THIRD FIVE-YEAR REVIEW REPORT

FOR
KOPPERS COMPANY, INC.
SUPERFUND SITE
OROVILLE, CALIFORNIA

July 2008

Approved by:

Kathleen Salyer
Chief, Site Cleanup Branch
EPA, Region 9

Date:

7/28/08

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Acronyms & Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
asl	above sea level
ATSDR	Agency for Toxic Substances and Disease Registry
AWSP	alternate water supply plan
Beazer	Beazer East, Inc.
CAMU	Corrective Action Management Unit
CD	Consent Decree
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
cy	cubic yards
DAP	di-ammonium phosphate
DNAPL	dense nonaqueous-phase liquid
DTSC	Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAC	granular activated carbon
gpm	gallons per minute
IC	Institutional control
IPE	isopropyl ether
KII	Koppers Industries, Inc.
L-P	Louisiana-Pacific Corp.
MCL	Maximum Contaminant Level
MNA	monitored natural attenuation
msl	mean sea level

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operations and maintenance
ORC	oxygen releasing compounds
OU	Operable unit
OWID	Oroville-Wyandotte Irrigation District (current name is South Feather Water & Power Agency)
P&T	Pump and treat
PAH	polynuclear aromatic hydrocarbon
PCDDs/PCDFs	polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
PCOR	Preliminary Close Out Report
PCP	pentachlorophenol
ppb	parts per billion
ppm	part per million
PR-1	passive recovery well
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
TI	Technical Impracticability

Executive Summary

The United States Environmental Protection Agency (EPA) completed the third site-wide five-year review of the remedial actions implemented at the Koppers Company, Inc., Superfund Site (Koppers), located east of Highway 70 in Oroville, California. The purpose of the five-year review is to evaluate whether the remedial measures implemented at Koppers continue to be protective of human health and the environment.

Koppers is bounded by the former Louisiana-Pacific Corporation (a delisted Superfund site) to the west, Georgia Pacific Way to the north and Baggett-Marysville Road to the south and east. Historically, wood-treatment operations were conducted at Koppers. Residual waste was discharged to unlined evaporative basins. Product handling and two fires (1963 and 1987) have also contributed to contamination at Koppers.

Chemicals of concern at Koppers include pentachlorophenol (PCP), isopropyl ether (IPE), polynuclear aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins\polychlorinated dibenzofurans (PCDDs/PCDFs), arsenic, barium, boron, chromium, copper, and creosote.

A Record of Decision (ROD) was signed for Koppers in September 1989 detailing four main impacted soil locations and impacted groundwater on and off property. An Explanation of Significant Differences (ESD) was issued in January 1991, and ROD Amendment No. 1 was issued in August 1996, modifying the soil remedy. ROD Amendment No. 2 was issued in September 1999, modifying the groundwater remedy.

All ROD, ESD, ROD Amendment No. 1, and ROD Amendment No. 2 selected remedies have been implemented. The remedies included excavation, disposal into onsite landfill cells and capping of contaminated soils, debris and sediments; groundwater pump and treat with enhanced in situ bioremediation; product recovery; providing an alternate water supply; and institutional controls. The Koppers Site achieved construction completion with the signing of the Preliminary Close Out Report (PCOR) on September 4, 2003.

This is the third site-wide five-year review for the Koppers Site. The activities conducted for this five-year review included a site inspection, technical interviews of operators and regulators of the site, community interviews and technical review and analysis of data from the last five years of reports submitted by Beazer East, Inc. (Beazer). Currently, all implemented remedies are found to be functioning as intended by the decision document and, therefore, are protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name : Koppers Company, Inc. Superfund Site

EPA ID: CAD009112087 **CERCLIS ID :** 0943

Region: 9 **State:** California **City/County:** Oroville/Butte

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

September 21, 1984

Remediation status (choose all that apply): ☒ Operating ☒ Complete

Multiple OUs? ☐ YES ☒ NO **Construction completion date:** 09/04/2003 (site-wide)

Has site been put into reuse? ☒ YES ☐ NO

REVIEW STATUS

Reviewing agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Kim Hoang, PhD, MPH

Author title: Remedial Project Manager **Author affiliation:** EPA Region 9

Review period: Data: July 2002 – July 2007 - Technical Reports: October 2002 – October 2007

Date(s) of Site inspection: December 18-19, 2007

Type of review: ☒ Statutory

☐ Policy ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only

☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead

☐ Regional Discretion)

Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify)

Triggering action:

☐ Actual RA Onsite Construction at OU No.__

☐ Actual RA at OU No.__

☒ Previous Five-Year Review Report

☐ Construction Completion

☐ Other (specify) _____

Triggering action date: February 7, 2003

Due date (five years after triggering action date): February 7, 2008

Issues and Recommendations

Issues

There are no issues that affect protectiveness.

Protectiveness Statement

The remedy at the Koppers Superfund Site is protective of human health and the environment because all exposure pathways that could result in unacceptable risk are being controlled. Residents within the former plume have been provided with an alternate water supply. A deed restriction on the property prevents unacceptable exposure to on-site soil contamination and restricts the property for industrial use only. Current data indicate that the groundwater remediation is progressing and that the remedy is functioning as required to achieve groundwater remediation standards.

1.0 Introduction

The United States Environmental Protection Agency has conducted a third five-year review of the remedial action implemented at the Koppers Company, Inc. Superfund Site (also referred to as the Koppers Site, Koppers, or the Site) located south of Oroville, California, east of Highway 70.

The purpose of the five-year review process is to evaluate whether the remedial measures implemented at the Site are protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify any deficiencies found during the review and provide recommendations for addressing them.

By statute, EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented."

The NCP, in section 300.430(f)(4)(ii), states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."

Consequently, this five-year review was performed because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure.

This is the third five-year review for the Koppers Site. EPA conducted an initial five-year review in December 1997. No deficiencies were noted at that time. In the second five-year review, completed in 2003, EPA found that the soil remedy was completed successfully and concluded that the existing pump-and-treat (P&T) system was remediating the immediate threats posed by the Site. The triggering action for this third statutory review is the date of the second five-year review, February 7, 2003.

2.0 Site Chronology

Table 2-1 provides the chronology of key events associated with the Koppers Company, Inc. Superfund site. A more detailed chronology table is provided in Appendix A.

TABLE 2-1
Chronology of Site Events

Event	Date
Dredge mining operations were conducted at the Site.	1900s
Wood was treated at the Site with several chemicals including pentachlorophenol, creosote, and chromated copper arsenate solution to prevent wood deterioration by insects or fungi. Several contaminants were discharged to the soil during process operations.	1920 to 2001
Koppers purchased the property and wood-treating operations from the National Wood Treating Company.	1955
A fire occurred at the Site; approximately 20,000 gallons of PCP were released from tanks. Debris was buried on property initially, then later excavated and disposed of at an approved landfill.	1963
Groundwater found contaminated with PCP on property and off property.	1971 to 1972
Regional Water Quality Control Board (RWQCB) issued several orders to Koppers to clean up groundwater, end discharge of PCP into soil, and clean up contaminated soil. Koppers implemented these orders.	1973 to 191982
Site was placed on the National Priorities List (NPL).	September 1984
Residences within areas of impacted groundwater were connected to Oroville Wyandotte Irrigation District (OWID). Thirty-four residences were initially put on the alternate water supply plan (AWSP), with Koppers paying for their water bill. Of those thirty-four, seven are still on the AWSP, receiving payment from Beazer East, Inc. (Beazer) for their annual water bill.	March 1986 to date
Administrative Order on Consent signed between Koppers and EPA, requiring completion of the Remedial Investigation and Feasibility Study (RI/FS).	April 1986
Explosion and fire at the Site. EPA issued a unilateral order for the cleanup, removal, and stabilization of soil and debris.	April 1987
After the fire, Department of Health Services sampled neighboring properties and found elevated dioxin levels in chicken eggs; an advisory was issued and the source of area-wide trace dioxin was not determined.	March 1988
Koppers and the associated Site were bought by Beazer East, Inc. (Beazer).	1988
Beazer sold the property and wood-treating operations to Koppers Industries, Inc. (KII), yet Beazer retained responsibility for CERCLA matters at the Site.	December 1988
RI/FS reports completed. ROD for cleanup of groundwater and soil was issued for the Site, covering four soil units on the property (S1 through S4) and two groundwater units (referred to as on-property and off-property).	1988 to 1989

TABLE 2-1
Chronology of Site Events

Event	Date
ESD issued for the Site to limit cleanup standards for soil in the ROD (which were based on direct human exposure) to a depth of 5 feet, and confirm that EPA will establish cleanup standards for deeper soils based on protection of groundwater from subsurface soil contamination. The ESD also clarifies the ROD's requirements for institutional controls.	January 1991
Consent Decree between EPA and Beazer requiring Beazer to conduct remedial action work as specified in the ROD.	February 6, 1992
Soil remedial action implemented for the four soil units. Treatability studies found soil washing and soil bioremediation not to be implementable. Soil from one bioremediation test plot with high dioxin level was landfilled in Cell #1.	1989 to 1995
Groundwater remediation action implemented on property and off property.	1993 to 1994
Pilot study for in situ biotreatment system of creosote in on-property western groundwater plume. Terminated in 2001 at the request of Beazer, because additives apparently resulted in increased mobility of PAHs.	1995 to 2001
Off-property groundwater remedial system taken off line because the plume retreated. The extraction wells were no longer effective in capturing the plume.	December 1995
ROD Amendment No. 1 issued for the Site in 1996, modifying the soil remedies in the four units by changing the cleanup standards to allow for industrial use only and requiring that contaminated soils be placed in an onsite landfill. This ROD amendment also required a deed restriction be added to the ICs to prohibit future residential use of the property. Construction of Cell # 2 completed in 2002.	1996 to 2002
First five-year review completed (statutory review, triggered 5 years after initiation of remedial action (RA) implementation. Remedial actions were deemed protective of public health and the environment and were functioning as designed.	December 1997
Implemented in situ enhanced bioremediation program to treat PCP in the on-property eastern plume.	March 1998
Implemented off property groundwater in situ bioremediation program.	August 1998
ROD Amendment No. 2 issued for the Site, modifying the groundwater remedy to provide for: (1) 4-acre Technical Impracticability (TI) Zone for plume areas with dense nonaqueous-phase liquid (DNAPL), (2) adding enhanced in situ bioremediation to the remedy, (3) providing monitored natural attenuation as a contingency remedy, and (4) revising groundwater standards for PCP (1 part per billion [ppb]) and barium (1,000 ppb).	September 1999
Koppers ceased operations and began work on Resource Conservation and Recovery Act (RCRA) closure, overseen by Department of Toxic Substances Control (DTSC).	March 15, 2001
Beazer East, Inc. purchased Site property from KII.	November 2002
Second five-year review completed. Remedial actions were deemed protective.	February 2003
Preliminary Close Out Report signed by EPA.	September 4, 2003
Amended Consent Decree entered by the court to implement changes in ROD Amendments No. 1 and No. 2.	September 22, 2003
Covenant to Restrict Use of Property to Industrial use only recorded with Butte County.	November 12, 2003

TABLE 2-1
Chronology of Site Events

Event	Date
Site Certification from DTSC.	June 30, 2004
Beazer sold most of property to North Ophir Land, LLC.	November 28, 2006
EPA approved to change oxygen-releasing compounds (ORC) from magnesium peroxide to the calcium peroxide-based compound for Groundwater In-Situ Bioremediation Program.	January 31, 2007
Third five-year review initiated.	November 5, 2007
North Ophir Land, LLC, sold portions of the property to Strategic Development Holding Co, LLC.	December 18, 2007

3.0 Site Background

3.1 Physical Characteristics

The Site is located approximately 2 miles south of Oroville off Highway 70 on Baggett-Marysville Road. Oroville is the county seat of Butte County, with a population of 14,400 as of 2007. It is situated at the head of navigation on the Feather River. The Yuba River flows into the Feather River near Marysville, California, and these flow together to the Sacramento River. Geologically, Oroville is situated at the meeting place of three provinces: the Central Valley alluvial plain to the west, the crystalline Sierra Nevada to the southeast, and the volcanic Cascade Mountains to the north. It has a Mediterranean climate.

The Koppers Company, Inc. Superfund Site is an area of approximately 205 acres located in Butte County, in the southern portion of the City of Oroville. The topography of the Site slopes toward the southwest. Koppers is bounded by the former Louisiana-Pacific Corporation (L-P) Lumber Mill to the west, Georgia Pacific Way to the north, and Baggett-Marysville Road to the south and east (Figure 3-1). Remnants of dredge mining operations during the 1900s remain throughout the northern portion of the Site.

The Site has been used for wood-treating operations since 1948 (EPA, 1989). Elevation of the Site is approximately 145 feet above sea level (asl). A historical mining tailing pile is present at the northern area of the property at approximately 120 feet asl (EPA, 1989). The Site is not located in an area that is considered environmentally sensitive.

3.2 Land and Resource Use

Land use near the Site is a mixture of residential, industrial, commercial, and agricultural. Rural homeowners on 1 to 5 acres of land commonly raise livestock and grow produce for home use. Residential areas are to the south, southeast, west, and northeast of the Site. There are three schools within a 2-mile radius of the Site (EPA, 1989). There were two NPL sites in the vicinity of Koppers: the L-P Corporation site, west of the Site, and the Western Pacific Railroad site, northeast of the Site. The former L-P Corporation site was deleted from the NPL in 1996, and the Western Pacific Railroad site was deleted in 2001. West of the Feather River is public open space, the Oroville Wildlife Area (Dames and Moore, 1988).

In September 2003, Beazer, the owner and responsible party at the Site, and the DTSC completed negotiations on a land use covenant intended to protect current and future users of the site, because the soil cleanup actions (per ROD Amendment No. 1) do not allow for unrestricted use of the property. The land use covenant incorporates 1) restrictions that prohibit certain uses of the property and prohibit certain activities, and 2) requirements for soil management whenever any excavation occurs. The future use of the property has been restricted to industrial/commercial use. Extraction of groundwater is prohibited except for Site remedial activities. Existing drainage patterns may be altered provided that the alteration does not impact onsite landfills, former pole-wash area, former dri-con area,

process area cap at the former biological treatment facility, TI zone, or remedial actions on the property. Irrigation or other activities that introduce water to subsurface soils are prohibited. All users and developers of the property are directed to preserve the integrity of all remedial systems including the P&T systems, onsite landfills, extraction and monitoring wells, remediation wells, and caps. The covenant provides right of entry and access for implementing remediation and operations and maintenance (O&M) until the CERCLA lead agency determines that such activities are not needed.

The majority of the property (205 acres) that has been remediated has been sold for redevelopment. It was purchased in November 2006 by North Ophir Land, LLC, and then subsequently sold to Strategic Development Holding Co, LLC, in December 2007. The land is zoned as industrial and will likely be divided into multiple parcels.

3.3 History of Contamination

Wood-treating operations, intended to prevent wood from deterioration by insects or fungi, were conducted at the Site from 1948 to 2001. The wood-treatment process involved the use of chemical preservatives such as PCP (from 1948 to 1988), creosote, and chromated copper arsenate solution. The cellon process used PCP in isopropyl ether and butane to treat wood. The non-com exterior (NCX®) process, discontinued in 1986, used chemicals containing formaldehyde and dicyandiamide. Other chemicals historically used at the Site include creosote, naphthalene, boron, phosphorous, diesel oil, and gasoline (Dames and Moore, 1988).

Chemicals were released to the environment through waste disposal practices, spills, fires, products dripping from treated wood, and storage and handling practices. From approximately 1952 to 1973, unlined creosote settling ponds located west of the former process area were used as evaporator basins for process residuals. Occasionally the creosote ponds overflowed to a marsh area southwest of the L-P ditch (Dames and Moore, 1988; HSI Geo Trans, 1999). Upon discontinued use, this area was later backfilled with soil and dredge tailings. From 1961 to 1973, the cellon process released residual wastes across approximately 1 acre near the western Site boundary (Dames and Moore, 1988). From 1963 to 1973, wastewater from a pole-washing unit at the northern portion of the Site was not contained and released just south of the pole washer. In 1963, a fire occurred at the Site resulting in a release of 20,000 gallons of PCP, and the cellon process plant was destroyed. Combustion of PCP produced polychlorinated dibenzo-p-dioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs). The debris from the fire was buried on property (Dames and Moore, 1988). There was another fire at the Site in 1987. The debris collected after the fire was placed in drums and stored on property (HSI Geo Trans, 1998).

3.4 Initial Responses

PCP-contaminated groundwater was first identified on property in 1971. The RWQCB issued two orders to Koppers in 1973 and 1982, directing Koppers to treat groundwater and end discharge of PCP into the soil. Koppers installed and operated two recovery wells from 1974 onsite. In 1984, when groundwater contamination was found more than 1 mile offsite, Koppers began supplying bottled water to 45 residences and completed a Phase I and Phase

II hydrogeologic groundwater investigation. Results indicated a plume of PCP, PAHs, and IPE moving southwest.

In 1984, the Site was placed on the NPL. Koppers signed an Administrative Order on Consent with the EPA in 1986, agreeing to conduct the RI/FS. As part of the initial response activities, Koppers began a groundwater monitoring program, and provided an alternate water supply through the OWID to downgradient residences with PCP-impacted drinking water supply wells. In 1987, a fire at the Site resulted in the EPA issuing an order for the cleanup, removal, and stabilization of impacted soils and debris.

