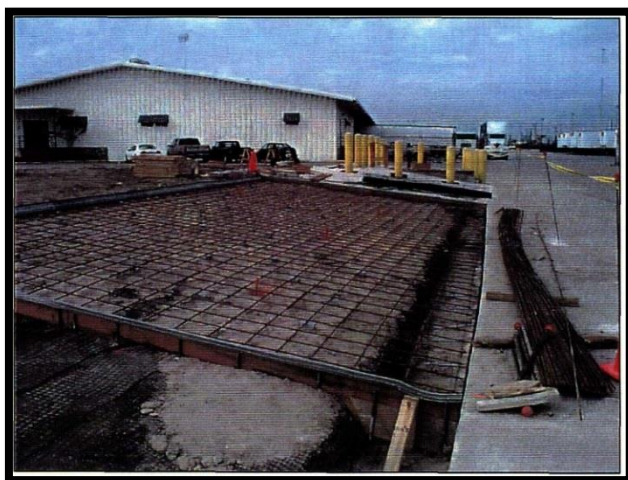


**FOURTH FIVE-YEAR REVIEW REPORT FOR
SOUTH CAVALCADE STREET SUPERFUND SITE
HARRIS COUNTY, TEXAS**



AUGUST 2017



Prepared by

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

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**FOURTH FIVE-YEAR REVIEW REPORT
SOUTH CAVALCADE STREET SUPERFUND SITE
EPA ID#: TXD980810386
HARRIS COUNTY, TX**

This memorandum documents the U.S. Environmental Protection Agency's performance, determinations and approval of the South Cavalcade Street Superfund site (Site) Fourth five-year review under Section 121 (c) 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 Five-Year Review Report

The site remedy for the single operable unit (OU) consists of long-term remedial actions to address contaminated groundwater and soil. The soil remedial actions completed at the Site include consolidation and containment of contaminated soil under a reinforced concrete cap at two locations, one along the southeastern boundary and the other adjacent to the south boundary. The groundwater remedial actions began with extraction and treatment of contaminated groundwater, including the recovery of dense non-aqueous phase liquid (DNAPL). In 2014, EPA selected an alternate groundwater remedy by establishing Technical Impracticability (TI) Zones in the shallow and intermediate aquifers, requiring Institutional Controls (ICs), continuing DNAPL removal, decommissioning the groundwater extraction and treatment system, and short term and long term monitoring. Not all ICs in the form of groundwater and land use restrictions are in place.

Environmental Indicators

Human Exposure Status: Under Control

Contaminated Groundwater Status: Under Control

Site-wide Ready for Reuse: Yes

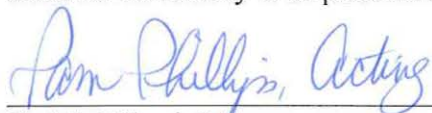
Actions Needed

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

- Evaluate background arsenic levels and the arsenic levels in the different Technical Impracticability (TI) Zone Boundary wells in comparison to the groundwater criteria and determine the impact of this on the TI Zone Boundary.
- Delineate the groundwater plume adjacent to OW-14 and P-05 and expand and verify the TI Zone Boundary as appropriate.
- Complete the implementation of Institutional Controls (ICs) for soils and groundwater once the TI Zone Boundary has been expanded and verified. The Consent Decree (CD) Amendment with the Potentially Responsible Party (PRP) and the Administrative Order on Consent (AOC) with the current property owners needs to be updated to reflect the expanded TI Zone Boundary.
- Evaluate the seepage of groundwater into the City of Houston storm sewer within the TI Zone to mitigate the seepage of any Dense Non-Aqueous Phase Liquid (DNAPL) into the storm sewer.
- Annual inspection of the capped area is to be conducted consistently on an annual basis and the capped areas need to be caulked and maintained to prevent storm water seepage into the underlying areas.

Determination

I have determined that the remedy for the South Cavalcade Street Superfund Site is currently protective of human health and the environment in the short term. This Five-Year Review Report specifies the actions that need to be taken for the remedy to be protective over the long term.



Carl E. Edlund, P.E.

Director, Superfund Division

U.S. Environmental Protection Agency Region 6



Date

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CONCURRENCES

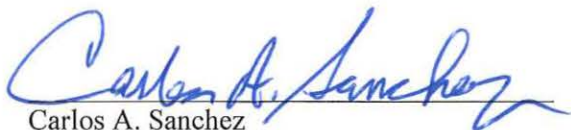
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HARRIS COUNTY, TEXAS



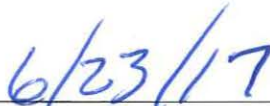
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Date



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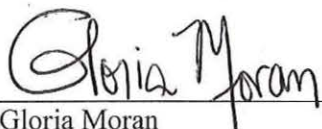
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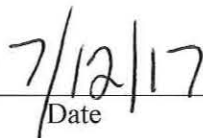
John C. Meyer
Chief, Superfund Remedial Branch



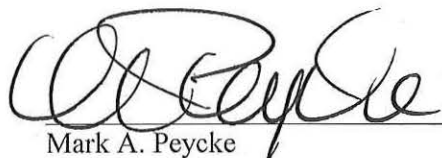
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Gloria Moran
Attorney, Office of Regional Counsel



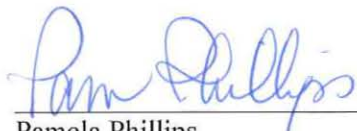
Date



Mark A. Peycke
Chief, Superfund Branch, Office of Regional Counsel



Date



Pamela Phillips
Deputy Director, Superfund Division



Date

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ISSUES/RECOMMENDATIONS

FOURTH FIVE-YEAR REVIEW REPORT
SOUTH CAVALCADE STREET SUPERFUND SITE
EPA ID#: TXD980810386
HARRIS COUNTY, TEXAS

Issues/Recommendations	
OU(s) without Issues/Recommendations Identified in the FYR:	
None	

Issues and Recommendations Identified in the FYR:
--

OU(s): Site-wide	Issue Category: Monitoring			
	Issue: Arsenic exceeds the groundwater criteria in the background well and a few of the shallow TI Zone Boundary wells.			
	Recommendation: Evaluate background arsenic levels and the arsenic levels in the different TI Zone Boundary wells in comparison to the groundwater criteria and determine the impact of this on the TI Zone Boundary.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP	EPA/TCEQ	9/30/2018

OU(s): Site-wide	Issue Category: Monitoring			
	Issue: Concentrations of certain contaminant parameters were detected greater than groundwater MCLs in the shallow well OW-14 located at the northern area TI Zone Boundary and in the intermediate zone well P-05 immediately outside the southern TI Zone Boundary.			
	Recommendation: Delineate the groundwater plume adjacent to OW-14 and P-05 and adjust and verify the TI Zone Boundary as appropriate.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP	EPA/TCEQ	12/31/2018

OU(s): Site-wide	Issue Category: Institutional Controls			
	Issue: Institutional Controls (ICs) have been partially implemented.			
	Recommendation: Complete the implementation of ICs for soils and groundwater once the TI Zone Boundary has been expanded and verified. The Consent Decree (CD) Amendment with the PRP and the Administrative Order on Consent (AOC) with the current property owners needs to be updated to reflect the expanded TI Zone Boundary.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/EPA	EPA/TCEQ	9/30/2019

OU(s): Site-wide	Issue Category: Changed Site Conditions			
	Issue: Groundwater was observed to be seeping into the City of Houston storm sewer within the TI Zone.			
	Recommendation: Evaluate the seepage of groundwater into the City of Houston storm sewer within the TI Zone to mitigate the seepage of any DNAPL into the storm sewer. Once the actions to be taken to address the seepage are identified, the Consent Decree (CD) Amendment needs to be updated.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/EPA	EPA/TCEQ	6/30/2018

OU(s): Site-wide	Issue Category: Operations and Maintenance			
	Issue: Annual inspection of the capped area for four of the past five years has been conducted 14-16 months apart; the joint sealer in some of the joints of the cap were observed to be either damaged or missing.			
	Recommendation: Annual inspection of the capped area is to be conducted consistently on an annual basis and the capped areas need to be caulked and maintained to prevent storm water seepage into the underlying areas.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/Property Owners	EPA/TCEQ	9/30/2018

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS.....	11
I. INTRODUCTION.....	12
Site Background.....	12
FIVE-YEAR REVIEW SUMMARY FORM	14
II. RESPONSE ACTION SUMMARY.....	14
Basis for Taking Action	14
Response Actions.....	15
Status of Implementation	17
Systems Operations/Operation & Maintenance (O&M).....	20
III. PROGRESS SINCE THE LAST REVIEW	20
IV. FIVE-YEAR REVIEW PROCESS.....	24
Community Notification, Involvement & Site Interviews	24
Data Review.....	25
Site Inspection.....	26
V. TECHNICAL ASSESSMENT	27
QUESTION A: Is the remedy functioning as intended by the decision documents?	27
QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?.....	28
QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?.....	29
VI. ISSUES/RECOMMENDATIONS	29
VII. PROTECTIVENESS STATEMENT.....	31
VIII. NEXT REVIEW	31
APPENDIX A – REFERENCE LIST	A-1
APPENDIX B – SITE CHRONOLOGY	B-1
APPENDIX C – SITE MAPS	C-1
APPENDIX D – PRESS NOTICE	D-1
APPENDIX E – SITE INSPECTION CHECKLIST	E-1
APPENDIX F – REMEDIAL ACTION AND SITE INSPECTION PHOTOS.....	F-1
APPENDIX G – DETAILED ARARs REVIEW.....	G-1
APPENDIX H – DATA ANALYSIS SUPPORTING DOCUMENTATION	H-1
APPENDIX I – RAOS AND RISK ASSESSMENT	I-1
APPENDIX J – INTERVIEW FORMS	J-1

Tables

Table 1: Site COCs, by Media.....	15
Table 2a: Soil Cleanup Goals (1988 ROD).....	16
Table 2b: MCLs Waived within TI Zone (2014 ROD Amendment No. 2).....	16
Table 3: Summary of Planned and/or Implemented Institutional Controls (ICs).....	18
Table 4: Protectiveness Determinations/Statements from the 2012 FYR	21
Table 5: Status of Recommendations from the 2012 FYR.....	21
Table B-1: Site Chronology.....	B-1
Table G-1: Previous and Current ARARs for Groundwater COCs.....	G-1
Table H-1: Summary of Arsenic Concentrations in Select Boundary Wells (µg/L).....	H-2
Table H-2: Summary of Naphthalene Concentrations in Boundary Well OW-14.....	H-2
Tables H-3.1 to H-3.6: Analytical Results for TI Boundary Intermediate Wells in Northern Area.....	H-3
Table H-4: Summary of Analytical Results for P-05 Monitoring Well	H-9

Table H-5: Summary of Analytical Results for DW-02	H-10
Table H-6: Summary of cPAH Results for DW-02.....	H-11
Table H-7: Summary of DNAPL Recovered During the TI Monitoring Period	H-12
Table I-1: Vapor Intrusion Model Inputs from the 2013 Human Health Risk Assessment	I-2
Table I-2: Commercial Worker Vapor Intrusion Evaluation for the Northern Area	I-2
Table I-3: Commercial Worker Vapor Intrusion Evaluation for the Southern Area	I-3

Figures

Figure 1: Site Vicinity	13
Figure 2: Institutional Control Map.....	19
Figure C-1: Capped Areas of the Site.....	C-1
Figure C-2: 2014 Benzene and Naphthalene Isoconcentration Contours, Shallow and Intermediate Zones	C-2
Figure C-3: Yearly DNAPL Recovered Over Time	C-3
Figure H-1: Monitoring Well Network	H-1

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BAT	Best Available Technology
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
DNAPL	Dense Nonaqueous Phase Liquid
EPA	United States Environmental Protection Agency
FFS	Focused Feasibility Study
FTS	Field & Technical Services, LLC
FYR	Five-Year Review
GESPMP	Groundwater Extraction System Performance Monitoring Plan
HCTRA	Harris County Toll Road Authority
HI	Hazard Index
HQ	Hazard Quotient
HGSD	Houston-Galveston Subsidence District
IC	Institutional Control
MCL	Maximum Contaminant Limit
µg/m ³	Micrograms per Cubic Meter
mg/kg	Milligrams per Kilogram
MNA	Monitored Natural Attenuation
MS4	Municipal Separate Storm Sewer System
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PCL	Protective Concentration Level
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
TCEQ	Texas Commission on Environmental Quality
TI	Technical Impracticability
TRRP	Texas Risk Reduction Program
UU/UE	Unlimited Use/Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
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 South Cavalcade Street Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared due to the fact that 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 one operable unit (OU) that will be addressed in this FYR. OU1 addresses the soil and groundwater remedies.

The FYR was led by EPA remedial project manager (RPM) Raji Josiam. Participants included Marilyn Long with the Texas Commission on Environmental Quality (TCEQ), Mike Bollinger, Environmental Manager with Beazer East, Inc. (Beazer), the potentially responsible party (PRP), Jim Zubrow with Key Environmental (PRP contractor), and Ryan Burdge and Claire Marcussen from Skeo (EPA contractor support). The review began on 9/7/2016.

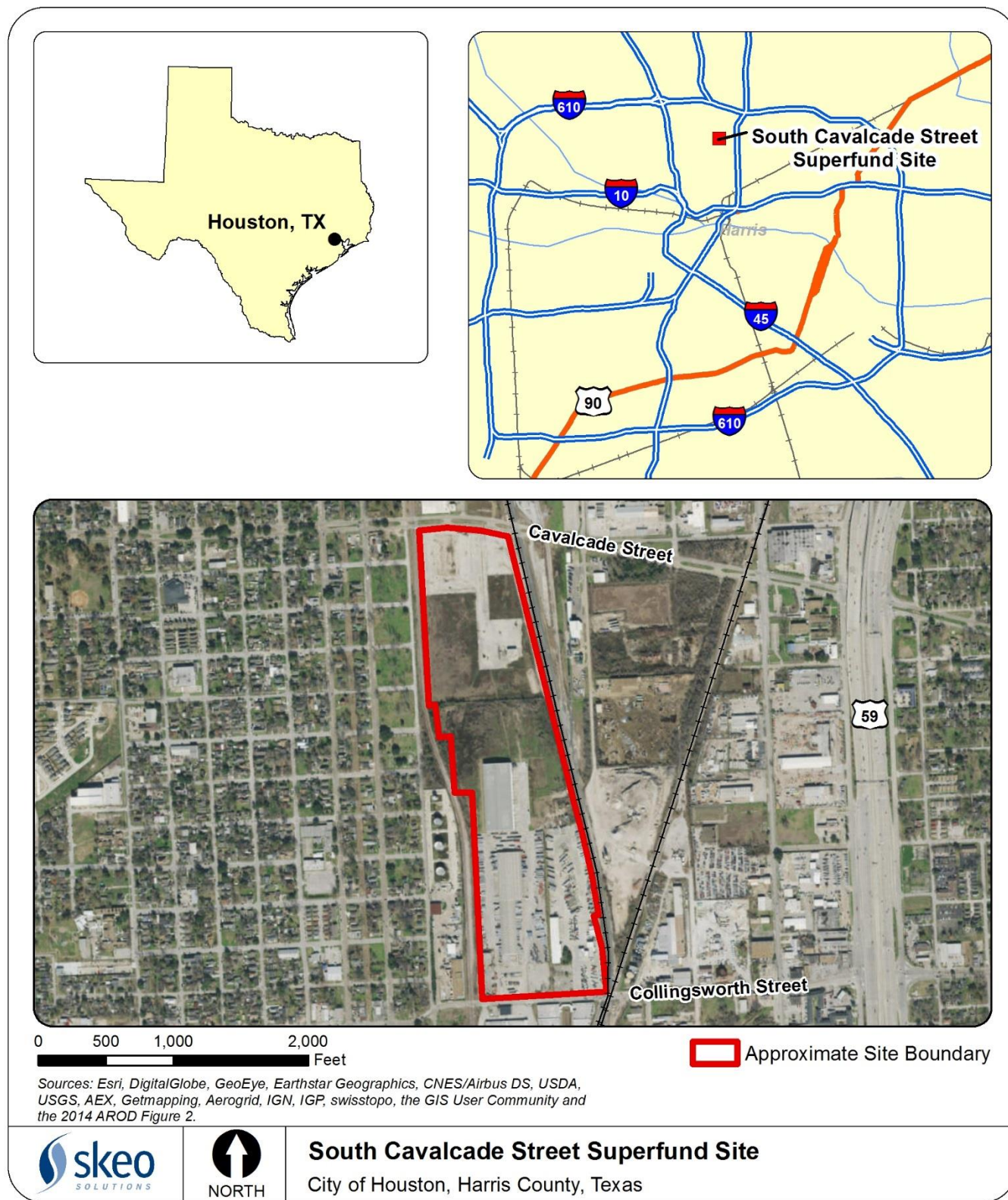
Site Background

The 66-acre area is located in a light industrial corridor of Harris County, 3 miles north of downtown Houston, Texas, and about 1 mile southwest of the intersection of Interstate Loop 610 and U.S. Highway 59 (Figure 1). Site owners operated a creosote wood-treating plant on the southwestern part of the Site from 1910 to 1962 and a coal tar distillation plant on the southeastern portion of the Site from 1944 to 1962. Site operations resulted in spills and releases that contaminated surface soil and subsurface soil with polycyclic aromatic hydrocarbons (PAHs) and groundwater with metals, volatile organic compounds (VOCs) and PAHs.

The North Cavalcade Superfund site, a former wood-treating business, is located directly north of the Site, across Cavalcade Street. Land use is industrial to the east of the Site and residential to the west of the Site. Most houses west of the northern portion of the Site (Northern Area) have been removed; the area is now vacant. Current site uses consist of an auto auction business on the northern portion of the Site and a trucking firm on the southern portion of the Site. A groundwater treatment facility is located along the eastern site boundary in the central portion of the Site. Site access is limited by perimeter fencing and is enforced by 24-hour security. Much of the ground surface, especially in the northern and southern portions of the Site, is covered by concrete, asphalt pavement or buildings, as shown in Figure 2 and Figure C-1.

Groundwater occurs in three zones – the shallow, intermediate and deep zones. Contamination is limited to the shallow and intermediate zones. These units are not being used for sources of drinking water on site or in the vicinity of the Site. On-site workers and neighboring residents access water from the City of Houston's water supply, which obtains drinking water from the Trinity River through Lake Livingston. Groundwater flow direction in the shallow zone is to the west in the Northern Area and to the southwest in the southern portion (Southern Area). Groundwater flow direction in the intermediate zone is to the northwest in the Northern Area and to the southwest in the Southern Area.

Figure 1: Site Vicinity



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: South Cavalcade Street		
EPA ID: TXD980810386		
Region: 6	State: Texas	City/County: Houston/Harris
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Rajalakshmi Josiam, with additional support provided by Skeo		
Author affiliation: EPA Region 6		
Review period: 9/7/2016 - 9/14/2017		
Date of site inspection: 11/15/2016		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/14/2012		
Due date (<i>five years after triggering action date</i>): 9/14/2017		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1988, EPA and Texas Water Commission (TWC which was the predecessor agency to the TCEQ) concluded that potential worker exposure to contaminants in soil posed unacceptable human health risks based on direct exposure while groundwater posed unacceptable risk if the shallow and intermediate zones were used as a future drinking water supply. Table 1 summarizes the primary exposure media and contaminants of concern (COCs) for the Site. The ecological exposure pathways to soil were deemed incomplete due to the ongoing industrial use of the Site, which is not expected to change in the future, and the presence of asphalt and concrete covers. EPA listed the Site on the National Priorities List (NPL) in June 1986. A detailed list of references and site chronology are located in Appendix A and Appendix B, respectively.

