FOURTH FIVE-YEAR REVIEW REPORT FOR KOPPERS CO., INC. (TEXARKANA PLANT) SUPERFUND SITE BOWIE COUNTY, TEXAS

SEPTEMBER 2016

1996

2016

Prepared by

U.S. Environmental Protection Agency
Region 6
Dallas, Texas

FOURTH FIVE-YEAR REVIEW REPORT
KOPPERS CO., INC. (TEXARKANA PLANT) SUPERFUND SITE
EPA ID#: TXD980623904
BOWIE COUNTY, TEXAS

This memorandum documents the U.S. Environmental Protection Agency's (EPA's) performance, determinations and approval of the Koppers Co., Inc. (Texarkana Plant) Superfund site (Site) fourth Five-Year Review (FYR) under Section 121 (e) of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S. Code Section 9621 (c), as provided in the attached fourth Five-Year Review Report.

Summary of the Fourth FYR Report

The Site's remedy included the buyout of the Carver Terrace subdivision and relocation of affected residents, as well as the demolition, removal and off-site disposal of debris. Contaminated soils were excavated and disposed of offsite. Other parts of the remedy include ongoing removal of creosote non-aqueous phase liquid (NAPL) from groundwater, institutional controls, and long-term maintenance and monitoring. Institutional controls are not yet in place. The Site is fenced and unused.

Human Exposure Status: Under Control
Contaminated Groundwater Status: Under Control

Actions Needed

The following actions must be taken for the remedy to be protective over the long term:

1) Work with the City of Texarkana to implement institutional controls.

2) Collect soil samples to determine whether dioxin concentrations at the Site are greater than the screening level resulting from the February 17, 2012 oral non-cancer toxicity, or reference dose (RfD) of $7x10^{-10}$ mg/kg-day for 2,3,7,8-tetrachlorodiebenzo-p-dioxin (TCDD) to ensure long-term protectiveness, if warranted.

3) Evaluate polynuclear aromatic hydrocarbon (PAH) levels and determine if they are within EPA's acceptable risk range for residential uses, and take measures to ensure long-term protectiveness, if warranted.

4) Collect additional soil samples in specific areas across the Site and uncharacterized lots within the former Carver Terrace neighborhood and implement measures to maintain long-term protectiveness, if warranted.

5) Collect samples to fully evaluate ecological risk, particularly for Wagner Creek sediment, drainage ditch sediment and water in the submerged gravel pits, and take measures to ensure long-term protectiveness, if warranted.

6) Evaluate analytical methods to determine if an alternative analytical method for PAHs can achieve reporting limits below surface water standards. Implement low-level detection of PAHs. Update decision documents to include the more stringent surface water applicable or relevant and appropriate requirements (ARARs).

7) Collect groundwater data to determine the extent of the dissolved phase groundwater plume at the Site and evaluate the potential for vapor intrusion to indoor air of occupied structures on nearby properties,

8) During the groundwater investigation, evaluate whether dense non-aqueous phase liquid (DNAPL) has migrated off site.

9) Investigate water quality of the gravel pit water and the cause of the oily sheen within the pit water.

10) Perform a remedy system evaluation to determine whether collection sumps are operating at an optimal level.

11) Evaluate whether groundwater cleanup goals should be added for arsenic, lead, toluene, pentachlorophenol and carcinogenic PAHs, given more stringent or newly issued drinking water ARARs for these contaminants. If so, include the revisions in a decision document.

12) Continue implementing all necessary institutional controls, including any affected off-site areas.

Determination

I have determined that the remedy for the Koppers Co., Inc. (Texarkana Plant) Superfund Site is protective in the short-term. This FYR Report specifies the actions that need to be taken for the remedy to be protective over the long term.

Pam Phillips, Acting

Carl E. Edlund, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency Region 6

9/27/16

Date

CONCURRENCES

FOURTH FIVE-YEAR REVIEW REPORT
KOPPERS CO., INC. (TEXARKANA PLANT) SUPERFUND SITE
EPA ID#: TXD980623904
BOWIE COUNTY, TEXAS

Charles S. Abshire — 8/1/16
David Abshire — Date
Remedial Project Manager

Carlos A. Sanchez — 8/1/16
Carlos A. Sanchez — Date
Chief, AR/TX Section

Carlos A. Sanchez — 8/23/16
John C. Meyer — Date
for Chief, Superfund Remedial Branch

8/26/16
Jacob Piehl — Date
Attorney, Office of Regional Counsel

08/29/16
Mark A. Peycke — Date
Chief, Superfund Branch, Office of Regional Counsel

Pam Phillips — 9/27/16
Pamela Phillips — Date
Deputy Director, Superfund Division

ISSUES/RECOMMENDATIONS

FOURTH FIVE-YEAR REVIEW REPORT
KOPPERS CO., INC. (TEXARKANA PLANT) SUPERFUND SITE
EPA ID#: TXD980623904
BOWIE COUNTY, TEXAS

Issues and Recommendations Identified in the Five-Year Review Report:

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Zoning has not yet been changed from residential to non-residential for the former Carver Terrace properties.			
	Recommendation: Work with the City of Texarkana to implement institutional controls and reclassify the former residential subdivision from residential to non-residential use through zoning changes.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Since soil confirmation samples were not collected after the removal actions, the effectiveness of the removal actions in remediating dioxin-contaminated soils to acceptable levels is unknown.			
	Recommendation: Collect soil samples to determine whether dioxin concentrations at the Site are greater than the screening level resulting from the February 17, 2012 oral non-cancer toxicity, or reference dose (RfD) of $7x10^{-10}$ mg/kg-day for 2,3,7,8-tetrachlorodiebenzo-p-dioxin (TCDD) to ensure long-term protectiveness, if warranted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	Issue Category: Remedy Performance
	Issue: PAH contamination may have been left on the Site at levels above the 100 mg/kg cleanup goal for potentially carcinogenic PAHs. Areas of potential concern include lots not characterized during the Remedial Investigation (RI) within the former Carver Terrace neighborhood due to lack of access agreements, three areas that were originally proposed for remediation but were located within the drip line of large-diameter trees and three areas on the Kennedy Sand and Gravel property where visual evidence of contamination was observed during the RI. The RI also notes that only five surface soil samples were collected from within the southern half of the Site (on the Kennedy Sand and Gravel property).

	Recommendation: Collect additional soil samples in specific areas across the Site and implement additional measures to maintain protectiveness, if warranted. These areas include the three dripline areas and other uncharacterized lots within the former Carver Terrace neighborhood, within the areas of visual contamination on the Kennedy Sand and Gravel property identified in the RI, and across the Kennedy Sand and Gravel property more broadly.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	**Issue Category: Remedy Performance**			
	Issue: Site documents indicate that an ecological risk assessment was not performed for the Wagner Creek sediment, drainage ditch sediment and submerged gravel pits' water.			
	Recommendation: Conduct a quantitative evaluation of ecological risk for the Wagner Creek sediment, drainage ditch sediment and water in the submerged gravel pits, and take measures to ensure long-term protectiveness, if warranted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	**Issue Category: Remedy Performance**			
	Issue: Data on the current extent of the dissolved phase groundwater plume at the Site is not available. Therefore, it is unclear if vapor intrusion to indoor air of occupied structures on nearby properties is a concern for this Site.			
	Recommendation: Collect groundwater analytical data to determine the current extent of the dissolved phase groundwater plume at the Site, the magnitude of contaminants relative to groundwater cleanup goals and any related vapor intrusion impacts. Use data as a basis for a long-term monitoring program that assesses natural attenuation of the dissolved phase contamination in the upper and lower aquifers and include data in semi-annual reports.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	**Issue Category: Monitoring**
	Issue: Monitoring data is needed to determine whether dense non-aqueous phase liquid (DNAPL) has migrated from the Site.
	Recommendation: During the groundwater investigation, evaluate whether DNAPL has migrated off site. Use the data to determine risk and implement additional measures to maintain protectiveness, if warranted. This should include

	monitoring of points downgradient of the sumps and in areas where DNAPL is likely to accumulate due to gravitational forces to determine the effectiveness of the sumps in preventing DNAPL migration off-site or to the creek.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	**Issue Category: Monitoring**			
	Issue: Water quality and the cause of the oily sheens in the submerged gravel pits are unknown.			
	Recommendation: Investigate water quality of the gravel pit water and the cause of the oily sheen within the pit water. Determine if DNAPL is accumulating in low points within the base of the gravel pit.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	**Issue Category: Remedy Performance**			
	Issue: Since the 1988 ROD, ARARs for four of the groundwater contaminants identified at the Site (arsenic, lead, toluene, pentachlorophenol) have become more stringent and a new ARAR was issued for one contaminant class (carcinogenic PAHs).			
	Recommendation: Evaluate whether groundwater cleanup goals should be added for arsenic, lead, toluene, pentachlorophenol and carcinogenic PAHs, given more stringent or newly issued drinking water ARARs for these contaminants. Include the revisions in a decision document, as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	9/27/2018

OU(s): 2, 3	**Issue Category: Institutional Controls**			
	Issue: Institutional controls are not in place for site properties to restrict soil digging or groundwater use. Institutional controls may also be necessary for some off-site areas, including the residential property east of the former church and portions of Wagner Creek.			
	Recommendation: Continue implementing all necessary institutional controls, including any affected off-site areas.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

Table of Contents

Tables

Figures

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BAP	Benzo(a)pyrene
BAT	Best Available Technology
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
DNAPL	Dense Non-aqueous Phase Liquid
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
HDPE	High Density Polyethylene
IC	Institutional Control
IRIS	Integrated Risk Information System
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/kg	Milligram per Kilogram
mg/kg-day	Milligram per Kilogram per Day
µg/L	Micrograms per Kilogram
µg/L	Microgram per Liter
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Act
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCP	Pentachlorophenol
POTW	Publicly Owned Treatment Works
ppm	Parts per Million
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To-Be-Considered
TCEQ	Texas Commission on Environmental Quality
TDWR	Texas Department of Water Resources
UST	Underground Storage Tank
UU/UE	Unlimited Use and Unrestricted Exposure
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Koppers Co., Inc. (Texarkana Plant) Superfund site (the Site). The triggering action for this statutory review is the September 27, 2011 completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three operable units (OUs). All OUs will be addressed in this FYR. OU1 addresses the buyout of the Carver Terrace subdivision and relocation of affected residents. OU2 addresses the excavation and off-site disposal of soils contaminated with polynuclear aromatic hydrocarbons (PAHs) at concentrations greater than 100 milligrams per kilogram (mg/kg). OU3 addresses the recovery of creosote non-aqueous phase liquid (NAPL) in the shallow aquifer and distribution of extracted groundwater to infiltration galleries on site.

The FYR was led by EPA remedial project manager (RPM) David Abshire, with additional support provided by contractor, Skeo Solutions. Participants also included Nancy Johnson from the Texas Commission on Environmental Quality (TCEQ). Beazer East, Inc., the Site's potentially responsible party (PRP), was notified of the initiation of the FYR. The review began on 11/9/2015.

Documents reviewed as part of this FYR are listed in Appendix A.

Site Background

The 62-acre area is located about 1 mile west of downtown Texarkana in Bowie County, Texas (Figure B-1, Appendix B). From 1903 to 1961, the Koppers Company operated a wood-preserving facility on the Site. When active, the wood-preserving facility consisted of an operations area in the east-central part of the Site, a drip track running diagonally from the operations area northwest to the northern boundary of the Site, treated wood storage areas located in the western and southeastern areas of the Site, and untreated wood storage areas in the northern part of the Site (Figure B-2, Appendix B). Within the operations area were wood-treating cylinders, chemical storage tanks and a wastewater lagoon. The wood-treating operation used pentachlorophenol (PCP), creosote and metallic salts.

The Site went through a succession of owners until developer Carver Terrace, Inc., purchased most of the Site in 1964. The developer built 79 single-family homes on the northern part of the Site. A church was also built immediately south of the subdivision (Figure B-3, Appendix B). Due to flooding problems in the southern area, the developer did not proceed with plans for redeveloping the southern part of the Site. In 1975, the developer sold the remaining 28 acres to Kennedy Sand and Gravel, which operated sand and gravel pits until 1984. The Koppers Company also sold a small portion of the original site area east of the church that became a single-family residence (Figure B-3, Appendix B). See Appendix C for a detailed chronology of the Site's history.

Structures in the former residential area on the northern part of the Site were demolished during removal activities; foundation slabs and roads remain. The gravel pits, inundated with water, remain on the southern half of the Site. The Site is not in use. A rail line borders the Site to the north. Jamison Street borders the Site to the south. Wagner Creek is located southwest of the Site. Residential and commercial properties border the Site to the east. A drainage ditch is located primarily along the southeast edge of the Site. The property to the south and west of the Site is undeveloped. Land use north of the Site is residential.

The uppermost aquifer identified at the Site is found at 3 to 5 feet below ground surface within alluvial sediments. Groundwater occurs under unconfined conditions in this aquifer. A leaky confining zone separates the shallow aquifer from a deeper semi-confined aquifer. The deeper aquifer is located within sand and silty sand layers of the Wilcox Group. Groundwater migrates from the deeper aquifer, through the leaky confining zone, into the shallow aquifer. Groundwater flow in the shallow aquifer in the northern part of the Site is to the southwest towards Wagner Creek. Groundwater flow in the shallow aquifer in the southern part of the Site is directed radially out from the gravel pits; pumping for the groundwater remedy also causes local variations in flow direction in the southern half of the Site. Groundwater flow in the deeper aquifer is to the south. The Site is located within the 100-year floodplain.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Koppers Co., Inc. (Texarkana Plant)		
EPA ID: TXD980623904		
Region: 6	**State:** TX	**City/County:** Texarkana/Bowie

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name: David Abshire, with additional support provided by Skeo Solutions
Author affiliation: EPA Region 6
Review period: 11/9/2015 – 9/27/2016
Date of site inspection: 2/23/2016
Type of review: Statutory
Review number: 4
Triggering action date: 9/27/2011
Due date ***(five years after triggering action date)***: 9/27/2016

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1980, the Texas Department of Water Resources (TDWR) found that soil and groundwater at the Site were contaminated with PCP, arsenic and creosote. EPA placed the Site on the Superfund program's National Priorities List (NPL) on June 10, 1986.

The Site's risk assessment calculated potential risks from contaminated soil, groundwater, sediment and surface water based on current site use and plausible future development conditions. It determined that people could be exposed to contaminants in the Carver Terrace residential area (soils), Wagner Creek (water, sediments and seeps) and the Kennedy Sand and Gravel area (soils and sediments) if they trespass. People also could become exposed if a groundwater well was installed on site. Based on the risk assessment, EPA concluded that potential public health hazards exceeded EPA's maximum level for leaving contamination at a site, primarily for risks from exposure to soil contaminated with polynuclear aromatic hydrocarbons (PAHs) in the Carver Terrace residential area and threats posed by the migration of NAPL consisting of free phase creosote.[1]

The Site's remedial investigation (RI) identified three wells located off site which were screened in Stratum III (50-75 feet); these wells were up-gradient of the Site. No water supply wells are within the area of groundwater contamination.

The most prevalent contaminants identified at the Site were PAHs. Other contaminants identified included PCP, metals and volatiles. Table 1 presents primary chemicals identified at the Site by media. Additional contaminants investigated at the Site are presented in Appendices J and K.

Table 1: Site Contaminants by Media

Contaminant[a]	Approximate Location/Prevalence[a]
Soils	
PAHs	Widespread across northern part of Site. Approximately 12 acres of the Site had PAHs exceeding 100 mg/kg, and 2 acres of the Site had PAHs exceeding 1,000 mg/kg.
PCP and metals	Found in only a few areas
Groundwater	
PAHs	Most frequently identified groundwater contaminant
Volatile Organic Compounds (VOCs) (e.g., benzene and toluene)	Higher concentrations found near pockets of NAPLs
PCP	Found in the old lagoon area only
Metals	Found across the Site but at levels below Maximum Contaminant Levels (MCLs)
Surface Water and Sediments	
PAHs	Surface and water sediments received contaminants by migration from the upper aquifer. Water samples showed no detectable concentrations of site contaminants except for those direct samples of the seeps. Impacts were more observable in the sediments. PAHs were seen in Wagner creek sediments just below the location of the seep and in the on-site drainage ditch which cuts across the area of the old wastewater lagoon.
Notes: a) From Site's 1988 ROD, sections 3.2 – 3.4	

Response Actions

In 1984, TDWR ordered Kennedy Sand and Gravel to cease operations at the sand and gravel pits. EPA performed preliminary site investigations in 1984. Findings indicated that clean soil and sod needed to be placed on 24 residential lots in the Carver Terrace subdivision. The sand and gravel pits on the southern portion of the Site also needed to be fenced. These protective measures were completed in 1986. According to the 1992 ROD amendment, soil in yards with concentrations of benzo(a)pyrene greater than 325 mg/kg were removed, replaced with clean fill and then resodded.

EPA selected a remedy to address soil, sediment and groundwater cleanup in the Site's 1988 ROD. Originally, EPA did not divide the Site into separate operable units (OUs) for cleanup. Surface soil, sediment, groundwater and NAPLs were addressed as one unit. The ROD listed the following remedial action objectives (RAOs):

- Protect against any non-carcinogenic hazards and prevent additional risks of cancer greater than 3×10^{-5} from soil exposure.
- Prevent migration of NAPLs consisting of creosote in a free phase form.

The 1988 ROD selected the following remedy components for contaminated soil and sediment:

- Excavation and soil washing of 3,300 to 19,400 cubic yards of soil from residential yards where PAHs were detected in excess of 100 mg/kg.
- Backfilling of yards with clean soil.
- Landscaping where necessary to restore each yard as closely as possible to its original state.
- Temporary relocation of affected residents.
- Excavation of sediments in the bend of the drainage ditch.
- On-site treatment of soil, drainage ditch sediments and drill cuttings; or transport to an off-site disposal facility (EPA transported wastes to an off-site disposal facility).
- Deed notices and access restrictions for the Kennedy Sand and Gravel property throughout the remedial action.

The 1988 ROD selected the following remedy components for shallow contaminated groundwater:

- Collection and treatment of NAPLs/groundwater at an on-site plant with an oil/water separator.
- Treatment of separated groundwater with an activated carbon or fluidized carbon bed treatment.
- Recycling of creosote and/or incinerating recovered NAPLs off site.
- Discharge of treated groundwater to Wagner Creek or the local publicly owned treatment works (POTW) or reinjection of the treated groundwater into the aquifer along with surfactants to help NAPL recovery.
- Continued groundwater monitoring (monitoring the effectiveness of natural attenuation and to provide data necessary to trigger future corrective action, if necessary).

The 1988 ROD remedy components for the deeper aquifer required monitoring only to make sure the aquifer naturally attenuated.

EPA issued an amended ROD on March 4, 1992, to include a buyout of the Carver Terrace community, relocation assistance for affected residents, reclassification of the area from residential use to non-residential use, and the demolition, removal and disposal of structures and debris.

The amendment divided the Site into three OUs. OU1 addressed the purchase of the homes and relocation of residents. OU2 involved the destruction, removal and disposal of structures and debris, as well as the excavation and treatment of soils and their replacement with clean fill. OU3 addressed the remediation of contaminated groundwater. The amendment established a requirement for institutional controls in the form of deed restrictions and zoning changes limiting the remediated area to non-residential uses. The remediated area was to be fenced and allowed to return to its natural state until such time that the State of Texas or the City of Texarkana plan to use the property consistent with land use limitation called for in the ROD amendment.

EPA issued an Explanation of Significant Differences (ESD) in 2002 for OU3, which modified the scope of the 1988 remedy for groundwater. The ESD removed the requirements for treatment of separated groundwater with carbon and the use of surfactants to mobilize NAPLs. In place of surface treatment, several DNAPL collection sumps were installed at locations determined to contain low areas where DNAPL source material had collected; two subsurface pumps were required for each collection sump, one dedicated to groundwater and the other to NAPLs, so that mixing (emulsion) would not occur.

Table 2 summarizes cleanup goals for the primary site contaminants identified in the decision documents. The 1988 ROD stated that treated groundwater was required to meet the best available treatment (BAT) requirements for the organic chemical, plastics and synthetic fibers industry. The 1988 ROD clarified that groundwater collection will continue until the NAPLs have been recovered to the maximum extent possible. After active treatment ends, groundwater will be required to meet background levels. The ROD did not identify specific values for the background levels or a timeframe for meeting them.

Table 2: Cleanup Goals

Contaminant	Media	Cleanup Goal[a]
Carcinogenic PAHs	Soil (Carver Terrace)	100 mg/kg[b]
Free phase creosote (NAPL)	Groundwater	No detection[b, c]
Carcinogenic PAHs	Sediment (drainage ditch)	No formal cleanup goal listed in ROD, but the 100 mg/kg goal used for drainage ditch cleanup
Carcinogenic PAHs	Surface water (Wagner Creek)	None
Carcinogenic PAHs	Sediment (Wagner Creek)	None
Carcinogenic PAHs	Soil (Kennedy Sand and Gravel property)	No formal cleanup goal, but deed notices and access restrictions were required – land use was assumed to remain commercial

Notes:

a) Source: 1988 ROD, Section 4.3 (Remedial Goals), unless otherwise noted. The 1988 ROD also specified that applicable or relevant and appropriate requirements (ARARs) must be met for groundwater and surface water contaminants. This FYR reviewed ARARs for groundwater and surface water contaminants identified at the Site during site investigations. These contaminants and their respective ARARs are listed in Appendix J.

b) The ROD only lists cleanup goals for Carver Terrace soils and groundwater in Section 4.3.

c) The 1988 ROD clarified that groundwater collection will continue until the NAPLs have been recovered to the maximum extent possible.

Status of Implementation

In March 1993, EPA issued a Unilateral Administrative Order that required the PRP (Beazer, Inc., formerly known as Koppers Co. Inc.) to conduct certain OU2 and OU3 remedial activities outlined in the ROD and ROD amendment.

Relocation of affected residents (OU-1), with the exception of one resident who elected not to participate, finished on July 30, 1993. The resident who elected not to participate owned the property immediately east of the church. On January 27, 1994, the PRP completed demolition of remaining houses and the church in the former Carver Terrace subdivision. As part of this effort, sewer and water lines were plugged. Roads, foundations, paved driveways and parking lots were not removed.

The 1988 ROD targeted three general areas for soil remediation: the treated/untreated wood storage area (Northern Area), the former drip track (Central Area), and the former wood-treating process area and creosote storage tank area (Southern Area) (see Figure B-2, Appendix B, for map of wood-preserving operation).

Beginning in April 1996, the PRP excavated approximately 3,000 tons of soil and materials (OU-2) and took them to an off-site disposal facility. The depth of the excavations extended to 1 foot below grade. Some small areas where excavation had been planned but corresponded to the drip lines of trees were not excavated; any excavation within the drip lines would destroy the tree. This included an area of the residential property east of the former church. Additional sampling was conducted at the residential property as part of the remedial action, and results were below the cleanup goal. In May 1996, the PRP removed approximately 50 cubic yards of contaminated sediment from the bend in the drainage ditch and disposed of the sediment off site. The PRP completed soil and sediment removal and replacement activities in July 1996 (see Figures B-4 – B-6, Appendix B, for approximate soil excavation limits). Depending upon the soil sampling results from the RI, some of the residential properties that had been addressed during the initial removal action were also subject to the remedial soil excavations.

Remedial design for OU3 (source material and ground water) began in March 1993. In July 1996, the PRP modified the NAPL/Groundwater Pilot Study Work Plan since the City of Texarkana would not allow discharge of pre-treated water from the Site to its POTW. The PRP submitted an alternative design that used eight large-diameter recovery sumps to collect and separate NAPL from groundwater inside the well. This design eliminated the need for groundwater treatment called for in the ROD, later documented in the 2002 ESD.

The system was modified and designed to collect the NAPLs within the sumps/wells screened in the shallow aquifer and distribute the associated/collected groundwater to infiltration galleries on site. This would increase the hydraulic gradient toward the collection sumps and increase dense NAPL (DNAPL) volume flow to the sumps. The PRP empties the sumps and disposes of the NAPL off site when the possibility of exceeding the capacity of the sumps could be encountered in the next month (See Figure B-3, Appendix B for sump locations). The PRP conducted a pilot test using two collection sumps to evaluate the effectiveness of the groundwater remedy between October 1996 and July 1997 and submitted results to EPA and TCEQ for review and approval.

In spring 1998, the PRP installed a high-density polyethylene plastic (HDPE) barrier wall between the gravel pits and Wagner Creek, to eliminate the horizontal migration of NAPL toward Wagner Creek. The wall is about 230 feet long and extends 2 feet into the uppermost portion of the Wilcox Formation clay immediately underlying the shallow aquifer at the Site. This creek area, immediate to the barrier, is inspected during NAPL collection from sumps; the wall prevents migration of NAPL source material to the creek.

Remedial design for OU3 finished in December 2001 and construction of the system began in May 2002. The PRP placed the collection sump system into full operation in July 2002. Operation of the groundwater remedy has been ongoing since system startup and is documented in regular progress reports. The PRP monitors groundwater levels and NAPL thickness using monitoring wells, piezometers and infiltration galleries. The PRP uses surface water sampling locations to monitor the surface water quality in Wagner Creek.

In September 2003, EPA and TCEQ approved the Site's NAPL/Groundwater Remedial Action Construction Completion Report.

IC Summary Table

The Site's 1988 ROD called for the imposition of necessary deed notices, and restrictions of access to the Kennedy Sand and Gravel property by use of a fence throughout the duration of the remedial action. The Site's 1992 ROD amendment changed the assumption of land use for the residential portion of the Site from residential to non-residential. The remediated area was to be limited to non-residential use through deed restrictions and zoning changes. Neither decision document includes detailed institutional control requirements.

The Site includes 102 lots – the federal government owns 88 lots and private individuals own the remaining 22 lots. The PRP is currently working to establish institutional controls for the affected private properties. The restrictive covenants will restrict well placement, limit digging below 2 feet and limit land use to non-residential uses only. EPA is negotiating institutional controls in the form of restrictive covenants for the properties purchased by the federal government. The restrictive covenants will restrict use of the site properties to non-residential, commercial/industrial uses, and restrict excavation of soil and access to groundwater on the Site. In the 1992 State Superfund Contract for this Site, the State of Texas agrees to take title to the Carver Terrace portion of the Site, along with the acquisition of restrictive covenants and deed notices. The Carver Terrace portion of the Site is currently zoned for residential uses. EPA is working with the City of Texarkana to reclassify the former residential subdivision from residential to non-residential use through zoning changes Figure B-7 in Appendix B shows a map of the Site's boundary and affected parcels. Table 3 shows institutional controls planned for the Site. Appendix D shows affected parcels by ownership type.

Table 3: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls and Areas that Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soils	Yes	Yes	Sitewide parcels	Limit land use to non-residential uses, restrict digging beyond approved depth below surface or disturbance of remaining roadway or concrete structures without EPA/State authorization	Restrictive covenant 9/27/2018
Groundwater	Yes	No	Sitewide parcels, and other affected parcels as needed[2]	Restrict well drilling and groundwater use on site without EPA/State authorization until groundwater contaminant levels are protective of human health	Restrictive covenant 9/27/2018

Systems Operations/Operation & Maintenance

The PRP is responsible for operation and maintenance (O&M) activities at the Site, which are specified in the DNAPL/Groundwater Pilot Study Report and 100% Remedial Design, dated December 2001 (DNAPL/Groundwater Remedial Design Report), and the Soil Remedial Action Report, dated November 1996.

Initially, the PRP submitted monthly NAPL monitoring reports and quarterly progress reports to EPA, which included recording groundwater and NAPL levels in the eight collection sumps, monitoring wells and piezometers. The PRP also included results of site inspections of monitoring wells, piezometers, sumps, fence, absorbent, booms and grass in the progress reports. The PRP conducted surface water sampling at four locations on a quarterly basis. Long-term maintenance responsibilities include inspecting revegetated areas for potential erosion, repairing erosion as needed and inspecting site controls.

Routine O&M activities include verifying that the groundwater and NAPL pumps are operating, inspecting the float switches for proper operation, and checking the integrity of groundwater conveyance lines.

As part of groundwater system optimization, in 2004 EPA agreed to eliminate monthly reporting. The PRP currently measures water and NAPL levels once every eight weeks at all operating sumps and associated piezometers. Operation of sump CS-08 was discontinued in 2005 due to lack of recoverable NAPL. Operation of sumps CS-04 and CS-05 were discontinued in 2011 and 2012, respectively, for the same reason. See Figure B-3 in Appendix B for locations of operational and discontinued sumps. The PRP currently records water levels and NAPL in the inoperable sumps and associated piezometers annually. Surface water sampling at four locations in Wagner Creek occurs semi-annually. The PRP submits progress reports semi-annually.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR, as well as the recommendations from the last FYR and the current status of those recommendations.

