SIXTH FIVE-YEAR REVIEW REPORT FOR TAR CREEK SUPERFUND SITE OTTAWA COUNTY, OKLAHOMA

JULY 2020

Prepared by

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

SIXTH FIVE-YEAR REVIEW REPORT
TAR CREEK SUPERFUND SITE
EPA ID#: OKD980629844
OTTAWA COUNTY, OKLAHOMA

This memorandum documents the U.S. Environmental Protection Agency's performance, determinations and approval of the Tar Creek Superfund site (Site) sixth 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 sixth Five-Year Review Report.

Summary of the Sixth Five-Year Review Report

This five-year review summarizes the current status of the remedies at three of the five operable units (OUs) at the Site:

OU	Media
OU1	Surface water and groundwater
OU2	Soils at residential properties and high access areas (HAAs)[a]
OU3	Eagle-Picher Office Complex – abandoned mining chemicals
OU4	Mining waste, milling waste piles (also known as chat) and smelter waste
OU5	Sediment and surface water

Note:
a. HAAs include daycare facilities, schoolyards and other areas where children may congregate.
b. The protectiveness of OUs 3 and 5 are not being evaluated in this five-year review.

- OU1 Surface Water/groundwater: Abandoned wells that could threaten the Roubidoux aquifer are being plugged, while annual groundwater quality of Roubidoux aquifer wells continues to be monitored by the Oklahoma Department of Environmental Quality (ODEQ). Although data indicate that the two off-line public supply wells installed in the Roubidoux aquifer are impacted as a result of inadequate depth of casing or deteriorated casing, primary drinking water standards have not been exceeded in over 20 years of monitoring operational public water supply wells. With respect to surface water, the remedy at OU1 does not meet applicable or relevant and appropriate requirements (ARARs), but those ARARs were waived.

- OU2 Residential areas: Human exposures continue to be addressed by excavating contaminated soils from residential yards and high-access areas (HAAs).

- OU3 Eagle-Picher Office Complex: –This former office and laboratory facility in Cardin, Oklahoma was subject to a removal action. Removal response actions at OU3 eliminated exposure to human health and the environment through off-site disposal of containerized lab chemicals, as intended. No waste was left in place so there is no triggering action for a five-year review.

- OU4 Chat piles, fine tailings and smelter waste: Human exposure has been addressed by voluntary relocation of residents, tenants and businesses in Picher, Cardin, Hockerville, Oklahoma, and in Treece, Kansas; remediation of contaminated soil and smelter wastes; provision of rural drinking water connections; and implementation of institutional controls. ODEQ and Quapaw Nation continue to remediate soil and smelter waste found in rural residential yards, chat piles, chat bases and fine-tailing piles.

- OU5 Sediment and surface water: EPA has not yet selected a remedy for OU5 since a remedial investigation and feasibility study (RI/FS) is ongoing; therefore, OU5 is not addressed in this FYR.

Environmental Indicators

Human Exposure Status: Not under control[1]
Contaminated Groundwater Status: Insufficient data
Site-Wide Ready for Reuse: No

Actions Needed

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

- OU1 - Plug and abandon or repair identified off-line impacted potable supply wells.
- OU4 – Comply with the Off-site Rule for chat sales per the 2008 OU4 ROD. Repair the cover of the Hockerville subsidence area

Determination

- OU1 — EPA has determined that the remedy at OU1 is short-term protective of human health and the environment with respect to groundwater. With respect to surface water, ARARs have been waived under 40 CFR § 300.430(f)(1)(ii)(C)(6). Surface water will be further addressed as part of OU5.
- OU2 — EPA has determined that the remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Remedial activities completed to date at targeted residences and HAAs where EPA has been granted access have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.
- OU4 — EPA has determined that the remedy for OU4 is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Remedial activities completed to date at targeted rural residential yards, chat piles, chat bases and fine tailings where EPA has been granted access have adequately addressed all exposure pathways, including exposure pathways associated with tribal uses of natural resources, that could result in unacceptable risks in these areas. By the start of FY21, EPA will be in compliance with the Off-Site Rule requirements for chat sales as stated in the OU4 ROD.

WREN STENGER

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Wren Stenger — Date
Director, Superfund and Emergency Management Division
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[1] As of May 2019, EPA considers the Site as Human Exposure Not under Control because people may be exposed to lead in soils, chat and mill ponds. The contaminated area is vast, and it is not possible to prevent all access to the mining waste. EPA continues to implement the cleanup of contaminated source areas during which EPA routinely conducts community outreach efforts to educate people about avoiding exposure to the mining waste to significantly reduce their exposure to the contamination. In 2011, EPA completed the voluntary buyout and relocation of more than 700 residences in the former mining towns of Picher, Cardin and Hockerville. EPA is currently working with partners to address potential human health risks related to surface water and sediment exposure under OU5 which covers about 437 square miles in Oklahoma, Kansas, Missouri and nine tribal areas.

CONCURRENCES

SIXTH FIVE-YEAR REVIEW REPORT
TAR CREEK SUPERFUND SITE
EPA ID#: OKD980629844
OTTAWA COUNTY, OKLAHOMA

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for

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Practice Group Leader, Office of Regional Counsel

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Superfund Branch, Office of Regional Counsel

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ISSUES/RECOMMENDATIONS

SIXTH FIVE-YEAR REVIEW REPORT
TAR CREEK (OTTAWA COUNTY) SUPERFUND SITE
EPA ID#: OKD980629844
OTTAWA COUNTY, OKLAHOMA

OU(s): OU1	**Issue Category: Remedy Performance**			
	Issue: Through its groundwater monitoring program ODEQ identified two off-line impacted potable supply wells (Q2 and Q5) that require plugging and abandonment. In addition, ODEQ identified a third well in the town of Picher (P5) that should be repaired or plugged.			
	Recommendation: Plug and abandon the two off-line impacted potable supply wells (Q2 and Q5) and determine if well P5 should be repaired or plugged.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
No	Yes	State	EPA	8/1/2023

OU(s): OU4	**Issue Category: Remedy Performance**			
	Issue: To date, EPA has not complied with the Off-site Rule requirements for chat sales per the 2008 OU4 ROD.			
	Recommendation: Develop and implement a process for Off-site Rule compliance for chat sales.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2020

OU(s): OU4	**Issue Category: Operations and Maintenance**			
	Issue: The soil cover of the Hockerville subsidence area has settled and is damaged from the settling and use of all-terrain vehicles.			
	Recommendation: Repair the cover at the Hockerville subsidence area. EPA cooperative agreements with ODEQ and the Quapaw Nation includes repository Operations and Maintenance (O&M) activities. Evaluate whether securing the area from trespassers will help to protect the soil cover in the long-term.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
No	Yes	State	EPA	8/1/2021

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BIA	Bureau of Indian Affairs
CB	Chat Base
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
CP	Chat Pile
DOI	United States Department of the Interior
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FT	Fine-Tailings
FY	Fiscal Year
FYR	Five-Year Review
HAA	High Access Area
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Biokinetic
IRIS	Integrated Risk Information System
ITEC	Inter-Tribal Environmental Council
LICRAT	Lead Impacted Communities Relocation Assistance Trust
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
µg/dL	Micrograms per Deciliter
µg/L	Micrograms per Liter
NCP	National Contingency Plan
NPL	National Priorities List
OCHD	Ottawa County Health Department
ODEQ	Oklahoma Department of Environmental Quality
OSDH	Oklahoma State Department of Health
O&M	Operation and Maintenance
OU	Operable Unit
OWQS	Oklahoma Water Quality Standards
OWRB	Oklahoma Water Resources Board
PRP	Potentially Responsible Party
QNEO	Quapaw Nation Environmental Office
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
START	Superfund Technical Assessment and Response Team
SMCL	Secondary Maximum Contaminant Level
TRA	Treece Relocation Assistance
USACE	United States Army Corps of Engineers
UU/UE	Unlimited Use and Unrestricted Exposure

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(c), 42 United States Code ("U.S.C") § 9621(c), consistent with the National Contingency Plan (NCP) [40 Code of Federal Regulations ("CFR") § 300.430(f)(4)(ii)] and considering EPA policy.

This is the sixth FYR for the Tar Creek (Ottawa County) Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared, because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of five operable units (OUs). This FYR addresses three of the five OUs. The operable units included in this FYR are:

- OU1 Surface water/groundwater: addresses the surface water degradation by the discharge of mine water and the threat of contamination of the Roubidoux Aquifer.
- OU2 Residential areas: addresses contaminated soil in residential areas.
- OU4 Chat piles, fine tailings and smelter waste: addresses the undeveloped rural and urban areas of the Site where mine and mill residues and smelter wastes have been placed, deposited, stored, disposed of, or otherwise have come to be located as a result of mining, milling, smelting, or related operations.

The OUs not included in this FYR are:

- OU3 Eagle-Picher Office Complex: This OU is not included in this FYR because no waste was left in place following a removal action.
- OU5 Surface water and sediments: addresses sediment and surface water. This OU is not included in this FYR because a remedy has not yet been selected. A remedial investigation and feasibility study (RI/FS) is ongoing to include a human health risk assessment that evaluates tribal lifeways scenarios.

EPA remedial project manager (RPM) Casey Luckett Snyder led the FYR. Additionally, EPA RPMs Katrina Higgins-Coltrain and Amber Howard provided support. Other participants included EPA community involvement coordinator (CIC) Janetta Coats, Oklahoma Department of Environmental Quality (ODEQ) project managers Amy Brittain and Brian Stanila, Timothy Kent from the Quapaw Nation, and Eric Marsh and Claire Marcussen from EPA FYR contractor Skeo. The review began on 5/1/2019. Documents used to prepare this FYR are listed in Appendix A. Appendix B includes the site chronology.

Site Background

The Site has no clearly defined boundaries; it consists of areas in Ottawa County, Oklahoma, and Treece Kansas impacted by mining wastes. The contamination came from wastes produced by historic mining, milling and smelting, which has been discontinued. The Site is also part of the Tri-State Mining District (the District), which spans parts of Oklahoma, Kansas and Missouri (Figure 1). Beginning in the early 20th century, the district produced vast amounts of lead and zinc, mostly to support America's efforts in World War I and World War II. The mining era left a legacy of open mine shafts, mine water, large areas prone to subsidence, and large volumes of mining waste and milling wastes contaminated with lead, zinc and cadmium. After mining, the ore was processed in mills and the remaining waste was left piled as gravel-like mill tailings called "chat," or as powdery or sand-like mill tailings called fines. The chat and fines were disposed on the Site. The large piles of chat were utilized for many years as aggregate for roads, foundation materials for buildings, and as fill materials for land

use. The mining and milling waste (i.e., chat and fines) released contaminants to soil, groundwater, surface water and sediment.

Due to the size of the Site, land uses are varied. The Site includes small towns with residential, commercial and industrial areas; much of the land outside the town boundaries is agricultural. Between 2009 and 2012, residents of the four most-heavily impacted mining communities (Picher, Cardin and Hockerville, Oklahoma, and Treece, Kansas) were relocated as part of the Site's remedy. These towns remain mostly vacant. However, the Quapaw Nation has a continual presence in Picher, in the form of several governmental facilities (i.e., tribal marshals, public utilities, and construction offices).

Site groundwater contamination occurs in the Boone aquifer, which overlies the Roubidoux aquifer, the regional water supply. At the Site, the Boone aquifer is both unconfined and confined, depending on location, and is separated geologically from the deeper Roubidoux. However, studies have shown that any hydraulic connection between the two aquifers is minimal. The primary contaminant migration routes of mine water entering the Roubidoux aquifer is through unplugged abandoned wells or from supply wells dating back to the early 1900s that have faulty well casings and/or poor seals across the Boone Formation, resulting in leaking into the Roubidoux aquifer.

Tar Creek and its primary tributary Lytle Creek comprise the principal surface water drainage system within the Picher Field. Tar Creek is characterized as a small perennial stream with standing pools. The headwaters of Tar Creek are located in Cherokee County, Kansas (located north of Ottawa County on the Kansas-Oklahoma border). Tar Creek then flows southward through the Picher Field, between the towns of Picher and Cardin, to the east of Commerce and Miami, and it then flows to its confluence with the Neosho River. The Neosho River flows south into the Grand Lake O' the Cherokees. The Site is divided into five operable units (Table 1, Figure 2).

Table 1: Summary of Site OUs

OU	Media	Corresponding Geographic Area
OU1	Surface water and groundwater	No exact boundary, but generally within 40 square mile area in northern Ottawa County, Oklahoma, that includes undeveloped rural and urban areas of the Site where mining wastes (i.e., source material) are located
OU2	Soils at residential properties and High Access Areas (HAAs)[a]	Ottawa County, Oklahoma
OU3	Eagle-Picher Office Complex – abandoned mining chemicals	Former office and laboratory facility in Cardin, Oklahoma
OU4	Chat piles, fine tailings and smelter waste	Approximately 40 square mile area in northern Ottawa County, Oklahoma, that includes undeveloped rural and urban areas of the Site where mining wastes (i.e., source material) are located
OU5	Sediment and surface water	437 square mile area spanning watershed areas in parts of northern Oklahoma, southern Kansas and western Missouri
Note: [a]HAAs are high access areas, including daycare facilities, schoolyards and other areas where children may congregate.		

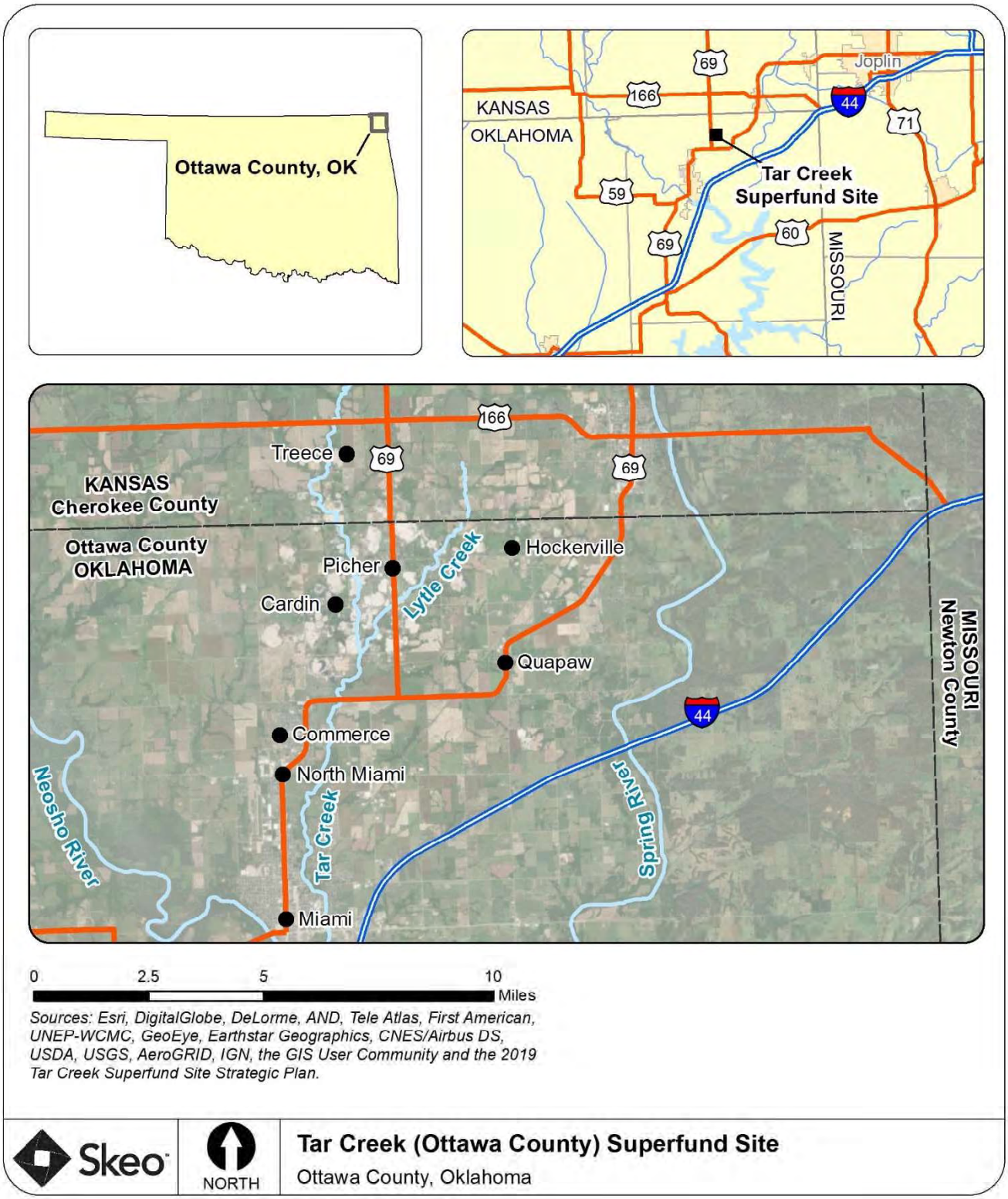
FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Tar Creek		
EPA ID: OKD980629844		
Region: 6	**State:** OK	**City/County:** Ottawa County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the Site achieved construction completion?** No

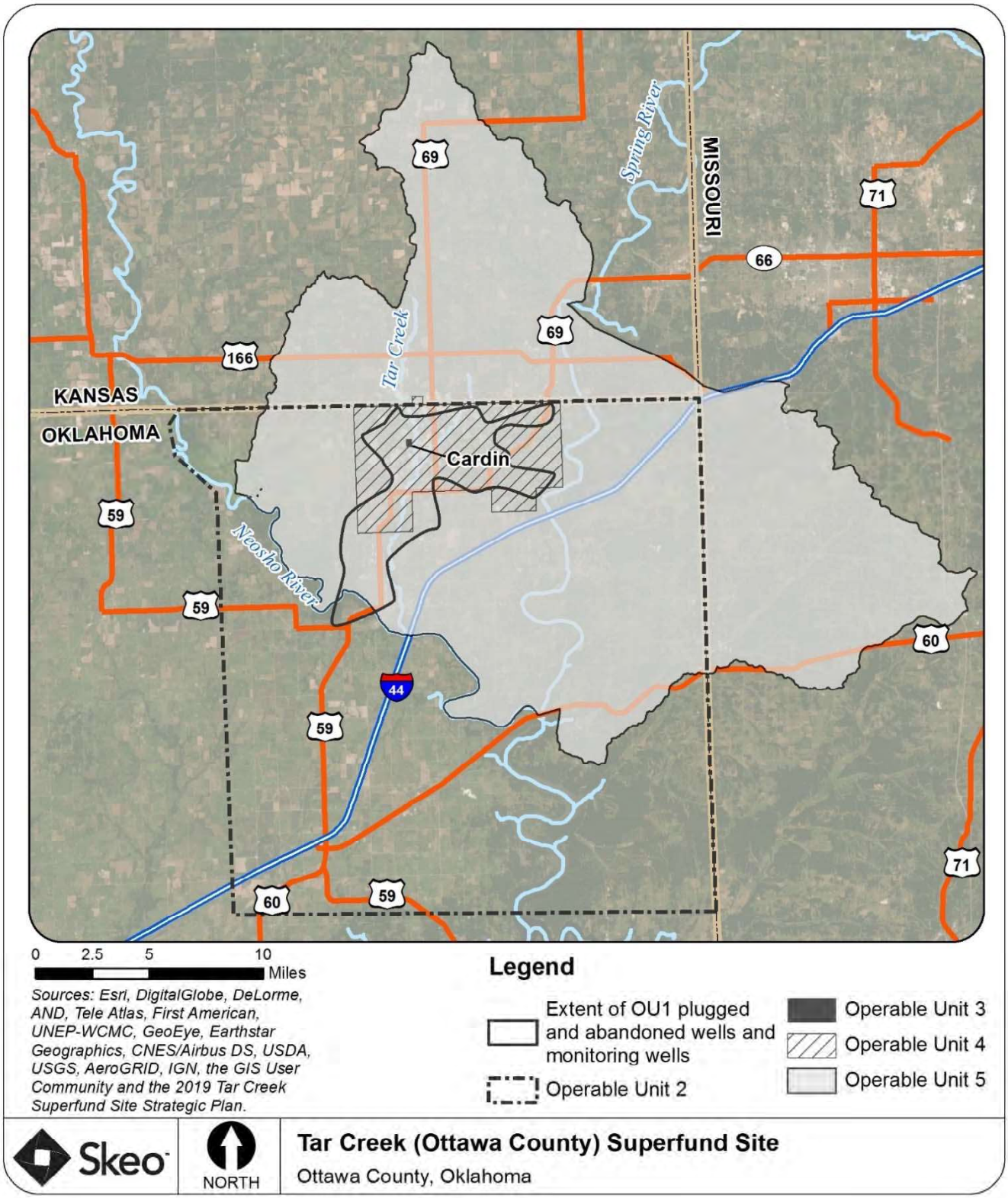
REVIEW STATUS
Lead agency: EPA
Author name: Casey Luckett Snyder, Katrina Higgins-Coltrain, Amber Howard, with additional support provided by ODEQ and Skeo. ODEQ was funded under a cooperative agreement to support certain elements of FYR development.
Author affiliation: EPA Region 6
Review period: 5/1/2019 - 5/29/2020
Date of site inspection: 6/25/2019-6/27/2019
Type of review: Statutory
Review number: 6
Triggering action date: 9/29/2015
Due date *(five years after triggering action date)*: 9/29/2020

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.

Figure 2: Site Operable Units



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.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The mines of the Picher Field that are located at the Site were completed in the Boone Aquifer. Huge pumps kept the mines dewatered until they were turned off about 1970, re-flooding the mines. Historically, the Tar Creek watershed received highly mineralized mine discharges from flooded underground lead-zinc mines of the Picher Field. Extensive lead and zinc mining took place in the Picher Field between the early 1900s and the 1970s. The Governor of Oklahoma established the Tar Creek Task Force in 1980 to evaluate the impact of mine water on the area's surface water and groundwater resources.

In December 1982, EPA proposed listing the Site on the Superfund program's National Priorities List (NPL) and finalized the Site's listing on the NPL in September 1983. The State of Oklahoma (the State) completed a remedial investigation of groundwater in 1983. It determined that discharges of mine water from the abandoned mines to surface water and possible direct migration to the underlying Roubidoux aquifer threatened human health and the environment.[2]

In 1994, the Indian Health Service in Miami, Oklahoma, notified EPA by letter of elevated blood lead levels in children routinely tested as part of their participation in the U.S. Department of Agriculture's Women, Infant, and Children program.[3] EPA recognized the need for an immediate response to address the elevated blood lead. Between August 1994 and July 1995, EPA conducted sampling of HAAs and residential areas. Based on the sampling results, EPA began a removal response action in residential areas in September 1995 which involved excavating contaminated soils, followed by backfilling with clean soils. EPA completed the remedial investigation of contaminated soil in 1997. It determined that exposure to lead contamination in residential soils could be associated with human health risks higher than the acceptable range. The primary exposure routes posing risks to public health and safety and the environment, as documented in the various Records of Decision (RODs) and removal assessment (for OU3) include:

- Potential contamination of water supply wells completed in the Roubidoux aquifer (OU1).
- Possible human direct contact with containerized chemical lab waste (OU3).
- Possible human direct dermal contact with contaminated surface water (OU1).
- Ecological impacts to Tar Creek (the stream) (OU1).
- Incidental ingestion of lead and smelter wastes in soils at residences and HAAs (OU2).
- Incidental ingestion of fine particles that are interspersed with the larger chat particles and tailings materials (OU4).

Table 2 provides a summary of contaminated media and contaminants of concern (COCs) at the Site. EPA completed an OU3 removal action in 2000 that removed all containerized chemicals from the Eagle-Picher Office Complex laboratory and disposed of them off site.

[2] The mining was conducted in the Boone aquifer, which is contaminated with hazardous substances including lead, cadmium and zinc. To reach the drinking water aquifer, the Roubidoux aquifer, wells must pass through the Boone aquifer and into the Roubidoux aquifer, which underlies the Boone aquifer.

[3] The Centers for Disease Control (CDC) considered a blood lead level greater than 10 micrograms per deciliter (µg/dL) to be a blood lead level of concern in children.

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Table 2: Site COCs, by Media

COC	Mine Surface Water and Groundwater (OU1)	Residential Soil and HAAs (OU2)	Eagle-Picher Office Complex - Abandoned Mining Chemicals (OU3)	Chat Piles, Mine and Mill Waste and Smelter Waste (OU4)
Cadmium	X			X
Iron	X			
Lead	X	X		X
Sulfate	X			
Zinc	X			X
pH	X			
Lab chemicals			X	
Notes: X = COC in the medium Blank = not a COC in the medium				

Response Actions

In April 1999, EPA determined that a short-term cleanup plan was warranted for the Eagle Picher Office Complex in Cardin, Oklahoma (OU3). In May 1999, EPA's contractor staged the drums and overpacked the laboratory jars in a secure area of the office complex. In June 1999, EPA performed inventory and sample collection, and assigned hazard categories to all drums and containers. On March 2, 2000, EPA issued an action memorandum authorizing a time-critical removal action to remove laboratory chemicals stored at the complex. EPA conducted the removal response between March 28 and May 23, 2000 and determined that no further response action was warranted for OU3.

EPA selected long-term cleanup plans for OU1, OU2 and OU4 in 1984, 1997 and 2008 RODs, respectively. In 2007, the ROD for OU2 was updated in an Explanation of Significant Differences (ESD), which formally modified the remedy to update costs and change the excavation depth. In 2012, the ROD for OU4 was updated in an ESD to add the relocation of Treece, Kansas to OU4. EPA has not yet selected a cleanup plan for OU5, since the RI/FS has not been finalized. A summary of the remedial action objectives (RAOs) and remedy components for OU1 (Table 3), OU2 (Table 4) and OU4 (Table 5) are provided below.

Table 3: OU1 Surface Water and Groundwater RAOs and Remedy Components from the 1984 ROD

Medium	RAO	Remedy Components
Groundwater	Mitigate the potential threat to public health and the environment by preventing contamination of the Roubidoux aquifer from mine water.	Plug abandoned wells completed in the Roubidoux aquifer.
		Long-term groundwater monitoring program of the Roubidoux aquifer for indicator parameters iron, sulfate and zinc to determine mine impacts as well as identify other metals.
Surface Water	Minimize the damage to Tar Creek [the stream] from mine water discharges.	Construct surface water diversion (O-3) and diking structures around two inflow areas, the abandoned Muncie and Big John mine shafts. Additional diking and surface water diversion if deemed necessary around the Admiralty mine shaft.
		Applicable or Relevant and Appropriate Requirement (ARAR) waiver invoked in the ROD to address surface water contamination in Tar Creek.[a]
		Two-year groundwater monitoring program for the Boone aquifer to evaluate the effectiveness of diversion work.
Notes: a. The States of Oklahoma and Kansas were consulted and agreed with the approved remedy. b. ARARs have been waived under 40 CFR § 300.430(f)(1)(ii)(C)(6). EPA determined that it would be cost prohibitive to institute additional engineering remedies to address environmental risks, and this cost would potentially drain the Superfund and impact EPA's ability to address other releases under CERCLA and the NCP. For a detailed discussion see the 2000 FYR report. *Source:* 1984 OU1 ROD.		

Table 4: OU2 Residential and HAA Soil RAOs and Remedy Components from 1997 ROD and modified by 2007 ESD

Medium	RAO	Remedy Components
Residential and HAA Soils	Reduce ingestion by humans, especially children, of surface soil in residential areas contaminated with lead at a concentration greater than or equal to 500 milligrams per kilogram (mg/kg).	Excavate soils in residential areas and HAAs containing lead with concentrations greater than or equal to 500 mg/kg up to a depth of 18 inches (changed to 12 inches in the 2007 ESD).
		Install a marker consisting of geotextile fabric or other suitable material if lead concentrations exceed 500 mg/kg below 12 inches in the excavations below the barrier.
		Backfill excavated areas with clean topsoil followed by new vegetation using sod or reseeding.
		Excavate hot spots (areas where chat contamination is readily observable at the surface).
		Backfill traffic areas and driveways with road base materials.
		On-site disposal of excavated materials at a permanent long-term disposal area.
		Implement measures to prevent the recontamination of residential properties, or that would reduce the potential for recontamination of residential properties. • Vegetating poorly vegetated or unvegetated areas. • Capping with soil. • Capping with base coarse material or paving. • Applying dust suppressants or other dust control measures. • Controlling drainage. • Consolidation of source materials. • Containment of source materials. • Abating lead sources to prevent releases into the environment that would re-contaminate remediated areas.
		Excavate soils at residential yards located generally outside the mining area but within Ottawa County where yard soils are at a concentration greater than or equal to 500 mg/kg of lead.
		Cover or replace chat material in alleyways, parking lots, roads, driveways and other such areas located near residences with road base materials such as gravel or crushed limestone.
		Expand the use of physical barriers (e.g., fencing and warning signs) to restrict access to mining wastes located near residences as necessary.
		Institutional controls (ICs) as deemed necessary: • Restrictions and management controls • Public health and environmental ordinances and controls. • Placing notices in property deeds. • Sampling and analysis of lead sources. • Blood lead monitoring. • Health education. • Lead-contaminated dust reduction activities.
Source: 1997 OU2 ROD and 2007 ESD *Note:* The 2007 OU2 ESD did not add any new remedy components, but increased the costs of the remedy and changed the depth of soil excavation and clarified the need for statutory reviews of the residential areas of the Site every five years.		

Table 5: OU4 Mining, Milling and Smelter Waste RAOs and Remedy Components from the 2008 ROD as modified by the 2010 ESD

Medium	RAO	Remedy Components
Source material, transition zone soil underlying source material	Prevent children and adolescents from coming in direct contact, through the ingestion and inhalation exposure pathways, with lead-contaminated source material where lead concentrations exceed 500 mg/kg. Prevent terrestrial fauna from coming in direct or indirect contact, through the ingestion exposure pathway, with cadmium-, lead- or zinc-contaminated source materials and soils where cadmium, lead and zinc concentrations exceed their respective remediation goals of 10.0 mg/kg, 500 mg/kg and 1,100 mg/kg, respectively.	• Excavate chat and chat bases from distal areas (including chat-covered haul roads and non-operating railroad grades) to the underlying native soil. • Transport and release chat to an on-site chat processor or future processing location in a previously contaminated area of the Site, inject into the mine workings, or dispose of in an on-site repository.[a] • Close the on-site repositories reaching capacity or at completion of the remedial action.[b] • Excavate smelter wastes and dispose of them in an on-site repository. Manage smelter-affected soils in the same manner as transition-zone soils. • Inject fine tailings into mine workings or cover in place, with the latter being the predominant disposal method. The covered fine tailings are being consolidated to reduce the footprint of the final cover. • Excavate transition-zone soils (soils around and underneath source materials) until remedial goals are met, followed by natural soil rebuilding • Place deed notices on land parcels where waste is left in place, including repositories and covered fine tailings ponds
	Prevent riparian biota, including waterfowl, from coming into contact, through the ingestion exposure pathway, with unacceptable concentrations of cadmium, lead and zinc in surface water and sediment by eliminating all discharges of cadmium, lead and zinc from source materials to surface water.	• Develop a baseline hydrology model to reflect existing land uses and any rainfall storage within the source materials. Use rainfall storage estimates based on this model to manage increased runoff and stream flow as remediation progresses. • Install sheet piling, berms, constructed wetlands or other engineering controls for near-stream source materials as an interim measure for the Tar, Lytle, Elm or Beaver Creek or other site waterways. • Excavate source materials and/or install a flexible membrane liner to prevent contaminant migration to surface water.
Soil	Prevent children from direct contact, through the ingestion and inhalation exposure, with lead-contaminated soil where soil lead concentrations exceed 500 mg/kg.	• Excavate rural[c] residential yard soil exceeding lead soil goal of 500 mg/kg to a maximum depth of 12 inches. • Backfill excavated areas with clean soil, contour them to promote drainage and revegetate the areas. • Voluntarily relocate residents in Picher, Cardin and Hockerville following the procedures and priorities established by the Lead Impacted Communities Relocation Assistance Trust (LICRAT). The 2010 ESD added the relocation of residents and businesses of Treece, Kansas, under the Treece Relocation Assistance Trust.
	Prevent terrestrial fauna from coming in direct or indirect contact, through the ingestion exposure pathway, with cadmium-, lead- or zinc-contaminated soils where cadmium, lead and zinc concentrations exceed their respective remediation goals of 10.0 mg/kg, 500 mg/kg and 1,100 mg/kg.	• Excavate down to underlying native soil until remedial goals are met.

Medium	RAO	Remedy Components
Groundwater	Prevent site residents from the ingestion of water from private wells that contain lead in concentrations exceeding the National Primary Drinking Water Standards.	• Provide an alternative water supply to any household where mining-related contaminants in water drawn from rural residential wells exceed 0.015 milligrams/liter (mg/L) for lead.[d] • Institutional controls to restrict future uses of groundwater from the portion of the Boone aquifer (or shallower) for potable or domestic supply that is impacted with site-related contaminants above the remediation goals.

Notes:

a. Where chat/landowners will not grant access or release the chat, they will be asked to provide a plan, including a schedule, for its final disposition consistent with the OU4 ROD. Further, chat/landowners have up to five years to sell or otherwise dispose of their chat.
b. As per the OU4 ROD, closure includes covering the repositories with a soil cover, contouring the soil cover to promote drainage and revegetating the soil cover.
c. Where rural residential properties that are not participating in the voluntary relocation program are found to have lead concentrations in yard soils that exceed 500 parts per million (ppm), the yard soil will be excavated. The soil will be excavated to a maximum depth of 12-inches, the area backfilled with clean soil, contoured to promote drainage, and revegetated. If contaminated soils are known to remain beyond the excavation depth, a warning material (typically high-visibility orange construction fencing) will be placed at the bottom of the excavation prior to backfilling. The warning material would serve to alert those conducting future earthmoving activity
d. Includes rural households in the area designated for relocation under the LICRAT relocation program, even if the household did not elect to participate in the relocation program (estimated to be two residences).

Sources: 2008 OU4 ROD and 2010 OU4 ESD.