At the request of Citizens for Clean Water, a local community group concerned with the contamination and cleanup of this Site, the Agency for Toxic Substances and Disease Registry (ATSDR) performed a public health assessment of the Site after the 1987 fire. The report was published in 2000. After reviewing and evaluating environmental sampling data and exposure pathways, ATSDR concluded the following:

- Past exposures to domestic contaminated well water, smoky air (from the fires), and onsite contaminated soils might have resulted in some short-term reversible adverse health effects such as skin irritations and headaches, but these exposures were unlikely at high enough concentrations or long enough duration to cause long-term health effects.
- As of the time of the report in 2000, after the remedial actions were underway, the Site posed no apparent public health hazards.

Table 2-1 summarized the responses on the Site. Table A-1 in Appendix A provides the detailed actions summarized in Table 2-1.

3.5 Basis for Taking Action

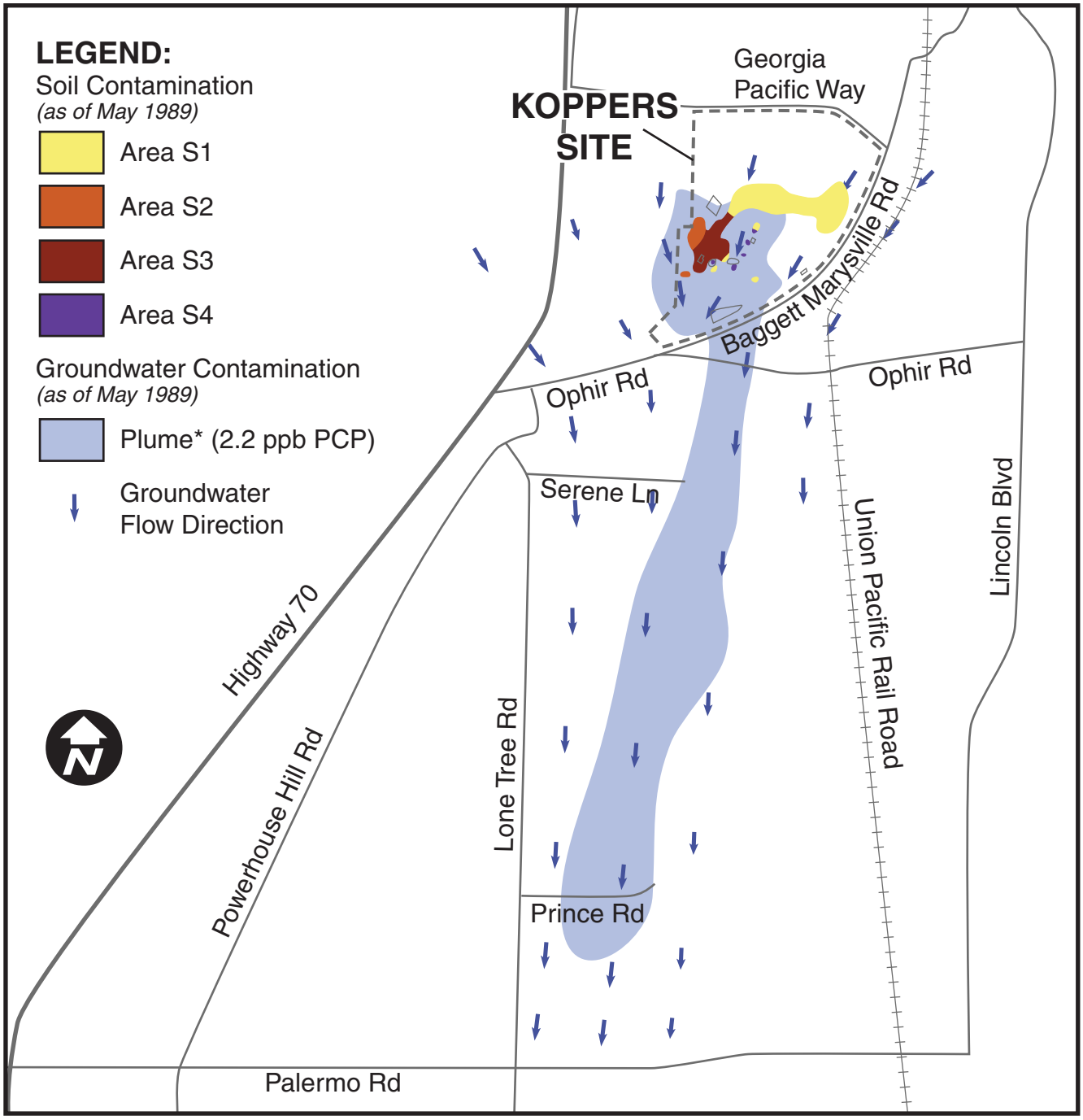
Contamination was found in soil at several areas on property, and in groundwater both on property and off property. The groundwater on-property plume extended to beneath the adjacent L-P site and was contaminated with higher concentrations of contaminants, including creosote which was previously disposed into an unlined pond. The off-property groundwater plume was characterized to be about 2,000 feet wide and extended over 2 miles south of the Koppers Site. The main contaminant found in groundwater off property at levels exceeding the drinking water standard was PCP.

The 1989 ROD identified one operable unit that covered both soil and groundwater (Operable Unit (OU) 1). The ROD referred to four different "soil units" labeled S1 thru S4 and had separate remedies for each. The 1989 ROD combined the "off-site- and on-site groundwater areas of contamination" into one unit and selected a pump & treat remedy for that unit, along with product recovery well(s) in the creosote pond area. Table 3-1 and Figure 3-1 identify contaminants of concern (hazardous substances, pollutants, and contaminants) that have been released at the Site.

TABLE 3-1
Estimated Quantities of Contaminated Media

Unit Designation	Chemicals of Concern	Area	Area and Volume of Contaminated Media
Soil: Area S1	PCP and PCDDs/ PCDFs	Former pole-wash area and areas along the drip track leading to the process area, areas east and south of the process area, the fire debris site at the eastern side of the western spray field, and the surface soils throughout the treated wood transport areas.	Area: 869,300 square feet, covering the largest surface area of the four OUs. Volume of contaminated soil: 110,000 cubic yards (cy).
Soil: Area S2 (includes future TI zone[a])	Present as dense nonaqueous-phase liquids (DNAPLs): PCP, PAHs, PCDDs/PCDFs[a], and carcinogenic PAHs[a]	Former creosote pond and cellon blowdown areas, an area of creosote-contaminated soil along the L-P ditch, and sediments in offsite drainage ditches and ponds southwest of the Site.	Area: 800,000 square feet, containing the largest volume of soil on the Site due to soil contamination extending to water table (25-30 feet [ft] deep). Volume of contaminated soil: 200,000 cy.
Soil: Area S3	PCP, PAHs, Metals	Wood-treating process area used in normal production operations at the Site.	Area: 308,000 square feet. Volume of contaminated soil: 19,400 cy.
Soil: Area S4	Metals (arsenic, chromium, and copper)	East and south of the process area, where wood treated with metals was stored.	Area: 84,600 square feet. Volume of contaminated soil: 4,000 cy.
Other soil areas	Not defined	Drums of debris from 1987 fire, soil filter bed of the Biological Treatment Unit, and sediments in the fire pond [b].	Volume of contaminated soil: 100,000 cy.
On-property groundwater Off-property groundwater	PCP, IPE, PAHs, Metals (arsenic and chromium) PCP, IPE	North and west of Baggett-Marysville Road. South of Baggett-Marysville Road.	Volume of contaminated groundwater: 84,000,000 cubic feet (cf). Volume of contaminated groundwater: 300,000,000 cf.

[a] Identified in ROD Amendment No. 2 (EPA, 1999)
[b] Identified in ROD Amendment No. 1 (EPA, 1996)



*Based on October, 1988 Sampling Results

FIGURE 3-1
SITE MAP

4.0 Remedial Action

The following sections summarize the remedial actions selected, as well as the implementation, operation, and maintenance of remedial systems.

4.1 Remedy Selection

The remedies were selected in several stages, as stated in the ROD, soil removal action memorandum and ROD Amendments, due to new information found onsite during the RA phase. The initial ROD (EPA, 1989) provided the basis for taking actions as described in Section 3.5.

Table 4-1 summarizes the cleanup standards from the 1989 ROD, and the two ROD amendments. These standards were based on direct exposures from current and future residential use of the Site. Exposure scenarios that posed unacceptable public health risks included drinking contaminated groundwater; and contact exposure to contaminated soils and sediments by trespassers, by construction workers implementing the soil remedies and by potential future residential use of the Site. The ESD (EPA, 1991) added the provision to require the establishment of subsurface soil cleanup standards below 5 ft to ensure the protection of groundwater.

TABLE 4-1
Remediation Standards

Media	Chemical	Units[a]	Standard from ROD and ROD Amendments
Soil	Arsenic	ppm	7.15[b]
	Chromium	ppm	181[b]
	Carcinogenic PAHs[c]	ppm	0.19
	PCDD/PCDFs[d]	ppt	30
	Pentachlorophenol	ppm	17
Sediments	Arsenic	ppm	7.15[b]
	Carcinogenic PAHs	ppm	11
	PCDD/PCDFs	ppb	1.8
Groundwater	Benzene	ppb	1.0
	Ethylbenzene	ppb	680
	Total Xylenes	ppb	1,750
	Isopropyl Ether	ppb	2,800
	Carcinogenic PAHs	ppb	0.007
	PCDD/PCDFs	ppq	0.53

TABLE 4-1
Remediation Standards

Media	Chemical	Units[a]	Standard from ROD and ROD Amendments
	Pentachlorophenol	ppb	1.0
	Arsenic	ppb	6-27[e]
	Barium	ppb	1,000
	Boron	ppb	1,200
	Cadmium	ppb	5
	Chromium	ppb	6-35[e]
	Copper	ppb	13-30[e]
	Mercury	ppb	2

[a] Units:
ppm = parts per million
ppt = parts per trillion
ppb = parts per billion
ppq = parts per quadrillion

[b] Background concentration per ROD Amendment No.1

[c] Includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(123-cd)pyrene

[d] Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (dioxins)

[e] Because chemical is naturally occurring, value ranges are based on background in groundwater

The remedies selected for soil cleanup in the ROD would treat the contaminated soil to remove contaminants and achieve the cleanup goals (proposed treatment technologies included soil washing, soil fixation, and bioremediation). As described in the ROD, the soil within the wood-treating process area (Area S3) was to be capped until the area became accessible. When operations ceased at the Site, this area would then be cleaned up with an appropriate technology to be selected based on contaminant levels in soil and the success of the other soil cleanup approaches used at the Site.

During implementation of the ROD, it was found that most of the contaminated soil onsite contained a mixture of several contaminants (e.g., both organic and inorganic contaminants) not as well separated as envisioned in the ROD. Therefore, the initial soil remedies selected in the ROD were not implementable for the mixtures of contaminants found in all the soil areas. ROD Amendment No. 1 selected a new soil remedy in which 1) all the contaminated soil was to be excavated and landfilled onsite; 2) cleanup standards for contaminated soil were changed to industrial standards instead of residential standards; and 3) institutional controls (via a land use covenant, or deed restriction) were required to restrict future use of the Site to industrial use. Based on the results of the Leachability and Degradation Study (HydroSearch, Inc., 1996), which identified two areas of the site with potential to impact groundwater (the former pole wash area and the former creosote pond area), ROD amendment No. 1 also required the removal of the potential source material in both areas as part of the new soil cleanup. As a result, EPA did not establish the subsurface soil cleanup

standards as envisioned in the 1991 ESD. A summary of all the soil remedy selections is presented in Table 4-2.

TABLE 4-2
Remedy Selection for the Soil Units

Unit Designation	ROD (1989)	ROD Amendment No. 1
Soil: Area S1	In situ biodegradation by applying water with nutrients and oxygen to soil contaminated with PCP, dioxins, and furans.	Modify soil remedies in ROD to onsite landfill in Cell No. 2 for contaminated soils from all four units (S1 through S4), as well as other contaminated soil areas not addressed in ROD. Total area of soil to be cleaned up was 25 acres, with estimated soil volume at 100,000 cy. Cleanup goals were changed to industrial use standards. Institutional Controls were implemented via a land use covenant (deed restriction) as described in Section 3.2.
Soil: Area S2 (includes TI zone[a] from ROD Amendment No. 2)	Soil excavation and washing of soil contaminated with PAHs, metals, PCP, and dioxins/furans.	
Soil: Area S3	Cap the process area to contain PCP, PAHs, dioxins/furans, and metals contamination until soil beneath the treating operations is accessible, with groundwater pumping to control leaching.	
Soil: Area S4	Excavation and chemical fixation of soils contaminated with arsenic and chromium. Small volume of contaminated soil can be disposed offsite at a permitted landfill.	
Other contaminated soil areas	Not addressed.	

For the groundwater remedies, the initial ROD selected P&T technology to treat groundwater both onsite and offsite, with onsite groundwater contaminated with DNAPL going through pretreatment before carbon adsorption. Treated water would be discharged or reinjected. For offsite private wells contaminated by Koppers' operations, the ROD provided a permanent alternative water supply. The ROD Amendment No. 2 added the in situ bioremediation component to the groundwater treatment remedy and declared a TI zone waiver for the areas contaminated with DNAPL containing PAHs and creosote, which cannot be removed and treated thoroughly enough to achieve the groundwater cleanup standards for the site. A summary of all the groundwater remedy selections from all the records of decision is presented in Table 4-3.

TABLE 4-3
Remedy Selection for the Groundwater Operable Units

Unit Designation	ROD (1989)	ROD Amendment No. 2 (1999) modified groundwater remedies in the ROD. Add the following:
On-property groundwater	Installation of extraction wells and treatment plant to treat contaminated water by carbon adsorption. Pretreatment required for water containing contaminants not treatable with carbon. Treated water disposed to surface water or reinjected into groundwater via injection wells.	1) Augment the P&T remediation by enhanced in situ bioremediation to on-property eastern plume treatment by adding nutrients (oxygen, nitrogen, phosphorus) to onsite wells with downgradient monitoring. 2) TI waiver for the groundwater cleanup at the former creosote pond and cellon blowdown areas due to the presence of DNAPL (on-property western plume). Allow monitored natural attenuation (MNA) as a contingency remedy (on- and off-property plumes). 3) Revised groundwater standards for PCP from 2.2 to 1.0 ppb and for barium from 680 ppb to 1,000 ppb. The complete list of remediation standards is provided in Table 4-1.
Off-property groundwater	Installation of extraction wells, with contaminated water treated by carbon adsorption. Provide an alternate water supply via OWID to those residents with contaminated wells until remedial standards are met.	1) Augment the P&T remediation by enhanced in situ bioremediation (on-property eastern plume). Allow MNA as a contingency remedy. 2) Revised groundwater standards for PCP from 2.2 to 1.0 ppb and for barium from 680 ppb to 1,000 ppb. The complete list of remediation standards is provided in Table 4-1. 3) Modify alternate water supply termination criteria to provide conditions under which the use of the alternate water supply can cease.

4.2 Remedy Implementation

In 1992, a Consent Decree (CD) was signed between Beazer and EPA. Under the consent decree, Beazer was to design, construct, and operate the cleanup remedies specified in the ROD for contaminated soil and groundwater at the Site. In 2003, a Stipulated Amendment to the CD required Beazer to implement the ROD Amendments No. 1 and No. 2 for the changes in soil and groundwater remedies, respectively.

4.2.1 Soil

For soil remedies, several pilot treatability studies were conducted for soils from 1993 to 1995, including in situ bioremediation for soils in area S1, soil excavation and soil washing for soils in area S2, and fixation for soils in area S4. The soils in area S3 (process area) were capped and were to be cleaned up at a later date, when access to this soil would not disrupt plant operations.

Results of the treatability studies showed that the cleanup technologies selected for the soil remedies were unsuccessful because they could not reduce contaminant levels to the residential cleanup standards and/or they were not capable by themselves of treating the

combination of organic contaminants and metals that was actually typical of soils found everywhere on the Site. During the in situ bioremediation treatability study for soils in area S1, high levels of PCDDs/PCDFs (dioxins) were found in the test plots, and a removal action was ordered by EPA in 1995. This contaminated soil was landfilled onsite in a RCRA-designated Class I landfill, later referred to as Cell No. 1.

Other alternatives were considered to treat this contaminated soil, and the 1996 ROD Amendment No. 1 changed all the soil remedies selected in the ROD to an onsite landfill. Onsite soil disposal Cell No. 2 was constructed as a RCRA-designated Class I landfill. Cell No. 2 was filled with 146,930 cy of material from 1996 to 2002. ROD Amendment No. 1 also changed the future land use from residential to industrial and required institutional controls via a land use covenant to restrict future use of the Site to industrial use.

On November 12, 2003, a Covenant to Restrict Use of Property (Koppers Superfund Site, Oroville, Butte County, California) was recorded in the official records of Butte County, as required by the ROD Amendment No. 1.