Table 4: Protectiveness Determinations/Statements from the 2011 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	None provided	None provided
2	Protective	The remedy for the soil OU at the Koppers site was completed in March 2003 and is considered protective of human health and the environment.
3	Short-term Protective	The remedy for the groundwater OU is protective of human health and the environment in the short term because there is no evidence that there is current exposure and the remedy is being implemented as planned to reduce the volume of contamination and to control migration. However, in order to remain protective for the long term, the recommendations listed in Section 9.0 should be implemented. Ongoing implementation of performance and compliance monitoring will ensure that the migration of contamination continues to be restricted.
Sitewide	Short-term Protective	Because the completed remedial actions and monitoring program for the Koppers site are protective for the short term, the remedy for the site is protective of human health and the environment and will continue to be protective if the action items identified in this report are addressed.

Table 5: Status of Recommendations from the 2011 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
3	Areas of fencing were knocked down allowing cattle onto the Site. It was difficult to inspect the entire fence perimeter because of overgrown vegetation along the fence line.	Repair fencing and remove excessive vegetation from fence line.	Ongoing	Fencing currently in good condition, except the main gate entrance.	9/27/2018
3	Several signs were barely legible.	Replace/install signs.	Completed	Legible warning signs were visible on fencing.	2/23/2016
3	Government owned properties and privately owned on-site properties do not have any deed notice/restrictions.	The TCEQ has reviewed and commented on a proposal from the PRP related to implementation of institutional controls at the Site.	Ongoing	The PRP is currently working to establish institutional controls for the 22 affected private properties. EPA is negotiating institutional controls in the form of restrictive covenants for the 88 properties purchased by the federal government.	9/27/2018
3	Several oily sheens were observed on the surface water within the gravel pits.	The source of the oily sheens should be investigated.	Under Discussion	This recommendation is not complete and will be addressed in the next FYR Discussions continue with the PRP.	9/27/2018
3	A long-term monitoring program for natural attenuation of the dissolved phase NAPL should be implemented.	Promulgate a long-term monitoring program for natural attenuation of the dissolved phase NAPL following collection of NAPL to the maximum extent practicable, and further definition of the plume.	Under Discussion	To begin once NAPL has been collected to the maximum extent practical, which is anticipated to be in 2017. Discussions with the PRP to begin the ground water monitoring and natural attenuation effort in 2017, with construction of the ground water monitoring system in 2018.	9/27/2018
3	The shallow groundwater plume outline/extent has not been thoroughly defined. The aquifer below the shallow contaminated aquifer has not been thoroughly investigated.	The groundwater plume outline/extent will be identified on site and off site, if it is found that the plume exists/extends off site following the collection of NAPL to the maximum extent practicable. The aquifer below the shallow contaminated aquifer	Under Discussion	To begin once NAPL has been collected to the maximum extent practical, which is anticipated to be in 2017. It is anticipated that plume outline/extent definition will begin in 2017 and completed in 2018.	9/27/2018

		will be further investigated to determine if there is contamination in that aquifer and, if so, determine the plume outline/extent.			
3	A review for system optimization should be conducted.	To date, only about 2,500 gallons of NAPL have been removed since 2002. A formal remedial system evaluation should be conducted to determine if improvements to the system are feasible.	Under Discussion	This recommendation is not complete and will be addressed in the next FYR	9/27/2017
3	There is currently no sediment data from Wagner Creek that gives information on the nature and extent of contamination and potential risk to human health and ecological receptors.	Sediment data from Wagner Creek should be collected and assessed for nature and extent of contamination and potential risk to human health and ecological receptors.	Under Discussion	This recommendation is not complete and will be addressed in the next FYR	9/27/2018

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by local newspaper in the *Texarkana-Gazette* on 2/7/2016, stating that there was a FYR and inviting the public to submit any comments to EPA. A copy of the public notice is included in Appendix E. The FYR site team also knocked on doors of residences near the Site's main entrance and left notices about the FYR process. The results of the review and the report will be made available at the Site's information repository, which is located at the Texarkana Public Library.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy implemented to date. Interviews were conducted with the PRP, the PRP contractor, TCEQ's project manager, staff from the City of Texarkana and a local resident. Complete interviews are included in Appendix F.

The PRP and the PRP contractor both had positive impressions of the project. They both stated that issues and recommendations identified in the last FYR have been adequately addressed. They believe that the groundwater remedy is currently effective. The PRP commented that the PRP is continuing to work with EPA and TCEQ to implement institutional controls for the Site. The PRP contractor suggested that surface water sampling of Wagner Creek could be reduced given that no COCs have been detected in the last 15 years.

City of Texarkana staff commented that the fence is not secure enough to prevent trespassing via foot. City staff also requested that the City be made aware of any restrictive covenants put in place by the PRP or EPA for site properties. The City would like more information and have greater involvement in communications about the Site. City staff also requested that EPA send communications about the Site to neighbors via U.S. mail. The City would also like information about whether site-related Natural Resource Damage Assessment funds are available to the locality.

The resident interviewed had only recently moved near the Site. The resident did not know much about the Site.

TCEQ staff expressed concerns about soil remaining in the ground below concrete and road surfaces, and deeper than 1 foot below the surface, that have carcinogenic PAHs exceeding 100 mg/kg. Institutional controls are needed to properly account for this. TCEQ is also concerned that the emergency response action in 1985 requiring a soil barrier (depth ranging from 2-to-6 inches of soil and sod) on 24 lots in the residential subdivision on site may not have been sufficient if additional steps were not taken to address these lots as part of the permanent soil remedy. There are also no formal O&M activities being conducted to ensure that the soil barrier (1 foot of clean fill and 2-to-6 inches of soil and sod) and remaining concrete structures are being maintained through formal O&M activities. TCEQ is also concerned about the liability associated with taking over the Carver Terrace portion of the Site. There are also concerns about the characterization and remediation of sediment contamination associated with the Site. The cleanup level of 100 mg/kg may no longer be appropriate. TCEQ does not feel that placement of institutional controls required by the last FYR has been adequately addressed. The EPA will work with TCEQ to formulate the ICs and work with the property owners and PRPs to implement the institutional controls at the Site.

Data Review

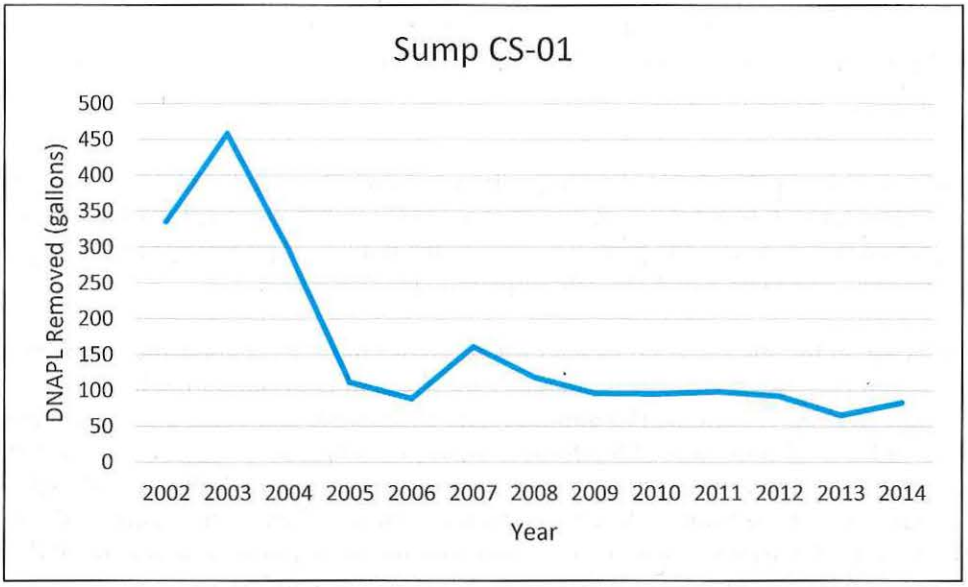
This data review incorporates data from the 2011 through 2014 semi-annual monitoring reports prepared by Field and Technical Services, LLC, the PRP's O&M contractor.

DNAPL Recovery and Monitoring

The primary objective of the DNAPL recovery system is to remove DNAPL to the maximum extent possible.

Groundwater levels and apparent DNAPL thicknesses are measured in each collection sump and associated piezometers on a regular basis to evaluate hydrogeologic and DNAPL flow conditions. These measurements are collected every eight weeks for operating sumps (CS-01, CS-02, CS-03, CS-06 and CS-07) and annually for sumps not in operation (CS-04, CS-05 and CS-08). Potentiometric surface maps in the semi-annual reports indicate hydraulic gradients toward to the operating sumps, which is consistent with the remedial design. Appendix G includes potentiometric surface maps and DNAPL thickness maps for 2014.

About 2,950 gallons of DNAPL have been recovered since operations began in July 2002. Sump CS-01 recovered more than 70 percent of this total, with nearly 2,100 gallons of DNAPL recovered since startup (Appendix G). Annual recovery rates from CS-01 have declined since the first two years of operation, but have been relatively steady since 2009 (removing between 65 and 100 gallons DNAPL per year) as shown in the graph below. During this FYR period, smaller volumes of DNAPL were recovered from sumps CS-02, CS-03, CS-06 and CS-07 (Appendix G). Sump CS-03 removed more DNAPL in 2014 (27 gallons) than the total volume removed between 2011 and 2013 (3.2 gallons).



Although DNAPL recovery operations continue, the semi-annual reports do not present data that can demonstrate that DNAPL has not migrated off site. Several sumps do not include monitoring points in all possible directions relative to the sump. There are no piezometers or wells east/southeast of CS-03 in the current monitoring program to confirm the DNAPL has not migrated off site. There are also no piezometers or sediment monitoring points southwest of the barrier wall at CS-01 to evaluate the wall's effectiveness (surface water monitoring alone may not detect DNAPL).

The semi-annual reports noted that at least one of the sumps (CS-01) was found to be out of operation during two routine monitoring events (2013 and 2014). If the sump is not operating as intended, DNAPL may flow under the influence of gravity towards depressions in the underlying confining zone, which separates the shallow aquifer from the deeper semi-confined aquifer. Piezometers or other sampling points should be in place to monitor all potential areas where DNAPL could accumulate to determine the effectiveness of the sumps in preventing DNAPL migration off site or to the creek during operational downtime.

The remedial design for the groundwater remedy also specified that a review of the DNAPL recovery sump network and the apparent DNAPL capture radius of each sump should be conducted yearly. However, this analysis was not available during this FYR period. The DNAPL/Groundwater Remedial Design Report notes that this review is to include a comparison of the apparent DNAPL capture radius of each sump to the extent of recoverable DNAPL previously established. The review should determine capture radii based on the evaluation of hydrodynamic and gravitational forces acting on the DNAPL and changes in the apparent thicknesses of the DNAPL as measured in the piezometers and monitoring wells within each area of potentially recoverable DNAPL.

Surface Water

Semi-annual surface water sampling for PAH analysis occurs at four locations in Wagner Creek to evaluate if DNAPL recovery operations are having an adverse effect on surface water quality. PAHs were not detected above laboratory reporting limits during any sampling event during this FYR period. These results are consistent with the 2002 baseline sampling event. Although PAHs were not detected, reporting limits for several PAHs – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene – exceeded either the Texas Surface Water Quality Criteria Standard protective of human health or the National Ambient Water Quality Criteria protective of human health during one or more sampling event (Appendix G, Table G-1).

Visual inspections of Wagner Creek also took place during each monitoring event in conjunction with groundwater/DNAPL monitoring. No sheens were observed on the creek during any monitoring event.

Site Inspection

The site inspection took place on 2/23/2016. Site inspection participants included David Abshire (Region 6 EPA), Nancy Johnson (TCEQ), Adra Hallford (City of Texarkana), and Eric Marsh and Jill Billus (Skeo Solutions). The purpose of the inspection was to assess the protectiveness of the remedy. Appendix H includes a completed site inspection summary form. Appendix I includes site inspection photographs.

The site inspection began at the site entrance located where West Third Street abuts the Site's entrance gate on the Site's eastern side. Participants inspected the north and south areas of the Site. Perimeter fencing surrounded the Site and appeared to be in good condition. The entrance gate is damaged and could allow unauthorized access. There was minimal evidence of vandalism. Monitoring wells overall appeared to be in good condition. A few wells had missing locks and unsecured caps. Collection sumps were locked and sump covers appeared to be in good condition. A small pile of used tires is located along the western edges of the submerged gravel pits. It appears that these tires have been there for some time. Because of heavy rains, several parts of the Site were flooded. Runoff from the Site was identified flowing into Wagner Creek immediately west of the Site. The submerged gravel pits had significant vegetation growing around them, and ducks were spotted on them. Oily sheens occasionally bubbled up from below the water surface in the submerged gravel pits. An oily gas odor, possibly creosote, was identified in the southern part of the Site.

After the site inspection, participants met at the City of Texarkana's offices on 220 Texas Boulevard in Texarkana, Texas, to discuss the Site's cleanup, institutional controls and potential redevelopment options. Participants met with several members of city staff, including the Assistant City Manager, the Director of Planning and Community Development, the Director of Economic Development, and the Director of Public Works. City staff identified the possibility of creating a special zoning district for the Site to further limit its use after all necessary restrictive covenants are in place. Various options for redevelopment as well as redevelopment challenges were discussed.

Skeo Solutions then visited the site repository at the Texarkana Public Library, located at 600 West Third Street in Texarkana. Site documents from as early as 1979 were identified. Most documents present were from the 1980s; some documents up through 1994 were also available. FYR reports were not located.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The remedy is functioning as intended by site decision documents, with some exceptions. By July 1996, EPA had completed the construction portions of the OU1 and OU2 remedies – buyout and relocation of affected residents in the Carver Terrace subdivision, demolition of site structures and debris, and excavation and off-site disposal of nearly 3,000 tons of PAH-contaminated soils and materials and sediment from the drainage ditch. Although the soil removal action addressed most surface soil contamination identified in the northern portion of the Site, contamination in at least three areas that were originally proposed for remediation but were located within the drip line of large-diameter trees (6-inches or greater) was not removed (see Section 3.4 of the Soil Remedial Action Report). Review of available documents also suggests that the northern portion of the Site may not have been completely characterized prior to remedy selection. The RI notes that sampling never occurred at 28 lots in Carver Terrace because access agreements had not been obtained (see Section 1.1.3.9 of the RI Report). Assessment of surface soil within the southern half of the Site (on the Kennedy Sand and Gravel property) was also limited; the

RI notes that only five surface soil samples were collected from this area (See Section 6.9.2 of the RI Report). The RI also states that visual evidence of contamination was identified in three areas in the central and southern parts of the Site but samples were not collected to assess the degree of contamination (see Figure B-8, Appendix B). Soil contamination above the 100 mg/kg cleanup goal for carcinogenic PAHs likely exists at the Site. There are no O&M procedures in place to monitor these areas.

The OU3 groundwater cleanup is ongoing. Nearly 3,000 gallons of DNAPL have been recovered by the collection sumps since operations began in July 2002, with nearly 70 percent of this total recovered by sump CS-01. Regular surface water sampling has not identified PAHs above laboratory method detection limits in any surface water sample during this FYR period. Sheens have not been observed on the creek surface during regular monitoring events. Although surface water impacts have not been observed, there are no current sediment data from Wagner Creek or the drainage ditch to evaluate potential impacts to sediment.

The semi-annual reports do not present data that can demonstrate that DNAPL has not migrated off site, however past investigations have shown the plume is stable. Several sumps do not include monitoring points in all possible directions relative to the sump to confirm that the DNAPL has not migrated off site or in directions counter to the hydraulic gradient as a result of gravitational forces. Additionally, sump CS-01 was found to be out of operation during two routine monitoring events (2013 and 2014). If the sump is not operating as intended, DNAPL migration in directions other than the sump is possible. This may be a possible cause of the sheens observed on water in the gravel pits during the site inspection or the DNAPL identified in piezometer CS-03-PZ-01. Piezometers or other sampling points should be in place to monitor downgradient areas and low points in the underlying confining zone to determine the effectiveness of the sumps in preventing DNAPL migration off site or to the creek. Current water quality of the gravel pits water and the cause of the sheen should also be investigated. This investigation should determine if DNAPL is accumulating at low points in the base of the pit.

The PRP has discontinued operation of three of the eight collection sumps (CS-04, CS-05 and CS-08) due to lack of recoverable DNAPL in these sumps. The PRP should determine if these sumps meet the criteria for demonstrating DNAPL recovery to the maximum extent possible, as outlined in the DNAPL/Groundwater Pilot Study Report and 100% Remedial Design (Key Environmental, Inc., December 2001). The PRP should consider optimization efforts at CS-01 to reduce operational downtime since the majority of DNAPL recovery continues in this area. Due to the relatively low removal rates at sumps other than CS-01, a formal remedial system evaluation of the recovery/injection system should be conducted to determine if improvements are feasible; however, considering the mechanics/operations of the system, improvement may be limited.

The remedial design for the groundwater remedy also specified the need for annual review of the DNAPL recovery sump network and the apparent DNAPL capture radius of each sump. However, this evaluation was not available for this FYR period.

Current groundwater monitoring focuses primarily on DNAPL and groundwater elevation measurements. Now that recovery efforts are shifting to targeted areas of the Site, groundwater analytical data should be collected to determine the current extent of the dissolved phase groundwater plume at the Site and the magnitude of contaminants relative to background. A long-term groundwater monitoring program that assesses natural attenuation of the dissolved phase contamination in the upper and lower aquifers should be prepared and implemented. EPA is presently negotiating with the PRP to shut down the system in 2017 and further define the plume for monitored natural attenuation.

Institutional controls to restrict future site use have not been implemented at the Site. EPA is working with the PRP, property owners and local authorities to implement institutional controls that will restrict use of the Site to non-residential uses, and to restrict excavation of soil and use of groundwater. Additional efforts are necessary to secure the entrance to the Site to restrict unauthorized access and to secure all piezometers and monitoring wells.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives

(RAOs) used at the time of the remedy selection still valid?

Question B Summary:

To determine if a change in applicable or relevant and appropriate requirements (ARARs) could call into question the protectiveness of the remedy, this FYR evaluated the chemical-specific ARARs in the 1988 ROD against the current values of these ARARs (See Appendix J for a detailed evaluation of ARARs). Since the 1988 ROD, ARARs for four of the groundwater contaminants identified at the Site have become more stringent (arsenic, lead, toluene, PCP). The ARARs for three contaminants have become less stringent (chromium, ethylbenzene, xylenes). A new ARAR was issued for one contaminant class (carcinogenic PAHs) and the ARARs for three contaminants have not changed (copper, zinc, benzene). Groundwater data should be compared to the most current ARARs once groundwater sampling is initiated.

The ESD stated that BAT discharge levels identified in Table 2 of the 1988 ROD are applicable to the natural discharge of groundwater to Wagner Creek. This FYR compared BAT discharge limits in the 1988 ROD to current BAT discharge limits, as well as the other surface water ARARs identified in the 1988 ROD. As shown in Table J-2 of Appendix J, the BAT monthly discharge limits have not changed since the 1988 ROD. However, for 14 contaminants, the other surface water ARARs selected in the 1988 ROD (state and federal surface water standards) are more stringent than the BAT discharge limits. COCs have not been detected in surface water so this change does not currently affect the protectiveness of the remedy. Surface water data, however, should be compared to all applicable ARARs.

This FYR evaluates the validity of the soil cleanup level of 100 mg/kg for total carcinogenic PAHs in residential soil, established in the 1988 ROD. The 1992 ROD amendment called for restricting site uses to non-residential uses, and concluded that the soil cleanup level of 100 mg/kg of total carcinogenic PAHs is protective for non-residential soil. To help determine whether the Site's soil cleanup level is still valid, this FYR performed the calculations presented in Tables K-1 and K-2 in Appendix K. A variety of PAHs were present at the Site, with varying levels of toxicity, so the Site's single soil cleanup level (for total carcinogenic PAHs) cannot be compared to a single screening value. Therefore, Table K-1 apportions the 100 mg/kg cleanup level among the various PAHs based on their pre-cleanup prevalence at the Site, and then compares the estimated maximum post-cleanup concentration of each PAH against its current EPA risk-based screening level for non-residential soil. Estimated post-cleanup concentrations were used because soil confirmation samples were not collected after the soil removals. As shown in Table K-1, each PAH's estimated maximum post-cleanup concentration is within EPA's range of acceptable risk.

Table K-2 presents a rough estimate of the estimated maximum post-cleanup concentration of carcinogenic PAHs in soil, expressed in units of benzo(a)pyrene equivalents. The estimated maximum post-cleanup concentration of carcinogenic PAHs in soil (23.8 mg/kg benzo(a)pyrene-equivalents) is within EPA's range of acceptable risk, based on EPA's current risk-based screening level for non-residential soil.

Partial excavation of contaminated soil occurred on the residential property located immediately east of the former church. A residence still exists at this property as the property owner opted not to be relocated. To determine if PAH concentrations in soil at this residential property are protective, soil analytical data collected during the removal action and included in the Soil Remedial Action Report were compared to current EPA regional screening levels based on residential exposures (Appendix K, Table K-3). The maximum detected concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluroanthene and dibenz(a,h)anthracene exceed EPA's range of acceptable risk. The maximum concentration detected for benzo(a)pyrene for the residential property, for example, was 17 mg/kg; the 10^{-4} EPA screening level for residential soil is 1.6 mg/kg.

EPA's dioxin reassessment has been developed and undergone review for many years, with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. The Agency followed current guidelines and incorporated the latest data and physiological/biochemical research into the reassessment. On February 17, 2012, EPA released the final human health non-cancer dioxin

reassessment, publishing an oral non-cancer toxicity value, or reference dose (RfD), of $7x10^{-10}$ milligrams per kilograms per day (mg/kg-day) for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in EPA's Integrated Risk Information System (IRIS). The dioxin cancer reassessment will follow thereafter. The dioxin RfD was approved for immediate use at Superfund sites to ensure protection of human health.

The 1992 ROD amendment (Table 3) indicates that, prior to the Site's soil cleanup, site soils had a maximum dioxin concentration of 767 micrograms per kilogram (µg/kg), which exceeds EPA's current screening level for industrial soil (0.022 µg/kg for cancer risk and 0.72 µg/kg for noncancer). The 1992 ROD amendment (Table 1) predicted that the Site's maximum dioxin soil concentration after the soil cleanup would be 0.0077 µg/kg, which is below EPA's current screening levels for both residential and industrial soil. Since soil confirmation samples were not collected after the removal actions, the effectiveness of the removal actions in remediating dioxin-contaminated soils to acceptable levels is unknown. EPA will negotiate with the PRP to obtain additional soil samples to confirm that the dioxin soil concentrations meet current cleanup levels.

Vapor intrusion to indoor air was not considered as a potential exposure pathway as part of the Site's risk assessment. Although the original shallow groundwater contaminant plume map shows the plume extending slightly off site into residential areas, current dissolved phase plume data is not available to evaluate potential vapor intrusion impacts. Data used to characterize the current extent of the dissolved phase groundwater plume should be used to determine if vapor intrusion to indoor air is a potential concern for any nearby residential properties.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

The cleanup goal for soil remediation was based on the protection of human health; it may not be protective of ecological receptors. Site documents indicate the need to perform an ecological risk assessment for the Site. The June 1988 Feasibility Study, which included an environmental assessment, noted that "quantification [of ecological risk] is not justified or possible because biota have not been completely surveyed at the Site, and standards/criteria are not available for most exposure media." Standards/criteria for several site contaminants in multiple media are now available, such as EPA's Biological Technical Assistance Group sediment and surface water screening values. In light of the advancements in the assessment of ecological risk and the change in land use of the Site since the original assessment, a quantitative evaluation of ecological risk should be conducted. In addition to sediment in Wagner Creek, ecological risk from water in the submerged gravel pits should also be evaluated.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Zoning has not yet been changed from residential to non-residential for the former Carver Terrace properties.			
	Recommendation: Continue to work with the City of Texarkana to implement institutional controls and reclassify the former residential subdivision from residential to non-residential use through zoning changes.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Since soil confirmation samples were not collected after the removal actions, the effectiveness of the removal actions in remediating dioxin-contaminated soils to acceptable levels is unknown.			
	Recommendation: Collect soil samples to determine whether dioxin concentrations at the Site are greater than the screening level resulting from the February 17, 2012 oral non-cancer toxicity, or reference dose (RfD) of $7x10^{-10}$ mg/kg-day for 2,3,7,8-tetrachlorodiebenzo-p-dioxin (TCDD) to ensure long-term protectiveness, if warranted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	Issue Category: Remedy Performance
	Issue: PAH contamination may have been left on the Site at levels above the 100 mg/kg cleanup goal for potentially carcinogenic PAHs. Areas of potential concern include lots not characterized during the RI within the former Carver Terrace neighborhood due to lack of access agreements, three areas that were originally proposed for remediation but were located within the drip line of large-diameter trees and three areas on the Kennedy Sand and Gravel property where visual evidence of contamination was observed during the RI. The RI also notes that only five surface soil samples were collected from within the southern half of the Site (on the Kennedy Sand and Gravel property).
	Recommendation: Collect additional soil samples in specific areas across the Site and implement additional measures to maintain protectiveness, if warranted. These areas include the three dripline areas and other uncharacterized lots within the former Carver Terrace neighborhood, within the areas of visual contamination on the Kennedy Sand and Gravel property identified in the RI, and across the Kennedy Sand and Gravel property more broadly.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	EPA	9/27/2018

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Site documents indicate that an ecological risk assessment was not performed for the Wagner Creek sediment, drainage ditch sediment and submerged gravel pits' water.			
	Recommendation: Conduct a quantitative evaluation of ecological risk for the Wagner Creek sediment, drainage ditch sediment and water in the submerged gravel pits, and take measures to ensure long-term protectiveness, if warranted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	Issue Category: Remedy Performance			
	Issue: Data on the current extent of the dissolved phase groundwater plume at the Site is not available. Therefore, it is unclear if vapor intrusion to indoor air of occupied structures on nearby properties is a concern for this Site.			
	Recommendation: Collect groundwater analytical data to determine the current extent of the dissolved phase groundwater plume at the Site, the magnitude of contaminants relative to groundwater cleanup goals and any related vapor intrusion impacts. Use data as a basis for a long-term groundwater monitoring program that assesses natural attenuation of the dissolved phase contamination in the upper and lower aquifers and include data in semi-annual reports.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	Issue Category: Monitoring			
	Issue: Monitoring data is needed to determine whether dense non-aqueous phase liquid (DNAPL) has migrated from the Site.			
	Recommendation: During the groundwater investigation, evaluate whether DNAPL has migrated off site. Use this data to determine risk and implement additional measures to maintain protectiveness, if warranted. This should include monitoring of points downgradient of the sumps and in areas where DNAPL is likely to accumulate due to gravitational forces to determine the effectiveness of the sumps in preventing DNAPL migration off-site or to the creek.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	Issue Category: Monitoring			
	Issue: Water quality and the cause of the oily sheens in the submerged gravel pits are unknown.			
	Recommendation: Investigate water quality of the gravel pit water and the cause of the oily sheen within the pit water. Determine if DNAPL is accumulating in low points within the base of the gravel pit.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 3	Issue Category: Remedy Performance			
	Issue: Since the 1988 ROD, ARARs for four of the groundwater contaminants identified at the Site (arsenic, lead, toluene, PCP) have become more stringent and a new ARAR was issued for one contaminant class (carcinogenic PAHs).			
	Recommendation: Evaluate whether groundwater cleanup goals should be added for arsenic, lead, toluene, PCP and carcinogenic PAHs, given more stringent or newly issued drinking water ARARs for these contaminants. Include the revisions in a decision document, as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	9/27/2018

OU(s): 2, 3	Issue Category: Institutional Controls			
	Issue: Institutional controls are not in place for site properties to restrict soil digging or groundwater use. Institutional controls may also be necessary for some off-site areas, including the residential property east of the former church and portions of Wagner Creek.			
	Recommendation: Continue implementing all necessary institutional controls, including any affected off-site areas.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/27/2018

OU(s): 2, 3	Issue Category: Site Access/Security			
	Issue: The Site's main gate is damaged and can allow unauthorized access to the Site.			
	Recommendation: Repair the main gate to avoid unauthorized access to the Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA	3/27/2017

OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR and may improve performance of the remedy, but do not affect current and/or future protectiveness:

- A few wells have missing locks and unsecured caps. Secure all piezometers and monitoring wells.
- Include updated site documents, including FYRs, in the site repository.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statements	
Operable Unit:1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because the buyout of the Carver Terrace community, relocation assistance for affected residents, and the demolition, removal and disposal of structures and debris have all been completed. In order for the remedy to be protective in the long term, institutional controls need to be implemented and the reclassification of the area from residential use to non-residential use needs to be accomplished through zoning changes.	

Operable Unit:2	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The OU2 remedy currently protects human health and the environment because there are no completed exposure pathways. For the remedy to be protective over the long term: 1) obtain additional soil samples to confirm new dioxin levels are still protective; 2) collect additional soil samples in specific areas across the Site and implement additional measures to maintain protectiveness, if warranted; 3) conduct a quantitative evaluation of ecological risk, particularly for Wagner Creek sediment, drainage ditch sediment and water in the submerged gravel pits; 4) continue implementing all necessary institutional controls, including any affected off-site areas,	

Protectiveness Statement(s)	
Operable Unit:3	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The OU3 remedy is currently protective of human health and the environment in the short-term because there are no completed exposure pathways. For the remedy to be protective over the long term: 1) collect groundwater analytical data to determine the current extent of the dissolved phase groundwater plume at the Site and any related vapor intrusion impacts; 2) during the groundwater investigation, evaluate whether DNAPL has migrated off site; 3) investigate water quality of the gravel pit water and the cause of the oily sheen within the pit water; 4) evaluate whether groundwater cleanup goals should be added for arsenic, lead, toluene, pentachlorophenol and carcinogenic PAHs, given more stringent or newly issued drinking water ARARs for these contaminants; 5) continue implementing all necessary institutional controls.	