Cleanup goals for soil were established in the OU2 and OU4 RODs (Table 6). The OU4 ROD also identified an action level for lead in groundwater; if exceeded, the remedy provided an alternative water supply. The OU1 ROD did not establish cleanup goals for mine surface water. However, the OU1 ROD required groundwater monitoring of the Roubidoux aquifer to identify mine-impacted wells. Mine-impacted wells are identified if the concentrations of three indicator contaminants (iron, sulfate and zinc) exceed established levels and background concentrations, which is discussed further in the data review.[4]

Table 6: OU2 and OU4 COC Cleanup Goals and Action Levels

COC	Soil (mg/kg)		Rural Residential Potable Well Groundwater Action Level (mg/L)
	OU2[a]	OU4[b]	
Cadmium	-	10	-
Lead	500	500	0.015[c]
Zinc	-	1,100	-

Notes:

a. OU2 cleanup goal established for the protection of human receptors.
b. OU4 cleanup goals for cadmium, lead and zinc are established for the protection of terrestrial receptors. The lead cleanup goal is also for the protection of rural residents' exposure to chat material.
c. OU4 ROD action level identified for OU4 rural residential wells to be obtained at the tap. The OU4 ROD stated that to meet the above remedial action objective, the remedy will include an alternative water source for those residences affected

Sources: Section IX of the 1984 OU2 ROD and Section 15.1 of the OU4 ROD.

Status of Implementation

This section summarizes the long-term remedial activities for OU1, OU2 and OU4, since the completion of the previous FYR in September 2015. Where necessary, some historical remediation is briefly summarized in order to evaluate remedy protectiveness. For details of remedial activities prior to September 2015, please refer to the 2015 FYR Report.

[4] The levels are National Secondary Drinking Water Standers established in the regulations.

OU1

Many of the public supply wells in the area that tap the Roubidoux aquifer date back to the early 1900s and have well casings which have inadequate depth, or they have deteriorated well casings. These inadequate or deteriorated casings can potentially be conduits for contaminant migration from the Boone aquifer.

ODEQ conducts the OU1 groundwater monitoring program, which is referred to as the Annual O&M Groundwater Monitoring. Prior to this FYR, ODEQ and its predecessor agency, in coordination with EPA, had plugged 83 abandoned wells that were completed in the deeper Roubidoux aquifer. As part of the monitoring program, ODEQ identifies, for EPA's consideration, additional wells that require closure. In addition, ODEQ inspects the diversion and dike structures to assess the integrity and functionality of the dike and diversion channel.

ODEQ plugged the Tulsa Mine Well and the Power House piezometer nest wells in January and February 2015, respectively. At that time ODEQ also recommended that two additional wells located in the town of Quapaw be plugged (Quapaw #5 (Q5) and Quapaw #2 (Q2)). The Q2 well is currently the town's backup source of drinking water, even though the quality is very poor due to mine water contamination. The town has been trying to acquire a replacement for this well and as soon as this occurs, Q2 should be plugged. The Q5 well is a deep well that was never connected to the distribution system of the town of Quapaw, due to high iron and sulfate concentrations. It is currently being used as a monitoring well. The only maintenance activity warranted at OU1 was repair of an animal burrow in the diversion structure at the Diversion Site (O-3), which was completed in July 2019. In addition, groundwater monitoring of the Roubidoux aquifer in 2018 (Figure 3) indicated that former public water supply well Picher #5 (P5), currently in use as a monitoring well, should be abandoned and plugged. P5 served as the primary public supply well for individuals remaining in the OU4 buyout area but is currently offline.

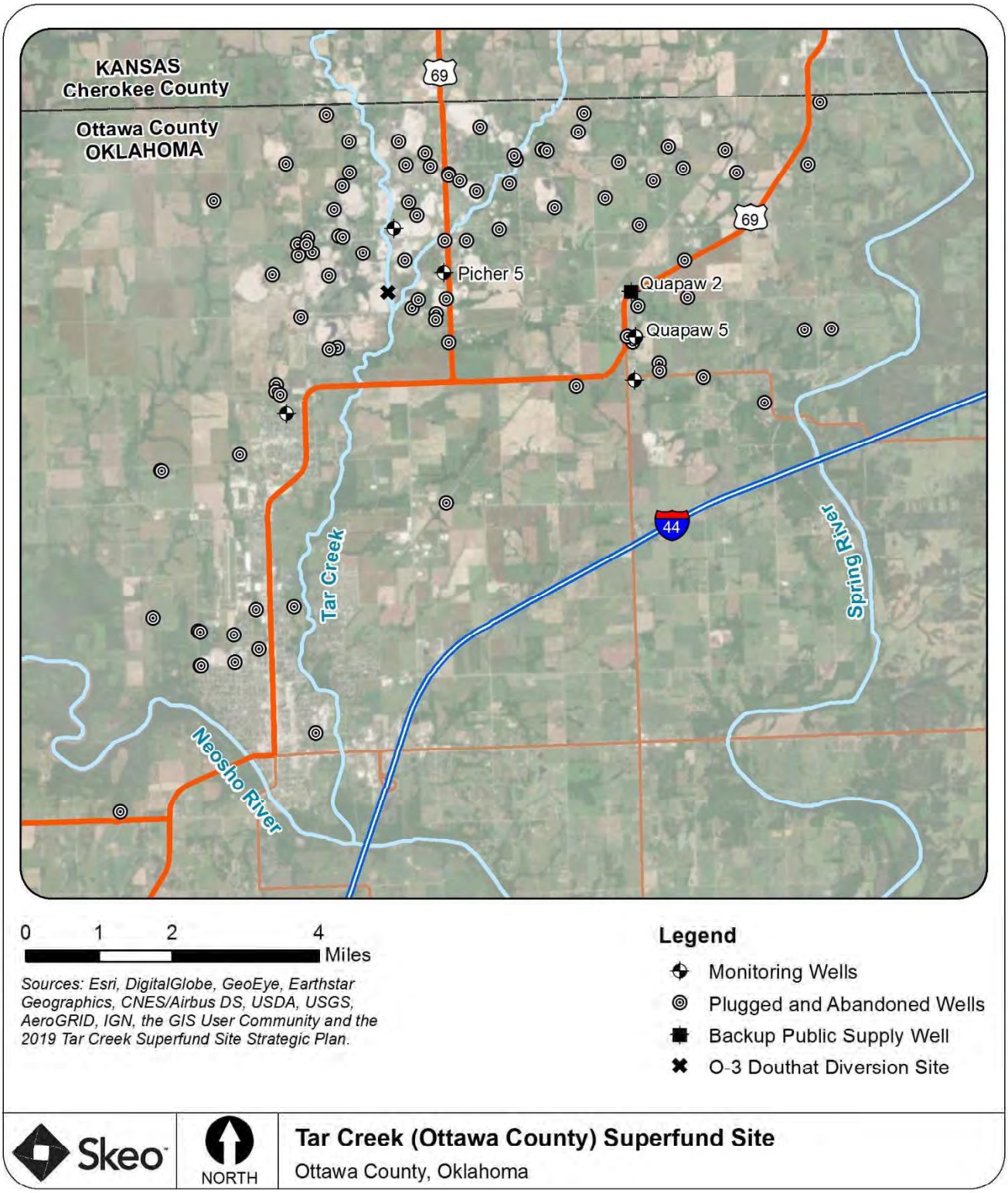
Previous FYRs (2005 and 2010) found that the fund-balancing ARAR waiver related to surface water quality in Tar Creek, as determined by the OU1 ROD and 40 CFR §300.430(f)(1)(ii)(C)(6), remained appropriate for the Site.[5] The fund-balancing ARAR waiver remains in place, because the discharges of mine water to Tar Creek has not decreased significantly since construction of the dikes and diversion channels.

The previous FYRs recommended consideration of testing the effectiveness of passive treatment systems to treat mine discharges not addressed by the OU1 O-3 diversion structure. Since 2008, independent studies, including hydrologic modeling and passive treatment pilot studies (through constructed wetlands) have since been implemented to address surface water issues at the Site. The University of Oklahoma constructed a passive treatment system in 2008, which continues to treat mine discharges at the Mayer Ranch in Commerce. According to the 2015 FYR Report, the Mayer Ranch passive treatment system had improved surface water quality in Tar Creek downstream of the treatment system by addressing about 20% of the contaminant mass loading from mine water discharges.

Based on the success, feasibility and cost effectiveness of the Mayer Ranch passive treatment system, the University of Oklahoma and ODEQ partnered and constructed an additional passive treatment system in southeast Commerce. The new system treats surface seepage, also known as upwellings, in the area of two former mining-related ponds. In 2006, the Oklahoma Conservation Commission filled ponds with chat and related debris without installing any water control. Shortly after closure of the ponds, mine drainage started appearing in several upwellings. EPA determined during the 2015 FYR that the southeast Commerce passive treatment system is operating as designed. That is, the passive treatment system is treating contaminated water at these upwellings. In July 2019, Dr. Robert Nairn from the University of Oklahoma provided a summary of the passive treatment systems at Mayer Ranch and Southeast Commerce. He indicated that the Mayer Ranch passive treatment system (operating for over 10 years) and the Southeast Commerce system (operating for about 2.5 years) have been effective in treating metals, based on the system effluent water quality results. In addition, Dr. Nairn stated that the chemical and ecological health of the common receiving stream has improved significantly, with the return of fish communities, including over a half dozen new species of fish. He also stated that the University's work to

[5] For a detailed discussion on the ARAR waiver see the 2000 FYR.

Figure 3: OU1 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.

characterize water quality and quantity in the Beaver Creek watershed and in the main stem Tar Creek watershed indicate that these discharges are amenable to passive treatment.

EPA and its remedial action partners are considering opportunities to accelerate cleanup. Such opportunities may include, for example: considering the expansion of passive treatment wetlands to treat mine discharge water.

OU2

EPA remediated nearly 3,000 residential and HAA properties from 1997 to 2014. Remedial activities included the following: 1) excavation and disposal in the on-site repository of lead contaminated soils exceeding 500 mg/kg; 2) using road base material such as gravel or crushed limestone to cover or replace chat found in alleyways, parking lots, roads, driveways and other such areas located near residences; and 3) installation of geotextile membranes at depth to alert anyone excavating that contaminated soil may be present beneath the membrane. EPA completed residential yard remediation in the towns of Afton, Fairland, Narcissa, Peoria, Miami, Wyandotte, Picher, Quapaw, North Miami, Commerce and Cardin (Figure 4).

In 2014, ODEQ became the lead agency on remedial activities in OU2. In 2015, ODEQ applied for and received funding through a Cooperative Agreement from EPA to begin state-led Remedial Design for OU2. ODEQ completed Phase 1 of the remedial design in 2016. In 2017, ODEQ applied for and received funding through a Cooperative Agreement from EPA for state-led Remedial Action. ODEQ has established a telephone hotline for Ottawa County residents to request soil sampling. ODEQ staff reviewed, visited or sampled 134 properties between August 2016 and December 2018. Based on the results of these activities, 42 properties – 25 in Miami, nine in Commerce, three in Quapaw, two in Afton – were determined to require remediation. Three properties denied remediation. ODEQ remediated these properties between October 2017 and November 2019. ODEQ's remedial activities included excavation, restoration and surveying. Several on-site repositories have been used in the past for disposal of excavated materials and were closed when they reached capacity. Currently, OU2 excavated materials are transported to the Central Mill Repository, which was constructed in 2010 and is now the primary final storage location for OU2 and OU4 waste.

OU2 actions are ongoing and will continue via EPA-funded cooperative agreements with ODEQ. In each of the upcoming fiscal years (FYs) through FY2023, ODEQ will receive funding to sample and remediate residential areas and HAAs in Ottawa County, as they are identified. EPA plans to provide ODEQ with approximately $550,000 in funding per FY to perform the necessary investigations in residential areas and HAAs with potential site contamination. The results from those investigations will determine which areas need to be cleaned up. In addition, EPA plans to provide ODEQ with approximately $600,000 in funding each fiscal year through FY2023 to perform the necessary cleanups.

OU3

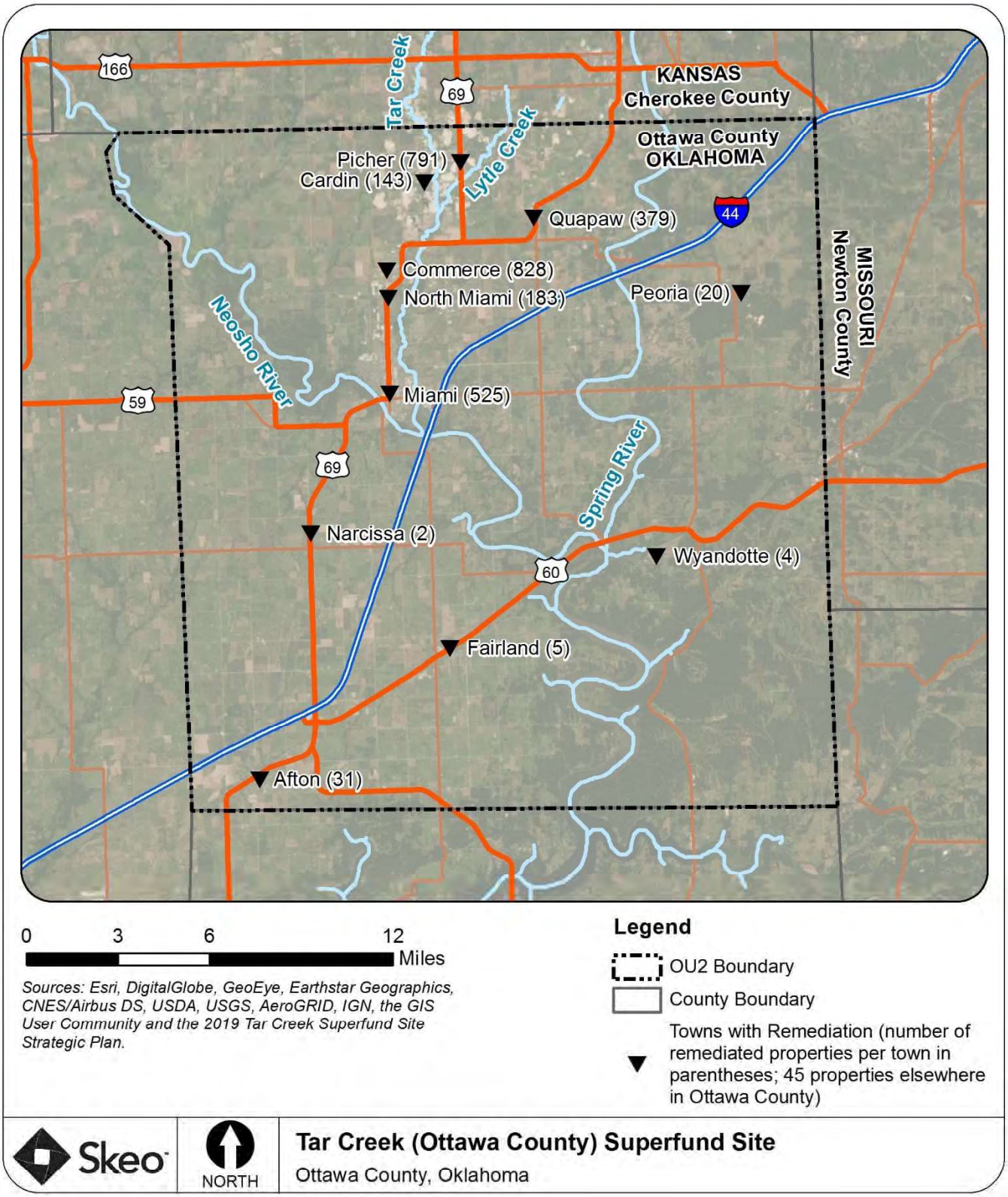
No additional remedial action is warranted at OU3 and no waste remains above levels that allow for unlimited use/unrestricted exposure; therefore, FYRs are not required for this OU. The removal actions completed in 2000 removed 120 containers of chemicals from the former office and laboratory facility at the Eagle-Picher Office Complex. The containers were disposed offsite. This OU will not be discussed further in this FYR.

OU4

OU4 addresses the undeveloped rural and urban areas of the Site where mining and mill waste and smelter wastes have been placed, deposited, stored, disposed of, or otherwise come to be located as a result of mining, milling, smelting, or related operations (Figure 5). OU4 includes rural residential yards located in Ottawa County outside of city or town limits, except for yards that were addressed under OU2.

OU4 remedial activities occurred in two phases. Phase 1 addressed voluntary relocation of residents, provided for chat sales in order to reduce the overall footprint of contamination and minimized the need for institutional controls, and O&M. Between 2009 and 2012, the occupants of 628 residences, 74 businesses and 125 rental units were relocated from contamination impacted areas in Picher, Cardin and Hockerville, Oklahoma and in Treece, Kansas. The voluntary buyout and relocation of a family residing at the former smelter site was completed in 2019.

Figure 4: OU2 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.

OU4 Phase 2 remediation is ongoing and continues to address remaining source areas, including chat bases, tailings ponds, unmarketable chat piles and bases, and the chat that remains from the consolidation of distal area chat. Chat sales are ongoing and average up to about 500,000 tons annually. As part of the OU4 ROD, a watershed-based remedial action approach is being taken to address the impacts of source material on the local watersheds and to manage increased runoff and stream flow.

Phase 2 activities address two main areas – core mining areas and distal areas (Figure 5). The core mining area includes the largest chat and fine tailings deposits, while the distal areas include smaller scale chat piles that are generally dispersed throughout the distal areas. Distal areas are also sparsely populated.

There are three distal areas: the Southeast Distal Zone, the Northeast Distal Zone and the Elm Creek Distal Zone. In each Distal Zone, contamination sources (e.g., chat piles, chat bases, and fine tailings ponds) and other features (e.g., mine shafts) are grouped into a cluster so they can generally be remediated as a unit. There are 16 distal groups.

OU4 waste is disposed in the Central Mill Repository. A repository located at 605 Road (the 605 Road Repository) was also used for OU4 waste until 2018, at which time the repository was closed.

Since the previous FYR, remediation has occurred in the Southeast Distal Zone and the Elm Creek Distal Zone, as summarized below:

- Southeast Distal Zone

    - Distal 4: Distal 4 was a group of distal contamination sources, which have now been remediated. Distal 4 remediation included three chat features (CB231, CP091 and FT063).[6] Six satellite chat areas (CP093-S1, CP093-S2, CP093-S3, CP093-S4, CP093-S5 and CP094-S1) identified during source removal activities at Distal Area Group 1 North (Distal 1 North) were also remediated. The satellite piles (chat piles that were not obvious during review of the aerial photography that took place during the remedial investigation) were designated with sequential numbers, beginning with the nearest identified chat feature. Thirteen mine shafts and ten cased borings were also identified at Distal 4 and addressed as part of the remedial activities. EPA completed the Distal 4 remedial design in 2009. The remedial action took place between August 2011 and June 2017. It included the excavation and disposal of contaminated mining waste, filling and capping of the mine shafts, closing borings according to Quapaw Nation Environmental Office (QNEO) closure procedures, confirmation sampling and site restoration. During excavation of the source material at CP091, it was discovered that the chat extended to depths of 6 to 8 feet below grade in the northern portions of CP091. EPA and ODEQ agreed that the best way to proceed was to consolidate transition-zone soils at CP091 and place them on top of the subgrade chat deposit in the area and to cap the transition-zone soil and source materials with a low-permeability cover. The excavated unmarketable source material (112,098 tons) was transported to the Central Mill Repository or used to fill mine shafts. Marketable chat was transported to a chat processor (170,008 tons). In total, about 388,652 tons of material were removed from Distal 4 and used to backfill mine shafts or consolidated under the CP091 cap area.

    - Distal 6A: Distal 6A is a group of distal contamination sources and other site features requiring remediation. Distal 6A is one chat base (CB011N), one known mine shaft, three additional mineshafts (discovered during remedial activities) and a former chat road on the east side of the area. Four rural residential yards were also remediated as part of Distal 6A, due to elevated levels of lead. EPA completed the Distal 6A remedial design in 2011. ODEQ received a cooperative agreement to conduct the remedial action in April 2014. ODEQ completed the remedial action for Distal 6A between December 2014 and August 2016. Remedial activities included the excavation of about 83,838 tons of source material, none of which was marketable (82,285 tons were hauled to the 605

[6] Chat features are abbreviated as follows: chat base (CB), chat pile (CP) and fine tailings ponds (FT). A satellite chat area is noted as (S1, S2, etc.).

Road Repository and 1,553 tons were hauled to the Central Mill Repository), filling and capping of the mine shaft, and confirmation sampling. The Distal 6A waste repository located on Road 605 was closed as part of ODEQ's remedial action.

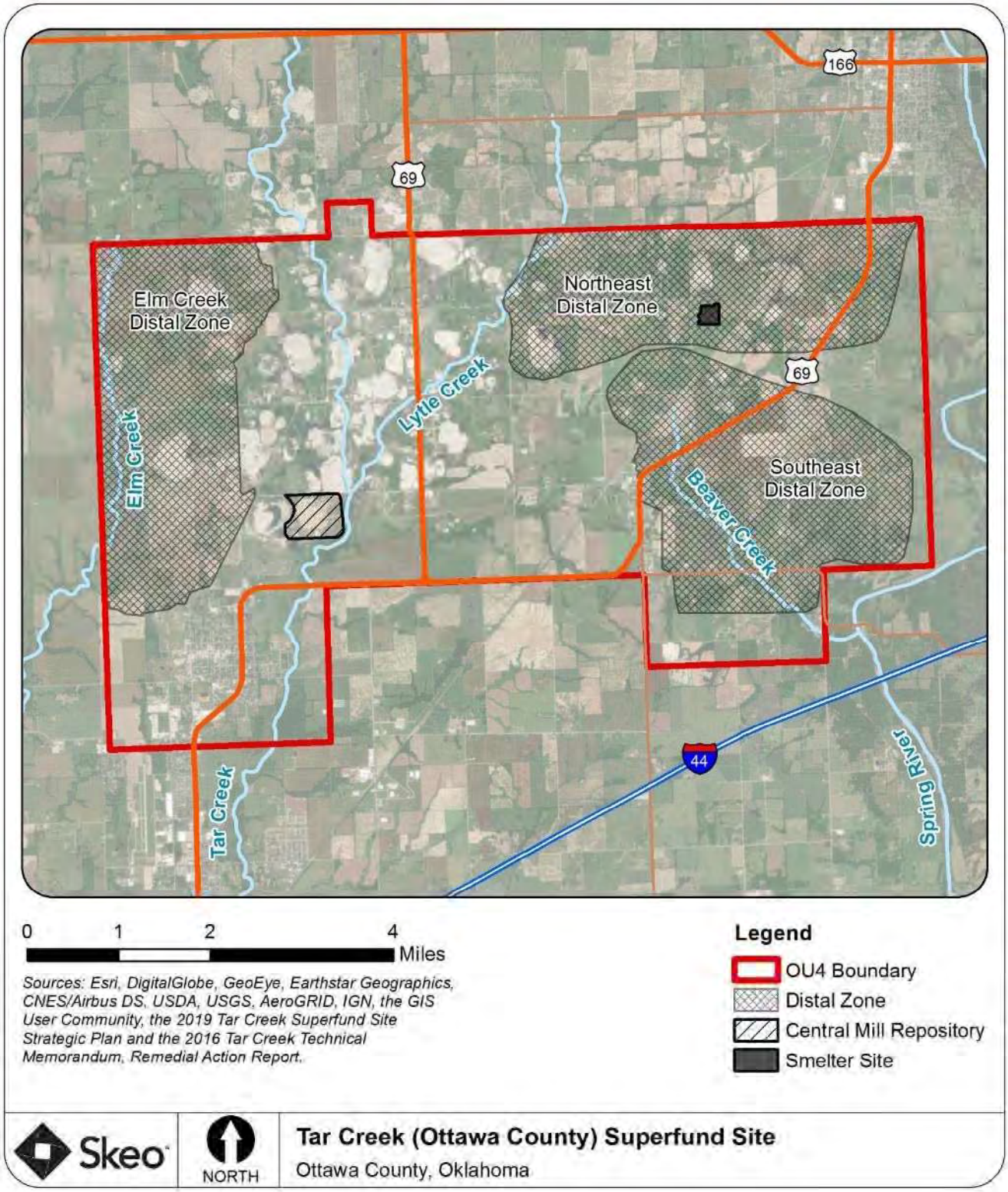
ODEQ also received funding from EPA in 2014 to support a pilot project, (1) to evaluate the use of soil amendments to reduce the bioavailability of chemicals of concern (COCs) lead (Pb), cadmium (Cd), and zinc (Zn) in transition zone (TZ) soil, and (2) to reduce the removal of contaminated soils through the use of soil amendments, as an approach to reduce bioavailability of the COCs. The pilot study was completed in June 2019, concluding that although the ecological remediation goals may be increased and remain protective, these increased concentrations may not be suitable for human health exposures. Therefore, the use of soil amendments to reduce the bioavailability of metals in soils is no longer considered and final remediation of these soil amendment pilot areas is being completed using the current OU4 ROD remediation goals for soil.

- Distal 7 North drainage feature: This 3-acre drainage feature includes six grids that were part of a larger distal area – Distal 7 North. There are no subsidence features, mine shafts or cased borings identified in this area. During initial remediation of the Distal 7 Area North in 2013 and 2014 efforts, six grids (CP101-08, 09, 10, 11, 12 and 13) were not remediated due to the presence of a drainage feature. A technical memorandum prepared and submitted to EPA Region 6, dated April 25, 2014, was used to estimate the amount of source material to be removed from the 3-acre drainage feature. QNEO conducted the remedial action between October 2015 and August 2016. It included excavation of about 3,515 tons of source material that was transported to the Central Mill Repository. None of the source material was marketable. Confirmation samples were collected, followed by soil regrading, application of soil amendments and spreading of grass seed on the areas for vegetative cover. In addition, a series of velocity-dissipation check dams were installed along the drainage feature to slow the flow of water during periodic rain events that cause the drainage feature to flow.

- Distal 8: Under a cooperative agreement, QNEO completed the remedial action at Distal 8 (also known as the Catholic 40 or CB011) between December 2013 and January 2015. This remedial action was the first tribal-led remediation at a Superfund site in the United States. It included the excavation and disposal of 107,310 tons of contaminated mining waste (one chat base), filling and capping of three mine shafts, closing of four borings according to QNEO closure procedures, confirmation sampling and site restoration. In addition, due to the sensitive historic and cultural nature of the Catholic 40 site, QNEO ensured the protection of the cultural and historical features at the area during remediation. In addition, QNEO took steps to mitigate the potential for accidental damage or removal of any historic structures or associated items.

- Beaver Creek North: The Beaver Creek North distal group included one chat pile (CP060), one railroad ballast and two known mine shafts. Under a cooperative agreement, QNEO completed the remedial action between June 2015 and April 2016. Remedial activities included the excavation of about 60,193 tons of source material, filling and capping of the mine shaft, confirmation sampling, and site restoration. Of the total 60,193 tons removed, 26,513 tons was sold as marketable and provided to a chat processor.

Figure 5: OU4 Map



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- Beaver Creek Unrestricted Tier 1: This distal group included one chat pile (CP087), three chat bases (CB008, CB213 and CB218), four satellite chat bases (CP094-S2, CP097-S1, CB011-S1 and CB216-S1) and eight mine shafts.[7] EPA completed the project design phase in 2009. Remedial action started in November 2014 and concluded in June 2018. ODEQ received a cooperative agreement for remedial action in September 2015. Remedial activities included the excavation of 108,114 tons of source material, none of which was marketable, hauling the material to the Central Mill Repository, filling and capping of the mine shaft, and confirmation sampling. Due to the historically and culturally significant structures located on the nearby tribally owned Catholic 40 property, ODEQ implemented the soil amendment pilot project, initiated in 2014 at two of the areas (CB008 and CB213). The pilot study was completed in June 2019, concluding that although the ecological remediation goals may be increased and remain protective, these increased concentrations may not be suitable for human health exposures. Therefore, the use of soil amendments to reduce the bioavailability of metals in soils is no longer considered, and final remediation of these soil amendment pilot areas is being completed using the current OU4 ROD remediation goals for soil.

- Elm Creek Distal Zone

  - Distal 13: The Distal 13 group included two chat piles (CP008 and CP009), six chat bases (CB026, CB027, CB028, CB028-S1, CB030 and CB031), one railroad ballast and 11 known mine shafts. In addition, three cased borings and two fine tailings (FT006 and FT007) were located on site. Between December 2013 and January 2015, QNEO completed the remedial action, which included the excavation of 759,937 tons of source material. Of the total 759,937 tons removed, 68,098 tons was sold as marketable and provided to a chat processor. The remaining excavated material was transported to the Central Mill Repository for disposal. Other activities included the capping of mine shafts, the closure of borings following QNEO closure procedures, confirmation sampling and site restoration. QNEO completed remediation between October 2015 and August 2018.

- Rural Residential Well Users
  The previous FYR Report noted that two rural residential wells completed in the Boone aquifer, GW2429-4 and GW2429-8, exceeded the groundwater lead action level when the wells were tested in 2009. However, the property owners of the two wells declined to provide access in 2009 for the remediation described in the OU4 ROD. In 2016, however, both property owners agreed to have the wells sampled and remediated as necessary. EPA connected both properties to a water line in August 2016. EPA recommended that the residents do not use their private wells for drinking, cooking or bathing. The wells were not plugged and abandoned. In addition, a third resident was identified in the site interviews for the previous FYR as having contaminated groundwater. The residence is located outside the OU4 boundaries and is being addressed by the Indian Health Service.

- Smelter Site: In 2011, EPA began remedial activities at a residence located on the former location of the Ottawa Smelter. At that time, however the property owner limited access to portions of the property, which resulted in certain portions of the property not being remediated. A few years later the property was sold. In 2018, a toddler residing at the property was found to have had blood lead levels exceeding 10 micrograms per deciliter. To address this immediate health threat, EPA funded a cooperative agreement to QNEO to relocate the residents, which was completed in 2019. The residents voluntarily relocated. This relocation was completed in 2019. Future remedial activities are planned to address remaining contamination at the smelter site property.

Additional remedial activities are ongoing in OU4. They include:

[7] Due to landowner access issues on the Beaver Creek Unrestricted Tier 1 project, remediation was never completed on the CB218 base. While a small amount of remediation did occur on this property, ODEQ considers this remediated area as likely contaminated due to the presence of contamination in proximity to the remediated area and the continued use of the property. Because of this, ODEQ believes CB218 should be removed from the list of Beaver Creek Unrestricted Tier 1 remediated properties in the bulleted list.

- Elm Creek Unrestricted Tier 1: This area includes remediation of chat, mine and milling waste and contaminated soil on property located about 1 mile north of Commerce, Oklahoma. Under a cooperative agreement, ODEQ began remedial activities in November 2017. As of April 2020, 915,301 tons of source material has been removed, with 167,410 tons provided to chat processors and 717,778 tons placed in the Central Mill Repository. Completion is planned for 2022.

- Distal 10-12-10b: This area includes 11 chat bases (CB017, CB018, CB018-S1, CB020, CB020-S1, CB020-S2, CB092, CB095, CB096, CB095-S1 and CB096-S1) and two fine tailings areas (FT024 and FT025). Under a cooperative agreement, QNEO began remediation in February 2017. As of April 2020, 293,552 tons of source material has been removed from Distal 10/10b and completion is expected in 2020. QNEO completed the remediation of Distal 12 in 2019, where 268,426 tons of source material has been removed. All source material has been placed in the Central Mill Repository.

- CB199: Under a cooperative agreement, QNEO is working to remediate chat, and other mine and milling waste associated with Chat Base 199. As of January 2020, 126,501 tons of source material has been removed and placed in the Central Mill Repository. Completion is planned for 2021, pending removal or encapsulation of a natural gas line at the site.

- Bird Dog: Under a cooperative agreement, QNEO is working to remediate chat, mine and milling waste associated with one chat pile (CP004), two chat bases (CB013 and CB014), and two fine tailings areas (FT001 and FT008). Field work began in November 2019, with planned completion in 2022. As of April 2020, 132,009 tons of source material has been removed, with 20,612 tons provided to chat processors and 111,397 tons placed in the Central Mill Repository.

- Marketable Chat: Under a cooperative agreement, QNEO is working to remove marketable chat from the core area and making it available to chat processors. As of April 2020, 264,834 tons of marketable chat has been provided to chat processors.

OU5

OU5 is the investigation of sediment and surface water (including mine discharge) and covers seven watersheds, about 437 square miles and 119 river miles in Oklahoma, Kansas, Missouri, and nine tribal areas. EPA Region 6 is coordinating efforts to characterize sediment and surface water throughout the lower Spring and Neosho River basins and potential risks to human and ecological health with EPA Region 7, three states (Oklahoma, Missouri and Kansas), nine tribes (Quapaw Nation, Peoria Tribe, Ottawa Tribe, Miami Tribe, Eastern Shawnee Tribe, Wyandotte Nation, Seneca-Cayuga Nation, Modoc Tribe and Cherokee Nation), and the community. EPA initiated the RI/FS in July 2015. The RI/FS studies are ongoing. After the completion of the RI/FS, EPA will select a remedy for OU5. This OU will not be discussed further in this FYR because a remedy has yet to be selected and implemented.

Institutional Control Review

The OU2 and OU4 RODs called for the use of institutional controls, while they were not required for OU1 or OU3. Table 7 provides a summary of the institutional controls in place at the Site. They include three types of controls:

- Informational controls: Includes the childhood lead poisoning prevention education programming for OU2 and fact sheets.
- Governmental controls: Includes state regulations requiring special protective well construction for wells to seal off the Boone aquifer to protect the Roubidoux aquifer, and toxic metals testing and possible treatment for Boone aquifer wells used for potable or domestic purposes.
- Proprietary controls: Includes deed notices and easements that limit how various properties, which do not support unrestricted use and unlimited exposures, can be used.

The OU2 ROD stipulated that all institutional controls may not be necessary, or that some would only be used in special circumstances as dictated by conditions encountered at a specific property during the remedial action. In addition, the OU2 ROD stated that authorities of other government entities might be required to implement some of the institutional controls (e.g., zoning restrictions would require municipal authority, lease restrictions might require United States Department of the Interior (DOI) authority). The institutional controls concerning blood lead monitoring, health education and lead-contaminated dust reduction activities are currently being implemented through agreements between EPA, ODEQ and the Oklahoma State Department of Health or as part of the OU2 remedial action; the Ottawa County Health Department (OCHD) has the lead on implementation. In addition, lead-contaminated dust reduction activities are part of ongoing community education efforts. Once remedial action activities for OU2 are completed, EPA will work with the various authorities (city, county, state and federal) to implement any additional institutional controls necessary to maintain the protectiveness of the OU2 remedy.

The OU4 ROD calls for institutional controls and O&M activities to be implemented at locations where source materials are covered in place. Locations where institutional controls and O&M activities are to be implemented under the OU4 ROD include tailing ponds that are covered, chat piles with waste in place and on-site repositories.