4.2.2 Groundwater

To implement the groundwater remedy selected in the ROD, the on-property P&T groundwater remediation system was constructed and included groundwater extraction wells EW-1 and EW-2, with 200 gallons per minute (gpm) capacity each, injection wells IW-3 and IW-4 for treated water, air strippers, and activated carbon filters. Since the late 1980s, a small-scale BIFAR™ system had been in operation at the Koppers plant to treat contaminated groundwater and industrial process wastewaters. This system was expanded to handle wastewater flows resulting from the initial onsite soil remedies. The BIFAR™ unit was a biodegradation treatment process in which chemicals were converted by micro-organisms into less toxic compounds. The onsite treatment system started operation in February 1994.

In September 1994, Beazer installed a passive recovery well (PR-1) in the former cellon blowdown area and former creosote pond area to evaluate whether the subsurface pools of creosote on property can be effectively removed by draining them into a recovery well. The well has two separate screened intervals. Each 10-foot screen is located immediately above a clay lens, where free creosote is perched. The mobile creosote enters the well through the screened intervals and collects in a 5-foot deep sump at the bottom of the well. Fluid is purged periodically from the well and taken to an off-site location for disposal.

Beazer also initiated a pilot study in 1995 to determine whether biodegradation can be used to reduce the volume and mobility of PAHs, which are the contaminants of concern in the creosote. The 3-year pilot in situ groundwater biodegradation study showed increased deterioration of the mobile creosote contaminants near the nutrient injection well BW-1.

From 1997 to 1998, Beazer applied for an EPA TI determination for groundwater restoration in the former creosote pond and cellon blowdown areas. This was because the on-property P&T system cannot effectively remove creosote from the DNAPLs found trapped on three clay layers under this area.

In March 1998, EPA approved adding the PCP in situ bioremediation to the on-property treatment process. ORC, including magnesium peroxide and di-ammonium phosphate

(DAP) to supply nitrogen and phosphorous, were added periodically to on-property wells MW-1, MW-4, MW-6, MW-12, MW-13, and MW-23. Monitoring wells MW-3, MW-5, MW-7, MW-8, and TW-1 were used to monitor the effectiveness of this process.

The off-property groundwater treatment system was constructed south of Prince Road and began operation in 1993. It included two extraction wells (EW-3 and EW-4) with capacity of 300 gpm each, a treatment plant, injection wells, and approximately 1,500 ft of pipelines. Initially, the treated water was discharged to Wyman Ravine. Later it was reinjected into groundwater. In December 1995, the off-property P&T system was shut down because the system achieved the cleanup objectives at the extraction wells. Downstream monitoring wells RI-2 and RI-3 were used to monitor the off-property groundwater plume.

Residences with contaminated private drinking water wells were put on an alternate water supply plan (AWSP) in which they were initially supplied with bottled water, and later on were connected to the OWID. The AWSP also required Beazer to reimburse residents for the cost of OWID water. Following the treatment of the off-property groundwater plume, 26 of the original set of contaminated wells were found to be within the cleanup criteria and taken off the AWSP.

In August 1998, the PCP in situ bioremediation started off-property. Magnesium peroxide and DAP were added to off-property wells RI-11, RI-20A, and 26. Performance evaluation of this system was based on data from off-property monitoring wells RI-2, RI-3, RI-10, RI-12, and RI-16B.

A ROD Amendment No. 2 was signed in 1999 approving the TI waiver for the former creosote pond and cellon blowdown areas due to presence of DNAPLs, allowing the P&T groundwater remediation to be augmented by enhanced in situ bioremediation, and making provision for monitored natural attenuation.

Construction of remedial systems was completed in 2003 and the PCOR was signed on September 4, 2003. At the time of the PCOR, it was expected that cleanup levels (excluding the TI zone) would be met by 2024.

4.3 System Operations/Operations and Maintenance

System O&M includes maintenance of the two onsite landfills and O&M of the treatment systems for the groundwater remediation on and off property. Current reporting requirements of data include either semiannual or annual or both.

4.3.1 Soil

Construction of the two onsite landfills Cells No. 1 and No. 2, or Corrective Action Management Units (CAMUs), which were designed and built for soil remediation, was completed in September 2002. Maintenance includes groundwater monitoring beneath/adjacent to the CAMUs, settlement monitoring, maintenance of side-slope covers, leachate monitoring and removal, and conducting regular inspections as long as the CAMUs remain in place.

Table 4-4 summarizes the monitoring systems in place for soil remedies.

TABLE 4-4
Summary of Soil Monitoring Systems

Unit Designation	Description	Monitoring system	Monitoring schedule	Monitoring Analysis (chemicals)	Data included in Annual/Semiannual report
Soil: Cell 1 Corrective Action Management Unit (CAMU) Soil: Cell 2 (CAMU)	Both landfills are double-lined with 60 milliliter flexible membrane, contain leachate monitoring equipment, and are equipped with unsaturated zone monitoring apparatus.	13 settlement monuments periodically inspected for evidence of changes in elevations or signs of damage.	Annually	n/a	Annual report only
		Groundwater MW: around Cell 1: 6 MW: DCMW-1A, DCMW-2A,DCMW-3A, DCMW-1B,DCMW-2B, DCMW-3B Around Cell 2: 4 MW: DCMW-5A, DCMW-5B, DCMW-6A, DCMW-6B	Monthly	Chemicals of concern	Annual report only
		Leachate monitoring by checking a passive leachate collection regularly, which is pumped out on an as needed basis. The leachate is sent to an appropriate disposal facility.	As needed		Not reported. Confirmed with onsite manager that these checks are conducted regularly

4.3.2 Groundwater

The on-property groundwater P&T treatment system has been in operation since February 1994. A product recovery well was installed in the former creosote pond and cellon blowdown areas in 1994 to recover creosote. The off-property groundwater P&T treatment system began operation in March 1993 and was shut down in December 1995, as the original plume retreated. By December 1997, the groundwater plume, which initially extended continuously from the Koppers property to 2 miles south of the property, was split into two plumes: on-property plume and off-property plume. In 1998, an in situ bioremediation program was implemented for both the on-property and off-property groundwater plumes. Groundwater sampling for each contaminant of concern (COC) has continued both on- and off-property since 1985. Frequency of sampling is dependent upon the location and contaminant history.

Changes in operations and monitoring during the O&M period are described below.

4.3.2.1 On Property

The on-property plumes include a western plume below the former creosote pond and cellon blowdown areas and an eastern plume being treated by the onsite P&T treatment plant and in situ PCP bioremediation.

For western plume, a 3-year pilot in situ PAH bioremediation system was operated at well BW-1 in the former creosote pond and cellon blowdown areas from 1998 to 2001. The system was shut down in September 2001 because monitoring data indicated treatment had resulted in an apparent increase in mobility of PAHs downgradient.

In 1999, about 4 acres surrounding the former creosote pond and cellon blowdown areas were declared a TI zone in the ROD Amendment No. 2. This was because both the existing P&T treatment system and in situ PAH bioremediation failed to remedy the DNAPLs present in the clay layers beneath this area. Currently, monitoring for carcinogenic PAHs (cPAHs) continues downgradient of the TI zone to ensure that the ROD standard of 0.007 ppb for total cPAHs is not exceeded.

The product recovery well PR-1 in the TI zone is still in operation. Fluid is purged twice or three times a month from the well. Black purged fluid is identified as product, gray and brown fluid is identified as creosote/water emulsion. The creosote is recovered and disposed off site at the Clean Harbors Aragonite, LLC facility in Utah. Manifests for the disposal of wastes collected on site are available from the Beazer offices located in Pittsburg, PA.

Through July 2007, approximately 1,300 gallons of product were recovered to date (since 1994). Overall, about 850 gallons of creosote/water emulsion have been recovered. Current recovery rate in the last several years is approximately 5 gallons of product, and 3 gallons of creosote/water emulsion per recovery episode, which occurs approximately every two weeks.

For the eastern plume, the P&T treatment system was augmented with an enhanced in situ PCP bioremediation in March 1998. Both of these processes are currently operating on property. The P&T treatment system operates 24 hours per day, 7 days per week and is monitored by an onsite operator. The in situ PCP bioremediation includes quarterly addition of nutrients (ORC/DAP) to on-property wells MW-1, MW-4, MW-6, MW-12, MW-13, and MW-23. Monitoring wells MW-3, MW-5, MW-7, MW-8, and TW-1 were used to monitor the effectiveness of this process. In January 2007, the ORC (calcium peroxide) product was changed to a calcium peroxide-based compound, EHC-O. All changes were made with regulatory approval.

During the final soil cleanup of the process area (OU S3) in 2002, boron and PCP were released to the groundwater beneath the former dri-con/CCA tank area. This release has impacted the groundwater in this area. Boron and PCP concentrations in samples from MW-8, downgradient of the dri-con area, were found as high as 12,000 ppb and 1,100 ppb, respectively. To maintain the ROD standard for boron, in 2002, MW-8 was modified to become an extraction well, with about 35 gpm extracted groundwater blended with the treatment plant influent from EW-1 and EW-2. At MW-8, PCP concentration remained at below 400 ppb, and boron concentrations ranged from 2,080 to 2,870 ppb, above the ROD standard of 1,200 ppb. The treatment plant continues to perform effectively, with effluent

PCP concentration below the reporting limit of 0.5 ppb, and boron concentration below 700 ppb.

4.3.2.2 Off Property

For off-property groundwater, the P&T treatment system was shut down in 1995 because the extraction wells met the cleanup standards. During operation, the system treated 626,578,940 gallons. The in situ bioremediation program has been in operation since August 1998, with magnesium peroxide and DAP added quarterly to off-property wells RI-11, RI-20A, and 26. In March 2004, EPA approved discontinuing DAP addition to groundwater, and analyses for the bioremediation program were limited to PCP. Performance evaluation of this system was based on data from off-property monitoring wells RI-2, RI-3, RI-10, RI-12, and RI-16B.

PCP has been detected in monitoring well 86, an off-property well, intermittently from 1986 to 1988, and since 1999. Since November 1999, some PCP detections have been above ROD standard, usually associated with water level in this well exceeding 122 feet mean sea level (msl). High PCP levels usually persist for 8 to 12 months after the time the water level reaches this elevation. Since February 2002, PCP concentrations have remained above the ROD standard, with the exception of the non-detect result for third quarter 2006, due to the repeated and extended durations of water levels above 122 msl. Water-level data indicated that well 86 is located within the on-property eastern plume captured by EW-2. No PCP has been detected in downgradient well 31C1, which further suggests the PCP is being captured. Both well 86 and well 31C1 are currently being monitored quarterly until PCP concentrations decline at well 86 for a minimum of 1 year.

Beazer continues to fund the costs of the AWSP for seven affected residences. Five residences have impacted water wells (wells 59, 60, 61, 62, and 81) near the residual off-property plume, and two residences are near well 86 (31C2 and 31D3), which has shown periodic high PCP readings. These wells continue to be monitored.

The O&M costs, as reported by Beazer's contractor, GeoTrans, Inc., are as follows:

- O&M costs for 2006 were approximately $190,000, which included $32,000 for groundwater sampling and $158,000 for operating the system and labor.
- O&M costs for 2007 were approximately $208,000, which included $28,000 for groundwater sampling and $180,000 for operating the system, utilities, parts, and labor.

Table 4-5 summarizes the monitoring systems in place for groundwater remedies.

TABLE 4-5
Summary of Groundwater Monitoring Systems

Unit Designation	Description	Monitoring system	Monitoring schedule	Monitoring Analysis (chemicals)	Data included in Annual/Semiannual report
On-property groundwater West plume	TI zone exists over an area of approximately 4 acres, where former creosote pond and cellon blowdown areas, where groundwater is contaminated with DNAPL of creosote and creosote emulsion	Water level monitoring at MW-15, MW-19, MW-20A, MW-20B, MW-21A, MW-21B, MW-22A, MW-22B, MW-22C	Monthly	n/a	Annual/ Semiannual reports
		Chemical monitoring at MW-15, MW-16, MW-17, MW-18, MW-19, MW-20A, MW-24, MW-25,	Quarterly	PCP, lPE, PAHs, benzene, ethylbenzene, xylenes, arsenic, barium, boron, cadmium, chromium, copper, mercury, and PCDD/PCDF	Annual/ Semiannual reports
	Product recovery well PR-1 operates as a passive recovery system		Collected every 2 weeks	n/a	Annual/ Semiannual reports
On-property East plume	P&T system with 2 extraction wells EW-1 and EW-2 pumped at 200 gpm. Contaminated water treated using air stripping and granular activated carbon (GAC), and reinjected into the aquifer through Injection Wells IW-3 and IW-4	Water level monitoring at EW-01, EW-02, MW-01, MW-02, MW-03, MW-4, MW-05, MW-07, MW-08, MW-11, MW-12, MW-13, MW-16, MW-17, MW-18, MW-23, MW-24, MW-25, SW-01, TW-01, TW-02	Monthly		Annual/ Semiannual
		Chemical monitoring at EW-01, EW-02, MW-02, MW-03, MW-05, MW-07, MW-08, SW-01, TW-01	Quarterly	PCP, lPE, PAHs, benzene, ethylbenzene, xylenes, arsenic, barium, boron, cadmium, chromium, copper, mercury, and PCDD/PCDF	Annual/ Semiannual

TABLE 4-5
Summary of Groundwater Monitoring Systems

Unit Designation	Description	Monitoring system	Monitoring schedule	Monitoring Analysis (chemicals)	Data included in Annual/Semiannual report
	In situ bioremediation: nutrients are added to MW-1, MW-4, MW-6, MW-12, MW-13, MW-23	Chemical monitoring at MW-3, MW-5, MW-7, MW-8, TW-1	Quarterly	PCP, orthophosphate as phosphorus, nitrite as nitrogen, nitrate as nitrogen, and ammonia as total nitrogen	Annual/ Semiannual
Off-property groundwater GW plume	In situ bioremediation: nutrients are added to 26, RI-20A quarterly and 11, 59, 81 semiannually. After March 2004, discontinue addition of DAP as nutrient	Chemical monitoring at RI-2, RI-3, RI-10, RI-12, and RI-16B After second quarter of 2004, chemical monitoring at RI-2, RI-6, RI-10, RI-12, RI-16B semiannually	Quarterly/ Semi-annually (after second quarter of 2004)	PCP, orthophosphate as phosphorus, nitrite as nitrogen, nitrate as nitrogen, and ammonia as total nitrogen. After March 2004, only PCP analysis	Annual/ Semiannual
	AWSP: 7 residents are still being reimbursed because PCP levels remain above 0.5 ppb in their wells	Chemical monitoring at 59, 60, 61, 62, 81, 31C2, and 3103	Semiannual	PCP	Annual/ Semiannual
Institutional controls	Deed restriction to limit future use of Site to industrial use	Oversight and Inspection by DTSC	Annual	n/a	Not reported, but confirmed with DTSC

4.4 Institutional Controls

A land use covenant to restrict the use of the Koppers Site was entered with Butte County in November 2003. DTSC has the primary role for enforcement of the institutional controls for the Site. The land use covenant restricts the entire Site to industrial use and prohibits drilling of wells within the TI zone for purposes other than monitoring or remedial activities. Use of groundwater within the TI zone is prohibited except for wood-treating operations

The off-property vacant land south of the former Koppers plant (south of Baggett-Marysville Road and east of Lone Tree Road) is currently zoned as Heavy Industrial (M2). An amendment to the City General Plan is currently in circulation at the City to change the zoning of 784-acres south of Baggett-Marysville Road and east of Lone Tree Road (this area will be called the South Ophir Specific Plan Area). The proposed plan for this area is mixed

industry, high tech business, industrial park, and mixed residential types of not more than 1,500 dwelling units. This area is within the service area of the South Feather Water & Power Agency (the successor to OWID), and water must be supplied by this provider. If for some reason this water purveyor cannot supply enough water, then water is to be provided by another water purveyor.

5.0 Progress since Last Five-Year Review

The first five-year review for this Site was completed in December 1997; the second was completed in February 2003. The protectiveness statement from the second five-year review was: "Currently all implemented remedies are functioning as intended by the decision document and, therefore, are protective of human health and the environment at this time."

Several outstanding issues were identified during the second five-year review. They are summarized in Table 5-1, including follow-up activities in the last 5 years to address them.

TABLE 5-1
Status of Recommendations from Second Five-Year Review

From Table 8.1 of Second Five-Year Review				Third Five-Year Review Implementation Status
Issue	**Recommendations/ Follow-up Action**	**Party Responsible**	**Milestone Date**	
A deed restriction is not yet in place for the on-property portion of the Site	Continue negotiations on the wording of the deed restriction.	Beazer, DTSC, EPA	August 2003	Land use covenant recorded with Butte County in November 2003.
Annual review of technology of PAH remediation	To be conducted once per year.	EPA, Beazer	By April of every year	Implemented. No new technology recommended.
Ongoing semiannual and annual evaluation of monitoring data in groundwater monitoring report	To be conducted twice annually.	EPA, Beazer	April and October of every year	Implemented. See semiannual and annual reports.
In situ bioremediation within the TI zone on property ceased in June 2001	Evaluation of viable alternatives as necessary.	Beazer	Annually (April), at a minimum until data suggest otherwise	Implemented. No new technology recommended.
Seven drinking water supply wells remain on an alternative drinking water supply source	Continue to supply alternative water and monitor COC concentrations in wells.	Beazer	Annually (April), until data suggest otherwise	Ongoing program.
Increased concentrations of PCP in well 86	Continue to evaluate concentrations and groundwater levels in wells 86 and 31C1 monthly.	Beazer	Monthly until data indicates otherwise	Study conducted from 2003 to 2004 with monthly data collected. See summary below.