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy currently protects human health and the environment because there are no completed exposure pathways. For the remedy to be protective over the long term: continue to work with the City of Texarkana to implement institutional controls and reclassify the former residential subdivision from residential to non-residential use through zoning changes; obtain additional soil samples to confirm new dioxin levels are still protective; collect additional soil samples in specific areas across the Site and implement additional measures to maintain protectiveness; conduct a quantitative evaluation of ecological risk, particularly for Wagner Creek sediment, drainage ditch sediment and water in the submerged gravel pits; collect groundwater analytical data to determine the current extent of the dissolved phase groundwater plume at the Site and any related vapor intrusion impacts; during the groundwater investigation, evaluate whether DNAPL has migrated off site; investigate water quality of the gravel pit water and the cause of the oily sheen within the pit water; evaluate whether groundwater cleanup goals should be added for arsenic, lead, toluene, pentachlorophenol and carcinogenic PAHs, given more stringent or newly issued drinking water ARARs for these contaminants; continue implementing all necessary institutional controls.

VIII. NEXT REVIEW

The next FYR Report for the Koppers Co., Inc. (Texarkana Plant) Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

DNAPL/Groundwater Construction Completion Report. Former Koppers Texarkana Site, Texarkana, Texas. Key Environmental, Inc. August 2003.

DNAPL/Groundwater Pilot Study Report and 100% Remedial Design. Koppers Texarkana Site, Texarkana, Texas. Key Environmental, Inc. December 2001.

Explanation of Significant Differences for the Record of Decision. Koppers Co., Inc. (Texarkana Plant) Superfund Site, Texarkana, Texas. EPA Region 6 – Superfund Division. August 2002.

Feasibility Study Report, Koppers Texarkana Site, Texarkana, Texas. Keystone Environmental Services, Inc. June 1988.

Final Remedial Investigation Report, Koppers Texarkana Site, Texarkana, Texas. Keystone Environmental Services, Inc. April 1988.

First Five-Year Review Report for Koppers Texarkana Superfund Site, Texarkana, Bowie County, Texas. EPA Region 6 – Superfund Division. September 2001.

Record of Decision, Koppers Co., Inc. (Texarkana Plant) Superfund Site, Operable Unit 1, Texarkana, Texas. EPA Region 6 – Superfund Division. September 1988.

Record of Decision Amendment, Koppers Co., Inc. (Texarkana Plant) Superfund Site, Operable Unit 1, Texarkana, Texas. EPA Region 6 – Superfund Division. March 1992.

Second Five-Year Review Report for Koppers Texarkana Superfund Site, Texarkana, Bowie County, Texas. EPA Region 6 – Superfund Division. September 2006.

Semi-Annual DNAPL Recovery System Operations and Monitoring Reports. Koppers Texarkana Site, Texarkana, Texas. Field & Technical Services, LLC. 2011 through 2014.

Soil Remedial Action Report, Koppers Texarkana Site, Texarkana, Texas. McCulley, Frick & Gilman, Inc. November 1996.

Third Five-Year Review Report for Koppers Texarkana Superfund Site, Texarkana, Bowie County, Texas. EPA Region 6 – Superfund Division. September 2011.

APPENDIX B – SITE MAPS

Figure B-1: Site Vicinity Map

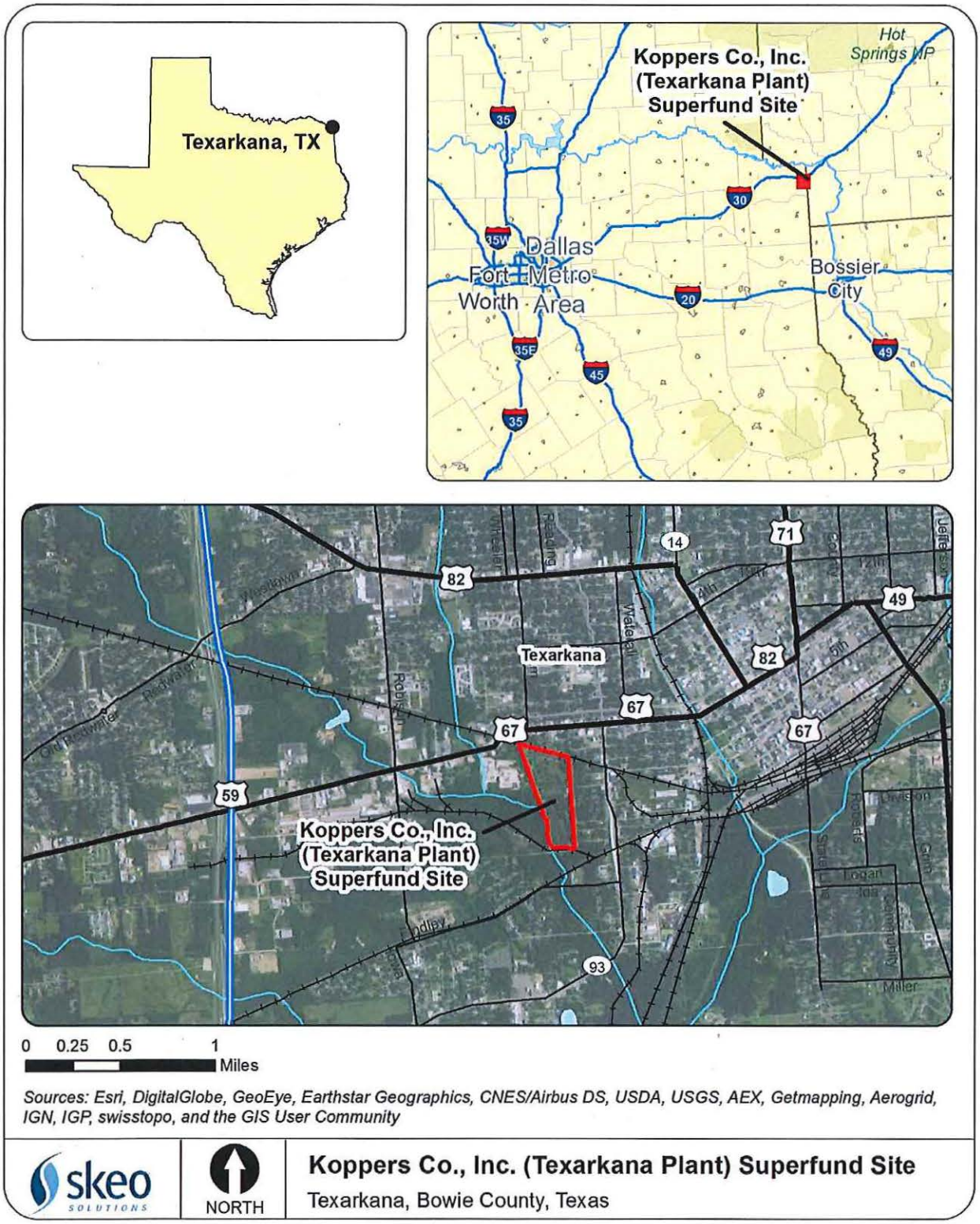


Figure B-2: Historic Wood Treating Operations (1988 ROD)

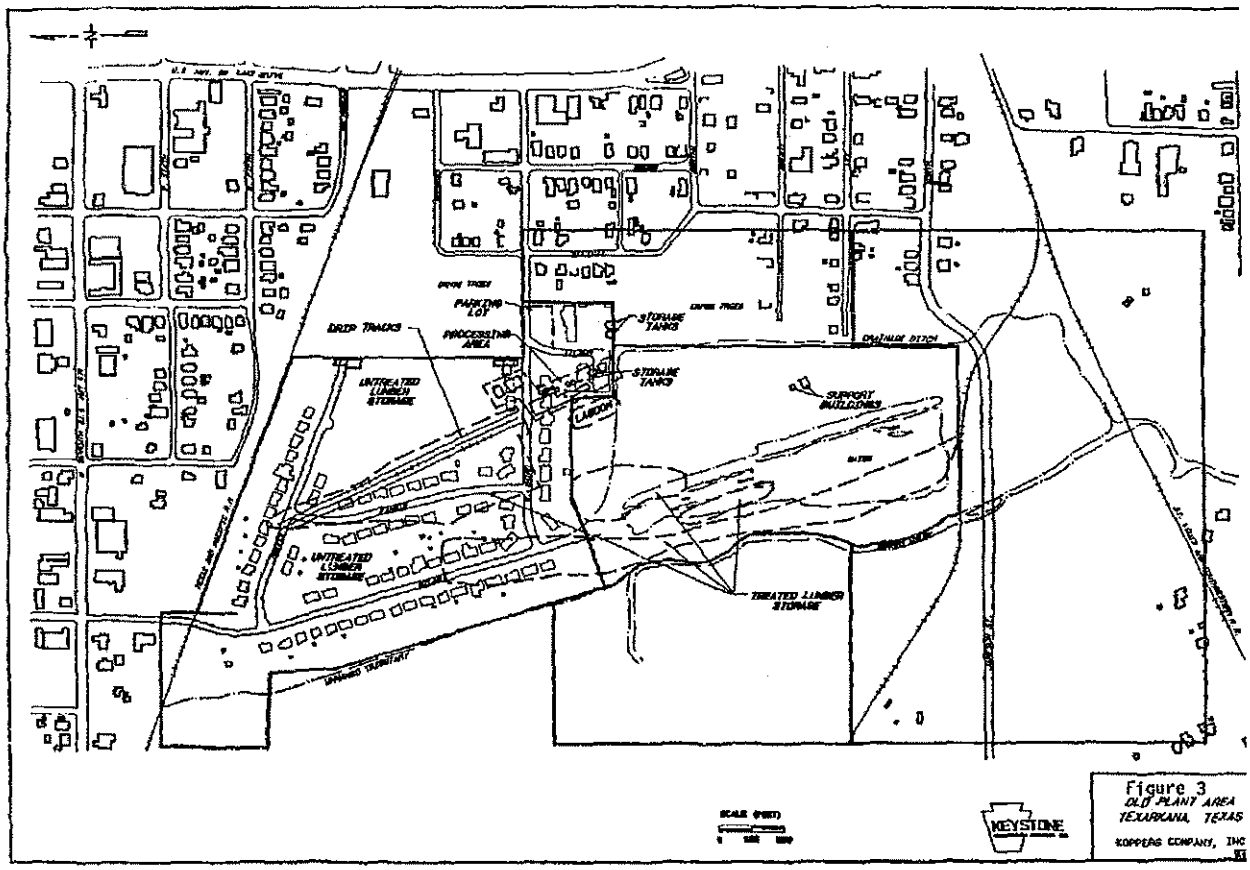


Figure B-3: Site Detail Map

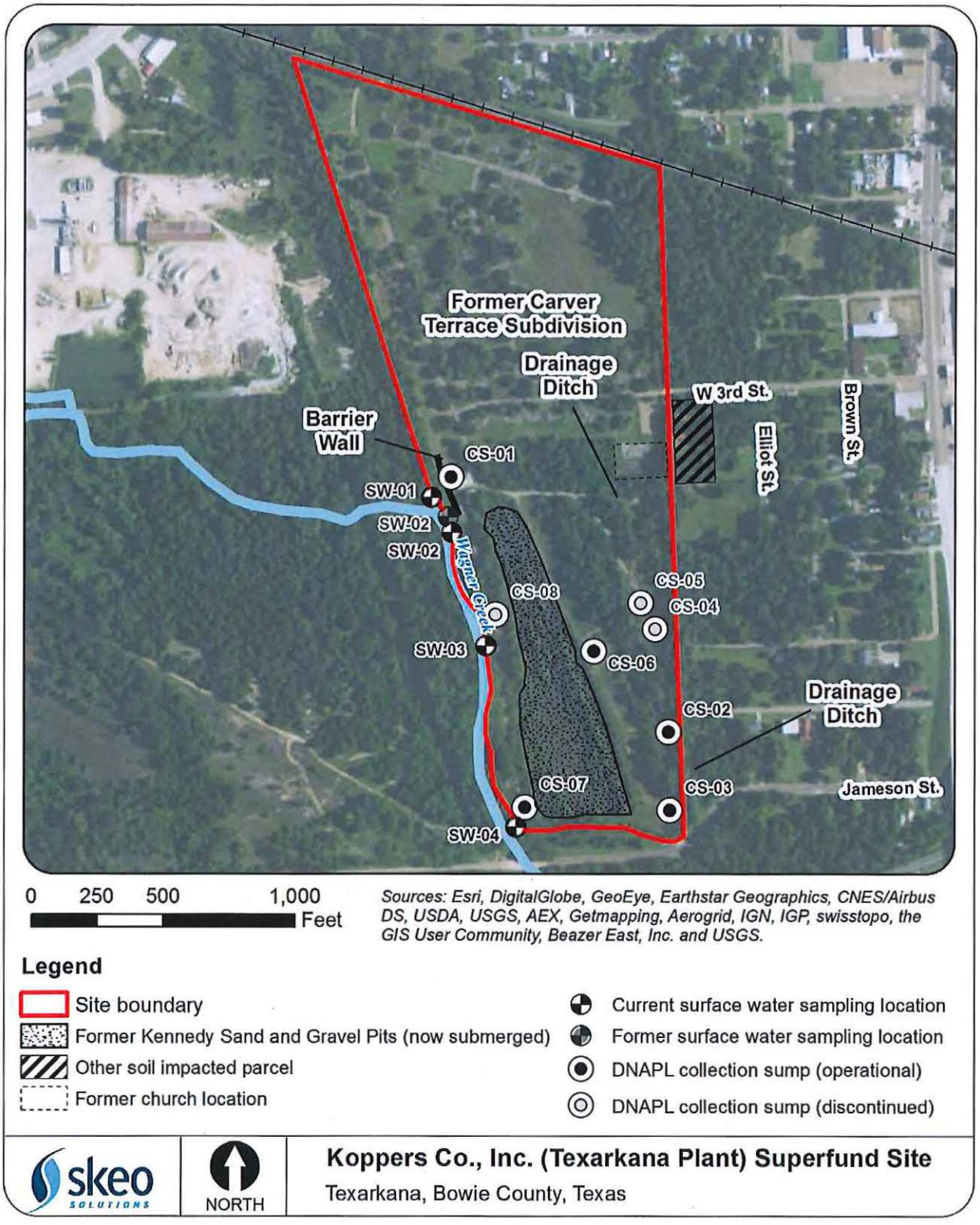


Figure B-4: Soil Excavation Limits Northern Area (2002 Soil Remedial Action Report)

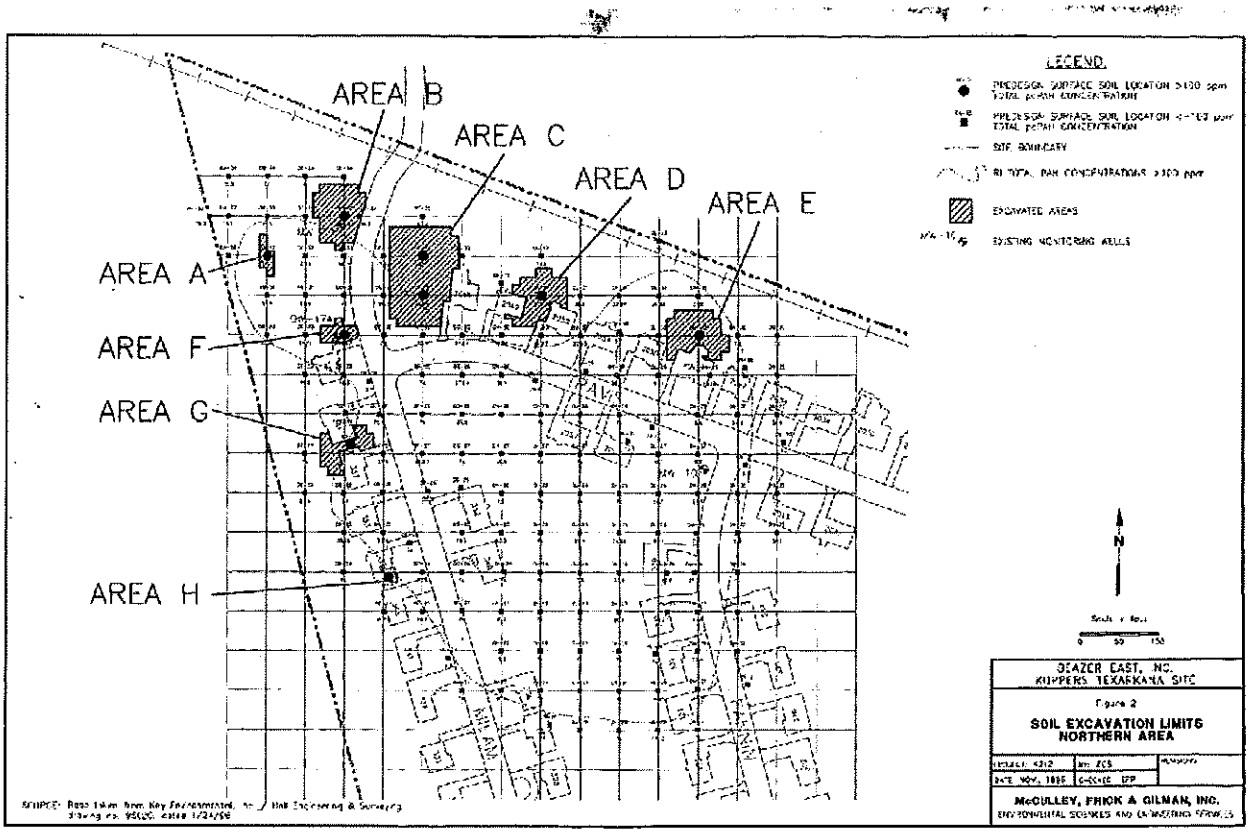


Figure B-5: Soil Excavation Limits Central and Southern Areas (2002 Soil Remedial Action Report)

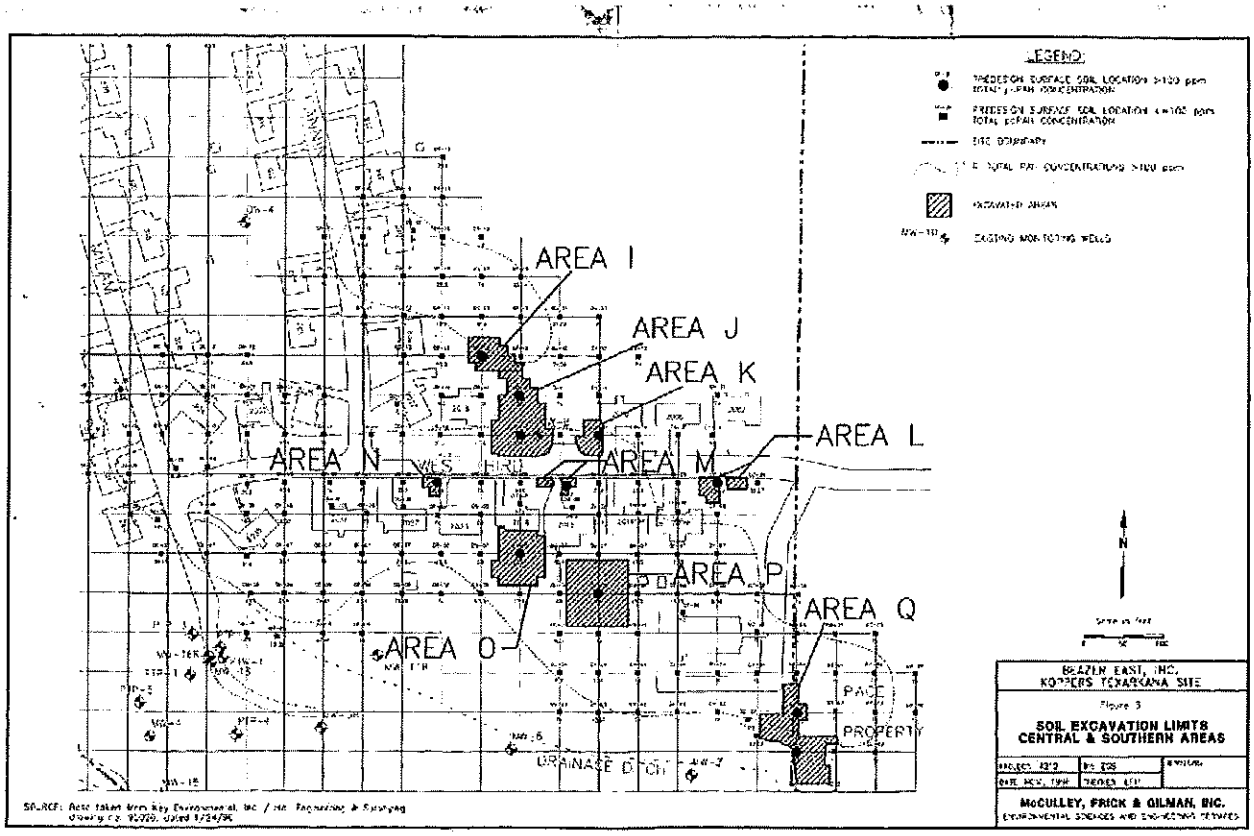


Figure B-6: Ditch Sediment Removal Area (2002 Soil Remedial Action Report)

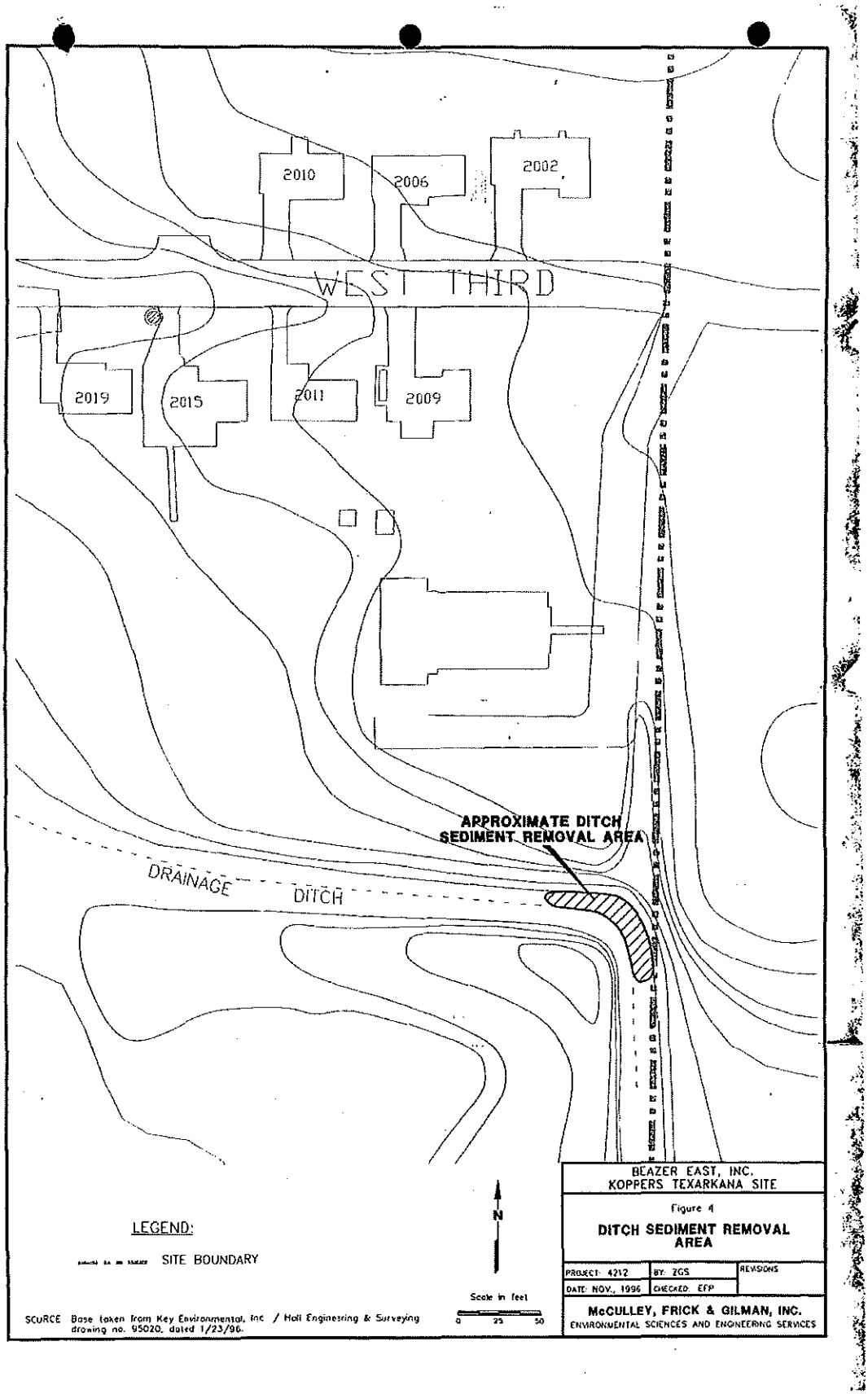


Figure B-7: Site Boundary and Affected Parcels

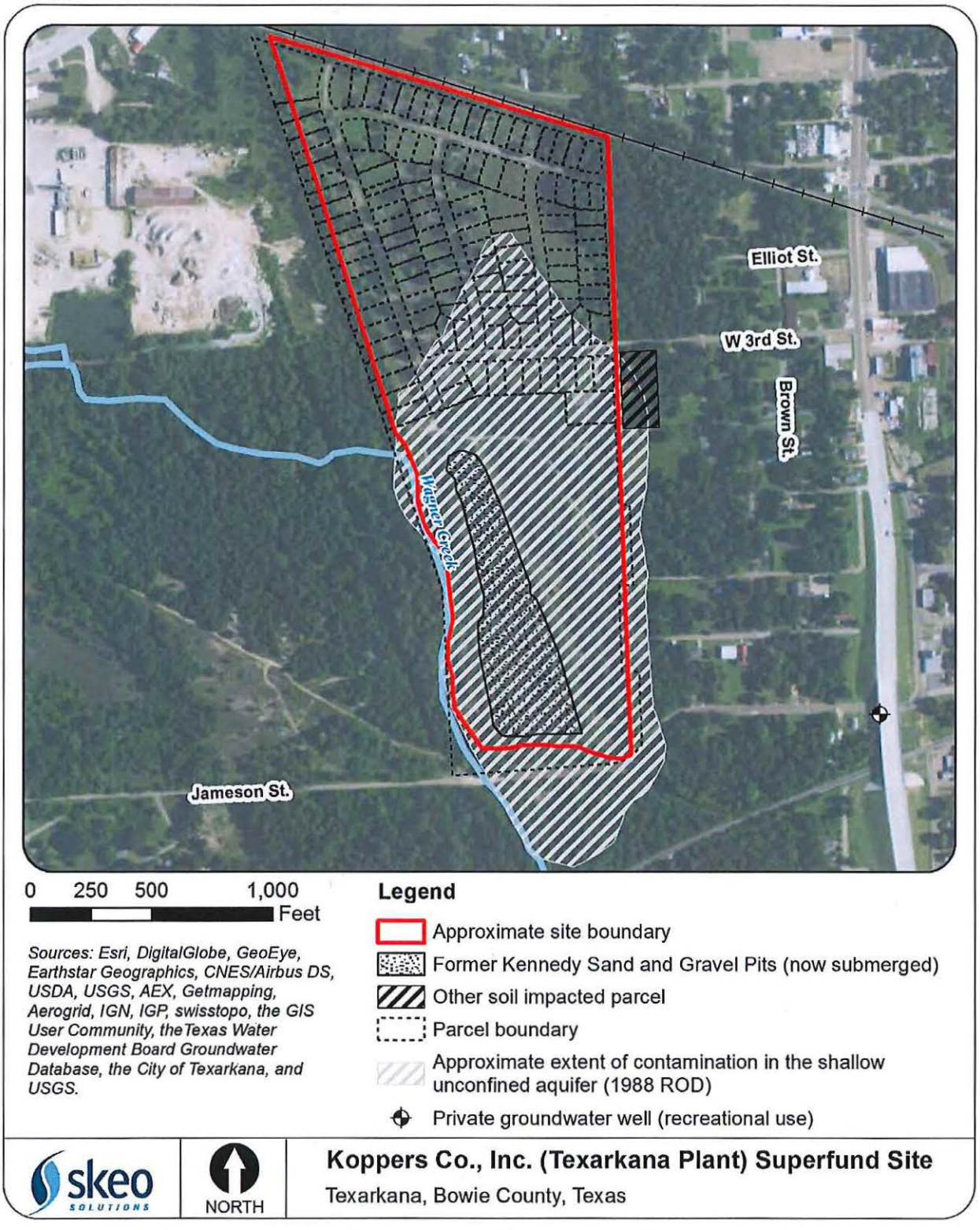


Figure B-8: Map of Total PAHs in Surface Soils and Areas with Visual Evidence Contamination (1988 RI)