The OU4 ROD also required institutional controls to restrict future uses of groundwater from the Boone aquifer for potable or domestic supply that is impacted with site-related contaminants above the remedial goals. In 2017, ODEQ revised Oklahoma's Water Quality Standards (Title 785: Chapter 45, Appendix H: Beneficial Use Designations for Certain Limited Areas of Groundwater) to provide additional requirements for limiting groundwater use specifically in the Boone aquifer within the Site (Appendix C). The regulations state that "acidic conditions, mine voids, and toxic metals [lead, cadmium and arsenic exceeding maximum contaminant levels (MCLs)] may be present in the Boone aquifer. Therefore, special protective well construction is required to seal off the Boone aquifer to protect the underlying Roubidoux aquifer. For Boone aquifer wells, competent groundwater testing for toxic metals is required for potable and domestic use; and treatment may be required when groundwater exceeds the Action Level for lead (15 µg/L), the MCL for arsenic (10 µg/L), and/or the MCL for cadmium (5 µg/L)."

Since the previous FYR, two deed notices were issued: one in December 2015 on property where an open pit zinc mine (CB011N-Pit A) was filled and capped, and one in April 2018 on property where an 18-inch cover was placed over the consolidated materials at CP091. The deed notices place land use restrictions on these properties to ensure the integrity of the soil caps is not compromised (Appendix J). In addition, a conservation easement restricting land use on a remediated Indian-owned property was recorded by the Bureau of Indian Affairs (BIA) Land, Title and Records Office in December 2018. This marks the first time where BIA, in partnership with EPA and a tribal nation, has recorded land use restrictions on restricted Indian land (property held in fee with restrictions on alienation) at a Superfund site (Appendix J). In early 2019, BIA, the Quapaw Nation and EPA worked together to record conservation easements at three other properties at the Site (Appendix J). To strengthen institutional controls on Quapaw Nation tribal trust and restricted properties, the Quapaw Nation developed the Tribal Conservation Easement Enforcement Act. The law establishes enforceable components within conservation easements recorded on Quapaw Nation tribal trust and restricted properties. Table 7 provides a summary of institutional controls implemented at the Site.

Table 7: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media 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)
OU2 Soil	Yes	Yes	Impacted OU2 parcels	Prevent or minimize childhood lead exposure.	• OCHD, in conjunction with Oklahoma State Department of Health (OSDH), continue to carry out the Oklahoma Childhood Lead Poisoning Prevention Program by providing childhood lead poisoning prevention education through community and tribal health fairs, Head Start and childcare programs, and community organizations and events. • OCHD continues to conduct voluntary blood lead screenings.
OU4 Covered mining waste	Yes	Yes	See Appendix J for CB011N-Pit A (page J-1) CP091 (page J-5) Catholic 40 (Page J-11) CP097 (Page J-16) Beaver Creek North (Page J-25) Tract 920 156 and 920 157 (Page J-32)	Restrict future use of the property to protect the cover.	• ODEQ continues to place deed notices on properties consistent and pursuant to Oklahoma statute 27A § 2-7-123(B). • The Quapaw Nation and EPA worked with BIA to record conservation easements at four tribal properties.
OU2/OU4 On-site repositories	Yes	Yes	On-site repositories	Restrict future use of the property to protect the engineered containment system.	ODEQ continues to restrict use at repositories according to Oklahoma statute 27A § 2-7-123(B).
OU4 Soil	Yes	Yes	Property acquired via buyouts and voluntary relocation by LICRAT (this property was transferred to the Quapaw Nation in December 2017)	Restrict future use of the property to prevent human exposure to contamination.	ODEQ filed deed notices and easements pursuant to Oklahoma statute 27A § 2-7-123(B).[8]

[8] The properties receiving deed notices are listed in Tables 9a-9b in the 2015 FYR Report. Copies of all deed notices filed as part of the LICRAT buyout can be accessed via ODEQ's Institutional Control Viewer (www.deq.ok.gov/land-protection-division/institutional-controls-web-viewer).

Media 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)
OU4 Groundwater	Yes	Yes	NA	Protect the integrity of the Roubidoux aquifer and ensure Boone aquifer wells for domestic and potable use do not exceed MCLs for toxic metals.	Oklahoma Water Quality Standard Pursuant to Title 785 Chapter 45, Appendix H (defines well construction restrictions)

Systems Operations/Operation and Maintenance (O&M)

The remedial action is ongoing for OU2 and OU4. Therefore, there are no O&M activities currently occurring for these two OUs. O&M activities at the Site are currently limited to OU1, although the OU1 remedial action is not yet complete, since not all identified Roubidoux aquifer wells have been plugged and additional abandoned wells may yet be identified. ODEQ accepted OU1 O&M responsibilities in August 2014. The 1984 OU1 ROD stipulated that a two-year monitoring and surveillance program (1987 to 1988) would be conducted after construction of the selected OU1 remedies. However, after the first FYR in 1994, EPA and ODEQ determined that the Roubidoux Groundwater Monitoring Program would continue for OU1 to further investigate potential impacts to the Roubidoux aquifer from mining. The monitoring of the Roubidoux remains ongoing to evaluate the success of the well plugging program at preventing contamination of the Roubidoux aquifer. Although groundwater monitoring continues, the scope has been significantly reduced.

ODEQ performs annual inspections of the diversion and dike remedy at the Admiralty mine shaft, according to the 2018 O&M Plan, as follows:

- Annual inspection elements:
  - Inspect the sealed mine shaft for settlement and for depressions.
  - Check slopes of diversion dike for deterioration and inspect the crown for settlement and for depressions that could hold water.
  - Inspect the diversion channel for blockage of flow by flood debris, vegetation or beaver dams.
- Abnormal occurrence response plans (defined as a 100-year flood event that may result in abnormal situations):
  - Requires permanent repair of any minor damage.
  - Requires temporary repair of major damage to contain the damage, followed by determination of the cause of the damage and permanent repairs.
- Performance standards:
  - Contain flow from the watershed in the channel.
  - Ensure storm flows do not top the dikes.
  - Ensure water does not accumulate over the sealed shaft areas.
  - Correct any depressions, ruts, holes or breaches in the dike and the absence of vegetation on the dike that may lead to erosion.

ODEQ also performs annual maintenance of the Diversion Site (O-3) and began an annual groundwater monitoring program in 2017. ODEQ finalized the O&M Plan in 2018 that describes O-3 O&M activities and procedures for the collection of groundwater samples. O&M Plan items related to O-3 maintenance and groundwater sampling include:

- O-3 Annual inspection elements:
  - Inspect the dike, channel and mineshaft seal for erosion, blockage or damage.
  - Maintain dike, channel or mineshaft seal, as warranted.
- O-3 Abnormal occurrence response plans (defined as a 100-year flood event that may result in abnormal situations):
  - Requires permanent repair of any minor damage.
  - Requires temporary repair of major damage to contain the damage, followed by determination of the cause of the damage and permanent repairs.
- Performance standards for O-3:
  - Contain flow from the watershed in the channel.
  - Ensure storm flows do not top the dikes.
  - Ensure water does not accumulate over the sealed shaft areas.
  - Correct any depressions, ruts, holes or breaches in the dike and the absence of vegetation on the dike that may lead to erosion.
- No less than annual groundwater monitoring of the Roubidoux aquifer, to include the Picher #5 (P5)[9], Quapaw #4 (Q4) and Commerce #5 (C5) monitoring wells.
- Performance standards for groundwater:
  - Background levels.
  - Tolerance limits.
  - Secondary maximum contaminant levels (SMCLs) for indicator parameters.

The OU1 ROD recognized that additional abandoned Roubidoux aquifer wells might be identified in the future. This has been the case, and abandoned wells that are discovered are addressed by ODEQ. During the five-year period that is the subject of this report, ODEQ plugged two abandoned wells

O&M activities conducted for O-3 periodically note the presence of beaver dams and an occasional hole in the dike or culvert, which are promptly repaired by ODEQ or the landowner.

The OU1 ROD states that O&M costs related to the diking and diversion portion of the selected remedy would be approximately $5,000 per year. No costs associated with the Roubidoux groundwater monitoring program were provided in the OU1 ROD. OU1 O&M costs provided by ODEQ totaled $36,406 from July 1, 2015, through June 30, 2019 (Appendix E). Maintenance of the dikes and diversion channels has been minimal following the completion of the OU1 remedial action.

III. PROGRESS SINCE THE PREVIOUS REVIEW

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

Table 8: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 is protective of human health and the environment with respect to groundwater. With respect to surface water, the remedy at OU1 does not meet ARARs, but those ARARs have been waived under 40 CFR§ 300.430(f)(1)(ii)(C)(6).
2	Will be Protective	The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date at residential yards and at areas frequented by children (i.e., HAAs) have adequately addressed all exposure pathways in those yards and HAAs that could result in unacceptable risks in these areas. There are approximately 19 residential yards that are currently scheduled to be sampled to determine if remediation will be required,

[9] P5 is a former public water supply well.

		and EPA estimates that it will take one year to complete remediation, if necessary, for the residential yards. ODEQ will continue to evaluate additional residential properties and HAAs as they become known and assess the need for sampling and remediation under a cooperative agreement.
3	Protective	The remedy at OU3 is protective of human health and the environment.
4	Will be Protective	The remedy at OU4 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks at the smelter site, at all rural residential yards, at the following chat piles: CP058, CP059, CP088, CP091, CP092, CP093, CP093-Sl, CP093-S2, CP093-S3, CP093-S4, CP093-S5, CP094, CP094-S1, CP097, CP098, CP099, CP100, CP101, CP102, CP103, CP104 and CP105; at the following chat bases: CBO11,CB044, CB046, CB048, CB049, CB053, CB143, CB146, CBl47, CB156, CB157, CB216, CB219, CB221, CB222, CB223, CB230, CB231, CB232, CB233, CB234, CB235, CB236, CB237, CB238, CB239, CB240, CB241, CB241-S1, CB241-S2, CB242 and CB243; and at the FT063 fine tailings deposit. There are 83 chat piles, 213 chat bases and 62 fine tailings deposits that still must be addressed. EPA estimates that it will take 30 years to complete this work.

Table 9: Status of Recommendations from the 2015 FYR Report

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1				
ODEQ research has found references to abandoned wells that need to be assessed to determine whether these wells should be plugged (this issue is carried over from the fourth FYR Report). The OU1 ROD recognized that additional abandoned wells completed in the Roubidoux aquifer might be identified after completion of the OU1 remedial action. The ROD stated that the need to plug additional wells would be evaluated as wells were identified. The existence of the wells, which were found by ODEQ's research in historical documents, has not been verified. Fieldwork will be necessary to verify the existence of these wells and to determine whether they are completed in the Roubidoux aquifer and in need of plugging.	ODEQ shall undertake actions to determine whether the wells that ODEQ found in the literature actually exist and evaluate whether it is necessary to plug them. Each well location found in the literature should be investigated, located, assessed and, if necessary and technically feasible, plugged in accordance with the OU1 ROD. Since the last FYR, ODEQ has plugged two wells.	Ongoing	ODEQ has plugged two additional wells since the fifth FYR and recommends plugging three additional public supply wells.	NA
ODEQ should evaluate the need to continue the groundwater monitoring program under state-funded OU1 O&M activities. EPA intends to work toward completing remedial action activities at OU1 after well plugging is complete.	ODEQ should complete an evaluation of the need to continue the groundwater monitoring program under state-funded OU1 O&M activities and revise the O&M Plan if necessary.	Completed	ODEQ prepared an O&M and sampling plan and determined that groundwater monitoring should continue until well plugging is complete.	2/28/2018

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU2				
While significant progress has been made, and 2,940 residential properties have been addressed, there is work remaining before completion of the OU2 remedial action (this issue is carried over from the 2015 FYR Report). Residential yard remediation has been completed in the towns of Afton, Fairland, Narcissa, Peoria, Miami, Wyandotte, Picher, Quapaw, North Miami, Commerce and Cardin. EPA continues to take calls from Ottawa County residents for residential yard remediation. The next FYR should consider whether OU2 can be deleted from the NPL. The deletion of OU2 from the NPL would be a partial deletion of the Site.	ODEQ shall undertake remaining actions to complete the OU2 remedial action. EPA currently operates a telephone hotline for Ottawa County residents to request soil sampling. The next FYR should consider whether OU2 can be deleted from the NPL. The deletion of OU2 from the NPL would be a partial deletion of the site.	Completed	OU2 remedial action has progressed. However, additional remediation is ongoing via EPA-funded cooperative agreements with ODEQ. In each of the upcoming FYs through FY2021, ODEQ will receive funding to sample and remediate residential areas and HAAs in Ottawa County as they are identified.	9/1/2016
OU4				
The soil cover at the Hockerville subsidence area is settling, has been vandalized and needs repair. The Hockerville subsidence area was filled with construction and demolition debris in 2012. During the site inspection, which was part of the 2015 FYR, the soil cover was found to have visible damage that was due to general settling of the cap, and also due to vandalism in the form of tire tracks made by all-terrain vehicles.	ODEQ should repair the cover at the Hockerville subsidence area. Additional soil should be added to repair the soil cover and the cover grade should be re-established. EPA cooperative agreements with ODEQ and the Quapaw Nation includes repository O&M activities.	Ongoing	ODEQ is continuing to work on having this repaired.	NA
The Central Mill Repository, which was constructed to handle OU4 related source material, requires general maintenance. Engineering options for preventing water from seeps from entering Tar Creek should be evaluated.	ODEQ and the Quapaw Nation should conduct general maintenance at the Central Mill Repository. EPA cooperative agreements with ODEQ and the Quapaw Nation include repository O&M activities. The Central Mill Repository has received source material from distal properties as part of the OU4 remedial action since 2010 and is at approximately 20% capacity.	Ongoing	Maintenance activities at the Central Mill Repository are ongoing.	NA
OU5				
An assessment of the surface water and sediment data for Tar Creek should be completed to verify if a human health or ecological threat exists (this issue is carried over from	EPA should complete the evaluation of current surface water and sediment data for Tar Creek and other site streams to verify	Completed	EPA completed the Remedial Investigation Data Gap Summary Report in 2016,	October 2017

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
the fourth FYR Report). The third and fourth FYR reports recommended that evaluating current surface water and sediment data for Tar Creek to verify that there is no threat to human health in Tar Creek.	that there are no unacceptable risks to human health and the environment in Tar Creek and the other streams. Many studies of the Site have been conducted over the past decade. These studies have collected surface water and sediment data in Tar Creek and other site streams. EPA should perform a data gap analysis to determine whether gathering additional surface water and sediment data is necessary. If EPA finds that additional surface water and sediment data are needed, EPA should collect enough additional data to determine whether there are risks to human health and the environment associated with exposure to surface water and sediments in streams of the site.		which compiled and analyzed all known and readily available data relevant to the OU5 RI and human health risk assessment (HHRA). The report identified additional data collection efforts necessary for completion of the RI and HHRA. EPA completed data gap sampling in 2017 and is currently completing the HHRA.	
Notes: 1. NA = not applicable because the activity is ongoing. 2. The issues and recommendations listed above were from the 2015 FYR and not edited.				

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

ODEQ made a public notice available by a newspaper posting in the *Miami News Record* on 6/14/2019 (Appendix D). It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the FYR and the FYR report will be made available at the Site's information repository, Miami Public Library, located at 200 North Main Street in Miami, Oklahoma.

During the FYR process, interviews were conducted to document any perceived problems and to document successes in the remedy implemented to date**.** The interviews are summarized below, and the completed interview forms are located in Appendix I.

Jason White, Cherokee Nation/ Inter-Tribal Environmental Council (ITEC): Mr. White is the Manager of Environmental Programs. Mr. White indicated that there has been good progress with remediation activities over the last five years. He is not aware of any vandalism, trespassing or emergency response activities at the Site. He indicated that the site cleanup activities have been beneficial to improving human health and the environment and have had positive effects on the surrounding community.

Kelly Dixon, ODEQ: Ms. Dixon is ODEQ's Land Protection Division Director. She indicated that the work completed at OU4 has been efficient and has focused on shrinking the site footprint by focusing on the

watersheds. She also was pleased with the ongoing residential yard sampling and cleanup (OU2). Ms. Dixon emphasized the importance of EPA's commitment to funding site cleanup along with the State's matching funds. She also indicated that government contracting with the Quapaw Nation has been effective in remediating the Site. Ms. Dixon raised the concern that the city of Commerce intends to implement a flood mitigation project that may impact the operation of one of the passive treatment systems. She would like to see coordination among all affected parties before the project begins. Ms. Dixon would like to see chat sales continue and recommended preparation of a material safety data sheet as a communication tool for end users of the product. She is concerned that the OU1 remedy after action monitoring program is not a long-term solution, which supports the need for ongoing evaluations and monitoring. She also raised the concern that episodic subsidence continues, and it is not always clear who has authority and funding to address this issue. She recommended development of a long-term strategy with appropriate state and federal agencies.

Dean Kruithof, City of Miami: Mr. Kruithof is Miami's City Manager. He indicated that, since growing up in the area, the change in the mined land areas appear to have improved overall, despite the loss of Picher and the effect it has had on former citizens. He was also concerned about the continued discharge of water from the abandoned mines into Tar Creek. He believes the immediate cleanup and attention to the mined lands has provided hope that a positive and long-lasting solution can be found for mine waste. He feels well informed about site activities and hopes that some of the pilot tests can become definitive long-term solutions.

Robert Nairn, University of Oklahoma: Dr. Nairn is a professor for the Center for the Restoration of Ecosystems and Watersheds at the University of Oklahoma. Dr. Nairn stated that the passive treatment systems at Mayer Ranch and the Southeast Commerce have been operating for over 10 years and online for 29 months, respectively. He believes the chemical and ecological health of the common receiving stream has improved significantly, with the return of fish communities, including over a half-dozen new species of fish. Dr. Nairn indicated that the discharges to the Beaver Creek watershed and in the main stem Tar Creek watershed are amenable to passive treatment systems if appropriately designed and sized and should be part of a long-term cooperative O&M program if implemented.

Craig Kreman and Summer King, Quapaw Nation: The Quapaw Nation believes that cooperation between EPA, ODEQ and the Quapaw Nation has been instrumental in cleaning up the Site. They believe cleanup activities have created jobs in the community and helped return local lands to productive use. They indicated that the primary concern raised by the community is whether reclaimed land will be able to sustain pastures and crops. They said that vandalism and trespassing continue on properties that have not yet been cleaned up.

Susan Quigley, OSDH: Ms. Quigley is the Program Manager for the Oklahoma Childhood Lead Poisoning Prevention Program at OSDH. Ms. Quigley is well informed about site activities and receives information through partnerships with ODEQ and OCHD. She is not aware of any complaints or incidents related to the Site requiring a response by her office.

Kathleen Welch, Wyandotte Nation: Ms. Welch is the Environmental Program Manager for the Wyandotte Nation. Ms. Welch believes the Wyandotte Nation continues to have concerns about the volume of waste that the repository can hold. In addition, Ms. Welch said the Wyandotte Nation has concerns that the bioremediation used thus far is not meeting standards. She does feel well informed most of the time, but would like to see quarterly updates on remediation activities in a local newspaper.

Resident 1: Resident 1 believes the work conducted in the last five years has been satisfactory and is not aware of any effects of cleanup activities on the surrounding community.

Resident 2: Resident 2 is very pleased with the work conducted at the Site since September 2015 and believes the cleanup has made the community healthier and a better place to live.

Resident 3: Resident 3 believes that site activities since the previous FYR have been favorable and that the buyout has generally been positive, although emotionally difficult.

Catholic Priest: The priest stated that the initial response was lacking, and the process appeared slow. He believes the cleanup in the last five years has made the environment safer. He was not aware of any community concerns regarding the Site and feels well informed about site activities. He would like to see the cleanup progress faster.

Tommy Long, City of Commerce Administrator: Mr. Long feels a lot of progress has been made, but much more work remains. He indicated that the most noticeable effect of the Site on the surrounding community has been an improvement in the local economy by providing jobs. He has not been aware of any complaints or other incidents related to site activities.

Data Review

OU1

The OU1 remedial action includes well plugging to reduce or eliminate pathways for mine water contamination to migrate from the Boone aquifer to the Roubidoux aquifer. Most of the people living in Ottawa County receive their drinking water from the Roubidoux aquifer. Monitoring of groundwater wells drilled to the Roubidoux aquifer within site boundaries are sampled to determine the effectiveness of the well plugging program. The OU1 ROD did not establish remediation goals for groundwater. As part of the monitoring program, performance standards (Table G-1) were developed to evaluate the Roubidoux aquifer sampling results to determine if a specific Roubidoux well is faulty (e.g., inadequate depth of casing or deteriorated casing) and requires plugging. The performance standards include background levels, tolerance limits and SMCLs for each of the selected indicator parameters of mine water (iron, zinc and sulfate). Lead and cadmium were also included and evaluated. ODEQ conducts annual sampling of Roubidoux aquifer wells to determine if the drinking water supplied from the Roubidoux aquifer in the mining area continues to meet MCLs, or whether these wells are being impacted by mine water from the Site due to deteriorating well casings. Wells identified as impacted are recommended for plugging. This determination is made by the following criteria[10] related to the indicator parameters:

- *Impacted*: A well producing water with concentrations in excess of the tolerance limits for all three indicator parameters.
- *Probably Impacted*: A well producing water with concentrations in excess of the background levels for all three indicator parameters and above the tolerance limits for two of the indicator parameters.
- *Possibly impacted*: A well producing water with concentrations in excess of the background levels for two of the three indicator parameters and above the tolerance limits for one of the indicator parameters.

All wells sampled and analyzed for lead and cadmium during the current FYR period were below detectable limits. Therefore, the evaluation of the OU1 well-plugging in this FYR is focused on mine water indicator parameters. As shown in Table 10, 13 wells were monitored between 2010 and 2013. In 2014, ODEQ accepted responsibility for OU1 O&M activities, at which time ODEQ reviewed historical data and determined that the number of wells could be reduced to three wells. Between 2014 and 2016, ODEQ developed a Groundwater Monitoring Work Plan, Sampling Plan and a Quality Assurance Project Plan, prior to starting the OU1 O&M sampling, which resumed in 2017. In 2018, ODEQ added a fourth well – Picher #7 (P7) – to the monitoring program because the Picher #5 (P5) pump was non operable so it could not be sampled, and P7 is located near P5. In 2018, ODEQ determined P7 was impacted by the three indicator parameters. P5 has served as the primary public supply well for individuals remaining in the OU4 buyout area but is currently offline due to these issues. P5 is maintained by the Quapaw Nation.[11] ODEQ identified Quapaw #5 (Q5) as impacted during the previous FYR period, and ODEQ continues to have discussions with the town of Quapaw regarding plugging and replacing this well.

[10] The criteria are included in ODEQ's annual O&M monitoring reports.
[11] The Quapaw Nation assumed ownership and operation of the Picher/Cardin public water supply system in 2009, which includes the referenced wells.

Table 10: Summary of OU1 Roubidoux Aquifer Monitoring Well Evaluation

Well Type	Well Name	Previous FYR (2010 to 2013)	Current FYR		
			2017	2018	2019
Monitoring Wells	Commerce #5 (C5) (monitoring well)	X (not impacted)	X (not impacted)	X (not impacted)	X (not impacted)
	Quapaw #5 (Q5)	X (impacted)	-	-	-
	Picher #5 (P5) (supply well)	X (possibly impacted)	X (possibly impacted)	X (impacted)	X (impacted)
	Picher #6 (P6)	X (probably impacted)	-	-	-
	Picher #7 (P7) (supply well)	X (possibly impacted)	-	X (probably impacted)	X (not impacted)
Municipal Well	Cardin #1 (supply well)	X (possibly impacted)	-	-	-
Edge of Mining Area	Commerce #4 (C4)	X (possibly impacted)	-	-	-
	Ontario Smelter (private well)	X (impacted)[a]	-	-	-
	Quapaw #4 (Q4) (supply well)	X (not impacted)	X (not impacted)	X (not impacted)	X (not impacted)
	Rural Water District #4 Well #3 (RWD4 #3)	X (not impacted)	-	-	-
Outside Mining Area	Miami #3	X (not impacted)	-	-	-
	Miami #11	X (not impacted)	-	-	-
	RWD7 #2	X (not impacted)	-	-	

Notes:
a. Ontario smelter (private) well ceased to be sampled after 2012 due to access issues.
- = well not targeted for sampling based on historical sampling results.
X = well included for sampling.
Sources: 2017, 2018 and 2019 Annual Monitoring Reports, prepared by ODEQ.

The data evaluated in this FYR period include 2017, 2018 and 2019 analytical results. The historical results are included in Table G-2. To place the sampling events for this FYR in perspective with historic levels, trends were also evaluated. As shown in Table 11, concentrations of sulfate exceed the background sulfate concentrations and also exceed the concentration level in P5 in 2017 and 2018, with a significant increase between 2017 (141 mg/L) and 2018 (1,300 mg/L), and with continued elevated levels in 2019. Historically, sulfate fluctuated above and below the tolerance limit (Figure G-2). Similarly, iron shows a significant increase from 2017 (43.2 µg/L) to 2018 (21,800 µg/L) with similar elevated concentrations in 2019. The 2018 data are the highest iron concentrations recorded for well P5. Historically, iron appeared close to the background and tolerance limits (Figure G-3). Zinc concentrations in P5 show similar increases from 2017 (19.4 micrograms per liter [µg/L]) to 3,040 µg/L in 2018 and slightly higher concentrations in 2019 (3,410 µg/L). The 2019 dissolved zinc concentration is the highest concentration recorded at P5. Historical data indicate that zinc concentrations were consistently less than 5.0 µg/L.

The concentrations of iron in P7 exceeded background concentration, the tolerance level and the SMCL, in 2018. However, in 2019, these concentrations decreased (Figure G-5) and only exceeded background (Table 11). Sulfate concentrations in P7 show a decline between 2018 and 2019 but still exceed background and the tolerance limit. Historical data indicated that sulfate concentrations have consistently exceeded tolerance limits (Figure G-4) but exhibited a decline starting in 2013.

Based on the monitoring results, ODEQ, in consultation with EPA and QNEO, will determine if P5 should remain part of future OU1 O&M sampling, if more work is required to properly install the packer, or if the well should be considered for plugging. SMCLs (aesthetically based) for the indicator parameters (sulfate and iron) were exceeded in previous FYRs and during this FYR for several supply wells completed in the Roubidoux aquifer,

indicating that there may be potential mine water impacts to the Roubidoux aquifer from the contaminated portion of the overlying Boone aquifer, at these wells. However, the drinking water supply wells from the Roubidoux aquifer continue to meet the MCLs. Therefore, the Roubidoux aquifer is a safe a drinking water supply.

Table 11: OU1 Annual Groundwater Monitoring Results[a]

Well	Zinc (µg/L)			Iron (µg/L)			Sulfate (mg/L)			Mine Water Impact Analysis		
Background Level	8.8			61.5			25					
Tolerance Limit	43			207			82					
SMCL	5,000			300			250					
Well	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
Quapaw #4	<5.0	***27.1*** ***(19.2)***	<5.0 (<5.0)	<20.0	<20.0 (26.4)	<20.0 (<20.0)	16.3	18.8	15.6	not impacted	not impacted	not impacted
Picher #7	-	***12.3*** ***(12.5)***	<5.0 (<5.0)	-	**387** **(372)**	***162*** (23.9)	-	**172**	**139**	-	probably impacted	not impacted
Picher #5	***19.4***	**2,850** **(3,040)**	**3,540** **(3,410)**	43.2	**21,500** **(21,800)**	**20,000** **(18,300)**	**141**	**1,300**	**1,180**	possibly impacted	impacted	impacted
Commerce #5	<5.0	***12.9*** (8.1)	<5.0 (<5.0)	***63.2***	***97.7*** (<20.0)	***98.3*** (<20.0)	15.6	18.2	15.4	not impacted	not impacted	not impacted

Notes:
a. Results presented as total and (dissolved) concentrations for the 2018 and 2019 samples and as dissolved concentrations for the 2017 samples.
- = well not sampled in 2017.
Bold italic = exceedance of the background level.
Bold value = exceedance of the background level and tolerance limit.
Bold underline = exceedance of the background level, tolerance level and SMCL.
mg/L – milligrams per liter
µg/L – micrograms per liter
Source: 2018 OU1 Operation and Maintenance Annual Report. Prepared by ODEQ. August 2018.

According to the 2018 Annual OU1 Monitoring report, ODEQ identified the existence of a burrow of about 1 foot by 1.5 feet on the O-3 diversion dike. This burrow was also observed during the FYR site inspection, and ODEQ filled this area in July 2019 as part of the routine maintenance. Based on visual observations, ODEQ reported that the O-3 diversion structure was functioning overall in promoting drainage of Lytle Creek upstream of O-3 during high-flow events.

OU2

In 2008, EPA selected a soil lead cleanup level of 500 mg/kg in the OU2 ROD, which is associated with a child risk of no more than 5% of exposed children exceeding a blood lead level of 10 µg/dL. EPA is working with the State to monitor blood lead levels to discover any cases of elevated blood lead levels in young children above the CDC reference level of 5 µg/dL. EPA and ODEQ have established a process for follow-up actions if elevated blood-lead levels are identified, as outlined in an agreement between the agencies. Follow-up actions include environmental investigation, soil sampling and soil removal if needed. A health education program on lead poisoning prevention and potential sources of lead is available and is administered in the impacted community.

ODEQ worked with OSDH to update the blood lead levels summary from the Ottawa County blood lead monitoring activities since the previous FYR (Table 12 below). In 2012, the Centers for Disease Control and Prevention (CDC) changed the reference blood lead level of concern in children 6 years old and younger from 10 µg/dL to a reference blood lead level of 5 µg/dL, to identify children with blood lead levels that are much higher than most children's blood lead levels. ODEQ and OSDH compared the blood lead levels to the EPA's risk reduction goal that no more than 5% of the population of similarly exposed children exceeds the CDC reference level of 5 µg/dL blood lead. The blood lead data collected during this FYR time period shows that the percentage of children with a blood lead level exceeding 5 µg/dL in Ottawa County, which includes the Site, fluctuated slightly above and below the 5% level. The percentage of children with blood lead levels that exceed 5 µg/dL in Ottawa County fluctuated between 3.3% (2014) and 6.7% (2016). In 2018, the percent of children with blood lead levels above 5 µg/dL decreased to 3.8%. This percentage remains significantly lower than the high of 34%

measured in 1994, representing the percentage of children with blood lead levels above the level of 10 µg/dL, before remedial activities started.[12] The blood lead levels across the state have been consistently below the 5% level based on a blood lead level of 5 µg/dL. Blood lead surveillance data for Ottawa County are based on voluntary convenience sampling, a type of non-probability sampling which is vulnerable to selection bias and sampling error.

Overall, blood lead levels in OU2 have declined since soil removal actions began in 1995 (Figure 6). The blood lead levels are expected to decline further as state, local and federal actions continue to be implemented and the community continues to be educated about lead exposures.

Table 12: Summary of Childhood Blood Lead Levels, 2014 to 2018[a,b]

Date	Ottawa County[c]		State of Oklahoma	
	Total Tested	≥5 µg/dL	Total Tested	≥5 µg/dL
2014	708	3.3%	43,636	2.5%
2015	627	5.9%	41,531	2.6%
2016	657	6.7%	45,004	2.3%
2017	668	4.8%	51,592	2.1%
2018	608	3.8%	49,862	1.6%

Notes:

a. Blood lead results were obtained from convenience sampling of children 6 months old to 6 years old, residing in Oklahoma, reported to OSDH's Oklahoma Childhood Lead Poisoning Prevention Program. Convenience sampling is a type of non-probability sampling that involves the sample being drawn from that part of the population that is close at hand. Blood lead test results were rounded to whole numbers for data analysis in accordance with CDC guidelines.

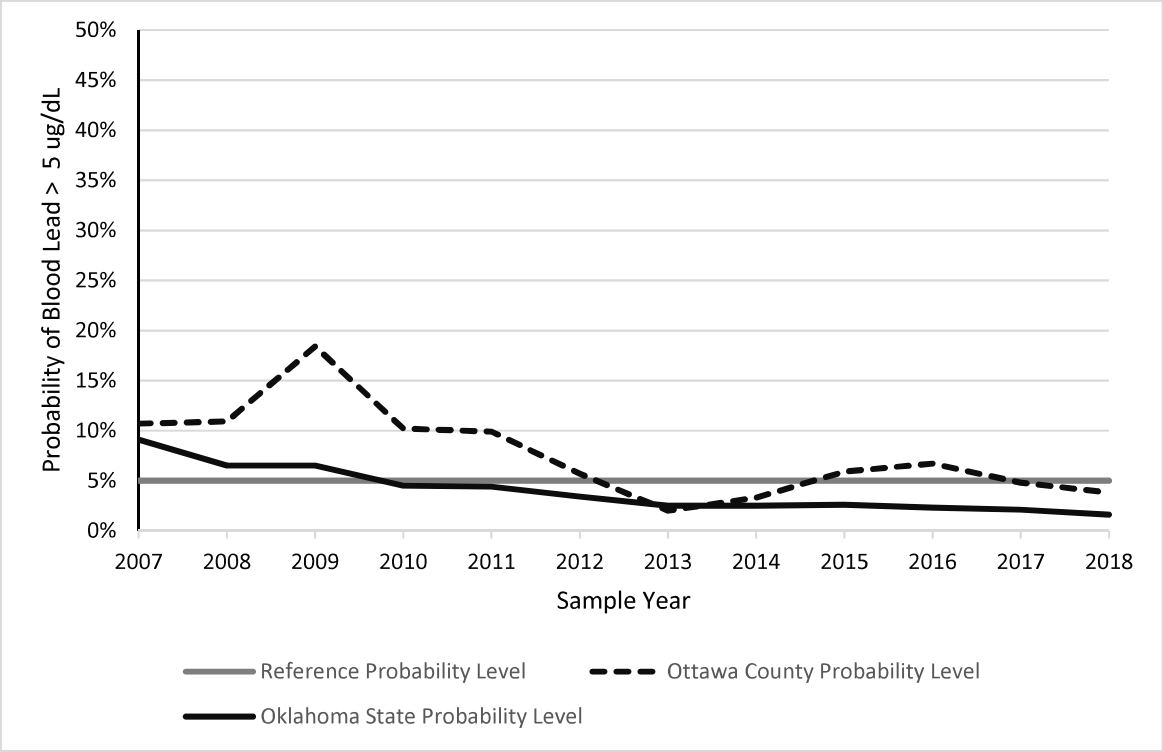
b. Blood lead levels: The test represents the highest venous blood lead test for an individual child per fiscal year. In absence of a venous blood lead test, the highest capillary blood lead test for an individual child is reported. Blood lead test results in the range 5 µg/dL or greater include children with capillary blood tests without a venous confirmation blood lead test.

c. Ottawa County includes the Tar Creek Site zip codes (74335 - Cardin, 74339 - Commerce, 74358 - North Miami, 74360 - Picher, 74363 - Peoria and Quapaw) and areas adjacent to the Site (zip codes 74331, 74343, 74354, 74355 and 74370).