Table 1: Site COCs, by Media

COC^a	Media
Carcinogenic PAHs (cPAHs)	Soil
cPAHs Benzene Ethylbenzene Toluene Xylene Arsenic Chromium Copper Lead Zinc	Groundwater (shallow and intermediate zones)
<i>Notes:</i> a. Obtained from Section 4.3 of the 1988 Record of Decision (ROD) for the Site.	

Response Actions

EPA selected the remedy for the Site in the September 1988 Record of Decision (ROD). EPA amended the cleanup plan in the 1997 ROD Amendment No. 1 and 2014 ROD Amendment No. 2 for the Site. The remedial action objectives (RAOs) identified in the ROD and 2014 ROD Amendment No. 2 that are currently applicable are as follows:

Soil RAO (1988 ROD)

- Surface and Surficial Soils (0-6 feet deep)
 - Prevent continued migration to groundwater.
 - Reduce risks to public health.
- Subsurface Soils
 - Minimize the leaching of groundwater.

Ground Water RAO (2014 ROD Amendment No. 2)

- *Within TI Zones*
 - Contain two ground water containment plumes, associated with the Shallow Zone and the Intermediate Zone (*containment*)
 - Prevent human exposure to contaminated ground water above acceptable risk levels (*prevent exposure to contaminated ground water above acceptable risk levels*)
 - Remove source (*source removal*)
- *Outside TI Zones*
 - Protect the ground water from degradation from Site contaminants.

Soil remedy components (Amended in the 1997 ROD Amendment No. 1) included:

- Soil excavation and consolidation of the contaminated soil.
- Construction of a concrete cap designed to withstand current and anticipated freight truck traffic to contain and seal the contaminated soil.
- Construction of a road over excavated areas and the existing roadway.
- ICs to alert future owners that impacted soil has been left on site.
- Preparation and execution of a post-closure plan that describes the maintenance activities that will be carried on after impacted soils are covered.

Groundwater remedy components (Amended in the 2014 ROD Amendment No. 2) included:

- Recycling of recovered DNAPL as creosote or incineration off site.
- Establishment of TI Zones in both the shallow and intermediate zones in the Northern and Southern Areas.
- Implementation of ICs to prevent human exposure to contaminated groundwater.
- Monitoring to ensure that groundwater contamination is contained within the TI Zones.
- Short-term groundwater monitoring to verify the TI Zone boundaries.
- Waiving of the groundwater applicable or relevant and appropriate requirements (ARARs) for selected chemicals within the TI Zones.
- Continued removal of DNAPL in impacted monitoring wells.
- Long-term monitoring upon completion of the short-term groundwater monitoring, to ensure that the plumes are not expanding and that natural attenuation is occurring to contain the plume.
- Decommissioning and dismantling of the groundwater extraction and treatment system.

The cleanup goals established for soil and groundwater established in the 1988 ROD are presented in Table 2a.

Table 2a: Soil Cleanup Goals (1988 ROD)

COC	Cleanup Goal	Basis	
Soil (mg/kg)			
cPAHs	700	10 ⁻⁵ risk level based on commercial worker exposures to a mixture of carcinogenic PAHs	1988 ROD

The 2014 ROD Amendment No. 2 identified the following federal maximum contaminant levels (MCLs) in Table 2b, promulgated under the Federal Safe Drinking Water Act to be waived within the TI Zones.

Table 2b: MCLs Waived within TI Zone (2014 ROD Amendment No. 2)

Contaminant	ARAR (µg/L)	Source
Benzo(a)pyrene (cPAH)	0.2*	EPA MCL
Benzene	5	EPA MCL
Ethylbenzene	700*	EPA MCL
Toluene	1000*	EPA MCL
Xylene	10000*	EPA MCL
Arsenic	10*	EPA MCL
Chromium (Total)	100*	EPA MCL
Copper	1300*	EPA MCL
Lead	15*	EPA MCL
Zinc	5000*	EPA Secondary Standards

* Updated values since 1988 ROD

The 2014 ROD Amendment No. 2 indicates all areas outside the TI Zones, must meet location, chemical, and action-specific ARARs and other criteria, advisory, and guidelines. The most currently available TCEQ TRRP Tier 1 Groundwater Residential Protective Concentration Levels (PCLs) available at <https://www.tceq.texas.gov/remediation/trrp/trrppcls.html> must not be exceeded outside the TI Zones.

The 2014 ROD Amendment No. 2 indicates that the TCEQ TRRP Tier 1 Groundwater Residential PCLs for the following chemicals will not be applied in the TI Zones:

PAHs: acenaphthylene, acenaphthene, anthracene, benzo(k)fluoranthene, benzo(g,h,i)perylene, fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene,

cPAHs: benz-a-anthracene, benzo(b)fluoranthene, chrysene, dibenz-a,h-anthracene, and indeno(1,2,3-cd)pyrene.

Status of Implementation

A brief overview of the remedy implementation for soil and groundwater contamination is presented below. Appendix B provides a detailed chronology of cleanup activities.

Soil

The PRP conducted additional delineation of impacted soils at the Site during 1995 construction activities and completed cap construction between November 1999 and July 2000. The soil remedial action concrete cap system covered impacted as well as non-impacted areas in the southeast and the southwest portions of the Site, providing usable parking and driveway systems for the current property owners (Appendix C, Figure C-1). The extent of the concrete cap is shown in Figure 2. The PRP excavated soils in the northeast area and placed them – along with existing on-site stockpiled materials – as fill under the concrete cap structures in the southeast and southwest areas. The northeast area was then backfilled with clean imported fill from an off-site source. EPA signed the Preliminary Close-Out Report for the soil and groundwater remedy in September 2000. Appendix C shows the locations of the concrete caps installed at the Site (Figure C-1).

Groundwater

In 1991 the PRP entered into a Consent Decree with EPA for implementation of the remedial design and remedial action for the Site. The PRP began remedial construction of the groundwater collection and DNAPL recovery system in June 1995. The PRP started the operation of the groundwater collection and DNAPL recovery components of the groundwater remedy in September 1995. In October 1995, EPA agreed to reconsider the groundwater remedial goals outlined in the 1988 ROD since groundwater pumping and DNAPL recovery operations demonstrated the impracticability of the attainment of the 1988 ROD remedial goals. EPA agreed to consider other remedial alternatives, including monitored natural attenuation (MNA) or a TI waiver. The PRP initiated studies in support of evaluating options that could improve remedy performance while continuing to operate the DNAPL recovery component of the groundwater remedy from January 1996 through April 2006. The PRP discontinued groundwater pumping after a lightning-related power surge that damaged the system controller in April 2006. DNAPL recovery since that time has been completed in a passive mode via manual pumping of DNAPL from the collection wells while EPA has been evaluating alternative remedial options for groundwater.

In 2012, the PRP completed a focused feasibility study (FFS) regarding MNA as the long-term remedy for the DNAPL and groundwater at the Site. In 2014, EPA revised the groundwater remedy with a TI waiver, ICs, DNAPL removal, and monitoring and decommissioning of the groundwater collection and DNAPL recovery system. The PRP is in the process of implementing the revised remedy. The groundwater treatment and DNAPL recovery system have been dismantled in the fall quarter of 2016 while the remaining residual DNAPL continues to be removed passively i.e. DNAPL will be manually pumped from the wells when there is a measurable thickness (greater than 0.1 feet thickness in six-inch diameter recovery wells and greater than 0.5 feet thickness in two-inch diameter monitoring wells or piezometers). Appendix C shows the location of the dissolved contaminant plumes in the shallow and intermediates zones as of 2014 (Figure C-2).

Institutional Controls

Table 3 summarizes the ICs required in the 1988 ROD. The ICs were required to ensure the protection of the concrete caps, to ensure that future use of the Site remains non-residential and to prohibit on-site groundwater use. In addition, the 2014 ROD Amendment No. 2 requires implementation of additional ICs to prevent exposure to groundwater within the designated TI Zone.

The January 1992 Administrative Order on Consent (AOC) for the Site entered into by EPA and site property owners required that the property owners file a notice in Harris County land records so that subsequent purchasers are notified that hazardous substances were disposed of on site and will continue to remain in both soils and groundwater at the Site. The AOC required that the notice and future land transactions must include a copy of the AOC and the 1991 Consent Decree. The responsibility to provide appropriate notice to future purchasers rests with the landowners; penalties for failing to do so are stipulated in the 1992 AOC. The 1997 ROD Amendment No. 1 states that each landowner has placed a deed notice on file to alert future landowners that contamination remains on site. The notices prevent residential use of the Site due to the continuing presence of hazardous

substances at the Site and prohibit the installation of on-site water wells (except for the purpose of groundwater monitoring).

The concrete cap maintenance requirements and on-site groundwater use restrictions are part of the consent agreements between EPA and site property owners. However, they were not required to be written into the deed notice filed in the county land records. Hence additional ICs are needed to be implemented at the Site such that the current and future new property owners are aware of the ICs and the requirement to implement them for both soil and groundwater.

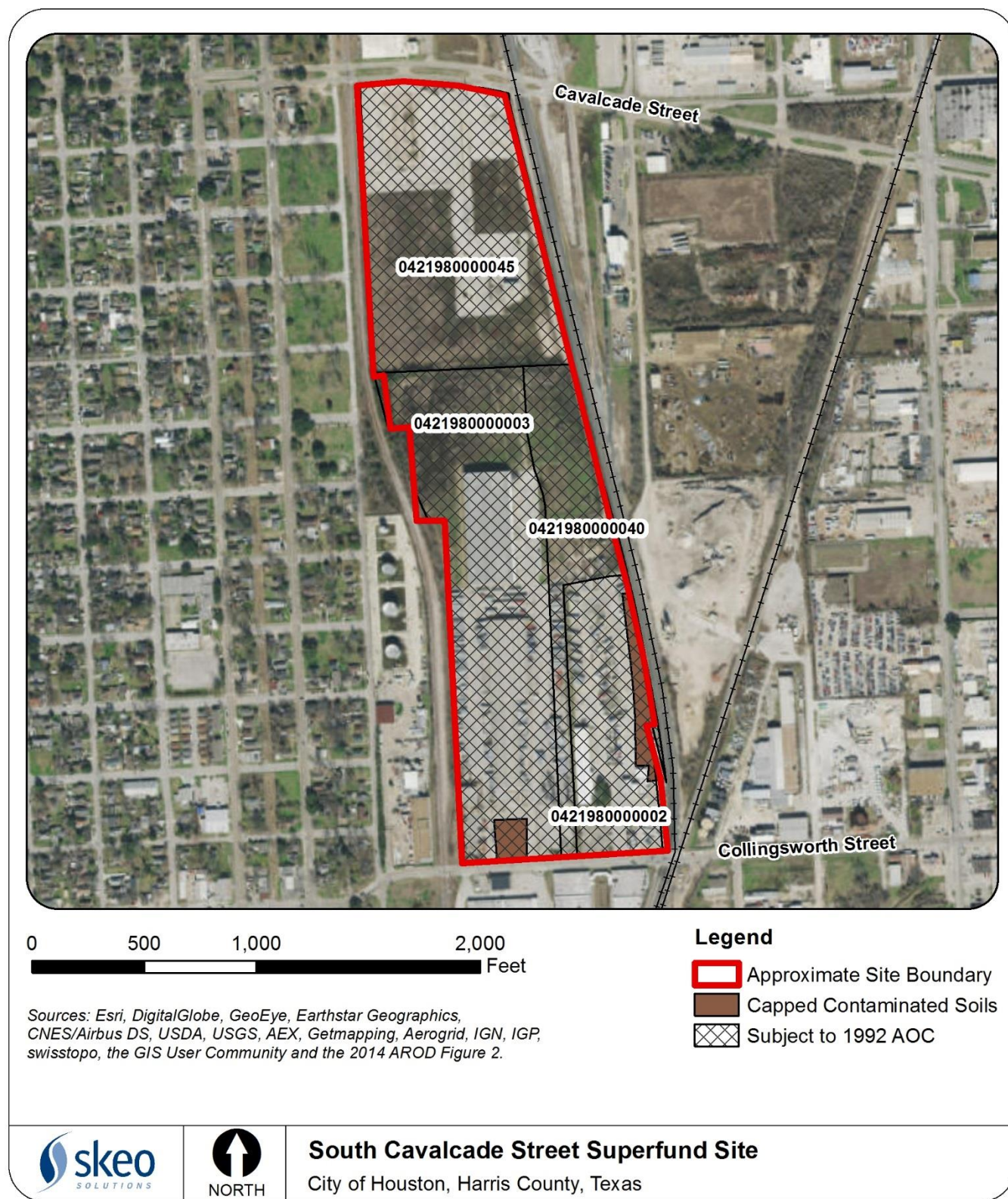
The Houston-Galveston Subsidence District (HGSD) requires the registration of new wells (HGSD Rule 5.1), except leachate wells, monitoring wells, and dewatering wells, by the well owner, well operator, or water well driller prior to being drilled (HGSD Rule 5.7). Single-family dwelling wells are excluded from the permit requirements (HGSD Rule 5.8). These requirements provide a mechanism to identify certain water wells being drilled on or downgradient of the Site. Though HGSD has notification and permitting requirements in place to reduce groundwater use and ground subsidence in Harris and Galveston counties, these requirements are not intended to prevent exposure to contaminated groundwater at the Site. Hence, additional ICs are needed to be implemented to further prevent exposure to groundwater. The 2014 ROD Amendment No. 2 requires groundwater access restrictions and prohibits the installation of groundwater wells within the designated TI Zone, other than those needed for groundwater monitoring. EPA is currently in the process of revising the Consent Decree for the Site. The AOC needs to be revised with the current owners to include IC provisions outlined in the 2014 ROD Amendment No 2.

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 the Decision Documents	Impacted Parcel(s)*	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	0421980000 003 0421980000 002 0421980000 045 0421980000 040	Ensure site use remains non-residential and alert future owners that impacted soil has been left on site. Ensure current owners maintain the caps.	AOC, January 1992 Additional ICs (likely deed restrictions) are under consideration.
Groundwater	Yes	Yes	0421980000 003 0421980000 002 0421980000 045 0421980000 040	Prevent human exposure to groundwater and prevent installation of wells except for investigation and remediation.	AOC, January 1992 Additional revisions to consent decree in progress

* The numbers listed are Account Numbers for the different parcels in the Harris County Appraisal District Property Search database available at www.hcad.org

Figure 2: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Systems Operations/Operation & Maintenance (O&M)

O&M activities are conducted in accordance with the O&M Plan incorporated into the Remedial Action Work Plan, as modified in November 1999 and the 2014 Groundwater Monitoring Plan approved by EPA. Ongoing O&M activities include cap maintenance (conducted by the property owners) and O&M of the DNAPL recovery system (conducted by Beazer's contractor).

Soil

There are several long-term system operations for the concrete cap overlying the contaminated consolidated soils at the Site:

- Property owners inspect and repair cracks and joint systems as necessary.
- Beazer performs an annual inspection to ensure that long-term O&M activities are carried out.
- Beazer submits a soil remedy Long-Term Operations and Maintenance Annual Report to EPA.

EPA reviewed the annual inspection reports for the past five years. The annual inspections for four of the past five years have been conducted 14-16 months apart. The results indicate that the concrete cap shows limited wear typical of curing, that joint systems are generally intact and functioning as designed with a few areas needing repair and recaulking, and that stormwater flow is unobstructed and occurring as intended. The annual inspections result in notifications for property owners of items needing maintenance and repair. Property owners need to continue the maintenance activities necessary to ensure the integrity and function of the cap.

Groundwater and DNAPL

The 2014 Groundwater Monitoring Plan includes a short-term and long-term groundwater monitoring program. The TI Zone groundwater monitoring program represents the short-term program that provides for eight quarters of monitoring to verify the proposed TI Zone boundary. TI Zone monitoring began in February 2015 and finished in November 2016. The evaluation of the TI Zone monitoring results is included in the Technical Impracticability Zone Groundwater Monitoring 2016 Annual Report. Two areas, where wells OW-14 and P-05 are located, have been identified for additional plume delineation and adjustments to the TI Zone Boundary in these areas need to be made accordingly. The Groundwater Monitoring Plan needs to be revised to include sampling of any new monitoring wells installed. The adjusted TI Zone Boundary will need to be confirmed after a few rounds of sampling. The next FYR will evaluate the long-term monitoring results to ensure that the plume is not expanding or migrating beyond the TI Zone boundary.

In addition, monthly DNAPL monitoring had been conducted where DNAPL accumulated in recovery wells. DNAPL was then removed for off-site recycling or disposal when it reached a thickness of about 6 inches. After February 2015, the frequency of DNAPL monitoring activities was reduced to quarterly, in accordance with the Groundwater Monitoring Plan.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR (Table 4) as well as the recommendations from the last FYR and the current status of those recommendations (Table 5).

Table 4: Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	<p>The soil remedial actions implemented at the Site are protective of human health and the environment. The concrete cap eliminates any potential for direct contact with impacted soil. The long-term O&M Plan for the concrete cap will ensure that the potential for future exposure to underlying soil is eliminated.</p> <p>The groundwater remedy is protective in the short term. Future protectiveness depends on the implementation of ICs to prohibit the use of off-site contaminated groundwater. ICs such as the AOC restrictions ensure that the future use of the Site remains nonresidential and prohibit on-site groundwater use. Current information shows that shallow and intermediate groundwater downgradient in the vicinity of the Site is not currently being used and deeper groundwater has not been impacted by site-related constituents.</p>
Sitewide	Short-term Protective	Overall, the site remedy is protective of human health and the environment in the short term.

