCOHOL	48.8
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	15.5

MW-161		DUPLICATE
1,2,4- TRIMETHYLBENZENE	139	156
1,3,5- TRIMETHYLBENZENE	ND (20.0)	ND (20.0)
BENZENE	1,660	1,710
cis-1,2-DICHLOROETHENE	--	--
ETHYLBENZENE	287	348
ISOPROPYLBENZENE (CUMENE)	47.4	62.5
METHYLENE CHLORIDE	85.8	74.1
n-PROPYLBENZENE	58.5	75.4
tert-BUTYL ALCOHOL	ND (200)	ND (200)
TETRACHLOROETHENE	ND (20.0)	ND (20.0)
TRICHLOROETHENE	ND (20.0)	ND (20.0)
TRICHLOROFLUOROMETHANE	ND (20.0)	ND (20.0)
VINYL CHLORIDE	ND (20.0)	ND (20.0)
XYLENE (TOTAL)	167	167

MW-145		DUPLICATE
1,2,4- TRIMETHYLBENZENE	ND (1.0)	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)	ND (1.0)
BENZENE	ND (1.0)	ND (1.0)
cis-1,2-DICHLOROETHENE	--	--
ETHYLBENZENE	ND (1.0)	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)	ND (1.0)
n-PROPYLBENZENE	ND (1.0)	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)	ND (10.0)
TETRACHLOROETHENE	ND (1.0)	ND (1.0)
TRICHLOROETHENE	ND (1.0)	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)	ND (1.0)
VINYL CHLORIDE	ND (1.0)	ND (1.0)
XYLENE (TOTAL)	ND (3.0)	ND (3.0)

MW-144	
1,2,4- TRIMETHYLBENZENE	19.6
1,3,5- TRIMETHYLBENZENE	5.3
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	12.4

MW-147	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

MW-146	
1,2,4- TRIMETHYLBENZENE	ND (1.0)
1,3,5- TRIMETHYLBENZENE	ND (1.0)
BENZENE	ND (1.0)
cis-1,2-DICHLOROETHENE	--
ETHYLBENZENE	ND (1.0)
ISOPROPYLBENZENE (CUMENE)	ND (1.0)
METHYLENE CHLORIDE	ND (1.0)
n-PROPYLBENZENE	ND (1.0)
tert-BUTYL ALCOHOL	ND (10.0)
TETRACHLOROETHENE	ND (1.0)
TRICHLOROETHENE	ND (1.0)
TRICHLOROFLUOROMETHANE	ND (1.0)
VINYL CHLORIDE	ND (1.0)
XYLENE (TOTAL)	ND (3.0)

NOTES:

- GROUNDWATER SAMPLES COLLECTED BETWEEN NOVEMBER 3-7, 2014.
- VOC CONCENTRATIONS ARE IN µg/L.
- ONLY SHOWING VOC CONSTITUENTS DETECTED ABOVE RESPECTIVE KDHE RSK SCREENING VALUES (EXCEPT TRICHLOROFLUOROMETHANE).
- KDHE RSK SCREENING VALUES ARE :

RESIDENTIAL NON-RESIDENTIAL

1,2,4 TRIMETHYLBENZENE	8.44	17.4
1,2,5 TRIMETHYLBENZENE	44	88.4
BENZENE	5	5
cis-1,2-DICHLOROETHENE	70	70
ETHYLBENZENE	700	700
ISOPROPYLBENZENE (CUMENE)	451	968
METHYLENE CHLORIDE	5	5
n-PROPYLBENZENE	660	1,910
tert-BUTYL ALCOHOL	256	859
TETRACHLOROETHENE	5	5
TRICHLOROETHENE	5	5
TRICHLOROFLUOROMETHANE	1,090	1,900
VINYL CHLORIDE	2	2
XYLENE (TOTAL)	10,000	10,000

- 470 = COMPOUND DETECTED ABOVE RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL. 340 = COMPOUND DETECTED ABOVE BOTH RESIDENTIAL/NON-RESIDENTIAL KDHE TIER 2 RSK SCREENING LEVEL.



LEGEND

- SOIL SAMPLE LOCATION
- MONITORING WELL
- ND NON-DETECT (LABORATORY REPORT LIMIT)
- MW-23 ALLUVIAL MONITORING WELL
- MW-22B BEDROCK MONITORING WELL (MW-9B, MW-22B, AND MW-32) (MW-40 IS SCREENED AT THE INTERFACE BETWEEN BEDROCK AND GRAVEL)
- PT-2 PHASE 2 SYSTEM AND PIPING
- PZ-1 PIEZOMETER
- SAW-4 SULFATE ADDITION WELL
- MW-40 ABANDONED WELL
- G-34 TEMPORARY MONITORING WELL (FEB. 2007)
- TRENCH



**FIGURE 2-7C
VOCs
FORMER AMOCO REFINERY
NEODESHA, KS**