µg/dL – micrograms per deciliter

[12] The 34% was based on a child blood lead level exceeding the previous reference level of 10 µg/dL. Based on the reference level of 5 µg/dL, the percentage would have been higher than 34%.

Figure 6: Child Blood Lead Level Trends, 2007 to 2018



OU4

The OU4 Phase 2 remediation is ongoing and continues to address remaining source areas, including chat bases, tailings ponds, unmarketable chat piles and bases, and the chat that remains from the consolidation of distal area chat. Phase 2 activities address two main areas – core mining areas and distal areas.

For OU4 remediation, once source material is removed from the Site, sampling grids covering the excavation areas are established. Sampling of soils within the grids is then conducted to determine whether or not COCs in the transition zone soil remaining onsite exceed RAOs. Removal of source material and contaminated soil is completed in accordance with the ROD and site-specific remediation plans, including the approved quality assurance project plan and field sampling plan.

The removal of surface soil that otherwise, if not contaminated, would be a valuable resource for agricultural purposes, evolved into a concern for Tar Creek Superfund Site stakeholders, including the ODEQ and the Quapaw Nation. In 2016 and in consultation with EPA, a pilot study was initiated (1) to evaluate the use of soil amendments to reduce the bioavailability of chemicals of concern (COCs) lead (Pb), cadmium (Cd), and zinc (Zn) in transition zone (TZ) soil, and (2) to reduce the removal of contaminated soils through the use of soil amendments as an approach to reduce bioavailability of the COCs. The pilot study was completed in June 2019, concluding that although the ecological remediation goals may be increased and remain protective, these increased concentrations may not be suitable for human health exposures. Therefore, the use of soil amendments to reduce the bioavailability of metals in soils is no longer considered, and final remediation of these soil amendment pilot areas is being completed using the current OU4 ROD remediation goals for soil.

Site Inspection

The site inspection took place on 6/25/2019 and 6/26/2019. Participants included ODEQ Environmental Programs Manager Amy Brittain, OU4 ODEQ Engineer Intern Zach Bradley, OU2 Programs Specialist Ellen Isbell, and Eric Marsh and Claire Marcussen from EPA support contractor Skeo. The purpose of the inspection was to assess the protectiveness of the remedy. The completed site inspection checklist is included in Appendix E. Photos documenting the inspection are included in Appendix F.

Site inspection participants began the inspection on 6/25/2019 with a viewing of representative chat piles being addressed as part of OU4 remediation activities. Site inspection participants then observed the county-filled subsidence area, which was observed to be covered by thick grass and secured by a locked fence and gate. The OU4 Hockerville Subsidence was observed and appeared to be covered by thick grass, except in the southeast corner where standing water was observed in a depression, potentially resulting from excessive rainfall in 2019. ODEQ is in the process of evaluating cap improvements to this area. Participants observed the OU4 Elm Creek area undergoing remediation to gain a perspective on how excavation activities are conducted for a large area of chat. Participants also observed completed OU4 remediation projects at large areas of chat, including CP091 and CB011N-Pit A. Both areas were fenced and covered by thick grass. In addition, participants observed the operational OU4 Central Mill Repository, which is located in a secured area. No vegetation is present at this time, since the OU4 repository remains operational. However, maintenance activities are in place to control dust and prevent erosion. Participants observed the OU2 closed repository, which was secured behind a fence and locked gate. The repository was covered with thick grass. Participants also observed two wells plugged as part of OU1 response actions – a well at the Power House area located southwest of Cardin and in one located in Picher. Both wells were in good condition. Participants visited the OU1 diversion dike and Douthat Bridge, which was surrounded by a fence and locked gate. The dike was well vegetated with tall grasses.

On 6/26/2019, site inspection participants observed the two passive wetland treatment systems located in the city of Commerce and maintained by the University of Oklahoma. Both treatment systems are fenced and located behind locked gates. The top cell of the Mayer Ranch system appeared orange due to the high iron concentrations in the upwelling. However, water in subsequent cells became clearer, and following the polishing cell and at the system outfall, the water was clear. The Southeast Commerce system is a smaller treatment system than the Mayer Ranch system, which requires some oxidation treatment followed by settling. Following the treatment cells, the water at the outfall was clear. The inspection participants observed multiple OU2 post-remediation areas, including driveways, residential yards and a HAA, the Rotary Centennial Park. The OU2 remediated yards and park were in good condition, with thick grass established, while the driveways appear to be in good condition with no erosion observed. The inspection concluded with a visit to the local information repository, located at the Miami Public Library. The library had a large collection of historical site information. The most recent two FYR reports could not be located.

V. TECHNICAL ASSESSMENT

OU1 – Technical Assessment

Question A – Is the remedy functioning as intended by the decision documents?

Yes. The remedy for OU1 is functioning as intended by the decision documents.

- Groundwater:
    - Since the last five-year review, ODEQ has plugged two wells identified at the Site that were completed in the Roubidoux aquifer, which is a significant drinking water source for Ottawa County. EPA and ODEQ continue to evaluate the need to plug abandoned Roubidoux wells as they are identified and located. ODEQ has recommended that two wells be plugged, Q2 and Q5. In addition, ODEQ, in consultation with EPA and QNEO, will determine if P5 should remain part of future OU1 O&M sampling, if more work is required to properly install the packer, or if the well should be considered for plugging. The plugging actions that have taken place, however, are functioning as intended by the decision documents, and the Roubidoux, which the OU1 ground water remedy is meant to protect, meets MCLs.
    - ODEQ completed a Groundwater Monitoring Plan and an O&M Plan in 2018, outlining the requisite activities to be conducted to evaluate the effectiveness of the OU1 remedy.

- Surface water:

- As noted in previous five-year reviews, the diking and diversion work performed as part of the OU1 remedy was not successful at reducing the discharges of mine water to Tar Creek; however, it did affect recharge to the mines associated with rainfall events. Therefore, the diking and diversion portion of the remedy is only partially functioning as intended (EPA, 1994). As stated in the Determinations, surface water will be further addressed as part of OU5.

- With respect to surface water, Question A is not germane because ARARs have been waived for the Site under 40 CFR § 300.430(f)(1)(ii)(C)(6).

Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs remain valid.

- Groundwater:
  The Roubidoux aquifer, which provides drinking water to most Ottawa County residents, meets MCLs established under the Safe Drinking Water Act. MCLs have not changed and the RAOs for the Roubidoux are still valid.
- Surface water
  Question B is not germane for OU1 surface water because ARARs have been waived under 40 CFR § 300.430(f)(1)(ii)(C)(6).

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

No other information has come to light as part of this FYR for OU1 that would call into question the protectiveness of the site remedy.

OU2 – Technical Assessment

Question A – Is the remedy functioning as intended by the decision documents?

Yes. The remedy for OU2 is functioning as intended by the decision documents.

- Soil
  - ODEQ continues to remediate contaminated soil at residential properties and HAAs. To date, there have been close to 3,000 residential properties and HAAs remediated, with cleanup activities including excavation, restoration and surveying. OU2 actions will remain ongoing via EPA-funded cooperative agreements with ODEQ. Through lead education and active remediation, the probability of blood lead levels above reference levels has generally declined since the remedy began, with blood-lead levels remaining stable within Ottawa County. In order to sustain the improvements achieved through the OU2 cleanup efforts and further reduce the risk of childhood lead poisoning from all potential lead sources in Ottawa County, EPA, ODEQ and OSDH will continue collaborating to provide community health education on prevention of childhood lead poisoning and enhance opportunities for blood lead screening of children.
  - The OU2 ROD calls for a clean soil cap on any parts of the repositories where the soil lead concentrations exceed the remediation goal. The two soil repositories used for OU2 have been capped and vegetated to prevent or reduce erosion.
  - The requisite OU2 institutional controls are currently being implemented through agreements between EPA, ODEQ and OSDH to include fact sheets, a Childhood Lead Poisoning Prevention Program, in conjunction with providing childhood lead poisoning prevention education and blood lead screenings. OCHD has the lead on implementation.

Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs remain valid.

- Soil:
  - The OU2 ROD soil lead cleanup goal of 500 mg/kg remains valid; the goal was based on site-specific and default exposure parameters input into EPA's child lead model (Appendix K).
  - EPA is in the process of updating its policy based on recent studies, which indicate that lower blood lead levels may be associated with health effects. EPA Region 6 will continue to use the current EPA policy until the Agency finalizes and updates its policy. EPA continues working with the State to monitor blood lead levels to identify any cases of elevated blood-lead levels in young children above the CDC reference level of 5 µg/dL. EPA and ODEQ have established a process for follow-up actions if elevated blood-lead levels are identified.
  - The OU2 remedial action has attained the RAOs where remediation has been completed. The OU2 remedial action is ongoing. Remaining areas of the Site to be addressed will meet the RAOs after completion of remediation.

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

No other information has come to light as part of this FYR for OU2 that would call into question the protectiveness of the site remedy.

OU4 – Technical Assessment

Question A – Is the remedy functioning as intended by the decision documents?

Yes, with the exception of compliance with the Off-site Rule. The remedy for OU4 is functioning as intended by the decision documents.

- Voluntary Relocations - Voluntary relocation of area residents and businesses – relocation of residents and businesses in Picher, Cardin, and Hockerville, Oklahoma, and Treece, Kansas is complete, and the relocation functioned as intended. Residents were relocated so that chat sales could continue in these areas in an effort to reduce the volume of source material that must be addressed in remedial actions.

- Source material
  - OU4 source material cleanup continues via EPA-funded cooperative agreements with site remedial action partners, ODEQ and QNEO. ODEQ and QNEO remediate rural residential yards not included under OU2 and source material areas including a former lead smelter, chat piles and chat bases and fine tailings, and associated transition zone soils.
  - Chat pile and chat bases – Chat excavated from chat piles and chat bases is either transported and disposed of at the on-site repository or, if it is determined to have commercial value (i.e., marketable) it is transported to a chat processor for sale. The OU4 ROD selected chat sales as a component of the remedy and stated that all Site chat must be managed according to the criteria provided in the Chat Rule, 40 CFR Part 278, and its preamble. The ROD also expanded the approved use of chat to include encapsulated chat (refer to ROD Section 19.2.2. for details). The ROD requires that chat taken off-site must be sent to a facility that complies with the Off-site Rule. To date EPA has not been making determinations that chat is sent to facilities that comply with the Off-site Rule. In an effort to rectify the lack of compliance, EPA Regions 6 and 7 consulted with the Assistant Administrator for EPA's Office of Land and Emergency Management regarding the Off-site Rule in June 2020. This consultation has resulted in

collaboration between Regions 6 and 7 to develop a process for full Off-site Rule implementation at the Site. Full implementation in compliance with the ROD is expected by the end of FY20.
    - Also, in 2019, a local chat processor voluntarily agreed to print information on the bags of chat sold to communicate prohibited and unsafe uses.

    - Fine tailings deposits – The OU4 ROD called for injecting fine tailings into mine workings or covering them in place, with the latter being the predominant disposal method. A chat processor is injecting fine tailings as part of their disposal process. Consolidation of fine tailings is currently occuring as part of the remedial action at the Bird Dog. This remedy element is functioning as intended by the OU4 ROD.
    - EPA is working with ODEQ and the Quapaw Nation on the Central Mill Repository to reduce O&M costs and expand capacity. In addition, during this FYR site inspection, the Hockerville subsidence area was observed to be covered by thick grass, except in the southeast corner where standing water was observed in a depression. ODEQ is in the process of evaluating cap improvements to this area.
    - As required by the OU4 ROD, deed notices are filed on properties and repositories calling property owners' attention to the presence of contamination.
- Groundwater
    - EPA has provided public water supply to residents if unsafe drinking water wells are identified and the property owner agrees to the public water supply connection.
    - Institutional controls are in place as required by the OU4 ROD to restrict future uses of groundwater from the Boone aquifer for potable or domestic supply that is impacted with site-related contaminants above the remedial goals. State regulations are in place to limit groundwater use specifically in the Boone aquifer within the Site (Appendix C).

Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs remain valid.

- Soil:
    - OU4 ROD established the Action Level for lead as the chemical-specific ARAR in groundwater. The chemical-specific ARARs were reviewed and there have been no changes to the Action Level or MCLs since the previous FYR (Appendix H).
    - The OU4 ROD established an action-specific ARAR to help ensure that site chat sales continue, and that chat is used in a manner that is protective of human health and the environment. The Chat Rule, 40 CFR Part §278, and its preamble was reviewed, and the rule has not changed.
    - The OU4 ROD soil cleanup goals for cadmium, lead and zinc were reviewed to evaluate whether any changes in toxicity and exposure values since the ROD could impact current remediation levels (Appendix K). The evaluation demonstrated that ROD soil cleanup goals remain valid.
    - There are no changes to the human health and ecological exposure pathways since completion of the previous FYR. There are no new exposure pathways that were not previously identified in the RODs. Future land uses are not expected to change. Agricultural and rural residential uses are anticipated to remain the most prominent land uses at the Site.
    - The OU4 remedial action is ongoing and RAOs have been met where remediation has been completed. The LICRAT buyout and the Treece Relocation Assistance Trust buyout were completed in 2011 and 2012, respectively, preventing these groups from direct exposure to soils and source material.
    - The RAO that aimed to prevent terrestrial fauna from coming in direct or indirect contact, through the ingestion exposure pathway, with cadmium-, lead-, or zinc-contaminated source materials and soils where concentrations exceed their respective remediation goals, has been met on properties where source material and transition-zone soils have been completely removed.
    - The RAO aimed at preventing riparian biota, including waterfowl, from coming in contact, through the ingestion exposure pathway, with unacceptable concentrations of cadmium, lead and

zinc in surface water and sediment by eliminating all discharges of cadmium, lead and zinc from source materials to surface water has not been met. Progress is being made toward this goal through remedial action efforts to remove source materials at the Site.

- Groundwater
  - The chemical-specific ARARs were reviewed and there have been no changes to the MCLs since the previous FYR (Appendix H).
  - The OU4 ROD identified the action-specific ARAR that called for ODEQ to restrict groundwater under the authority of the Oklahoma Water Quality Standards (OWQS) Title 785, Chapter 45, Appendix H. The OWQS regulation was reviewed and no changes have occurred.
  - The OU4 RAO of preventing site residents from ingesting water from private wells that contains lead in concentrations exceeding the National Primary Drinking Water Standards continues to be met. The previous FYR Report noted that two rural residential wells completed in the Boone aquifer exceeded the groundwater lead remediation goal in 2009. However, at that time neither property owner provided access to EPA to implement the remediation described in the ROD. In 2016, both property owners agreed to have the wells sampled and remediated as necessary. EPA connected both properties to a water line in August 2016 and recommended that the residents do not use their private wells for drinking, cooking or bathing.

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

No other information has come to light as part of this FYR for OU4 that would call into question the protectiveness of the site remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU2

Issues and Recommendations Identified in the FYR:

OU(s): OU1	**Issue Category: Remedy Performance**			
	Issue: Through its groundwater monitoring program ODEQ identified two off-line impacted potable supply wells (Q2 and Q5) that require plugging and abandonment. In addition, ODEQ identified a third well in the town of Picher (P5) that should be repaired or plugged.			
	Recommendation: Plug and abandon the two off-line impacted potable supply wells (Q2 and Q5) and determine if well P5 should be repaired or plugged.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
No	Yes	State	EPA	8/1/2023

OU(s): OU4	Issue Category: Remedy Performance			
	Issue: To date, EPA has not complied with the Off-site Rule requirements for chat sales per the 2008 OU4 ROD.			
	Recommendation: Develop and implement a process for Off-site Rule compliance for chat sales.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2020

OU(s): OU4	Issue Category: Operations and Maintenance			
	Issue: The soil cover of the Hockerville subsidence area has settled and is damaged from the settling and use of all-terrain vehicles.			
	Recommendation: Repair the cover at the Hockerville subsidence area. EPA cooperative agreements with ODEQ and the Quapaw Nation includes repository O&M activities. Evaluate whether securing the area from trespassers will help to protect the soil cover in the long-term.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party/Support Agency**	**Milestone Date**
No	Yes	State	EPA	8/1/2021

OTHER FINDINGS

Additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- Update the public document repository to include copies of the most current FYR reports.
- ODEQ and the University of Oklahoma should coordinate with the city of Commerce to ensure that a planned city flood mitigation project does not impact the operation of passive treatment systems.
- Consider evaluating certain remediated areas within OU4 for partial NPL deletions.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment with respect to groundwater. With respect to surface water, ARARs have been waived under 40 CFR § 300.430(f)(1)(ii)(C)(6). In order for the remedy to be protective in the long-term, ODEQ should plug and abandon the two off-line impacted potable supply wells (Q2 and Q5) and determine if well P5 should be repaired or plugged.	

Protectiveness Statement	
Operable Unit: 2	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Remedial activities completed to date at targeted residences and at areas frequented by children (i.e., HAAs) have adequately addressed all exposure pathways in those yards and HAAs that could result in unacceptable risks in these areas. ODEQ will continue to evaluate additional residential properties and HAAs as they become known and assess the need for sampling and remediation under a cooperative agreement with EPA. In addition, for properties that have not yet been remediated, ODEQ and its partners (OSDH and OCHD) make information available about the safe uses of chat. In addition, OCHD provides childhood lead poisoning prevention education and blood lead screenings.	

Protectiveness Statement	
Operable Unit: 4	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at OU4 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways, including exposure pathways associated with tribal uses of natural resources by the Quapaw Nation, that could result in unacceptable risks. These remedial activities have included: - Remediating soil at the smelter site, at all rural residential yards, at a number of chat piles, chat bases and fine tailings piles. - Voluntarily relocating residents, tenants and businesses in the most heavily impacted mining communities. - Providing rural drinking water connections at homes with high levels of lead in their water wells. - Continuing to maintain subsidence areas such as Hockerville to ensure the cover is adequate and evaluate whether securing the area from trespassers will help to protect the soil cover in the long-term. - Implementing institutional controls to restrict land use, protect remedy components and ensure that site chat sales continue, and that chat is used in a manner that is protective of human health and the environment. - By the start of FY21, EPA will be in compliance with the Off-Site Rule requirements for chat sales as stated in the OU4 ROD. Additional remediation is ongoing. EPA estimated in the decision documents it will take approximately 30 years to complete this work.	

VIII. NEXT REVIEW

The next FYR Report for the Tar Creek site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

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U.S. Environmental Protection Agency. 2016. Technical Memorandum, Remedial Action Report For Two Water Line Installations, Tar Creek Superfund Site, Ottawa County, Oklahoma. September.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Site mining operators began lead and zinc mining activities in the Picher Field of the Tri-State Mining District	Early 1900s
Site mining operators ceased mining activities in the Picher Field	1970s
Mine water began flowing to the surface and draining into Tar Creek	November 1979
Governor of Oklahoma appointed the Tar Creek Task Force to investigate environmental impacts associated with mine drainage	June 1980
Several government agencies conducted the first investigations under the Tar Creek Task Force to assess environmental impacts associated with mine drainage at the Site	1980 and 1981
Tar Creek Task Force received a report documenting the impacts of mine drainage in the Tar Creek basin	October 1981
EPA signed a cooperative agreement with OSDH to conduct the OU1 RI/FS	June 16, 1982
EPA proposed the Site for listing on the NPL	December 30, 1982
OSDH conducted the OU1 RI	June 16, 1982 - March 31, 1983
EPA conducted the OU1 FS	March 31, 1983 - June 6, 1984
EPA finalized the Site's listing on the NPL	September 8, 1983
EPA signed the OU1 ROD	June 6, 1984
EPA sent notice letters to companies and individuals as potentially responsible parties (PRPs) to allow them to complete the OU1 remedial design/remedial action	June 15, 1984
OSDH completed the OU1 remedial design	June 29, 1984 - August 31, 1984
Oklahoma Water Resources Board (OWRB) lowered the designated use of Tar Creek to habitat limited fishery and secondary recreation water body	1985
EPA completed an OU1 removal action	August to October 1985
OWRB completed the OU1 remedial action	June 29, 1984 - December 31, 1986
OWRB began a two-year surface water and groundwater monitoring program to assess the effectiveness of the OU1 remedy	1987 - 1988
EPA signed a referral to the U.S. Department of Justice to implement cost recovery against seven companies identified as PRPs	December 30, 1987
OWRB began a Roubidoux aquifer groundwater monitoring program	1991
EPA entered into a Consent Decree with six PRPs to recover costs related to the RI/FS, ROD and emergency response actions related to OU1	June 10, 1991
U.S. Public Health Service's Indian Health Services notified EPA that 34% of children routinely tested near the Site had blood lead levels that exceeded the CDC's level of 10 µg/dL	January 21, 1994
EPA completed the first FYR for the Site	April 30, 1994
EPA completed the OU2 RI/FS	August 25, 1994 - August 27, 1997
EPA completed removal actions at OU2	September 12, 1995 - September 28, 2006
EPA conducted sampling at the Site in support of a baseline HHRA and RI/FS for the residential portion of OU2	August 1994 - July 1995
EPA issued an action memorandum authorizing a removal response action to address lead-contaminated soils at HAAs	August 15, 1995
EPA issued notices to the PRPs and DOI providing them the opportunity to conduct or finance the removal action at HAAs	August 25, 1995
EPA conducted removal actions at HAAs	September - December 1995

Event	Date
EPA issued Special Notices to PRPs providing them the opportunity to undertake the RI/FS and remedial design for the residential portion of OU2	November 17, 1995
EPA issued an action memorandum authorizing a removal response action to address lead-contaminated soils at 300 residential properties	March 21, 1996
U.S Army Corp of Engineers (USACE) remediated HAAs and residences as a removal action on behalf of EPA	June 1996 - December 1997
EPA completed the OU2 RI/FS	August 25, 1994 - February 7, 1997
EPA signed the OU2 ROD	August 27, 1997
USACE continued removal actions at HAAs and residential yards	January 1998
EPA entered into cooperative agreements with ITEC, the Quapaw Nation and ODEQ to provide funding for RI/FS activities for nonresidential portions of OU2	1998 and 1999
EPA issued an action memorandum authorizing a removal response action to remove laboratory chemicals stored at the Eagle-Picher Office Complex in Cardin, Oklahoma, and designated this response as OU3	March 2, 2000
EPA conducted the OU3 removal response and determined that no further action is warranted	March 28 - May 23, 2000
EPA completed the second FYR for the Site	April 11, 2000
USACE completed the OU2 residential remediation; EPA hired a contractor to continue the OU2 residential remediation	July 2000
ODEQ issued the results of the OU1 Roubidoux groundwater monitoring program	September 2002
EPA, USACE and DOI signed a memorandum of understanding for the Site	May 1, 2003
ODEQ continued the Roubidoux groundwater monitoring program	November 2003
DOI and two mining companies signed an Administrative Order on Consent with EPA to conduct the RI/FS for OU4; PRP began the RI/FS	December 9, 2003
ODEQ plugged five abandoned Roubidoux aquifer wells	April 2004
EPA completed the third FYR for the Site	September 28, 2005
EPA signed the OU2 ESD	August 30, 2007
PRP and EPA finalized the RI/FS and EPA signed the OU4 ROD	February 20, 2008
EPA and ODEQ began the OU4 remedial action	June 5, 2008
EPA established the LICRAT and began the OU4 voluntary buyout	2009
EPA began the construction of the Central Mill Repository	January 2010
EPA signed the OU4 ESD	April 13, 2010
EPA completed the fourth FYR for the Site	September 29, 2010
The Quapaw Nation began OU4 remedial action	October 1, 2010
EPA and ODEQ completed the OU4 voluntary buyout and relocation for communities of Picher, Cardin and Hockerville, Oklahoma	November 2011
EPA and ODEQ completed the OU4 voluntary buyout and relocation for the community of Treece, Kansas	September 2012
The Quapaw Nation signed a cooperative agreement with EPA to conduct the remediation of the Catholic 40 site, the first tribal-led remediation of a Superfund site	October 2012
ODEQ completed Tar Creek After Action Monitoring Part 2 of Roubidoux aquifer	October 2013
The Quapaw Nation completed the first ever tribal lead Superfund remediation performed under a Superfund Cooperative Agreement at the Catholic 40 site, including the preservation of historical features	December 2013 - January 2014
The Quapaw Nation signed the first ever cooperative agreement between a state and tribe to perform remediation at a Superfund site	June 2014
EPA proposed to transfer OU2 from EPA lead to ODEQ lead	July 2014

Event	Date
ODEQ began OU1 O&M activities	August 25, 2014
EPA completed Site's Remedial Action Optimization Report	September 2014
EPA completed OU4 remediation of 10 distal packages, the former smelter property, four residences and construction of the Central Mill Repository	January 2010 - September 2014
EPA completed remediation of 579 properties through implementation of nine remedial action projects under OU2	2009 - September 2014
EPA completed remediation of 2,940 total properties under OU2; EPA began a pilot study by adding soil amendments to determine if topsoil may be preserved for the OU4 remedies	September 2014
ODEQ completed plugging of OU1 Tulsa Mine well	January 30, 2015
ODEQ completed plugging of OU1 Power House well and piezometers	February 2, 2015
EPA began the OU5 RI/FS	July 16, 2015
EPA completed the fifth FYR for the Site	September 29, 2015
ODEQ filed deed notice for a filled in open pit zinc mine (CB011N-Pit A)	December 2015
Quapaw completed remediation of OU4 Southeast Distal Zone, Distal Area Group 8	July 2016
EPA connected two OU4 rural residences to water lines	August 5, 2016
ODEQ completed remediation of Southeast Distal Zone, Distal 6a	September 2016
The Quapaw Nation completed remediation of OU4 Southeast Distal Zone, Distal 7 North (drainage feature)	September 2016
The Quapaw Nation completed remediation of OU4 Southeast Distal Zone, Distal Area Group Beaver Creek North (CP060)	September 2016
EPA completed remediation at OU4 Southeast Distal Area Group 4	September 2017
ODEQ filed deed notice for property where an 18-inch cover was placed over the consolidated materials at CP091	April 2018
ODEQ completed remediation of OU4 Southeast Distal Zone, Beaver Creek Unrestricted Tier 1	July 2018
The Quapaw Nation completed remediation of OU4 Elm Creek Distal Zone, Distal 13	July 2018
ODEQ completed remediation of 16 OU2 properties	August 2018
EPA begins OU5 Feasibility Study with webinar kick-off meeting with stakeholder group	November 28, 2018
BIA in partnership with EPA and the Quapaw Nation recorded the first conservation easement restricting land use on a remediated Indian-owned property	December 2018
BIA in partnership with EPA and the Quapaw Nation recorded conservation easements at three additional Indian-owned properties at the Site	August 2019
EPA completed voluntary buyout and relocation of a family residing at the former smelter site	February 10, 2019
EPA releases the draft RI Characterization Report for review and comment	July 1, 2019
EPA released final Tar Creek Strategic Plan	September 17, 2019

APPENDIX C – ODEQ GROUNDWATER REGULATIONS

Table C-1: Oklahoma Water Quality Standards Title 785, Chapter 45, Appendix H

Groundwater Formation Name (Site name)	Location	Address	Depth Zone (upper-lower limit) feet	Class* (1-4)	Water Supply	Ag	M&I	Agency	Remarks
Boone (Tar Creek Superfund site)	Sec. 13, 14, 23, 24, 25, 26, 35, & 36 of T29N, R22E, IM. Sec. 13-36 of T29N, R23E, IM. Sec. 17-19, W 1/2 Sec. 20, W 1/2 Sec. 29, & Sec. 30-32 of T29N, R24E, IM. Sec. 1, E 1/2 Sec. 2, E 1/2 Sec. 11, Sec. 12, N 1/2 Sec. 13, NE 1/4 Sec. 14 all in T28N, R22E, IM. Sec. 1, W 1/2 Sec. 5, Sec. 6, Sec. 7, W 1/2 Sec. 8, NW 1/4 Sec. 17, N 1/2 Sec. 18 all in T28N, R23 E, IM, W 1/2 Sec. 5, Sec. 6 all in T28N, R24E, IM.	Ottawa County	0 – 350 ft.	2	•	•	•	DEQ, Land Protection Division	Acidic conditions, mine voids, and toxic metals (lead, cadmium and arsenic exceeding MCLs) may be present in the Boone aquifer. Therefore special protective well construction is required to seal off the Boone to protect the underlying Roubidoux aquifer. For Boone wells, competent ground-water testing for toxic metals is required for potable and domestic use; and treatment may be required when groundwater exceeds the MCLs for lead (15 µg/l), arsenic (10 µg/l), or cadmium (5 µg/l).

Source: Oklahoma Office of Administrative Rules Accessed 9/5/2019 at http://www.oar.state.ok.us/graphics/785_45H3.tif

APPENDIX D – PRESS NOTICE

The Oklahoma Department of Environmental Quality (DEQ) and United States Environmental Protection Agency (EPA) Region 6 will be conducting the sixth Five-Year Review of remedy implementation and performance at the Tar Creek Superfund Site (Site) in Ottawa County, Oklahoma. The Five-Year review will determine if the remedies are protective of human health and the environment, and will document the methods, findings, and conclusions of the Five-Year Review in a report. The report will be available to the public on or before September 29, 2020. The Site is a former lead and zinc mining area located in the Tri-State Mining District. The cities of Cardin, Commerce, Miami, North Miami, Picher, Afton, Fairland, Wyandotte, and Quapaw, as well as rural areas in northern Ottawa County, are located within the Site boundaries. Elevated levels of lead, zinc, and cadmium exist in the mining waste and affect the soils, ground water, surface water, and sediments of the Site.

The Site is divided into five Operable Units (OU), each addressing distinct contamination with their own Record of Decision (ROD) that outlines the remedy. The ROD for OU1, signed in 1984, addresses surface water and ground water discharges of acid mine water to Tar Creek and the Roubidoux aquifer. The OU2 ROD, signed in 1997, addresses mining and milling waste and associated contaminated soils in residential yards and high access areas. OU3, which included a drum removal in Cardin, does not have a ROD, but abandoned mining chemicals were addressed under a removal action in 2000. The 2008 ROD for OU4 addresses mining and milling waste, rural residential yard contamination, transition zone soil contamination, and contamination in rural residential wells. Investigations into sediment and surface waters for OU5 are ongoing and a ROD is planned in 2021. Previous Five-Year Review reports are available at the Miami Public Library. Information about the Tar Creek Superfund Site including EPA contact information is available at www.epa.gov/superfund/tar-creek.

DEQ will be conducting interviews in June and July 2019 as part of the Five-Year Review. If you wish to be interviewed, have any questions, or need further information, please contact:

Ms. Amy Brittain
Oklahoma Department of Environmental Quality
Land Protection Division
707 North Robinson
PO Box 1677
Oklahoma City, OK 73101
Phone: (405) 702-5100
Email: amy.brittain@deq.ok.gov

(Published in The Miami News Record – June 14, 2019)

LPXLP

APPENDIX E – SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site Name: Tar Creek Superfund Site	**Date of Inspection:** June 25-26, 2019
Location and Region: Ottawa County, Oklahoma (Region 6)	**EPA ID:** OKD980629844
Agency leading the five-year review: ODEQ	**Weather/temperature:** Clear, mid 80 degrees, light wind

Remedy Includes: (check all that apply)

- ☒ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump-and-treatment
- ☐ Surface water collection and treatment
- ☒ Other - Groundwater monitoring, surface water diversion, excavation and relocation

Attachments: ☒ Inspection team roster attached ☒ Site map attached to report

II. INTERVIEWS (check all that apply)

2. O&M

Interviewed: ☒ by email ☐ at office ☐ by phone ☒ by letter

Problems, suggestions: ☒ Reports attached

3. Local regulatory authorities and response agencies (e.g., 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: Oklahoma Department of Environmental Quality
Contact: Kelly Dixon
☒ Reports attached

Agency: Oklahoma State Department of Health
Contact: Susan Quigley
☒ Reports attached

Agency: Members of Oklahoma Trustee Council
☒ Reports attached

4. Other interviews (optional):

OU2 property owners
Citizens

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

1. O&M Documents

☐ O&M manual (long term monitoring plan)	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: There are no on-site facilities and therefore no records are maintained at the Site. Records and documents are maintained at EPA and ODEQ.

2. Site-Specific Health and Safety Plan	☐ Readily available	☒ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☒ Up to date	☐ N/A

Remarks: All projects operate under project-specific health and safety plans.

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

Remarks:_____

4. Permits and Service Agreements

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

Remarks:_____

5. Gas Generation Records	☐ Readily available	☐ Up to date	☒ N/A
6. Settlement Monument Records	☐ Readily available	☐ Up to date	☒ N/A
7. Groundwater Monitoring Records	☒ Readily available	☒ Up to date	☐ N/A

Yearly groundwater reports are available through ODEQ in Central Records and on ODEQ's website.

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

9. Discharge Compliance Records

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

Remarks:_____

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

IV. O&M COSTS

1. O&M Organization

☒ State in-house ☐ Contractor for State ☐ PRP in-house
☐ Contractor for PRP ☐ Other:

2. O&M Cost Records –

☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
☐ Original O&M cost estimate_____ ☐ Breakdown attached

Total annual State cost by year for OU1 O&M

Date		Date	Total Cost		
From July 1, 2015	to	June 30, 2016	$61.79	-	☐ Breakdown attached
From July 1, 2016	to	June 30, 2017	$13,749.59	-	☐ Breakdown attached
From July 1, 2017	to	June 30, 2018	$8,400.23	-	☐ Breakdown attached
From July 1, 2018	to	June 30, 2019	$14,194.42	-	☐ Breakdown attached

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

None

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

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: _____

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls

1. Implementation and enforcement

Site conditions imply institutional controls not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply institutional controls not being fully enforced	☐ Yes	☒ No	☐ N/A

There are deed notices placed on LICRAT buyout homes and contaminated soil repositories. More properties will need deed notices filed when cleanup work is completed.