Table 5: Status of Recommendations from the 2012 FYR

Issue #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Shallow rooted vegetation observed in the expansion joints along the eastern edge in the southeast area of the Site.	<p>The property owners should inspect and maintain joint systems and repair cracks and joint systems as required.</p> <p>Beazer is responsible for continuing annual cap inspections.</p>	Ongoing	<p>According to the 2016 Annual O&M Soil Report, the southwest and southeast areas have locations where the joint sealer was damaged or had weed growth in the joints. These conditions need to be addressed by weed removal and inspection and replacement of caulk as necessary.</p> <p>In addition, spalling, cracking and potential joint separation have been observed in certain locations in the southeast area. These conditions may need to be repaired.</p> <p>Minor joint separation and shifting at the bollards and removed sign posts were observed in the southwest area. Further, water ponding was seen along the eastern edge of the cap and property boundary due to weeds and debris, affecting stormwater runoff. Ongoing maintenance activities needs to be included in the revised AOC.</p>	Ongoing

Issue #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	The owner of the Northern Area is unknown and needs to be determined to ensure that the AOC is still effective for institutional controls.	A Title Search is to be conducted to determine the current owners. Conduct a record search and discuss with current landowners the AOC and ensure the landowners are aware of the ICs and that the ICs are being implemented.	Completed	RCAK Properties LLC currently owns the northern parcel and is leasing the parcel to Texas Direct Auto. A Notice to Purchasers was added to the property deed on March 25, 2014, describing the restrictions. Beazer will update the current ICs in consultation with RCAK Properties LLC once the TI Zone boundaries have been finalized.	3/25/2015
3	The groundwater collection and DNAPL recovery system may no longer be the best remedial alternative.	Evaluation of the FFS supporting MNA as an alternative remedial action for groundwater is to be continued. As part of this re-examination of remedial options and objectives, groundwater monitoring requirements and extraction to contain the dissolved plume should also be evaluated and reinstated as appropriate. It must also be demonstrated that the DNAPL and plume are not migrating vertically and horizontally.	Completed	EPA issued a ROD Amendment No. 2 that revised the groundwater remedy to include a TI waiver and short-term and long-term monitoring to ensure DNAPL and dissolved phase contaminant plumes are not migrating vertically and horizontally.	9/24/2014
4	There is no groundwater monitoring plan being implemented and groundwater monitoring is insufficient.	A groundwater monitoring plan should be developed and monitoring reinstated without waiting for the development and implementation of the revised groundwater remedy. Annual monitoring should be conducted as specified in the Groundwater Extraction System Performance Monitoring Plan (GESMPM) until a new monitoring system is identified and a new monitoring frequency is established as part of the 2014 ROD Amendment No. 2.	Completed	EPA approved the Groundwater Monitoring Plan.	11/26/2014

Issue #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
5	The groundwater monitoring has not been including all the groundwater constituents with remedial goals specified in the ROD. The GESMPMP called for analyzing these constituents in groundwater monitoring at the Site.	Groundwater samples should be analyzed for all the groundwater constituents in which the ROD specified remedial goals. The results should be included in groundwater monitoring reports.	Completed	EPA approved the Groundwater Monitoring Plan, which includes all COCs specified in the decision documents.	11/26/2014
6	There are insufficient institutional controls preventing use of off-site contaminated groundwater.	Institutional controls prohibiting off-site use of the groundwater in the area of the contaminant plume should be implemented.	Ongoing	Cannot be implemented until the TI Zone Boundary is expanded and verified.	9/30/2019
7	The Harris County Toll Road extension and Collingsworth Street expansion may impact the Site.	Continued discussions are to be held with the Harris County Toll Road Authority (HCTRA) and the City of Houston concerning potential site impacts of the expansion. Worker health and safety should be considered for those areas where short-term contact with groundwater contamination is anticipated. Precautions should also be taken during construction to prevent the creation of conduits and preferential pathways for migration of DNAPL to deeper aquifers.	Ongoing	HCTRA is handling its worker safety responsibilities. EPA, TCEQ, HCTRA, and Beazer and its contractors have ongoing discussions to discuss ground water seepage into City of Houston storm water pipe. Any future storm sewer work by Beazer will be covered by an approved workplan and worker health and safety will be addressed by Beazer's health and safety plan.	Ongoing
8	Groundwater remedial goals for arsenic and lead were based on the MCLs of these constituents at the time of the ROD. The MCLs have decreased since the issuance of the ROD and the remedial goals are now above the MCLs.	Consideration should be given to revising groundwater remedial goals for arsenic and lead. Implementation of institutional controls to prevent groundwater use off-site in the plume area.	Ongoing	EPA issued a ROD Amendment No. 2 on 9/24/2014 that included revised cleanup goals for arsenic and lead. However, ICs cannot be implemented until TI Zone boundary is expanded and verified.	Ongoing

Issue #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
9	Unable to locate in public records the plat and survey of the impacted area and cap.	Ensure the plat and survey of the impacted area and cap are part of the Administrative Record and entered into county land records.	Ongoing	Received concrete cap as-built drawings with impacted areas from Beazer on 4/10/17. Needs to be incorporated into the ICs for the Site	9/30/2019
10	Monitoring wells are in need of repair.	All wells should be inspected to evaluate their condition. The wells should have caps, locking protective casing lids, labels and sound well pads. Lost wells should be located. Damaged and inoperable wells should be evaluated for usefulness and either plugged and abandoned or replaced.	Completed	Second Quarter 2015 Progress Report documented well repairs and abandonment.	8/13/2015

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

Two public notices were made available in both English and Spanish, by press notices published in the *Houston Chronicle* newspaper on November 11, 2016, stating that there was a draft FYR and inviting the public to submit any comments to EPA (Appendix D). The notice also invited the public to obtain more information about the FYR process at an open house on November 15, 2016.

The open house was held at the Carnegie Neighborhood Library, located at 1050 Quitman Street in Houston and EPA and TCEQ representatives were present. The open house was attended by a few members from the community and by representatives from Harris County, Harris County Toll Road Authority (HCTRA), and local commercial entities. After a brief presentation regarding the status of the Site was presented, the questions from the participants were addressed. All the attendees were provided with an opportunity to provide comments. One resident indicated that though he grew up in the area, he no longer lives in the area and has not been kept informed. He will be added to EPA's mailing list for future notifications regarding the Site. He expressed concern that the contamination from the buried soil gets into the groundwater and will remain for hundreds of years. Beazer will continue to monitor and sample the groundwater and will evaluate the results to ensure the plume has not migrated beyond the TI Zone Boundary. ICs will be implemented to ensure that there is no exposure to the contaminated soil or groundwater.

During the FYR process, responses to interview questionnaires were requested to document any perceived problems or successes with the remedy that has been implemented to date. The responses to these interview questionnaires are summarized below. Appendix J provides the completed interview questionnaires.

Mr. Hubregsen, RCAF Property LLC, owner of the northern portion of the Site, is aware of the environmental issues and the cleanup activities that have taken place at the Site. Overall, he has a positive impression of site activities. He is not aware of any impacts to the surrounding community. There have not been any problems with vandalism or trespassing. Communications with the regulators have been positive and constructive.

Marilyn Long, TCEQ project manager, indicated that, overall, the site remedy is functioning as intended. TI waiver zone boundaries are in the process of being finalized and the Consent Decree will be revised. Ms. Long indicated that TCEQ has not received any complaints or inquiries from nearby residents in the last five years or any changes in state laws that would affect the protectiveness of the remedy.

The City of Houston and the Harris County have expressed concern in the seepage of contamination from the Site into the City of Houston Municipal Separate Storm Sewer System (MS4) and that the contamination from the Site may not have been fully identified and that the plume may not be stable. The EPA and the TCEQ continue to coordinate with Beazer, the steps to be taken to assess the seepage and the actions that would follow to mitigate the seepage of groundwater from the Site into the City of Houston MS4. The actions to be taken will be coordinated with the City of Houston, the Harris County, and the HCTRA.

The Technical Impracticability Zone Groundwater Monitoring 2016 Annual Report, submitted by Beazer, dated March 31, 2017 includes the results from eight quarters of groundwater sampling conducted in 2015 and 2016. Arsenic levels exceed the groundwater criteria in the background well and a few of the shallow TI Zone Boundary wells. The background arsenic levels and the arsenic levels in the different TI Zone Boundary wells need to be evaluated and compared with the MCLs to determine the impact of this on the TI Zone Boundary. The evaluation of the remaining groundwater sampling results indicates no evidence of increasing concentration trends within the TI Zone or plume migration toward the TI Zone boundaries.

The results of the review and the report will be made available at the information repositories for the Site, located at the Houston Central Library at the Houston Metropolitan Research Center (Julia Ideson Building) in Houston, Texas, at TCEQ's office in Austin, Texas, and at EPA Region 6's office in Dallas, Texas.

Data Review

The PRP monitors groundwater inside and outside the TI Zone boundaries, source area wells and background wells. The review focused on the TI Zone boundary wells to determine if the groundwater remedy is effective in containing the groundwater contaminant plumes within the TI Zone boundaries in the Northern and Southern Areas.

Groundwater – Shallow and Intermediate

This FYR evaluates eight quarters of groundwater data collected as part of the short-term monitoring program to verify the proposed TI Zone boundary and to determine if the proposed boundary can be finalized. TCEQ TRRP Tier 1 Groundwater Residential PCLs must not be exceeded outside the TI Zones. The PRP completed the eight quarters of sampling in November 2016. All eight quarters of groundwater data were used as part of this FYR to evaluate whether the TI Zone boundary can be finalized, after which long-term monitoring will begin to ensure that the plumes are not expanding beyond the TI Zone boundary. The first quarter of TI Zone monitoring began in February 2015. The eighth quarter finished in November 2016. The groundwater cleanup goals are only applicable beyond the TI Zone boundary (Appendix H, Figure H-1); however, the groundwater within the TI Zone is also compared to the cleanup goals for monitoring purposes only.

The 2014 ROD Amendment No. 2 identified benzene and naphthalene as primary indicators of the impact of creosote and coal tar on groundwater quality at the Site because these COCs represent the most mobile constituents of creosote. Thus, these two chemicals are used as indicators to establish the TI Zone boundaries. Well OW-14 (located at the eastern boundary) has concentrations of two organic COCs, naphthalene and 2-methylnaphthalene, and one inorganic COC (arsenic) that exceed the groundwater criteria. All monitoring reports state that OW-14 is located at the upgradient TI Zone boundary and adjacent to a known on-site source area. The PRP reports that the analytical results are consistent with historical data. In addition, Northern Area shallow boundary wells TIN-01S and TIN-06S routinely exceed the groundwater criterion for arsenic. The consistent presence of naphthalene above the groundwater criterion in the Northern Area boundary well OW-14 (i.e., up to 9,800 micrograms per liter, or $\mu\text{g/L}$, versus the criterion of 490 $\mu\text{g/L}$) as well as other organics suggests additional delineation of contamination is warranted to determine if the TI Zone boundary at this location needs to be expanded (Appendix H, Table H-2). In addition, the TI Zone boundary should also be reviewed to determine if expansion is warranted due to exceedances of the groundwater criterion for arsenic in the Northern Area wells TIN-01S and TIN-06S (Appendix H, Table H-1). Data from TI Zone Boundary wells in the intermediate zone in the Northern Area show no arsenic exceedances at these wells.

The Technical Impracticability Zone Groundwater Monitoring 2016 Annual Report submitted by Beazer indicates that COC concentrations greater than groundwater concentration criteria were detected in intermediate zone monitoring well P-05. An isolated DNAPL area in the intermediate zone, immediately north of P-05, was identified in the March 2006 Supplemental Ground Water Investigation Report. However, this area was not accounted for when the TI Zone investigation was conducted in 2013. This well is located approximately 105 feet north of the northern boundary of the southern TI Zone along the eastern (upgradient) boundary of the Site and more than 600 feet from the western (downgradient) property boundary. All COC concentrations in intermediate zone monitoring wells located at the TI zone boundaries downgradient of well P-05 are less than groundwater concentration criteria. Beazer informed EPA and TCEQ of the exceedances of concentration criteria in the groundwater samples collected from monitoring well P-05. A conference call among Beazer, EPA and TCEQ was held on March 21, 2017 to review the relevant data. Further discussions among the parties regarding the assessment of the extent of groundwater impact in the vicinity of monitoring well P-05 and associated modifications to the TI Zone boundary will be conducted.

Groundwater – Deep

The monitoring program also included sampling of deep well 2 (DW-02) in the first quarters of 2015 and 2016 to ensure the plume has not reached this groundwater zone. Review of data for DW-02 indicates that deep groundwater has not been affected by the Site. There have been no detections of any PAHs or VOCs and inorganic COCs remain below the cleanup criteria. PAHs have been below detection limits in DW-02 for over 20 years.

DNAPL

The PRP's contractor identified trace amounts of DNAPL in several shallow and intermediate wells but the amounts were immeasurable or did not exceed the thickness criteria requiring removal. The PRP contractor removes DNAPL from wells when the thickness is at 0.1 feet or greater and 0.5 feet or greater in 6-inch and 2-inch diameter wells or piezometers, respectively. During 2015 and 2016, DNAPL was routinely present in ITW-01, an intermediate well in the Northern Area, where a total of 51 gallons were removed during the eight quarters of monitoring. PZS-20 also required DNAPL removal, with a total of 1.6 gallons removed during the monitoring (Table H-3). DNAPL removal has declined significantly since April 2006 when lightning damaged the groundwater pumping system. Since that time, the PRP contractor has recovered DNAPL in a passive mode via manual pumping of DNAPL from the collection wells (Appendix C, Figure C-3).

Site Inspection

The site inspection took place on 11/15/2016. In attendance were Raji Josiam (EPA Region 6 RPM), Bill Little (EPA Community Involvement Coordinator), Marilyn Long (TCEQ), Mike Bollinger (Beazer), Jim Zubrow (Key Environmental) and Ryan Burdge and Claire Marcussen (Skeo). Ms. Morgan Cavallo (Direct Auto), tenant of the Northern Area, also attended the inspection of the Northern Area. The purpose of the inspection was to assess the protectiveness of the remedy. Appendix E includes a completed Site Inspection Checklist. Appendix F includes photographs of the Site prior to remediation as well as photos taken during the site inspection.

The inspection began in the main building of the Northern Area, which has recently been refurbished from a former trucking facility into an auto auction office. Site participants visited the capped areas and monitoring wells. The cap had some cracking and the joint sealer in some of the joints of the cap were observed to be either damaged or missing. Regular weed removal from the joints and maintenance of these joints need to be addressed as part of the routine O&M, which involves vegetation removal and caulking. Some wells were not locked because the final quarter of short-term groundwater monitoring and water level measurements were ongoing during the site inspection. One area south of the auto auction building is covered in heavy grass rather than capped. Several monitoring wells and piezometers were observed in this area. The entire Site is surrounded by a tall, locked chain-link fence. A smaller building located in the southeast corner of the Northern Area was observed. Ms. Cavallo explained that the building will be refurbished for use as a photo booth for the auto auction business. Ms. Cavallo also explained that the grass field will likely be covered in gravel in the future, as the business needs more space for car storage.

Site inspection participants viewed the southern portion of the Site where active trucking operations are taking place on the capped areas. The southeast and southwest caps were intact with some cracking of the pavement from heavy truck traffic and weathering. The cracks are routinely inspected and repaired as part of O&M activities for these areas. Several sealed recovery wells were observed; monitoring wells and fencing were secured. The inspection concluded with observation of the toll road expansion along the southern boundary of the Site. Several newly installed manholes were viewed. The road contractor opened two of the manholes (Manhole 8 and Manhole 4). A strong creosote odor was noted and a sheen was observed in the water at the bottom of both manholes. Groundwater was observed to be seeping into Manhole 8. Worker health and safety plans are being implemented by HCTRA to ensure the protection of their workers as they work on site and on associated infrastructure. The EPA and the TCEQ have had follow up discussions with HCTRA and Beazer regarding the storm water issue. The EPA and the TCEQ continue to coordinate with Beazer, the steps to be taken to assess the seepage and the actions that would follow to mitigate the seepage of groundwater from the Site into the City of Houston MS4. The actions to be taken will be coordinated with the City of Houston, the Harris County, and the HCTRA.

After the site inspection, Skeo, EPA and TCEQ staff visited the local information repository for the Site, Houston Central Library, located at the Houston Metropolitan Research Center (Julia Ideson Building) in Houston, Texas. Administrative record documents appeared to be in place, including a copy of the 2012 FYR.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes. The soil remedy is performing as intended by the 1988 ROD and 1997 ROD Amendment No. 1. Contaminated soils have been excavated, consolidated and sealed under reinforced concrete caps, eliminating direct contact with surface soils by on-site occupants. The cap has also provided positive drainage, preventing standing surface water. The DNAPL recovery and groundwater treatment system operated from 1996 to 2006, followed by ongoing passive removal of DNAPL using existing recovery wells. Although historical data reviewed indicate that remedial actions as specified in the 1988 ROD and 1997 ROD Amendment No. 1 have reduced DNAPL and dissolved phase contamination, EPA revised the groundwater remedy in 2014 to address remaining areas of localized DNAPL and groundwater contamination with a TI waiver. The short-term data review indicates that the contamination may require delineation near well OW-14 and P-05 to expand the TI Zone boundary in these areas as appropriate. The next FYR period will review the annual long-term groundwater monitoring to evaluate if the DNAPL and dissolved phase contaminant plumes are stable and not migrating.

The PRP completed annual inspections of the reinforced concrete caps overlying the consolidated contaminated soil and reports that the condition of the caps is generally good. They are functioning as intended and will continue to as long as the current property owners continue repair and maintenance of the cap which includes removing weeds and routinely repairing joints as needed. Passive DNAPL recovery continues to operate and monitoring has been reduced from a monthly to a quarterly schedule due to historical reduction in the gallons removed from the recovery wells. The groundwater pumping and treatment system was dismantled and decommissioned in December 2016. Short-term monitoring to finalize the TI Zone boundary is complete except for the potential additional delineation needed near wells OW-14 and P-05. Long-term groundwater monitoring will follow.

The AOC for the Site restricts site uses to non-residential uses. Non-residential use is consistent with the exposure assumptions used to develop the remedial goals for soil. Site access at all parcels is restricted to authorized personnel via fencing, locked access gates and on-site security personnel. The AOC also prohibits the installation of on-site water wells (except for the purpose of groundwater monitoring). The concrete cap maintenance

requirements and on-site groundwater use restrictions are part of the consent agreements between EPA and the property owners. Additional ICs are needed such that the current and any future new property owners are aware of the ICs and will implement them for both soil and groundwater.

For areas adjacent to the Site, HGSD has notification and permitting requirements in place to further reduce groundwater use and to discourage the use of private wells where a public water supply is readily available. Although HGSD rules greatly reduce the possibility of off-site use of contaminated groundwater, they do not completely prohibit it. Based on the 2014 ROD Amendment No. 2, additional ICs will be implemented to prevent human exposure to contaminated groundwater, to restrict access to and use of contaminated water, and to prohibit the installation of groundwater wells, other than groundwater monitoring wells, within the designated TI Zone boundary. EPA is currently in the process of revising the Consent Decree for the Site. In addition, the 2014 ROD Amendment No. 2 requires that the AOC will be amended to reflect the provisions of the 2014 ROD Amendment No. 2. The implementation of the additional groundwater ICs will take place once the TI Zone boundaries are finalized.

EPA is continuing to coordinate with involved parties on the Harris County Toll Road extension and Collingsworth Street expansion to ensure that it proceeds in a protective manner and does not impact the conditions of the site. HCTRA is handling its worker safety responsibilities to ensure protectiveness during these activities.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

Yes. The RAOs used at the time of the remedy selection are still valid. The Site remains in commercial use. The chemical-specific ARARs for groundwater presented in the 2014 ROD Amendment No. 2 were reviewed and demonstrate that the most current MCLs are being used for monitoring the TI Zone boundary (Appendix G).

The vapor intrusion pathway was evaluated by the PRP in 2013 to address indoor air risks to workers in the tire shop in the southeast portion of the Site. The risk assessment indicated that the risks were within EPA's risk management range and below the noncancer Hazard Quotient (HQ) of 1.0 based on the use of 1999 groundwater data. Since the vapor intrusion evaluation relied on historical data, this FYR conducted the evaluation using the most current shallow zone well data collected in 2016. The screening-level vapor intrusion risk evaluation demonstrates that based on 2016 groundwater data, the 2013 human health risk assessment conclusions have not changed (Appendix I).

Except for road expansion and sewer activities south of the Site and seepage identified during the Site inspection, there have been no changes in site conditions that would suggest the presence of new exposure pathways. During the Site inspection, groundwater was observed to be seeping into the City of Houston storm sewer within the TI Zone in the manholes completed by HCTRA. Beazer is evaluating this issue to mitigate the seepage of any DNAPL into the storm sewer. Currently there is no indication of any exposure and the remedy is still protective. Although the northern portion of the property was vacant during the last FYR, an auto auction business is currently operating at this location. Trucking company continue to operate on the southern parcel. Both of these commercial uses are consistent with uses allowed on site.

Short-term monitoring was completed in fall 2016. The long-term monitoring will be reviewed over the next FYR period to determine if the remedy is progressing as expected toward meeting RAOs.