TABLE 5-1
Status of Recommendations from Second Five-Year Review

From Table 8.1 of Second Five-Year Review				Third Five-Year Review Implementation Status
Issue	**Recommendations/ Follow-up Action**	**Party Responsible**	**Milestone Date**	
Modifications to the Groundwater Monitoring Report	Implement modifications to concentration versus time plots and include the TI zone on all Site maps.	Beazer	April 2003	Implemented. TI zone is now indicated on the site figures and the concentration vs. time plots now have log scales.
Increase in boron concentrations in groundwater at well MW-8	Continue to extract groundwater from this well and treat with the on-property treatment system. Evaluate boron concentration of influent regularly.	Beazer	December 2003, or until EPA approves alternative approach	Ongoing operation. See summary below.

The second five-year review report identified two unanticipated contaminant detections in groundwater that would impact the protectiveness of the selected remedies. One was an increased concentration of PCP in off-property well 86. The other was detection of boron in the eastern plume on-property well MW-8. Boron concentrations detected in well MW-8 have exceeded the remediation standard of 1,200 ppb since November 2001.

These issues have been addressed since the previous five-year review as follows:

- PCP has been detected in well 86 intermittently from 1986 to 1988, and since 1999. The higher PCP concentrations in this well were reportedly associated with periods of higher water levels in this well (exceeding 120 ft above mean sea level). The PCP detections typically persist for eight to twelve months after the time the water level reaches this elevation. In 2003-2004, to evaluate whether well 86 was within the capture zone of the on-property groundwater extraction system, Beazer conducted two field data collections during a 6-month period. The first field activity involved resurveying the top of casing elevation for well 86. The second field activity included a pump test in EW-2, with water-level measurements conducted in MW-2 and well 86. The results showed that well 86 is screened in the B zone aquifer, where Extraction well EW-2 is screened, and located within the capture zone of this extraction well. Sampling of well 31C1 was discontinued after this study, since well 31C1 is screened in the A zone, where initially well 86 was thought to be screened until the resurvey determined otherwise.
- For the boron issue in well MW-8, both short-term and long-term groundwater remediation work plans were prepared to address this issue. The on-property groundwater remediation system was not designed to remove boron from extracted groundwater. Therefore, a short-term remedy was implemented in August 2002, which consists of blending extracted boron-impacted groundwater from well MW-8 with treatment plant influent. In May 2003, the effectiveness of the short-term remedy was

evaluated, and a long-term remedy for boron-impacted groundwater containment, as well as maintenance of the remediation standard for effluent discharge from the treatment plant was presented. The short-term remedy was found to be effective. The current long-term remedy would continue the blending of groundwater extracted from MW-8 to the influent from EW-1 and EW-2 into the treatment plant. The treatment plant continues to perform effectively, with effluent PCP concentration below the reporting limit of 0.5 ppb, and boron concentration below 700 ppb.

6.0 Five-Year Review Process

6.1 Administrative Components of the Five-Year Review Process

This section presents the activities performed during the five-year review process and a summary of the findings. This third five-year review consisted of a review of relevant documents; interviews with community members; interviews with technical staff familiar with the Koppers Company, Inc. regulatory requirements and operations; a regulatory review; ecological and human health risk evaluations, and a Site inspection. The Koppers Company, Inc. five-year review was led by Kim Hoang, the EPA Remedial Project Manager for the Site. EPA received technical support from CH2M HILL, Inc.

Through Site inspection, document review and technical interviews, it has been determined that all of these key components are being conducted per the currently agreed upon requirements. Some of the documentation that was available and provided for inspection by the Operations and Maintenance Manager, K.C Hendrix, of GeoTrans, Inc., included Site Heath and Safety Plan, Operations and Maintenance Manual, Post Closure Maintenance and Monitoring Plan, Training Records, Maintenance Records , Field Sampling Logs, and Inspection Logs.

6.2 Community Notification and Involvement

As part of the startup of the five-year review process, EPA published a notification in the *Oroville Mercury Register* (*Oroville Mercury Register*, 2007) and sent a fact sheet to local residents on January 14, 2008, announcing that EPA started the five-year review of the cleanup actions undertaken at the Koppers Site.

A fact sheet was sent out in January 2008 regarding the preparation of the current five-year review. The location of the information repositories and contacts were also provided in the fact sheet. The mailing list for the fact sheet was compiled from a pre-existing mailing list merged with a list of addresses within the historically affected areas of the 95965 and 95968 postal codes. EPA placed additional fact sheets in the Butte County Library on January 29, 2008. No community inquiries have been received by EPA as a result of the public notice or the fact sheet.

On January 29, 2008, EPA contacted community members including city officials, business owners and residents in the vicinity of the Koppers Site to obtain community input on the current status of the Site cleanup. All of the community interviews were conducted in person. The results of the community interviews are described in Section 6.6.2 of this report.

Following the release of this five-year review report, EPA will produce and distribute a fact sheet to the community near the Site. The fact sheet will summarize the findings of the five-year review and instructions on how to access a copy of the review.

In January 2008, the CDPH released a report analyzing pancreatic cancer trends in the Oroville area from 1988 to 2005. The report was requested in May 2007 by a local citizen who was concerned about pancreatic cancer in the Oroville area, and that it might be related to a chemical fire in 1987 at the Koppers Site.

After the Koppers fire, ATSDR conducted environmental assessments in the area. As a routine part of that assessment, ATSDR worked with the Cancer Registry of Northern California to look at cancer incidence in Oroville from data in 1988 and 1989. The ATSDR study showed no increased risk of cancer in the area, but recommended "that it would be advisable for the Cancer Registry of Northern California to redo its analysis in the future."

The new 2008 study responded to a citizen concern and represented a follow-up to the earlier Cancer Registry of Northern California analysis, which was part of the ATSDR report in 2000. It looked at pancreatic cancer incidence data from both primary and secondary cases between 1988 and 2005. Annual population estimates for the Oroville area were derived from the 1990 and 2000 U.S. decennial censuses. The study included preliminary analyses looking at observed and expected cases for every year during this period, followed with the main statistical analysis based on 2-year intervals beginning with 1988 to 1990 and ending with 2004 to 2005. Results from the preliminary analyses showed no difference between observed and expected cases for the years 1988 to 2003, and a higher number of observed cases from 2004 to 2005, comparing both to expected cases and previous observed cases. Results from the statistical analysis of two-year intervals confirmed the above finding, with no significant difference found between observed and expected cases for the years 1988 to 2003, while the observed cases were nearly twice the expected cases during 2004 to 2005. The Environmental Health Investigations Branch of CDPH is currently following up on this study, in collaboration with the Butte County Public Health Department, to investigate what factors may have contributed to this increase.

6.3 Document Review

As part of the five-year review process, CH2M HILL conducted a review of documents related to activities associated with the Koppers Site. The documents reviewed included decision documents associated with the recommended remedial actions for the Site, the first and second five-year review reports, O&M documentation, and other reports and correspondence prepared after the publication of the second five-year review. Appendix C provides a list of the documents reviewed as part of this five-year review.

6.3.1 ARAR Review

Appendix D contains three tables that list the Applicable or Relevant and Appropriate Requirements (ARARs) established in the above-referenced decision documents, summarize the requirement for each ARAR, cite the regulatory basis for each ARAR, state the evaluated status of each ARAR, and provide comments where applicable, including comments on any regulatory changes since the 2003 five-year review.

Action-specific ARARs. There are no changes to existing action-specific ARARs as stated in the ROD, ROD Amendments, and previous five-year reviews.

Chemical-specific ARARs. There are no changes to existing chemical-specific ARARs as stated in the ROD, ROD Amendments, and previous five-year reviews. On January 23, 2006, the rule for all drinking water systems to comply with the new maximum contaminant level (MCL) for arsenic of 10 ppb (adopted January 22, 2001) came into effect. As noted in the previous five-year review for the Koppers site, the new MCL for arsenic is less than half the Site background concentration.

Location-specific ARARs. A new regulation for property that contains hazardous waste (Title 22, California Codes of Regulation, Chapter 39, Section 67391.1, effective April 19, 2003) requires all land use covenants to be signed by the DTSC and the landowner, and be recorded in the county where the land is located. The signature requirement is considered applicable to the land use covenants at Koppers, where land use will be restricted to industrial uses, and groundwater wells will be used for monitoring or injection purposes only.

6.3.2 Human Health and Ecological Risk Assessment Review

There have been no changes in the last five years to the Site conditions or to the exposure pathways in consideration of both human health and ecological risk. Although some toxicity values for specific constituents of concern found in soil and groundwater at the Site have changed, these changes have not had a significant effect on the protectiveness of the current remediation standards. The detailed review is provided in Appendix E.

6.4 Data Review

Semiannual reports (October of each year) and annual reports (April of each year) submitted by Beazer were reviewed for this five-year review. The period covered by the reports was from the annual 2002 report (April 2002) through the semiannual 2007 report (October 2007). The detailed evaluation results are provided in the groundwater data review memorandum found in Appendix F of this report. Table 6-1 provides a summary of the monitoring results for the five-year period.

6.4.1 Soil

The areas of interest include the soil disposal cells; the on-property TI zone, also known as the western plume, which includes product recovery of DNAPL; the on-property eastern plume where groundwater monitoring and enhanced in situ bioremediation are being conducted; and the off-property plume to the south, which also includes groundwater monitoring, in situ bioremediation, and residential wells where alternate water supplies are required.

In summary, for the five-year period covered by this review, the soil disposal cells showed little change in the settlement. Groundwater monitoring around the cells was conducted monthly and reported annually. The samples were analyzed for pentachlorophenol, arsenic, chromium, copper, and PAHs. Copper was detected at 58.2 ppb, above the ROD standard of 13 to 30 ppb, in well DCMW-1A during a 2006 sampling event. For all other sampling events, concentrations of the chemicals of concern in the disposal cell monitoring wells were below the ROD standards.

6.4.2 Groundwater

6.4.2.1 On Property

For the TI zone on property, in the last five years (from July 2002 to June 2007), the product recovery well on the TI zone was purged 127 times, yielding about 675 gallons of product with about 328 gallons of creosote/water emulsion extracted. Water level monitoring of the groundwater plume in the TI zone showed no change in water levels. Chemical monitoring for this zone showed PCP concentrations below the ROD standards for all wells except for MW-16. The concentration of PCP in MW-16 has decreased from 2003 to 2007. MW-25 has high boron levels, which have remained more or less constant or decreased minimally in the last 5 years. MW-15, MW-16, MW-19, and MW-24 show PAH concentrations above ROD standards in the last 5 years. PAHs show an increasing trend in MW-15.

For the eastern groundwater plume on property, overall water level has been fairly stable since 1999, with levels in individual wells fluctuating 5 to 10 feet between wet and dry seasons. The current treatment operation includes groundwater extraction from EW-1, EW-2, and MW-8. The combined influent allows dilution of the high concentration boron water from MW-8, and the influent is then treated by the air stripper and GAC filter to remove other contaminants before the treated water is reinjected into the groundwater via injection wells IW-3 and IW-4. Chemical monitoring of the treatment plant showed that the effluent PCP is less than 0.5 ppb and the boron concentration is less than 700 ppb. PCP was detected at concentrations above the ROD cleanup level in wells MW-2, MW-3, MW-18, and MW-8, with a decreasing trend from 2003 to 2007 in all wells except for MW-8. Boron concentrations are above ROD levels in MW-18. The in situ bioremediation continues to operate on property to enhance the P&T system, with one of the nutrients changed from magnesium peroxide to calcium peroxide in 2007. Figure 6-1 shows that the size of the plume has remained more or less the same from 2002 to 2007.

6.4.2.2 Off Property

The off-property groundwater plume is still undergoing in situ bioremediation at the current time. The P&T system was shut down in 1995 because contaminant levels in the extraction wells met the cleanup standards. Water-level monitoring showed stable water level since 1999. Chemical monitoring showed that PCP concentrations at RI-2, RI-6, RI-10, RI-12, and RI-16B have been below the reporting limit of 0.5 ppb since the second quarter of 2004. PCP concentrations detected at well RI-3 have decreased significantly, with the concentrations below 1 ppb in 2007. The plume map in Figure 6-1 shows that the off-property groundwater plume has receded in the last 5 years, which reflects the effectiveness of the ongoing in situ bioremediation treatment.

Well 86 has PCP concentrations above ROD standards and is showing a slow decreasing trend. However, while this well is located off property, based on the plume map in Figure 3-1, it is actually within the capture zone of the on-property extraction well EW-2, and thus contaminated groundwater in the vicinity of Well 86 is currently being captured and treated by the on-property P&T treatment system.

Beazer continues to monitor the private wells for the residences in the AWSP and pays the water bill for the seven families whose wells were contaminated and remain shut down.

TABLE 6-1
Summary of Results

Unit Designation	Previous 5 Yr Review Results	2003	2004	2005	2006	2007	Current changes from Last Five-Year Review
Soil Disposal Cells 1 and 2:							
Soil: Cell 1/ 2 monument survey	As of December 2001, there were no recorded changes in settlement monuments on the disposal cells.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No changes.
Soil: Cell 1/ 2 groundwater monitoring Notes: ROD standard: Copper - 13 to 30 ppb	Only chemical of concern detected in monitoring points was copper in the shallow aquifer at concentrations less than background level.	Copper DCMW-1A at 11.7 ppb DCMW-2A at 19.2 ppb	Copper DCMW-2A at 14.1 ppb (close to the quantitation limit of 10 ppb and was not considered to be indicative of a release from the disposal cell).	Site constituents were not detected in the disposal cell wells.	Copper DCMW-1A at 58.2 ppb. Because this well is upgradient of the disposal cells, this detection level is considered to be anomalous, and not indicative of a release from the disposal cells.	Data not included in 2007 semi-annual report.	Increase in copper concentration from 2003 to 2006.
On-property Groundwater West Plume:							
Water level Notes: Groundwater has been extracted from well MW-8 at approximately 35 gpm since July 31, 2002, as approved by the EPA. This extraction has influenced groundwater flow in the vicinity of well MW-8. A depression in the groundwater elevations is present in the vicinity of well MW-8	Water levels are monitored monthly.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.	No change. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and that observed prior to startup of groundwater remediation systems.
Chemical monitoring Notes: All values are in ppb (ug/L) ND = Non Detect ROD standards: PCP - 1.0 ppb Boron - 1,200 ppb PAHs - 0.007 ppb Benzene - 1.0 ppb	Remedial actions within the TI zone are functioning as intended. Installation of a new monitoring well downgradient of the TI zone (required 1 year prior to shutdown of on-property treatment system) may provide a more comprehensive conclusion.	Upgradient wells MW-15 PCP <0.5, PAH 4000-7700 MW-16 PCP 36-58, PAH 100000-4000000 MW-19 PCP <0.5, PAH 23-226 MW-20A PCP <0.5, PAH ND Downgradient wells MW-24 PCP <1, Boron 514 , PAH 4-6 MW-25 PCP <0.5, Boron 3700-3900, PAH -ND	Upgradient wells MW-15 PAH 5000-9000 MW-16 PCP 36-53, PAH 600000-13000000 MW-19 PAH 18-50 MW-20A PCP <0.5 Downgradient wells MW-24 PCP <1, Boron 504 , PAH 4-6 MW-25 PCP <0.5, Boron 3720-4320, PAH -ND	Upgradient wells MW-15 PCP <0.5, PAH 6900-7300 MW-16 PCP 15-40, PAH 500000-1450000 MW-19 PCP <0.5, PAH 9-10 MW-20A PCP <0.5, PAH-ND Downgradient wells MW-24 PCP <1, Boron 524 , PAH 3-5 MW-25 PCP <0.5, Boron 3920-3940 , PAH -ND	Upgradient wells MW-15 PAH 6000-9000 MW-16 PCP 11-20, PAH 300000-900000 MW-19 PAH ND-16 MW-20A PCP <0.5 Downgradient wells MW-24 PCP <1, Boron 520-510 , PAH ND-4 MW-25 PCP <0.5, Boron 3660-3800 , PAH -ND	Upgradient wells MW-15 PCP <0.5, PAH 6600-8000 MW-16 PCP 12-16, PAH 200000-800000 MW-19 PAH ND Downgradient wells MW-24 PCP <1, PAH 3-5 MW-25 PCP <0.5, Boron 3470-3900 , PAH -ND	PCP concentrations are below the ROD standards for all wells except for MW-16. Concentration of PCP in MW-16 has decreased from 2003 to 2007. MW-25 has high boron concentration which has remained more or less constant or decreases minimally in the last 5 years. MW-15, MW-16, MW-19 and MW-24 show PAH concentrations above ROD standards in the last 5 years. PAHs show an increasing trend in MW-15.
PR-1 (Product Recovery Well)	Product recovery is continuing at PR-1 and monitored every 2 weeks. Recovery is greater than 1 gallon per year.	07/2002-06/2003 137 gallons of product and 65 gallons of emulsion	07/2003-06/2004 140 gallons of product and 70 gallons of emulsion	07/2004-06/2005 134 gallons of product and 60 gallons of emulsion .	07/2005-06/2006 135 gallons of product and 68 gallons of emulsion	07/2006-06/2007 130 gallons of product and 65 gallons of emulsion	Increase in quantity of product recovered.