Type of monitoring (e.g., self-reporting, drive by): general site visits

Frequency: multiple times per year
Responsible party/agency: EPA/ODEQ
Contact: not applicable

Reporting is up to date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☐ No	☒ N/A
Violations have been reported	☐ Yes	☐ No	☒ N/A

Other problems or suggestions: ☐ Report attached

2. Adequacy ☒ Institutional controls are adequate ☐ Institutional controls are inadequate ☐ N/A

Remarks: Ottawa County Clerk's Office visit took place on June 26, 2019. Both deed notices filed since last FYR were found (CP091 and CB011N-Pit A) in the computer look-up available to the public. Copies of all 534 deed notices filed for the Site are available in ODEQ's institutional control database on ODEQ's website.

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident

Remarks:_____

2. Land use changes on site ☐ N/A ☒ Land use changes evident

Remarks:

Remediated properties were vegetated and have agricultural use. Contaminated soils and chat were placed in repositories constructed from subsidence holes, old mill ponds, and chat bases. Repositories have limited agricultural use and have deed notices filed on them.

3. Land use changes off site ☒ N/A

Remarks:_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are publicly owned and maintained.

B. Other Site Conditions ☒ Applicable ☐ N/A

Remarks:_____

VII. LANDFILL COVERS ☒Applicable ☐ N/A

A. Landfill Surface

1. Settlement (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent: 10 square feet Depth: 6 inches
Remarks: At the capped Hockerville subsidence, there is a low spot in the southeast corner that has standing water.

2. Cracks ☐ Location shown on site map ☒ Cracking not evident
Lengths _____ Widths_____ Depths_____
Remarks:_____

3. Erosion ☐ Location shown on site map ☒ Erosion not evident
Areal extent _____ Depth _____
Remarks:_____

4. Holes ☐ Holes evident ☒ Holes not evident
Areal extent _____ Depth _____
Remarks:_____

5. Vegetative Cover ☒ Grass ☒ Cover properly established ☒ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: Good vegetative growth present on site.

6. Alternative Cover (armored rock, concrete, etc.) ☒ N/A
Remarks: _____

7. Bulges ☐ Location shown on site map ☒ Bulges not evident
Areal extent _____ Depth _____
Remarks: _____

8. Wet Areas/Water Damage ☐ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	☐ Areal extent _____
☒ Ponding	☐ Location shown on site map	☐ Areal extent _____
☐ Seeps	☐ Location shown on site map	☐ Areal extent _____
☐ Soft subgrade	☐ Location shown on site map	☐ Areal extent _____

Remarks: Ponding evident in southeast corner of the capped Hockerville subsidence area.

9. Slope Instability ☐ Slides ☐ Location shown on site map
☒ No evidence of slope instability Areal extent _____
Remarks:_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. Flows Bypass Bench ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

2. Bench Breached ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

3. Bench Overtopped ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

1. Settlement ☐ Location shown on site map ☐ No evidence of settlement
Remarks: _____

2. Material Degradation ☐ Location shown on site map ☐ No evidence of degradation
Material type _____ Areal extent _____
Remarks:_____

3. Erosion ☐ Location shown on site map ☐ No evidence of erosion
Areal extent _____ Depth _____
Remarks: _____

4. Undercutting ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent _____ Depth _____
Remarks:_____

5. Obstructions Type _____
☐ No obstructions ☐ Location shown on site map
Areal extent _____ Size _____
Remarks:_____

6. Excessive Vegetative Growth Type _____
☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent _____
Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. Gas Vents ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☒ N/A
Remarks:_____

2. Gas Monitoring Probes
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☒ N/A
Remarks:_____

3. Monitoring Wells (within surface area of landfill)
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks:_____

4. Leachate Extraction Wells
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks: _____

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks:_____

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

1. Gas Treatment Facilities
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O&M
Remarks: _____

2. Gas Collection Wells, Manifolds, and Piping ☐ Good condition ☐ Needs O&M
Remarks: _____

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs O&M ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A
Remarks: _____

2. Outlet Rock Inspected ☐ Functioning ☐ N/A
Remarks:_____

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

1. Siltation Areal extent _____ Size _____
☐ N/A ☐ Siltation not evident
Remarks: _____

2. Erosion Areal extent _____ Depth_____
☐ Erosion not evident
Remarks: _____

3. Outlet Works ☐ Functioning ☐ N/A
Remarks: _____

4. Dam ☐ Functioning ☐ N/A
Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. Deformations ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement _____
Rotational displacement _____
Remarks:_____

2. Degradation ☐ Location shown on site map ☐ Degradation not evident
Remarks:_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. Siltation ☐ Location shown on site map ☐ Siltation not evident
Areal extent _____ Depth _____
Remarks:_____

2. Vegetative Growth ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent _____ Type _____
Remarks: _____

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent _____ Depth _____
Remarks:_____

4. Discharge Structure ☐ Functioning ☐ N/A
Remarks:_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. Settlement ☐ Location shown on site map ☐ Settlement not evident
Areal extent _____ Depth _____
Remarks:_____

2. Performance Monitoring Type of monitoring _____
☐ Performance not monitored Frequency _____ ☐ Evidence of breaching
Head differential _____
Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. Pumps, Wellhead Plumbing, and Electrical

☒ Good condition ☐ All required wells located ☐ Needs O&M ☐ N/A

Remarks: Both the Mayer Ranch and Southeast Commerce passive treatment systems are maintained by the University of Oklahoma. The University of Oklahoma has an operations agreement with the city of Commerce. The systems are regularly inspected by the city.

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☒ Good condition ☐ Needs O&M

Remarks: _____

3. Spare Parts and Equipment

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

Remarks: _____

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

1. Collection Structures, Pumps, and Electrical

☒ Good condition ☐ Needs O&M

Remarks: Series of wetland/surface flow ponds, re-aeration ponds and vertical flow bio-reactors are present as part of the surface water treatment train.

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

☒ Good condition ☐ Needs O&M

Remarks: Presumed to be in good condition but are not visible.

3. Spare Parts and Equipment

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

Remarks:_____

C. Treatment System ☒ Applicable ☐ N/A

1. Treatment Train (check components that apply)

☒ Metals removal ☐ Oil/water separation ☒ Bioremediation
☐ Air stripping ☐ Carbon absorbers
☐ Filters
☒ Additive (e.g., chelation agent, flocculent): pH management
☒ Others: Passive aeration system
☒ Good condition ☐ Needs O&M
☒ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually

Remarks: Metals removal occurs in oxidation pond, vertical flow bio-reactors, re-aeration ponds and limestone beds. Additive occurs via vertical flow bio-reactors.

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

☐ N/A ☒ Good condition ☐ Needs O&M

Remarks: Most electrical equipment run by solar panels and windmill.

3. Tanks, Vaults, Storage Vessels

☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs O&M

Remarks:_____

4. Discharge Structure and Appurtenances

☐ N/A ☒ Good condition ☐ Needs O&M

Remarks:_____

5. Treatment Building(s)

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

☐ Chemicals and equipment properly stored

Remarks:_____

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

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

☐ All required wells located ☐ Needs O&M ☒ N/A

Remarks:_____

D. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. Monitoring Wells (natural attenuation remedy)

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

☐ All required wells located ☐ Needs O&M ☐ N/A

Remarks:_____

X. OTHER REMEDIES

If there are remedies applied at the Site that are 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.

OU1

Plugged well at Power House property southwest of Cardin and one near Picher water tower; both are in good condition. Diversion Dike at Douthat Bridge is fenced and behind locked gate. Good vegetative growth present on site. Evidence of animal burrow in railroad right-of-way before start of constructed diversion dike.

OU2

The OU2 ROD addresses soils in residential yards and HAAs contaminated with lead. Residential yards MIA0274, MIA0933-0935, COM0242 and Centennial Park in Miami appeared to be in good condition. There was recent evidence of flooding in Centennial Park. However, grass was well established.

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 to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedial objectives include controlling exposure to contaminated soil, waste and groundwater. Cleanup work continues to be performed to meet these goals. The current implementation of the remedy is effective and functioning as planned.

B. Adequacy of O&M

Current O&M activities are adequate.

C. Early Indicators of Potential Remedy Failure

Remedial actions should continue to ensure remedy success.

D. Opportunities for Optimization

Agencies continue to look for optimization opportunities for all OUs.

INSPECTION TEAM ROSTER

Name	Organization	Title
Amy Brittain	ODEQ	Environmental Programs Manager
Zach Bradley	ODEQ	Engineer Intern/Project Manager
Ellen Isbell	ODEQ	Environmental Programs Specialist
Eric Marsh	Skeo	Project Manager
Claire Marcussen	Skeo	Project Writer

APPENDIX F – REMOVAL ACTION AND/OR REMEDIAL ACTION AND SITE INSPECTION PHOTOS

Remediation Distal 6A - BEFORE (October 2014) and AFTER (September 2015)

Remediation Distal 13 Chat Base CB028-S1- BEFORE (August 2016) and AFTER (July 2018)

Date: 6/25/2019; Taken By: Amy Brittain, ODEQ
Location: Stop 1, Hockerville subsidence area
Photo Direction: South
Comments: Fenced and behind locked gate. Good vegetative growth present on site.

Date: 6/25/2019; Taken By: Amy Brittain, ODEQ
Location: Stop 2, OU2 repository – state line
Photo Direction: South
Comments: Fenced and behind locked gate. Good vegetative growth present on site.

Date: 6/25/2019; Taken By: Amy Brittain, ODEQ
Location: Stop 3, Hockerville subsidence area
Photo Direction: South
Comments: Good vegetative growth present except in southeast corner, which has standing water in a depression.

Date: 6/25/2019; Taken By: Amy Brittain, ODEQ
Location: Stop 3, Hockerville subsidence area
Photo Direction: Southeast
Comments: Southeast corner of filled subsidence area with standing water in a depression.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 4, Plugged well at Power House
Photo Direction: South
Comments: The plugged well is in good condition.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 6, OU4 Elm Creek project
Photo Direction: South
Comments: This OU4 project is still under remediation.

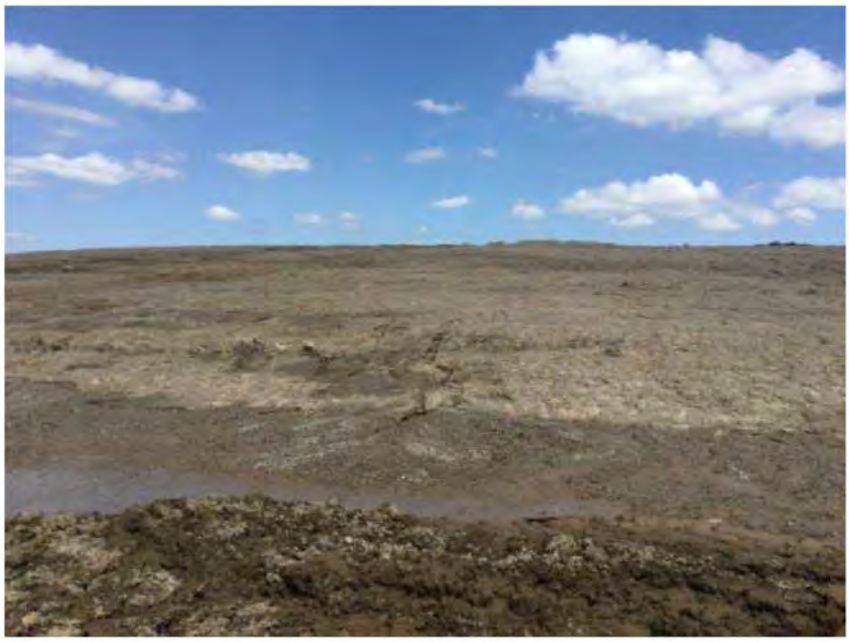
Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 4, OU4 Elm Creek project
Photo Direction: West
Comments: This OU4 project is still under remediation.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 5, Plugged well in Picher
Photo Direction: North
Comments: The plugged well is in good condition.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 8, Diversion Dike at Douthat Bridge
Photo Direction: West
Comments: Fenced and behind locked gate. Good vegetative growth present on diversion dike.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 9, OU2 Repository – Central
Photo Direction: North
Comments: Fenced and behind locked gate. Good vegetative growth present on site.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 7, OU4 Repository
Photo Direction: Northwest
Comments: Fenced and behind locked gate. No final cap established and no vegetative growth.



Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 7, OU4 Repository
Photo Direction: East
Comments: Well-graded side slope of repository.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 10, CP091
Photo Direction: West
Comments: Fenced and behind locked gate. Good vegetative growth present on site.

Date: 6/25/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 11, CB011N-Pit A
Photo Direction: West
Comments: Fenced and behind gate. Good vegetative growth present on site.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 12, Mayer Ranch passive treatment system
Photo Direction: South
Comments: Fenced and behind locked gate. Maintained by University of Oklahoma. Top cell of passive treatment system, inflow water is very high in iron.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 12, Mayer Ranch passive treatment system
Photo Direction: Southwest
Comments: Polishing cell, water clear.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 12, Mayer Ranch passive treatment system
Photo Direction: East
Comments: Outfall of system, water clear.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 13, Southeast Commerce passive treatment system
Photo Direction: South
Comments: Fenced and behind locked gate. Maintained by University of Oklahoma. Top cell of system, inflow water high in iron.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 13, Southeast Commerce passive treatment system
Photo Direction: South
Comments: Treatment wetland cell of system.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 13, Southeast Commerce passive treatment system
Photo Direction: Northeast
Comments: Final polishing cell of system, water looks clear.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 13, Southeast Commerce passive treatment system
Photo Direction: North
Comments: Pump house and carbon filter. Door kept locked.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 13, Southeast Commerce passive treatment system
Photo Direction: Northeast
Comments: Outfall of system, water looks clear.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 19, Residential yard COM0242
Photo Direction: North
Comments: OU2 remedial property. Good condition with good vegetation.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 19, Residential yard COM0242
Photo Direction: Northwest
Comments: Good condition with good vegetation.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 14, residential yard MIA0274
Photo Direction: Southeast
Comments: OU2 remedial property. Good condition with good vegetation.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 15, residential yard MIA0933-0935
Photo Direction: East
Comments: OU2 remedial property. Good condition with good vegetation.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 15, residential yard MIA0933-0935
Photo Direction: Southeast
Comments: Property is well maintained.

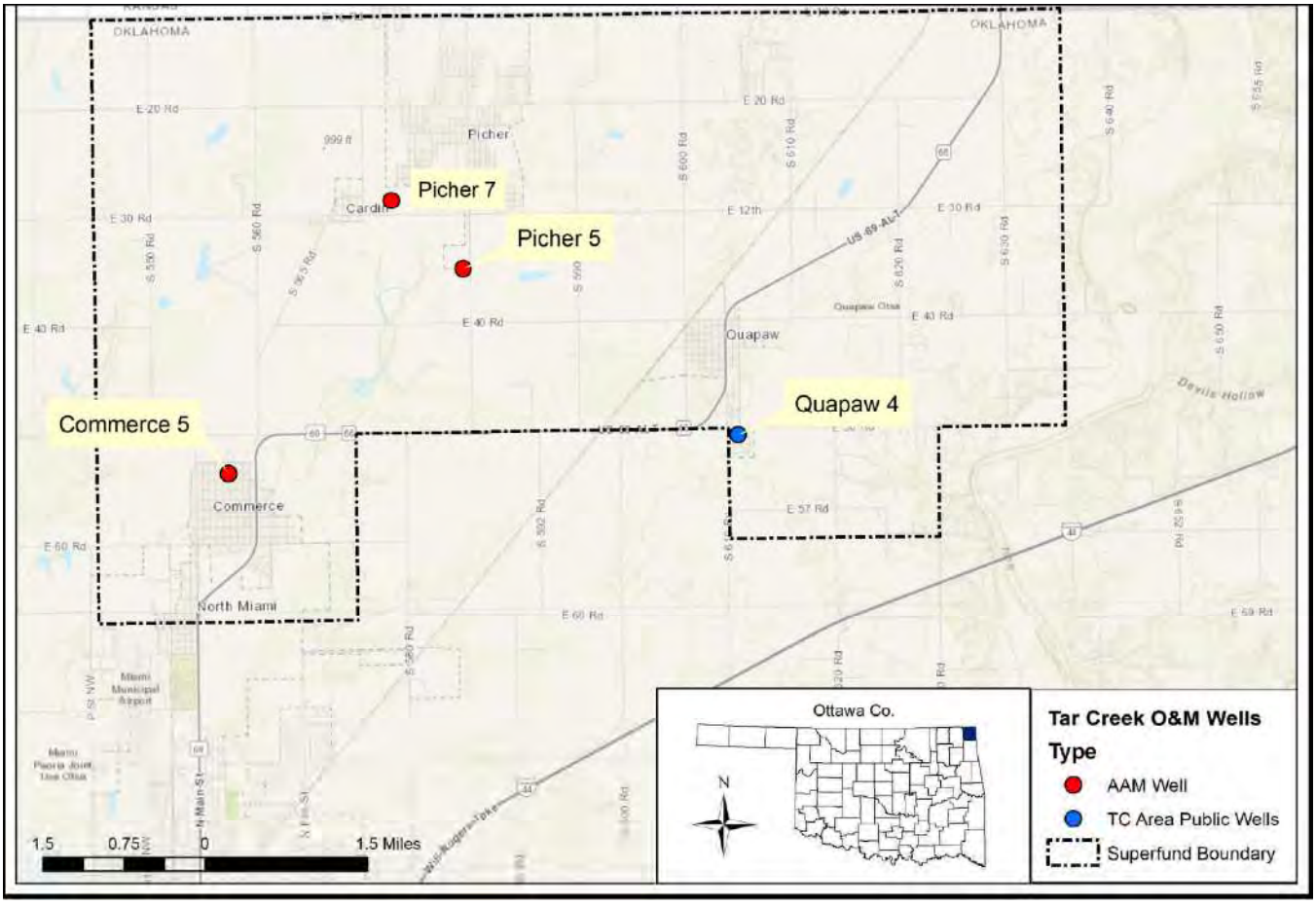
Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 16, Centennial Park
Photo Direction: West
Comments: Cleanup area RY7. Good condition with good vegetation.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 16, Centennial Park
Photo Direction: West
Comments: Cleanup area RY6. Well vegetated. Evidence of recent flooding.

Date: 6/26/2019
Taken By: Amy Brittain, ODEQ
Location: Stop 17, Local Information Repository – Miami Public Library
Photo Direction: North
Comments: Well stocked, missing last two FYR reports. Located in the basement of the library.

APPENDIX G – DATA ANALYSIS FIGURES AND TABLES

Figure G-1: Location of OU1 Groundwater Wells Included in Annual Monitoring



Notes:

AAM = After Action Monitoring Wells
TC = Tar Creek

Source: ODEQ. 2018. Operable Unit 1 – Operation and Maintenance Annual Report 2018. Tar Creek Superfund Site, Ottawa County, Oklahoma.

Table G-1: OU1 Performance Standards for Indicator Chemicals and COCs

Parameter	Indicators of Possible Mine Impacts						Lead		Cadmium	
	Zinc		Iron		Sulfate					
Unit	**mg/L**	**µg/L**	**mg/L**	**µg/L**	**mg/L**	**µg/L**	**mg/L**	**µg/L**	**mg/L**	**µg/L**
Background Levels	0.0088	8.8	0.0615	61.5	25	25,000	NA	NA	NA	NA
Tolerance Limit	0.043	43	0.207	207	82	82,000	0	0	0	0
SMCL	5	5,000	0.300	300	250	250,000	NA	NA	NA	NA
MCL	NA	NA	NA	NA	NA	NA	0.015	15	0.005	5

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
SMCL = secondary maximum contaminant level
MCL = maximum contaminant level
NA = does not apply; performance standard not established.
Source: Roubidoux Aquifer Groundwater Monitoring Plan, Operable Unit 1. Tar Creek Superfund Site. Ottawa County, Oklahoma. February 2018.

Table G-2: OU1 Historical Data

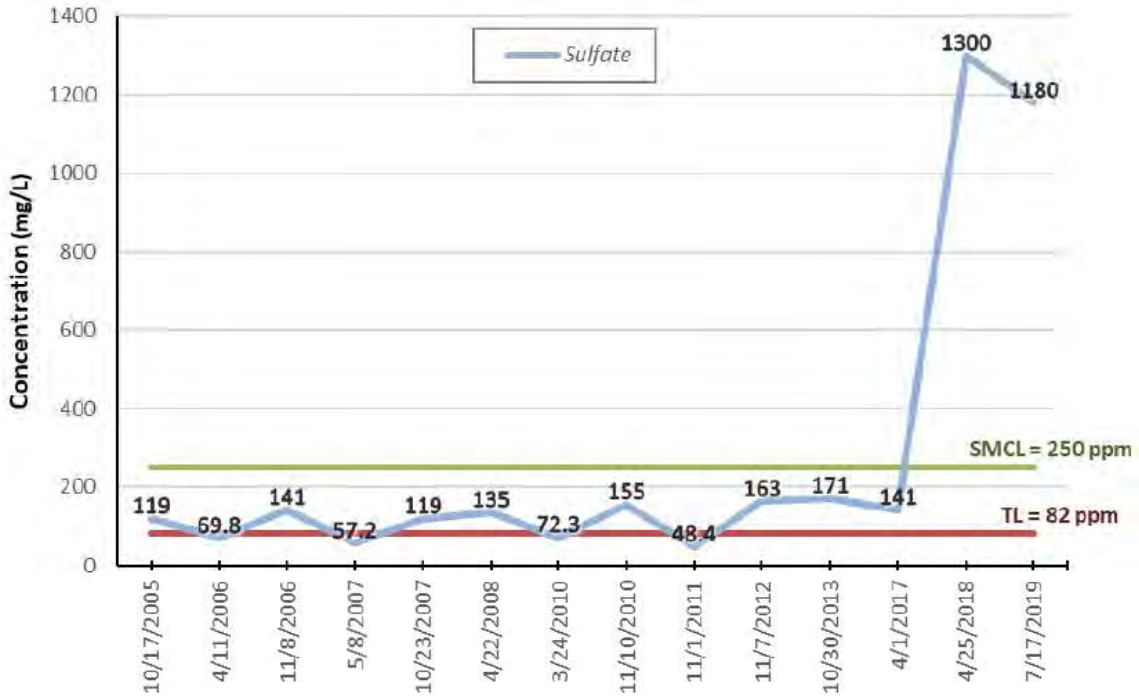
		Cond.	Temp.	pH	D.O.	Sulfate	Hardness	Cadmium	Iron	Lead	Zinc
	Analysis	(Field)	(Field)	(Field)	(Field)	SO_4	$CaCO_3$	Cd	Fe	Pb	Zn
	Unit	µS/cm	°C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
	MCL/(SMCL)			(6.5 – 8.5)		250		0.005	0.3	0.015	5
	Roub. T.L.					82			0.207		0.043
	Roub. Bkgnd					25			0.062		0.009
Picher #5 - MW		Master Record of Data Results									
7/17/2019	Totals	2000	19.4	6.4	-	1180	-	<0.002	19.9	<0.005	3.49
	Dissolved	-	-	-	-		-	<0.002	17.8	<0.005	3.38
7/17/2019	Totals	-	-	-	-	1180	-	<0.002	20	<0.005	3.54
	Dissolved	-	-	-	-	-	-	<0.002	18.3	<0.005	3.41
5/2/2018	Totals	1891	23.3	6.17	14.1	1360	-	<0.002	21.8	<0.005	3.14
	Dissolved	-	-	-	-	-	-	<0.002	21.9	<0.005	3.06
5/2/2018	Totals	-	-	-	-	1300	-	<0.002	21.5	<0.005	2.85
	Dissolved	-	-	-	-	-	-	<0.002	21.8	<0.005	3.04
3/14/2017	Totals	587	17.55	7.76	14	141	-	<0.002	-	<0.005	-
	Dissolved	-	-	-	-	-	-	<0.002	0.0432	<0.005	0.0194
3/14/2017	Totals	-	-	-	-	141	-	<0.002	-	<0.005	-
	Dissolved	-	-	-	-	-	-	<0.002	0.0406	<0.005	0.0194
10/30/2013	Totals	703	19.17	6.82	1.11	171	329	<0.002	0.168	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.138	<0.005	<0.005
10/30/2013	Totals	688	19.24	6.72	1.83	169	328	<0.002	0.172	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.137	<0.005	<0.005
11/7/2012	Totals	671	17.43	6.98	1.29	160	301	<0.002	0.144	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.129	<0.005	<0.005
11/7/2012	Totals	671	17.43	6.98	1.29	163	306	<0.002	0.146	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.13	<0.005	<0.005
11/1/2011	Totals	431	20.18	7.66	0.71	48.4	146	<0.002	0.239	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.223	<0.005	<0.01
11/1/2011	Totals	431	20.18	7.66	0.71	48.4	146	<0.002	0.238	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.216	<0.005	<0.01
11/10/2010	Totals	601	19.43	5.61	1.14	153	258	<0.002	0.141	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.102	<0.005	<0.01
11/10/2010	Totals	601	19.43	5.61	1.14	155	260	<0.002	0.144	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.102	<0.005	<0.01
3/24/2010	Totals	412	18.76	7.25	1.35	69.5	198	<0.002	0.119	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.096	<0.005	<0.005
3/24/2010	Totals	412	18.76	7.25	1.35	72.3	198	<0.002	0.112	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.09	<0.005	<0.005
4/22/2008	Totals	604	21.67	7.26	2.35	135	264	<0.002	0.113	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.11	<0.005	<0.005
10/23/2007	Totals	605	19.25	7.17	2.5	119	265	<0.002	0.118	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.115	<0.005	0.042
10/23/2007	Totals	605	19.25	7.17	2.5	122	268	<0.002	0.118	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.101	<0.005	<0.005
5/8/2007	Totals	442	20.03	7.59	1.56	57.2	194	<0.002	0.116	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.11	<0.005	<0.005
11/8/2006	Totals	635	21.46	7.23	0.88	141	282	<0.002	0.118	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.108	<0.005	<0.005
4/11/2006	Totals	483	23.9	8.51	2.68	68.3	189	<0.002	0.629	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.112	<0.005	<0.005
4/11/2006	Totals	483	23.9	8.51	2.68	69.8	189	<0.002	0.227	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.1	<0.005	<0.005
10/17/2005	Totals	544	21.8	7.81	0.3	119	264	<0.002	0.098	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.046	<0.005	<0.005

		Cond.	Temp.	pH	D.O.	Sulfate	Hardness	Cadmium	Iron	Lead	Zinc
Analysis		(Field)	(Field)	(Field)	(Field)	SO_4	$CaCO_3$	Cd	Fe	Pb	Zn
Unit		µS/cm	°C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
MCL/(SMCL)				(6.5 – 8.5)		250		0.005	0.3	0.015	5
Roub. T.L.						82			0.207		0.043
Roub. Back						25			0.062		0.009
Picher #7 – MW		Master Record of Data Results									
4/30/2019	Totals	468.5	19.5	7.22	-	138		<0.002	0.153	<0.005	<0.005
	Dissolved							<0.002	< 0.020	<0.005	<0.005
4/30/2019	Totals					139		<0.002	0.162	<0.005	<0.005
	Dissolved							<0.002	0.0239	<0.005	<0.005
4/25/2018	Totals	1328	19.3	7.24	9.6	172	-	<0.002	**0.387**	<0.005	0.0123
	Dissolved					-	-	<0.002	**0.372**	<0.005	0.0125
4/25/2018	Totals	-	-	-	-	164	-	<0.002	**0.374**	<0.005	0.0146
	Dissolved	-	-	-	-	-	-	<0.002	< 0.020	<0.005	0.0108
10/29/2013	Totals	855	19.25	6.74	2.9	**346**	551	<0.002	**0.278**	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	**0.325**	<0.005	<0.005
10/29/2013	Totals	858	19.55	6.68	2.18	**334**	552	<0.002	**0.276**	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	**0.326**	<0.005	<0.005
11/6/2012	Totals	933	19.24	7	1.42	**351**	565	<0.002	**0.537**	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	**0.431**	<0.005	<0.005
11/1/2011	Totals	na	na	na	na	na	na	na	na	na	na
	Dissolved	-	-	-	-	-	-	na	na	na	na
11/9/2010	Totals	835	21.74	5.96	1.59	**277**	419	<0.002	0.204	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.201	<0.005	<0.01
3/23/2010	Totals	829	20.82	6.28	2.96	**263**	467	<0.002	**0.317**	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.285	<0.005	<0.005
4/21/2008	Totals	779	22.21	7.09	1.92	240	393	<0.002	0.176	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.187	<0.005	<0.005
10/22/2007	Totals	700	16.05	7.3	1.38	194	347	<0.002	0.079	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.071	<0.005	<0.005
5/8/2007	Totals	647	19.65	7.41	1.14	198	307	<0.002	0.08	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.075	<0.005	<0.005
11/7/2006	Totals	652	19.81	7.04	2.04	175	329	<0.002	0.124	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.113	<0.005	<0.005
4/11/2006	Totals	482	19.6	8.2	1.43	103	216	<0.002	0.079	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.065	<0.005	<0.005
10/17/2005	Totals	527	20.4	7.82	0.2	137	280	<0.002	0.064	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.062	<0.005	<0.005
4/25/2005	Totals	524	18.3	7.71	1.87	125	261	<0.002	0.09	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.09	<0.005	<0.005
10/12/2004	Totals	483	17.9	7.83	1.31	112	244	<0.002	0.127	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.121	<0.005	<0.005
4/27/2004	Totals	480	20.2	7.5	4.35	112	237	<0.005	0.078	<0.01	<0.005
	Dissolved	-	-	-	-	-	-	<0.005	0.072	<0.01	<0.005
11/5/2003	Totals	563	14.7	6.89	n.a.	141	284	<0.002	0.166	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.16	<0.005	<0.01
4/19/2002	Totals	525	20.2	7.38	n.a.	112	255	<0.002	0.092	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.073	<0.005	<0.01
12/13/2001	Totals	455	16.9	7.6	n.a.	93.3	211	<0.002	0.063	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.049	<0.005	<0.01
3/9/2001	Totals	546	17.7	7.48	n.a.	121	257	<0.002	0.173	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.16	<0.005	<0.01
10/17/2000	Totals	453	16.9	7.25	n.a.	71.1	215	<0.002	0.163	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.159	<0.005	<0.01
	Averages	638	19	7.22	1.91	184.5	336	0.002	0.163	0.005	0.007

		Cond.	Temp.	pH	D.O.	Sulfate	Hardness	Cadmium	Iron	Lead	Zinc
Analysis		(Field)	(Field)	(Field)	(Field)	SO_4	$CaCO_3$	Cd	Fe	Pb	Zn
Unit		µS/cm	°C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
MCL/(SMCL)				(6.5 – 8.5)		250		0.005	0.3	0.015	5
Roub. T.L.						82			0.207		0.043
Roub. Back						25			0.062		0.009
Quapaw #4		Master Record of Data Results									
4/30/2019	Totals	213.2	18.8	7.57	-	15.6	-	<0.002	< 0.020	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	< 0.020	<0.005	<0.005
4/25/2018	Totals	498.7	18.7	7.65	17.4	18.8	-	<0.002	< 0.020	<0.005	0.0271
	Dissolved	-	-	-	-	-	-	<0.002	0.0264	<0.005	0.0192
3/14/2017	Totals	287	17.81	7.49	6	16.3	-	<0.002	-	<0.005	-
	Dissolved	-	-	-	-	-	-	<0.002	< 0.02	<0.005	<0.005
10/31/2013	Totals	295	19.12	7.09	1.49	14.3	126	<0.002	0.025	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.02	<0.005	<0.005
11/8/2012	Totals	284	18.23	7.34	0.58	15.5	128	<0.002	0.031	<0.005	0.007
	Dissolved	-	-	-	-	-	-	<0.002	0.036	<0.005	<0.005
11/8/2012	Totals	284	18.23	7.34	0.58	15.7	127	<0.002	0.032	<0.005	0.006
	Dissolved	-	-	-	-	-	-	<0.002	0.026	<0.005	<0.005
11/3/2011	Totals	276	15.3	7.72	0.8	14.3	104	<0.002	0.026	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.034	<0.005	<0.01
11/11/2010	Totals	263	17.89	**5.73**	0.48	15.7	117	<0.002	<0.02	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.01
11/11/2010	Totals	263	17.89	**5.73**	0.48	15.2	116	<0.002	<0.02	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.01
3/25/2010	Totals	228	17.16	6.97	0.86	14.7	121	<0.002	0.026	<0.005	0.031
	Dissolved	-	-	-	-	-	-	<0.002	0.021	<0.005	<0.005
3/25/2010	Totals	228	17.16	6.97	0.86	14.8	119	<0.002	0.022	<0.005	0.012
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
4/22/2008	Totals	263	20.35	7.54	1.35	13.2	123	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
10/24/2007	Totals	280	17.87	7.4	1.46	14.3	127	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	0.01
5/9/2007	Totals	287	19.85	7.28	1.12	12.6	132	<0.002	<0.02	<0.005	0.043
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	0.041
11/9/2006	Totals	276	19.12	7.39	0.52	20	134	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
4/12/2006	Totals	270	18.8	8.53	1.03	15.2	118	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
10/18/2005	Totals	258	19.9	7.96	1.58	16.4	136	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
4/26/2005	Totals	261	16.8	8.04	1.57	13.5	119	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
10/13/2004	Totals	242	17.4	7.86	1.43	12.7	121	<0.002	<0.02	<0.01	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.01	0.005
10/13/2004	Totals	242	17.4	7.86	1.43	12.8	121	<0.002	<0.02	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
4/28/2004	Totals	275	19.4	7.31	2.29	11.8	122	<0.005	<0.02	<0.005	0.005
	Dissolved	-	-	-	-	-	-	<0.005	<0.02	<0.005	<0.005
11/6/2003	Totals	249	17.7	7.03	n.a.	11.1	120	<0.002	<0.02	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.01
11/6/2003	Totals	249	17.7	7.03	n.a.	11.1	121	<0.002	<0.02	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.01