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

Question C Summary:

No other information has come to light that would call into the question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations	
OU(s) without Issues/Recommendations Identified in the FYR:	
None	

Issues and Recommendations Identified in the FYR:

OU(s): Site-wide	Issue Category: Monitoring			
	Issue: Arsenic exceeds the groundwater criteria in the background well and a few of the shallow TI Zone Boundary wells.			
	Recommendation: Evaluate background arsenic levels and the arsenic levels in the different TI Zone Boundary wells in comparison to the groundwater criteria and determine the impact of this on the TI Zone Boundary.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP	EPA/TCEQ	9/30/2018

OU(s): Site-wide	Issue Category: Monitoring			
	Issue: Concentrations of certain contaminant parameters were detected greater than groundwater MCLs in the shallow well OW-14 located at the northern area TI Zone Boundary and in the intermediate zone well P-05 immediately outside the southern TI Zone Boundary.			
	Recommendation: Delineate the groundwater plume adjacent to OW-14 and P-05 and adjust and verify the TI Zone Boundary as appropriate.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP	EPA/TCEQ	12/31/2018

OU(s): Site-wide	Issue Category: Institutional Controls			
	Issue: Institutional Controls (ICs) have been partially implemented.			
	Recommendation: Complete the implementation of ICs for soils and groundwater once the TI Zone Boundary has been expanded and verified. The Consent Decree (CD) Amendment with the PRP and the Administrative Order on Consent (AOC) with the current property owners needs to be updated to reflect the expanded TI Zone Boundary.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/EPA	EPA/TCEQ	9/30/2019

OU(s): Site-wide	Issue Category: Changed Site Conditions			
	Issue: Groundwater was observed to be seeping into the City of Houston storm sewer within the TI Zone.			
	Recommendation: Evaluate the seepage of groundwater into the City of Houston storm sewer within the TI Zone to mitigate the seepage of any DNAPL into the storm sewer. Once the actions to be taken to address the seepage are identified, the Consent Decree (CD) Amendment needs to be updated.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/EPA	EPA/TCEQ	6/30/2018

OU(s): Site-wide	Issue Category: Operations and Maintenance			
	Issue: Annual inspection of the capped area for four of the past five years has been conducted 14-16 months apart; the joint sealer in some of the joints of the cap were observed to be either damaged or missing.			
	Recommendation: Annual inspection of the capped area is to be conducted consistently on an annual basis and the capped areas need to be caulked and maintained to prevent storm water seepage into the underlying areas.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party/Support Agency	Milestone Date
No	Yes	PRP/Property Owners	EPA/TCEQ	9/30/2018

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy at OU1 currently protects human health and the environment because concrete caps and the long-term O&M of these caps eliminate any potential for direct contact with impacted soil. In addition, the Administrative Order on Consent and deed notices restrict nonresidential use of the Site and prohibit on-site groundwater use. Further, current information shows that shallow and intermediate groundwater are not currently being used downgradient in the vicinity of the Site and deeper groundwater has not been impacted by site-related constituents. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: <ul style="list-style-type: none">• Evaluate background arsenic levels and the arsenic levels in the different Technical Impracticability (TI) Zone Boundary wells in comparison to the groundwater criteria and determine the impact of this on the TI Zone Boundary.• Delineate the groundwater plume adjacent to OW-14 and P-05 and expand and verify the TI Zone Boundary as appropriate.• Complete the implementation of Institutional Controls (ICs) for soils and groundwater once the TI Zone Boundary has been expanded and verified. The Consent Decree (CD) Amendment with the Potentially Responsible Party (PRP) and the Administrative Order on Consent (AOC) with the current property owners needs to be updated to reflect the expanded TI Zone Boundary.• Evaluate the seepage of groundwater into the City of Houston storm sewer within the TI Zone to mitigate the seepage of any Dense Non-Aqueous Phase Liquid (DNAPL) into the storm sewer. Once the actions to be taken to address the seepage are identified, the Consent Decree (CD) Amendment needs to be updated.• Annual inspection of the capped area is to be conducted consistently on an annual basis and the capped areas need to be caulked and maintained to prevent storm water seepage into the underlying areas.

VIII. NEXT REVIEW

The next FYR Report for the South Cavalcade Street Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Amended Record of Decision. South Cavalcade Street Site, Houston, Texas. EPA Region 6, May 1997.

Amended Record of Decision. South Cavalcade Street Site, Houston, Texas. EPA Region 6, September 2014.

Administrative Order on Consent (AOC), Docket Number 6-08-92, June 1992.

Consent Decree between the United States of America and Beazer East, Inc., March 1991.

Five-Year Review South Cavalcade Street Site, Houston, Harris County Texas. EPA Region 6. September 2002.

Five-Year Review South Cavalcade Street Site, Houston, Harris County, Texas. EPA, September 2007.

Five-Year Review South Cavalcade Street Site, Houston, Harris County, Texas. EPA, September 2012.

Harris Galveston Subsidence District Rules – Amended September 14, 2016

Long-Term Operations and Maintenance Report (Soil Remedy), South Cavalcade Superfund Site – Concrete Cap. ARCADIS U.S. Inc., April 2012.

Long-Term Operations and Maintenance Report (Soil Remedy), South Cavalcade Superfund Site – Concrete Cap. ARCADIS U.S. Inc., February 2015.

Long-Term Operations and Maintenance Report (Soil Remedy), South Cavalcade Superfund Site – Concrete Cap. ARCADIS U.S. Inc., May 2016.

South Cavalcade Superfund Site Human Health Risk Assessment. Houston, Texas. Technical Memorandum. Prepared by Arcadis, April 2011.

South Cavalcade Superfund Site Human Health Risk Assessment – Revised. Houston, Texas. Technical Memorandum. Prepared by Arcadis, August 2013.

Technical Memorandum – South Cavalcade Superfund Site Human Health Risk Assessment. Prepared by ARCADIS U.S., Inc., April 2011.

Technical Memorandum – South Cavalcade Superfund Site Revised Human Health Risk Assessment. Prepared by ARCADIS U.S., Inc., April 2013.

Quarterly Progress Report #66, South Cavalcade Superfund Site, Houston, Texas. Prepared by Field & Technical Services, LLC (FTS) for Beazer East, Inc., First Quarter 2015. May 2015.

Quarterly Progress Report #67, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Second Quarter 2015. August 2015.

Quarterly Progress Report #68, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Third Quarter 2015. November 2015.

Quarterly Progress Report #69, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Fourth Quarter 2015. February 2016.

Quarterly Progress Report #70, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., First Quarter 2016. May 2016.

Quarterly Progress Report #71, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Second Quarter 2016. August 2016.

Quarterly Progress Report #72, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Third Quarter 2016. November 2016.

Quarterly Progress Report #73, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc., Fourth Quarter 2016. February 2017.

Record of Decision. South Cavalcade Street Site, Houston, Texas. EPA Region 6, September 1988.

Remedial Design and Short Term and Long Term Groundwater Monitoring Plan. Prepared by Arcadis, November 2014.

Remedial Action Report. South Cavalcade Street Site, Houston, Texas. Prepared by Key Environmental for Beazer East, Inc., May 2015.

Remedial Action Work Plan Volumes 1 and 2. Dames and Moore for Beazer East, Inc., May 1995. Modifications incorporated November 1999.

Supplemental Ground Water Investigation Report, South Cavalcade Superfund Site, Houston, Texas. Prepared by Key Environmental, Inc. for Beazer East, Inc., March 2006.

TI Zone Groundwater Monitoring 2016 Annual Report, South Cavalcade Superfund Site, Houston, Texas. Prepared by FTS for Beazer East, Inc. March 2017.

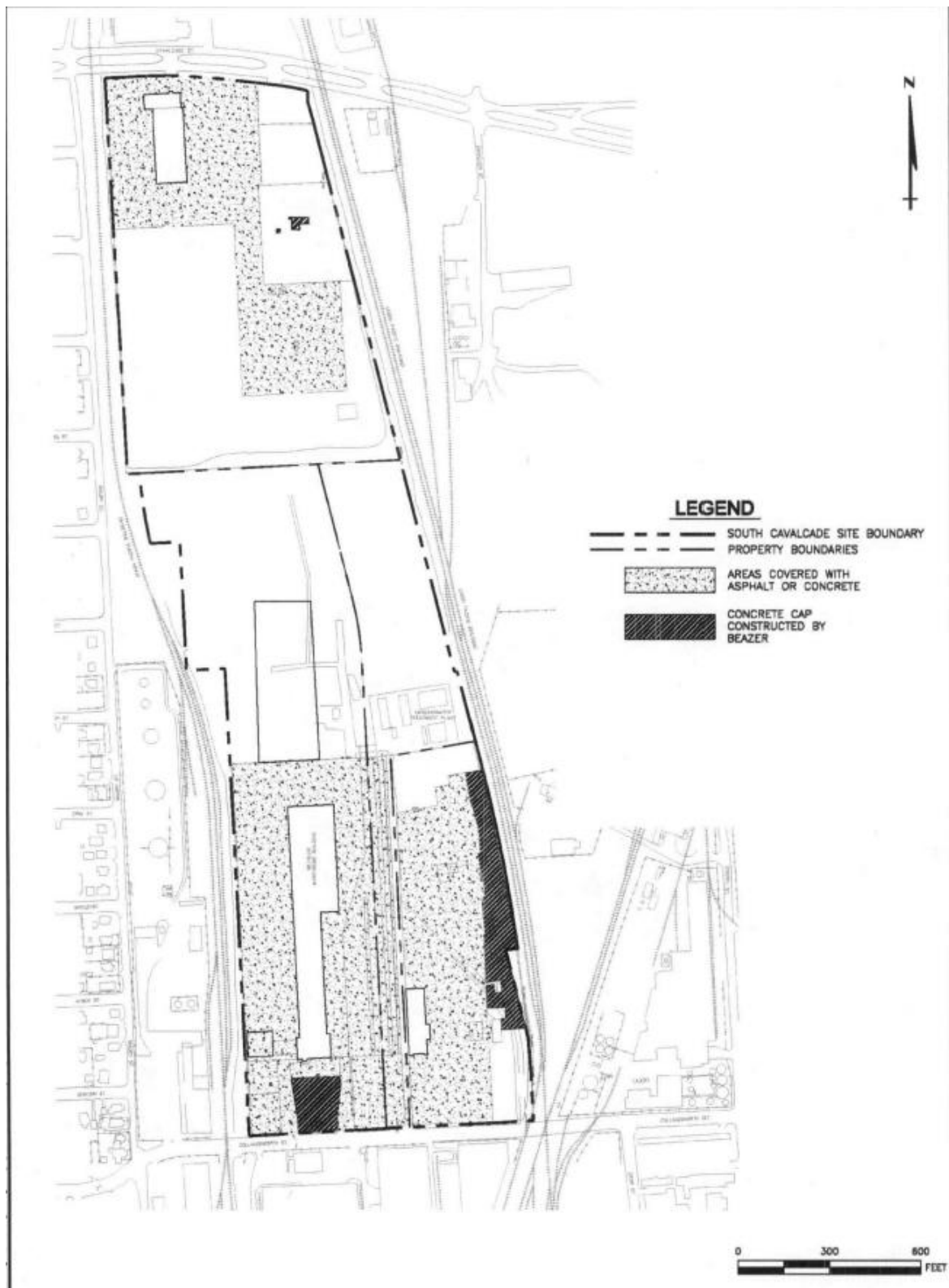
APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Texas Department of Water Resources notified EPA of contamination at the Site	July 1, 1983
EPA proposed the Site for listing on the National Priorities List (NPL)	October 15, 1984
Potential Responsible Party (PRP) enters into Administrative Order on Consent (AOC) with EPA to perform a remedial investigation/feasibility study (RI/FS)	March 28, 1985
EPA listed the Site on the NPL	June 10, 1986
PRP completed the RI/FS and EPA issued the Record of Decision (ROD)	September 26, 1988
EPA issued a Consent Decree requiring the PRP to complete remedial design and remedial action activities at the Site	March 31, 1991
PRP entered into an AOC with EPA for PRP payment of remediation costs	July 27, 1992
PRP completed the remedial design and began the groundwater remedy	January 11, 1995
PRP began construction of the groundwater collection and dense nonaqueous phase liquid (DNAPL) recovery system	June 1995
PRP completed the construction for the groundwater collection and DNAPL recovery system	September 1995
EPA issued a memorandum asking whether 1988 ROD groundwater cleanup goals still applied	October 6, 1995
PRP began operation of the groundwater collection and DNAPL recovery system	January 1996
EPA issued an amended ROD (ROD Amendment No. 1) to revise the soil remedy	June 27, 1997
PRP completed the remedial design for the soil remedy	November 11, 1999
PRP began remedial construction of the soil remedy	November 17, 1999
PRP completed remedial construction and remedial action of the soil remedy	July 12, 2000
EPA signed the Preliminary Close Out Report for the Site	September 15, 2000
EPA signed the first Five-Year Review (FYR) for the Site	September 25, 2002
PRP initiated an RI/FS to address DNAPL and groundwater	August 31, 2005
PRP discontinued the operation of the groundwater collection and DNAPL recovery system due to lightning damage	April 2006
EPA signed the second FYR for the Site	September 24, 2007
PRP completed a supplemental investigation of groundwater	September 2008
EPA signed the third FYR for the Site	September 14, 2012
PRP completed the RI/FS for DNAPL and groundwater	September 13, 2013
EPA signed a ROD Amendment No. 2 to revise the DNAPL/groundwater remedy	September 24, 2014
PRP completed remedial design of the revised DNAPL/groundwater remedy	November 26, 2014
PRP began the revised remedial action for DNAPL/groundwater	November 27, 2014
PRP began operation and maintenance activities for the soil and groundwater remedy	January 16, 2015
PRP began quarterly TI Zone groundwater monitoring program	February 2015
PRP completed well abandonment and replacement activities	June 30, 2015
PRP completed quarterly TI Zone groundwater monitoring program	November 2016
PRP completed decommissioning of groundwater treatment facility	December 20, 2016

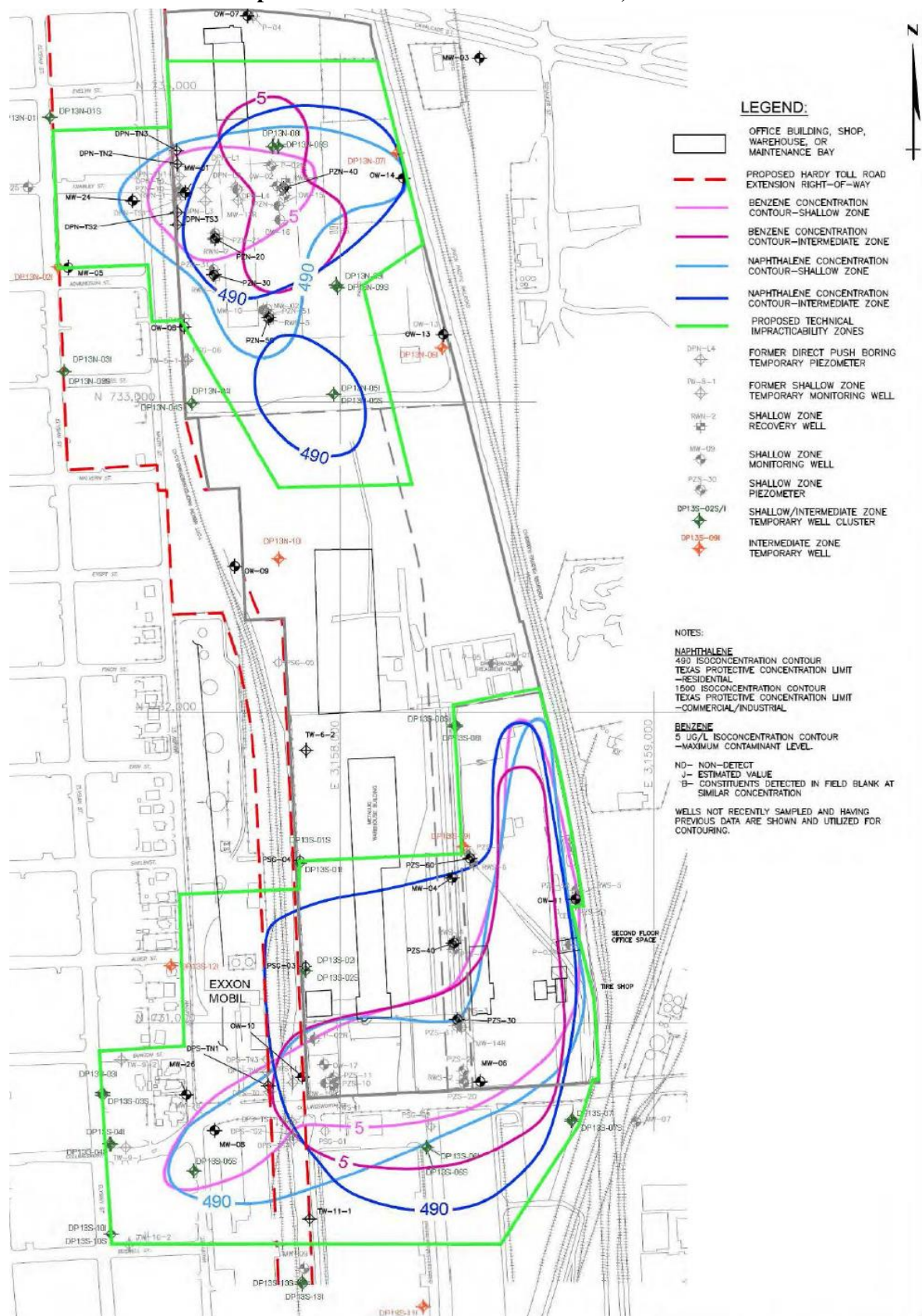
APPENDIX C – SITE MAPS

Figure C-1: Capped Areas of the Site



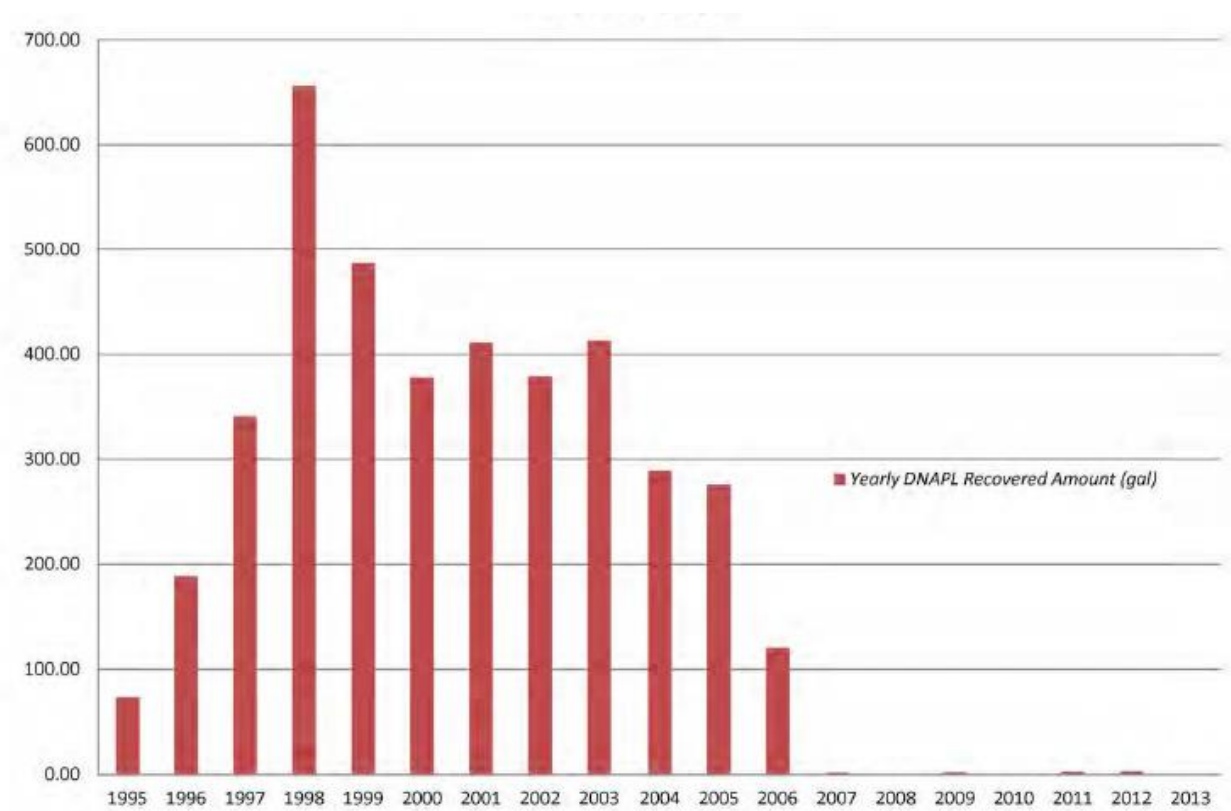
Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure C-2: 2014 Benzene and Naphthalene Isoconcentration Contours, Shallow and Intermediate Zones



Source: 2014 ROD Amendment No. 2.