TABLE 6-1
Summary of Results

Unit Designation	Previous 5 Yr Review Results	2003	2004	2005	2006	2007	Current changes from Last Five-Year Review
On-property Groundwater East Plume:							
Water level	The onsite groundwater remediation system continues to treat groundwater extracted from EW-1 and EW-2. Influent PCP concentrations have decreased over time to 5.2 ppb. Injection wells IW-3 and IW-4 are functioning optimally. The increase in PCP concentration in well 86 is being monitored to verify that EW-1 and EW-2 are adequately capturing the plume. Groundwater extraction at well MW-8 began in July 2002. Periodic increases in PCP concentration in well 86 are reportedly related to groundwater elevation increases in the A-Zone. Recent detection of increased PCP in well MW-8 to 780 ppb and boron at 2,450 ppb is attributed to historical activities at the dri-con/CCA Tank Area.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels overall decreased slightly from 1986 to 1990, increased from 1991 through 1999, and began to level off from 1999 through present.
Chemical monitoring Notes: ND = Non Detect		MW-2 PCP 59-84, Boron 1300-1500 in Aug, 586 in Dec, PAH – ND MW-3 PCP 40-60, Boron 1200-1500 MW-18 PCP <0.5, Boron 3200-3450, PAH ND MW-8 PCP 250-430, Boron 1050-1500, PAH ND-50	MW-2 PCP 67-63, MW-3 PCP 20-30, Boron 1180-1300 MW-18 Boron 3100-3600 MW-8 PCP 340-390, Boron 1220-1280, PAH ND Treatment plant effluent PCP is less than 0.5 ppb, and boron concentration is less than 700 ppb.	MW-2 PCP 24-37, Boron 546, PAH ND MW-3 PCP 10-15, Boron 1110-1170 MW-18 PCP <0.5, Boron 3200-3400, PAH ND MW-8 PCP 360-370, Boron 1300-1600, PAH ND Treatment plant effluent PCP is less than 0.5 ppb, and boron concentration is less than 700 ppb.	MW-2 PCP 27-19 MW-3 PCP 1-3, Boron 920-950, MW-18 Boron 3000-3250, PAH 540-707 MW-8 PCP 250-290, Boron 1700-2300, PAH ND Treatment plant effluent PCP is less than 0.5 ppb, and boron concentration is less than 700 ppb.	MW-2 PCP 25-20 MW-3 PCP 1-2, Boron 840, MW-18 Boron 2990-3060 MW-8 PCP 200-350, Boron 2000-2900, PAH ND Treatment plant effluent PCP is less than 0.5 ppb, and boron concentration is less than 700 ppb.	PCP has been detected at concentrations above the ROD cleanup level in Wells MW-2, MW-3, MW-18 and MW-8. PCP concentrations in all the above wells except for MW-8 show a decreasing trend from 2003 to 2007. Boron concentrations are above ROD levels in MW-18.
On-property groundwater in situ bioremediation	Concentration trends in the wells overall indicate stabilization in PCP trends. Monitored natural attenuation not yet implemented. Bioremediation ceased at well BW-1 in June 2001 as it resulted in increase in mobility of PAHs.	PCP concentrations are below detection limit except for well MW-8.	The results of the implementation of the On-Property Groundwater In Situ Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of pentachlorophenol.	Results of the implementation of the On-Property Groundwater In Situ Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of PCP to less than ROD standards in MW -5 and 7.	Dissolved mobile PAHs have been detected at low concentrations at well MW-24. The steady decrease in pentachlorophenol concentrations at MW-16 indicates that bioremediation of pentachlorophenol was stimulated, and this increased bioactivity appears to be ongoing.	The results of the implementation of the On-Property Groundwater In Situ Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of pentachlorophenol.	In situ bioremediation has stimulated aerobic degradation of PCP, but the size of the plume (Figure 3-1) has remained more or less the same from 2002 to 2007.
Off-property Groundwater GW Plume:							
Notes: Pentachlorophenol has been detected in well 86 intermittently from 1986 to 1988, and since 1999. The detections of pentachlorophenol are correlated with times at which the water level in well 86 reaches or exceeds 122 feet msl. The pentachlorophenol detections typically persist for 8 to 12 months after the time the water level reaches this elevation	Monitoring data do not indicate that any contaminants would be captured by extraction from wells EW-3 or EW-4. PCP in well 86 > 50 ppb since 2000. Boron detected in vicinity of MW-8.	Well PCP (ppb) Upgradient RI-2 0.5 RI-3 -10 86 0-100 25 0.5 Downgradient RI-12 0.5	Well PCP (ppb) Upgradient RI-2 0.5 RI-3 -10 86 0-140 25 0.5 Downgradient RI-12 0.5	Well PCP (ppb) Upgradient RI-2 0.5 RI-3 -5 86 0-90 25 0.5 Downgradient RI-12 0.5	Well PCP (ppb) Upgradient RI-2 0.5 RI-3 .5-3.5 86 3-100 25 0.5 Downgradient RI-12 0.5	Well PCP (ppb) Upgradient RI-2 0.5 RI-3 .5-1 86 0-40 25 0.5 Downgradient RI-12 0.5	PCP concentrations detected at well RI-3 have decreased significantly with the concentrations below 1 ppb in 2007. Well 86 has PCP concentrations above ROD standards and is showing a slow decreasing trend.

TABLE 6-1
Summary of Results

Unit Designation	Previous 5 Yr Review Results	2003	2004	2005	2006	2007	Current changes from Last Five-Year Review
Off-property groundwater in situ bioremediation	Concentration trends in the wells indicate a decreasing trend in PCP except for an anomalous detection in well RI-12 during November 2000 (0.66 ppb).	Nitrate concentration in wells RI-2, RI-3, RI-10, and RI-12 are higher than concentration in background wells. Concentration in RI13 is less than 15 ppb.	The addition of DAP (nutrients) has been discontinued.	The Off- Property Bioremediation Program is considered to be enhancing bioremediation of pentachlorophenol effectively. Sampling at RI-2, RI-6, RI-10, RI-12 and RI-16B has been reduced to semiannual monitoring.	As of September 2006, ORC socks have been added to wells 59 and 81 to enhance the bioremediation of pentachlorophenol detected at well 59.	-	In situ bioremediation has stimulated aerobic degradation of PCP.
Off-property AWS	Beazer continues to provide an alternate water supply for downgradient residences with PCP-impacted drinking water supply wells. As of December 2001, five residences with private wells in the vicinity of RI-11 (59, 60, 61, 62, and 81), plus wells 31C2 and 31D3, remain in the AWS program.	The pentachlorophenol analytical results were below 0.5 ppb for each sample collected at both wells 31C2 and 31D3.	The pentachlorophenol analytical results were below 0.5 ppb for each sample collected at both wells 31C2 and 31D3.	The pentachlorophenol analytical results were below 0.5 ppb at both wells 31C2 and 31D3.	The pentachlorophenol analytical results were below 0.5 ppb at both wells 31C2 and 31D3.	The pentachlorophenol analytical results were below 0.5 ppb at both wells 31C2 and 31D3.	The pentachlorophenol analytical results were below 0.5 ppb at both wells 31C2 and 31D3 from 2003 to 2007.

6.4.3 Institutional Controls

Enforcement of the institutional controls implemented by the land use covenant consists of an annual site inspection conducted by DTSC, as confirmed through the interview with DTSC. There is no written report from DTSC for these annual inspections, and they are not reported in the semi-annual and annual Beazer reports.

The majority of the property (205 acres) that has been remediated has been sold for redevelopment. It was first purchased in November 2006 by North Ophir Land, LLC, and then subsequently sold to Strategic Development Holding Co, LLC, in December 2007. The land is zoned as industrial and will likely be divided into multiple parcels. Amenities include electrical power, city water supply, two existing buildings, an office, and a warehouse with railway access.

6.5 Site Inspection

Caroline Ziegler and Seena Babu (from CH2M HILL) and Kim Hoang from EPA took part in a Site inspection on December 18 and December 19, 2007. K.C Hendrix, Site Manager for GeoTrans, Inc led the Site inspection. Weather conditions during the inspection were overcast and breezy with temperatures around 48 degrees Fahrenheit.

The inspection was accomplished by walking the Site and observing, photographing, and documenting Site information. The purpose of the Site inspection was to assess the integrity of the landfill cover and to observe the onsite P&T system. The extraction wells, product recovery well, and the inactive offsite groundwater P&T system were included as part of this inspection. Other Site security features such as fencing and gates were also noted. Visual inspection of some of the monitoring wells was also conducted to note any damage.

The landfill site and the onsite P&T system were accessible by vehicle and foot. During landfill cover inspection, the inspectors walked the Site looking for areas of wind or water erosion on the cover, indications of ponding, indications of stressed vegetation, signs of animal burrowing, and other physical deterioration. Both landfills present on the property have a vegetative cover, and no signs of erosion were evident. The drainage channel located in between the landfills is lightly vegetated and in good condition. In general, no sections of the cap appear to be exposed and the integrity of the landfill cap appears to have been maintained. A buffer zone and a fence surrounding the landfill cap provide an additional factor of safety. There is no regular leachate extraction system at this Site. The leachate elevation levels are monitored and extracted only as needed. The last extraction was conducted in 2006, and approximately 4,000 gallons of liquid were removed. The monitoring system appeared to be in good condition, and there were no indications of damage or disturbance to the leachate well points. Landfill gas vents were observed on the landfills; however, the gases are released to the atmosphere, and there are no monitoring or treatment measures in place to control potential migration of landfill gases. Annual surveys are conducted to mark the height of the settlement monuments on the landfill in order to check for subsidence.

The Site manager reported that there were problems with security and vandalism at Koppers. A portion of the fence surrounding the soil disposal cells was cut out and stolen in 2004. Also, some illegal dumping of trash and white goods happens on a regular basis.

The fence gate to the pump station was locked at the time of the inspection. An alarm system is maintained in the pump station to prevent unauthorized entry to the station. The onsite treatment plant, including air strippers, filters, carbon absorption units, surge tanks and effluent and influent holding tanks, appeared to be well maintained and in good condition.

As a part of the onsite inspection, the location of the storage building, which was formerly used to store contaminated soil, was noted. Presently the building is not in use and has been decontaminated and pressure washed. Injection well 3 and the product recovery well appear to be in good condition, and there are no indications of damage.

The biological treatment bed near EW-1 was inspected on December 19, 2007. Standing water was observed in the bed, which can be attributed to the heavy rainfall on December 18, 2007. Wells EW-1 and EW-2 were both leaking at the time of inspection. Leaking well EW-2 can be of potential concern because pentachlorophenol has been detected at concentrations above the ROD cleanup level (1 ppb) in EW-2 with values ranging from 12 ppb in 2003 to 2.9 in 2007.

Inspection of the offsite treatment plant and adjoining areas were conducted by driving through the area and stopping occasionally for documentation and photographs. The inactive offsite treatment plant was not accessible due to locked gate and fence. The offsite treatment plant has been abandoned, and all treatment units except for the carbon absorption units have been removed. Wells RI-11 and RI-12 were observed for signs of damage, and the general direction of the offsite pentachlorophenol plume was noted. The locations of four unknown wells that could not be located on the map were noted south of Prince Road. These appeared to be old or abandoned wells. Location of extraction wells EW-3 and EW-4 could not be found during the inspection.

A general inspection of Site documents including but not limited to O&M documents, Site Health and Safety Plans, Quarterly and Annual Monitoring Checklists were conducted and found satisfactory. The Site inspection checklist is incorporated in Appendix G of this five-year review report. Select site photographs are found in Appendix H.

6.6 Interviews

As part of the five-year review process, both community and technical interviews were conducted with people having knowledge of and/or concerns with the Koppers Site.

6.6.1 Technical Interviews

The following individuals were interviewed regarding their knowledge of, or concerns about, technical aspects of the remedial actions that have been conducted at the Koppers Company, Inc. and ongoing operations and maintenance activities.

- Mike Tischuk – Beazer East, Inc., Project Manager
- Jennifer Abrahams – GeoTrans, Inc., Project Manager
- K.C. Hendrix – GeoTrans, Inc., Operations and Maintenance Manager
- Phil Woodward – Regional Water Quality Control Board, Project Manager
- Ed Cargile, Department of Toxic Substances Control, Project Manager

The following subsections summarize the key comments from the technical interviews.

6.6.1.1 Responsible Party Interviews

Mr. Mike Tischuk, of Beazer East, Inc., represents the responsible party for the remedial activities being conducted at the Koppers Site in Oroville, California. Ms. Jennifer Abrahams is the responsible party contractor project manager and she, along with Mr. K.C. Hendrix, both of GeoTrans, Inc., are overseeing the operations, maintenance, and reporting requirements for the Site. Mr. Hendrix conducts day-to-day activities onsite, including treatment system operations, groundwater monitoring, leachate collection, Site inspections, routine maintenance, etc. Ms. Abrahams is the overall project manager responsible for report preparation, communications with the responsible party and regulators, etc. The reporting is provided by GeoTrans, Inc. to Mr. Tischuk for his review and approval prior to distribution to the appropriate stakeholders. All three agree that the remedial activities are going very well. They feel that the remedy is functioning as expected, and that the groundwater remediation is progressing. They feel that the ROD and CD requirements are being met. They are planning to review the system operations during calendar year 2008 to determine potential optimization opportunities that could result in greater efficiencies.

The responsible party representatives are aware of a recent complaint from an Oroville resident to the State and Local Public Health Department that the pancreatic cancer spike in the region is due to the 1987 fire at the Koppers Site. Mr. Tischuk stated that he thought a correlation between the pancreatic cancer cluster and the fire at the Site was unlikely because none of the residents affected live close to the plume. He also indicated that a dioxin study was conducted after the 1987 fire, and no remarkable results were noted.

6.6.1.2 State Agency Interviews

EPA is the lead agency overseeing the remedial activities at the Koppers Site. The two state agencies that serve in supporting roles for oversight are the RWQCB and DTSC. The project managers from both these agencies were interviewed as part of the five-year review process. Phil Woodward, RWQCB, and Ed Cargile, DTSC, both feel that the remedial activities that have been and are being conducted at the Site are going well.

Both Mr. Cargile and Mr. Woodward were asked whether they were aware of any community issues. They both stated that they had not received any complaints or heard of any issues about the project in a very long time. However, Mr. Cargile recently was contacted by a community member in regards to the potential pancreatic cancer spike in the region and the issue of whether it is related to the 1987 fire at Koppers Site. Mr. Woodward was also aware of the complaint.

Copies of the completed interview forms are provided in Appendix I.

6.6.2 Community Interviews

EPA conducted interviews with six community members. Interviewees were asked to participate based on their role in the community or location relative to the Koppers Site. Interviewees included the local librarian, two businesses neighboring the Koppers Site, residents living adjacent to the Koppers Site, and residents living near the offsite plume. No interviewees voiced concerns or complaints with the cleanup processes, activities, or

administration. Overall feedback was very positive. Copies of the completed community interview forms are provided in Appendix B.

N

Soil Disposal Cell 2
Soil Disposal Cell 1
DCMW-1A
DCMW-1B
DCMW-4A
DCMW-2B
DCMW-4B
DCMW-3B
DCMW-6E
DCMW-5B
DCMW-5A
IW-4
Former Pole Wash Area
TI Zone
Existing Groundwater Treatment Plant
Former Biological Treatment Facility
Former Offsite Groundwater Treatment Plant
1.0
2.2
Highway 70
Baggett Marysville Rd
Baggett Palermo Rd
Southern Pacific Railroad
Hill Rd
Lone Tree Rd
Theresa Rd
Horny Toad Rd
Prince Rd
Palermo Rd
Upper Palermo Rd
25HI
146
ML-7
25J1
25J
ML-1
ML-2
30M
30LN
30LI
30LS
MW-6
P-3
SW-4
MW-5
MW-20A
MW-20B
MW-13
MW-14
TW-7
MW-15
MW-16
MW-12
TW-6
MW-21A
MW-21B
MW-19
PR-1
MW-1
MW-9
MW-11
77
MW-8
SW-2
MW-10
MW-25
MW-17
TW-1
TW-5
LF-2
LF-5
30R
MW-24
TW-4
SW-1
TW-2
MW-22A
MW-22C
TW-9
MW-22B
MW-7
Tw-3
MW-23
EW-2
EW-1
RW-1
MW-2
MW-3
TW-8
MW-18
25P1
25R
SWG-10
86
31D2
RI-20A
31C3
SWG-11
36A1
31C1
RI-20B
87
P-1B
P-1A
73
56
82
80
4
94
5
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54R
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53
IW-1
84
63
69
62
81
RI-11
RI-8
61
92
91
RI-12
59
2
70
68
1
65
RI-9
RI-10
RI-17
IW-2
64
44
RI-16
66
41
67
RI-18
EW-3
EW-4
RI-19
35
38
137
45
39
36
107
78
40
43
88
46
P-2
SWG-12
134
135
136
133
42
RI-2
RI-14
RI-4
76
RI-3
RI-5
RI-6
RI-1
72
57A
57B
75
29MI
LF-1
29E
LF-3
LF-4

LEGEND

- Domestic Well
- Destroyed Well
- Extraction and Injection Wells
- Irrigation and Stock Wells
- Industrial Well
- Monitoring, Test, and Remedial Investigation Wells
- Surface Water Gage
- Unused Well

Year of Plume Delineation

- 1994
- 1998
- 2002
- 2007
- Property Boundary
- 1.0 — Pentachlorophenol Concentration (µg/L) in Groundwater

FIGURE 6-1
ON-PROPERTY AND OFF-PROPERTY PLUME COMPARISON FOR 1994 - 2007

5 YEAR REVIEW REPORT
KOPPERS COMPANY, INC
SUPERFUND SITE
OROVILLE, CA

CH2MHILL

BAO \\ZINFANDEL\PROJ\USENVIRONMENTALPROTE\363329KOPPERS\GIS\MAPFILES\OFFSITE_PLUME.MXD OFFSITE_PLUME.PDF 2/6/2008 11:24:49

7.0 Technical Assessment

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

7.1.1 Soil

All remedial actions pertaining to soil, as mandated in the 1989 ROD, 1991 ESD, and 1996 ROD Amendment No. 1, have been implemented. The objective of the selected soil remedies was to reduce contamination to health protective levels consistent with potential future industrial exposure. Field observations and confirmation sampling during soil remediation were conducted in accordance with the approved Remedial Action Work Plan. As of January 2007, there were no substantial recorded changes in settlement monuments on the disposal cells either laterally or vertically, and the only chemical of concern detected in monitoring points was copper in the shallow aquifer at concentrations above background (GeoTrans, Inc. and EMKO, 2007). Remedial actions completed to date pertaining to this remedy are functioning as intended by the applicable decision documents.