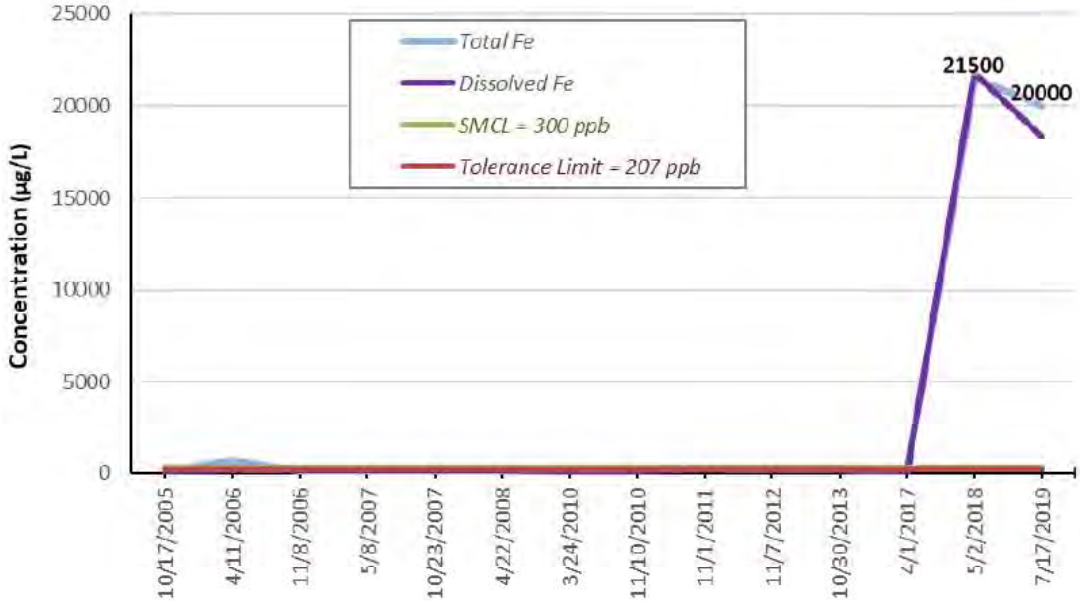
		Cond.	Temp.	pH	D.O.	Sulfate	Hardness	Cadmium	Iron	Lead	Zinc
Analysis		(Field)	(Field)	(Field)	(Field)	SO_4	$CaCO_3$	Cd	Fe	Pb	Zn
Unit		µS/cm	°C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
MCL/(SMCL)				(6.5 – 8.5)		250		0.005	0.3	0.015	5
Roub. T.L.						82			0.207		0.043
Roub. Back						25			0.062		0.009
Commerce #5		Master Record of Data Results									
4/30/2019	Totals	235.3	19.8	7.65	-	15.4		<0.002	0.0983	<0.005	<0.005
	Dissolved							<0.002	< 0.02	<0.005	<0.005
4/25/2018	Totals	585	19.6	7.69	18.1	18.2	-	<0.002	0.0977	<0.005	0.0129
	Dissolved	-	-	-	-	-	-	<0.002	< 0.02	<0.005	0.0081
3/14/2017	Totals	291	17.55	7.92	-	15.6	-	<0.002	-	<0.005	-
	Dissolved	-	-	-	-	-	-	<0.002	0.063	<0.005	<0.005
10/30/2013	Totals	293	19.99	7.3	1.47	14.9	128	<0.002	0.034	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.032	<0.005	<0.005
11/7/2012	Totals	304	18.47	7.6	1.89	15.9	130	<0.002	0.08	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.031	<0.005	<0.005
11/2/2011	Totals	308	19.52	7.78	0.57	13.9	109	<0.002	0.036	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.032	<0.005	<0.01
11/2/2011	Totals	308	19.52	7.78	0.57	14.1	111	<0.002	0.042	<0.005	0.365
	Dissolved	-	-	-	-	-	-	<0.002	0.037	<0.005	<0.01
11/10/2010	Totals	292	20.05	**6.12**	1.58	17.5	119	<0.002	0.047	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.035	<0.005	<0.01
3/24/2010	Totals	284	19.42	7.5	1.25	15.7	126	<0.002	0.043	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.033	<0.005	<0.005
4/22/2008	Totals	279	20.65	7.47	1.11	13.7	127	<0.002	0.045	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.035	<0.005	<0.005
10/23/2007	Totals	283	18.58	7.65	0.78	14.2	129	<0.002	0.04	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.031	<0.005	0.0076
5/8/2007	Totals	308	20.04	7.74	1.49	12.1	135	<0.002	0.042	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.031	<0.005	<0.005
11/8/2006	Totals	313	21.2	7.74	2.12	17.4	129	<0.002	0.033	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.028	<0.005	<0.005
4/11/2006	Totals	301	19.9	8.57	1.44	14.6	124	<0.002	0.038	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.026	<0.005	<0.005
10/18/2005	Totals	269	20.4	7.81	0.1	13.7	130	<0.002	0.043	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.023	<0.005	<0.005
4/26/2005	Totals	268	18.4	8.17	5.18	13.9	121	<0.002	0.07	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	0.034	<0.005	<0.005
10/12/2004	Totals	260	17.9	8.64	5.65	13	124	<0.002	0.092	<0.005	<0.005
	Dissolved	-	-	-	-	-	-	<0.002	<0.02	<0.005	<0.005
4/27/2004	Totals	252	18.9	7.82	5.75	11.8	122	<0.005	0.093	<0.01	<0.005
	Dissolved	-	-	-	-	-	-	<0.005	0.034	<0.01	<0.005
4/27/2004	Totals	252	18.9	7.82	5.75	11.8	123	<0.005	0.114	<0.01	<0.005
	Dissolved	-	-	-	-	-	-	<0.005	0.039	<0.01	<0.005
11/6/2003	Totals	294	17.7	7.29	n.a.	12	127	<0.002	0.08	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.048	<0.005	0.01
4/18/2002	Totals	294	20.6	7.5	n.a.	11.6	128	<0.002	0.116	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.082	<0.005	<0.01
12/13/2001	Totals	282	17.7	7.48	n.a.	40.9	126	<0.002	0.159	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.12	<0.005	<0.01
3/9/2001	Totals	296	15.6	7.75	n.a.	12.4	125	<0.002	0.197	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.137	<0.005	<0.01
10/13/2000	Totals	333	21	7.68	2.89	10.3	129	<0.002	0.22	<0.005	<0.01
	Dissolved	-	-	-	-	-	-	<0.002	0.178	<0.005	<0.01

Figure G-2: Exceedances of Sulfate Tolerance Limits and SMCL in Picher #5



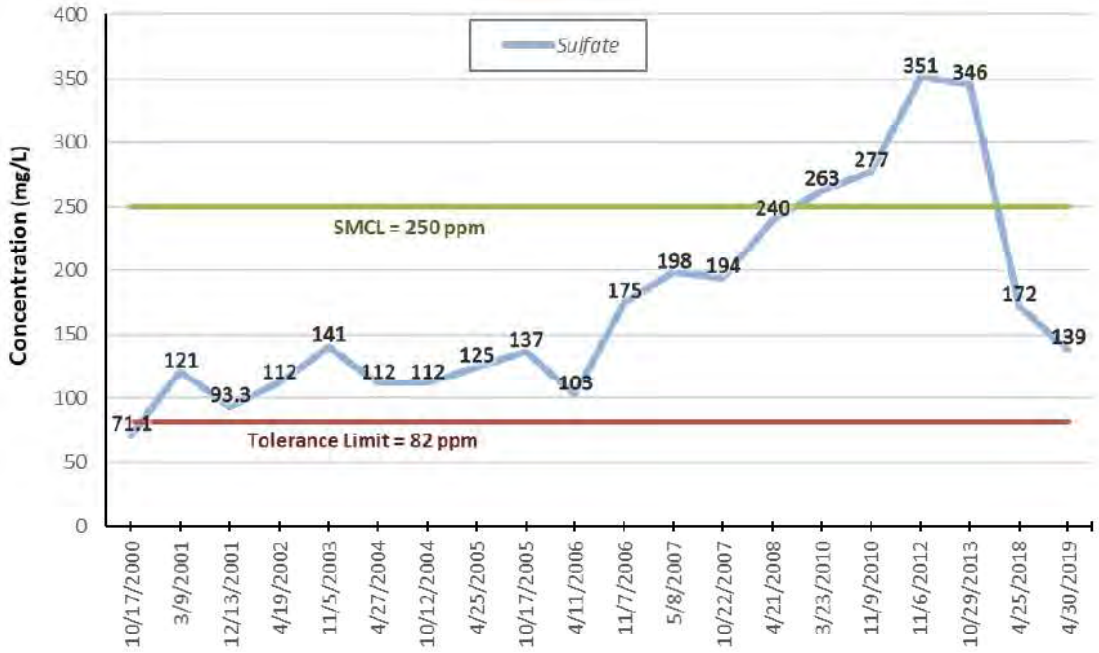
Source: Figure 3a. 2019 OU1 Operation and Maintenance Annual Report. Prepared by ODEQ. October 2019.

Figure G-3: Exceedances of Iron Tolerance Limits and SMCL in Picher #5



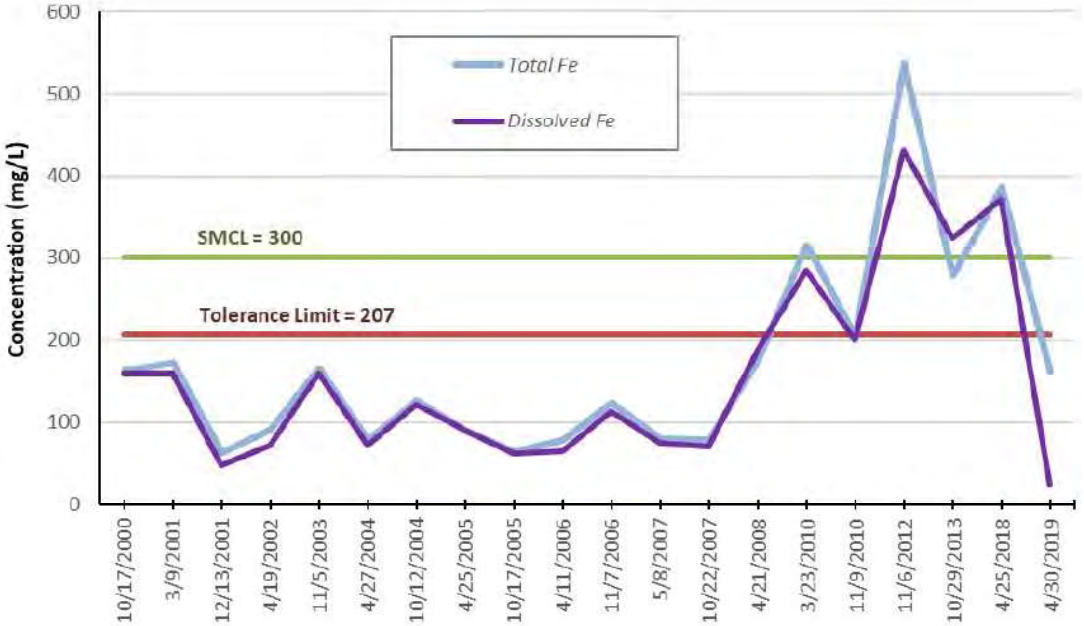
Source: Figure 3b. 2019 OU1 Operation and Maintenance Annual Report. Prepared by ODEQ. October 2019.

Figure G-4: Exceedances of Sulfate Tolerance Limits in Picher #7



Source: Figure 4a. 2019 OU1 Operation and Maintenance Annual Report. Prepared by ODEQ. October 2019.

Figure G-5: Exceedances of Iron Tolerance Limits in Picher #7



Source: Figure 4b. 2019 OU1 Operation and Maintenance Annual Report. Prepared by ODEQ. October 2019.

APPENDIX H – APPLICABLE OR RELEVANT AND APPROPRIATE (ARARS)

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. For this FYR, chemical-specific ARARs and action-specific ARARs were reviewed since they are used to assess the performance of the OU1 and OU4 remedy components to protect groundwater.

The only chemical-specific ARARs identified as a cleanup goal for the Site was the primary drinking water standard for lead in groundwater in the OU4 ROD. The OU1 ROD did not establish cleanup goals for groundwater but the ROD did require groundwater monitoring of the Roubidoux aquifer to identify whether potable wells were impacted by mine water. Wells are identified as impacted by mine water if the concentrations of three indicator contaminants (iron, sulfate and zinc) exceed established tolerance levels and background concentrations, which is discussed in the data review. The monitoring also compares the results to the MCLs for lead and cadmium, which are the national primary drinking water standards for these COCs. Thus, for completeness, the OU4 lead cleanup goal and the OU1 monitoring program performance standards for cadmium and lead were compared to current ARARs to determine if the ARARs have changed. As shown in Table H-1 chemical-specific groundwater ARARs have not changed for lead or cadmium.

The OU2 and OU4 RODs did not identify chemical-specific ARARs for soil COCs. However, the cleanup goals were further evaluated in a screening-level risk evaluation to determine if they remain valid (Appendix K).

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

OU	COC	Performance Standard/Cleanup Goal (µg/L)[a]	Current ARARs (µg/L)	ARAR Change
OU1	Cadmium	5[a]	5	None
	Lead	15[a]	15	None
OU4	Lead	15[b]	15	None

Notes:

a. Performance standards from the 2018 Groundwater Monitoring Plan.
b. Cleanup goal included in the OU4 2008 ROD.
c. Based on the Safe Drinking Water Act primary MCL. Current Safe Drinking Water Act standards can be found at https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants (accessed 6/6/2019).

Action-Specific ARARs

The OU4 ROD calls for ODEQ to restrict groundwater under the authority of OWQS Title 785, Chapter 45, Appendix H. Appendix H states that the Boone aquifer in Ottawa County is a Class II groundwater source suitable for use as a water supply for agriculture and municipal and industrial processes. This information was amended in 2013 in OWQS 785 Chapter 45, Appendix H, Beneficial Use Designations for Certain Limited Areas of Groundwater, including the remark: "Toxic metals, special well construction required." The OWQS regulation was reviewed and no additional changes have occurred.[13] In addition, to help ensure that site chat sales continue and that chat is used in a manner that is protective of human health and the environment, under the OU4 ROD, chat that is used on site or off site must be managed according to the criteria provided in the Chat Rule, 40 CFR Part §278, and its preamble. The ARAR review indicated that the chat rule has not been changed.[14]

[13] Title 785. OWRB Chapter 45. Oklahoma's Water Quality Standards, Appendix H. http://www.owrb.ok.gov/rules/pdf/current/Ch45.pdf (accessed 6/19/2019).

[14] 40 CFR 278 Criteria for the Management of Granular Mine Tailings (Chat). https://www.govinfo.gov/app/details/CFR-2011-title40-vol27/CFR-2011-title40-vol27-part278 (accessed 6/19/2019).

APPENDIX I – INTERVIEW FORMS

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, Oklahoma		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit **X** Other		**Time:** 3:30 p.m.	**Date:** 7/02/19
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** ODEQ	
Telephone No: 405-702-5100 **Email:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Jason White	**Title:** Manager, Environmental Programs	**Organization:** Cherokee Nation/ITEC	
Telephone No: 918-453-5110 **Email Address:** jason-white@cherokee.org	**Street Address:** P.O. Box 948 **City, State, Zip:** Tahlequah, OK 74465		

Summary of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last FYR period (September 2015)?

   Good, there has been progress with remediation activities for the Site within the last five years.

2. Are you aware of any events, incidents or activities at the Site such as vandalism, trespassing or emergency response from local authorities? If so, please provide details.

   No, not aware of any vandalism, trespassing or emergency response activities taken place.

3. What effects have site activities in the last five years had on the surrounding community?

   The site activities have been very beneficial for improving human health and the environment. Each site remediation project is progress to cleaning up the Site and has been very positive to the surrounding community.

4. Have there been any complaints, violations or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results of the responses.

   There have been no complaints, violations and calls to our office during the last five years. There have been no incidents requiring investigation or responses from the Cherokee Nation Environmental Programs Office.

5. Do you feel well informed about the Site's activities and progress?

   Yes, we work with ODEQ, EPA and other northeastern tribes and everyone has worked hard to keep everyone informed of remediation, activities and progress for the Site.

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

   I am happy with the consultation and the inclusion of Cherokee Nation for the remediation activities of Site's management and operations.

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit □ Other		**Time:**	**Date:**
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality	
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Kelly Dixon	**Title: Division Director**	**Organization: OK DEQ**	
Telephone No: 405-702-5151 **E-Mail Address: Kelly.dixon@deq.ok.gov**	**Street Address: 707 N Robinson** **City, State, Zip: OKC, OK 73101**		

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

A tremendous amount of work has been done on OU4. The work appears to be done correctly and efficiently. The efforts to shrink the footprint of the site, focusing on watersheds, seems to be working well. EPA's commitment to funding the site is critical to this continued effort, as is the state's ability to provide the required 10% match. Contracting with another governmental entity, e.g. the Quapaw Nation, has proven to be an effective mechanism to acquire remediation services. State construction lead on unrestricted land and tribal construction lead on restriction land should continue.

The construction of a second passive treatment wetland to improve surface water quality is also critical to continued cleanup at the site.

The commitment to continue to offer residential yard sampling and cleanup (OU2) is critical to the well-being of residents in Ottawa County. The credit goes to DEQ and EPA for this commitment.

The Tar Creek Strategic Plan provides a road map to ensure site progress and to allow common sense approaches that are protective of people and the environment.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

I recently became aware of a project that the City of Commerce intends to implement to mitigate flooding. Unfortunately, it appears that this project could adversely impact the operation of one of the 2 constructed wetland projects. I believe that immediate coordination among all affected parties should begin prior to start of this work; otherwise, sound science that demonstrates the benefits of this remedy may be lost.

3. What effects have site activities in the last five years had on the surrounding community?

Continued residential yard cleanup has benefited residents by removing potential exposure.

Land cleaned up under OU4 is now available as pasture or other agricultural use.

4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

There have been some concerns about end user compliance with the chat rule. EPA is working on appropriate response to that. I do believe that chat sales should continue as long as the end use is approved and safe. Use in federally funded road projects per the chat rule, is probably the highest and best reuse of the chat.

Mine water impacts in some Roubidoux wells may indicate that the OU1 AAM actions are not long-term solutions. This merits close scrutiny and on-going monitoring.

Episodic subsidences continue to pose safety hazards to residents. It is not always clear who has authority and funding to address this issue. A long-term strategy with appropriate state and federal agencies may be indicated.

5. Do you feel well informed about the site's activities and progress?

Yes. I rely on my staff to brief me.

Continued frequent and open coordination with EPA R6, EPA R7, and the Quapaw Nation as well as our KS and MO counterparts will ensure the best outcome of projects at the site.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   Continuing blood lead monitoring is critical to identify possible concerns and to document success.

   Continuing installation of passive treatment wetlands to improve surface water quality should be funded as optimum sites are identified.

   EPA R6 may want to consider writing a MSD for chat as a communication tool for end users of the product. This could be one of several layers of control to ensure chat is used safely.

   DEQ, Quapaw Nation and EPA may want to consider different venue(s) for public meetings about the site.

   Continued evaluation of cleanup numbers that are protective will help to ensure that the cleanups match reuse scenarios.

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, Oklahoma		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit X Other		**Time:**	**Date:** 07/05/2019
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** ODEQ	
Telephone No: 405-702-5100 **Email:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Robert W. Nairn	**Title:** Professor	**Organization:** University of Oklahoma, Center for Restoration of Ecosystems and Watersheds	
Telephone No: 405-325-3354 **Email Address:** nairn@ou.edu	**Street Address:** CEES, 202 West Boyd Street, Room 334 **City, State, Zip:** Norman, OK 73019		

Summary of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last FYR period (September 2015)?

Substantial progress has been made. However, such a complex and extensive site will obviously require dedicated and comprehensive attention. It is encouraging that OU5 and the recently released Strategic Plan seem to be finally reconnecting to OU1 – surface and groundwater. Although source removal (chat use and management) may be expected to address runoff and leachate concerns to some degree, the production of poor-quality water from the underground mine workings and resultant artesian discharges are expected to last decades to centuries, depending on what assumptions are made. The artesian discharges cause dramatic and substantial degradation of receiving streams and require treatment, despite the lack of attention and use of the fee balance waiver under OU1. However, the two operational passive treatment systems near Commerce have shown substantial and sustained improvement of water quality and resulted in both chemical and biological recovery of the receiving stream. Completed characterization of water quality and quantity in the Beaver Creek watershed and in the main stem Tar Creek watershed indicate that these waters are amenable to passive treatment. Tar Creek can run clean and clear again, with appropriately designed, sized and operated passive treatment systems.

2. What effects have site activities in the last five years had on the surrounding community?

Despite the long Superfund history and its many ups and downs, recent activities (e.g., EPA open houses, regular participation by state and federal personnel in the annual Tar Creek Conference, hiring of Quapaw Services Authority to conduct land reclamation work) seem to have had positive impacts on community perspectives.

3. Are you aware of any community concerns regarding the ongoing activities at the Site? If so, please give details. Surface water needs to be addressed. Waiting for land reclamation to be completed before water is addressed is not seen as a viable or acceptable alternative. Although passive treatment technology has proven to be effective, these systems must be recognized as low-maintenance (NOT no maintenance) and a cooperative plan for long-term operation and maintenance of existing and future systems needs to be developed.
4. Are you aware of any events, incidents or activities at the Site such as vandalism, trespassing or emergency response from local authorities? If so, please provide details. I am not aware of any such events.
5. Do you feel well informed about the Site's activities and progress? I feel relatively well informed. The higher-level decision-making process could be more open at times and be arguably less politicized.
6. Do you have any comments, suggestions or recommendations regarding the Site's management or operation? No more than what I already said regarding water concerns.

INTERVIEW RECORD – Tar Creek, Sixth FYR

Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, Oklahoma		**EPA ID No.:** OKD980629844
Type: □ Telephone □ Visit X Other	**Time:** 1:05 p.m.	**Date:** 07/02/2019

PLEASE RETURN TO (may return by mail or email | you can also call):

Name: Ellen Isbell	**Title:** Environmental Programs Manager	**Organization:** ODEQ
Telephone No: 405-702-5129 **Email:** ellen.isbell@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677	

YOUR CONTACT INFORMATION (we want to hear from you – anonymous submissions are welcome, but are not guaranteed to be included in the official review):

Name: Craig Kreman and Summer King	**Title:** Assistant Environmental Director and Environmental Scientist	**Organization:** Quapaw Nation
Telephone No: 918-238-3097 **Email Address:** ckreman@quapawnation.com	**Street Address:** 334 S. Main Street **City, State, Zip:** Quapaw, OK 74363	

QUESTIONS (feel free to attach an additional sheet if more writing space is needed):

1. What is your overall impression of the work conducted on site since the conclusion of the last FYR period (September 2015)?

Cooperation between EPA, ODEQ and the Quapaw Nation has provided instrumental and monumental change to the landscape at Tar Creek and how the cleanup has proceeded. As a vested stakeholder in the cleanup, the Quapaw Nation will continue providing utmost commitment to cleaning up its lands.

2. What effects have site activities in the last five years had on the surrounding community?

The effects have been positive and constructive. There is always room for improvement, optimization and better communication. The Quapaw Nation strives for all of this and more, and this land will be theirs in perpetuity. This work is keeping jobs local and building a community of people committed to putting their land back into some sort of productive use.

3. Are you aware of any community concerns regarding the ongoing activities at the Site? If so, please give details.

I think typical concerns include what is the plan for the washed chat after the processors take the marketable material they want, and will the reclaimed land be able to sustain vegetation in the form of pasture grass and/or row crops?

4. Are you aware of any events, incidents or activities at the Site such as vandalism, trespassing or emergency response from local authorities? If so, please provide details.

Vandalism is a regular occurrence on active cleanup sites, sites that have not been cleaned up yet and the Central Mill Repository. There are still many people trespassing on sites to fish, shoot guns and recreate.

5. Do you feel well informed about the Site's activities and progress? Yes, as a key stakeholder to the cleanup activities and a lead agency to EPA and its cooperative agreements, we feel well informed.
6. Do you have any comments, suggestions, or recommendations regarding the Site's management or operation? No.

INTERVIEW RECORD

Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844
Type: ☐ Telephone ☐ Visit ☒ Other	**Time:** 3:45pm	**Date:** 5-31-19

Contact Made By:

Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677	

Individual Contacted:

Name: SUSAN Quigley	**Title:** OKLA Childhood Lead Poisoning PROGRAM MANAGER Prevention	**Organization:** Oklahoma State Dept of Health
Telephone No: (405) 271-9444 x56720 **E-Mail Address:** SUSAN.Q@Health.OK.GOV	**Street Address:** 1000 NE 10th St **City, State, Zip:** OKLAHOMA City, OK 73117	

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

   Do not have any direct knowledge of work conducted

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

   No, do not live in the area and have not received any information or reports regarding events at the site.

3. What effects have site activities in the last five years had on the surrounding community?

Not in a position to speak in regards to effects in the area or community.

4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

No

5. Do you feel well informed about the site's activities and progress?

Receive some information through partnerships or work with DEQ and Ottawa County Health Department.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

INTERVIEW RECORD

Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit ☒ Other (Letter)		**Time:**	**Date:** 5/24/19

Contact Made By:

Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677	

Individual Contacted:

Name: Kathleen Welch	**Title:** Env. Program Manager	**Organization:** Wyandotte Nation
Telephone No: 918-678-6335 **E-Mail Address:** Kwelch@wyandotte-nation.org	**Street Address:** 64790 E. Hwy 60 **City, State, Zip:** Wyandotte, OK 74370	

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)? Wyandotte Nation still has concerns about the repository and the fact that it Cant possibly hold much more fill. Also, that information attained about the bio-remediation that EPA + Quapaw Tribe has used thus far is not meeting the standards that was originally hoped for.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

NO

3. What effects have site activities in the last five years had on the surrounding community?

Not sure!

4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

NO

5. Do you feel well informed about the site's activities and progress?

Most of the time.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

I think it would be good to every quarter, report to the local news paper on the progress of remediation at the site.

INTERVIEW RECORD – Tar Creek, Sixth 5 Year Review

Site Name: *Tar Creek Superfund Site* **Site Location:** *Ottawa County, OK*	**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit □ Other	**Time:**	**Date:**

PLEASE RETURN TO (May return by mail or email. You can also call!):

Name: Ellen Isbell	**Title:** Environmental Programs Manager	**Organization:** OK Department Environmental Quality
Telephone No: (405)702-5129 **E-Mail:** ellen.isbell@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677	

Resident #1 (interviewed June 24, 2019)

QUESTIONS (Feel free to attach an additional sheet if more writing space is needed.):

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

   OK - Satisfactory

2. What effects have site activities in the last five years had on the surrounding community?

   None We are Aware of

3. Are you aware of any community concerns regarding the ongoing activities at the site? If so, please give details.

NO

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

~~NO~~ NO

5. Do you feel well informed about the site's activities and progress?

NO

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

NO

Resident #2 (interviewed June 20, 2019)

QUESTIONS (Feel free to attach an additional sheet if more writing space is needed.):

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

Very Pleased

2. What effects have site activities in the last five years had on the surrounding community?

Makes our Community Healthier and a better place to live.

3. Are you aware of any community concerns regarding the ongoing activities at the site? If so, please give details.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

5. Do you feel well informed about the site's activities and progress?

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

INTERVIEW RECORD

Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: ☐ Telephone ☐ Visit ☐ Other		**Time:**	**Date:**
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality	
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		

Resident #3 (Interviewed June 6, 2019)

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

It is Favorable

2. What effects have site activities in the last five years had on the surrounding community?

The Buyout has generally been positive although emotionally difficult

3. Are you aware of any community concerns regarding the ongoing activities at the site? If so, please give details.

NO

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

No

5. Do you feel well informed about the site's activities and progress?

yes

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit X Other		**Time: 2:35 PM**	**Date: July 24, 2019**
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality	
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Dean Kruithof	**Title: City Manager**	**Organization: City of Miami**	
Telephone No: 918-541-2201 **E-Mail Address: dean@miamiokla.net**	**Street Address: 129 5th Avenue NW** **City, State, Zip: Miami, OK 74354**		

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

I have been back in Miami during this 5 year period so my perspective related to relatively short term history is limited. However having grown up here in the late 1960's through the 1970's the change in the mined land areas appear to have improved overall. The only sad aspect is the loss of Picher and the effect it has had on former citizens, and the continued discharge of water from the abandoned mines into Tar Creek.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

Over the past 5 years I am aware of two arson fires in the Picher area. Neither of those had an effect on the City of Miami. There were no other notable problems I am aware of.

3. What effects have site activities in the last five years had on the surrounding community?

I believe the immediate clean up and attention to the mined lands has provided hope that a positive and long lasting solution to mine waste can be found. I think the efforts of everyone are very well meaning and greatly appreciated. However, being near the nation's largest Superfund site gives a negative reflection to our community and region. Some overall projects everyone can point to as a definitive "win" would help greatly. For example, initiation of a wide scale water clarification project like that tested as part of OU2 (clarifying ponds) can provide hope water in Tar Creek flowing through Miami is not hazardous.

4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

None that I am aware of.

5. Do you feel well informed about the site's activities and progress?

Generally yes, I think everyone is curious about the next steps after the announcement of funding about 6 months ago.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

We know the issues related to this site are incredibly difficult. I have yet to have an experience with anyone from EPA or ODEQ which was not positive – great team being developed. I wish we could go beyond experiments (like the clarifying ponds) and commence definitive programs that everyone can point to as a solution to these long standing problems.

INTERVIEW RECORD – Tar Creek, Sixth 5 Year Review

Site Name: *Tar Creek Superfund Site* **Site Location:** *Ottawa County, OK*		**EPA ID No.:** OKD980629844
Type: ☐ Telephone ☐ Visit ☑ Other	**Time:** 1545	**Date:** 25JUL19

PLEASE RETURN TO (May return by mail or email. You can also call!):

Name: Ellen Isbell	**Title:** Environmental Programs Manager	**Organization:** OK Department Environmental Quality
Telephone No: (405)702-5129 **E-Mail:** ellen.isbell@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677	

Catholic Priest

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

The initial response was so lacking that I had given up on getting action. Someone encouraged me to contact again after several attempts. After return contact was received the process was slow, but seemed professional.

2. What effects have site activities in the last five years had on the surrounding community?

The environment is now safer.

RECEIVED
JUL 29 2019
LAND PROTECTION DIVISION
DEPT. OF ENVIRON. QLTY

3. Are you aware of any community concerns regarding the ongoing activities at the site? If so, please give details.

I am not aware of any concerns.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

No

5. Do you feel well informed about the site's activities and progress?

Yes, even though it seemed very slow.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Less paperwork and faster remediation

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit □ Other		**Time:**	**Date:**
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality	
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Tommy Long	**Title: City Administrator**	**Organization: City of Commerce**	
Telephone No: 918-675-4373 **E-Mail Address: tlong@commerceokla.com**	**Street Address: 618 Commerce Ave** **City, State, Zip: Commerce OK 74339**		

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

I feel there has been a lot of progress made but there is still much to do.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None that I am aware of.

INTERVIEW RECORD			
Site Name: Tar Creek Superfund Site **Site Location:** Ottawa County, OK		**EPA ID No.:** OKD980629844	
Type: □ Telephone □ Visit □ Other		**Time:**	**Date:**
Contact Made By:			
Name: Amy Brittain	**Title:** Environmental Programs Manager	**Organization:** Oklahoma Department Environmental Quality	
Telephone No: (405)702-5100 **E-Mail:** amy.brittain@deq.ok.gov	**Street Address:** 707 N. Robinson, P.O. Box 1677 **City, State, Zip:** Oklahoma City, OK 73101-1677		
Individual Contacted:			
Name: Tommy Long	**Title: City Administrator**	**Organization: City of Commerce**	
Telephone No: 918-675-4373 **E-Mail Address: tlong@commerceokla.com**	**Street Address: 618 Commerce Ave** **City, State, Zip: Commerce OK 74339**		

Summary Of Conversation

1. What is your overall impression of the work conducted on site since the conclusion of the last five year review period (September 2015)?

I feel there has been a lot of progress made but there is still much to do.

2. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None that I am aware of.

3. What effects have site activities in the last five years had on the surrounding community?

   The largest noticeable effect has been an improvement on the local economy by providing jobs to local people that would otherwise have to go elsewhere to work.

4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

   None that I am aware of.

5. Do you feel well informed about the site's activities and progress?

   There isn't much that has happened directly in my community so I don't know of any of the activities happening in the surrounding communities.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   Not at this time.

APPENDIX J – DEED NOTICES AND CONSERVATION EASEMENTS SINCE THE PREVIOUS FYR

Notice for CB011N-Pit A

I-2015-004754 Book1021 Pg:133
12/08/2015 2:17 pm $19.00
Reba G Sill - Ottawa County Clerk

DEED NOTICE

NOTICE OF REMEDIATION
TAR CREEK OU4
NELSON PROPERTY

NAME OF SITE: CB011N-PitA

AFFECTED PROPERTY: The Affected Property is owned by Glenda Nelson and located at 62697 E South Road, Quapaw, Oklahoma, 74363.

The legal description of the Affected Property is as follows:

Government Lot 2 (NW¼ NE¼) of Section 6, Township 28 North, Range 24 East of the Indian Meridian, Ottawa County, Oklahoma LESS AND EXCEPT Commencing at the NW corner of the NW¼ NE¼ of said Section 6; thence East 792 feet; thence South to the South line of the NE¼ NW¼ NE¼; thence West along said line to the SW corner of the NW¼ NW¼ NE¼; thence North to the point of beginning, containing 12 acres, more or less AND LESS All that portion of Government Lot 2 platted and described as EE-TUN-KEH TOH-WAH ESTATES (SISTERS FOUR) filed in the office of the Ottawa County Clerk, Ottawa County, Oklahoma AND LESS a tract of land located in Government Lot 2 (NW¼ NE¼) of said Section 6 described as follows: Beginning at the NE corner of Government Lot 2; thence Southerly 529 feet; thence Westerly 187.07 feet; thence Northerly 35 feet; thence Westerly 370 feet; thence Northerly 494 feet; thence Easterly on and along the Section line 557.07 feet to the point of beginning.

LEGAL BASIS FOR NOTICE: The Oklahoma Department of Environmental Quality (DEQ) hereby files this Notice of Remediation pursuant to Oklahoma Statute, 27A O.S. § 2-7-123 (B). This Notice does not grant any right to any person not already allowed by law and shall not be construed to authorize or encourage any person or other legal entity to cause or increase pollution, to avoid compliance with state or federal laws and regulations regarding pollution or to escape responsibility for maintaining environmentally sound operations.

BACKGROUND/ REASON FOR NOTICE: The Tar Creek area encompasses the Oklahoma portion (approximately 40 square miles) in far northeastern Oklahoma of the historic Tri-State Mining District, where lead and zinc were mined in underground drifts and milled at the surface from about 1900 to 1960's. When mining ceased, huge volumes of mining waste, including chat and mill tailings, were left on the surface. These wastes contain elevated concentrations of lead and zinc and contributed to elevated blood lead concentrations in area children. More than 1,320 mine shafts and thousands of exploratory boreholes, air vents were abandoned. Since mining ceased, subsidence has occurred in several areas due both to roof collapse and erosion of mine shafts. The Affected Property contains a filled open pit zinc mine (CB011N-PitA) with a clean soil cap.