Figure C-3: Yearly DNAPL Recovered Over Time



Source: 2014 ROD Amendment No. 2.

APPENDIX D – PRESS NOTICE

English Version

**South Cavalcade Street Superfund Site
Public Notice
U. S. Environmental Protection Agency, Region 6**

November 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 South Cavalcade Street Superfund site (Site) in Houston, Texas. A former wood-treating plant operated on site from 1910 to 1962. A coal tar distillation plant also operated on site from 1944 to 1962.

The soil remedy included soil flushing and washing. After a pilot study demonstrated that the remedy would not reduce contaminants to meet cleanup goals, EPA updated the remedy to include a reinforced concrete cap.

The groundwater remedy involved extracting the ground water and treating it on-site. After additional investigations, in 2014 EPA modified the remedy to establish Technical Impracticability (TI) Zones for the groundwater contaminated areas. Monitoring of the groundwater is continuing in these areas to ensure the groundwater contamination remains stable and is not migrating outside the TI Zone.

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 August 2017.

For more information about the Site, contact:

Raji Josiam/Remedial Project Manager

(214) 665-8529

or 1-800-533-3508 (toll-free) or by email at josiam.raji@epa.gov

Community members can stop by to get more information about the Fourth Five Year Review process for the Site at an **Open House to be held by the EPA on November 15th at:**

Carnegie Neighborhood Library

1050 Quitman Street

Houston, Texas 77009

832-393-1720

6:30 pm – 8:00 pm

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

Houston Central Library

500 McKinney Street

Houston, Texas 77002

832-393-1662

Site status updates are available on the Internet at
<https://www.epa.gov/superfund/south-cavalcade>

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

Bill Little/Community Involvement Coordinator
(214) 665-8131

or 1-800-533-3508 (toll-free) or by email at little.bill@epa.gov

LEGAL NOTICE

Spanish Version

Sitio Superfund Calle Cavalcade Sur
Aviso Público
Región 6 de la Agencia de Protección Ambiental de los Estados Unidos
Noviembre 2016

La Región 6 de la Agencia de Protección Ambiental (EPA, por sus siglas en inglés) llevará a cabo la cuarta revisión de cinco años de la implementación y rendimiento del plan de limpieza del sitio Superfund (sitio) Calle Cavalcade Sur en Houston, Texas. Una antigua planta de tratamiento de madera operó en el sitio de 1910 a 1962. Una planta de destilación de alquitrán de hulla también operó en el sitio entre 1944 y 1962.

El remedio del suelo incluyó el enjuague y lavado del suelo. Después de que un estudio piloto demostró que el remedio no reduciría los contaminantes lo suficiente para cumplir con los objetivos de limpieza, la EPA actualizó el remedio para incluir una tapa de hormigón armado.

El remedio de las aguas subterráneas involucra la extracción de las aguas subterráneas y su tratamiento en el sitio. En 2014, luego de realizar investigaciones adicionales, la EPA modificó el remedio para establecer zonas de impracticabilidad técnica (TI, por sus siglas en inglés) de las áreas de aguas subterráneas contaminadas. El monitoreo de las aguas subterráneas continúa en estas áreas para asegurar que el nivel de contaminación de aguas subterráneas se mantenga estable y que la contaminación no migre fuera de la Zonas de TI.

La revisión de cinco años determinará si la limpieza, tal como se ha implementado hasta la fecha, protege la salud humana y el medio ambiente. Está programado para completarse en agosto 2017.

Para obtener más información sobre el sitio, contacte a:
Raji Josiam/Gerente de Proyecto de Limpieza
(214) 665-8529
o 1-800-533-3508 (número gratuito) o por correo electrónico a
josiam.raji@epa.gov

Los miembros de la comunidad pueden pasar a recibir más información sobre el proceso de la cuarta revisión de cinco años en una **Casa Abierta** organizada por la EPA el 15 de noviembre 15 en:

Biblioteca del Vecindario Carnegie
1050 Quitman Street
Houston, Texas 77009
832-393-1720
6:30 pm - 8:00 pm

El informe final de la revisión de cinco años se pondrá a disposición del

APPENDIX E – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST			
I. SITE INFORMATION			
Site Name: South Cavalcade Street		Date of Inspection: <u>11/15/2016</u>	
Location and Region: Houston, Texas 6		EPA ID: TXD980810386	
Agency, Office or Company Leading the Five-Year Review: <u>EPA Region 6</u>		Weather/Temperature: <u>82 F. Sunny</u>	
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 48%;"> <input checked="" type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other: _____ </div> <div style="width: 48%;"> <input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>			
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (check all that apply)			
1. O&M Site Manager <u>Mike Bollinger</u> <u>Env. Manager, Beazer East, Inc.</u> _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone: _____ Problems, suggestions <input type="checkbox"/> Report attached: _____			
2. O&M Staff _____ _____ _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone: _____ Problems/suggestions <input type="checkbox"/> 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 <u>Texas Commission on Environmental Quality (TCEQ)</u> Contact <u>Marilyn Long</u> <u>Project</u> _____ _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Manager Title Date Phone No. </div> Problems/suggestions <input checked="" type="checkbox"/> Report attached: _____ Agency <u>Harris County</u> Contact _____ Name _____ _____ _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date Phone No. </div> Problems/suggestions <input checked="" type="checkbox"/> Report attached: _____ Agency <u>City of Houston</u> Contact _____ Name _____ _____ _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date Phone No. </div> Problems/suggestions <input checked="" type="checkbox"/> Report attached: _____ Agency _____ Contact _____ Name _____ _____ _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date Phone No. </div> Problems/suggestions <input type="checkbox"/> Report attached: _____			

Agency _____ Contact _____ <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Name _____ Title _____ Date _____ Phone No. _____ </div> Problems/suggestions <input type="checkbox"/> Report attached: _____
4. Other Interviews (optional) <input checked="" type="checkbox"/> Report attached: _____
Bob Hubregsen, owner of northern parcel of the Site
III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)
1. O&M Documents <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> O&M manual</div> <div><input checked="" type="checkbox"/> Readily available</div> <div><input checked="" type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> As-built drawings</div> <div><input checked="" type="checkbox"/> Readily available</div> <div><input checked="" type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> Maintenance logs</div> <div><input checked="" type="checkbox"/> Readily available</div> <div><input checked="" type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> Remarks: _____
2. Site-Specific Health and Safety Plan <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> Contingency plan/emergency response plan</div> <div><input checked="" type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> Remarks: _____
3. O&M and OSHA Training Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> Remarks: _____
4. Permits and Service Agreements <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Air discharge permit</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Effluent discharge</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Waste disposal, POTW</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Other permits: _____</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> Remarks: <u>Effluent permit expired in 2006 when system was no longer operational.</u>
5. Gas Generation Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> Remarks: _____
6. Settlement Monument Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> Remarks: _____
7. Groundwater Monitoring Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input checked="" type="checkbox"/> Readily available</div> <div><input checked="" type="checkbox"/> Up to date</div> <div><input type="checkbox"/> N/A</div> </div> Remarks: _____
8. Leachate Extraction Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> Remarks: _____
9. Discharge Compliance Records <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Air</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div><input type="checkbox"/> Water (effluent)</div> <div><input type="checkbox"/> Readily available</div> <div><input type="checkbox"/> Up to date</div> <div><input checked="" type="checkbox"/> N/A</div> </div> Remarks: _____

10.	Daily Access/Security Logs	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A																				
Remarks: _____																								
IV. O&M COSTS																								
1.	O&M Organization <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> State in-house <input checked="" type="checkbox"/> PRP in-house <input type="checkbox"/> Federal facility in-house <input type="checkbox"/> _____ </div> <div style="width: 48%;"> <input type="checkbox"/> Contractor for state <input checked="" type="checkbox"/> Contractor for PRP <input type="checkbox"/> Contractor for Federal facility </div> </div>																							
2.	O&M Cost Records <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <input type="checkbox"/> Readily available <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate: _____ </div> <div style="width: 48%;"> <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> Unavailable <input type="checkbox"/> Breakdown attached </div> </div> <p style="text-align: center;">Total annual cost by year for review period if available</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">From: _____ Date</td> <td style="width: 25%;">To: _____ Date</td> <td style="width: 25%;">_____ Total cost</td> <td style="width: 25%; text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td>From: _____ Date</td> <td>To: _____ Date</td> <td>_____ Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td>From: _____ Date</td> <td>To: _____ Date</td> <td>_____ Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td>From: _____ Date</td> <td>To: _____ Date</td> <td>_____ Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td>From: _____ Date</td> <td>To: _____ Date</td> <td>_____ Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> </table>				From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached	From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached	From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached	From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached	From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
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From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached																					
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached																					
3.	Unanticipated or Unusually High O&M Costs during Review Period Describe costs and reasons: _____																							
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A																								
A. Fencing																								
1.	Fencing Damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks: <u>Site fully enclosed by a secured chain-link fence.</u>																							
B. Other Access Restrictions																								
1.	Signs and Other Security Measures <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks: <u>No trespassing signs were posted across the Site.</u>																							
C. Institutional Controls (ICs)																								

1.	Implementation and Enforcement	
	Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Type of monitoring (e.g., self-reporting, drive by): <u>Self-reporting</u>	
	Frequency: _____	
	Responsible party/agency: <u>PRP</u>	
	Contact _____	_____
	Name	Title
		Date
		Phone no.
	Reporting is up to date	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Reports are verified by the lead agency	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
	Other problems or suggestions: <input checked="" type="checkbox"/> Report attached (see Table 3 of the FYR)	

2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A	
	Remarks: <u>Once the TI Zone boundary is finalized, additional institutional controls will be established to ensure that groundwater use is restricted and no wells are installed within the TI waiver zone.</u>	

D. General

1.	Vandalism/Trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident	
	Remarks: _____	

2.	Land Use Changes On Site <input checked="" type="checkbox"/> N/A	
	Remarks: <u>An auto auction facility is operating on the Northern Area while trucking companies continue to operate on the Southern and Southeastern Area.</u>	

3.	Land Use Changes Off Site <input checked="" type="checkbox"/> N/A	
	Remarks: <u>A toll road being built will include installation of new manholes south of the Site.</u>	

VI. GENERAL SITE CONDITIONS

	A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
--	---	--

1.	Roads Damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A	
	Remarks: <u>Some cracking was observed across the large paved cover. However, the cracks are recaulked as part of the O&M activities.</u>	

B. Other Site Conditions

	Remarks: <u>The lessee is planning improvements to an existing structure on the northern portion of the Site to be used as a photo booth for the auto auction business.</u>	
--	---	--

VII. LANDFILL/SOIL COVERS

	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
--	---	--

A. Landfill Surface/Soil Covers

1.	Settlement (low spots) <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Settlement not evident	
	Area extent: _____	Depth: _____
	Remarks: _____	

2.	Cracks <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Cracking not evident	
----	---	--

Lengths: _____ Widths: _____ Depths: _____ Remarks: <u>Some cracking from the trucking industry and weather was observed. Routine O&M activities address the cracks by recaulking as needed.</u>		
3.	Erosion Area extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Erosion not evident Depth: _____
4.	Holes Area extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Holes not evident Depth: _____
5.	Vegetative Cover <input type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/shrubs (indicate size and locations on a diagram) Remarks: <u>Grass is present only on a portion of the Northern Area, which is enclosed within the secured area.</u>	<input checked="" type="checkbox"/> Grass <input type="checkbox"/> Cover properly established
6.	Alternative Cover (e.g., armored rock, concrete) Remarks: _____	<input checked="" type="checkbox"/> N/A
7.	Bulges Area extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Bulges not evident Height: _____
8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Ponding <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Seeps <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Soft subgrade <input type="checkbox"/> Location shown on site map Remarks: _____	<input type="checkbox"/> Wet areas/water damage not evident Area extent: _____ Area extent: <u>Ponding observed along the eastern edge of the cap and property boundary due to weeks and debris affecting stormwater runoff.</u> Area extent: _____ Area extent: _____
9.	Slope Instability <input checked="" type="checkbox"/> No evidence of slope instability Area extent: _____ Remarks: _____	<input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map
B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> 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 Remarks: _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	Bench Breached	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay

Remarks: _____			
3.	Bench Overtopped	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____			
C. Letdown Channels <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> 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)	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of settlement
Area extent: _____		Depth: _____	
Remarks: _____			
2.	Material Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of degradation
Material type: _____		Area extent: _____	
Remarks: _____			
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of erosion
Area extent: _____		Depth: _____	
Remarks: _____			
4.	Undercutting	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
Area extent: _____		Depth: _____	
Remarks: _____			
5.	Obstructions	Type: _____	<input type="checkbox"/> No obstructions
<input type="checkbox"/> Location shown on site map		Area extent: _____	
Size: _____			
Remarks: _____			
6.	Excessive Vegetative Growth		Type: _____
<input type="checkbox"/> No evidence of excessive growth			
<input type="checkbox"/> Vegetation in channels does not obstruct flow			
<input type="checkbox"/> Location shown on site map		Area extent: _____	
Remarks: _____			
D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Gas Vents	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
<input type="checkbox"/> Properly secured/locked		<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> Good condition
		<input checked="" type="checkbox"/> N/A	
Remarks: _____			
2.	Gas Monitoring Probes		
<input type="checkbox"/> Properly secured/locked		<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> Good condition
		<input checked="" type="checkbox"/> N/A	
Remarks: _____			

3.	Monitoring Wells (within surface area of landfill)	<input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A	Remarks: _____
4.	Extraction Wells Leachate	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs maintenance <input checked="" type="checkbox"/> N/A	Remarks: <u>As of 2006, the extraction wells are no longer used as part of the extraction system.</u>
5.	Settlement Monuments	<input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input checked="" type="checkbox"/> N/A	Remarks: _____
E. Gas Collection and Treatment		<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Gas Treatment Facilities	<input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance	
Remarks: _____			
2.	Gas Collection Wells, Manifolds and Piping	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance	
Remarks: _____			
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A	
Remarks: _____			
F. Cover Drainage Layer		<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Outlet Pipes Inspected	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	Remarks: _____
2.	Outlet Rock Inspected	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	Remarks: _____
G. Detention/Sedimentation Ponds		<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Siltation	Area extent: _____ Depth: _____	<input type="checkbox"/> N/A <input type="checkbox"/> Siltation not evident Remarks: _____
2.	Erosion	Area extent: _____ Depth: _____	<input type="checkbox"/> Erosion not evident Remarks: _____
3.	Outlet Works	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	Remarks: _____
4.	Dam	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	

Remarks: _____			
H. Retaining Walls <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Deformations	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
Horizontal displacement: _____		Vertical displacement: _____	
Rotational displacement: _____			
Remarks: _____			
2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
Remarks: _____			
I. Perimeter Ditches/Off-Site Discharge <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
Area extent: _____		Depth: _____	
Remarks: _____			
2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
<input type="checkbox"/> Vegetation does not impede flow			
Area extent: _____		Type: _____	
Remarks: _____			
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
Area extent: _____		Depth: _____	
Remarks: _____			
4.	Discharge Structure	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks: _____			
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
Area extent: _____		Depth: _____	
Remarks: _____			
2.	Performance Monitoring Type of monitoring: _____		
<input type="checkbox"/> Performance not monitored			
Frequency: _____		<input type="checkbox"/> Evidence of breaching	
Head differential: _____			
Remarks: _____			
IX. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Groundwater Extraction Wells, Pumps and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Pumps, Wellhead Plumbing and Electrical		
<input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A			
Remarks: <u>The groundwater extraction system has been decommissioned and no longer used.</u>			
2.	Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances		

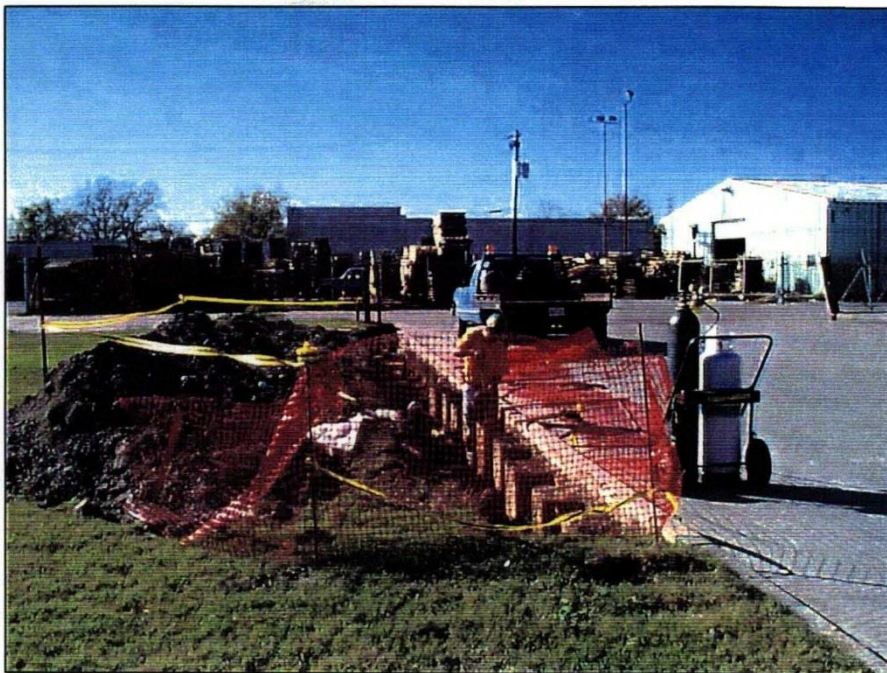
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance Remarks: <u>The groundwater extraction system has been decommissioned and no longer used.</u>
3. Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks: _____
B. Surface Water Collection Structures, Pumps and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A
1. Collection Structures, Pumps and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance Remarks: _____
2. Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance Remarks: _____
3. Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks: _____
C. Treatment System <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A
1. Treatment Train (check components that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"><input type="checkbox"/> Metals removal</div> <div style="width: 33%;"><input type="checkbox"/> Oil/water separation</div> <div style="width: 33%;"><input type="checkbox"/> Bioremediation</div> <div style="width: 33%;"><input type="checkbox"/> Air stripping</div> <div style="width: 33%;"><input type="checkbox"/> Carbon adsorbers</div> </div> <input type="checkbox"/> Filters: _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent): _____ <input type="checkbox"/> Others: _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually: _____ <input type="checkbox"/> Quantity of surface water treated annually: _____ Remarks: _____
2. Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance Remarks: _____
3. Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs maintenance Remarks: _____
4. Discharge Structure and Appurtenances