7.1.2 Groundwater

7.1.2.1 On Property

All remedial actions pertaining to groundwater, as mandated in the 1989 ROD, and 1999 ROD Amendment No. 2 have been implemented. Remedial actions within the TI zone are functioning as intended by the decision document where implemented. Product recovery is continuing at PR-1 and monitored every 2 weeks. Through December 2006, approximately 1,250 gallons of product had been recovered. In addition, over 820 gallons of creosote/water emulsion have been recovered. Recovery is greater than 1 gallon per year (approximately 5 gallons of product per recovery episode); therefore, this remedial action continues and is functioning as intended.

The onsite groundwater P&T remediation system continues to treat groundwater extracted from EW-1 and EW-2. The system is pumping at optimum rates with minimal shutdown time due to maintenance. Influent PCP concentrations have decreased over time. Injection wells IW-3 and IW-4 are functioning optimally. It was observed during the December 2007 Site inspection that both extraction wells EW-1 and EW-2 had minor leaks that were described by the O&M manager as an on-going problem. The area around the wells is fenced and the O&M manager tries to control the leaks on a regular basis. The potential for exposure is minimized; however, because it is an on-going problem, it should be more optimally addressed. Photos 10 and 11 found in

H show that there is no secondary containment for either of the extraction wells; therefore any leaks go directly onto the ground. Monitoring data do, however, indicate that they are adequately capturing the plume in Sub-unit A. Extraction of MW-8 water and diluting it with the influent water from EW-1 and EW-2 continues to mitigate the high boron

concentration in MW-8, reducing the high boron concentration in MW-8 to around 700 ppm in the effluent from the treatment plant, below the ROD standards.

The operation of the On-property In Situ Bioremediation Program continues to enhance the P&T system. However, the plume maps in Figure 3-1 for 2002 and 2007 show little change of the on-property plume. So, the combined treatment system is effective in containing the plume, but not as effective as previous years in reducing it.

7.1.2.2 Off Property

The Off Property In Situ Bioremediation Program, which began in 1998, continues with ORC additions made to wells 26, RI-11, and RI-20A and since September 2006, wells 59 and 81. Downgradient monitoring points corresponding to these locations include RI-2, RI-6, RI-10, RI-12, and RI-16B. The Off-Property Bioremediation Program seems to be efficient in enhancing bioremediation of pentachlorophenol, as established by the reduction of the groundwater plume from 2002 to 2007.

In compliance with the ROD and Consent Decree, as amended, Beazer continued to provide an alternate water supply (i.e., the OWID system) for downgradient residences with PCP-impacted drinking water supply wells. Currently, five residences with private wells in the vicinity of RI-11 (59, 60, 61, 62, and 81), plus two residences with private wells 31C2 and 31D3, remain in the alternate water supply program. The following wells are sampled on a regular basis: 31C2, 31D3, 31C1, 25, and 86. Removal from the program is contingent upon meeting the alternative water supply termination criteria , which is not anticipated until cessation of in situ bioremediation at RI-11. Remedial actions pertaining to providing an alternative drinking water supply are functioning as intended by decision documents.

7.1.3 Institutional Controls

The Covenant to Restrict Use of Property for the former Koppers property (including groundwater use) was documented in the official records of Butte County in November 2003. A review of a recently obtained Condition of Title confirmed that this deed restriction is in place and is functioning as intended.

For the area overlying the groundwater plume that is located south of the Koppers property (see Figure 6-1), no institutional controls (ICs) have been required in EPA's selected remedies in order to ensure protectiveness. Initially, in lieu of an IC for the off-property plume area, the alternate water supply program required by the ROD addressed any existing water supply wells in this area, and it required Beazer to connect all residents located either within the plume (i.e., all residents with contaminated wells) or within a defined buffer area around the plume to the OWID system. The alternate water supply program continues to this day, with reimbursements provided to all residents whose wells remain contaminated. This program, coupled with the off-property well monitoring program conducted by Beazer, has been successful in preventing the use of contaminated wells as a source of water supply.

The current location of the plume, (i.e., largely in a land-locked rural area) combined with the primary land use (agriculture and raising of livestock) make it highly unlikely that anyone would install a new water supply well within the area of the plume. In addition, there is currently a City of Oroville ordinance that requires all parcels in a new subdivision

to be connected to a public water supply system. This ordinance would apply to development of land in the vicinity of the off-property plume.

7.1.4 Optimization

The current remedial operations and monitoring are effective in treating the contaminants left on the Site, and in addressing the issues identified from the second five-year review. Beyond their continuation, some additional potential improvements in operation and reporting are identified in Table 7-1.

TABLE 7-1
Recommendations for Optimization

Suggestion	Recommendations/Follow-up Action
Water-level data currently not analyzed beyond hydrographs	Perform a capture analysis once every 5 years for the P&T system, to be used in the five-year review report.
On-property groundwater plume did not seem to be reduced in size between 2002 and 2007, as compared to reduction seen in previous years	Optimize the groundwater remedy by revisiting both the P&T pump rates and the in-situ bioremediation program on- and off-property. This optimization study may include additional sampling, aquifer testing, capture zone analysis, consideration of additional wells for the in-situ bioremediation or any other additional appropriate task.
Clarity of semiannual and annual reports	Reorganize reports to separate past activities and results from the latest ones. Provide distinct summaries to list actual current operations and results, either in table format or separate sections.
Leaking extraction wells	While the areas are fenced, and there is no potential exposure, Beazer should find a more permanent solution to eliminate the leaks, either by replacing parts and/or providing secondary containment so as not to allow for contaminated groundwater to contact the ground surface.

7.2 Question B: Are the Assumptions Used at the Time of Remedy Selection Still Valid?

The ARARs review (Appendix D) showed that a new regulation for property that contains hazardous waste (Title 22, CCR, Chapter 39, Section 67391.1, effective April 19, 2003) requires all land use covenants to be signed by the DTSC and the landowner, and be recorded in the county where the land is located. The signature requirement is considered applicable to the entire site where land use will be restricted to industrial uses, and groundwater wells will be used for monitoring or injection purposes only. DTSC signed the Covenant to Restrict Use of Property in October 2003, and it was recorded at the Butte County Clerk-Recorder's Office in November 2003.

The risk review revealed that there have been a number of changes to the toxicity values for specific constituents of concern in soil and groundwater at the Koppers Site since the final endangerment assessment was submitted in 1988.

On January 23, 2006, the rule for all drinking water systems to comply with the new standard for arsenic of 10 ppb (adopted January 22, 2001) came into effect. The new MCL for arsenic is less than half the Site background concentration (which is 27 ppb). At the time the 1989 ROD selected background levels as the cleanup goal for arsenic, the arsenic MCL was 50 ppb, i.e., greater than local background levels. For a contaminant such as arsenic, which is also a naturally-occurring chemical in groundwater, there would be no long-term benefit in attempting to clean up a site to levels below background concentrations. The background concentration for arsenic of 27 ppb will continue to be the cleanup standard for groundwater at the Koppers Site.

Pentachlorophenol was not evaluated as a carcinogen in 1988 and has since been classified as one. This change does not affect protectiveness because 1) the clean-up level for groundwater was updated in ROD Amendment 2 to the current MCL and 2) the cleanup level for soil, although originally set at the State's Total Threshold Limit Concentration for soil, is still protective for industrial use of the property based on EPA's May 2008 Regional Screening Levels for Chemical Contaminants at Superfund Sites.

For PCDDs/PCDFs (dioxins) expressed as 2,3,7,8-TCDD Toxic Equivalency Factor, the ROD cleanup standard for groundwater was set at 0.53×10^{-7} ppb. The current MCL for groundwater is 3×10^{-8} ppb (i.e., 0.3×10^{-7} ppb), but this difference does not affect protectiveness, particularly since the area of dioxin-contaminated groundwater is within the TI waiver zone as defined in ROD Amendment No. 2, where groundwater use is severely restricted. For soil cleanup levels, the change in toxicity factors is similarly relatively small and does not affect the protectiveness of the remedy

7.3 Question C: Has Any Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

Although portions of the Site have been sold, based upon the condition of title review, it appears that appropriate institutional controls are in place to maintain remedy protectiveness.

7.4 Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESD and two ROD Amendments. There have to date been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy; however, the property was recently sold and is anticipated to be redeveloped. The deed restriction, which is a part of the condition of title for the property, is very explicit and any future redevelopment should not affect the protectiveness of the remedy, if the restrictions are followed as prescribed.

At the time of the December 2007 Site inspection, both extraction wells EW-1 and EW-2 were observed to be leaking. According to the O&M manager, these leaks are a regular occurrence. The water from the leaks falls directly onto the grass covered ground and soaks back into the soil (pictures of the extraction wells are included in Appendix H). However,

the leaks appeared to be minor at the time of the site inspection, and the area around the wells is fenced to minimize potential exposure. With the fence preventing exposure to contaminated water, at the current time these leaks are considered to be O&M issues that need to be addressed, but they do not affect the protectiveness of the remedy.

8.0 Issues and Recommendations

There is no issue identified that affects the current protectiveness of the remedy.

9.0 Protectiveness Statement

The remedy at the Koppers Superfund Site is protective of human health and the environment because all exposure pathways that could result in unacceptable risk are being controlled. Residents within the former plume have been supplied with an alternate source of drinking water. A deed restriction on the property prevents unacceptable exposure to on-site soil contamination and restricts the property for industrial use only. Current data indicate that the groundwater remediation is progressing and that the remedy is functioning as required to achieve groundwater remediation standards.

10.0 Next Five-Year Review

The next five-year review for the Koppers Company, Inc. Superfund Site will be completed in July 2013.

11.0 References

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Appendix A
Detailed Site Chronology

APPENDIX A

Detailed Site Chronology

TABLE A-1
Chronology of Site Events
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Event	Date
Mine dredging operations were conducted at the Site.	1900s
Hutchinson Lumber Mill operated at the Site.	1920 to 1948
National Wood Treating Company operated at the Site.	1948 to 1955
Wood was treated at the Site with chemicals including, but not limited to, pentachlorophenol (PCP), creosote, and chromated copper arsenate solution to prevent wood deterioration by insects or fungi.	1948 to 2001
Lumber mill facility operated at the Site, concurrently with the wood-treatment operations.	1952 to 1962
Creosote residuals from wood-treating process were discharged to unlined settling ponds near the western Site boundary.	Approximately 1952 to 1973
Koppers purchased the property and wood-treating operations from the National Wood Treating Company.	1955
A fire occurred at the Site; approximately 20,000 gallons of PCP were released from tanks. Debris was buried on property initially, then later excavated and disposed of at an approved landfill.	1963
Wastes from cellon process (mixiing PCP with isopropyl ether and butane, then injecting moisture into wood for wood preservation) disposed at an area near creosote disposal pond.	1961 to 1973
Treated poles encrusted with PCP crystals were washed with caustic water over unlined soil, apparently contributing greatly to the Site's contamination.	1963 to 1973
PCP-contaminated groundwater was first documented on property.	1971
PCP was discovered in nearby residential wells.	1972
Regional Water Quality Control Board (RWQCB) issued a Cease and Desist Order to Koppers to treat contaminated groundwater.	1973
Koppers installed and began operation of two recovery wells (RW-1 and RW-2) to recover PCP in local groundwater in accordance with RWQCB order.	1974
Concentrations of PCP in offsite wells decreased, and the RWQCB order was rescinded.	1974
Waste disposal area in the Eastern Spray Field (fire debris), the two areas in the Western Spray Field (fire debris), and the cellon blowdown area were excavated, and the soils were disposed of at the soil bed of the biological wastewater treatment unit (BWTU).	1973
BWTU was used for the disposal of all residual wastes.	1973 to 1988
The RWQCB ordered Koppers to conduct a comprehensive groundwater and soil investigation. Koppers found that groundwater contamination was contained by the extraction wells on property. The soil survey showed that over 43,000 cy of onsite soil were contaminated with at least 10 ppm of PCP.	1981 to 1982

TABLE A-1
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Oroville, Butte County, California

Event	Date
The RWQCB issued a Cease-and-Desist order directing Koppers to end discharge of PCP into soil at the plant, and a Cleanup and Abatement Order directing Koppers to clean up contaminated soils.	1982
The Site was proposed for placement on the National Priorities List (NPL).	September 1983
Groundwater contamination in residential wells was found about 1.5 mile south of the Site. Of the 108 wells sampled, 19 showed PCP levels higher than 0.5 ppb.	December 1983
Bottled water was supplied to 45 residences with impacted drinking water supply wells, and start negotiation with Oroville Wyndotte Irrigation District (OWID) to upply residents with domestic water at Koppers expense.	March 1984 to 1986
Site was placed on the NPL.	September 1984
Groundwater monitoring program was initiated.	June 1985
Use of PCP in the wood-treating process was phased out.	1986 to 1988
Residences within areas of impacted groundwater were connected to Oroville Wyandotte Irrigation District (OWID). Thirty-four residences were initially put on the alternate water supply plan (AWSP), with Koppers paying for their water bill. Of those thirty-four, seven are still on the AWSP, receiving payment from Koppers for their annual water bill.	March 1986 to date
The RWQCB rescinded the two 1982 orders and adopted a new order requiring Koppers to complete a RI/FS in accordance with EPA guidelines and time schedule.	January 1986
Administrative Order of Consent signed between Koppers and EPA, requiring completion of the Remedial Investigation and Feasibility Study (RI/FS).	April 1986
Quarterly monitoring conducted for water wells south of the plant.	From 1986
Explosion and fire at the Site. EPA issued a unilateral removal order for the cleanup, removal, and stabilization of soil.	April 1987
After the fire, Department of Health Services (DHS) sampled neighboring properties and found elevated dioxins in chicken eggs; an advisory was issued and the source of area-wide trace dioxin was not determined.	March 1988
Temporary chip-seal cap was constructed over process area.	1987 to 1988
Koppers and the associated Site was bought by Beazer East, Inc. (Beazer).	1988
Operations ceased at the Former Biological Wastewater Treatment Facility (soil) on property.	1988
RI Report completed, including investigation of soil, groundwater, surface water and air.	June 1988
Risks evaluated by the EPA and reported in an Endangerment Assessment Report.	November 1988
Beazer sold the Koppers Superfund Site to Koppers Industries, Inc. (KII), yet Beazer retained responsibility for CERCLA matters at the Site.	December 1988
Feasibility Study completed.	May 1989

TABLE A-1
Chronology of Site Events
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Event	Date
Record of Decision (ROD) for cleanup of groundwater and soil was issued for the Site with soil remediation alternatives in four operable units (S1 through S4) based on risk from direct exposure to contaminated surface soil, and groundwater remediation in two operable units (G1 and G2) based on ingestion risk of groundwater.	September 1989
Explanation of Significant Difference (ESD) issued for the Site to include protection of groundwater from subsurface soil contamination, which limited soil remediation to 5 feet unless a potential contaminant source to groundwater was found.	January 1991
The RWQCB issued a Cleanup and Abatement Order requiring Beazer to clean up past discharge of wood-treating compounds to the lagoon located at the biological wastewater treatment unit. The lagoon was designated as a toxic pit under the law and must be removed.	
Consent Decree between EPA and Beazer agreeing that Beazer will conduct remedial action work as specified in the ROD.	February 6, 1992
Two concrete drip pads were installed in S3 as part of the concrete cap designed as an interim remedy to prevent migration of the contaminants while the plant is still in operation.	1992
Completed soil washing pilot study (remedy selection for S2 and S3) found inadequate as a remedy by itself.	1993
Construction of test plots for in situ biodegradetion pilot study for soil in area S1. Found higher than expected concentrations of PCDDs/PCDFs (above industrial standards for workers) and PAHs in surface soil. Contaminated soil to be landfilled onsite as the most effective remedy. Pilot study canceled.	1993
Off property groundwater remediation system constructed and operation started (600 gpm).	March 1993
On-property groundwater remediation system constructed and operation started (400 gpm).	February 1994
Product recovery well (PR-01) installed to recover and cleanup of the creosote pools trapped on top of clay layers in the on-property groundwater contaminated plume.	1994
Soil Fixation Treatability Study completed for area S4. Effective for arsenic, chromium and other metals, but not for PCP and PAHs. Found to be not implementable as a remedy. Soil landfilled offsite at a permitted facility.	1994
Pilot study for in situ biotreatment system of creosote in on-property groundwater plume.	July 1995
Construction complete for onsite landfill, Cell No. 1 for dioxin-contaminated soil from S-1 test plot soils (15,000 cy).	August 1995
Off-property groundwater remedial system taken off line because the plume retreated. The extraction wells were no longer effective in capturing the plume.	December 1995