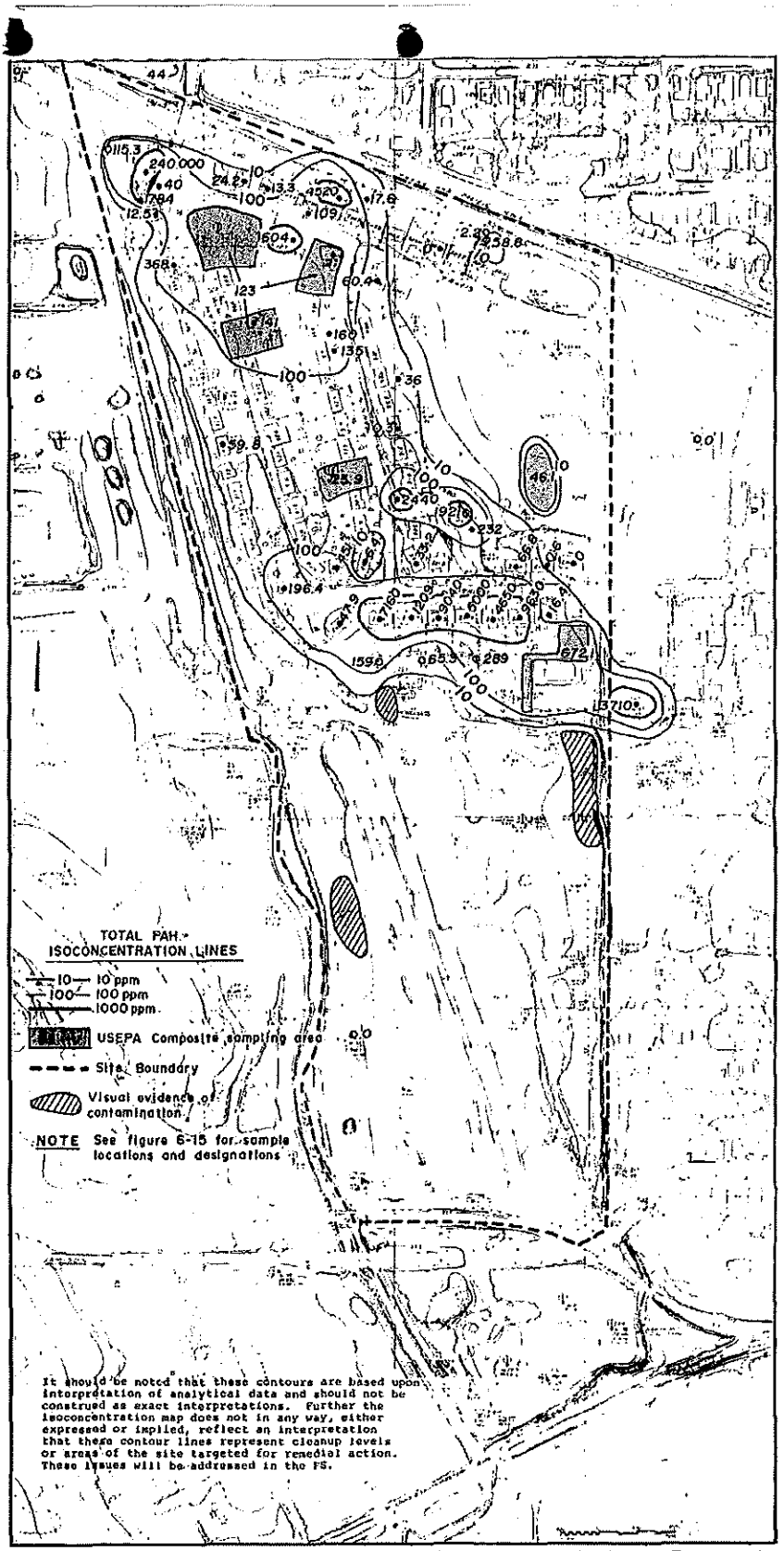


FIGURE 6-17: Isoconcentration Map of Total PAH in Surface Soils at the Koppers Texarkana Site

901-9

APPENDIX C – SITE CHRONOLOGY

Event	Date
Wood-preserving facility operated on site	1910 through 1961
Koppers Company ceased operations at the facility, removed surface structures and sold the site property	1961
Carver Terrace purchased most of the site property and built 79 single-family houses on the northern part of the property	1964
Carver Terrace sold the southern portion of the property to Kennedy Sand and Gravel	1975
TDWR became aware of the Site	1979
TDWR and EPA sampled the Site	1980-1981
TDWR ordered Kennedy Sand and Gravel to cease mining operations	1984
EPA proposed the Site for listing on the NPL	October 15, 1984
Preliminary site investigations by EPA determined that a fence needed to be placed around the sand and gravel pits and that 24 residential lots needed to be covered with soil and sod to protect residents until completion of Site's RI/FS	1984
EPA constructed a fence around the sand and gravel pits	December 1984-January 1985
EPA issued an AOC to the Koppers Company and one other party to construct a fence around the Kennedy Sand and Gravel property and to conduct additional response actions	1985
The PRP placed clean soil and sod on the 24 residential lots	July 1985-March 1986
EPA added the Site to the NPL	June 10, 1986
The PRP completed the Site's RI; the RI included EPA and PRP sampling results	April 1988
The PRP completed the Site's FS	June 1988
EPA signed the Site's ROD	September 23, 1988
Agency for Toxic Substances and Disease Registry (ATSDR) issued a health assessment for the Site	April 1990
Congress reviewed the assessment and ordered EPA to purchase the homes located on site in its Fiscal Year 1991 and Fiscal Year 1992 appropriations bills	1991-1992
EPA signed the Site's amended ROD	March 4, 1992
EPA issued a Unilateral Administrative Order that required the PRP to conduct certain OU2 and OU3 remedial activities outlined in the ROD and ROD amendment.	March 1993
The PRP began remedial design and remedial action for groundwater	March 31, 1993
Last on-site resident relocated	July 30, 1993
Demolition completed	January 27, 1994
The PRP completed surface soil predesign investigation	Summer and Fall of 1994
The PRP completed soil removal and replacement activities	April-July 1996
The PRP modified NAPL/Groundwater Pilot Study Work Plan	July 12, 1996
The PRP performed a geophysical investigation to ensure underground storage tanks were not present on site	September 8, 1997
The PRP installed a barrier wall between the CS-01 NAPL collection system location and Wagner Creek to contain seeps	Spring of 1998
The PRP submitted the NAPL/Groundwater Pilot Study Report and 95% Remedial Design to EPA	November 13, 1998
EPA informed the PRP that the Soil Remedial Action Report would be approved following further evaluation of the magnetic anomalies identified by the geophysical investigation of the former process area and lagoon	March 2, 1999
The PRP received comments on the NAPL/Groundwater Pilot Study Report and 95% Remedial Design from the State and Trustees	June 5, 2000
The PRP submitted revised sections of the NAPL/Groundwater Pilot Study Report and 95% Remedial Design	January 31, 2001

Event	Date
EPA gave final comments on the NAPL/Groundwater Pilot Study Report and 95% Remedial Design	March 13, 2001
EPA issued the Site's FYR Report	September 29, 2001
The PRP submitted a "Soil Remedial Action Report Addendum" to EPA	May 10, 2002
The PRP constructed a full-scale NAPL/groundwater remediation system	May-June 2002
The PRP placed the NAPL/groundwater remediation/collection system in operation	July 2002
EPA signed Site's ESD	August 20, 2002
EPA approved the Site's Soils Remedial Action Report	March 28, 2003
EPA approved the Site's NAPL/Groundwater Remedial Action Construction Completion Report	September 4, 2003
EPA modified surface water sampling in 2003 to require collecting two samples at all locations	April 26, 2004
EPA agreed to reduce the frequency of surface water monitoring to tri-annual and submission of progress reports to semi-annual	February 23, 2006
EPA issued the Site's Second FYR Report	September 18, 2006
EPA issued the Site's Third FYR Report	September 27, 2011

APPENDIX D – OWNERSHIP OF SITE PARCELS

Parcel Number[a]	Owner
15620003900	Private owner
15620004000	U.S. EPA Region 6
03740002300	U.S. EPA Region 6
03740002400	U.S. EPA Region 6
03740002500	U.S. EPA Region 6
03740002600	U.S. EPA Region 6
03740002700	U.S. EPA Region 6
03740002800	U.S. EPA Region 6
03740002900	U.S. EPA Region 6
03740003000	U.S. EPA Region 6
03740003100	U.S. EPA Region 6
03740003200	U.S. EPA Region 6
03740000100	Private owner
03740000200	Private owner
03740000300	Private owner
03740000400	U.S. EPA Region 6
03740000500	U.S. EPA Region 6
03740000600	U.S. EPA Region 6
03740000700	U.S. EPA Region 6
03740000800	U.S. EPA Region 6
03740000900	U.S. EPA Region 6
03740003300	Private owner
03740003400	Private owner
03740003500	Private owner
03740003600	Private owner
03740003700	Private owner
03740003800	Private owner
03740003900	Private owner
03740004000	Private owner
03740004100	Private owner
03740004200	Private owner
03740004300	Private owner
03740004400	U.S. EPA Region 6
03740004500	U.S. EPA Region 6
03740004600	U.S. EPA Region 6
03740004700	Private owner
03740004800	Private owner
03740004900	Private owner
03740005000	Private owner
03740005100	Private owner
03740005200	Private owner
03740005300	Private owner
03740005400	U.S. EPA Region 6
03740005500	U.S. EPA Region 6
03740005600	Private owner
03740005700	Private owner
03740005800	Private owner
03740005900	Private owner
03740006000	Private owner
03740006100	Private owner
03740006200	Private owner
03740006300	Private owner

Parcel Number[a]	Owner
03740006400	Private owner
03740006500	Private owner
03740006600	Private owner
03740006700	U.S. EPA Region 6
03740006800	U.S. EPA Region 6
03740006900	Not Listed
03740007000	Private owner
03740007100	U.S. EPA Region 6
03740007200	U.S. EPA Region 6
03740007300	U.S. EPA Region 6
03740007400	U.S. EPA Region 6
03740007500	U.S. EPA Region 6
03740007600	U.S. EPA Region 6
03740007700	U.S. EPA Region 6
03740007800	U.S. EPA Region 6
03740007900	U.S. EPA Region 6
03740008000	U.S. EPA Region 6
03740008100	U.S. EPA Region 6
03740008200	U.S. EPA Region 6
03740008300	U.S. EPA Region 6
03740008400	U.S. EPA Region 6
03740008500	U.S. EPA Region 6
03740008600	U.S. EPA Region 6
03740008700	U.S. EPA Region 6
03740008800	U.S. EPA Region 6
03740008900	Private owner
03740009000	Private owner
03740009100	U.S. EPA Region 6
03740009200	U.S. EPA Region 6
03740009300	Private owner
03740009400	Private owner
03740009500	U.S. EPA Region 6
03740009600	U.S. EPA Region 6
03740009700	Private owner
03740009800	U.S. EPA Region 6
03740009900	U.S. EPA Region 6
03740010000	U.S. EPA Region 6
03740010100	U.S. EPA Region 6
03740010200	U.S. EPA Region 6
03740010300	U.S. EPA Region 6
03740010400	U.S. EPA Region 6
03740010500	Private owner
03740010600	U.S. EPA Region 6
03740010700	U.S. EPA Region 6
03740010800	Private owner
03740010900	U.S. EPA Region 6
03740011000	U.S. EPA Region 6
03740011100	U.S. EPA Region 6
03740011200	U.S. EPA Region 6
03740011300	U.S. EPA Region 6
03740011400	U.S. EPA Region 6
03740011500	U.S. EPA Region 6
03740011600	U.S. EPA Region 6
03740011700	U.S. EPA Region 6
03740011800	U.S. EPA Region 6

Parcel Number[a]	Owner
03740011900	U.S. EPA Region 6
03740012000	U.S. EPA Region 6
03740012100	U.S. EPA Region 6
03740012200	U.S. EPA Region 6
03740012300	Private owner
03740012400	Private owner
03740012500	Private owner
03740009700	U.S. EPA Region 6
03740001000	U.S. EPA Region 6
03740001100	U.S. EPA Region 6
03740001200	U.S. EPA Region 6
03740001300	U.S. EPA Region 6
03740001400	U.S. EPA Region 6
03740001500	U.S. EPA Region 6
03740001600	U.S. EPA Region 6
03740001700	U.S. EPA Region 6
03740001800	U.S. EPA Region 6
03740001900	U.S. EPA Region 6
03740002000	U.S. EPA Region 6
03740002100	U.S. EPA Region 6

Notes:

a) Source: Texarkana Maps USA. http://www.texarkanamaps.com, accessed, December 2015.

APPENDIX E – PRESS NOTICE

Koppers Co., Inc. (Texarkana Plant) Superfund Site
Public Notice
U. S. Environmental Protection Agency, Region 6

February 2016

The U.S. Environmental Protection Agency Region 6 (EPA) will be conducting the fourth five-year review of remedy implementation and performance at the Koppers Co., Inc. (Texarkana Plant) Superfund site (Site) in Texarkana, Texas. From 1903 to 1961, a wood treatment facility operated on site. The Site includes a former residential area and an inactive sand and gravel pit. Nearby land uses include homes, an industrial operation and a forested area.

The remedy included the buyout of the Carver Terrace subdivision and relocation of the affected residents, and the demolition, removal and off-site disposal of debris. Contaminated soils were also excavated and disposed of off site. Other parts of the remedy include ongoing removal of creosote from groundwater, institutional controls, and long-term maintenance and monitoring. The five-year review will determine if the remedies are still protective of human health and the environment. The five-year review is scheduled for completion in September 2016.

The report will be made available to the public at the following local information repository:

Texarkana Public Library
600 West Third Street
Texarkana, Texas 75501
(903) 794-2149

Site status updates are available on the Internet at http://www.epa.gov/superfund/koppers-co

All media inquiries should be directed to the EPA Press Office at (214) 665-2200

For more information about the Site, contact:

David Abshire/Remedial Project Manager
(214) 665-7188
or 1-800-533-3508 (toll-free)
or by email at abshire.david@epa.gov
Donn Walters/Community Involvement Coordinator
(214) 665-6483
or 1-800-533-3508 (toll-free)
or by email at walters.donn@epa.gov

APPENDIX F – INTERVIEW FORMS

Koppers Co., Inc. (Texarkana Plant) **Five-Year Review Interview Form**

Site Name: Koppers Co., Inc. (Texarkana Plant) **EPA ID No.:** TXD980623904

Interviewer Name: Eric Marsh **Affiliation:** Skeo Solutions

Subject Name: City of Texarkana **Affiliation:** _____

Subject Contact Information:

Time: **Date:** 02/25/2015

Interview Location:

Interview Format (circle one): **In Person** **Phone** **Email** **Other:**

Interview Category: **Local Government**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   The City is aware of the environmental issues as well as the cleanup activities to date.

2. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Somewhat, but we request EPA provide a copy to the City of environmental studies and/or results of any soil and groundwater testing conducted in past years and in the future.

3. Have there been any problems with unusual or unexpected activities at the Site in the past five years, such as emergency response, vandalism or trespassing?

   To our knowledge, there have not been emergency responses. The fence is not secure to prevent trespassing via foot traffic; however, it has not created an emergency response that we are aware of.

4. Are you aware of any changes to state laws or local regulations in the past five years that might affect the protectiveness of the Site's remedy?

   No.

5. Are you aware of any changes in projected land use(s) at the Site?

   If restrictive covenants are put in place by EPA or PRP on the Deed of Record, the City requests to be made aware of these restrictive covenants for future land use planning efforts.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site?

   Yes.

   How can EPA best provide site-related information in the future?

   Continue additions to the website; continue public meetings if any additional changes are made that warrant citizen input; continue efforts to inform neighboring property owners by direct mail and notify City officials prior to any direct mail notifications.

7. Do you have any comments, suggestions or recommendations regarding the project?

Please keep the City informed regarding any restrictive covenants or land use changes at the Site. This will help the City with future land use and comprehensive planning efforts.

Are Natural Resource Damage Assessment funds available to the City for the Site?

Site Name:	Koppers Co., Inc. (Texarkana Plant)	**EPA ID No.:**	TXD980623904
Interviewer Name:	Eric Marsh	**Affiliation:**	Skeo Solutions
Subject Name:	Nancy Johnson	**Affiliation:**	TCEQ
Subject Contact Information:	(817) 588-5862; nancy.johnson@tceq.texas.gov		
Time:		**Date:**	03/04/2016
Interview Location:	Not applicable		

Interview Format (circle one): **In Person** **Phone** **Email** **Other:**

Interview Category: **State Agency**

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   In the Carver Terrace subdivision, where some lots are owned by EPA, the remedy left soils that exceeded 100 parts per million (ppm) (mg/kg) total carcinogenic PAHs beneath foundation slabs, driveways and roads. Also in this area, the remedy left soils deeper than one foot below the ground surface that likely exceed 100 ppm total carcinogenic PAHs.

   To prepare the Site for future use, institutional controls (ICs) must be in place because the effectiveness of the soil remedy in this area will depend upon ICs to maintain and protect the foundation slabs, driveways and roads and also to prevent soil excavation greater than one foot in depth. However, at this point in the project, the Site is not ready for future use because these essential ICs are not in place.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The groundwater remedy appears to be performing as expected.

   TCEQ is concerned that adequate soil remediation may not have been performed in those yards where the EPA conducted an emergency response action in 1985. In this response action, a soil barrier (depth ranging from 2 to 6 inches of soil and sod) was placed in portions of 24 lots in the Carver Terrace subdivision. Koppers implemented these actions in 1985 as an interim measure for the residents during the time EPA was investigating the Site. It is unclear to TCEQ whether temporary measures implemented during the emergency response action became the permanent remedy without further evaluation of the long-term effectiveness of this temporary measure.

   Because high levels of contamination may remain close to the surface in many areas, TCEQ's concerns are further elevated by the fact that no continuing O&M activities are being conducted to ensure that the soil barrier (1 foot of clean fill and 2 to 6 inches of soil and sod) or the remaining house slabs and driveways are maintained. In addition to concerns regarding the protectiveness of the implemented remedy, TCEQ is concerned with the potential liability associated with the Site. Because the State of Texas is expected to take title to the Carver Terrace portion of the Site, TCEQ is concerned that the degree of soil remediation achieved would render the Site generally useless, and the State may take on additional liability due to contaminated soil existing so close to the surface. It must be noted that although the State of Texas may take title to the property, TCEQ did not agree to perform O&M activities. TCEQ asserts that provisions should be in place for the PRP to provide long-term maintenance of all physical controls in place at the Site, including, but not limited to, the clean fill that replaced excavated contaminated soil and the concrete foundation slabs and driveways.

   Finally, TCEQ is concerned with the extent of characterization and remediation of the sediment contamination. This concern is shared by EPA's Office of Inspector General in its report on the review of the

RI/FS for Koppers Texarkana Superfund Site (September 1992). The report states "The review of the investigation concerning the nature and extent of sediment contamination indicated that the characterization of the sediment was not fully addressed." Also, with regard to the proposed remedial action, the report states "The limited amount of sediment that is proposed to undergo remediation may not be adequate." Although additional sampling was conducted in a small portion of the drainage ditch, it is TCEQ's belief that the nature and extent of the sediment contamination in the drainage ditch and other areas were not fully characterized nor adequately remediated, thereby continuing to pose a threat to human health and the environment. TCEQ also questions the protectiveness of the target remedial level and whether, in light of current science, the 100 ppm of total carcinogenic PAH is still appropriate.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   I am aware of inquiries related to the transfer of EPA's interest in the Koppers Texarkana property to the State of Texas. Also, we are aware of at least one newspaper story that indicated that former Carver Terrace Subdivision residents still have health and financial complaints regarding site-related environmental issues and remedial activities.

4. Has your office conducted any site-related activities or communications in the past five years, apart from standard communications? If so, please describe the purpose and results of these activities.

   No.

5. Are you aware of any changes to state laws in the past five years that might affect the protectiveness of the Site's remedy?

   No.

6. Do you feel that the recommendations from the 2011 FYR have been sufficiently addressed?

   Recommendation No. 3 (placement of ICs) has not been sufficiently addressed. EPA should implement this activity as soon as possible.

7. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   No. As stated in our responses for questions #1 and #6, ICs are needed and essential for maintaining the effectiveness of the remedy and reuse of the site. EPA should implement the ICs.

8. Are you aware of any changes in projected land use(s) at the Site?

   No.

9. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   EPA should formulate, record, and implement ICs at the Site that are essential for moving it toward reuse.

Site Name:	**Koppers Co., Inc. (Texarkana Plant)**	**EPA ID No.:**	**TXD980623904**
Interviewer Name:	**Eric Marsh**	**Affiliation:**	**Skeo Solutions**
Subject Name:	**Michael Bollinger**	**Affiliation:**	**Beazer East, Inc.**
Subject Contact Information:	**(412) 208-8864**		
Time:	**5:00 p.m.**	**Date:**	**3/4/2016**
Interview Location:	**Not Applicable**		

Interview Format (circle one): **In Person** **Phone** **Email** **Other:**

Interview Category: **Potentially Responsible Parties (PRPs)**

1. What is your overall impression of the remedial activities at the Site?

   My overall impression of the project is favorable. The remediation system has been in-place and performing well for well over a decade.

2. What have been the effects of the Site on the surrounding community, if any?

   The effects of the implementation of the remedy have been positive.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy is performing well and is meeting its objectives.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents in the past five years?

   Beazer is not aware of any inquires or complaints.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Beazer and EPA communicate effectively.

6. Do you feel that the recommendations from the 2011 FYR have been sufficiently addressed?

   Beazer is continuing to work with EPA and TCEQ to implement institutional controls for the Site.

7. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   None at this time.

Site Name:	**Koppers Co., Inc. (Texarkana Plant)**	**EPA ID No.:**	**TXD980623904**
Interviewer Name:	**Eric Marsh**	**Affiliation:**	**Skeo Solutions**
Subject Name:	**James Zubrow**	**Affiliation:**	**Key Environmental, Inc.**
Subject Contact Information:	**(412) 428-9387**		
Time:	**11:00 a.m.**	**Date:**	**02/23/2016**
Interview Location:	**Not Applicable**		

Interview Format (circle one): **In Person** **Phone** **Email** **Other:**

Interview Category: **O&M Contractor**

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   My impression of the project is favorable. Goals are being met in a cost-effective manner.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The DNAPL recovery system continues to function well although accumulation rates have expectedly declined some over the years. Contaminant mass is being removed and no complete exposure pathways exist at the Site.

3. What are the findings from the monitoring data over the past five years? What are the key trends in contaminant levels that are being documented over time at the Site?

   The remedial program involves the physical removal of creosote as a separate phase liquid. DNAPL accumulations in wells and piezometers are monitored. DNAPL accumulation rates have generally decreased over time. Surface water samples from Wagner Creek adjacent to the Site are collected for analyses. No COCs have ever been detected.

4. Please briefly describe staff O&M responsibilities and the frequency of site inspections and activities.

   Site inspections are performed every eight weeks. Recovery wells and piezometers are gauged for depth to groundwater, depth to DNAPL and total well depth.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   DNAPL accumulations in two recovery wells have ceased so the frequency of monitoring was reduced to annual for these locations with EPA approval. This modification does not effect the protectiveness or effectiveness of the remedy.

6. Please provide approximate annual O&M costs over the past five years.

   I do not have access to this financial information.

7. Have there been unexpected O&M difficulties or costs at the Site in the last five years? If so, please provide details.

   There have not been unexpected O&M difficulties or costs at the Site in the last five years.

8. Have there been opportunities over the past five years to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   Monitoring frequencies have been reduced at recovery well locations where DNAPL accumulation rates have declined to approach zero.

9. Do you feel that the recommendations from the 2011 FYR have been sufficiently addressed?

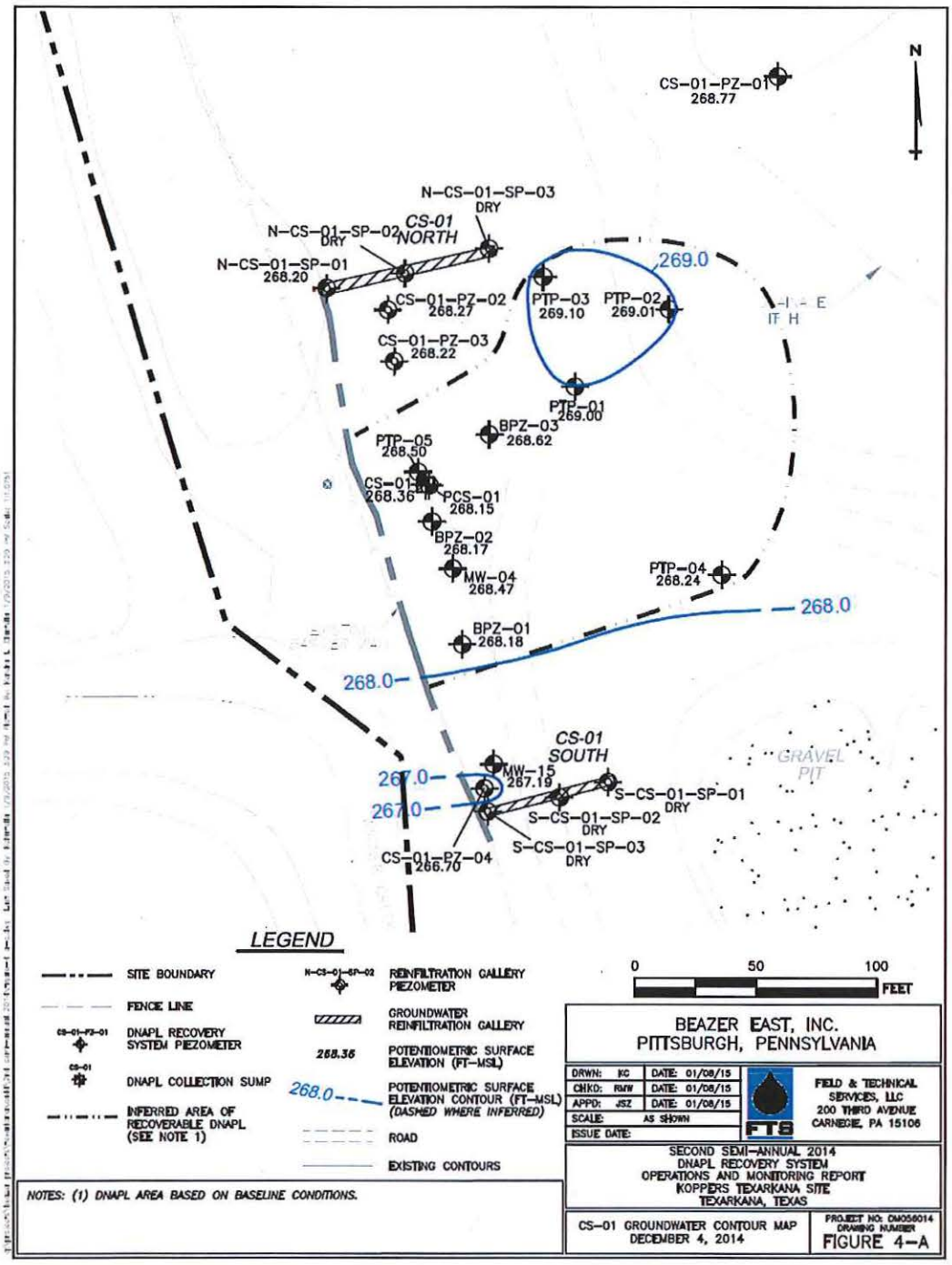
   Yes.

10. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

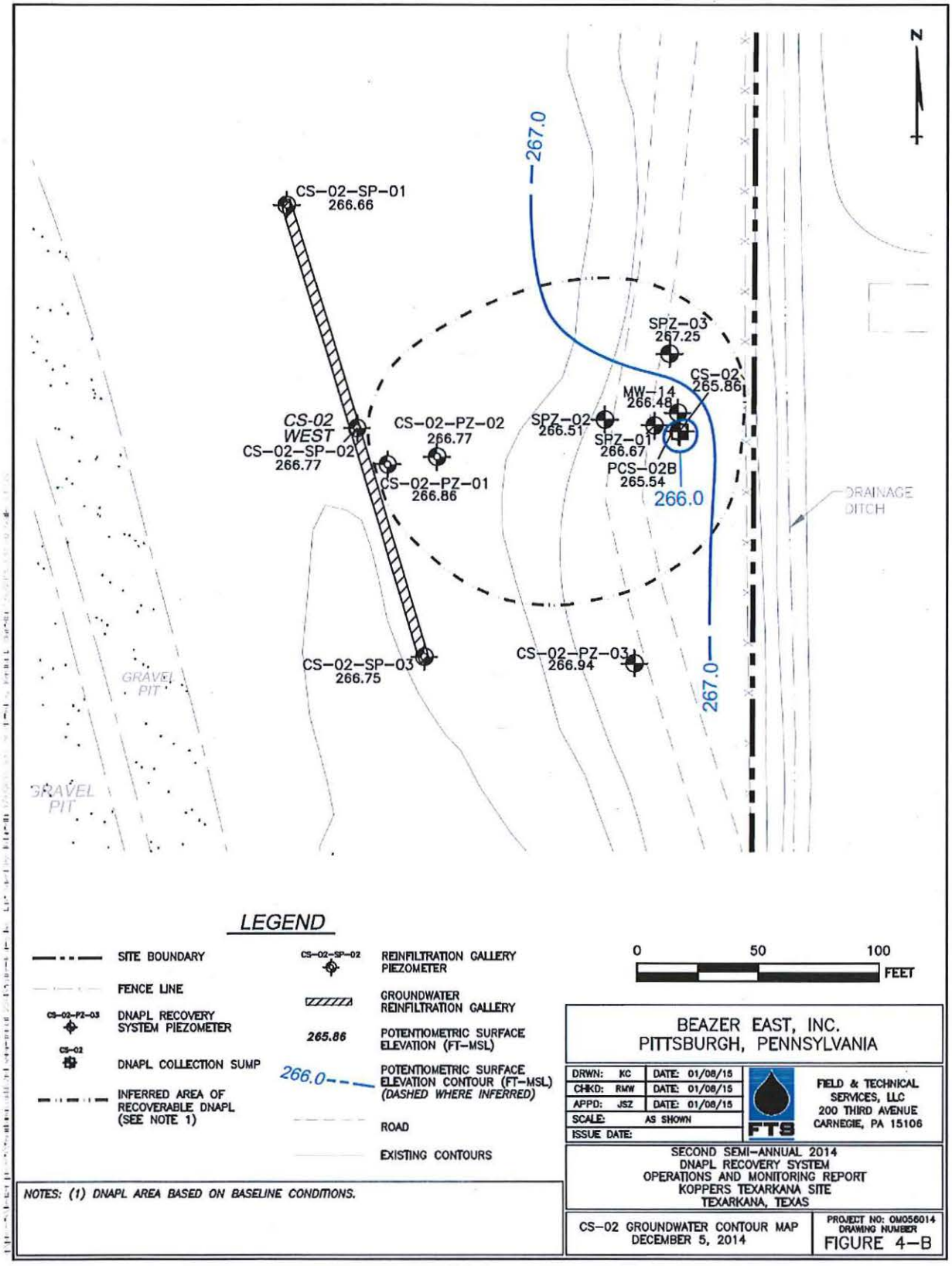
    We have been sampling Wagner Creek at various frequencies for the last 15 years or so and no COCs have ever been detected. I believe a reduction in surface water sampling frequency to annual sampling is appropriate.

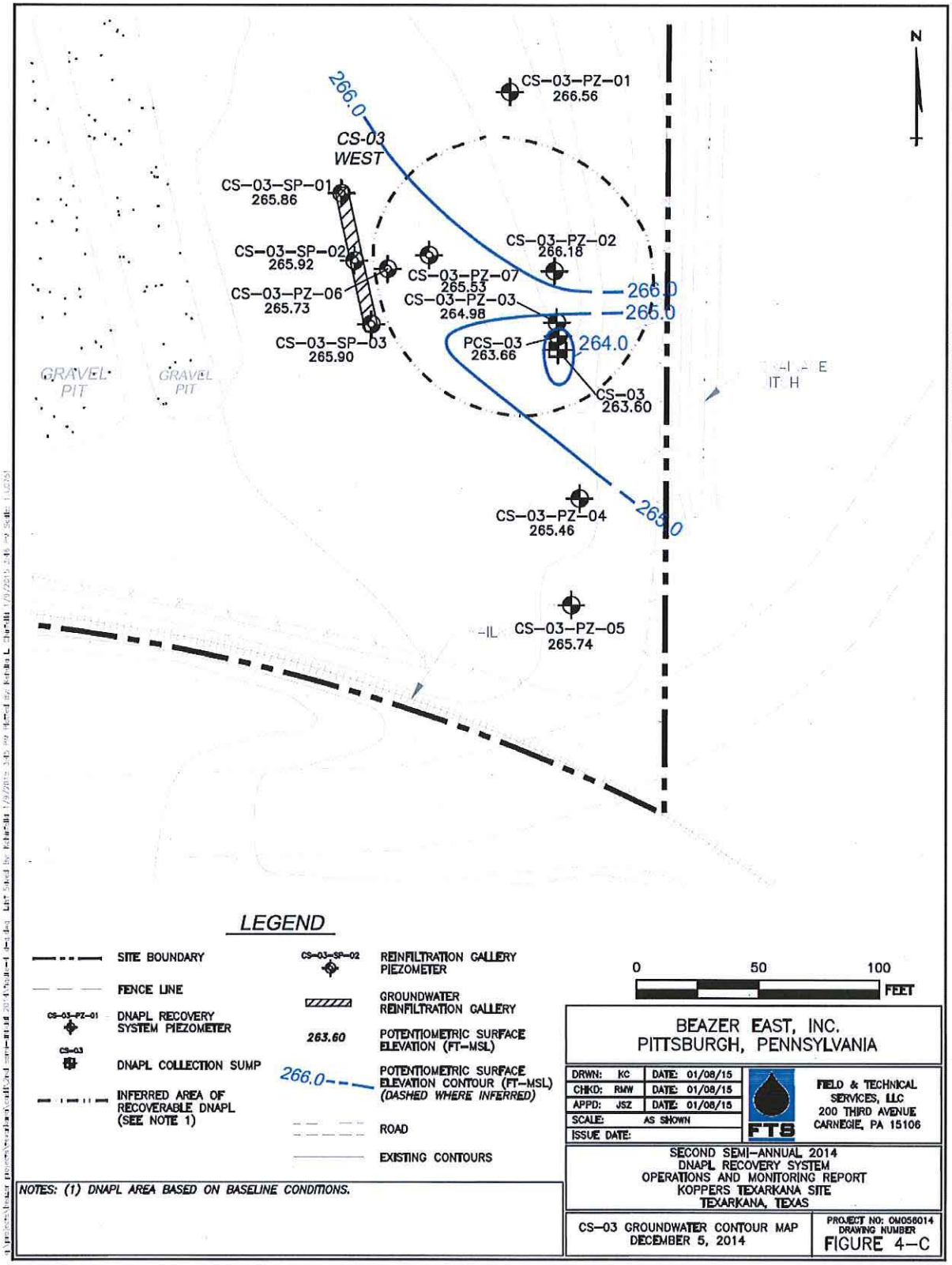
APPENDIX G – FIGURES AND TABLES SUPPORTING DATA ANALYSIS

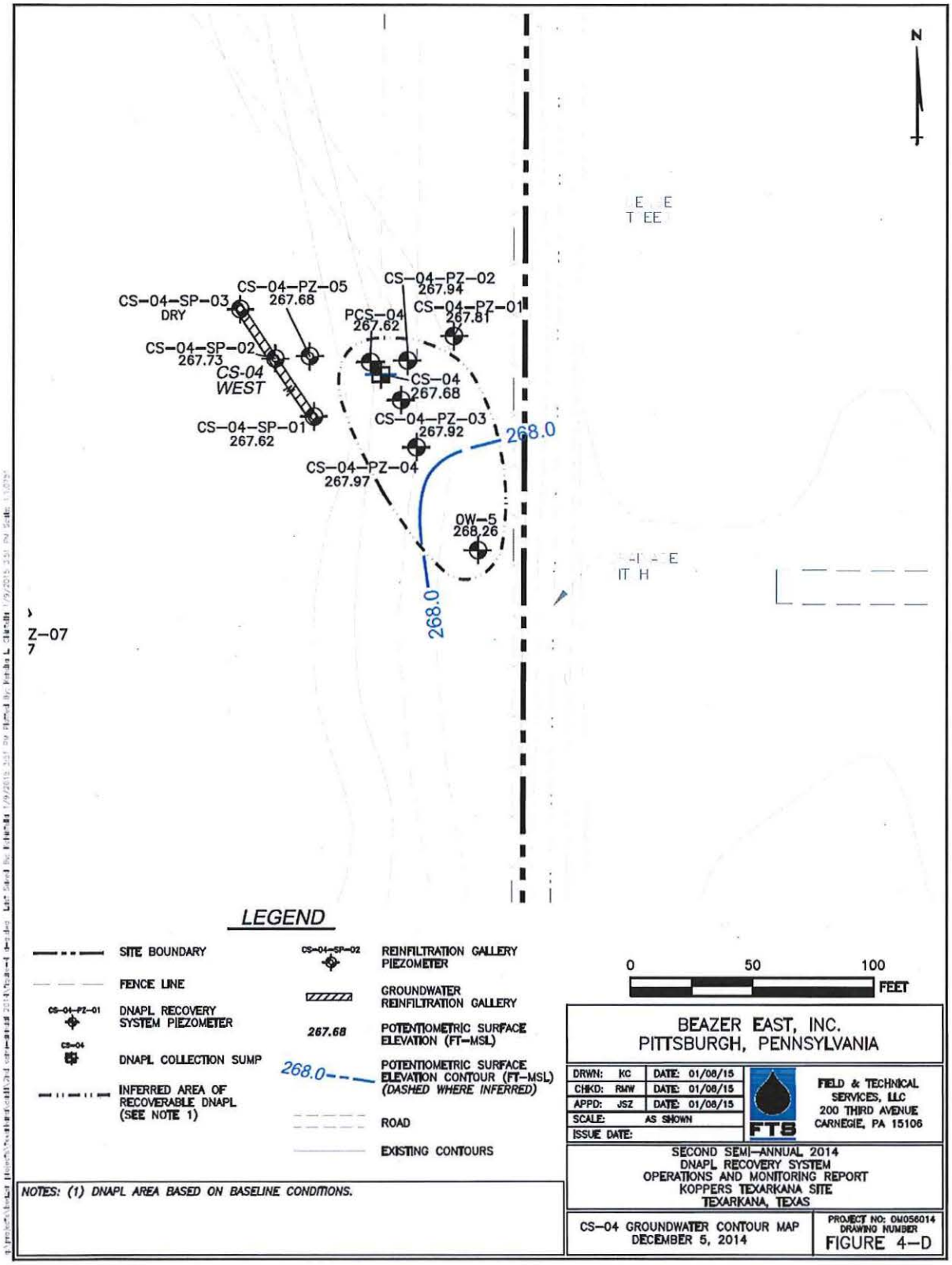
Figure G-1: 2014 Potentiometric Surface Maps[9]

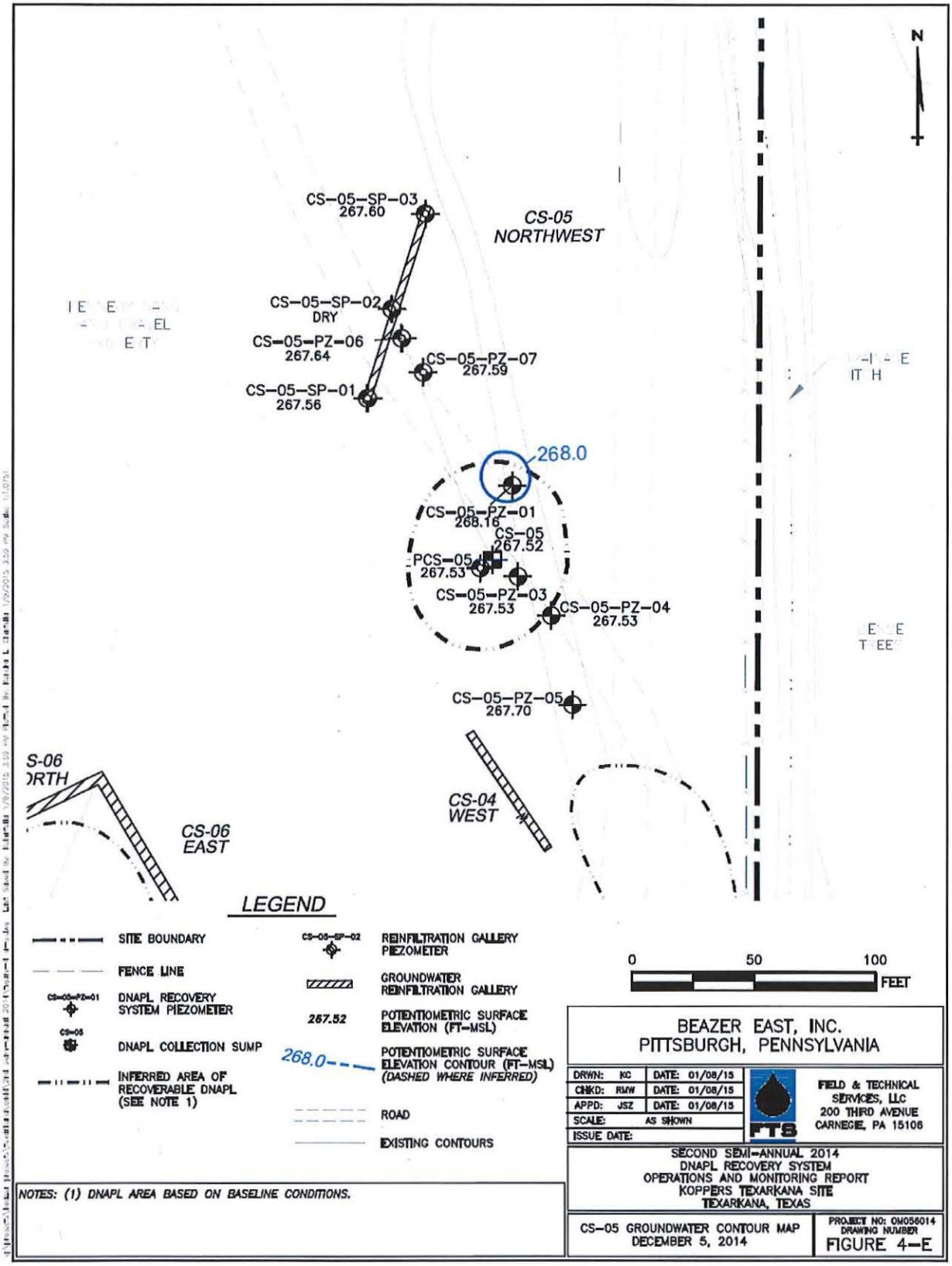


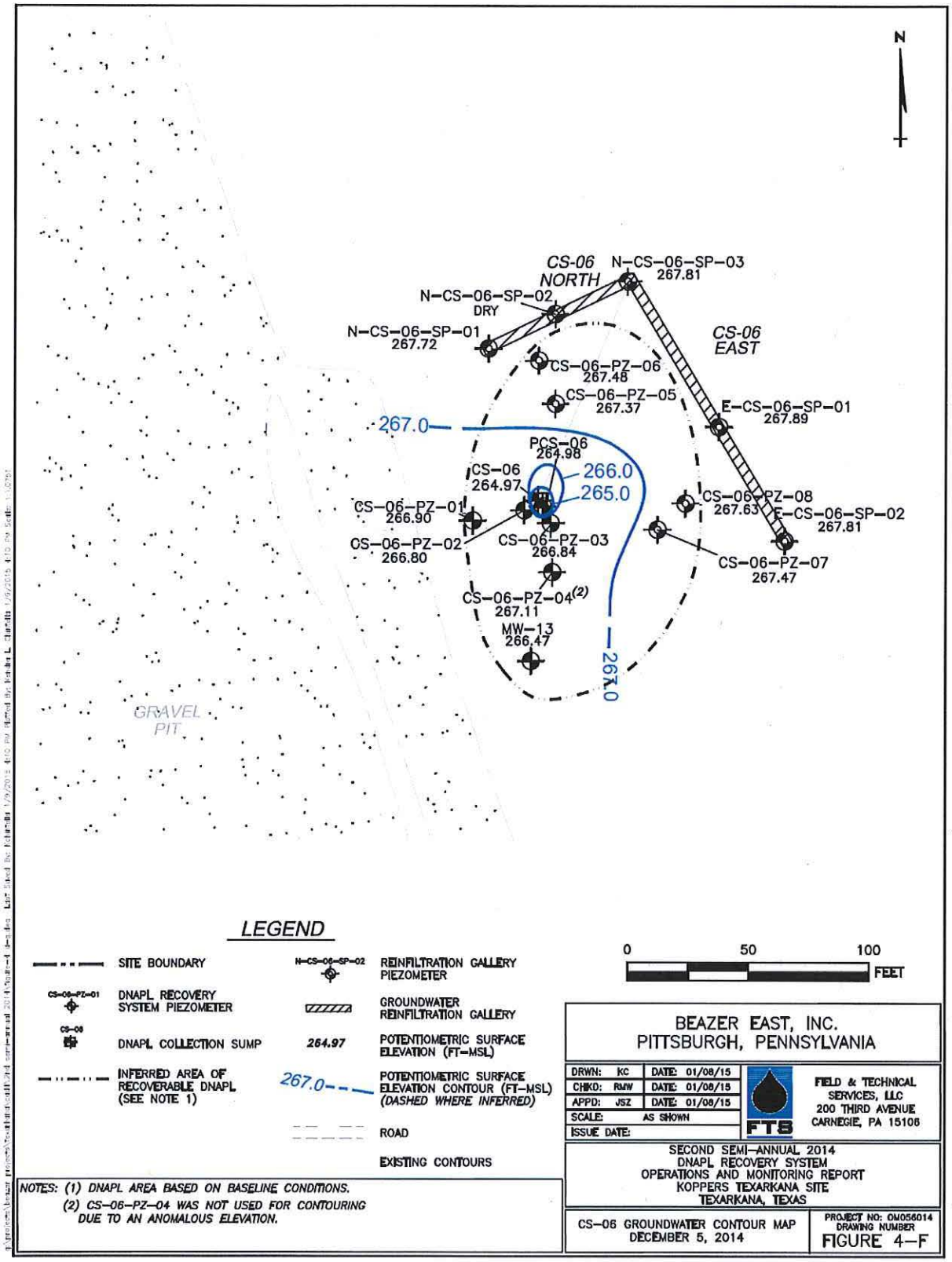
[9] *Source:* Second Semi-Annual 2014 DNAPL Recovery System Operations and Monitoring Report, prepared by Field & Technical Services, LLC.


N
267.0
CS-02-SP-01
266.66
SPZ-03
267.25
CS-02
265.86
MW-14
266.48
CS-02
WEST
CS-02-SP-02
266.77
CS-02-PZ-02
266.77
SPZ-02
266.51
SPZ-01
266.67
PCS-02B
265.54
CS-02-PZ-01
266.86
266.0
DRAINAGE
DITCH
CS-02-SP-03
266.75
CS-02-PZ-03
266.94
267.0
GRAVEL
PIT
GRAVEL
PIT
LEGEND
SITE BOUNDARY
FENCE LINE
DNAPL RECOVERY SYSTEM PIEZOMETER
DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
265.86
POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
266.0
POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
ROAD
EXISTING CONTOURS
0
50
100
FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-02 GROUNDWATER CONTOUR MAP
DECEMBER 5, 2014
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-B


N
CS-03-PZ-01
266.56
266.0
CS-03
WEST
CS-03-SP-01
265.86
CS-03-SP-02
265.92
CS-03-PZ-07
265.53
CS-03-PZ-02
266.18
CS-03-PZ-06
265.73
CS-03-PZ-03
264.98
266.0
266.0
CS-03-SP-03
265.90
PCS-03
263.66
264.0
CS-03
263.60
GRAVEL PIT
GRAVEL PIT
CS-03-PZ-04
265.46
266.0
CS-03-PZ-05
265.74
LEGEND
SITE BOUNDARY
FENCE LINE
CS-03-PZ-01 DNAPL RECOVERY SYSTEM PIEZOMETER
CS-03 DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
CS-03-SP-02 REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
263.60 POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
266.0 POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
ROAD
EXISTING CONTOURS
0 50 100
FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-03 GROUNDWATER CONTOUR MAP
DECEMBER 5, 2014
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-C


N
CS-04-SP-03
DRY
CS-04-PZ-05
267.68
CS-04-PZ-02
267.94
CS-04-PZ-01
267.81
PCS-04
267.62
CS-04-SP-02
267.73
CS-04
WEST
CS-04
267.68
CS-04-SP-01
267.62
CS-04-PZ-03
267.92
268.0
CS-04-PZ-04
267.97
OW-5
268.26
268.0
Z-07
7
LEGEND
SITE BOUNDARY
FENCE LINE
DNAPL RECOVERY SYSTEM PIEZOMETER
DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
267.68
POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
268.0
POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
ROAD
EXISTING CONTOURS
0
50
100
FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-04 GROUNDWATER CONTOUR MAP
DECEMBER 5, 2014
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-D


N
CS-05-SP-03
267.60
CS-05
NORTHWEST
CS-05-SP-02
DRY
CS-05-PZ-06
267.64
CS-05-PZ-07
267.59
CS-05-SP-01
267.56
268.0
CS-05-PZ-01
268.16
CS-05
267.52
PCS-05
267.53
CS-05-PZ-03
267.53
CS-05-PZ-04
267.53
CS-05-PZ-05
267.70
CS-04
WEST
CS-06
EAST
LEGEND
SITE BOUNDARY
FENCE LINE
DNAPL RECOVERY SYSTEM PIEZOMETER
DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
267.52
POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
268.0
POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
ROAD
EXISTING CONTOURS
0
50
100
FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-05 GROUNDWATER CONTOUR MAP
DECEMBER 5, 2014
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-E



NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
(2) CS-06-PZ-04 WAS NOT USED FOR CONTOURING DUE TO AN ANOMALOUS ELEVATION.

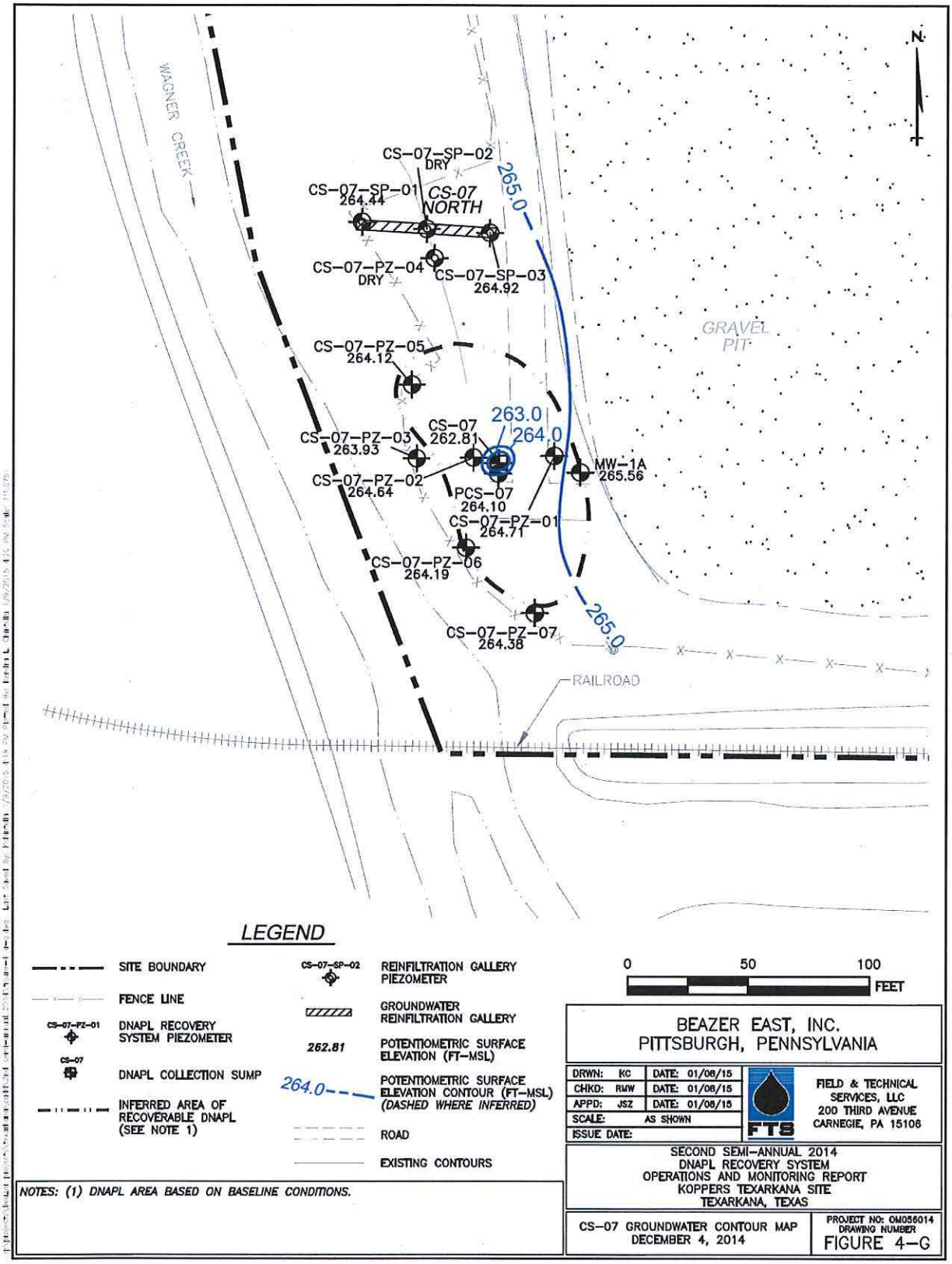
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: KC	DATE: 01/08/15	FIELD & TECHNICAL SERVICES, LLC
CHKD: RMW	DATE: 01/08/15	200 THIRD AVENUE
APPD: JSZ	DATE: 01/08/15	CARNEGIE, PA 15106
SCALE: AS SHOWN		
ISSUE DATE:		

SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS

CS-06 GROUNDWATER CONTOUR MAP
DECEMBER 5, 2014

PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-F


WAGNER CREEK
N
CS-07-SP-02
DRY
CS-07-SP-01
264.44
CS-07
NORTH
265.0
CS-07-PZ-04
DRY
CS-07-SP-03
264.92
GRAVEL
PIT
CS-07-PZ-05
264.12
263.0
264.0
CS-07
262.81
CS-07-PZ-03
263.93
MW-1A
265.56
CS-07-PZ-02
264.64
PCS-07
264.10
CS-07-PZ-01
264.71
CS-07-PZ-06
264.19
CS-07-PZ-07
264.38
265.0
RAILROAD
LEGEND
SITE BOUNDARY
FENCE LINE
CS-07-PZ-01
DNAPL RECOVERY SYSTEM PIEZOMETER
CS-07
DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
CS-07-SP-02
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
262.81
POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
264.0
POTENTIOMETRIC SURFACE ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
ROAD
EXISTING CONTOURS
0
50
100
FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-07 GROUNDWATER CONTOUR MAP
DECEMBER 4, 2014
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 4-G