<input type="checkbox"/> N/A	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance
Remarks: _____		
5. Treatment Building(s) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks: _____		
6. Monitoring Wells (pump and treatment remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A Remarks: _____		
D. Monitoring Data		
1. Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2. Monitoring Data Suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		
E. Monitored Natural Attenuation		
1. Monitoring Wells (natural attenuation remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs maintenance <input type="checkbox"/> 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). <u>The soil remedy, a concrete cap covering two areas of contaminated soil (southeast and southwest), was constructed to serve as truck parking. It effectively provides a barrier to contaminated soils and eliminates surface infiltration to groundwater. The remedy is effective and functioning as designed.</u> <u>The groundwater extraction system and treatment plant were put into operation in September 1995 and operated until April 2006 when the system became inoperative as a result of a suspected lightning strike. The remedy was revised in 2014 to include the establishment of TI waiver zones, monitored natural attenuation, manual removal of DNAPL and institutional controls. Eight quarters of short-term monitoring was completed in November 2016 to establish the TI Zone boundary. As per the 2014 ROD Amendment No. 2, once the TI Zone boundaries are finalized, additional institutional controls will be implemented to restrict access to and use of contaminated water and prohibit the installation of groundwater wells within the designated TI Zone boundary.</u>		
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. <u>O&M procedures are in place to ensure that contaminated soils will be contained for long-term protection. The Site is fenced and secure. Once the TI waiver zone boundary is verified from the short-term groundwater monitoring, long-term monitoring will be initiated to ensure the groundwater plumes are not expanding.</u>		

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. <u>There are no indications that the soil remedy is failing. Routine maintenance of the cap addresses cracking of the cap from heavy truck traffic and weathering. The groundwater remedy is still being implemented.</u>
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>The groundwater TI waiver zone boundary is currently in the process of being verified. Once the boundary is verified, any changes will be addressed to finalize the boundary.</u>

APPENDIX F – REMEDIAL ACTION AND SITE INSPECTION PHOTOS

BEFORE – Photos from the Interim Remedial Action Report, 2000



PHOTOGRAPH 1: SOUTHWEST AREA SHEET PILING CUTTING



PHOTOGRAPH 2: STOCKPILE 12 HAULING FOR FILL



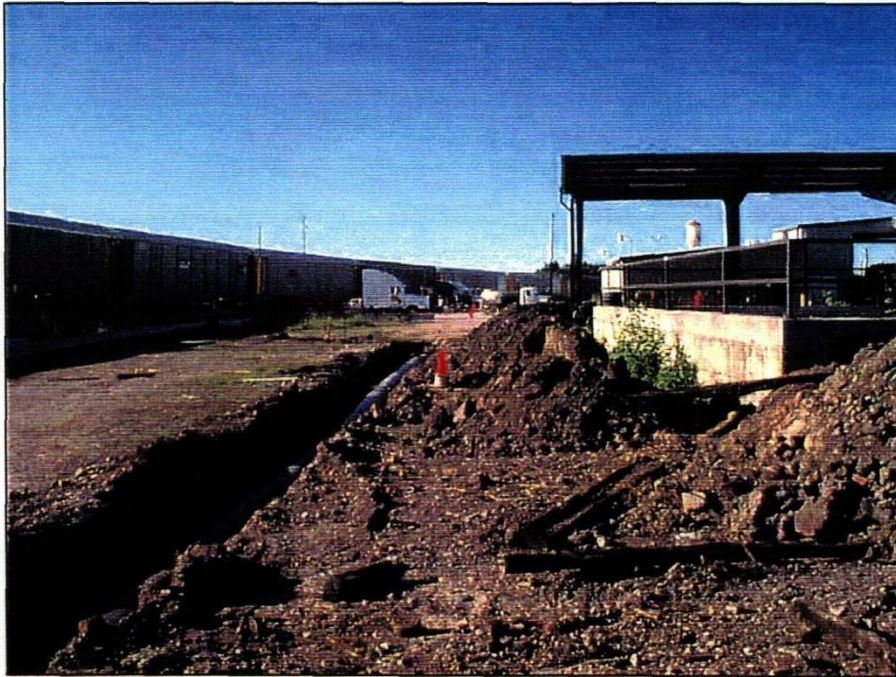
PHOTOGRAPH 3: REBAR PLACEMENT AND THICKENED
EDGE IN SOUTHWEST AREA



PHOTOGRAPH 4: CONCRETE TESTING



PHOTOGRAPH 5: CONCRETE POUR IN SOUTHEAST AREA



PHOTOGRAPH 6: STORM DRAIN INSTALLATION FROM
BASIN 4 TO DETENTION BASIN

AFTER – Site Inspection Photos, November 2016



Auto auction offices at northern end of Site



South facing view of Site, with auto auction offices at the right



South facing view of vegetated area of northern end of Site



North facing view of northern end of Site



South facing view of western fencing at northern end of Site



East facing view of northern fencing at northern end of Site



Asphalt cap at southern end of Site



North facing view of asphalt cap at eastern edge of southern end of Site



Waste Water Treatment System (dismantled in fall 2016)

APPENDIX G – 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 2014 ROD Amendment No. 2 revised the chemical-specific ARARs for the groundwater COCs at the Site as the updated MCLs specified under the Safe Drinking Water Act. In the absence of an MCL, the 2014 ROD Amendment No. 2 listed the Tier 1 residential protective concentration limits established under TCEQ’s Texas Risk Reduction Program (TRRP Tier 1 PCLs). The PCLs are health-based guidance levels and not enforceable standards. The 2014 ROD Amendment No. 2 granted a TI waiver for groundwater ARARs within the designated TI Zones. However, the short-term monitoring uses MCLs to verify the TI Zone boundaries and the long-term monitoring uses the ARARs to verify that the plumes are not expanding.

This review compared current federal MCLs to those used in the 2014 ROD Amendment No. 2 for the groundwater COCs. None of the MCLs have changed since the 2014 ROD Amendment No. 2 was published (Table G-1).

Table G-1: Previous and Current ARARs for Groundwater COCs

COC	2014 ROD Amnd. No. 2 ARAR (µg/L)	Current Federal MCL ^a (µg/L)	ARAR Change
Benzo(a)pyrene	0.2	0.2	none
Benzene	5	5	none
Ethylbenzene	700	700	none
Toluene	1,000	1,000	none
Xylene	10,000	10,000	none
Arsenic	10	10	none
Chromium (total)	100	100	none
Copper	1,300	1,300	none
Lead	15	15	none
Zinc	5000 ^b	5000 ^b	none
<p><i>Notes:</i></p> <p>a. The source for the Safe Drinking Water Act MCLs is http://water.epa.gov/drink/contaminants/index.cfm (accessed on 10/19/2016).</p> <p>b. = MCLs have not been established for this COC. The 2014 ROD Amendment No. 2 established an EPA secondary MCL as the cleanup goal.</p>			

APPENDIX H – DATA ANALYSIS SUPPORTING DOCUMENTATION

Figure H-1: Monitoring Well Network

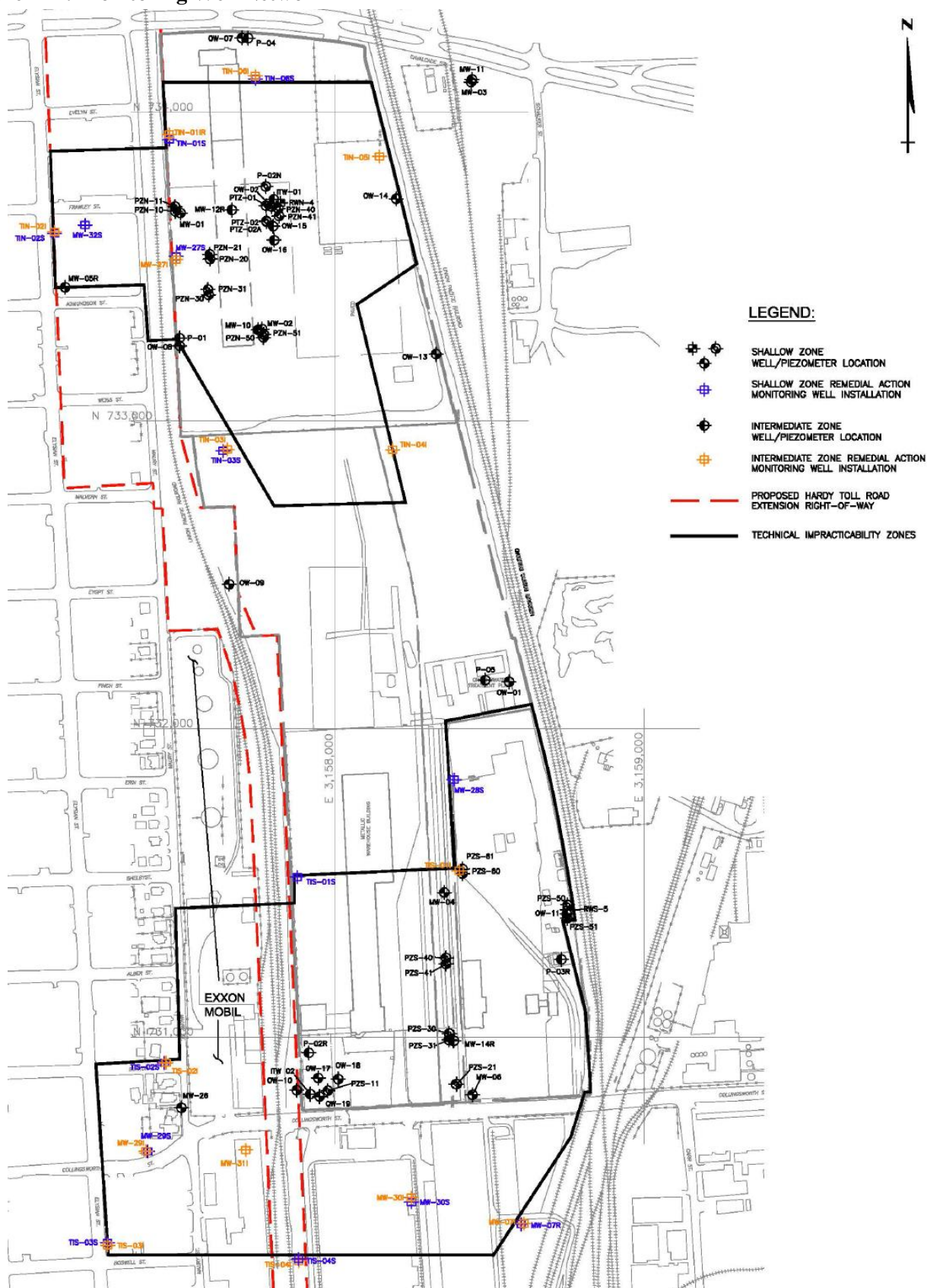


Table H-1: Summary of Arsenic Concentrations in Select Boundary Wells (µg/L)

Sample Quarter	OW-14		TIN-01S		TIN-06S	
	Dissolved	Total	Dissolved	Total	Dissolved	Total
Criterion = 10 µg/L						
1Q 2015	32	36	14	20	8.2	11
2Q 2015	24	22	22	23	13	14
3Q 2015	52	58	18	18	19	20
4Q 2015	33	40	20	20	5.3	5.4
1Q 2016	37	44	14	18	5.6	6.6
2Q 2016	54	58	19	20	14	16
3Q 2016	97	130	17	17	20	21
4Q 2016	110	120	20	19	15	16
<i>Notes:</i> a. Monitoring criterion for arsenic is the MCL of 10 µg/L. b. Bold value indicates that the result exceeds the monitoring criterion.						

Table H-2: Summary of Naphthalene Concentrations in Boundary Well OW-14

Sample Quarter	OW-14
	Criterion = 490 µg/L
1Q 2015	6,600
2Q 2015	3,000
3Q 2015	9,800
4Q 2015	6,000
1Q 2016	420
2Q 2016	9,100
3Q 2016	1,500
4Q 2016	12,000
<i>Notes:</i> a. Bold value indicates that the result exceeds the monitoring criterion.	

Tables H-3.1 to H-3.6: Analytical Results for TI Boundary Intermediate Wells in Northern Area

Table H-3.1: P-01

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	P-01 2/24/2015	P-01 6/3/2015	P-01 8/12/2015	P-01 11/10/2015	P-01 3/9/2016	P-01 5/24/2016	P-01 8/9/2016	P-01 11/15/2016
Chemical Name	Units		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Quarter	Sixth Quarter	Seventh Quarter	Eight Quarter
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Acenaphthene	ug/l	1500 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Acenaphthylene	ug/l	1500 (1)	0.3 U	0.29 U	0.31 U	0.29 U	NA*	0.29 U	0.3 U	0.29 U
Anthracene	ug/l	7300 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Benzo(a)anthracene	ug/l	1.3 (1)	0.3 U	0.29 U	0.31 U	0.29 U	NA*	0.29 U	0.3 U	0.29 U
Benzo(a)pyrene	ug/l	0.2	0.18 U	0.17 U	0.19 U	0.18 U	NA*	0.18 U	0.18 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 (1)	0.3 U	0.29 U	0.31 U	0.29 U	NA*	0.29 U	0.3 U	0.29 U
Benzo(g,h,i)perylene	ug/l	730 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Benzo(k)fluoranthene	ug/l	13 (1)	0.3 U	0.29 U	0.31 U	0.29 U	NA*	0.29 U	0.3 U	0.29 U
Chrysene	ug/l	130 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Dibenz(a,h)anthracene	ug/l	0.2 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Fluoranthene	ug/l	980 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Fluorene	ug/l	980 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Naphthalene	ug/l	490 (1)	1 U	0.97 U	2.6 U	0.98 U	NA*	0.97 U	0.99 U	0.95 U
Pentachlorophenol	ug/l	1 (1)	1 U	0.97 U	1 U	0.98 U	NA*	0.97 U	0.99 U	0.95 U
Phenanthrene	ug/l	730 (1)	0.2 U	0.19 U	0.21 U	0.2 U	NA*	0.19 U	0.2 U	0.19 U
Pyrene	ug/l	730 (1)	0.51 U	0.49 U	0.52 U	0.49 U	NA*	0.49 U	0.49 U	0.48 U
Arsenic, dissolved	ug/l	10	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	2	2.6	2.8	2.3	2.4	2.6	1.9	4.5
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Arsenic, total	ug/l	10	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium, total	ug/l	100	1.5 U	1.5 U	1.6	1.7	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1300	2.5	1.9	4.6	3.3	2.2	2.5	2.9	4
Lead, total	ug/l	15	1 U	1 U	1.2	1.1	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	10 U	10 U	11	10 U	10 U	10 U	10 U	10 U

Notes:

Detected results in bold typeface

U - result non-detect at reported concentration

ug/l - micrograms per liter

NA* - not analyzed for; damaged by delivery service

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-3.2: TIN-01I

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	TIN-01I 2/24/2015	TIN-01I 6/3/2015	TIN-01IR 8/14/2015	TIN-01IR 11/11/2015	TIN-01IR 3/10/2016	TIN-01IR 5/25/2016	TIN-01IR 8/10/2016	TIN-01IR 11/16/2016
Chemical Name	Units		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Quarter	Sixth Quarter	Seventh Quarter	Eight Quarter
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Acenaphthene	ug/l	1500 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Acenaphthylene	ug/l	1500 ⁽¹⁾	6 U	0.29 U	0.57 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U
Anthracene	ug/l	7300 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Benzo(a)anthracene	ug/l	1.3 ⁽¹⁾	6 U	0.29 U	0.57 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U
Benzo(a)pyrene	ug/l	0.2	3.6 U	0.18 U	0.34 U	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 ⁽¹⁾	6 U	0.29 U	0.57 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U
Benzo(g,h,i)perylene	ug/l	730 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Benzo(k)fluoranthene	ug/l	13 ⁽¹⁾	6 U	0.29 U	0.57 U	0.3 U	0.29 U	0.28 U	0.29 U	0.29 U
Chrysene	ug/l	130 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Dibenz(a,h)anthracene	ug/l	0.2 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Fluoranthene	ug/l	980 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Fluorene	ug/l	980 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Naphthalene	ug/l	490 ⁽¹⁾	20 U	0.98 U	11 U	0.99 U	8.1 U	0.95 U	0.96 U	0.97 U
Pentachlorophenol	ug/l	1 ⁽¹⁾	20 U	0.98 U	1.9 U	0.99 U	0.96 U	0.95 U	0.96 U	0.97 U
Phenanthrene	ug/l	730 ⁽¹⁾	4 U	0.2 U	0.38 U	0.3	0.19 U	0.19 U	0.19 U	0.19 U
Pyrene	ug/l	730 ⁽¹⁾	10 U	0.49 U	0.95 U	0.5 U	0.48 U	0.47 U	0.48 U	0.48 U
Arsenic, dissolved	ug/l	10	2.5	2.1	4.5	3.5	3.8	1.8	1.4	1.1
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	1 U	1 U	1.3	1 U	1 U	3.4	1 U	3.7
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	19
Arsenic, total	ug/l	10	2.5	2.2	4.3	3.6	4.1	2	1.4	1
Chromium, total	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1300	1 U	1 U	3.1	1.5	1.5	1.6	1.1	1 U
Lead, total	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	10 U	10 U	14	10 U	27	10 U	35	19

Notes:**Detected results in bold typeface**

U - result non-detect at reported concentration

ug/l - micrograms per liter

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-3.3: TIN-02I

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	TIN-02I 2/24/2015 First Quarter	TIN-02I 6/2/2015 Second Quarter	TIN-02I 8/13/2015 Third Quarter	TIN-02I 11/11/2015 Fourth Quarter	TIN-02I 3/9/2016 Fifth Quarter	TIN-02I 5/24/2016 Sixth Quarter	TIN-02I 8/10/2016 Seventh Quarter	TIN-02I 11/16/2016 Eight Quarter
Chemical Name	Units									
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	1 U	1	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Acenaphthene	ug/l	1500 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Acenaphthylene	ug/l	1500 ⁽¹⁾	0.3 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Anthracene	ug/l	7300 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Benzo(a)anthracene	ug/l	1.3 ⁽¹⁾	0.3 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Benzo(a)pyrene	ug/l	0.2	0.18 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 ⁽¹⁾	0.3 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Benzo(g,h,i)perylene	ug/l	730 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Benzo(k)fluoranthene	ug/l	13 ⁽¹⁾	0.3 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Chrysene	ug/l	130 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Dibenz(a,h)anthracene	ug/l	0.2 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Fluoranthene	ug/l	980 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Fluorene	ug/l	980 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Naphthalene	ug/l	490 ⁽¹⁾	1 U	0.97 U	0.95 U	0.96 U	0.95 U	0.96 U	0.96 U	2.8
Pentachlorophenol	ug/l	1 ⁽¹⁾	1 U	0.97 U	0.95 U	0.96 U	0.95 U	0.96 U	0.96 U	0.95 U
Phenanthrene	ug/l	730 ⁽¹⁾	0.2 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Pyrene	ug/l	730 ⁽¹⁾	0.51 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Arsenic, dissolved	ug/l	10	7	5.2	4.9	4.5	5	4.5	4.1	3
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Arsenic, total	ug/l	10	7.1	4.5	4.7	4.6	5.1	5.2	4.1	3.2
Chromium, total	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1300	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Lead, total	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	10 U	10 U	10 U	110	150	110	42	65