REMEDY: Remediation activities ("Remedy") at the Affected Property included: Filling of the local subsidence with mining waste, including chat and mill tailings, and placing a soil cover over

I-2015-004754 Book1021 Pg:134
12/08/2015 2:17 pm $19.00
Reba G Sill - Ottawa County Clerk

it. This was done in accordance with a Record of Decision for the Tar Creek Superfund Site (Operable Unit 4) produced by the U.S. Environmental Protection Agency on February 20, 2008. The area was capped with a layer of uncontaminated soil, and the entire surface of the affected property was vegetated with grass.

Remedial activities were completed in 2013.

For more detailed information please contact:

Oklahoma Department of Environmental Quality
Central Records

Mailing Address
P.O. Box 1677
Oklahoma City, Oklahoma 73101

Physical Address
707 N Robinson
Oklahoma City, OK 73102

ENGINEERING CONTROLS: The engineering control at this site is a soil cover with vegetation (grass) planted over top of the soil. Location of capped area at this site can be found in attached map.

LAND USE RESTRICTIONS: The land use restrictions at the above-described Affected Property are:

a. If digging takes place within the capped area, soils shall be backfilled to no higher than 12 inches below grade, and remainder backfilled with uncontaminated soil and re-vegetated. The excavation area shall be graded to the pre-excavation elevation. The finished grade shall match the surrounding area and promote positive drainage.
b. No activities that will cause erosion of the soil;
c. No residential, daily care, preK-12 schools uses of the capped area of the Affected Property.
d. No erection of buildings or permanent structures on capped areas;
e. No drilling water wells and no shallow groundwater use on capped areas;
f. No tilling deeper than 12 inches to prevent working the contaminated soil to the surface.

CHANGING LAND USE RESTRICTIONS: Changes to land use restrictions must be approved by the DEQ or its successor agency. The person requesting the change in land use must demonstrate to the DEQ's satisfaction that contamination at the site has reached levels appropriate for the proposed new land uses and that further remediation is not necessary or that additional institutional or engineering controls are adequate to achieve levels protective of human health and the environment for the proposed uses.

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12/08/2015 2:17 pm $19.00
Reba G Sill - Ottawa County Clerk

The DEQ may require oversight costs, work plans, sampling, reports, and public participation as part of its review of the new information to support the requested change in land use restrictions. The person requesting the change will be required to follow agency procedures effective at the time of the request.

The DEQ at its discretion may determine, based on the new information submitted, that contaminants are present at the Site at levels that will not pose a risk to human health or the environment if the new land use restrictions being requested are allowed. Upon making this determination, the DEQ will file a recordable notice of remediation pursuant to state law in the land records in the office of the county clerk where the Site is located designating the new land use restrictions.

This Notice of Remediation and the restrictions and requirements contained herein run with the land and no change of ownership of the Affected Property will change the Land Use Restrictions.

Scott A. Thompson, Executive Director
Oklahoma Department of Environmental Quality

8-26-14
Date

ACKNOWLEDGMENT

TERESA MCPHERSON
Notary Public
State of Oklahoma
Commission # 08000761 Expires 01/17/16

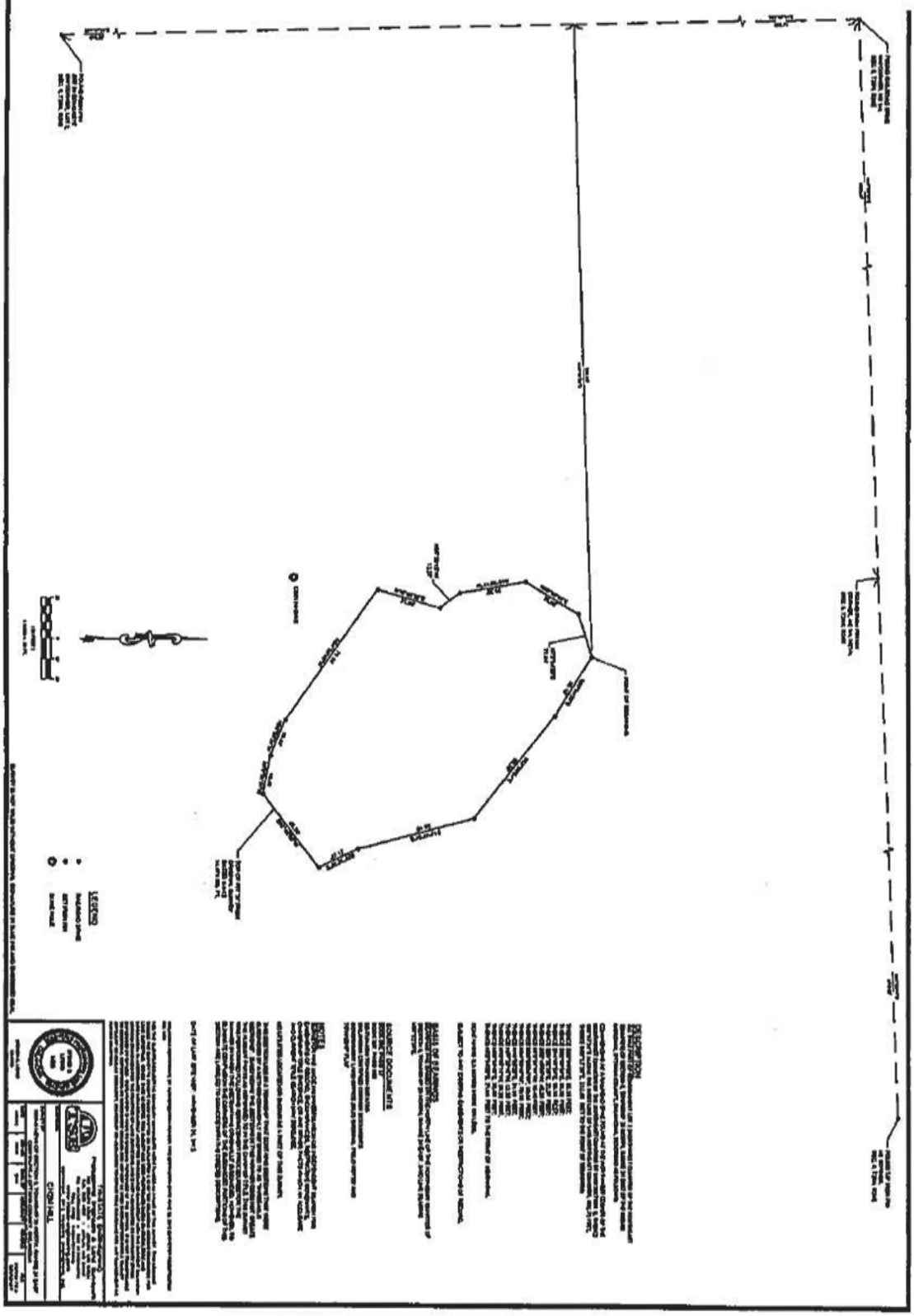
STATE OF OKLAHOMA
COUNTY OF OKLAHOMA

Before me, a Notary Public, in and for said County and State, on this 26th day of August 2014, personally appeared Scott A. Thompson to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me that executed the same as free and voluntary act and deed for the uses and purposed therein set forth. In Testimony Whereof, I have hereunto set my hand and official seal the day and year above written.

My Commission expires:
January 17, 2016.

Notary Public

I-2015-004754 Book1021 Pg:136
12/08/2015 2:17 pm $19.00
Reba G Sill - Ottawa County Clerk



I-2018-001347 Book1067 Pg.556
04/10/2018 9:17 am $23.00
Robyn Mitchell - Ottawa County Clerk

NOTICE OF REMEDIATION OR RELATED ACTION TAKEN PURSUANT TO THE FEDERAL COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT AND LAND USE RESTRICTIONS AND CREATION OF AN EASEMENT

TAR CREEK SUPERFUND SITE OPERABLE UNIT 4

AFFECTED PROPERTY: The Affected Property is administratively designated as the CP091 Consolidation Area.

The Affected Property, as described in Attachment A, contains 15.1 acres more or less, and is located entirely within the following legal description:

The East Half of the Northwest Quarter; and Lot 1; and Lot 2 of Section 30, Township 29 North, Range 24 East of the Indian Meridian, Ottawa County, Oklahoma.

LESS that part deeded or taken for highway purposes;

AND LESS All that part of the Northwest Quarter of the Northwest Quarter of said Section 30, lying North and West of the Highway Right-of-Way line;

AND LESS The East 50 feet of the Northeast Quarter of the Northwest Quarter of said Section 30;

AND LESS the East Half of the Southeast Quarter of the Northwest Quarter except the West 225 feet thereof, and except beginning 225 feet East of the Northwest corner of the East Half of the Southeast Quarter of the Northwest Quarter for the point of beginning; Thence East 990 feet; Thence South 660 feet; Thence West 990 feet; Thence North 660 feet to the point of beginning.

LEGAL BASIS FOR NOTICE: The Oklahoma Department of Environmental Quality ("DEQ") hereby files this NOTICE OF REMEDIATION OR RELATED ACTION TAKEN PURSUANT TO THE FEDERAL COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT and CREATION OF EASEMENT (hereinafter "Notice") pursuant to Oklahoma Statutes, 27A O.S. § 2-7-123(B). This Notice does not grant any right to any person not already allowed by law. This Notice shall not be construed to authorize or encourage any person or other legal entity to cause or increase pollution, to avoid compliance with State or Federal laws and regulations regarding pollution or to in any manner escape responsibility for maintaining environmentally sound operations.

DEQ may take administrative or civil action to recover costs or to compel compliance with the below described "Land Use Restrictions" and to prevent damage to, or interference with the below described "Engineering Controls" and "Continuing Operation and Maintenance." The Land Use Restrictions, Engineering Control and Continuing Operation and Maintenance will apply to the Affected Property and to persons who own and/or use

the Affected Property until such time as the DEQ files a subsequent Notice that changes or removes the Land Use Restrictions, Engineering Control and Continuing Operation and Maintenance set forth below. Activities that cause or could cause damage to the Remedy or the Engineering Control described below, or recontamination of soil or groundwater are prohibited.

The owner of the below described Affected Property has the legal authority to create, and does hereby voluntarily create, an easement granted to DEQ and its employees and agents, for ingress and egress through, across and onto the Affected Property to assure the ongoing operation, maintenance and protection of the remedy, engineering control and land use restrictions described below. This easement touches and concerns the land; runs with the land; is legally binding on all future owners of the Affected Property and will only be removed or modified if and when DEQ modifies or removes its land use restrictions or engineering control in the manner described below.

REASON FOR NOTICE: The above described Affected Property was contaminated with materials that required remediation pursuant to State and Federal environmental laws and regulations. Remediation activities ("Remedy") at the Affected Property were completed in accordance with a Record of Decision for the Tar Creek Superfund Site (Operable Unit 4) produced by the U.S. Environmental Protection Agency ("EPA") on February 20, 2008.

REMEDY: The Remedy at the Affected Property included: Construction of an 18 inch soil cover over the consolidated materials at CP091. An on-property borrow source was used for the 18 inch uncontaminated soil cover and a vegetative support layer was established over the consolidated chat and fine tailings.

Remedial activities were completed on February 15, 2017.

I-2018-001347 Book1067 Pg:557
04/10/2018 9:17 am $23.00
Robyn Mitchell - Ottawa County Clerk

For more detailed information please contact:

Oklahoma Department of Environmental Quality
Central Records
(405) 702-1188

Mailing Address
P.O. Box 1677
Oklahoma City, Oklahoma 73101

Physical Address
707 N Robinson
Oklahoma City, OK 73102

ENGINEERING CONTROL: The engineering control at this site is an 18 inch soil cover with established vegetation (grass). The location of the capped area can be found in attached map. (See Attachment A).

CONTINUING OPERATION, MAINTENANCE AND MONITORING: DEQ's employees and agents have the power to enter the Affected Property at reasonable times to sample, to inspect, and to prevent interference with the operation, maintenance or monitoring of the Remedy in accordance with 27A O.S. § 2-3-501(A) and (B). EPA and DEQ will perform CERCLA Five-Year Reviews on the property to ensure it remains protective of human health and the environment.

Use of the Affected Property must not interfere with or disturb any engineering control, nor interfere with the operation, maintenance or monitoring of the Remedy.

Pursuant to 27A O.S. § 2-7-123(D), any person who damages or interferes with the Remedy, the Engineering Controls, or Continuing Operation, Maintenance or Monitoring of the Affected Property, or who increases the

I-2018-001347 Book 1007 Pg 338
04/10/2018 9:17 am $23.00
Robyn Mitchell - Ottawa County Clerk

amount or extent of contamination, is liable to repair the damage, remedy the interference, or remediate the contamination, or for costs incurred by the DEQ in doing so.

LAND USE RESTRICTIONS: The following land use restrictions apply to the Affected Property (See Attachment A):

a. No digging in the capped area unless digging is performed in the manner stated below:
   i. Contaminated material exists 18 inches below grade within the capped area. Clean material exists between the surface and 18 inches. If digging takes place within the capped area, clean material removed above 18 inches shall be segregated from material excavated from below 18 inches.
   ii. Material below 18 inches has some level of contaminants and is not suitable for the top 18 inches of fill. Material removed from below 18 inches shall be returned to the excavation area to the extent possible but no higher than 18 inches below grade. Any remaining soil excavated from below the barrier shall be properly disposed in an offsite landfill.
   iii. The top 18 inches shall be backfilled with uncontaminated soil and revegetated. The excavation area shall be compacted and graded to the pre-excavation elevation. The finished grade shall match the surrounding area and promote positive drainage;
b. No residential or daycare use;
c. No drilling water wells or groundwater use;
d. No tilling deeper than 12 inches to prevent working the source materials or contaminated soil to the surface; and
e. No activity that would be likely to cause erosion or otherwise damage the integrity of the cover.

CHANGING LAND USE RESTRICTIONS: Changes to land use restrictions must be approved by the DEQ or its successor agency. The person requesting the change in land use must demonstrate to the DEQ's satisfaction that contamination at the Affected Property has reached levels appropriate for the proposed new land use(s) and that further remediation is not necessary or that additional institutional or engineering controls are adequate to achieve levels protective of human health and the environment for the proposed use(s).

The DEQ may require oversight costs, work plans, sampling, reports, and public participation as part of its review of the new information to support the requested change in land use restrictions. The person requesting the change will be required to follow agency procedures effective at the time of the request.

The DEQ at its discretion may determine, based on the new information submitted, that contaminants are present at the Site at levels that will not pose a risk to human health or the environment if the new land use restrictions being requested are allowed. Upon making this determination, the DEQ will file a recordable notice of remediation pursuant to state law in the land records in the office of the county clerk where the Affected Property is located designating the new land use restrictions.

This Notice of Remediation and the restrictions contained herein run with the land and no change of ownership of the Affected Property will change the Land Use Restrictions.

Scott A. Thompson, Executive Director
Oklahoma Department of Environmental Quality

3-15-18
Date

ACKNOWLEDGMENT

I-2018-001347 Book1067 Pg 559
04/10/2018 9:17 am $23.00
Robyn Mitchell - Ottawa County Clerk

STATE OF OKLAHOMA
COUNTY OF OKLAHOMA

Before me, a Notary Public, in and for said County and State, on this 15 day of March, 2018, personally appeared Scott A. Thompson to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me that executed the same as free and voluntary act and deed for the uses and purposed therein set forth. In Testimony Whereof, I have hereunto set my hand and official seal the day and year above written.
My Commission expires:

January 17, 2020 Teresa McPherson
Notary Public

TERESA MCPHERSON NOTARY # 08000751 EXP. 01/17/20 PUBLIC STATE OF OKLAHOMA

I hereby certify that I have the legal right to, and do hereby, create an easement and encumber the real property as described in the foregoing Notice of Remediation. I hereby voluntarily grant an easement to the DEQ and its employees and agents, for ingress and egress through, across and onto the Affected Property to assure the ongoing placement, operation, maintenance and protection of the remedy, engineering controls and land use restrictions described herein above.

I have had notice and an opportunity to meet with representatives of DEQ to comment on the foregoing Notice of Remediation and agree herewith. I hereby agree to the filing of the foregoing Notice of Remediation and Easement.

Kelly Chey
Owner of the Affected Property

2/7/18
Date

Subscribed and sworn to before me this 7 day of February, 2018.

My Commission expires:

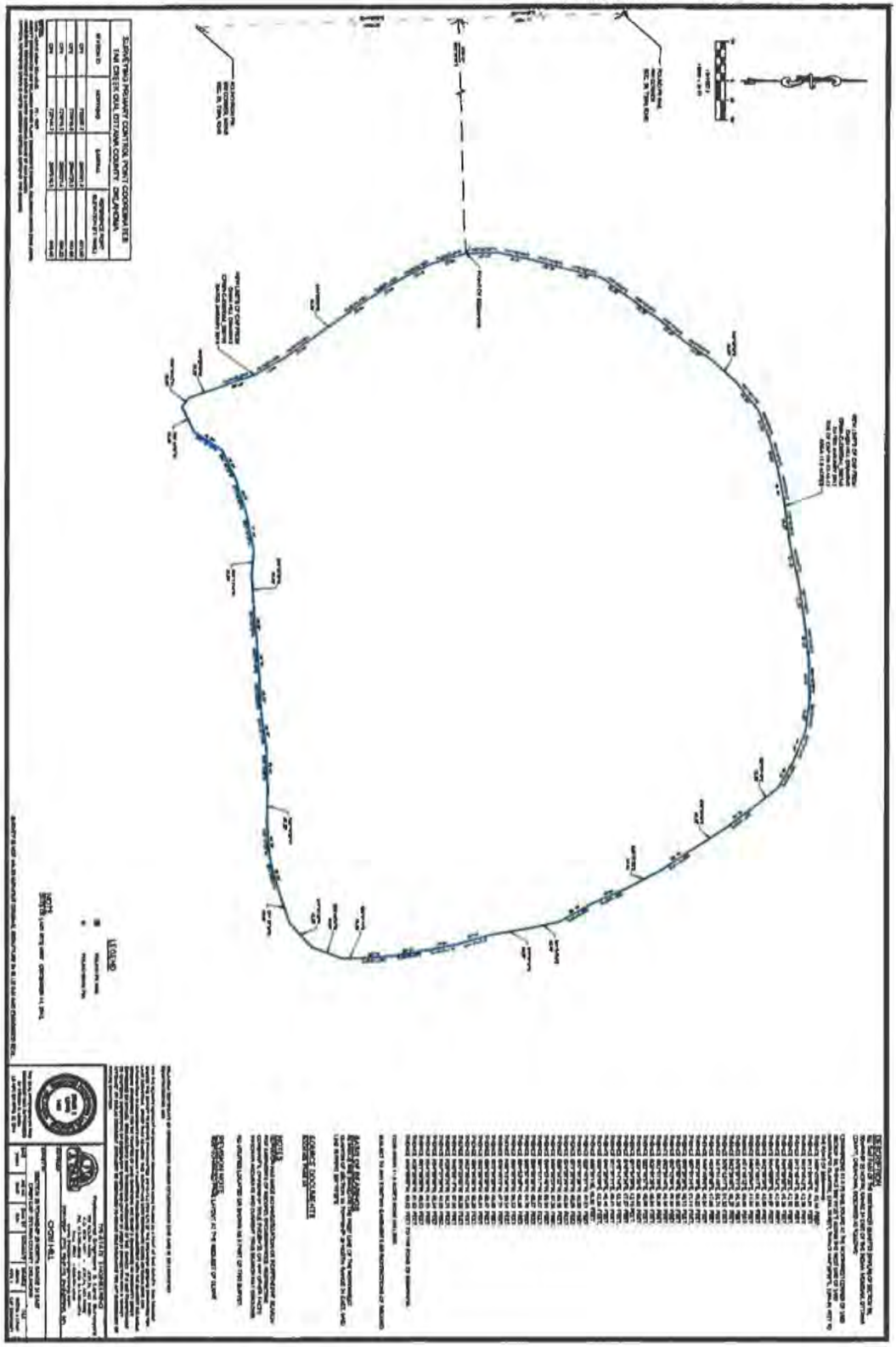
May 17, 2020. Michele Woods
Notary Public

MICHELE WOODS NOTARY # 16004019 EXP. 05/17/20 PUBLIC STATE OF OKLAHOMA

ATTACHMENT A

I-2018-001347 Book1067 Pg 560
04/10/2018 9:17 am $23.00
Robyn Mitchell - Ottawa County Clerk

I-2018-001347 Book1067 Pg 561
04/10/2018 9 17 am $23 00
Robyn Mitchell - Ottawa County Clerk



Conservation Easement for Tract 920 T 2001 (Catholic 40)

R.O. #: 920 4200141281
Allt: 920 T 2001
Allot Name: Catholic 40

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
MIAMI AGENCY
P.O. BOX 391
MIAMI, OK 74355

CONSERVATION EASEMENT

KNOW ALL MEN BY THESE PRESENTS: That the Secretary of the Interior, acting by and through the Superintendent, Miami Agency, Eastern Oklahoma Region, Bureau of Indian Affairs ("BIA"), Department of the Interior ("Grantor") on behalf of the restricted Indian landowner(s) identified in "Attachment A", pursuant to the provisions of the Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328), and 25 C.F.R. Part 169, and under authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4, and Regional Delegation to 3 IAM 4 issued April 17, 2018, in consideration of REMEDIATION OF THE PROPERTY, and other good and valuable consideration, the receipt of which is acknowledged, does hereby grant to the The Quapaw Tribe of Indians, ("Grantee"), a Conservation Easement (25 C.F.R. § 169.5(a)(12)) over, across, in, and upon the Trust / Restricted interest in the following described lands ("Property") located in the County of Ottawa, State of Oklahoma, with Third-Party enforcement rights to the United States Environmental Protection Agency ("EPA") ("Third-Party Beneficiary"):

This Easement is limited to the following area(s) of the Property and is more particularly described as:

A piece, parcel, or tract of land lying in the SW¼NE¼ of Section 6, Township 28 North, Range 24 East of the Indian Base and Meridian, Ottawa County, Oklahoma more particularly described as follows: Commencing at the NW corner of said Section 6; thence, N87°47'39"E along the North line thereof a distance of 3,342.05 feet; thence, S01°59'29"E a distance of 1445.40 feet to the center of an existing mine shaft having a radius of 31.19' and being the point of termination; and

Commencing at the NW corner of said Section 6, thence, N87°47'19"E along the North line thereof a distance of 2,608.75 feet; thence S02°12'41"E a distance of 1,404.40 feet to the center of an existing mine shaft having a radius of 33.19' and being the point of termination all in Section 6, Township 28 North, Range 24 East, Ottawa County Oklahoma. All located within tract 920 T 2001 also known as the Catholic 40.

and is further depicted on the map/diagram attached hereto.

This Easement is subject to any valid existing right or adverse claim and is **perpetual,** so long as said Easement shall actually be used for the purpose above specified:

This Easement is subject to all conditions and restrictions set out by the Indian Landowners consent(s) as stated in the Application.

The Property is a tract of Indian land within the Tar Creek Superfund Site that has been the subject of environmental remediation in accordance with the EPA's *Record of Decision, Tar Creek OU4 Superfund Site* ("ROD"), dated February 2008. The restrictions on use set forth hereunder are necessary to ensure that only appropriate land use and reuse options are implemented, and to notify current and future owners of record, as well as lessees and others, of

the presence of engineering controls and/or other restrictions on uses of the Property. The Easement hereunder is being given by the Landowners in consideration for the remediation of the Property by the EPA, in conjunction with the State of Oklahoma and the Tribe. The Grantor and Landowners determine that such remediation, in addition to the consideration noted in the first paragraph, is just compensation for this easement.

Any other usage will be treated as non-compliance in accordance with 25 C.F.R. § 169 Subpart F.

Assignment(s) of said Easement shall not be permitted.

Mortgage(s) of said Easement by the Grantee shall not be permitted.

Restrictions on Use. Under this Easement, the areas of the Property within the Easement shall be used and managed for conservation purposes in accordance with the following restrictions on use:

(a) Prohibited Uses. The Property shall not be used for: [FOLLOWING TO BE REVISED AS APPROPRIATE FOR INDIVIDUAL TRACTS]

(i) any commercial use, excluding commercial uses relating to or involving conservation, fishing, hunting, and wildlife management, remediation, chat sales, and commercial use relating to chat sales;

(ii) educational use, excluding educational, research, scientific and similar uses that do not involve habitation or continuous occupation over an extended period of time;

(iii) residential use; and

(iv) any other purpose that involves the continuous occupancy of private or public buildings on the Property, except as provided for herein.

(b) Limitations on Water Well Drilling. No public water wells shall be drilled on the Property, unless the design of such water wells are determined by EPA to not interfere with the integrity of the remediation activities at the Site, as described in EPA's ROD, and approval for such drilling is given by the appropriate entities.

Said restrictions do not apply to any areas of the Property not within the defined area(s) of the Easement.

Permitted Uses of the Property. With the consent of the Landowners and the approval of the BIA as may be required by applicable federal law, the areas of the Property within the Easement may, without limitation, be used for:

(a) hunting and fishing, including traditional Tribal/American Indian hunting and fishing;

(b) agriculture, including traditional Tribal/American Indian and subsistence agriculture and agricultural leases approved by the BIA;

(c) governmental activities of the Tribe that do not involve continuous habitation;

(d) cultural and religious activities of the Tribe and its members; and

Enforcement of Restrictions on Use and Right of Entry. The Grantee may bring an action hereunder in the United States District Court or any other forum with jurisdiction against any person or entity alleged to be in violation of the restrictions on use set forth herein. Such court shall have jurisdiction to interpret and/or award any appropriate relief permitted by law to enforce the land use restrictions, including but not limited to legal and equitable remedies to abate the breach, restore the area to its prior condition, and secure compensation for the costs of the enforcement action, including reasonable attorney's fees. Nothing hereunder provides a waiver of the privileges and immunities of the Grantee. BIA may treat any provision of a grant that violates Federal law as a

violation of the grant.

Upon any breach or alleged breach of the covenants hereunder, the Grantee may, at their discretion, treat such an occurrence, giving rise to a right of entry to the Property. In the event that the Grantee exercises its right of entry, no compensation or damages shall be due to the Landowners or Landowners' successors and assigns against the Grantee.

Third Party Beneficiary's Rights. EPA, as Third-Party Beneficiary of this Easement, shall third-party enforcement rights of the terms, provisions and restrictions of this Easement. EPA's enforcement of the terms, provisions and restrictions shall be at the discretion of EPA, and any forbearance on behalf of EPA to exercise its Third-Party Beneficiary rights shall not be deemed or construed to be a waiver of those rights.

Modifications of Restrictions on Use. The restrictions on use granted hereunder may be removed or modified only with the written approval of the EPA, and only if the EPA determines that such restrictions are no longer necessary, in whole or part, to protect the public health and safety and the environment.

Payment(s) – No monetary compensation shall be given pursuant to 25 C.F.R. §§ 169.112(d)(3). In that the tribe or grantee has constructed infrastructure improvements benefitting the individual Indian landowners. Compensation is agreed to be in consideration of REMEDIATION OF THE PROPERTY.

Additional Provisions. The Grantee maintains its existing jurisdiction over the land, activities, and persons within the Easement under 25 C.F.R. §169.10. This Easement grants the Grantee reasonable access to the Property to determine compliance with the Easement or to protect public health and safety.

The Grantee has no right to any of the products or resources of the land, including but not limited to, timber, forage, agricultural, mineral, and animal resources, unless otherwise provided herein.

If historic properties, archaeological resources, human remains, or other cultural items not previously reported are encountered during the course of any activity associated with this Easement, all activity in the immediate vicinity of the properties, resources, remains, or other cultural items will cease and the Grantee will respond in accordance with applicable law.

Any loss, liability, or damages resulting from this Easement will be determined under applicable law.

Improvements. This Easement must have attached or include by reference, maps of the definite location of the area(s) of the Easement and any improvements. If improvements are to be made upon the aforementioned property, it is the Grantee's responsibility to notify BIA and Grantor(s) and to provide a schedule of construction/completion of said improvements. If the schedule of construction is not able to be adhered to, it is the Grantee's responsibility to provide documentation showing good cause as to the nature of any delay, the anticipated date of construction of the Improvements, and evidence of progress toward commencement of the construction, or cancelation of agreed upon improvements. Failure of the Grantee to comply with the due diligence requirements of the grant is a violation of the grant and may lead to cancellation of the right-of-way under §169.405 or §169.408.

Grantee agrees to:

- Construct and maintain improvements within the right-of-way in a professional manner consistent with industry standards; comply with all applicable laws and obtain all required permits; not commit waste; Operate, repair and maintain improvements consistent with the right-of-way grant; refrain from interfering with the landowner's use of the land, provided that the landowner's use of the land is not inconsistent with

the right-of-way; hold the United States and the Indian landowners harmless from any loss, liability, or damages resulting from the Grantee's use or occupation of the premises; and indemnify the United States and the Indian landowners against all liabilities or costs relating to the Grantee's use, handling, treatment, removal, storage, transportation, or disposal of hazardous materials, or release or discharge of any hazardous material from the premises that occurs during the term of the grant, regardless of fault, with the exception that the applicant is not required to indemnify the United States or the Indian landowners for liability or costs arising from the Indian landowners' negligence or willful misconduct or breach of the terms of this Easement.

IN WITNESS WHEREOF, the Grantor has executed this grant of Easement this 23 day of July, 20 19.

This right of way is hereby granted in accordance with Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328) 25 CFR §169.107(a), §169.124, and approved in accordance with authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4 and Regional Delegation to 3 IAM 4 issued April 17, 2018.

Name	Undivided Indian Interest
The Quapaw Tribe of Indians	1/1

Superintendent, Miami Agency

Date 7/23/2019

ACKNOWLEDGEMENT

State _____)

County of _____)

Before me _____, a Notary Public in and for said County and State on this _____ day of _____, 20____, personally appeared _____, to me known to be the identical person(s) who executed the within and foregoing instrument and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and Year last above written.

_____ _____, 20____

Notary Public My commission expires

R.O [illegible]: 920
All: 920 T 2001
Allot Name: Colbolie 40

Attachment A

Tamara Smiley-Reeves 06-19-19

Tamara Smiley-Reeves, Secretary/Treasurer of
The Quapaw Tribe of Indians Business Committee

Date

The Quapaw Tribe of Indians
P.O. Box 765
Quapaw, OK 74363

1/1

Conservation Easement for Tract 920 S 24 (CP097)

R.O.W.#: 920 4200180081
Allot: 920 S 24
Allottee: Lena Whitebird/ CP097

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
MIAMI AGENCY
P.O. BOX 391
MIAMI, OK 74355

CONSERVATION EASEMENT

KNOW ALL MEN BY THESE PRESENTS: That the Secretary of the Interior, acting by and through the Superintendent, Miami Agency, Eastern Oklahoma Region, Bureau of Indian Affairs ("BIA"), Department of the Interior ("Grantor") on behalf of the restricted Indian landowner(s) identified in "Attachment A", pursuant to the provisions of the Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328), and 25 C.F.R. Part 169, and under authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4, and Regional Delegation to 3 IAM 4 issued April 17, 2018, in consideration of REMEDIATION OF THE PROPERTY, and other good and valuable consideration, the receipt of which is acknowledged, does hereby grant to the The Quapaw Tribe of Indians, ("Grantee"), a Conservation Easement (25 C.F.R. § 169.5(a)(12)) over, across, in, and upon the Trust / Restricted interest in the following described lands ("Property") located in the County of Ottawa, State of Oklahoma, with Third-Party enforcement rights to the United States Environmental Protection Agency ("EPA") ("Third-Party Beneficiary"):

This Easement is limited to the following area(s) of the Property and is more particularly described as:

A piece, parcel, or tract of land lying in the SE¼ of Section 31, Township 29 North, Range 24 East of the Indian Base and Meridian, Ottawa County, Oklahoma more particularly described as follows: Commencing at the SE corner of said Section 31; thence, S87°45'05"W along the South line thereof a distance of 881.91 feet; thence, N02°14'55"W a distance of 680.70 feet to the center of an existing mine shaft and being the point of termination and

Commencing at the SE corner of said Section 31; thence, S87°45'05"W along the South line thereof a distance of 783.20 feet; thence, N02°14'55"W a distance of 885.70 feet to the center of an existing mine shaft being the point of termination CP097-MS-A and MS-C all in Section 31, Township 29 North, Range 24 East, Ottawa County Oklahoma. All located within tract 920 S 24 also known as the Lena Whitebird or known to EPA as CP097.

and is further depicted on the map/diagram attached hereto.

This Easement is subject to any valid existing right or adverse claim and is **perpetual,** so long as said Easement shall actually be used for the purpose above specified:

This Easement is subject to all conditions and restrictions set out by the Indian Landowners consent(s) as stated in the Application.

The Property is a tract of Indian land within the Tar Creek Superfund Site that has been the subject of environmental remediation in accordance with the EPA's *Record of Decision, Tar Creek OU4 Superfund Site* ("ROD"), dated February 2008. The restrictions on use set forth hereunder are necessary to ensure that only appropriate land use and reuse options are implemented, and to notify current and future owners of record, as well as lessees and others, of

the presence of engineering controls and/or other restrictions on uses of the Property. The Easement hereunder is being given by the Landowners in consideration for the remediation of the Property by the EPA, in conjunction with the State of Oklahoma and the Tribe. The Grantor and Landowners determine that such remediation, in addition to the consideration noted in the first paragraph, is just compensation for this easement.

Any other usage will be treated as non-compliance in accordance with 25 C.F.R. § 169 Subpart F.

Assignment(s) of said Easement shall not be permitted.

Mortgage(s) of said Easement by the Grantee shall not be permitted.

Restrictions on Use. Under this Easement, the areas of the Property within the Easement shall be used and managed for conservation purposes in accordance with the following restrictions on use:

(a) Prohibited Uses. The Property shall not be used for: [FOLLOWING TO BE REVISED AS APPROPRIATE FOR INDIVIDUAL TRACTS]

(i) any commercial use, excluding commercial uses relating to or involving conservation, fishing, hunting, and wildlife management, remediation, chat sales, and commercial use relating to chat sales;

(ii) educational use, excluding educational, research, scientific and similar uses that do not involve habitation or continuous occupation over an extended period of time;

(iii) residential use; and

(iv) any other purpose that involves the continuous occupancy of private or public buildings on the Property, except as provided for herein.