TABLE A-1
Chronology of Site Events
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Event	Date
ROD Amendment No. 1 issued for the Site, modifying the soil remedies in the ROD (which were found to be not implementable and not cost effective) to an onsite landfill (incineration and thermal desorption also considered as alternatives and found to be not the best remedies for this Site), Also changed soil cleanup level from residential to industrial, and required deed restriction for future land use. Cell No. 2 was to contain 100,000 cy and occupy about 7 acres onsite adjacent to Cell No. 1. Soil in S1 and S2 will be landfilled first, soil in S3 (process area) will be landfilled after the plant closed.	August 1996
Former creosote pond in area S2 was excavated to 14 feet below ground surface (bgs) (approximately 11,216 cy of soil). Soil placed in Cell No. 2.	1996
Excavated former cellon blowdown in area S2 to 10 feet bgs (approximately 11,130 cy of soil). Soil placed in Cell No. 2.	1997
Excavated pole-wash area S1 to depths of up to 20 feet bgs, 4,830 cy removed. Backfilled with plastic, low-permeability soils beneath and coarse, gravelly onsite soils on top. Soil placed in Cell No. 2.	September 1997
First five-year review completed (statutory review, triggered 5 years after initiation of RA implementation. Remedial actions were deemed protective of public health and the environment and were functioning as designed.	December 1997
Implemented in situ enhanced bioremediation program to treat PCP in the on-property eastern plume. Periodic quantities of magnesium peroxide (supply oxygen) and di-ammonium phosphate (supply nitrogen and phosphorous) were added to MW-1, MW-4, MW-6, MW-12, MW-13, and MW-23. Monitoring wells system included MW-3, MW-5, MW-7, MW-8, and TW-1.	March 1998
Restriction for domestic drinking water for 26 residences removed (private wells taken off the alternative drinking water supply).	April 1998
Implemented off-property groundwater in situ bioremediation program, similar to onsite program. Magnesium peroxide and di-ammonium phosphate were added to RI-11, RI-20A, and Well 26. Monitoring wells system included RI-2, RI-3, RI-10, RI-12, and RI-16B.	August 1998
ROD Amendment No. 2 issued for the Site, modifying the groundwater remedy to provide for: (1) 4-acre Technical Impracticability (TI) Zone for plume areas with DNAPL, (2) adding enhanced in situ bioremediation to the remedy, (3) providing monitored natural attenuation as a contingency remedy, and (4) groundwater standards changed for PCP (1 part per billion [ppb]) and barium (1,000 ppb).	September 1999
Koppers ceased operations and began work on Resource Conservation and Recovery Act (RCRA) closure, overseen by Department of Toxic Substances Control.	March 15, 2001
Restriction for domestic drinking water for one residence removed (seven remaining).	April 2001
Pilot in situ bioremediation study of creosote treatment in the area of the former creosote pond terminated at the request of Beazer, because additives apparently resulted in increased mobility of polynuclear aromatic hydrocarbons (PAHs).	June 2001
Elevated boron concentrations detected in monitoring well MW-8 (on-property eastern plume).	July 2002

TABLE A-1
Chronology of Site Events
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Oroville, Butte County, California

Event	Date
Soil removal completed. Cell # 2 construction complete.	September 2002
RWQCB transmits Order No. R5-2002-0163, rescinding waste discharge requirements as per Order No. 97-076.	September 2002
Beazer East, Inc. purchased Site property from KII.	November 2002
Second five-year review completed. Remedial actions were deemed protective.	February 2003
Consent Decree amended (incorporated land use covenants restricting access to groundwater) (signed by EPA).	June 2003
Public notice was issued for lodging of proposed CERCLA Consent Decree amendment, United States vs Beazer East, Inc civil action No. S-91-767.	August 2003
Preliminary Close Out Report (PCOR) signed by EPA.	September 4, 2003
Amended Consent Decree entered by the court.	September 22, 2003
Covenant to Restrict Use of Property recorded with Butte County.	November 12, 2003
Site Certification from DTSC.	June 30, 2004
Monthly reporting was reduced to quarterly reporting.	May, 2006
Beazer East, Inc. sold most of property to North Ophir Land, LLC.	November 28, 2006
EPA approved to change ORC from magnesium peroxide to the calcium peroxide-based compound for Groundwater In-Situ Bioremediation Program.	January 31, 2007
Third five-year review initiated.	November 5, 2007
North Ophir Land, LLC, sold portions of the property to Strategic Development Holding Co, LLC.	December 18, 2007

Appendix B
Community Interviews Record

APPENDIX B

Community Interviews Record

INTERVIEW DOCUMENTATION FORM			
The following is a list of individuals interviewed for the community involvement portion of this five-year review. See the attached contact records for a detailed summary of the interviews. Interviews were conducted by Mr. Luis Garcia-Bakarich, Community Involvement Coordinator, U.S. Environmental Protection Agengy (EPA) Region 9, and Ms. Jen Blonn, Superfund Intern, EPA Region 9.			
Name	**Title/Position**	**Organization**	**Date**
1. Brenda Crotts	Branch Librarian	Butte County Library	1/29/08
2. Reba & Dan Pierce	Owner & Staff, also Residential Neighbor	NORCA Precision Machinery	1/29/08
3. John Rowe	Owner	Diversified Products	1/29/08
4. Owen Young	Resident	----------	1/29/08
5. Walter Shaner	Resident	----------	1/29/08
6. Alfred Herfi	Resident	----------	1/29/08
EPA staff asked each interviewee the following six questions. 1. What is your overall impression of the project? (general sentiment) 2. What effects have Site operations had on the surrounding community? 3. Are you aware of any community concerns regarding the Site or its operation and administration? If so, please give details. 4. Are you aware of any events, incidents, or activities at the Site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give 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: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: Brenda Crotts	**Title:** Branch Librarian	**Organization:** Butte County Library
Telephone No: (530)538-7196 **Fax No:** **E-Mail Address:**	**Street Address:** 1820 Mitchell Avenue **City, State, Zip:** Oroville, CA 95966	

Summary Of Conversation

- Doesn't have much of an impression of the site. No one has come in to the library to request information lately.
- Not aware of effects Site operations have had on the community in the past 5 years. Recalled concerns over chickens 20 years ago and recent discussion of health concerns from past contamination.
- Not aware of community concerns regarding the Site or its operation and administration.
- Not aware of any events, incidents, or activities at the Site such as vandalism, trespassing, or emergency responses from local authorities.
- Not well informed about the Site's activities and progress because she chooses not to read the fliers.
- No comments, suggestions, or recommendations regarding the Site's management or operation.

INTERVIEW RECORD

Site Name: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: Reba & Dan Pierce	**Title:** Owner, staff, residents	**Organization:** NORCA Precision Machinery
Telephone No: (530)534-6872 **Fax No:** **E-Mail Address:**	**Street Address:** 5625 Baggett-Marysville Rd. **City, State, Zip:** Oroville, CA 95965	

Summary Of Conversation

Reba Pierce lives directly across Baggett-Marysville Rd. from the Koppers Superfund Site. Her residence is located on the same parcel as NORCA Precision Machinery, which Reba Pierce owns. Dan, Reba's son, works at the facility.

- Both feel the Koppers Site was cleaned up well and EPA did all that it could.
- Stated that the cleanup positively affected the surrounding community because documentation of cleanup is publicly available. Stated that this is good for property values.
- Not aware of community concerns regarding the Site or its operation and administration.
- Aware of individuals going onto the Site at night. Referred to these activities as harmless. Activities include cars pulling onto the property and youth socializing.
- Do not feel they need to be well informed about the Site because they are not concerned with it.
- No concerns or suggestions and happy with cleanup.

INTERVIEW RECORD

Site Name: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: John Rowe **Accompanied by:** Ron Morgan, Health & Safety Coordinator	**Title:** Owner	**Organization:** Diversified Products
Telephone No: (530) 534-3966 **Fax No:** **E-Mail Address:**	**Street Address:** 5523 Baggett Marysville Road **City, State, Zip:** Oroville, CA 95965	

Summary Of Conversation

- Does not have much of an impression of the Site. He has not received much information.
- Stated that the cleanup has made the Site more attractive.
- Not aware of any community concerns regarding the Site or its operation and administration.
- Has seen hunters on the property.
- Does not feel well informed about the Site and would like more information.
- Is more interested in commercial development than environmental concerns.

INTERVIEW RECORD

Site Name: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: Owen Young	**Title:** Resident	**Organization:**
Telephone No: (530)532-4352 **Fax No:** **E-Mail Address:**	**Street Address:** 4823 Powerhouse Hill Road **City, State, Zip:** Oroville, CA 95965	

Summary Of Conversation

Mr. Young currently receives a water reimbursement, funded by Beazer East, Inc.

- Happy with cleanup.
- Does not believe that the cleanup had noticeable effects on the community.
- Not aware of any community concerns regarding the Ssite or its operation and administration. Only aware of people who are happy with it.
- Not aware of anyone trespassing or causing problems on the Site.
- Felt well informed about the property years ago but not lately.
- No concerns, suggestions, or recommendations.

INTERVIEW RECORD

Site Name: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: Walter Shaner	**Title:** Resident	**Organization:**
Telephone No: (530)533-3496 **Fax No:** **E-Mail Address:**	**Street Address:** 467 Lone Tree Road **City, State, Zip:** Oroville, CA 95965	

Summary Of Conversation

Mr. Shaner previously received supplied water through Beazer East, Inc. He is located near the offsite plume and treatment pump.

- Believes that everything was done that could have been to clean up the Site.
- Stated that there were no significant impacts on the community.
- Not aware of any community concerns regarding the Site or its operation and administration.
- Not aware of any events, incidents, or activities at the Site such as vandalism, trespassing, or emergency responses from local authorities.
- Feels well informed about the Site.
- No concerns, suggestions, or recommendations.

INTERVIEW RECORD

Site Name: Koppers	**EPA ID No.:**	
Subject: Five-Year Review	**Time:** PM	**Date:** 1/29/08
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Luis Garcia-Bakarich **Accompanied by:** Jen Blonn, U.S. EPA	**Title:** Community Involvement Coordinator, U.S. EPA	**Organization:** US EPA, Region 9

Individual Contacted:

Name: Alfred Herfi	**Title:** Resident	**Organization:**
Telephone No: (530)532-1537 **Fax No:** **E-Mail Address:**	**Street Address:** 62 Horny Toad Rd. **City, State, Zip:** Oroville, CA 95965	

Summary Of Conversation

Mr. Herfi currently receives a water reimbursement, funded by Beazer East, Inc. He is located near the offsite plume and treatment pump.

- Believes Site activities are going pretty well.
- One of the pumps made a lot of noise, but not a current concern due to decommissioning of offsite pump and treat unit. Overall cleanup has had a positive effect on the community.
- Community is concerned with cancer risks from the Site.
- Not aware of anyone trespassing on the Site.
- Feels well informed about Site activities and progress.
- No concerns, suggestions, or recommendations.

Appendix C
Documents Reviewed

APPENDIX C

Documents Reviewed

General

CA Environmental Protection Agency – Department of Toxic Substances Control. 2003. *Covenant to Restrict Use of Property, Environmental Restriction.* October.

Chicago Title Insurance Company. 2008. *Condition of Title Report.* January.

GeoTrans, Inc. 2002. *Short-Term Groundwater Remediation Workplan, Dricon/CCA Tank Area.* September.

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TRC. 2002. *Soil Remediation Workplan Dricon-CCA Area, Koppers Company, Inc. Superfund Site, Feather River Plant, Oroville, California.* August.

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U.S. District Court—Eastern District California. 2003. *Stipulated Amendment to Consent Decree and Proposed Order No. S-91-767.* September.

U.S. Environmental Protection Agency, Region 9. 2003. *Preliminary Closeout Report*. September.

U.S. Environmental Protection Agency, Region 9. 2007. *Letter: Approves Product Change for Groundwater In-Situ Bioremediation Programs.* January.

ARARs

U.S. Environmental Protection Agency, Region 9. 1989. *Record of Decision, Koppers Co., Inc. (Oroville Plant), OU1, Oroville, CA.* September.

U.S. Environmental Protection Agency, Region 9. 1991. *Explanation of Significant Differences Koppers Superfund Site, Oroville, California.* January.

U.S. Environmental Protection Agency, Region 9. 1996. *Amendment #1 to the Record of Decision for the Soil and Groundwater Operable Unit, Koppers Company, Inc., Oroville, California.* August.

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U.S. Environmental Protection Agency, Region 9. 1999. *Amendment #2 to the Record of Decision for the Soil and Groundwater Operable Unit, Koppers Company, Inc., Oroville, California.* September.

U.S. Environmental Protection Agency, Region 9. 2003. *Final Second 5-Year Review Report for Koppers Company, Inc. Superfund Site, Oroville, California*. February.

Human Health and Ecological Risk

Dames & Moore. 1988. *RI/FS Remedial Investigation Report, Koppers, Feather River Plant, Oroville, California.* June.

Ebasco Services Incorporated. 1988. *Final Endangerment Assessment, Koppers Company Feather River Plant Superfund Site.* November.

Data

GeoTrans, Inc. 2003. *Annual 2002 Remedial Action Groundwater Monitoring Report Koppers Company, Inc. Superfund Site (Feather River Plant) Oroville, California, Volume I of 2.* April.

GeoTrans, Inc. 2003. *Annual 2002 Remedial Action Groundwater Monitoring Report, Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California, Volume 2 of 2.* April.

GeoTrans, Inc. 2003. *Semiannual 2003 Remedial Action Groundwater Monitoring Report, Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California.* November.

GeoTrans, Inc. 2004. *Annual 2003 Remedial Action Groundwater Monitoring Report Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California.* March.

GeoTrans, Inc. 2004. *Semiannual 2004 Remedial Action Groundwater Monitoring Report Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California.* September.

GeoTrans, Inc. 2005. *Annual 2004 Remedial Action Groundwater Monitoring Report, Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California.* April.

GeoTrans, Inc. 2005. *Semiannual 2005 Remedial Action Groundwater Monitoring Report, Koppers Company, Inc. Superfund Site (Feather River Plant), Oroville, California.* September.

GeoTrans, Inc. 2006. *Annual 2005 Remedial Action Groundwater Monitoring Report, Koppers Company, Inc. Superfund site (Feather River Plant), Oroville, California*. April.

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Appendix D
ARARs Review Memorandum

Koppers Company, Inc. Superfund Site 5-Year Review

Applicable or Relevant and Appropriate Requirements Review

PREPARED FOR: Kim Hoang/U.S. Environmental Protection Agency, Region 9 Superfund Division

PREPARED BY: CH2M HILL, Inc.

DATE: February 22, 2008

This technical memorandum presents an evaluation of the Applicable or Relevant and Appropriate Requirements (ARARs) for the Koppers Company, Inc. Superfund Site (Koppers site) located in Oroville, California. The U.S. Environmental Protection Agency (EPA) identification number for the site is CAD009112087.

Purpose of the ARARs Review

The purpose of an ARARs review is to determine whether laws, regulations, or guidance promulgated since the approval of site decision documents alter the remedy's protectiveness of human health and the environment.

ARARs are established in the site decision documents, primarily in Record of Decision (ROD) documents. Changes to ARARs, where necessary, can be memorialized in ROD Amendment documents, Explanation of Significant Differences (ESD) documents, and 5-Year Review documents.

The preamble to the National Contingency Plan (NCP) states that remedy selection decisions are not to be reopened unless new or modified requirements call into question the protectiveness of the selected remedy (55 CFR 8757, March 8, 1990). This is interpreted to mean generally that ARARs are frozen at the time of remedy approval, unless updated by additional decision documents.

ARARs Background

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that remedial actions implemented at CERCLA sites are carried out in compliance with any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be ARARs.

CERCLA response actions are exempted by law from the requirement to obtain federal, state, or local permits related to any activities conducted completely on site. However, this

does not remove the requirement to meet the substantive provisions of permitting regulations that are ARARs. The specific ARAR terms are defined below.

Applicable. Applicable requirements are cleanup standards, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. A requirement is applicable if the jurisdictional prerequisites of the environmental standard show a direct correspondence when objectively compared with the conditions at the site.

Relevant and Appropriate. If a requirement is not legally applicable, the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of the site. The criteria for determining relevance and appropriateness are listed in 40 CFR 300.400(g) (2).

To Be Considered (TBC). TBC criteria are requirements that may not meet the definition of an ARAR, but still may be useful in determining whether to take action at a site or to what degree action is necessary. TBC criteria, as defined in 40 CFR 300.400(g) (3), are non-promulgated advisories or guidance issued by federal or state government that are not legally binding but may provide useful information or recommended procedures for remedial action. Although TBC criteria do not have the status of ARARs, they are considered together with ARARs to establish the required level of cleanup for protection of human health and the environment.