Notes:**Detected results in bold typeface**

U - result non-detect at reported concentration

ug/l - micrograms per liter

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-3.4: TIN-03I

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	TIN-03I 2/24/2015 First Quarter	TIN-03I 6/3/2015 Second Quarter	TIN-03I 8/12/2015 Third Quarter	TIN-03I 11/11/2015 Fourth Quarter	TIN-03I 3/8/2016 Fifth Quarter	TIN-03I 5/24/2016 Sixth Quarter	TIN-03I 8/9/2016 Seventh Quarter	TIN-03I 11/15/2016 Eight Quarter
Chemical Name	Units									
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	2.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Acenaphthene	ug/l	1500 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Acenaphthylene	ug/l	1500 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.28 U	0.31 U	0.28 U
Anthracene	ug/l	7300 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Benzo(a)anthracene	ug/l	1.3 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.28 U	0.31 U	0.28 U
Benzo(a)pyrene	ug/l	0.2	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.28 U	0.31 U	0.28 U
Benzo(g,h,i)perylene	ug/l	730 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Benzo(k)fluoranthene	ug/l	13 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.28 U	0.31 U	0.28 U
Chrysene	ug/l	130 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Dibenz(a,h)anthracene	ug/l	0.2 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Fluoranthene	ug/l	980 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Fluorene	ug/l	980 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Naphthalene	ug/l	490 ⁽¹⁾	0.95 U	0.96 U	1.7 U	0.96 U	0.95 U	0.95 U	1 U	0.95 U
Pentachlorophenol	ug/l	1 ⁽¹⁾	0.95 U	0.96 U	0.97 U	0.96 U	0.95 U	0.95 U	1 U	0.95 U
Phenanthrene	ug/l	730 ⁽¹⁾	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.2 U	0.19 U
Pyrene	ug/l	730 ⁽¹⁾	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.47 U	0.51 U	0.47 U
Arsenic, dissolved	ug/l	10	1.8	1.1	1.1	1 U	1 U	1 U	1 U	1 U
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	1 U	1 U	1 U	1 U	1 U	1.8	1 U	1 U
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Arsenic, total	ug/l	10	1.6	1.1	1	1 U	1 U	1 U	1 U	1 U
Chromium, total	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1300	1	1.1	1 U	1.3	1 U	1 U	1 U	1 U
Lead, total	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:**Detected results in bold typeface**

U - result non-detect at reported concentration

ug/l - micrograms per liter

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-3.5: TIN-04I

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	TIN-04I 2/26/2015 First Quarter	TIN-04I 6/4/2015 Second Quarter	TIN-04I 8/14/2015 Third Quarter	TIN-04I 11/11/2015 Fourth Quarter	TIN-04I 3/10/2016 Fifth Quarter	TIN-04I 5/25/2016 Sixth Quarter	TIN-04I 8/10/2016 Seventh Quarter	TIN-04I 11/16/2016 Eight Quarter
Chemical Name	Units									
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Acenaphthene	ug/l	1500 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Acenaphthylene	ug/l	1500 ⁽¹⁾	0.31 U	0.3 U	0.59 U	0.28 U	0.28 U	0.28 U	0.29 U	0.29 U
Anthracene	ug/l	7300 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Benzo(a)anthracene	ug/l	1.3 ⁽¹⁾	0.31 U	0.3 U	0.59 U	0.28 U	0.28 U	0.28 U	0.29 U	0.29 U
Benzo(a)pyrene	ug/l	0.2	0.18 U	0.18 U	0.35 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 ⁽¹⁾	0.31 U	0.3 U	0.59 U	0.28 U	0.28 U	0.28 U	0.29 U	0.29 U
Benzo(g,h,i)perylene	ug/l	730 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Benzo(k)fluoranthene	ug/l	13 ⁽¹⁾	0.31 U	0.3 U	0.59 U	0.28 U	0.28 U	0.28 U	0.29 U	0.29 U
Chrysene	ug/l	130 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Dibenz(a,h)anthracene	ug/l	0.2 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Fluoranthene	ug/l	980 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Fluorene	ug/l	980 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Naphthalene	ug/l	490 ⁽¹⁾	1 U	1 U	13	0.95 U	1.2 U	0.95 U	0.97 U	0.97 U
Pentachlorophenol	ug/l	1 ⁽¹⁾	1 U	1 U	2 U	0.95 U	0.95 U	0.95 U	0.97 U	0.97 U
Phenanthrene	ug/l	730 ⁽¹⁾	0.45 U	0.64	0.93	0.55	0.37	0.26	0.19 U	0.19 U
Pyrene	ug/l	730 ⁽¹⁾	0.51 U	0.5 U	0.98 U	0.47 U	0.47 U	0.47 U	0.48 U	0.49 U
Arsenic, dissolved	ug/l	10	5.2	6.3	6.4	4.2	3.3	5	2.9	1.3
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	1	1.6	5.3	1 U	1 U	2.9	1 U	1 U
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	15	10 U	10 U	10 U	10 U	40
Arsenic, total	ug/l	10	6.6	7.4	6.6	4.8	4.2	5.1	3	1.1
Chromium, total	ug/l	100	3.2	1.7	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1300	3.2	3.4	1.8	1.5	1.2	1 U	1 U	1 U
Lead, total	ug/l	15	2.1	1.3	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	13	10 U	10 U	10 U	10 U	10 U	10 U	40

Notes:**Detected results in bold typeface**

U - result non-detect at reported concentration

ug/l - micrograms per liter

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-3.6: TIN-06I

Sample Name Sample Date		Groundwater Concentration Criteria (ug/l)	TIN-06I 2/25/2015 First Quarter	TIN-06I 6/2/2015 Second Quarter	TIN-06I 8/12/2015 Third Quarter	TIN-06I 11/11/2015 Fourth Quarter	TIN-06I 3/8/2016 Fifth Quarter	TIN-06I 5/25/2016 Sixth Quarter	TIN-06I 8/10/2016 Seventh Quarter	TIN-06I 11/16/2016 Eight Quarter
Chemical Name	Units									
Benzene	ug/l	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	ug/l	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/l	1000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene	ug/l	10000	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	98 ⁽¹⁾	0.49 U	0.89 U	0.48 U	0.49 U	0.54 U	0.77 U	0.47 U	0.47 U
Acenaphthene	ug/l	1500 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Acenaphthylene	ug/l	1500 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.33 U	0.29 U	0.28 U	0.28 U
Anthracene	ug/l	7300 ⁽¹⁾	0.45 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Benzo(a)anthracene	ug/l	1.3 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.33 U	0.29 U	0.28 U	0.28 U
Benzo(a)pyrene	ug/l	0.2	0.18 U	0.17 U	0.17 U	0.18 U	0.2 U	0.17 U	0.17 U	0.17 U
Benzo(b)fluoranthene	ug/l	1.3 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.33 U	0.29 U	0.28 U	0.28 U
Benzo(g,h,i)perylene	ug/l	730 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Benzo(k)fluoranthene	ug/l	13 ⁽¹⁾	0.29 U	0.29 U	0.29 U	0.29 U	0.33 U	0.29 U	0.28 U	0.28 U
Chrysene	ug/l	130 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Dibenz(a,h)anthracene	ug/l	0.2 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Fluoranthene	ug/l	980 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Fluorene	ug/l	980 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Indeno(1,2,3-cd)pyrene	ug/l	1.3 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Naphthalene	ug/l	490 ⁽¹⁾	7.4 U	24 U	3.3 U	0.98 U	1.1 U	6 U	0.95 U	0.95 U
Pentachlorophenol	ug/l	1 ⁽¹⁾	0.98 U	0.95 U	0.96 U	0.98 U	1.1 U	0.96 U	0.95 U	0.95 U
Phenanthrene	ug/l	730 ⁽¹⁾	0.2 U	0.19 U	0.8	0.2 U	0.22 U	0.47	0.19 U	0.19 U
Pyrene	ug/l	730 ⁽¹⁾	0.49 U	0.48 U	0.48 U	0.49 U	0.54 U	0.48 U	0.47 U	0.47 U
Arsenic, dissolved	ug/l	10	10	7.4	5.2	4.4	1 U	1.1	1 U	1.3
Chromium, dissolved	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5	1.5 U	1.5 U
Copper, dissolved	ug/l	1300	1 U	1 U	1 U	1 U	1 U	3.1	1 U	1 U
Lead, dissolved	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	5000	10 U	10 U	10 U	10 U	13	45	23	25
Arsenic, total	ug/l	10	9.6	7.1	5.6	4.9	1.1	1.2	1 U	1.1
Chromium, total	ug/l	100	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.6	1.5 U	1.5 U
Copper, total	ug/l	1300	1 U	1 U	1 U	1 U	1.8	1.1	1 U	2.1 U
Lead, total	ug/l	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, total	ug/l	5000	10 U	10 U	10 U	10 U	110	52	50	47

Notes:**Detected results in bold typeface**

U - result non-detect at reported concentration

ug/l - micrograms per liter

(1) - Texas Risk Reduction Program Tier 1 Residential Groundwater

Protective Concentration Limits; all other groundwater concentration criteria are U.S. EPA MCLs specified in ROD Amendment #2

Table H-4: Analytical Results for P-05 Monitoring Well

Sample Name Sample Date		P-05 2/27/2015	P-05 6/3/2015	P-05 8/12/2015	P-05 11/11/2015	P-05 3/9/2016	P-05 5/25/2016	P-05 8/10/2016	P-05 11/16/2016
Chemical Name	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Fifth Quarter	Sixth Quarter	Seventh Quarter	Eight Quarter
Benzene	ug/l	200	260	25	220	24	5 U	40 U	390
Ethylbenzene	ug/l	81	98	17	73	17	5 U	40 U	98
Toluene	ug/l	20	25	5 U	19	5 U	5 U	40 U	40 U
Xylene	ug/l	180	190	37	160	42	10 U	80 U	200
2-Methylnaphthalene	ug/l	1100	2500 U	260 U	550	380 E	9.5 U	9.6 U	460
Acenaphthene	ug/l	1600	2500 U	440	620	610	220	170	700
Acenaphthylene	ug/l	580 U	15 U	150 U	150 U	7.2 U	9.2	5.7 U	150 U
Anthracene	ug/l	970 U	140	260 U	260 U	12 U	9.5 U	13	240 U
Benzo(a)anthracene	ug/l	580 U	43	150 U	150 U	7.2 U	5.7 U	5.7 U	150 U
Benzo(a)pyrene	ug/l	350 U	21	92 U	93 U	4.3 U	3.4 U	3.4 U	87 U
Benzo(b)fluoranthene	ug/l	580 U	32	150 U	150 U	7.2 U	5.7 U	5.7 U	150 U
Benzo(g,h,i)perylene	ug/l	970 U	25 U	260 U	260 U	12 U	9.5 U	9.6 U	240 U
Benzo(k)fluoranthene	ug/l	580 U	15 U	150 U	150 U	7.2 U	5.7 U	5.7 U	150 U
Chrysene	ug/l	970 U	55	260 U	260 U	12 U	9.5 U	9.6 U	240 U
Dibenz(a,h)anthracene	ug/l	970 U	25 U	260 U	260 U	12 U	9.5 U	9.6 U	240 U
Fluoranthene	ug/l	970 U	410	260 U	260 U	55	62	48	240 U
Fluorene	ug/l	970 U	2500 U	260 U	290	240	34	86	280
Indeno(1,2,3-cd)pyrene	ug/l	970 U	25 U	260 U	260 U	12 U	9.5 U	9.6 U	240 U
Naphthalene	ug/l	18000	35000	3800	15000	4800	19 U	19 U	14000
Pentachlorophenol	ug/l	1900 U	50 U	510 U	520 U	24 U	19 U	19 U	490 U
Phenanthrene	ug/l	1400	1400	490	560	330	22	88	540
Pyrene	ug/l	970 U	240	260 U	260 U	32	36	28	240 U
Arsenic, dissolved	ug/l	8.8	7.3	2.1	8.5	2.5	1.3	1.6	8.2
Chromium, dissolved	ug/l	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1.1	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Lead, dissolved	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc, dissolved	ug/l	10 U	10 U	10 U	10 U	10 U	19	10 U	10 U
Arsenic, total	ug/l	9.2	8.5	2.3	9.2	2.6	1.5	1.7	8.1
Chromium, total	ug/l	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1.3	1.4	1.2	1.3	1	1.7	2	1.2 U
Lead, total	ug/l	1 U	1 U	1 U	1.2	1 U	1 U	1 U	1 U
Zinc, total	ug/l	10 U	10 U	10 U	10 U	10 U	42	31	19

Notes:

Detected results in bold typeface

U - result non-detect at reported concentration

E - estimated result exceeded calibration range

ug/l - micrograms per liter

Table H-5: Analytical Results for DW-02

Sample Name Sample Date		DW-02 2/24/2015	DW-02 DUP 2/24/2015	DW-02 3/8/2016
Chemical Name	Units			
Benzene	ug/l	1 U	1 U	1 U
Ethylbenzene	ug/l	1 U	1 U	1 U
Toluene	ug/l	1 U	1 U	1 U
Xylene	ug/l	2 U	2 U	2 U
2-Methylnaphthalene	ug/l	0.51 U	0.5 U	0.51 U
Acenaphthene	ug/l	0.51 U	0.5 U	0.51 U
Acenaphthylene	ug/l	0.3 U	0.3 U	0.31 U
Anthracene	ug/l	0.51 U	0.5 U	0.51 U
Benzo(a)anthracene	ug/l	0.3 U	0.3 U	0.31 U
Benzo(a)pyrene	ug/l	0.18 U	0.18 U	0.19 U
Benzo(b)fluoranthene	ug/l	0.3 U	0.3 U	0.31 U
Benzo(g,h,i)perylene	ug/l	0.51 U	0.5 U	0.51 U
Benzo(k)fluoranthene	ug/l	0.3 U	0.3 U	0.31 U
Chrysene	ug/l	0.51 U	0.5 U	0.51 U
Dibenz(a,h)anthracene	ug/l	0.51 U	0.5 U	0.51 U
Fluoranthene	ug/l	0.51 U	0.5 U	0.51 U
Fluorene	ug/l	0.51 U	0.5 U	0.51 U
Indeno(1,2,3-cd)pyrene	ug/l	0.51 U	0.5 U	0.51 U
Naphthalene	ug/l	1 U	1 U	1 U
Pentachlorophenol	ug/l	1 U	1 U	1 U
Phenanthrene	ug/l	0.2 U	0.2 U	0.21 U
Pyrene	ug/l	0.51 U	0.5 U	0.51 U
Arsenic, dissolved	ug/l	1.3	1.2	1.2
Chromium, dissolved	ug/l	1.5 U	1.5 U	1.5 U
Copper, dissolved	ug/l	1 U	1 U	1 U
Lead, dissolved	ug/l	1 U	1 U	1 U
Zinc, dissolved	ug/l	10 U	10 U	10 U
Arsenic, total	ug/l	1.2	1.5	1.2
Chromium, total	ug/l	1.5 U	1.5 U	1.5 U
Copper, total	ug/l	1 U	1 U	1 U
Lead, total	ug/l	1 U	1 U	1 U
Zinc, total	ug/l	10 U	10 U	10 U

Notes:

Detected results in bold typeface

U - result non-detect at reported concentration

ug/l - micrograms per liter

Table H-6: cPAH Results for DW-02

1995-2004

Sample Location: Sample Date:		DW-02 Mar-95	LCW-01 Mar-95	DW-02 Apr-96	LCW-01 Apr-96	DW-02 Mar-97	DW-02 Sep-99	DW-02 Mar-00	DW-02 Mar-01	DW-02 Dec-02	DW-02 Dec-03	DW-02 Dec-04
METHOD	UNIT											
Benzo(A)Pyrene	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.054 U	0.02 U	0.02 U	0.22 U	0.20 U	0.19 U	0.19 U
Benzo(A)Anthracene	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.22 U	0.20 U	0.19 U	0.19 U
Benzo(B)Fluoranthene	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.053 U	0.02 U	0.02 U	0.22 U	0.20 U	0.19 U	0.19 U
Benzo(K)Fluoranthene	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.046 U	0.02 U	0.02 U	0.22 U	0.20 U	0.19 U	0.19 U
Chrysene	UG/L	0.15 U	0.15 U	0.15 U	0.20 U	0.150 U	0.15 U	0.15 U	2.20 U	0.20 U	0.19 U	0.19 U
Dibenzo(A,H)Anthracene	UG/L	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.22 U	0.20 U	0.19 U	0.19 U
Indeno(1,2,3-CD)Pyrene	UG/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.22 U	0.20 U	0.19 U	0.19 U

2005-2016

Sample Location: Sample Date:		DW-02 Dec-05	DW-02 Dec-06	DW-02 Dec-07	DW-02 Dec-08	DW-02 Dec-09	DW-02 Dec-10	DW-02 Apr-11	DW-02 May-12	DW-02 Dec-13	DW-02 Feb-15	DW-02 Mar-16
METHOD	UNIT											
Benzo(A)Pyrene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.18 U	0.18 U
Benzo(A)Anthracene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.3 U	0.3 U
Benzo(B)Fluoranthene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.3 U	0.3 U
Benzo(K)Fluoranthene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.3 U	0.3 U
Chrysene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.51 U	0.5 U
Dibenzo(A,H)Anthracene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.51 U	0.5 U
Indeno(1,2,3-CD)Pyrene	UG/L	0.19 U	0.20 U	0.20 U	0.19 U	0.20 U	0.20 U	0.19 U	0.19 U	0.20 U	0.51 U	0.5 U

Notes:

U indicates compound was analyzed for, but not detected.

In 1998, neither well LCW-01 nor well DW-02 were sampled. In 2014, well DW-02 was not sampled.

Table H-7: Summary of DNAPL Recovered During the TI Monitoring Period

Sampling Quarter	Wells Requiring DNAPL Removal (Gallons)		Wells Exhibiting Trace or Measurable DNAPL Levels Not Requiring DNAPL Removal
	ITW-01	PZS-20	
2015			
1Q 2015	14	1	OW-02, MW-12R, P-05, OW-10, OW-11, RWS-1, RWS-2, RWS-5, ITW-02, P-02N, RWN-4, and OW-20
2Q 2015	10	0.6	OW-02, MW-12R, OW-10, OW-11, RWS-5, ITW-02, P-02N and OW-20
3Q 2015	12	Abandoned June 2015	OW-02, MW-12R, P-05, OW-10, OW-11, RWN-4, RWS-5, ITW-02 and P-02N
4Q 2015	12.5	Abandoned June 2015	OW-02, P-05, OW-10, OW-11, OW-15, OW-18, RWN-4, RWS-5, ITW-02 and P-02N
Total Gallons Removed	48.5	1.6	NA
2016			
1Q 2016	2.4	Abandoned June 2015	OW-02, P-02N, P-05, OW-10, OW-11, OW-15, OW-18, RWN-4, RWS-5 and ITW-02
2Q 2016	0	Abandoned June 2015	MW-12R, OW-02, P-02N, P-05, OW-10, OW-11, OW-15, RWN-4, RWS-5, ITW-01 and ITW-02
3Q 2016	0	Abandoned June 2015	MW-12R, OW-02, OW-10, OW-11, OW-15, P-02N, P-05, RWN-4, RWS-5, ITW-01, ITW-02 and STW-02
4Q 2016	0	Abandoned June 2015	MW-12R, OW-02, OW-10, OW-11, OW-15, P-02N, P-05, RWN-4, RWS-5, ITW-01, ITW-02 and STW-02
Total Gallons Removed	2.4		NA

APPENDIX I – RAOS AND RISK ASSESSMENT

Changes in Standards and TBCs

The chemical-specific ARARs for groundwater presented in the 2014 ROD Amendment No. 2 were reviewed and demonstrate that the most current MCLs are being used for monitoring the TI Zone boundary (Appendix G).