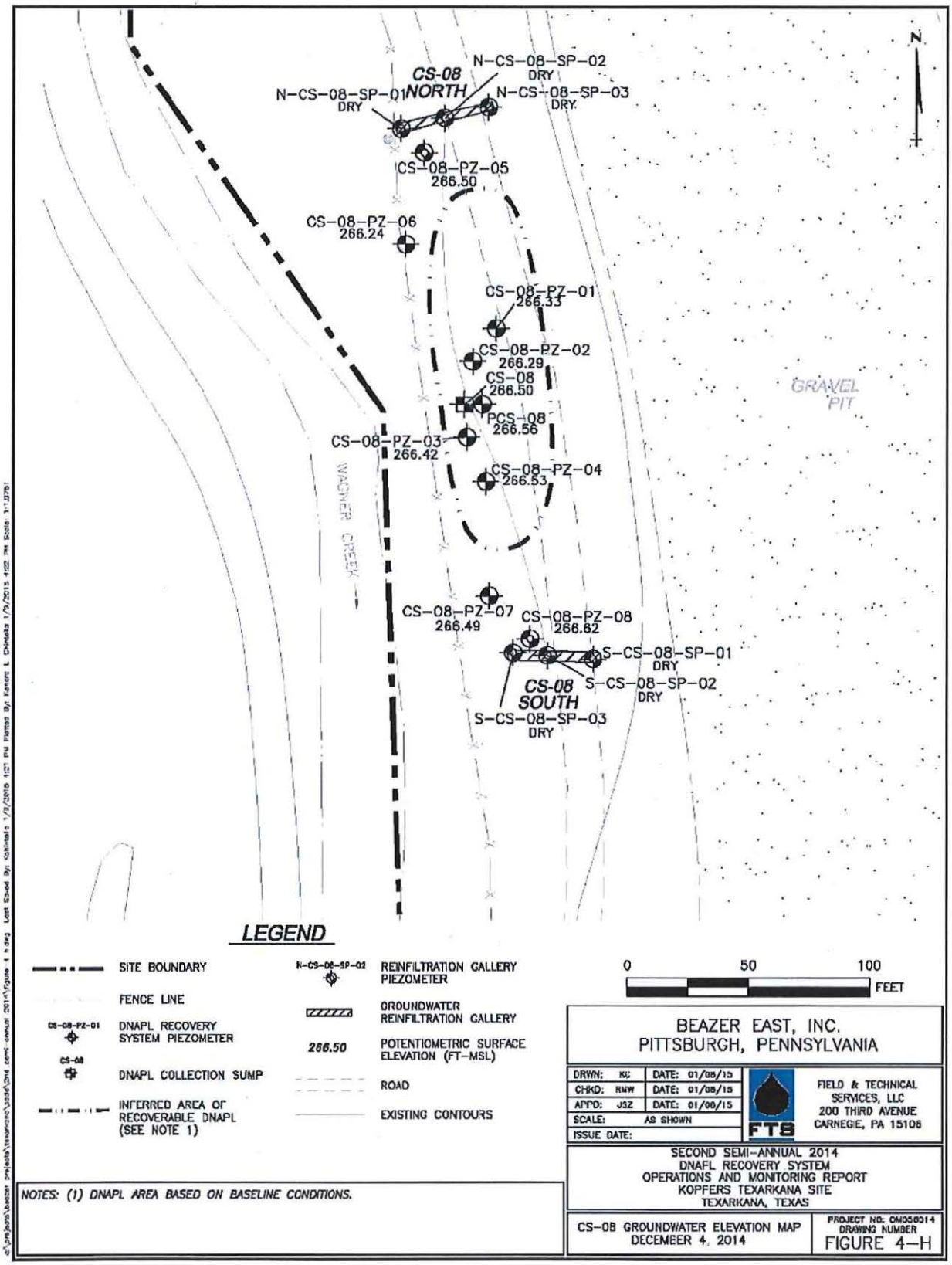
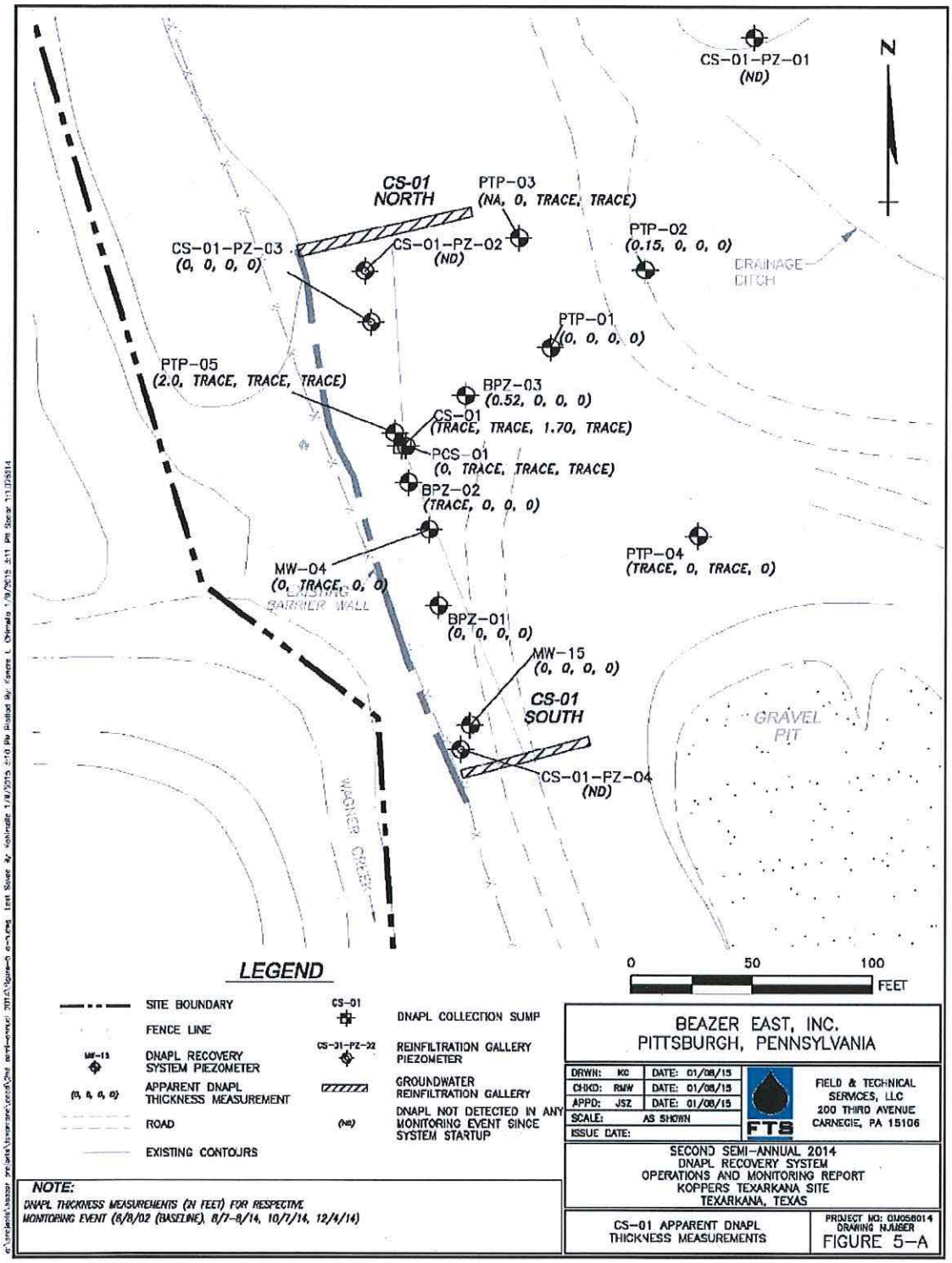
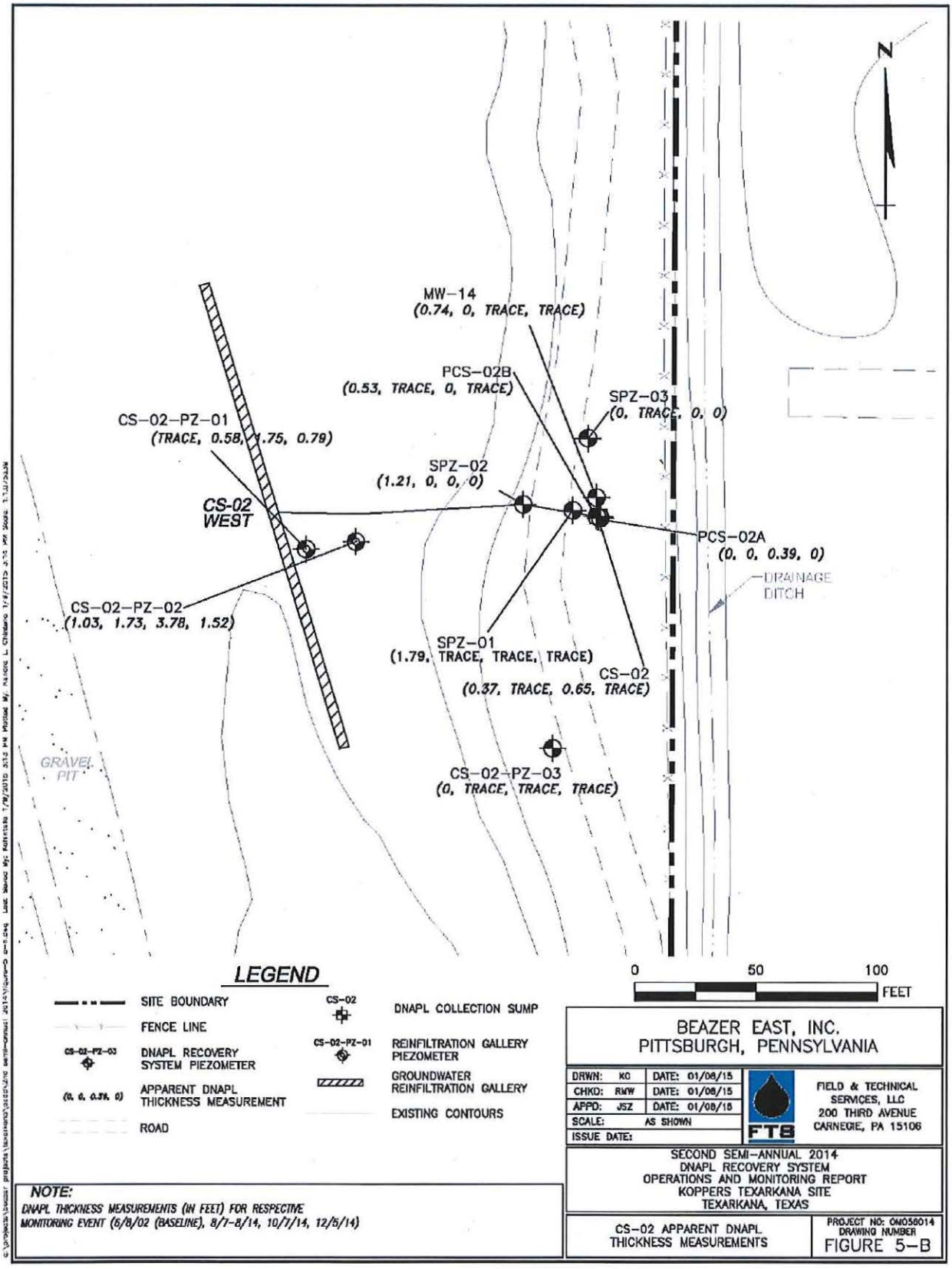
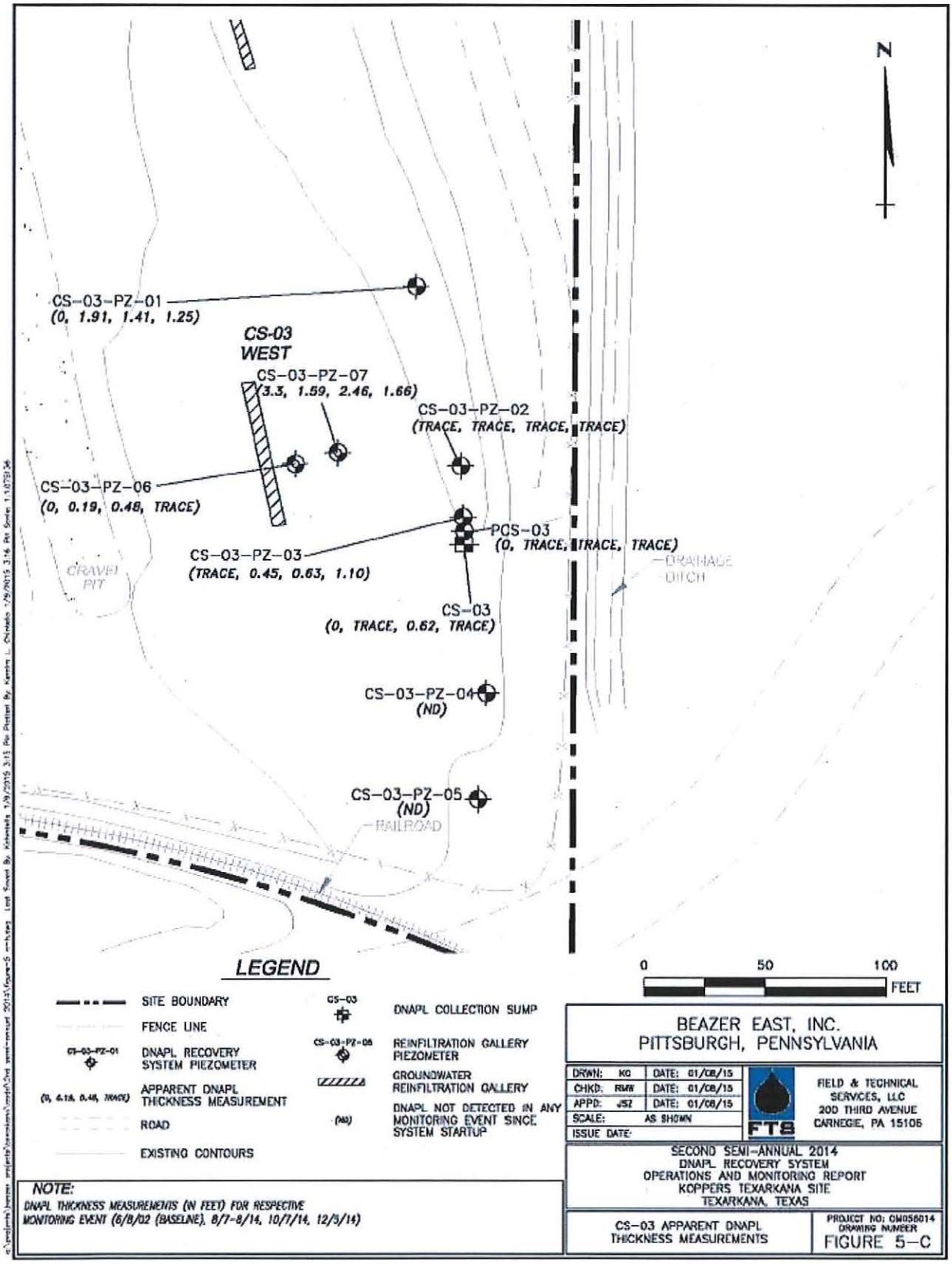

N
CS-08 NORTH
N-CS-08-SP-01 DRY
N-CS-08-SP-02 DRY
N-CS-08-SP-03 DRY
CS-08-PZ-05 266.50
CS-08-PZ-06 266.24
CS-08-PZ-01 266.33
CS-08-PZ-02 266.29
CS-08 266.50
PCS-08 266.56
CS-08-PZ-03 266.42
CS-08-PZ-04 266.53
GRAVEL PIT
WAGNER CREEK
CS-08-PZ-07 266.49
CS-08-PZ-08 266.62
S-CS-08-SP-01 DRY
S-CS-08-SP-02 DRY
CS-08 SOUTH
S-CS-08-SP-03 DRY
LEGEND
SITE BOUNDARY
FENCE LINE
CS-08-PZ-01 DNAPL RECOVERY SYSTEM PIEZOMETER
CS-08 DNAPL COLLECTION SUMP
INFERRED AREA OF RECOVERABLE DNAPL (SEE NOTE 1)
N-CS-08-SP-02 REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
266.50 POTENTIOMETRIC SURFACE ELEVATION (FT-MSL)
ROAD
EXISTING CONTOURS
0 50 100 FEET
NOTES: (1) DNAPL AREA BASED ON BASELINE CONDITIONS.
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/00/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-08 GROUNDWATER ELEVATION MAP
DECEMBER 4, 2014
PROJECT NO: 0M05014
DRAWING NUMBER
FIGURE 4-H

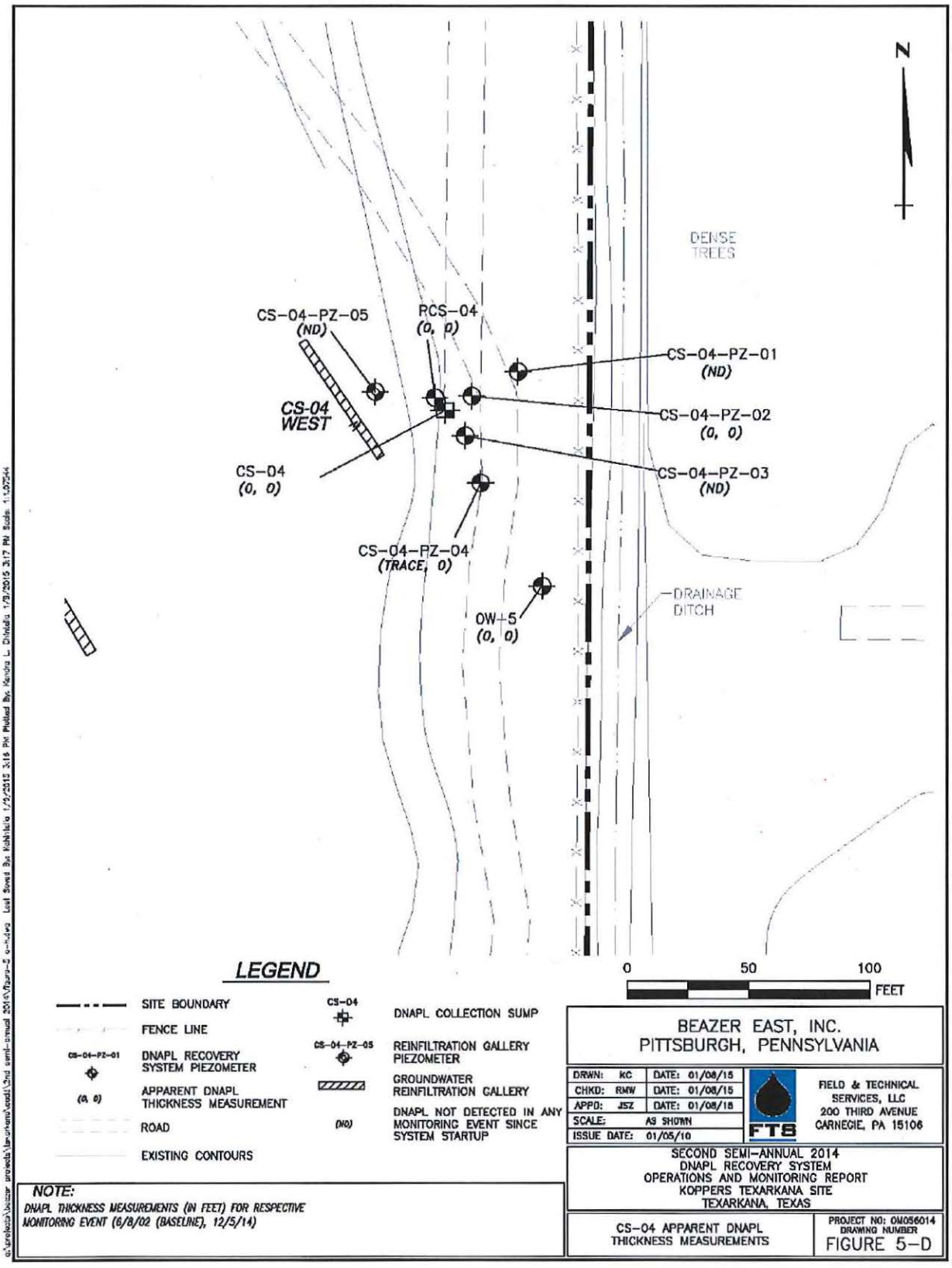
Figure G-2: 2014 DNAPL Thickness Measurements[10]

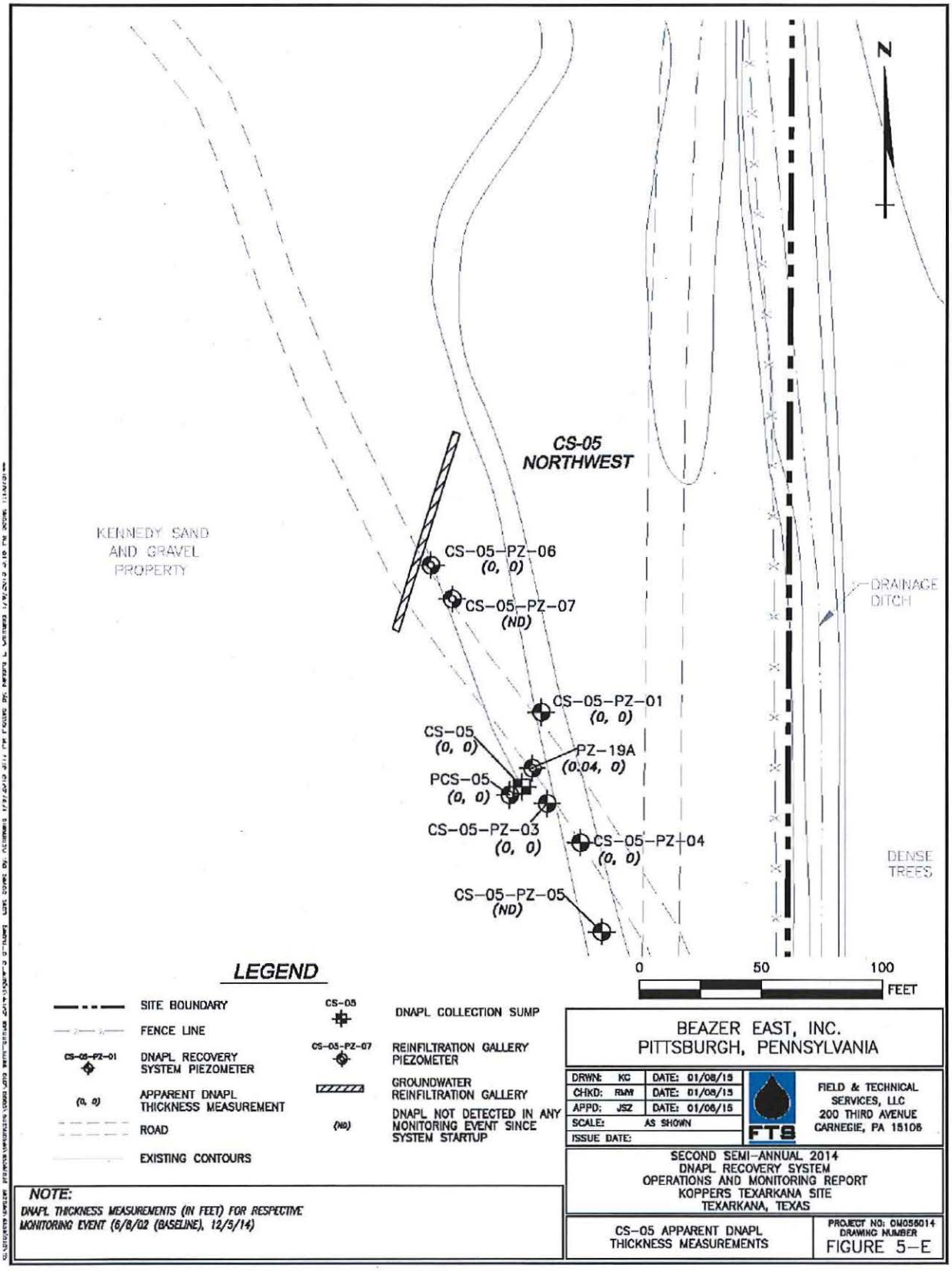


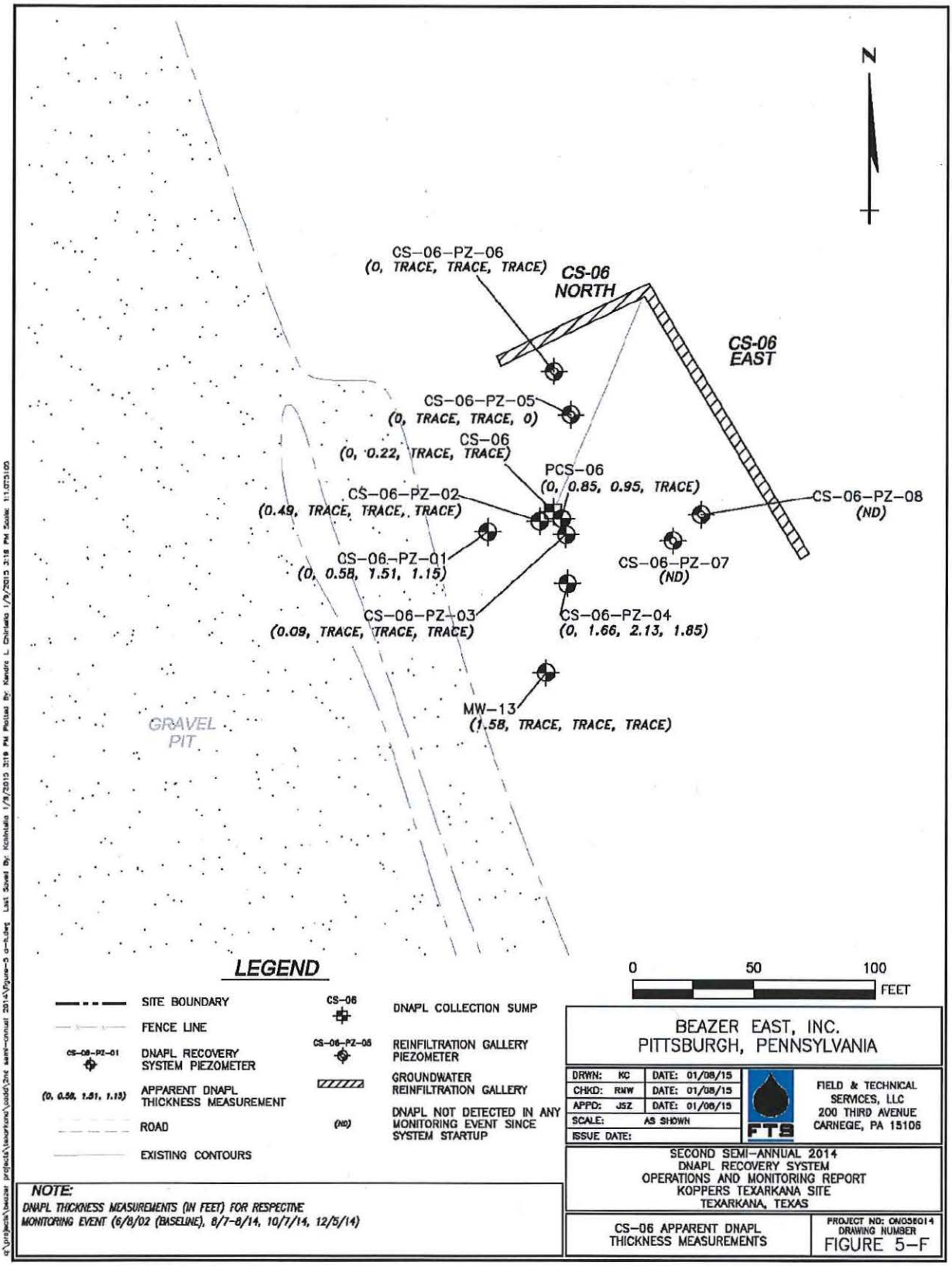
[10] *Source:* Second Semi-Annual 2014 DNAPL Recovery System Operations and Monitoring Report, prepared by Field & Technical Services, LLC).