(b) Limitations on Water Well Drilling. No public water wells shall be drilled on the Property, unless the design of such water wells are determined by EPA to not interfere with the integrity of the remediation activities at the Site, as described in EPA's ROD, and approval for such drilling is given by the appropriate entities.

Said restrictions do not apply to any areas of the Property not within the defined area(s) of the Easement.

Permitted Uses of the Property. With the consent of the Landowners and the approval of the BIA as may be required by applicable federal law, the areas of the Property within the Easement may, without limitation, be used for:

(a) hunting and fishing, including traditional Tribal/American Indian hunting and fishing;

(b) agriculture, including traditional Tribal/American Indian and subsistence agriculture and agricultural leases approved by the BIA;

(c) governmental activities of the Tribe that do not involve continuous habitation;

(d) cultural and religious activities of the Tribe and its members; and

Enforcement of Restrictions on Use and Right of Entry. The Grantee may bring an action hereunder in the United States District Court or any other forum with jurisdiction against any person or entity alleged to be in violation of the restrictions on use set forth herein. Such court shall have jurisdiction to interpret and/or award any appropriate relief permitted by law to enforce the land use restrictions, including but not limited to legal and equitable remedies to abate the breach, restore the area to its prior condition, and secure compensation for the costs of the enforcement action, including reasonable attorney's fees. Nothing hereunder provides a waiver of the privileges and immunities of the Grantee. BIA may treat any provision of a grant that violates Federal law as a

violation of the grant.

Upon any breach or alleged breach of the covenants hereunder, the Grantee may, at their discretion, treat such an occurrence, giving rise to a right of entry to the Property. In the event that the Grantee exercises its right of entry, no compensation or damages shall be due to the Landowners or Landowners' successors and assigns against the Grantee.

Third Party Beneficiary's Rights. EPA, as Third-Party Beneficiary of this Easement, shall third-party enforcement rights of the terms, provisions and restrictions of this Easement. EPA's enforcement of the terms, provisions and restrictions shall be at the discretion of EPA, and any forbearance on behalf of EPA to exercise its Third-Party Beneficiary rights shall not be deemed or construed to be a waiver of those rights.

Modifications of Restrictions on Use. The restrictions on use granted hereunder may be removed or modified only with the written approval of the EPA, and only if the EPA determines that such restrictions are no longer necessary, in whole or part, to protect the public health and safety and the environment.

Payment(s) – No monetary compensation shall be given pursuant to 25 C.F.R. §§ 169.112(d)(3). In that the tribe or grantee has constructed infrastructure improvements benefitting the individual Indian landowners. Compensation is agreed to be in consideration of REMEDIATION OF THE PROPERTY.

Additional Provisions. The Grantee maintains its existing jurisdiction over the land, activities, and persons within the Easement under 25 C.F.R. §169.10. This Easement grants the Grantee reasonable access to the Property to determine compliance with the Easement or to protect public health and safety.

The Grantee has no right to any of the products or resources of the land, including but not limited to, timber, forage, agricultural, mineral, and animal resources, unless otherwise provided herein.

If historic properties, archaeological resources, human remains, or other cultural items not previously reported are encountered during the course of any activity associated with this Easement, all activity in the immediate vicinity of the properties, resources, remains, or other cultural items will cease and the Grantee will respond in accordance with applicable law.

Any loss, liability, or damages resulting from this Easement will be determined under applicable law.

Improvements. This Easement must have attached or include by reference, maps of the definite location of the area(s) of the Easement and any improvements. If improvements are to be made upon the aforementioned property, it is the Grantee's responsibility to notify BIA and Grantor(s) and to provide a schedule of construction/completion of said improvements. If the schedule of construction is not able to be adhered to, it is the Grantee's responsibility to provide documentation showing good cause as to the nature of any delay, the anticipated date of construction of the Improvements, and evidence of progress toward commencement of the construction, or cancelation of agreed upon improvements. Failure of the Grantee to comply with the due diligence requirements of the grant is a violation of the grant and may lead to cancellation of the right-of-way under §169.405 or §169.408.

Grantee agrees to:

- Construct and maintain improvements within the right-of-way in a professional manner consistent with industry standards; comply with all applicable laws and obtain all required permits; not commit waste; Operate, repair and maintain improvements consistent with the right-of-way grant; refrain from interfering with the landowner's use of the land, provided that the landowner's use of the land is not inconsistent with

R.O.W. #: 920
Alk: 920 S 24
Allot Name: Lena Whitebird/ CP097

the right-of-way; hold the United States and the Indian landowners harmless from any loss, liability, or damages resulting from the Grantee's use or occupation of the premises; and indemnify the United States and the Indian landowners against all liabilities or costs relating to the Grantee's use, handling, treatment, removal, storage, transportation, or disposal of hazardous materials, or release or discharge of any hazardous material from the premises that occurs during the term of the grant, regardless of fault, with the exception that the applicant is not required to indemnify the United States or the Indian landowners for liability or costs arising from the Indian landowners' negligence or willful misconduct or breach of the terms of this Easement.

IN WITNESS WHEREOF, the Grantor has executed this grant of Easement this 23 day of July, 20 19.

This right of way is hereby granted in accordance with Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328) 25 CFR §169.107(a), §169.124, and approved in accordance with authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4 and Regional Delegation to 3 IAM 4 issued April 17, 2018.

Name	Undivided Indian Interest
The Quapaw Tribe of Indians	3/180

Superintendent, Miami Agency

Date 7/23/2019

This right of way is hereby granted in accordance with Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328) 25 CFR §169.107(b), §169.124, and approved in accordance with authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4 and Regional Delegation to 3 IAM 4 issued April 17, 2018.

Name	Undivided Indian Interest
Janice M. Funk	12/180
Joanna K. Stand	12/180
James A. Cantrell	3/180

Superintendent, Miami Agency

Date 7/23/2019

R.O.W.#: 920
Alt: 920 S 24
Allot name: Lena Whitbird/ CP097

ACKNOWLEDGEMENT

State __ _____)

County of _____)

Before me _____, a Notary Public in and for said County and State on this _____ day of _____, 20____, personally appeared _____, to me known to be the identical person(s) who executed the within and foregoing instrument and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and Year last above written.

_____ _____, 20____

Notary Public My commission expires

R.O.W #: 220
Allot #: 920 S 24
Allot Name: Lena Whitebird/ CP097

Attachment A

Tamara Smiley-Reeves 01/08/2019

Tamara Smiley-Reeves, Secretary/Treasurer of Quapaw Nation Business Committee — Date

Quapaw Nation (O-Gah-Pah) 3/180
P.O. Box 765
Quapaw, OK 74363

Janice M. Funk — Date

Janice M. Funk 12/180
602 E Huntsville PL
Broken Arrow, OK 74011-3509

Joanna K. Stand — Date

Joanna K. Stand 12/180
5637 S Newport Ave
Tulsa, OK 74105-7842

R.O.W #: 920
Allot #: 920 S 24
Allot Name: Lena Whitebird/ CP097

Attachment A

Tamara Smiley-Reeves, Secretary/Treasurer of Quapaw Nation Business Committee — Date

Quapaw Nation (O-Gah-Pah) 3/180
P.O. Box 765
Quapaw, OK 74363

Janice M. Funk 1/17/19
Janice M. Funk — Date

Janice M. Funk 12/180
602 E Huntsville PL
Broken Arrow, OK 74011-3509

Joanna K. Stand — Date

Joanna K. Stand 12/180
5637 S Newport Ave
Tulsa, OK 74105-7842

R.O.W #: 920
Allot #: 920 S 24
Allot Name: Lena Whitehird/ CP097

Attachment A

Tamara Smiley-Reeves, Secretary/Treasurer of Quapaw Nation Business Committee — Date

Quapaw Nation (O-Gah-Pah) 3/180
P.O. Box 765
Quapaw, OK 74363

Janice M. Funk — Date

Janice M. Funk 12/180
602 E Huntsville PL
Broken Arrow, OK 74011-3509

Joanna K. Stand — Date

Joanna K. Stand 12/180
5637 S Newport Ave
Tulsa, OK 74105-7842

R.O.W #: 920
Allot #: 920 S 24
Allot Name: Lena Whitebird/ CP097

ATTACHMENT A

James A. Cantrell 01/28/19

James A. Cantrell — Date

James A. Cantrell
1048 SW Belle Ave
Topeka, KS 66604-2072

3/180

Conservation Easement for Tract 920 S 14 (Beaver Creek North)

R.O.W #: 920 4200180053e
Allot #: 920 S 14
Allot Name: Alice Greenback/ Beaver Creek North

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
MIAMI AGENCY
P.O. BOX 391
MIAMI, OK 74355

CONSERVATION EASEMENT

KNOW ALL MEN BY THESE PRESENTS: That the Secretary of the Interior, acting by and through the Superintendent, Miami Agency, Eastern Oklahoma Region, Bureau of Indian Affairs ("BIA"), Department of the Interior ("Grantor") on behalf of the restricted Indian landowner(s) identified in "Attachment A", pursuant to the provisions of the Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328), and 25 C.F.R. Part 169, and under authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4, and Regional Delegation to 3 IAM 4 issued April 17, 2018, in consideration of REMEDIATION OF THE PROPERTY, and other good and valuable consideration, the receipt of which is acknowledged, does hereby grant to the The Quapaw Tribe of Indians, ("Grantee"), a Conservation Easement (25 C.F.R. § 169.5(a)(12)) over, across, in, and upon the Trust / Restricted interest in the following described lands ("Property") located in the County of Ottawa, State of Oklahoma, with Third-Party enforcement rights to the United States Environmental Protection Agency ("EPA") ("Third-Party Beneficiary"):

This Easement is limited to the following area(s) of the Property and is more particularly described as:

A piece, parcel, or tract of land lying in the SE¼ of Section 26, Township 29 North, Range 23 East of the Indian Base and Meridian, Ottawa County, Oklahoma more particularly described as follows: Commencing at the SE corner of said Section 26; thence, S87°45'00"W along the South line thereof a distance of 901.10 feet; thence, N02°15'05"W a distance of 1455.25 feet to the center of an existing mine shaft having a radius of 29.76 feet and being the point of termination MS-A; and

Commencing at the SE corner of said Section 26; thence, S87°45'00"W along the South line thereof a distance of 904.65 feet; thence, N02°15'00"W a distance of 1403.30 feet to the center of an existing mine shaft having a radius of 18.82 feet and being the point of termination MS-B; and

Commencing at the SE corner of said Section 26; thence, S87°45'00"w along the South line thereof a distance of 84.11 feet; thence, N02°15'00"W a distance of 371.73 feet to the center of an existing mine shaft having a radius of 34.80 feet and being the point of termination, all in Section 26, Township 29 North, Range 23 East, Ottawa County Oklahoma. All located within tract 920 S 14 also known as the Alice Greenback.

and is further depicted on the map/diagram attached hereto.

This Easement is subject to any valid existing right or adverse claim and is **perpetual**, so long as said Easement shall actually be used for the purpose above specified:

This Easement is subject to all conditions and restrictions set out by the Indian Landowners consent(s) as stated in the Application.

The Property is a tract of Indian land within the Tar Creek Superfund Site that has been the subject of environmental remediation in accordance with the EPA's *Record of Decision, Tar Creek OU4 Superfund Site* ("ROD"), dated

February 2008. The restrictions on use set forth hereunder are necessary to ensure that only appropriate land use and reuse options are implemented, and to notify current and future owners of record, as well as lessees and others, of the presence of engineering controls and/or other restrictions on uses of the Property. The Easement hereunder is being given by the Landowners in consideration for the remediation of the Property by the EPA, in conjunction with the State of Oklahoma and the Tribe. The Grantor and Landowners determine that such remediation, in addition to the consideration noted in the first paragraph, is just compensation for this easement.

Any other usage will be treated as non-compliance in accordance with 25 C.F.R. § 169 Subpart F.

Assignment(s) of said Easement shall not be permitted.

Mortgage(s) of said Easement by the Grantee shall not be permitted.

Restrictions on Use. Under this Easement, the areas of the Property within the Easement shall be used and managed for conservation purposes in accordance with the following restrictions on use:

(a) Prohibited Uses. The Property shall not be used for: [FOLLOWING TO BE REVISED AS APPROPRIATE FOR INDIVIDUAL TRACTS]

(i) any commercial use, excluding commercial uses relating to or involving conservation, fishing, hunting, and wildlife management, remediation, chat sales, and commercial use relating to chat sales;

(ii) educational use, excluding educational, research, scientific and similar uses that do not involve habitation or continuous occupation over an extended period of time;

(iii) residential use; and

(iv) any other purpose that involves the continuous occupancy of private or public buildings on the Property, except as provided for herein.

(b) Limitations on Water Well Drilling. No public water wells shall be drilled on the Property, unless the design of such water wells are determined by EPA to not interfere with the integrity of the remediation activities at the Site, as described in EPA's ROD, and approval for such drilling is given by the appropriate entities.

Said restrictions do not apply to any areas of the Property not within the defined area(s) of the Easement.

Permitted Uses of the Property. With the consent of the Landowners and the approval of the BIA as may be required by applicable federal law, the areas of the Property within the Easement may, without limitation, be used for:

(a) hunting and fishing, including traditional Tribal/American Indian hunting and fishing;

(b) agriculture, including traditional Tribal/American Indian and subsistence agriculture and agricultural leases approved by the BIA;

(c) governmental activities of the Tribe that do not involve continuous habitation;

(d) cultural and religious activities of the Tribe and its members; and

Enforcement of Restrictions on Use and Right of Entry. The Grantee may bring an action hereunder in the United States District Court or any other forum with jurisdiction against any person or entity alleged to be in violation of the restrictions on use set forth herein. Such court shall have jurisdiction to interpret and/or award any appropriate relief permitted by law to enforce the land use restrictions, including but not limited to legal and equitable remedies to abate the breach, restore the area to its prior condition, and secure compensation for the costs

of the enforcement action, including reasonable attorney's fees. Nothing hereunder provides a waiver of the privileges and immunities of the Grantee. BIA may treat any provision of a grant that violates Federal law as a violation of the grant.

Upon any breach or alleged breach of the covenants hereunder, the Grantee may, at their discretion, treat such an occurrence, giving rise to a right of entry to the Property. In the event that the Grantee exercises its right of entry, no compensation or damages shall be due to the Landowners or Landowners' successors and assigns against the Grantee.

Third Party Beneficiary's Rights. EPA, as Third-Party Beneficiary of this Easement, shall third-party enforcement rights of the terms, provisions and restrictions of this Easement. EPA's enforcement of the terms, provisions and restrictions shall be at the discretion of EPA, and any forbearance on behalf of EPA to exercise its Third-Party Beneficiary rights shall not be deemed or construed to be a waiver of those rights.

Modifications of Restrictions on Use. The restrictions on use granted hereunder may be removed or modified only with the written approval of the EPA, and only if the EPA determines that such restrictions are no longer necessary, in whole or part, to protect the public health and safety and the environment.

Payment(s) – No monetary compensation shall be given pursuant to 25 C.F.R. §§ 169.112(d)(3). In that the tribe or grantee has constructed infrastructure improvements benefitting the individual Indian landowners. Compensation is agreed to be in consideration of REMEDIATION OF THE PROPERTY.

Additional Provisions. The Grantee maintains its existing jurisdiction over the land, activities, and persons within the Easement under 25 C.F.R. §169.10. This Easement grants the Grantee reasonable access to the Property to determine compliance with the Easement or to protect public health and safety.

The Grantee has no right to any of the products or resources of the land, including but not limited to, timber, forage, agricultural, mineral, and animal resources, unless otherwise provided herein.

If historic properties, archaeological resources, human remains, or other cultural items not previously reported are encountered during the course of any activity associated with this Easement, all activity in the immediate vicinity of the properties, resources, remains, or other cultural items will cease and the Grantee will respond in accordance with applicable law.

Any loss, liability, or damages resulting from this Easement will be determined under applicable law.

Improvements. This Easement must have attached or include by reference, maps of the definite location of the area(s) of the Easement and any improvements. If improvements are to be made upon the aforementioned property, it is the Grantee's responsibility to notify BIA and Grantor(s) and to provide a schedule of construction/completion of said improvements. If the schedule of construction is not able to be adhered to, it is the Grantee's responsibility to provide documentation showing good cause as to the nature of any delay, the anticipated date of construction of the Improvements, and evidence of progress toward commencement of the construction, or cancelation of agreed upon improvements. Failure of the Grantee to comply with the due diligence requirements of the grant is a violation of the grant and may lead to cancellation of the right-of-way under §169.405 or §169.408.

Grantee agrees to:

- Construct and maintain improvements within the right-of-way in a professional manner consistent with industry standards; comply with all applicable laws and obtain all required permits; not commit waste;

Operate, repair and maintain improvements consistent with the right-of-way grant; refrain from interfering with the landowner's use of the land, provided that the landowner's use of the land is not inconsistent with the right-of-way; hold the United States and the Indian landowners harmless from any loss, liability, or damages resulting from the Grantee's use or occupation of the premises; and indemnify the United States and the Indian landowners against all liabilities or costs relating to the Grantee's use, handling, treatment, removal, storage, transportation, or disposal of hazardous materials, or release or discharge of any hazardous material from the premises that occurs during the term of the grant, regardless of fault, with the exception that the applicant is not required to indemnify the United States or the Indian landowners for liability or costs arising from the Indian landowners' negligence or willful misconduct or breach of the terms of this Easement.

IN WITNESS WHEREOF, the Grantor has executed this grant of Easement this 23 day of July, 20 19.

This right of way is hereby granted in accordance with Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328) 25 CFR §169.107(b), §169.124, and approved in accordance with authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4 and Regional Delegation to 3 IAM 4 issued April 17, 2018.

Name	Undivided Indian Interest
Janice M. Funk	1/15
Joanna K. Stand	1/15

Superintendent, Miami Agency

7/23/2019
Date

R.O.W #: 920
Allot #: 920 S 14
Allot Name: Alice Greenbeak/ Beaver Creek North

ACKNOWLEDGEMENT

State _____)

County of _____)

Before me _____, a Notary Public in and for said County and State on this _____day of _____, 20____, personally appeared _____, to me known to be the identical person(s) who executed the within and foregoing instrument and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and Year last above written.

_____ _____, 20____

Notary Public My commission expires

R.O.W #: 920
Allot #: 920 S 14
Allot Name: Alice Greenhead/ Beaver Creek North

Attachment A

Janice M Funk 1/17/19
Janice M. Funk Date

Janice M. Funk 1/15
602 E Huntsville PL
Broken Arrow, OK 74011-3509

Joanna K. Stand Date

Joanna K. Stand 1/15
5637 S Newport Ave
Tulsa, OK 74105-7842

R.O.W #: 220
Allot #: 220 S 24
Allot Name: Alice Greenhook/ Beaver Creek North

Attachment A

Janice M. Funk Date

Janice M. Funk 1/15
602 E Huntsville PL
Broken Arrow, OK 74011-3509

Joanna K. Stand 1/19/19
Joanna K. Stand Date

Joanna K. Stand 1/15
5637 S Newport Ave
Tulsa, OK 74105-7842

Conservation Easement for Tracts 920 156 and 920 157

R.O.W #: 920 4200158 4400
Allot #: 920 156 and 920 157
Allot Name: Pius Quapaw and TaMeeHeh Quapaw

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
MIAMI AGENCY
P.O. BOX 391
MIAMI, OK 74355

CONSERVATION EASEMENT

KNOW ALL MEN BY THESE PRESENTS: That the Secretary of the Interior, acting by and through the Superintendent, Miami Agency, Eastern Oklahoma Region, Bureau of Indian Affairs ("BIA"), Department of the Interior ("Grantor"), pursuant to the provisions of the Act of February 5, 1948 (62 Stat. 17, 25 U.S.C. 323-328), and 25 C.F.R. Part 169, and under authority delegated by 209 DM 8, 230 DM 1 and 3 IAM 4, and Regional Delegation to 3 IAM 4 issued April 17, 2018, in consideration of REMEDIATION OF THE PROPERTY, and other good and valuable consideration, the receipt of which is acknowledged, does hereby grant to the Quapaw Tribe of Oklahoma ("Tribe"), ("Grantee"), a Conservation Easement (25 C.F.R. § 169.5(a)(12)) over, across, in, and upon the Trust / Restricted interest in the following described lands ("Property") located in the County of Ottawa, State of Oklahoma, with Third-Party enforcement rights to the United States Environmental Protection Agency ("EPA") ("Third-Party Beneficiary"):

This Easement is limited to the following area(s) of the Property and is more particularly described as:

Being located within the allotment of Pius Quapaw 920 156 particularly described as follows: Commencing at the NE corner of said SE/4 of said Section 36; thence, West parallel to the North line thereof a distance of 2047.50 feet; thence, South parallel to the East line thereof a distance of 202.32 feet to the center of an existing mine shaft having a radius of 98.1 feet and being the point of termination, CB028 SI MS C; and Commencing at the NE corner of said SE/4 of said Section 36; thence, West parallel to the North line thereof a distance of 2172.14 feet; thence, South parallel to the East line thereof a distance of 339.21 feet to the center of an existing mine shaft having a radius of 20.8 feet and being the point of termination, CB028 SI MS F; and Commencing at the SE corner of said S/2 of said Section 36; thence, West parallel to the South line thereof a distance of 2860.72 feet; thence, North parallel to the East line thereof a distance of 1594.99 feet to the center of an existing mine shaft having a radius of 24.3 feet and being the point of termination all in Section 36, Township 29 North, Range 22 East, Ottawa County Oklahoma; and

Being located within the allotment of TaMeeHeh Quapaw 920 157 particularly described as follows: Commencing at the SE corner of said NE/4 of said Section 36; thence, West parallel to the South line thereof a distance of 2065.34 feet; thence, North parallel to the East line thereof a distance of 357.66 feet to the center of an existing mine shaft having a radius of 43.6 feet and being the point of termination CB028 SI MS A; and Commencing at the SE corner of said NE/4 of said Section 36; thence, West parallel to the South line thereof a distance of 1864.62 feet; thence, North parallel to the East line thereof a distance of 261.99 feet to the center of an existing mine shaft having a radius of 20.0 feet and being the point of termination CB028 SI MS B; and Commencing at the SE corner of said NE/4 of said Section 36; thence, West parallel to the South line thereof a distance of 1820.14 feet; thence, North parallel to the East line thereof a distance of 417.46 feet to the center of an existing mine shaft having a radius of 19.2 feet and being the point of termination CB028 SI MS D; and Commencing at the SE corner of said NE/4 of said Section 36; thence, West parallel to the South line thereof a distance of 1867.84 feet; thence, North parallel to the East line thereof a distance of 463.60 feet to the center of an existing mine shaft having a radius of 23 feet and being the point of termination CB028 SI MS E all in Section 36, Township 29 North, Range 22 East, Ottawa County Oklahoma.

and is further depicted on the map/diagram attached hereto.

This Easement is subject to any valid existing right or adverse claim and is **perpetual,** so long as said Easement shall actually be used for the purpose above specified:

This Easement is subject to all conditions and restrictions set out by the Indian Landowners consent(s) as stated in the Application.

The Property is a tract of Indian land within the Tar Creek Superfund Site that has been the subject of environmental remediation in accordance with the EPA's *Record of Decision, Tar Creek OU4 Superfund Site* ("ROD"), dated February 2008. The restrictions on use set forth hereunder are necessary to ensure that only appropriate land use and reuse options are implemented, and to notify current and future owners of record, as well as lessees and others, of the presence of engineering controls and/or other restrictions on uses of the Property. The Easement hereunder is being given by the Landowners in consideration for the remediation of the Property by the EPA, in conjunction with the State of Oklahoma and the Tribe. The Grantor and Landowners determine that such remediation, in addition to the consideration noted in the first paragraph, is just compensation for this easement.

Any other usage will be treated as non-compliance in accordance with 25 C.F.R. § 169 Subpart F.

Assignment(s) of said Easement shall not be permitted.

Mortgage(s) of said Easement by the Grantee shall not be permitted.

Restrictions on Use. Under this Easement, the areas of the Property within the Easement shall be used and managed for conservation purposes in accordance with the following restrictions on use:

(a) Prohibited Uses. The Property shall not be used for: [FOLLOWING TO BE REVISED AS APPROPRIATE FOR INDIVIDUAL TRACTS]

(i) any commercial use, excluding commercial uses relating to or involving conservation, fishing, hunting, and wildlife management, remediation, chat sales, and commercial use relating to chat sales;

(ii) educational use, excluding educational, research, scientific and similar uses that do not involve habitation or continuous occupation over an extended period of time;

(iii) residential use; and

(iv) any other purpose that involves the continuous occupancy of private or public buildings on the Property, except as provided for herein.

(b) Limitations on Water Well Drilling. No public water wells shall be drilled on the Property, unless the design of such water wells are determined by EPA to not interfere with the integrity of the remediation activities at the Site, as described in EPA's ROD, and approval for such drilling is given by the appropriate entities.

Said restrictions do not apply to any areas of the Property not within the defined area(s) of the Easement.

Permitted Uses of the Property. With the consent of the Landowners and the approval of the BIA as may be required by applicable federal law, the areas of the Property within the Easement may, without limitation, be used for:

(a) hunting and fishing, including traditional Tribal/American Indian hunting and fishing;

(b) agriculture, including traditional Tribal/American Indian and subsistence agriculture and agricultural

leases approved by the BIA;

(c) governmental activities of the Tribe that do not involve continuous habitation;

(d) cultural and religious activities of the Tribe and its members; and

Enforcement of Restrictions on Use and Right of Entry. The Grantee may bring an action hereunder in the United States District Court or any other forum with jurisdiction against any person or entity alleged to be in violation of the restrictions on use set forth herein. Such court shall have jurisdiction to interpret and/or award any appropriate relief permitted by law to enforce the land use restrictions, including but not limited to legal and equitable remedies to abate the breach, restore the area to its prior condition, and secure compensation for the costs of the enforcement action, including reasonable attorney's fees. Nothing hereunder provides a waiver of the privileges and immunities of the Grantee. BIA may treat any provision of a grant that violates Federal law as a violation of the grant.

Upon any breach or alleged breach of the covenants hereunder, the Grantee may, at their discretion, treat such an occurrence, giving rise to a right of entry to the Property. In the event that the Grantee exercises its right of entry, no compensation or damages shall be due to the Landowners or Landowners' successors and assigns against the Grantee.

Third Party Beneficiary's Rights. EPA, as Third-Party Beneficiary of this Easement, shall third-party enforcement rights of the terms, provisions and restrictions of this Easement. EPA's enforcement of the terms, provisions and restrictions shall be at the discretion of EPA, and any forbearance on behalf of EPA to exercise its Third-Party Beneficiary rights shall not be deemed or construed to be a waiver of those rights.

Modifications of Restrictions on Use. The restrictions on use granted hereunder may be removed or modified only with the written approval of the EPA, and only if the EPA determines that such restrictions are no longer necessary, in whole or part, to protect the public health and safety and the environment.

Payment(s) – To be determined and added to this instrument as appropriate to the given situation under 25 C.F.R. §§ 169.112 thru 169.122.

Additional Provisions. The Grantee maintains its existing jurisdiction over the land, activities, and persons within the Easement under 25 C.F.R. §169.10. This Easement grants the Grantee reasonable access to the Property to determine compliance with the Easement or to protect public health and safety.

The Grantee has no right to any of the products or resources of the land, including but not limited to, timber, forage, agricultural, mineral, and animal resources, unless otherwise provided herein.

If historic properties, archaeological resources, human remains, or other cultural items not previously reported are encountered during the course of any activity associated with this Easement, all activity in the immediate vicinity of the properties, resources, remains, or other cultural items will cease and the Grantee will respond in accordance with applicable law.

Any loss, liability, or damages resulting from this Easement will be determined under applicable law.

Improvements. This Easement must have attached or include by reference, maps of the definite location of the area(s) of the Easement and any improvements. If improvements are to be made upon the aforementioned property, it is the Grantee's responsibility to notify BIA and Grantor(s) and to provide a schedule of construction/completion of said improvements. If the schedule of construction is not able to be adhered to, it is the Grantee's responsibility

to provide documentation showing good cause as to the nature of any delay, the anticipated date of construction of the Improvements, and evidence of progress toward commencement of the construction, or cancelation of agreed upon improvements. Failure of the Grantee to comply with the due diligence requirements of the grant is a violation of the grant and may lead to cancellation of the right-of-way under §169.405 or §169.408.

Grantee agrees to:

- Construct and maintain improvements within the right-of-way in a professional manner consistent with industry standards; comply with all applicable laws and obtain all required permits; not commit waste; Operate, repair and maintain improvements consistent with the right-of-way grant; refrain from interfering with the landowner's use of the land, provided that the landowner's use of the land is not inconsistent with the right-of-way; hold the United States and the Indian landowners harmless from any loss, liability, or damages resulting from the Grantee's use or occupation of the premises; and indemnify the United States and the Indian landowners against all liabilities or costs relating to the Grantee's use, handling, treatment, removal, storage, transportation, or disposal of hazardous materials, or release or discharge of any hazardous material from the premises that occurs during the term of the grant, regardless of fault, with the exception that the applicant is not required to indemnify the United States or the Indian landowners for liability or costs arising from the Indian landowners' negligence or willful misconduct or breach of the terms of this Easement.

IN WITNESS WHEREOF, the Grantor has executed this grant of Easement this 6 day of December 20 18 .

Superintendent, Miami Agency

ACKNOWLEDGEMENT

State _____)

County of _____)

Before me _____, a Notary Public in and for said County and State on this _____ day of _____, 20____, personally appeared _____, to me known to be the identical person(s) who executed the within and foregoing instrument and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and Year last above written.

_____ _____, 20____

Notary Public My commission expires

APPENDIX K – SCREENING-LEVEL RISK REVIEW

The soil cleanup goals for OU2 were established for the protection of human receptors. The OU4 soil cleanup goals were established based on rural residents' exposure to chat material and terrestrial exposure to chat material. To evaluate whether any exposure factor and toxicity value changes since the ROD could affect remediation levels, the OU2 and OU4 soil cleanup levels were compared to EPA's RSLs. Ecological risk guidance has not changed since the ecological-based cleanup goals were established. Thus, these levels remain valid for ecological exposure.

As demonstrated in Table K-1, the ROD cleanup goals for cadmium and zinc represent cancer risks that are within EPA's risk management range of 1 x 10^{-6} to 1 x 10^{-4} and below the target noncancer hazard quotient (HQ) of 1.

Table K-1: Screening-Level Risk Evaluation of OU2 and OU4 Soil Cleanup Goals

COC	ROD Residential Cleanup Goal (mg/kg)	Residential RSL[a] (mg/kg)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ=1.0		
Cadmium	10	2,100	71	5 x 10^{-9}	0.14
Lead	500	400[d]		> 400	
Zinc	1,100	NA	23,000	--	0.04

Notes:

a. Current EPA RSLs, dated 2019, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 7/16/2019).

b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (cleanup level ÷ cancer-based RSL) × 10^{-6}.

c. The noncancer HQ was calculated using the following equation: HQ = cleanup level ÷ noncancer-based RSL.

d. EPA has no consensus on carcinogenic or noncarcinogenic toxicity values for inorganic lead, so it is not possible to calculate RSLs. Therefore, EPA evaluates lead exposure by using blood-lead modeling and established a default residential level of 400 mg/kg. If this value is exceeded, use of site-specific information is recommended, which may include blood-lead models or blood-lead testing. Blood-lead testing continues to be conducted at the Site.

NA = not applicable; noncancer toxicity criteria not established

EPA has no consensus on carcinogenic or noncarcinogenic toxicity values for inorganic lead, so it is not possible to calculate RSLs. Therefore, EPA evaluates lead exposure by using blood-lead modeling and established a default residential level of 400 mg/kg for screening soil based on a standard default residential exposure. If this value is exceeded, use of site-specific information is recommended in the blood-lead model.

According to the OU2 and OU4 RODs, the lead cleanup goal of 500 mg/kg is based on EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model for lead in young children utilizing site-specific sampling information obtained for the preparation of the baseline human health risk assessments and also upon EPA Region 6 experience with large-area lead cleanups. The lead cleanup goal of 500 mg/kg represents a level where less than 5% of the exposed children and adolescent populations would exceed a blood-lead level of 10 µg/dL; this level was based on a blood-lead model following EPA's lead guidance at the time of the OU2 and OU4 RODs. Until 2012, the CDC's blood lead reference level of concern in children 6 years old and younger was 10 µg/dL. Since 2012, the CDC has used a reference level of 5 µg/dL for young children. The revised reference level was used in evaluating blood-lead data during the previous FYR and was used in evaluating the blood-lead results for this FYR.

EPA is in the process of updating its policy based on recent studies, which indicate that lower blood lead levels may be associated with health effects. EPA Region 6 will continue to use the current EPA policy until the Agency finalizes and updates its policy, at which time the ROD cleanup goal may be re-evaluated. In the meantime, EPA is working with the State to monitor blood lead levels to discover any cases of elevated blood-lead levels in young

children above the CDC reference level of 5 µg/dL and a process is in place for follow-up actions if elevated blood-lead levels are identified as summarized in the following paragraphs.

An agreement is currently in place between EPA and ODEQ to provide funding for OSDH to continue to screen blood lead levels in children 6 months to 6 years of age in the site area. The goal is to identify children with high blood-lead levels, help their families locate the source of the problem and develop solutions. OSDH tests children, at no cost to the family, and provides a follow up with children and their families if elevated blood-lead levels are found. OSDH also engages in public health education by developing and presenting educational materials related to sources of lead and contamination. It provides lead poisoning prevention education in schools, childcare centers and Head Start programs; distribution of educational materials on childhood lead poisoning prevention to families and the general public; and participation in community and tribal events and activities to promote lead poisoning prevention awareness.

ODEQ also provides quarterly reports for EPA review. In addition, EPA and ODEQ provided a hotline for OSDH to encourage parents of children with elevated blood-lead level to contact ODEQ, which in turn contacts EPA to carry out environmental investigations and, if needed, a soil removal action.

Outcomes for this project coincide with EPA's Strategic Plan objective to ensure protecting human health from chemical risks and to ensure that the percentage of children with blood lead levels above 5 µg/dL does not rise above the target level. The overall objective is to help eliminate childhood lead poisoning as a public health concern in Ottawa County by reducing the number of cases of children (aged 6 months to 6 years) with blood lead level greater than 5 µg/dL.