Changes in Risk Assessment Methods

EPA has completed an update of standard default exposure factors (EPA, 2014). Thus, many of the exposure assessment input parameters in the original risk assessment are different than values currently recommended. Overall, these changes do not have a significant impact on the conclusions of the risk assessment and do not affect the protectiveness of the remedy.

The vapor intrusion pathway was evaluated by the PRP in 2013 to address indoor air risks to workers in the tire shop located on the southeast portion of the Site. The risk assessment stated that clean groundwater prevents migration of VOCs from groundwater to indoor air in all off-site locations and also prevents migration of volatiles from groundwater to indoor air in all on-site locations except at source entry points.¹ Despite the presence of a clean layer of groundwater overlying the contaminated deeper portion of groundwater, the risk assessment conservatively modeled from OW-02, a shallow source area monitoring well exhibiting the highest concentrations of VOCs as observed in data from 1999. The results demonstrated that the cancer risks were within EPA's risk management range and below the noncancer hazard index (HI) of 1. Since the vapor intrusion evaluation relied on historical data, this FYR conducted the evaluation using the most current shallow zone well data collected in 2016. The wells exhibiting the most elevated VOCs are PZN-40 in the Northern Area and OW-17 in the Southern Area. Using the same exposure assumptions in the 2011 and 2013 risk assessments (Table I-1), the 2004 EPA version of the Johnson and Ettinger Model was run to predict the indoor air concentrations if a structure was to overlie PZN-40 in the north or OW-17 in the south. The screening-level commercial worker vapor intrusion risk evaluation demonstrates that vapor intrusion risks are within EPA's risk management range and below the noncancer hazard quotient (HQ) of 1.0 in the Northern and Southern Areas (Table I-2 and I-3, respectively).

¹ Verification of Groundwater Fate and Transport Evaluation. South Cavalcade Superfund Site, Houston, Texas. Prepared by Key Environmental, Inc. and Groundwater Insight. July 2000.

Table I-1: Vapor Intrusion Model Inputs from the 2013 Human Health Risk Assessment

Input Parameters	Symbol	Units	USEPA Default Value	Site-Specific Values Developable Area	Notes [a]
Initial Groundwater Concentration	C_g	$\mu\text{g/L}$	Site-Specific	Chemical-specific	Presented in Table 1 and 3
Geology/Hydrogeology					
Average Soil Temperature	T_s	$^{\circ}\text{C}$	10	21.1	USEPA (2004)
Depth below grade to bottom of enclosed space floor	L_f	cm	15/200	15	Slab on Grade
Depth below grade to top of water table	L_{wt}	cm	Site-Specific	305	10 feet to GW
SCS soil type directly above water table			Site-Specific		
Vadose Zone Soil Parameters					
Vadose zone SCS soil type			Site-Specific	Fill (Sand) / Sandy Clay	Site Soil Type, 76 cm / 228.8 cm
Soil Dry Bulk Density	ρ_b^A	g/cm^3	1.66 / 1.63	DV	
Soil Total Porosity	n^A	cm^3/cm^3	0.38 / 0.39	DV	
Air Filled Porosity (Intercalcs)	q_a, c_z	cm^3/cm^3	0.321 / 0.188	DV	
Soil Water-filled Porosity	q_w^A	cm^3/cm^3	0.05 / 0.20	DV	
Building Dimensions					
Enclosed Space Floor Thickness	L_{crack}	cm	10	DV	
Soil-Building Pressure Differential	P	g/cm-s^2	40	DV	
Enclosed Space Floor Length	L_b	cm	1,000	2,286	Tire shop approximately 75' long
Enclosed Space Floor Width	W_b	cm	1,000	914.4	Tire shop approximately 30' wide
Enclosed Space Height	H_b	cm	244 / 366	304.8	Assumed 10-foot ceiling
Floor-wall Seam Crack Width	w	cm	0.1	DV	
Indoor Air Exchange Rate	ER	1/hour	0.25	1	Calculated to be 9, but conservatively assumed to be 1.
Ave. Vapor Flow Rate Into Building	Q_{soil}	L/m	5	DV	

Notes:

[a] References and notes for those values different than default

cm = centimeter

$^{\circ}\text{C}$ = degrees Celsius

cm^2 = square centimeter

cm^3/cm^3 = cubic centimeters per cubic centimeter

DV = default value used as input

g/cm^3 = grams per cubic centimeter

g/cm-s^2 = grams per centimeter second squared

J&E = Johnson and Ettinger

L/m = liters per minute

$\mu\text{g/L}$ = micrograms per liter

N/A = not applicable

USEPA 2004 = United States Environmental Protection Agency. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings.

Office of Emergency and Remedial Response. February.

Table I-2: Commercial Worker Vapor Intrusion Evaluation for the Northern Area

Volatile COC	PZN-40 ^a Groundwater Concentration ($\mu\text{g/L}$)	Modeled Indoor Air Concentration ($\mu\text{g/m}^3$) ^b	Screening-Level Risk Evaluation ^c	
			Cancer Risk	Noncancer HQ
2-Methylnaphthalene	870	0.335	--	--
Benzene	13	0.0153	9.7×10^{-9}	0.0001
Ethylbenzene	54	0.059	1.2×10^{-8}	0.00001
Naphthalene	13,000	5.16	1.4×10^{-5}	0.39
Toluene	66	0.0761	--	0.000004
Xylene	180	0.205	--	0.0005

Notes:

a. Used May 2016 results; included maximum of duplicate samples.

b. Modeled using the same site-specific inputs from the 2011 and 2013 vapor intrusion risk assessments using EPA's 2004 advanced Johnson and Ettinger spreadsheet model.

c. Conducted screening using EPA's Vapor Intrusion Screening Level (VISL) calculator, available at https://www.epa.gov/sites/production/files/2016-07/visl-calculator_v_351.xlsm. Accessed December 19, 2016.

-- = cancer risk or noncancer HQ could not be calculated due to absence of toxicity value.
 $\mu\text{g/m}^3$ = micrograms per cubic meter.

Table I-3: Commercial Worker Vapor Intrusion Evaluation for the Southern Area

Volatile COC	OW-17 ^a Groundwater Concentration (µg/L)	Modeled Indoor Air Concentration (µg/m ³) ^b	Screening-Level Risk Evaluation ^c	
			Cancer Risk	Noncancer HQ
2-Methylnaphthalene	950 ^d	0.365	--	--
Benzene	1,500	1.77	1.1 x 10 ⁻⁶	0.013
Ethylbenzene	550	0.601	1.2 x 10 ⁻⁷	0.0001
Naphthalene	21,000	8.33	2.3 x 10 ⁻⁵	0.63
Toluene	2,300	2.65	--	0.0001
Xylene	1,300	1.48	--	0.0034
<p><i>Notes:</i></p> <p>a. Used May 2016 results; included maximum of duplicate samples.</p> <p>b. Modeled using the same site-specific inputs from the 2011 and 2013 vapor intrusion risk assessments using EPA's 2004 advanced Johnson and Ettinger spreadsheet model.</p> <p>c. Conducted screening using EPA's VISL calculator, available at https://www.epa.gov/sites/production/files/2016-07/visl-calculator_v_351.xlsm. Accessed December 19, 2016.</p> <p>d. Represents half the detection limit.</p> <p>-- = cancer risk or noncancer HQ could not be calculated due to absence of toxicity value.</p>				

Changes in Exposure Pathways

There have been no changes in site conditions that would suggest the presence of new exposure pathways. The northern portion of the site property was vacant during the last FYR. An auto auction business currently operates at this location. This commercial use is consistent with uses allowed on site.

Expected Progress Towards Meeting RAOs

Short-term monitoring has been completed and EPA and TCEQ are currently evaluating the data to determine if the TI Zone boundaries can be finalized for the groundwater plumes. Therefore, long-term monitoring will be reviewed over the next FYR period to determine if the remedy is progressing as expected toward meeting RAOs.

APPENDIX J – INTERVIEW FORMS

South Cavalcade Street Superfund Site Five-Year Review Interview Form

Site Name:	<u>South Cavalcade Street</u>	EPA ID No.:	<u>TXD980810386</u>	
Interviewer Name:		Affiliation:		
Subject Name:	Bob Hubregsen	Affiliation:	Owner of Northern Parcel	
Subject Contact Information:				
Time:		Date:	January 24, 2017	
Interview Location:				
Interview Format (circle one):	In Person	Phone	Mail	Other: email
Interview Category:	Property Owner			

<p>Do you give permission for the following to be included in the Five-Year Review Report and appendices, which becomes a public document (please initial) <u> RH </u></p> <p>a. Your name? Yes <u> x </u> No _____</p> <p>b. Your affiliation? Yes <u> x </u> No _____</p> <p>c. Your responses? Yes <u> x </u> No _____</p>

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

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

3. What have been the effects of the Site on the surrounding community, if any?
None.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?
None.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?
Yes. Email.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?
No.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?
None. Working with EPA and its vendors has been very positive and constructive.

South Cavalcade Superfund Site**Five-Year Review Interview Form**Site Name: South CavalcadeEPA ID No.: TXD980810386Subject Name: Marilyn Czimer LongAffiliation: TCEQDate: 01/31/2017Interview Format (circle one): In Person

Phone

Mail

Other: EmailInterview Category: State Agency

Do you give permission for the following to be included in the Five-Year Review Report and appendices, which becomes a public document (please initial) _____

a. Your name? Yes MLL No _____b. Your affiliation? Yes MLL No _____c. Your responses? Yes MLL No _____

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

In general, the project has been acceptable. The Responsible Party (RP), RP contractor, U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) have maintained good communication/coordination since the previous Five Year Review (FYR), the Proposed Plan and public meeting, Record of Decision (ROD) Amendment No. 2, and current Site tasks/phases. The RP has elected to implement Remedial Action (RA), in support of ROD Amendment No. 2, although the final Consent Decree (CD) is pending.

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

The RP is conducting groundwater sampling events in support of ROD Amendment No. 2 remedy which is to establish a Technical Impracticability (TI) Waiver Zone (TI Zone) with short-term and long-term monitoring and institutional controls. The final CD is pending.

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

To my knowledge, the TCEQ has not received any notice(s) of community concern regarding site-related environmental issues and/or remedial activities.

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

I have visited the site on numerous occasions from assisting the EPA when I provided technical assistance during a drilling program conducted by the RP (December 2014), site visits/conference calls with the EPA RPM and RP, participated with the EPA during the Proposed Plan public meeting, and attended meetings/conference calls with the EPA and the

Harris County Toll Road Authority (HCTRA). Lastly, I participated with the EPA RPM during the Fourth FYR inspection conducted on 11/15/2016.

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

To my knowledge there have not been any changes to state law(s) that might affect the protectiveness of the Site's remedy.

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

To my knowledge, the implementation of institutional controls is pending.

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

South Tract. The HCTRA, Hardy Downtown Connector, is a four toll lane, 3.6 mile roadway construction project. This project includes the relocation of a railroad line, construction of interchanges, storm sewers, stormwater detention pond (11-acre-foot) and the re-routing of utilities (gas & electricity). The Hardy Downtown Connector will parallel the South Cavalcade site along western boundary and the Collingsworth interchange project will be a four-lane overpass located along the southern boundary of the site. The Hardy Downtown Connector project has an estimated total cost of \$400 million.

North Tract. A former trucking company was located on this tract; however, an auto auction firm purchased the property, upgraded the original building to offices and installed security fencing and gates. Per our site visit during the Five-Year Review, the owners indicated that additional improvements are planned.

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

Overall, the RP has progressed with conducting groundwater monitoring and the dismantling of the former groundwater treatment plant, in support of the ROD Amendment No. 2. The final CD is pending. In addition, communication/coordination between the RP, EPA, TCEQ and HCTRA, specific to the adjacent construction in the Collingsworth area has been very good. The RP has been in close coordination with the EPA, TCEQ and HCTRA regarding the recent identification of the presence of DNAPL in the storm sewer/manholes at the Collingsworth construction area.

South Cavalcade Street Superfund Site Five-Year Review Interview Form

Site Name:	South Cavalcade Street	EPA ID No.:	TXD980810386		
Interviewer Name:		Affiliation:			
Subject Name:	(1) Withheld	Affiliation:	City of Houston		
Subject Contact Information:	900 Bagby St., 3rd Floor, Houston TX 77002				
	(1) Withheld				
Time:		Date:	6/1/17		
Interview Location:					
Interview Format (circle one):	In Person	Phone	Mail	Other:	

Interview Category: Local Government

Do you give permission for the following to be included in the Five-Year Review Report and appendices, which becomes a public document (please initial) ____ (1) Withheld

- a. Your name? Yes _____ No (1) Withheld
b. Your affiliation? Yes (1) Withheld No _____
c. Your responses? Yes (1) Withheld No _____

- Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?
Yes, to the degree that environmental issues may be considered "former." It appears that environmental issues are ongoing, actively discharging to Waters of the US and Waters in Texas, and the plume is expanding in size.
- 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?
No. The EPA website could contain additional detail about the selected remedy, evidence of effectiveness of the remedy, evidence of alleged plume stability, ongoing remedial/monitoring activities, and schedule for remedial reviews.
- Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?
As further discussed in #7, below, the creosote from the site appears to be expanding in footprint and is discharging directly into the City of Houston Municipal Separate Storm Sewer System (MS4). This appears to be the result of plume expansion due to an inadequate site remedy, which requires further remedial action.
- Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?
Under the current remedy, the site is currently violating the City's MS4 permit (NPDES TXS001201 and TPDES WQ0004685000) and the City of Houston, Texas Code of Ordinances § 47-741(a).
- Are you aware of any changes in projected land use(s) at the Site?

Yes. The Harris County Toll Road Authority is currently constructing a new, elevated section of the Hardy Toll Road over the S. Cavalcade Superfund site. I understand that footings from the new elevated highway will go through the cap on this site.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

The City of Houston did not receive this questionnaire; therefore the City requests that additional care be taken to ensure City participation in this Superfund site within its territorial jurisdiction. In addition to the City of Houston Bureau of Pollution Control & Prevention, please direct a copy of any future correspondence related to this site to:

*City of Houston Legal Department
Attn: (1) Withheld
P.O. Box 368
Houston, TX 77001-0368*

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

As indicated above, the current remedy is inadequate in maintaining plume stability and control of contaminant exposure. The plume from the S. Cavalcade Superfund site, including NAPL, is currently discharging into the City of Houston MS4 system, which flows into Little White Oak Bayou, thence to White Oak and Buffalo Bayous, and ultimately into Galveston Bay, which is a National Estuary. This discharge is clear evidence that the selected remedy is not working as intended and additional remedial measures are necessary.

(1) Withheld as per interviewee request

South Cavalcade Street Superfund Site Five-Year Review Interview Form

Site Name:	South Cavalcade Street	EPA ID No.:	TXD980810386	
Interviewer Name:		Affiliation:		
Subject Name:	(1) Withheld	Affiliation:	Harris County	
Subject Contact Information:	1019 Congress, 15th Street, Houston, Texas 77002 (1) Withheld			
Time:		Date:	6/13/2017	
Interview Location:				
Interview Format (circle one):	In Person	Phone	Mail	Other: E-mail

Interview Category: Local Government

Do you give permission for the following to be included in the Five-Year Review Report and appendices, which becomes a public document (please initial) (1) Withheld

- a. Your name? Yes _____ No (1) Withheld
b. Your affiliation? Yes (1) Withheld No _____
c. Your responses? Yes (1) Withheld No _____

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

Harris County is generally aware of the environmental issues at the South Cavalcade Street Site as the Record of Decision and five years reviews are publicly available documents. However, Harris County is concerned that there may be on-going issues at the Site that are not being address by the current soil and groundwater remedies. Based on observations made by Harris County Toll Road Authority (HCTRA) during construction near the Site and subsequent testing by the City of Houston, it appears that the Site may be actively discharging to the storm sewers and ultimately to the Waters in the State of Texas and the Waters of the United States.

Additionally, Harris County is concerned that contamination previously discharged from the Site may still be present off-Site. During construction of a nearby stormwater detention basin, HCTRA encountered black, discolored sediment within and below existing corrugated steel drainage pipes. These pipes drained the ditches along the Houston Belt & Terminal (HB&T) Passenger Main railroad. Runoff from the US EPA South Cavalcade Superfund site, American Warehouse, Ltd, Palletized Trucking, Inc. Petroleum Wholesale, L.P. plus the former onsite business, Gray Steel, would have drained through these pipes. The chemicals of concern (COC) profile for the soil samples collected along Collingsworth during manhole construction activities, within the South Cavalcade Street Superfund site southern TI Zone, was similar to the COC profile measured in the soil samples collected from immediately below the former corrugated steel pipes. While further investigation of the HCTRA construction site is on-going, Harris County is concerned that the full extent of contamination that discharged off-Site has not been fully identified or investigated.

Harris County has reviewed some of the monitoring well data collected by the PRP and noted an upward trend in the data for monitor well MW-07R. Based on this review, Harris County is concerned that the groundwater plume might not be stable or fully delineated.

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?

Harris County acknowledges that certain documents are available on-line through the EPA website. However, it can be difficult to ascertain the current status of remedial actions at the Site. Therefore, Harris County requests that the website include current activities at the Site as well as documentation regarding plume stability, on-going remedial and monitoring activities, and remedy implementation and effectiveness.

Harris County Pollution Control Services Department (HCPCSD) is a department of Harris County that has jurisdiction over environmental issues within the County. In order to keep apprised of developments at the Site, HCPCSD respectfully requests that it be copied on any approved sampling plans, work plans, sampling results or progress reports.

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

As noted herein, Harris County is concerned that there are continuing discharges from the Site.

4. Are you aware of any changes to state laws or local regulations 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?

No.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

Harris County appreciates the EPA extending the opportunity to complete this questionnaire. Moving forward, please send future correspondence to the following:

Bob Allen, Director
Harris County Pollution Control Services Department
101 S. Richey, Suite H
Pasadena, Texas 77506

John Tyler, Deputy Director, Engineering
Harris County Toll Road Authority
7704 Wilshire Place Dr. (Correct Number is 7701 as per email on 6-13-17)
Houston, Texas 77040

With a copy to:

(1) Withheld

Harris County Attorney's Office
1019 Congress, 15th Street
Houston, Texas 77002

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

As previously mentioned, Harris County is concerned that the current remedy is inadequate and that contamination from the Site may have not been fully identified. As an initial step, Harris County request that the EPA require the PRP to investigate whether the Site is the source of the contamination documented in the nearby storm sewers. Additionally, Harris County requests that EPA require the PRP to determine if historical runoff impacted off-Site properties, as may be evidenced by observations and sampling at the nearby HCTRA detention pond construction site. As to the groundwater plume, Harris County requests that the PRP conduct additional monitoring events and potentially install additional groundwater monitor wells to determine if the groundwater plume edge near monitor well MS-07R is stable and fully delineated.

(1) Withheld name as per request of interviewee