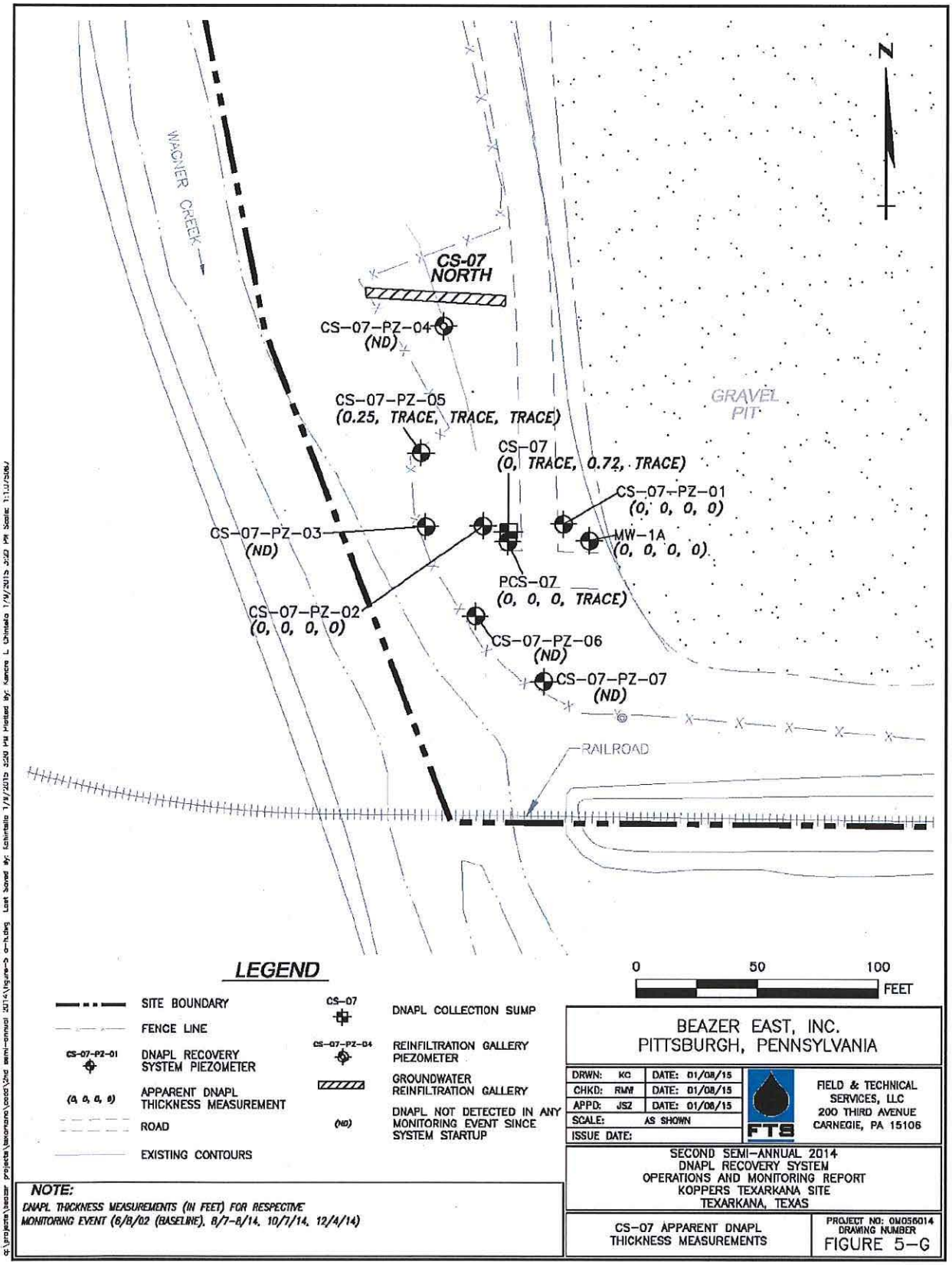

N
MW-14
(0.74, 0, TRACE, TRACE)
PCS-02B
(0.53, TRACE, 0, TRACE)
SPZ-03
(0, TRACE, 0, 0)
CS-02-PZ-01
(TRACE, 0.58, 1.75, 0.79)
SPZ-02
(1.21, 0, 0, 0)
CS-02 WEST
PCS-02A
(0, 0, 0.39, 0)
DRAINAGE DITCH
CS-02-PZ-02
(1.03, 1.73, 3.78, 1.52)
SPZ-01
(1.79, TRACE, TRACE, TRACE)
CS-02
(0.37, TRACE, 0.65, TRACE)
CS-02-PZ-03
(0, TRACE, TRACE, TRACE)
GRAVEL PIT
LEGEND
SITE BOUNDARY
FENCE LINE
CS-02-PZ-03 DNAPL RECOVERY SYSTEM PIEZOMETER
(0, 0, 0.39, 0) APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
CS-02 DNAPL COLLECTION SUMP
CS-02-PZ-01 REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
EXISTING CONTOURS
0
50
100
FEET
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/8/02 (BASELINE), 8/7-8/14, 10/7/14, 12/5/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-02 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: 0M058014
DRAWING NUMBER
FIGURE 5-B


N
CS-03-PZ-01
(0, 1.91, 1.41, 1.25)
CS-03
WEST
CS-03-PZ-07
(3.3, 1.59, 2.46, 1.66)
CS-03-PZ-02
(TRACE, TRACE, TRACE, TRACE)
CS-03-PZ-06
(0, 0.19, 0.48, TRACE)
PCS-03
(0, TRACE, TRACE, TRACE)
CS-03-PZ-03
(TRACE, 0.45, 0.63, 1.10)
GRAVEL PIT
DRAINAGE DITCH
CS-03
(0, TRACE, 0.62, TRACE)
CS-03-PZ-04
(ND)
CS-03-PZ-05
(ND)
RAILROAD
LEGEND
SITE BOUNDARY
FENCE LINE
DNAPL RECOVERY SYSTEM PIEZOMETER
APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
DNAPL COLLECTION SUMP
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
DNAPL NOT DETECTED IN ANY MONITORING EVENT SINCE SYSTEM STARTUP
0
50
100
FEET
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/8/02 (BASELINE), 8/7-8/14, 10/1/14, 12/3/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KG DATE: 01/08/15
CHKD: RMR DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-03 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: GM058014
DRAWING NUMBER
FIGURE 5-C


N
DENSE TREES
CS-04-PZ-05
(ND)
RCS-04
(0, 0)
CS-04-PZ-01
(ND)
CS-04 WEST
CS-04-PZ-02
(0, 0)
CS-04
(0, 0)
CS-04-PZ-03
(ND)
CS-04-PZ-04
(TRACE, 0)
OW-5
(0, 0)
DRAINAGE DITCH
0
50
100
FEET
LEGEND
SITE BOUNDARY
FENCE LINE
DNAPL RECOVERY SYSTEM PIEZOMETER
APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
CS-04
DNAPL COLLECTION SUMP
CS-04-PZ-05
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
(ND)
DNAPL NOT DETECTED IN ANY MONITORING EVENT SINCE SYSTEM STARTUP
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/8/02 (BASELINE), 12/5/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE: 01/05/10
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-04 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 5-D


CS-05
NORTHWEST
KENNEDY SAND
AND GRAVEL
PROPERTY
CS-05-PZ-06
(0, 0)
CS-05-PZ-07
(ND)
CS-05-PZ-01
(0, 0)
CS-05
(0, 0)
PZ-19A
(0.04, 0)
PCS-05
(0, 0)
CS-05-PZ-03
(0, 0)
CS-05-PZ-04
(0, 0)
CS-05-PZ-05
(ND)
DRAINAGE
DITCH
DENSE
TREES
N
0
50
100
FEET
LEGEND
SITE BOUNDARY
FENCE LINE
CS-05-PZ-01
DNAPL RECOVERY
SYSTEM PIEZOMETER
(0, 0)
APPARENT DNAPL
THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
CS-05
DNAPL COLLECTION SUMP
CS-05-PZ-07
REINFILTRATION GALLERY
PIEZOMETER
GROUNDWATER
REINFILTRATION GALLERY
(ND)
DNAPL NOT DETECTED IN ANY
MONITORING EVENT SINCE
SYSTEM STARTUP
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE
MONITORING EVENT (6/8/02 (BASELINE), 12/5/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RWM DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL
SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-05 APPARENT DNAPL
THICKNESS MEASUREMENTS
PROJECT NO: 0M055014
DRAWING NUMBER
FIGURE 5-E


N
CS-06-PZ-06
(0, TRACE, TRACE, TRACE)
CS-06
NORTH
CS-06
EAST
CS-06-PZ-05
(0, TRACE, TRACE, 0)
CS-06
(0, 0.22, TRACE, TRACE)
PCS-06
(0, 0.85, 0.95, TRACE)
CS-06-PZ-02
(0.49, TRACE, TRACE, TRACE)
CS-06-PZ-08
(ND)
CS-06-PZ-01
(0, 0.58, 1.51, 1.15)
CS-06-PZ-07
(ND)
CS-06-PZ-03
(0.09, TRACE, TRACE, TRACE)
CS-06-PZ-04
(0, 1.66, 2.13, 1.85)
MW-13
(1.58, TRACE, TRACE, TRACE)
GRAVEL PIT
LEGEND
SITE BOUNDARY
FENCE LINE
CS-06-PZ-01
DNAPL RECOVERY SYSTEM PIEZOMETER
(0, 0.58, 1.51, 1.13)
APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
CS-06
DNAPL COLLECTION SUMP
CS-06-PZ-05
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
(ND)
DNAPL NOT DETECTED IN ANY MONITORING EVENT SINCE SYSTEM STARTUP
0
50
100
FEET
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/6/02 (BASELINE), 8/7-8/14, 10/7/14, 12/5/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-06 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: ONOSE014
DRAWING NUMBER
FIGURE 5-F


N
WAGNER CREEK
CS-07
NORTH
CS-07-PZ-04
(ND)
CS-07-PZ-05
(0.25, TRACE, TRACE, TRACE)
GRAVEL
PIT
CS-07
(0, TRACE, 0.72, TRACE)
CS-07-PZ-01
(0, 0, 0, 0)
CS-07-PZ-03
(ND)
MW-1A
(0, 0, 0, 0)
PCS-07
(0, 0, 0, TRACE)
CS-07-PZ-02
(0, 0, 0, 0)
CS-07-PZ-06
(ND)
CS-07-PZ-07
(ND)
RAILROAD
LEGEND
SITE BOUNDARY
FENCE LINE
CS-07-PZ-01
DNAPL RECOVERY SYSTEM PIEZOMETER
(0, 0, 0, 0)
APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
CS-07
DNAPL COLLECTION SUMP
CS-07-PZ-04
REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
(ND)
DNAPL NOT DETECTED IN ANY MONITORING EVENT SINCE SYSTEM STARTUP
0
50
100
FEET
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/8/02 (BASELINE), 8/7-8/14, 10/7/14, 12/4/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE:
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-07 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: 0M056014
DRAWING NUMBER
FIGURE 5-G

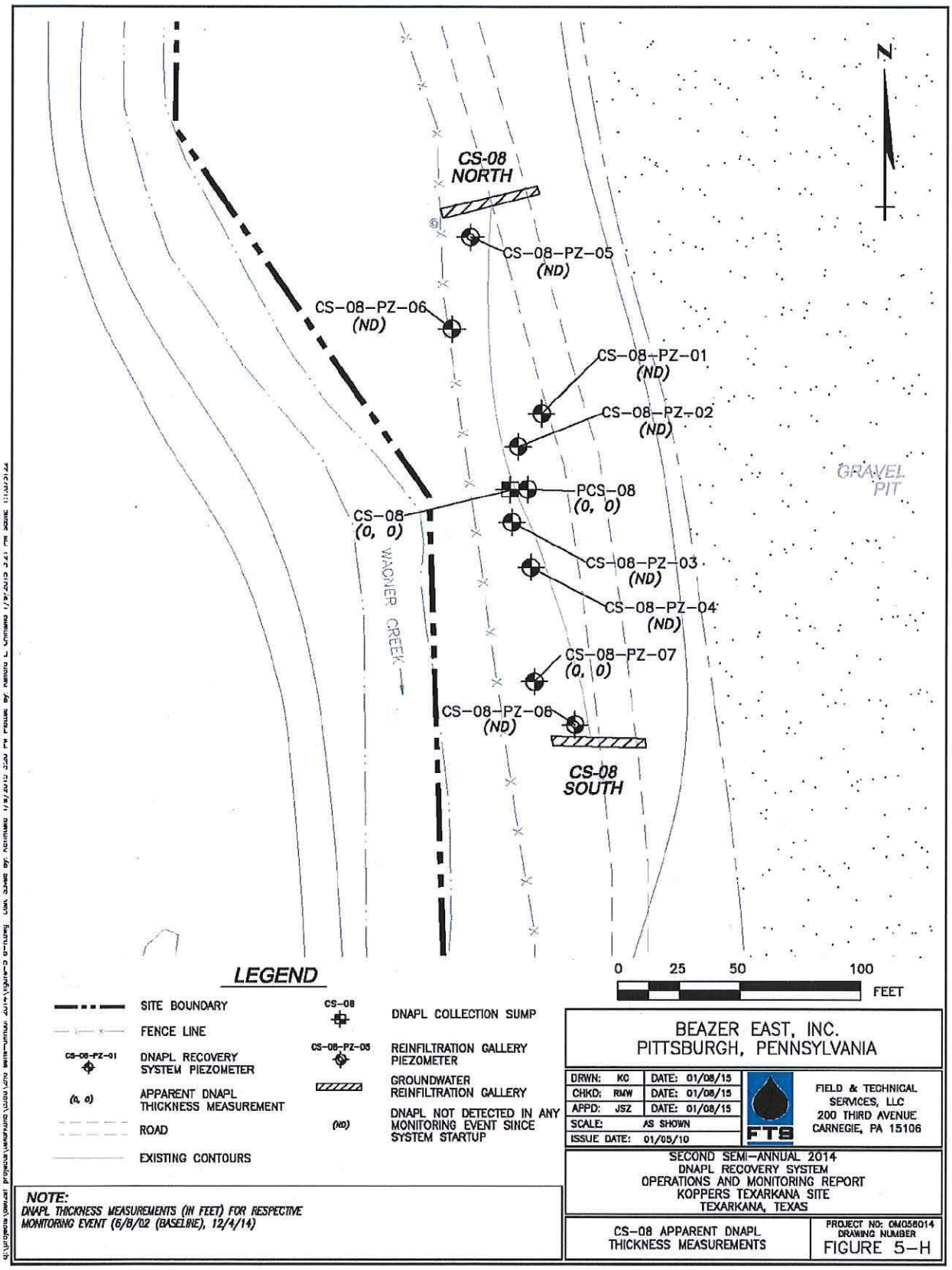

N
CS-08 NORTH
CS-08-PZ-05 (ND)
CS-08-PZ-06 (ND)
CS-08-PZ-01 (ND)
CS-08-PZ-02 (ND)
PCS-08 (0, 0)
CS-08 (0, 0)
CS-08-PZ-03 (ND)
CS-08-PZ-04 (ND)
CS-08-PZ-07 (0, 0)
CS-08-PZ-08 (ND)
CS-08 SOUTH
WAGNER CREEK
GRAVEL PIT
0 25 50 100
FEET
LEGEND
SITE BOUNDARY
FENCE LINE
CS-08-PZ-01 DNAPL RECOVERY SYSTEM PIEZOMETER
(0, 0) APPARENT DNAPL THICKNESS MEASUREMENT
ROAD
EXISTING CONTOURS
CS-08 DNAPL COLLECTION SUMP
CS-08-PZ-05 REINFILTRATION GALLERY PIEZOMETER
GROUNDWATER REINFILTRATION GALLERY
(ND) DNAPL NOT DETECTED IN ANY MONITORING EVENT SINCE SYSTEM STARTUP
NOTE:
DNAPL THICKNESS MEASUREMENTS (IN FEET) FOR RESPECTIVE MONITORING EVENT (6/8/02 (BASELINE), 12/4/14)
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
DRWN: KC DATE: 01/08/15
CHKD: RMW DATE: 01/08/15
APPD: JSZ DATE: 01/08/15
SCALE: AS SHOWN
ISSUE DATE: 01/05/10
FTS
FIELD & TECHNICAL SERVICES, LLC
200 THIRD AVENUE
CARNEGIE, PA 15106
SECOND SEMI-ANNUAL 2014
DNAPL RECOVERY SYSTEM
OPERATIONS AND MONITORING REPORT
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS
CS-08 APPARENT DNAPL THICKNESS MEASUREMENTS
PROJECT NO: 0M058014
DRAWING NUMBER
FIGURE 5-H

TABLE 2
SUMMARY OF DNAPL RECOVERY
Second Semi-Annual 2014 DNAPL SYSTEM Operations and Monitoring Report
Koppers Texarkana Site
Texarkana, Texas

Date	Collection Sump I.D.																Total DNAPL Removed (gallons)
	CS-01		CS-02		CS-03		CS-04		CS-05		CS-06		CS-07		CS-08		
	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	
7/10/2002	2.75	55	1.78	20	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	75
7/19/2002	2.75	55	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	55
8/9/2002	2.00	40	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	40
8/16/2002	1.25	25	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	25
9/5/2002	2.50	50	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	50
9/16/2002	1.97	35	1.04	15	0.70	0	0.00	0	0.70	0	0.31	0	trace	0	trace	0	50
9/29/2002	1.50	0	0.98	0	0.31	0	trace	0	1.32	20	0.63	0	0.25	0	0.25	0	20
10/27/2002	3.48	75	0.66	0	0.42	0	trace	0	0.76	0	0.42	0	trace	0	trace	0	75
11/14-15/2002	0.76	0	1.40	15	0.60	0	0.00	0	0.76	8	NA [1]	0	0.29	0	0.00	0	23
12/18/2002	2.12	0	0.84	0	0.23	0	0.13	0	0.92	0	0.93	0	0.18	0	0.00	0	0
1/8/2003	3.70	50	0.48	0	0.10	0	trace	0	0.68	0	0.84	0	trace	0	0.53	5	55
1/15/2003	2.73	40	0.64	4	0.12	0	trace	0	0.96	19	0.98	20	0.10	0	0.00	0	83
2/11/2003	2.62	40	1.00	0	0.40	0	0.21	0	0.39	0	0.10	0	0.29	0	0.00	0	40
2/27/2003	2.20	35	1.73	15	0.21	0	trace	0	0.50	1.5	0.38	5	0.32	0	trace	0	56.5
3/6/2003	0.82	0	0.72	0	0.42	0	0.33	0	0.45	0	0.27	0	0.35	0	0.00	0	0
3/23/2003	2.86	50	1.10	20	0.20	0	0.33	0	0.41	2.5	0.45	5	0.40	5	trace	0	82.5
4/8/2003	1.51	30	0.70	15	0.11	0	0.89	0	0.41	0	0.26	0	trace	0	trace	0	45
4/26/2003	1.40	23	0.61	0	0.58	0	0.82	6	0.47	0	0.44	0	0.35	0	trace	0	29
5/29/2003	2.16	30	0.54	0	0.51	0	0.48	0	0.42	0	0.56	0	0.30	0	trace	0	30
6/23/2003	1.64	20	1.37	7	0.29	0	0.49	0	0.68	0	0.66	0	trace	0	trace	0	27
7/12/2003	1.35	20	NM [2]	0	NM	0	NM	0	NM	0	NM	0	NM	0	NM	0	20
7/31/2003	1.57	30	0.75	0	0.71	0	trace	0	0.61	0	0.91	0	0.45	0	0.00	0	30
8/27/2003	1.35	20	1.00	7	0.80	4.5	trace	0	0.32	0	1.05	21	0.30	0	0.00	0	52.5
9/29/2003	2.49	40	0.65	0	0.65	0	0.40	0	0.50	0	0.26	0	0.30	0	0.00	0	40
10/24/2003	1.31	0	0.57	0	0.88	0	0.00	0	0.26	0	0.37	0	0.46	0	0.00	0	0
11/9/2003	1.78	30	0.61	8	0.62	17	0.31	8	0.40	12	0.50	9	0.04	0	0.03	0	84
11/30/2003	0.80	0	0.76	0	trace	0	trace	0	0.31	0	0.20	0	trace	0	0.00	0	0
12/2/2003	0.89	0	0.14	0	trace	0	trace	0	0.29	0	0.22	0	trace	0	0.00	0	0
1/13/2004	1.13	0	0.76	0	trace	0	trace	0	0.31	0	0.58	0	0.43	0	trace	0	0
1/30/2004	1.67	20	0.81	9	trace	0	0.32	0	0.33	0	0.61	0	0.55	0	trace	0	29
2/28/2004	2.30	35	0.60	8	trace	0	trace	0	0.30	0	0.61	15	0.46	10	0.00	0	68
3/10/2004	0.47	10	0.12	0	0.11	0	0.12	0	0.32	0	0.12	0	0.07	0	0.00	0	10
3/26/2004	1.10	20	0.50	0	0.15	0	0.12	0	0.01	0	0.40	0	0.20	0	0.00	0	20
4/28/2004	1.11	35	0.52	5	0.20	6.5	0.15	0	0.34	0	0.41	5	0.21	0	0.00	0	51.5
5/29/2004	1.12	25	0.32	0	0.32	0	0.15	0	0.35	0	0.12	0	0.22	0	0.00	0	25
6/22/2004	0.67	15	0.65	0	0.13	0	0.01	0	0.29	0	0.18	0	0.21	0	0.01	0	15
7/30/2004	1.88	40	0.76	10	0.25	0	0.07	0	0.48	0	0.27	0	0.53	8	0.01	0	58
8/28/2004	0.51	0	0.85	10	0.22	0	0.12	0	0.40	0	0.71	8	0.11	0	0.00	0	18
9/19/2004	1.21	25	0.84	7	0.13	0	0.10	0	0.40	0	0.93	18	0.24	0	0.12	0	50
10/29/2004	1.40	25	0.28	0	0.14	0	0.11	0	0.43	4	0.49	5	0.26	0	0.14	0	34
11/16/2004	0.70	17	0.30	0	0.11	0	0.12	0	0.14	0	0.18	0	0.01	0	0.11	0	17
12/14/2004	1.61	30	0.62	8	0.48	0	0.00	0	0.55	8	0.67	11	0.13	0	0.13	0	57

TABLE 2
SUMMARY OF DNAPL RECOVERY
Second Semi-Annual 2014 DNAPL SYSTEM Operations and Monitoring Report
Koppers Texarkana Site
Texarkana, Texas

Date	Collection Sump I.D.																Total DNAPL Removed (gallons)
	CS-01		CS-02		CS-03		CS-04		CS-05		CS-06		CS-07		CS-08		
	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	
1/27/2005	1.30	25	0.98	6	0.51	0	0.15	0	0.43	0	0.60	8	0.50	6	0.00	0	45
2/25/2005	0.87	17	0.34	0	0.45	0	0.01	0	0.58	6	0.47	0	0.77	12	0.00	0	35
3/8/2005	0.74	12	0.12	0	0.59	6	0.09	0	0.34	4	0.65	0	0.30	0	0.00	0	22
4/6/2005	0.42	0	0.38	0	0.08	0	0.16	0	0.27	0	0.43	0	0.32	0	0.00	0	0
5/21/2005	0.01	0	0.34	0	0.12	0	0.19	0	0.25	0	0.73	10	0.12	0	0.00	0	10
6/30/2005	0.50	0	0.42	0	0.01	0	0.20	0	0.25	0	0.43	0	0.42	0	0.00	0	0
7/19/2005	0.89	15	0.45	5	0.00	0	0.11	0	0.61	8	0.78	12	0.43	8	0.00	0	48
8/4/2005	0.61	10	0.11	0	0.12	0	0.15	0	0.06	0	0.19	0	0.07	0	0.00	0	10
9/28/2005	0.87	10	0.17	0	0.16	0	0.15	0	0.07	0	0.35	0	0.09	0	0.00	0	10
11/8/2005	0.66	12	0.18	0	0.01	0	0.01	0	0.01	0	0.39	10	0.16	0	0.00	0	22
12/14/2005	0.75	10	0.34	0	0.21	0	0.01	0	0.10	0	0.49	0	0.27	0	0.00	0	10
1/30/2006	1.10	10	0.78	7	1.38	0	0.65	5	0.29	0	0.47	1	0.75	4	NM	0	27
3/14-15/2006	0.73	7.5	0.25	0	0.11	0	0.20	0	0.25	0	0.35	0	0.20	0	NM	0	7.5
4/25/2006	1.28	13	0.17	0	0.47	5	trace	0	0.34	0	0.91	3	0.25	0	NM	0	21
6/20-21/2006	1.51	25	0.46	0	0.35	0	0.10	0	0.18	0	0.55	0	0.33	0	NM	0	25
8/1/2006	1.01	16	0.32	0	0.14	0	0.17	0	0.26	0	0.42	0	0.44	0	NM	0	16
9/14/2006	0.00	0	0.22	0	0.13	0	trace	0	trace	0	trace	0	0.00	0	NM	0	0
11/16/2006	1.02	17	0.02	0	0.01	0	0.01	0	0.00	0	trace	0	0.00	0	NM	0	17
12/19-20/2006	0.03	0	0.00	0	0.00	0	0.02	0	0.16	0	0.03	0	0.02	0	0.02	0	0
2/6/2007	1.20	22.5	0.04	6	0.18	3.5	trace	0	0.24	5.5	0.33	7.5	0.42	6.5	NM	0	51.5
3/7/2007	1.07	20	0.00	0	trace	0	0.00	0	trace	0	trace	0	trace	0	NM	0	20
4/16/2007	0.94	18	trace	0	trace	0	0.00	0	trace	0	trace	0	trace	0	NM	0	18
6/12/2007	1.54	32	trace	0	trace	0	trace	0	0.80	7	trace	0	0.47	6	NM	0	45
8/7/2007	0.72	32	0.05	0	trace	0	trace	0	trace	0	trace	0	0.35[3]	7	NM	0	39
10/2/2007	1.15	23	trace	0	0.41[3]	8	trace	0	trace	0	trace	0	trace	0	NM	0	31
11/17/2007	0.66[3]	13	trace	0	0.41[3]	8	0.45	7.5	trace	0	0.03[3]	0.5	0.30[3]	6	0.00	0	35
1/9/2008	0.90	20	0.32	6.5	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	26.5
2/26/2008	trace	0	trace	0	trace	0	0.00	0	trace	0	trace	0	trace	0	NM	0	0
4/15/2008	0.70[3]	14	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	14
5/21/2008	0.75[3]	15	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	15
7/15/2008	1.22	22	trace	0[5]	trace	0[5]	trace	0[5]	trace	0[5]	0.36[4]	0[5]	0.51[4]	0[5]	NM	0	22
8/12/2008[6]	NM	0	trace	0	trace	0	trace	0	0.41	7	1.00[3]	20	0.25[3]	5	NM	0	32
9/10/2008	1.02	22	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	22
10/23/2008	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	0
12/9/2008	1.43	25	trace	0	0.25[4]	0	0.08[4]	0	trace	0	trace	0	trace	0	0.00	0	25
1/24/2009	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	0
3/9-10/2009	1.41	28	0.88	8	0.56	15	trace	0	trace	0	0.86	11	0.36	4	NM	0	66
4/25/2009	0.90[4]	11	trace	0	trace	0	trace	0	trace	0	0.84[4]	9	trace	0	NM	0	20
6/10/2009	1.20	15	trace	0	trace	0	0.00	0	trace	0	trace	0	trace	0	NM	0	15
7/22/2009	1.20[3]	15	trace	0	0.15[3]	3	trace	0.125	0.25[3]	5	0.25[3]	5	0.025[3]	0.5	NM	0	28.625
9/18/2009	0.15[3]	3	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.0	0	NM	0	3
11/11/2009	0.10[3]	2	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.025[3]	0.5	NM	0	2.5
12/19/2009	1.09	22	trace	0	0.38[3]	7	sheen	0	trace	0	0.3[3]	6	0.46[3]	8	trace	0	43

TABLE 2
SUMMARY OF DNAPL RECOVERY
Second Semi-Annual 2014 DNAPL SYSTEM Operations and Monitoring Report
Koppers Texarkana Site
Texarkana, Texas

Date	Collection Sump I.D.																Total DNAPL Removed (gallons)
	CS-01		CS-02		CS-03		CS-04		CS-05		CS-06		CS-07		CS-08		
	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	DNAPL Thickness (feet)	DNAPL Removed (gallons)	
2/3-4/2010	1.37	21	0.47	6.5(7)	0.14	0	0.00	0	trace	0	trace	0	trace	0	NM	0	27.5
3/15-17/2010	0.87	11	trace	0	trace	0	trace	0	trace	0	trace	0	0.67	4	NM	0	15
5/15-16/2010	0.45(3)	9	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	9
7/14-15/2010	1.62	27	trace	1.5	trace	0	trace	0	trace	0	trace	0	trace	2	NM	0	30.5
8/27-28/2010	0.61(3)	12	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	12
10/13-14/2010	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	0
12/18/2010	0.76(3)	15	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	15
2/17/2011	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	0
4/21/2011	0.70(3)	14	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	14
6/7-8/2011	1.4(3)	28	trace	0	trace	0	trace	0	trace	0	trace	0	trace	0	NM	0	28
8/6-7/2011	1.52	28	trace	0	trace	0	trace	0	trace	0	0.04	0	0.15	3	NM	0	31
10/20/2011	trace	0	trace	0	0.17	0	trace	0	trace	0	trace	0	trace	0	NM	0	0
12/21-22/2011	1.65	28	0.22	3	trace	0	trace	0	trace	0	trace	0	0.39	0	0(8)	0(8)	31
2/29-3/1/2012	1.00	23	trace	0	trace	0	NM	0	NM	0	trace	0.4 (9)	trace	0	NM	0	23.4
4/12/2012	0.5	11 (9)	trace	1 (9)	0.18	0.2 (9)	NM	0	NM	0	trace	0.5 (9)	trace	0	NM	0	12.7
6/21-6/22/2012	1.90	37	trace	0.5 (9)	trace	0.6 (9)	NM	0	NM	0	trace	0	trace	0	NM	0	38.1
8/9/2012	trace	0	trace	0.2 (9)	trace	0.2 (9)	NM	0	NM	0	trace	0.5 (9)	trace	0	NM	0	0.9
10/23/2012	1.05	21	trace	0.3 (9)	trace	0.5 (9)	NM	0	NM	0	trace	0.25 (9)	trace	0	NM	0	22.05
12/29-30/2012	trace	0	trace	0	trace	0.2 (9)	0.00	0	trace	0	trace	0	trace	0	trace	0	0.2
2/22-23/2013	trace	0	trace	0	trace	0	NM	0	NM	0	0	0	trace	0	NM	0	0
4/8/2013	trace	0	trace	0	trace	0	NM	0	NM	0	trace	0	trace	0	NM	0	0
6/4-5/2013	2.15	38	trace	0	trace	0.5(6)	NM	0	NM	0	trace	0	0.69	0	NM	0	38.5
8/13-14/2013	trace	0	trace	0.5 (9)	trace	0.5(9)	NM	0	NM	0	trace	0	trace	0	NM	0	1
10/16/2013	1.50	27	trace	0	trace	0.5(6)	NM	0	NM	0	trace	0	trace	0	NM	0	27.5
12/20/2013	trace	0	trace	0	trace	0	trace	0	0.00	0	trace	0	trace	0	0	0	0
2/13/2014	trace	0.5(6)	0.4	0	0.85	17	NM	0	NM	0	0.82	16	trace	0	NM	0	33.5
4/14/2014	1.80	35.8(9)	0.43	0	trace	0	NM	0	NM	0	trace	0	0.4	0	NM	0	35.8
6/16-17/2014	1.10	18	trace	0	trace	0	NM	0	NM	0	trace	0	trace	0	NM	0	18
8/7-8/2014	trace	0	trace	0	trace	0	NM	0	NM	0	0.22	0	trace	0	NM	0	0
10/7/2014	1.70	28	0.42	0.5(9)	0.62	10	NM	0	NM	0	trace	0	0.72	7.5	NM	0	46
12/4-5/2014	trace	0	trace	0	trace	0	0	0	0	0	trace	0	trace	0	0	0	0
Total (gallons)		2096.3		236.5		113.7		26.625		117.5		242.65		113		5	

Total Recovered (gallons)	2951.28
Total Recovered (gallons) Second Semi-Annual Period of 2014	46.00
Monthly Average (gallons)	19.68

Notes:

(1) - NA - not available due to measurement error.

(2) - NM - not measured.

(3) - Thickness of DNAPL based on the amount of DNAPL recovered for the 22" Pumping Well. Technician indicated that the interface probe did not detect the presence of DNAPL but visual signs of DNAPL were evident on the tape.

(4) - Technician indicated that the interface probe did not detect the presence of DNAPL but visual signs of immulsified DNAPL were evident on the tape.

(5) - Equipment problems during the 7/15/08 event resulted in not being able to recover DNAPL from these wells.

(6) - Technician returned to the site to address the July 2008 issues.

(7) - Technician returned to the site on Feb 24, 2010 to remove DNAPL.

(8) - Measurements collected on Jan. 3, 2012

(9) - DNAPL removed value includes sump and associated piezometers.

Table G-1: Surface Water Analytical Results, reported in micrograms per liter (µg/L)

COC	BAT Monthly Discharge Limits from the 1988 ROD[a] (µg/L)	Texas Surface Water Quality Standards[b] (µg/L)			National Ambient Water Quality Criteria[c] (µg/L)		SW-1					SW-2				
		Aquatic Life[d]		HH			Sample Date					Sample Date				
		FW Acute	FW Chronic	Water and Fish	Aquatic Life	HH	3/11	8/11	2/12	8/13	8/14	3/11	8/11	2/12	8/13	8/14
Naphthalene	19	NA	NA	NA	NA	NA	<9.8	<2.1	<2.1	<2.0	<2.0	<10.0	<2.2	<2.1	<2.2	<2.0
Acenaphthylene	19	NA	NA	NA	NA	NA	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Acenaphthene	19	NA	NA	NA	NA	70	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Fluorene	19	NA	NA	NA	NA	50	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Phenanthrene	19	30	30	NA	Not ARAR[e]		<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Anthracene	19	NA	NA	5,569	NA	300	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Fluoranthene	22	NA	NA	NA	NA	20	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Pyrene	20	NA	NA	NA	NA	20	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Benzo(a)-anthracene	19	NA	NA	0.68	Not ARAR[e]		**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Chrysene	19	NA	NA	68.13	Not ARAR[e]		<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0
Benzo(b)-fluoranthene	19	NA	NA	NA	NA	0.001[f]	**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Benzo(k)-fluoranethene	19	NA	NA	NA	NA	0.012[f]	**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Benzo(a)pyrene	20	NA	NA	0.068	Not ARAR[e]		**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Indeno (1,2,3-cd)pyrene	NA	NA	NA	NA	NA	0.001	**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Dibenzo(a,h)-anthracene	NA	NA	NA	NA	NA	1E-04[f]	**<9.8**	**<2.1**	**<2.1**	**<2.1**	**<2.0**	**<10.0**	**<2.2**	**<2.1**	**<2.0**	**<2.0**
Benzo(g,h,i)-perylene	NA	NA	NA	NA	NA	NA	<9.8	<2.1	<2.1	<2.1	<2.0	<10.0	<2.2	<2.1	<2.0	<2.0

COC	BAT Monthly Discharge Limits from the 1988 ROD[a] (µg/L)	Texas Surface Water Quality Standards[b] (µg/L)			National Ambient Water Quality Criteria[c] (µg/L)		SW-3				
		Aquatic Life[d]		HH							
		FW Acute	FW Chronic	Water and Fish	Aquatic Life	HH	3/11	8/11	2/12	8/13	8/14
Naphthalene	19	NA	NA	NA	NA	NA	<10.0	<2.0	<2.1	<2.2/<2.1	<2.0/<2.0
Acenaphthylene	19	NA	NA	NA	NA	NA	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Acenaphthene	19	NA	NA	NA	NA	70	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Fluorene	19	NA	NA	NA	NA	50	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Phenanthrene	19	30	30	NA	Not ARAR[e]		<10.0	<2.0	<2.1	<2.0/<2.1	<2.0<2.0
Anthracene	19	NA	NA	5,569	NA	300	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Fluoranthene	22	NA	NA	NA	NA	20	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Pyrene	20	NA	NA	NA	NA	20	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Benzo(a)anthracene	19	NA	NA	0.68	Not ARAR[e]		**<10.0**	**<2.0**	**<2.1**	**<2.0/<2.1**	**<2.0<2.0**
Chrysene	19	NA	NA	68.13	Not ARAR[e]		<10.0	<2.0	<2.1	<2.0/<2.1	<2.0<2.0
Benzo(b)fluoranthene	19	NA	NA	NA	NA	0.001[f]	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Benzo(k)fluoranthene	19	NA	NA	NA	NA	0.012[f]	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Benzo(a)pyrene	20	NA	NA	0.068	Not ARAR[e]		**<10.0**	**<2.0**	**<2.1**	**<2.0/<2.1**	**<2.0/<2.0**
Indeno (1,2,3-cd)pyrene	NA	NA	NA	NA	NA	0.001[f]	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	1E-04[f]	**<10.0**	**<2.0**	**<2.1**	**<2.0/<2.1**	**<2.0/<2.0**
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	<10.0	<2.0	<2.1	<2.0/<2.1	<2.0/<2.0

COC	BAT Monthly Discharge Limits from the 1988 ROD[a] (µg/L)	Texas Surface Water Quality Standards[b] (µg/L)			National Ambient Water Quality Criteria[c] (µg/L)		SW-4				
		Aquatic Life[d]		HH							
		FW Acute	FW Chronic	Water and Fish	Aquatic Life	HH	3/11	8/11	2/12	8/13	8/14
Naphthalene	19	NA	NA	NA	NA	NA	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Acenaphthylene	19	NA	NA	NA	NA	NA	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Acenaphthene	19	NA	NA	NA	NA	70	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Fluorene	19	NA	NA	NA	NA	50	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Phenanthrene	19	30	30	NA	Not ARAR[e]		<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Anthracene	19	NA	NA	5,569	NA	300	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Fluoranthene	22	NA	NA	NA	NA	20	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Pyrene	20	NA	NA	NA	NA	20	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Benzo(a)anthracene	19	NA	NA	0.68	Not ARAR[e]		**<11.0/<11.0**	**<2.2/<2.1**	**<2.0/<2.0**	**<2.0**	**<2.0**
Chrysene	19	NA	NA	68.13	Not ARAR[e]		<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Benzo(b)fluoranthene	19	NA	NA	NA	NA	0.001[f]	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Benzo(k)fluoranthene	19	NA	NA	NA	NA	0.012[f]	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0
Benzo(a)pyrene	20	NA	NA	0.068	Not ARAR[e]		**<11.0/<11.0**	**<2.2/<2.1**	**<2.0/<2.0**	**<2.0**	**<2.0**
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	0.001[f]	**<11.0/<11.0**	**<2.2/<2.1**	**<2.0/<2.0**	**<2.0**	**<2.0**
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	1E-04[f]	**<11.0/<11.0**	**<2.2/<2.1**	**<2.0/<2.0**	**<2.0**	**<2.0**
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	<11.0/<11.0	<2.2/<2.1	<2.0/<2.0	<2.0	<2.0

Notes:

a) BAT monthly discharge limits from 1988 ROD Table 2. 1988 ROD does not present numerical values for the other surface water ARARs (Texas Water Quality Standards for Surface Waters, National Ambient Water Quality Criteria).

b) Source: Texas Administrative Code Title 30 Chapter 307. Accessed on January 14, 2016, at http://www.tceq.state.tx.us/waterquality/standards/WQ_standards_intro.html.

c) Accessed on January 15, 2016, at http://www.epa.gov/wqc/national-recommended-water-quality-criteria.

d) Some Texas aquatic life criteria include a stream-specific water-effect ratio. Wagner Creek does not have a water-effect ratio, so the default ratio of 1 is used.

e) 1988 ROD stated that national ambient water quality criteria are ARARs for compounds that do not have a state water quality standard.

f) This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

g) HH = human health

h) FW = freshwater

i) NA = no criterion established

j) **Bold** results indicate detected concentration or detection limit exceeds surface water quality criterion.

APPENDIX H – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Koppers Co., Inc. (Texarkana Plant)	**Date of Inspection:** 02/23/2016
Location and Region: Texarkana, Texas; Region 6	**EPA ID:** TXD980623904
Agency, Office or Company Leading the Five-Year Review: U.S. EPA	**Weather/Temperature:** 50 degrees Fahrenheit; heavy rain

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: DNAPL capture through collection sumps
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** James Zubrow (Name) _____ (Title) 02/23/2016 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency City of Texarkana
   Contact Daphnea Ryan (Name) | Planner II (Title) | 02/25/2016 (Date) | _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency TCEQ
   Contact Nancy JohnsonName | Project Manager, Superfund Section, Remediation Divsion (Title) | 03/04/2016 (Date) | 817-588-5862 (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____

Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☒ Report attached: _____

Resident
Beazer East, Inc. (PRP)

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Data related to DNAPL collection is contained in semi-annual reports.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☐ PRP in-house ☒ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: Main entrance gate is damaged, potentially allowing unauthorized access.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs are located on site perimeter fencing.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (e.g., self-reporting, drive by): ICs are not yet in place.

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A

Remarks: PRP and EPA are working to make sure proper ICs are put in place.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☐ No vandalism evident

Remarks: One area of used tires located on site.

2. **Land Use Changes On Site** ☐ N/A

Remarks: None

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None identified.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☐ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☐ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☐ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☐ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☐ No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable	☐ N/A
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
C. Letdown Channels		☐ Applicable	☐ N/A
	(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		

1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ No evidence of settlement
	Arial extent: _____		Depth: _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type:_____		Arial extent: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☐ No evidence of undercutting
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Obstructions**	Type: _____	☐ No obstructions
	☐ Location shown on site map	Arial extent: _____	
	Size: _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type: _____	
	☐ No evidence of excessive growth		
	☐ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Arial extent: _____	
	Remarks: _____		
D. Cover Penetrations	☐ Applicable	☐ N/A	
1.	**Gas Vents**	☐ Active	☐ Passive
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled ☐ Good condition
	☐ Evidence of leakage at penetration		☐ Needs maintenance ☐ N/A
	Remarks: _____		
2.	**Gas Monitoring Probes**		
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled ☐ Good condition
	☐ Evidence of leakage at penetration		☐ Needs maintenance ☐ N/A
	Remarks: _____		
3.	**Monitoring Wells** (within surface area of landfill)		
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled ☐ Good condition
	☐ Evidence of leakage at penetration		☐ Needs maintenance ☐ N/A
	Remarks: _____		
4.	**Extraction Wells Leachate**		
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2.	**Degradation**	☐ Location shown on site map	☐ Degradation not evident
	Remarks: _____		
I. Perimeter Ditches/Off-Site Discharge		☐ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☐ Siltation not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Vegetative Growth**	☐ Location shown on site map	☐ N/A
	☐ Vegetation does not impede flow		
	Area extent: _____		Type: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Discharge Structure**	☐ Functioning	☐ N/A
	Remarks: _____		
VIII. VERTICAL BARRIER WALLS		☒ Applicable	☐ N/A
1.	**Settlement**	☐ Location shown on site map	☒ Settlement not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Performance Monitoring**	Type of monitoring: Sampling of Wagner Creek	
	☐ Performance not monitored		
	Frequency: semi-annually		☐ Evidence of breaching
	Head differential: _____		
	Remarks: _____		
IX. GROUNDWATER/SURFACE WATER REMEDIES		☒ Applicable	☐ N/A
A. Groundwater Extraction Wells, Pumps and Pipelines		☒ Applicable	☐ N/A
1.	**Pumps, Wellhead Plumbing and Electrical**		
	☐ Good condition	☒ All required wells properly operating	☐ Needs maintenance ☐ N/A
	Remarks: _____		
2.	**Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**		
	☐ Good condition	☐ Needs maintenance	
	Remarks: Appeared to be in good condition.		
3.	**Spare Parts and Equipment**		
	☐ Readily available	☐ Good condition	☐ Requires upgrade ☐ Needs to be provided
	Remarks: _____		

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

   ☐ Good condition ☐ Needs maintenance

   Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

   ☐ Good condition ☐ Needs maintenance

   Remarks: _____

3. **Spare Parts and Equipment**

   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

   Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

   ☐ Air stripping ☐ Carbon adsorbers

   ☐ Filters: _____

   ☐ Additive (e.g., chelation agent, flocculent): _____

   ☐ Others: _____

   ☐ Good condition ☐ Needs maintenance

   ☐ Sampling ports properly marked and functional

   ☐ Sampling/maintenance log displayed and up to date

   ☐ Equipment properly identified

   ☐ Quantity of groundwater treated annually: _____

   ☐ Quantity of surface water treated annually: _____

   Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

   ☐ N/A ☐ Good condition ☐ Needs maintenance

   Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

   Remarks: _____

4. **Discharge Structure and Appurtenances**

   ☐ N/A ☐ Good condition ☐ Needs maintenance

   Remarks: _____

5. **Treatment Building(s)**

   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

   ☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

Remedy includes subdivision buyout and relocation, demolition, debris removal and off-site disposal, excavation and off-site disposal of contaminated soils, ongoing removal of creosote from groundwater, institutional controls, and long-term maintenance and monitoring.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The need for routine groundwater monitoring should be considered.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

Monitoring wells overall appeared to be in good condition. A few wells had missing locks and inappropriately placed caps. Collection sumps were locked and sump covers appeared to be in good condition. The submerged gravel pits had significant vegetation growing around them, and ducks were spotted on the ponds. Oily sheens occasionally bubbled up from below the water surface in the ponds. An oily gas odor, possibly creosote, was identified on the southern part of the Site.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Evaluate the need for continued collection of DNAPL, given the continued decrease in the amount of DNAPL being collected by the system. Institutional controls need to be placed on site properties. The gate needs to be repaired to avoid unauthorized site access.

FYR site inspection participants:
David Abshire, EPA RPM
Nancy Johnson, TCEQ
Adra Hallford, City of Texarkana
Eric Marsh and Jill Billus, Skeo Solutions (EPA's FYR contractor)

APPENDIX I –SITE INSPECTION PHOTOS

Main entrance to the Site

Staging area for DNAPL collection operations

DNAPL recovery system piezometer

DNAPL collection sump, covered and locked

DNAPL recovery system piezometer BPZ 01, unlocked

DNAPL recovery system piezometer BPZ 01, without cover and missing cap

Well cap located near DNAPL recovery system piezometer BPZ 01

Wagner Creek, located directly west of the Site

Locked gate on the western edge of the Site near Wagner Creek

Runoff during a heavy rain event leading from the Site to Wagner Creek

On-site tire pile, west of the gravel pond area

Eastern side of the gravel pond, looking south

Unoccupied trailer on site

Oily sheen on the eastern side of the gravel pond

Additional oily sheens on the eastern side of the gravel pond

APPENDIX J – DETAILED ARARs REVIEW

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Groundwater ARARs
The 1988 ROD selected the following ARARs and to-be-considered criteria (TBCs) for groundwater, stating that the Site's groundwater remediation will prevent off-site migration of contaminants exceeding these levels:

- National Primary Drinking Water Standards (Maximum Contaminant Levels (MCLs)) (ARAR)
- National Secondary Drinking Water Standards (ARAR)
- National Maximum Contaminant Level Goals (MCLGs) (TBC)
- Texas Department of Health Allowable Limits of Metals in Drinking Water (health-based standards for public water systems) (ARAR)[11]

This FYR compared groundwater ARARs in the 1988 ROD against the current values of these ARARs (see Table J-1). Since the 1988 ROD, ARARs for four of the groundwater contaminants identified at the Site have become more stringent (arsenic, lead, toluene, pentachlorophenol). The ARARs for three contaminants have become less stringent (chromium, ethylbenzene, xylenes). A new ARAR was issued for one contaminant class (carcinogenic PAHs) and the ARARs for three contaminants have not changed (copper, zinc, benzene).

Surface Water ARARs
The 1988 ROD selected several ARARs to protect surface water because the selected remedy called for any treated groundwater that is not re-injected into the aquifer to be discharged either to Wagner Creek or to a local wastewater treatment plant:

- Texas Water Commission Water Quality Standards for Surface Waters were selected as an ARAR for disposal of water into Wagner Creek. These standards would apply to the discharge after mixing with Wagner Creek water.
- Clean Water Act Ambient Water Quality Criteria, based on toxicity to aquatic organisms and human health, were selected as an ARAR for compounds that do not have a state water quality standard. These standards would apply to the discharge after mixing with Wagner Creek water.
- National Pollutant Discharge Elimination System (NPDES) Best Available Treatment (BAT) effluent guidelines for the Organic Chemical, Plastics and Synthetic Fibers industry (for organic chemical facilities including those manufacturing creosote-type products) were selected as an ARAR for disposal of water into Wagner Creek. These standards would apply to the discharge after mixing with Wagner Creek water.
- National Pretreatment Standards were selected as an ARAR for discharge to a wastewater treatment plant.

The 2002 ESD changed the remedy's groundwater discharge method; rather than discharging groundwater to a wastewater treatment plant or to Wagner Creek, the untreated groundwater is sent to re-infiltration trenches. After re-entering the subsurface, the groundwater naturally attenuates and eventually discharges into Wagner Creek through natural groundwater flow. The ESD stated that BAT discharge levels identified in Table 2 of the 1988 ROD are applicable to the natural discharge of groundwater to Wagner Creek. This FYR compared BAT discharge limits in the 1988 ROD to current BAT discharge limits, as well as the other surface water ARARs

[11] TCEQ is now the state agency that administers state drinking water standards for public water systems.

identified in the 1988 ROD (see Table J-2). This FYR did not review the National Pretreatment Standards because the Site's groundwater is not sent to a wastewater treatment plant.

As shown in Table J-2, the BAT monthly discharge limits have not changed since the 1988 ROD was issued. However, for 14 contaminants, the other surface water ARARs selected in the 1988 ROD (state and federal surface water standards) are more stringent than the BAT discharge limits.

Soil ARARs
The soil-related ARARs selected in the 1988 ROD no longer affect the Site's protectiveness because the soil cleanup has been completed. See Section V, Question B of this FYR for a discussion of the Site's soil cleanup level.

Air ARARs
The 1988 ROD selected several ARARs pertaining to air quality. These ARARs no longer affect the Site's protectiveness because the Site's soil excavation has been completed and there are no air emissions from a groundwater treatment system (because groundwater treatment is not being conducted). Therefore, this FYR does not review the Site's air ARARs.

Table J-1: Groundwater ARAR Review

Contaminant	1988 ROD ARAR (µg/L)[a]	Current ARARs (µg/L)		ARAR Change
		Federal[b]	State[c]	
Arsenic	50	10	10	More stringent
Chromium	50	100	100	Less stringent
Copper	1,000	1,300	MCL = 1,300 Secondary standard = 1,000[d]	No change
Lead	50	15	15	More stringent
Zinc	5,000	5,000[e]	5,000[d]	No change
Benzene	5	5	no ARAR selected[f]	No change
Ethylbenzene	680	700	no ARAR selected[f]	Less stringent
Toluene	2,000	1,000	no ARAR selected[f]	More stringent
Xylenes	440	10,000	no ARAR selected[f]	Less stringent
Pentachlorophenol	220	1	no ARAR selected[f]	More stringent
Carcinogenic PAHs	Not based on ARAR[g]	0.2	no ARAR selected[f]	New ARAR

Notes:
a) Source: 1988 ROD Table 2.
b) Listed values are MCLs unless otherwise noted.
c) Listed values are MCLs unless otherwise noted. Source: Texas Administrative Code Title 30 Chapter 290 Subchapter F, Accessed on January 14, 2016, at https://www.tceq.texas.gov/drinkingwater/pdw_rules.html.
d) Enforceable state secondary drinking water standard (30 TAC §290.118).
e) Secondary drinking water standard based on taste.
f) 1988 ROD selected Texas public water system standards for metals as ARARs.
g) 1988 ROD Table 2 presents a groundwater standard of 0.003 µg/L based on a 10^{-6} risk level.

Table J-2: Surface Water ARAR Review

Contaminant	1988 ROD ARAR (µg/L)[a]	Current ARARs (µg/L)						ARAR Change
		BAT Monthly Discharge Limit[b]	Texas Surface Water Quality Standard[c]			National Ambient Water Quality Criteria[d]		
			Aquatic Life[e]		Human Health (water and fish)	Aquatic Life	Human Health (water and organism)	
			Freshwater Acute	Freshwater Chronic				
Arsenic	none listed	none listed	340[f]	150[f]	10[f]	not ARAR[g]		more stringent
Chromium	1,110	1,110	344[f,h,i]	45[f,h,i]	no value[j]	not ARAR[g]		more stringent
Copper	1,450	1,450	8[f,h]	6[f,h]	none listed	not ARAR[g]		more stringent
Lead	320	320	33[f,h]	1[f,h]	1.15[f]	not ARAR[g]		more stringent
Zinc	1,050	1,050	70[f,h]	70[f,h]	none listed	not ARAR[g]		more stringent
Benzene	57	57	none listed	none listed	5	not ARAR[g]		more stringent
Ethylbenzene	142	142	none listed	none listed	700	not ARAR[g]		no change
Toluene	28	28	none listed	none listed	1,000	not ARAR[g]		no change
Xylenes	none listed	none listed	none listed	none listed	none listed	none listed	none listed	no change
Pentachlorophenol	none listed	none listed	5[k]	4[k]	0.80	not ARAR[g]		more stringent
Acenaphthylene	19	19	none listed	none listed	none listed	none listed	none listed	no change
Acenaphthene	19	19	none listed	none listed	none listed	none listed	70	no change
Anthracene	19	19	none listed	none listed	5,569	none listed	300	no change
Benzo(a)anthracene	19	19	none listed	none listed	0.68	not ARAR[g]		more stringent
Benzo(a)pyrene	20	20	none listed	none listed	0.068	not ARAR[g]		more stringent
Benzo(b)fluoranthene	19	none listed	none listed	none listed	none listed	none listed	0.0012[l]	more stringent
Benzo(k)fluoranthene	19	19	none listed	none listed	none listed	none listed	0.012[l]	more stringent
Benzo(g,h,i)pyrene[m]	none listed	none listed	none listed	none listed	none listed	none listed	none listed	no change
Chrysene	19	19	none listed	none listed	68.13	not ARAR[g]		no change
Dibenzo(a,h)anthracene	none listed	none listed	none listed	none listed	none listed	none listed	0.00012[l]	more stringent
Fluoranthene	22	22	none listed	none listed	none listed	none listed	20	more stringent

Contaminant	1988 ROD ARAR (µg/L)[a]	Current ARARs (µg/L)							ARAR Change
		BAT Monthly Discharge Limit[b]	Texas Surface Water Quality Standard[c]			National Ambient Water Quality Criteria[d]			
			Aquatic Life[e]		Human Health (water and fish)	Aquatic Life	Human Health (water and organism)		
			Freshwater Acute	Freshwater Chronic					
Fluorene	19	19	none listed	none listed	none listed	none listed	50		no change
Indeno(1,2,3-c,d)pyrene	none listed	none listed	none listed	none listed	none listed	none listed	0.0012[l]		more stringent
2-Methylnaphthalene	none listed	none listed	none listed	none listed	none listed	none listed	none listed		no change
Naphthalene	19	19	none listed	none listed	none listed	none listed	none listed		no change
Phenanthrene	19	19	30	30	none listed	not ARAR[g]			no change
Pyrene	20	20	none listed	none listed	none listed	none listed	20		no change

Notes:

a) BAT monthly discharge limits from 1988 ROD Table 2. The 1988 ROD does not present numerical values for the other surface water ARARs (Texas Water Quality Standards for Surface Waters, National Ambient Water Quality Criteria).

b) Current BAT monthly discharge limits were obtained from 40 CFR Part 414 Subpart G (§414.73 and §414.101). Accessed January 14, 2016, at http://www.ecfr.gov.

c) Source: Texas Administrative Code Title 30 Chapter 307. Accessed on January 14, 2016, at http://www.tceq.state.tx.us/waterquality/standards/WQ_standards_intro.html.

d) Accessed on January 15, 2016, at http://www.epa.gov/wqc/national-recommended-water-quality-criteria.

e) Some Texas aquatic life criteria include a stream-specific water-effect ratio. Wagner Creek does not have a water-effect ratio, so the default ratio of 1 is used.

f) Value is for dissolved fraction.

g) The 1988 ROD stated that national ambient water quality criteria are ARARs for compounds that do not have a state water quality standard.

h) Calculated using a hardness of 54 mg/L (default value for Sulphur River Basin in June 2010 Procedures to Implement the Texas Surface Water Quality Standards (RG-194), Appendix D).

i) Value shown is for chromium (III). Aquatic life criteria for chromium (VI) are 15.7 µg/L (acute) and 10.6 µg/L (chronic).

j) No value for total chromium or for chromium (III). Human health criterion for chromium (VI) (dissolved) is 62 µg/L.

k) Calculated using a pH of 6.5 (default value for Sulphur River Basin Segment 0304 in June 2010 *Procedures to Implement the Texas Surface Water Quality Standards* (RG-194), Appendix D).

l) This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

m) aka benzo(g,h,i)perylene.

APPENDIX K – DETAILED RISK REVIEW

Table K-1: Review of Soil Cleanup Level

	Pre-Cleanup Reasonable Maximum Concentration (mg/kg)[a]	Percentage of Total PAH Concentration[b]	Estimated Maximum Post-Cleanup Concentration Given Cleanup Level of 100 mg/kg for Total PAHs (mg/kg)[c]	EPA 2015 Risk-Based Screening Level for Soil in Non-Residential Areas (mg/kg)[d]		Does Estimated Post-Cleanup Concentration Exceed EPA's Range of Acceptable Risk?
				Risk = 10^{-6}	Risk = 10^{-4}	
Benzo(a)anthracene	530	22%	22	2.9	290	no
Benzo(a)pyrene	473	19%	19	0.29	29	no
Benzo(b)fluoranthene	450	18%	18	2.9	290	no
Chrysene	912	37%	37	290	29,000	no
Dibenzo(a,h)anthracene	1.15	0.05%	0.05	0.29	29	no
Indeno(1,2,3-c,d)pyrene	73	3%	3	2.9	290	no
Totals	2,439.15	100%	100			

Notes:

a) Source: 1992 ROD Amendment, Table 4.

b) Example calculation (for benzo(a)anthracene): 530 mg/kg ÷ 2439.15 mg/kg = 22%.

c) Example calculation (for benzo(a)anthracene): 22% × 100 mg/kg = 22 mg/kg.

d) Composite worker soil table. Accessed January 19, 2016, at http://www.epa.gov/risk/risk-based-screening-table-generic-tables.

Table K-2: Review of Soil Cleanup Level (Cumulative)

	Toxicity Relative to Benzo(a)pyrene[a]	Assumed Post-Cleanup Concentration (mg/kg of B(a)P-equivalents)[b]
Benzo(a)anthracene	0.1	2.2
Benzo(a)pyrene	1	19.4
Benzo(b)fluoranthene	0.1	1.8
Chrysene	0.001	0.04
Dibenzo(a,h)anthracene	1	0.05
Indeno(1,2,3-c,d)pyrene	0.1	0.3
	Total	23.8

Notes:

a) Calculated using EPA risk-based screening levels (see Table K-1 above). Example calculation (for benzo(a)anthracene):

RSL for benzo(a)pyrene ÷ RSL for benzo(a)anthracene = 0.29 ÷ 2.9 = 0.1

b) Calculated using assumed post-cleanup concentrations (see Table K-1 above) and toxicities relative to benzo(a)pyrene. Example calculation (for benzo(a)anthracene):

22 mg/kg × 0.1 = 2.2 mg/kg B(a)P-eq

Table K-3: Review of Soil Concentrations at the Residential Property East of Former Church

	Maximum Detected Concentration (mg/kg)[a]	Location of Maximum Concentration[b]	EPA 2015 Risk-Based Screening Level for Soil in Residential Areas (mg/kg)[c]		Do Concentrations Left in Place in Soil Exceed EPA's Range of Acceptable Risk?
			Risk = 10^{-6}	Risk = 10^{-4}	
Benzo(a)anthracene	22	Q13	0.16	16	Yes
Benzo(a)pyrene	17	Q16	0.016	1.6	Yes
Benzo(b)fluoranthene	42	Q16	0.16	16	Yes
Benzo(k)fluoranthene	13	Q23	1.6	160	No
Chrysene	26	Q13	16	1,600	No
Dibenzo(a,h)anthracene	2 J[d]	Q16	0.016	1.6	Yes
Indeno(1,2,3-c,d)pyrene	6.4	Q7	0.16	16	No

Notes:

a) Maximum detected concentrations found in Appendix E of the Soil Remedial Action Report, dated November 21, 1996 (Soil Remedial Action Report). Soil at the Q-designated sampling locations was not excavated during the soil removal action because total potentially carcinogenic PAH (pcPAH) concentrations at these locations did not exceed the 100 mg/kg cleanup goal. Total pcPAH concentrations can be found in Table 2 of the Soil Remedial Action Report.

b) Map with locations found in Figure 6 of the Soil Remedial Action Report. The Q-designated sample locations appear to be located outside the Q-area excavation boundaries shown on Figure 3 of the Soil Remedial Action Report.

c) Resident soil table. Accessed April 7, 2016, at http://www.epa.gov/risk/risk-based-screening-table-generic-tables.

d) J = estimated concentration.