Pursuant to EPA guidance, ARARs generally are classified into three categories: action-specific, chemical-specific, and location-specific requirements. These categories of ARARs are identified below:

- **Action-specific ARARs** are requirements that apply to specific actions that may be associated with site remediation. Action-specific ARARs often define acceptable handling, treatment, and disposal procedures for hazardous substances. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Examples of action-specific ARARs include requirements applicable to landfill closure, wastewater discharge, hazardous waste disposal, and emissions of air pollutants.
- **Chemical-specific ARARs** include those laws and regulations that regulate the release to the environment of materials possessing certain chemical or physical characteristics or containing specified chemical compounds. These requirements generally set health- or risk-based concentration limits or discharge limits for specific hazardous substances.
- **Location-specific ARARs** are those requirements that relate to the geographical or physical location of the site, rather than the nature of the contaminants or the proposed site remedial actions. These requirements may limit the placement of remedial action and may impose additional constraints on the cleanup action. For example, location-specific ARARs may refer to activities in the vicinity of wetlands, floodplains, endangered species habitat, and areas of historical or cultural significance.

Site Background

The Koppers site is located in Butte County just south of the Oroville, California city limits. The site covers approximately 200 acres, including the area where wood treating operations were performed and the predominately southward extending groundwater plume. The EPA identification number for the site is CAD009112087. The site is a CERCLA Superfund Site, and was placed on the National Priorities List (NPL) on September 21, 1984.

The following site-related documents were used in preparing this ARARs review technical memorandum:

- ROD, September 13, 1989
- ESD, January 29, 1991
- ROD Amendment No. 1, August 29, 1996
- First 5-Year Review, December 22 , 1997
- ROD Amendment No. 2, September 23, 1999
- Second 5-Year Review, February 7, 2003

Selected Remedies

The 1989 ROD selected remedies to provide on-site treatment of four areas of contaminated soil (Soil Units 1 through 4) and remove contaminants from on-site and off-site groundwater. The major components of the ROD selected remedies include:

- Groundwater extraction, carbon filtration treatment, and reinjection until California State Action Levels are achieved in all on-site and off-site monitoring wells using two distinct treatment systems
- *In situ* biodegradation at Soil Unit 1
- Excavation and soil washing at Soil Unit 2
- Capping at Soil Unit 3
- Excavation and treatment by chemical fixation and on-plant disposal of soil at Soil Unit 4

The ESD issued on January 29, 1991 modified portions of the ROD by establishing a soil depth of 5 feet for existing remedial objectives unless a source of groundwater contamination was found. ROD Amendment No. 1, issued on August 29, 1996, changed the soil remedy to on-site landfilling, changed cleanup standards for soil from residential to industrial, and provided for institutional controls. ROD Amendment No. 2 ,issued on September 23, 1999, modified the groundwater remedy to provide for a 4-acre Technical Impracticability (TI) Zone waiver due to the presence of dense non-aqueous phase liquids (DNAPLs), added enhanced *in situ* bioremediation as a remedial option, provided monitored natural attenuation as a contingency remedy, lowered the standard for pentachlorophenol (PCP) in groundwater to 1 part per billion (ppb) from 2.2 ppb, and increased the standard for barium in groundwater to 1,000 ppb from 680 ppb.

Remediation Standards

The 1989 ROD established the soil and groundwater cleanup criteria for the Koppers site with the following statement:

> *"The soil cleanup goals for the major contaminants at the Koppers site are 17 parts per million (ppm) for PCP, 30 parts per trillion (ppt) for dioxins and furans, background for arsenic and chromium, and 0.19 ppm for carcinogenic polyaromatic hydrocarbons (PAHs). Remedial objectives for groundwater are based on the more stringent goal of 10^{-6} excess cancer risk from use of groundwater as a drinking water supply or state action levels"..*

The ROD amendments (1996 and 1999) limited the ROD cleanup standards to the top 5 feet of soil and changed the soil cleanup standards from residential to industrial. Groundwater cleanup standards were modified to include implementation of a 4-acre TI Zone for groundwater remediation in the area of the former creosote pond at Soil Unit 2, as well as revision of groundwater cleanup standards for PCP from 2.2 to 1.0 ppb and for barium from 680 to 1,000 ppb.

Soil remediation was achieved by excavation and on-site landfilling in 2002.

The groundwater remediation goals are to restore contaminated groundwater, using extraction, to the following standards:

- Cleanup standards as documented in the 1989 ROD, amendments, and 5-year reviews
- Federal or state Maximum Contaminant Levels (MCLs)

On January 23, 2006, the rule for all drinking water systems to comply with the new standard for arsenic of 10 ppb (adopted January 22, 2001) came into effect. The new MCL for arsenic is less than half the site background concentration. The *Water Quality Control Plan for Sacramento and San Joaquin River Basins* of September 15, 1998 expressly states that its water quality objectives do not require improvement over naturally occurring background concentrations. The background concentration for arsenic of 27 ppb will continue to be the cleanup standard for groundwater at the Koppers site. Because this standard was adopted in January 2001, it was discussed in the second 5year review that was completed in 2003. Therefore, no chemical-specific changes to ARARs are noted for this ARARs evaluation.

The groundwater cleanup criteria established for the site in the 1989 ROD and ROD amendments are presented in Table D-1.

Site ARARs Review

Tables D-2 through D-4 list the ARARs established in the above-referenced decision documents, summarize the requirement for each ARAR, cite the regulatory basis for each ARAR, state the evaluated status of each ARAR, and provide comments where applicable, including comments on any regulatory changes since the 2003 5-Year Review.

Table D-2 contains action–specific ARARs, Table D-3 contains chemical–specific ARARs, and Table D-4 contains location-specific ARARs. Current versions of the California Code of Regulations (CCR) and the Code of Federal Regulations (CFR) were consulted (via the internet or in hard copy) to review pertinent updates of laws, regulations, or guidance.

Site ARARs Summary

The basis for ARARs are laws and regulations applicable to the site location, remedy actions, and/or contaminants of concern.

The Koppers site consists of approximately 200 acres in Oroville, California. It is a CERCLA Superfund Site and was placed on the NPL on September 21, 1984. CERCLA response actions are exempted by law from the requirement to obtain federal, state, or local permits related to any activities conducted completely on site. However, this does not remove the requirement to meet the substantive provisions of permitting regulations that are ARARs. Koppers site ARARs (as established in the ROD, ROD Amendments, and previous 5-year reviews) are evaluated and discussed in detail in Tables D-2 through D-4, and summarized briefly below.

Action-specific ARARs. The risk review revealed that there have been a number of changes to the toxicity values for specific constituents of concern in soil and groundwater at the Koppers Site since the final endangerment assessment was submitted in 1988.

On January 23, 2006, the rule for all drinking water systems to comply with the new standard for arsenic of 10 ppb (adopted January 22, 2001) came into effect. The new MCL for arsenic is less than half the Site background concentration. The Water Quality Control Plan for Sacramento and San Joaquin River Basins of September 15, 1998, expressly states that its water quality objectives do not require improvement over naturally occurring background concentrations. The background concentration for arsenic of 27 ppb will continue to be the cleanup standard for groundwater at the Koppers Site.

Pentachlorophenol was not evaluated as a carcinogen in 1988 and has since been classified as one. This change does not affect protectiveness because the clean-up value for groundwater remains the same as what was used in the ROD and ROD amendment.

For PCDDs/PCDFs (dioxin) as 2,3,7,8-TCDD Toxic Equivalency Factor, the cleanup standard was changed from 0.53×10^{-7} ppb to 3×10^{-8} ppb, but this does not affect protectiveness since this area of contamination is under TI waiver.

Chemical-specific ARARs. There are no changes to existing chemical-specific ARARs as stated in the ROD, ROD Amendments, and previous 5-year reviews.

Location-specific ARARs. The ARARs review showed that a new regulation for property that contains hazardous waste (Title 22, CCR, Chapter 39, Section 67391.1, effective April 19, 2003) requires all land use covenants to be signed by the DTSC and the landowner, and be recorded in the county where the land is located. The signature requirement is considered applicable to the entire site where land use will be restricted to industrial uses, and groundwater wells will be used for monitoring or injection purposes only. DTSC signed the Covenant to Restrict Use of Property in October 2003, and it was recorded at the Butte County Cleark-Recorder's Office in November 2003.

Tables

TABLE D-1
Groundwater Remediation Standards
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Chemical	Standard or Cleanup Level	Reference	Current (September 2007) Drinking Water Standard, MCLs
Pentachlorophenol (PCP)	1.0 ppb[a,b]	State and Federal MCL	1.0 ppb, effective 01/1991 (Federal) and 09/08/1994 (State)
Pentachlorophenol (PCP) at well RI-11	0.5 ppb for four consecutive quarters before use of alternative water supply can cease	1999 ROD Amendment #2	NA
Isopropyl Ether	2,800 ppb	TBC from 1989 ROD	NA
Benzene	1.0 ppb	State MCL	1.0 ppb, effective 02/25/1989
Ethylbenzene	680 ppb	State MCL	680 ppb, effective 02/25/1989
Xylenes	1,750 ppb	State MCL	1,750 ppb, effective 02/25/1989
Barium	1,000[b]	State and Federal MCL	1,000 ppb, effective 06/24/1977
Boron	1,200 ppb	TBC from 1989 ROD	NA
Cadmium	5 ppb	State and Federal MCL	5.0 ppb, effective 01/1991 (Federal) and 09/08/1994 (State)
Copper	13-30 ppb	State Secondary MCL	1,000 ppb, effective 1977
Mercury	2 ppb	State and Federal MCL	2 ppb, effective 06/24/1977
Arsenic	Background (27 ppb)	1989 ROD	10 ppb effective 01/23/2006 (Federal)
Chromium	50 ppb	1989 ROD	50 ppb effective 06/24/1977 (State)
PCDDs/PCDFs (dioxin) as 2,3,7,8-TCDD Toxic Equivalency Factor	0.53×10^{-7} ppb[a]	1989 ROD	3×10^{-8} ppb, effective 9/8/1994
Total Carcinogenic PAHs	0.007 ppb[a]	1989 ROD	NA

Notes:
MCL = maximum contaminant level
PAH = polynuclear aromatic hydrocarbon
ppb = parts per billion
ROD = Record of Decision
[a]Waived for TI Zone
[b]Updated from remediation standard in 1989 ROD

TABLE D-2
Action-Specific ARARs
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Action	Media	Citation	Requirement	Origin	ARARs Determination	Comments
Cleanup Actions	Groundwater	Porter-Cologne Water Quality Control Act (CCR Sections 13140-13147, 13172, 13260, 13262, 12267, and 13304)	Title 27 CCR, Section 20410, and Title 23 CCR, Section 2550.6	1999 ROD Amendment	Relevant and Appropriate	There have been no substantive changes to this regulation since the 1999 ROD amendment.
Cleanup Actions	Groundwater	Porter-Cologne Water Quality Control Act (CCR Sections 13000, 13140, 13240, 13260, 13263, 13267, 13300, 13307, and 13394)	State Water Resources Control Board Resolution 92-49 (as amended April 21, 1994) (Subparagraph IIIG)	1989 ROD	Relevant and Appropriate	Applies to groundwater remedial actions. The groundwater cleanup system will be operated in such a way that the best water quality reasonable is restored. Amended on October 2, 1996 by SWRCB Resolution No. 96-079 to include provisions for a containment zone policy. There have been no changes to Subpart IIIG.
Underground Injection	Groundwater	SDWA 40 CFR 144, including section 144.13 (4) (c) Underground Injection Control	Safe Drinking Water Act Underground Injection Control	1989 ROD	Applicable	If treated groundwater is injected, then it must be done in compliance with regulations for a Class V underground injection well. There have been no changes to this regulation.
Disposal in On-site Landfill	Soil	Title 22, 66264.301(a)(1)(B)	Requires landfill foundation to be placed on a foundation or base capable of providing adequate support to prevent liner failure	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.301(c) as implemented through Title 22, 66264.301(c)	Design standards for a landfill liner system, the leachate collection and removal systems, and leak detection systems	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.303(g)-(i) as implemented through Title 22, 66264.301(a)	Requires that during construction of a landfill the liner must be inspected to ensure that it meets the standards	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.310(a) as implemented through Title 22, 66264.310(a)	Requirements for the design and construction of a landfill cover	1999 ROD Amendment	Applicable	There have been no changes to this regulation.
Disposal in On-site Landfill	Soil	40 CFR 264.14 as implemented through Title 22 66264.14	Requires maintenance of security during placement of contaminated soil and debris in the landfill	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.15 as implemented through Title 22, 66264.15	General requirements for inspection of the landfill during placement of soil and contaminated debris	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.314 and 264.316 as implemented through Title 22, 66264.314 and 66264.316	Requirements for management of liquids and containers in a landfill	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 624.117 and 624.118 as implemented through Title 22 66264.117 and 66264.118	Requirements for landfill post-closure care and maintenance and written post-closure plan	1999 ROD Amendment	Applicable	There have been no changes to these regulations.
Disposal in On-site Landfill	Soil	40 CFR 264.91(a), 264.94, 64.97 and 264.98 as	Requirements for detection and evaluation monitoring, including	1999 ROD Amendment	Applicable	There have been no changes to these regulations.

TABLE D-2
Action-Specific ARARs
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Action	Media	Citation	Requirement	Origin	ARARs Determination	Comments
		implemented through Title 22, 66264.91(a), 66264.94, 66264.97, and 66264.98	monitoring of soil pore and liquids, to ensure that the landfill does not release any contaminants to groundwater			
Disposal in On-site Landfill	Soil	40 CFR 264.303(b) as implemented through Title 22, 66264.303(b)	Requirements for inspections during placement of contaminated soil and debris in the landfill	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal in On-site Landfill	Soil	40 CFR 264.552 as implemented through Title 22, 66264.552	Requirements for designating a Corrective Action Management Unit	1999 ROD Amendment	Applicable	On-site landfill design and construction have been completed.
Disposal of RCRA Wastes	Spent Carbon	RCRA, Land Disposal Restrictions	Restrictions on disposal of RCRA wastes	1989 ROD	Relevant and Appropriate	As stated in the 1991 ROD, "RCRA land disposal restrictions are not applicable but are relevant and appropriate to disposal of treatment media due to the presence of constituents which are sufficiently similar to RCRA wastes." The contaminated groundwater contains PCB, a listed waste. PCP is a F037 listed waste. Adsorbents and other materials used for remediation of groundwater VOCs, such as activated carbon, chemical-adsorbing resins, or other materials used in the treatment of groundwater or air will contain the chemicals after use.
Disposal of RCRA Wastes	Spent Carbon	27 CCR, Division 2 Subdivision 1	Title 27 establishes waste and siting classification systems and minimum waste management standards for discharges of waste to land for treatment, storage, and disposal. Title 27 also contains corrective action provisions for responding to leaks and other unauthorized discharges. Spent carbon will be classified and handled in accordance with appropriate regulations.	1989 ROD	Applicable	There have been no substantive changes to this regulation.
Transportation of Waste for Off-site Treatment, Storage, or Disposal	Waste	40 CFR 264.70; Subpart E	Manifest system, recordkeeping, and reporting procedures for hazardous waste	1989 ROD	Applicable	Applicable when waste is transported for off-site treatment, storage, or disposal. There have been no changes to this regulation.
Response Activities under the NCP	Worker Safety	Occupational Health and Safety Act, 29 USC Sections 651-678	Regulates worker health and safety; applies to all response activities under the NCP	1989 ROD	Applicable	Applicable when carbon (used for on site treatment) is shipped off-site. There have been no changes to this regulation.
Transportation of Hazardous Materials	Hazardous Materials	Hazardous Materials Transportation Act, 49 USC Sections 1802 - 1813	Regulates transportation of hazardous materials	1989 ROD	Applicable	Applicable when carbon (used for on site treatment) is shipped off-site. There have been no changes to this regulation.
Transportation of Hazardous Materials	Hazardous Materials	Hazardous Materials Transportation Regulations, 49 CFR Parts 107, and 171 - 177	Regulates transportation of hazardous materials	1989 ROD	Applicable	Applicable when carbon (used for on site treatment) is shipped off-site. There have been no changes to this regulation.
Air Stripping	Air	Title 22 CCR 66265.1030-	Applies to treatment, storage,	1989 ROD	Relevant and Appropriate	There have been no changes to this regulation.

TABLE D-2
Action-Specific ARARs
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Action	Media	Citation	Requirement	Origin	ARARs Determination	Comments
		66265.1035	and disposal facilities with process vents associated with solvent extraction or air or steam stripping operations managing RCRA hazardous wastes with organic concentrations of at least 10 ppm. These operations must reduce total organic emissions below specified device to reduce the total organic emissions by 95 percent by weight.			
Air Stripping	Air	Butte County Air Pollution Control District Rules 201, 202, 203, and 207	Requirement regarding nuisance conditions, emissions, and fugitive dust	1989 ROD	Applicable	There have been no changes to this regulation.
Soil Remediation	Soil	40 CFR 6.302(a) and Appendix A; Executive Order 11990	Requirements to avoid or mitigate impacts to wetlands	1989 ROD	Applicable	On-site landfill design and construction has been completed.

Notes:
CCR = California Code of Regulations
CFR = Code of Federal Regulations
COC = contaminants of concern
CWA = Clean Water Act
EPA = U.S. Environmental Protection Agency
RCRA = Resource Conservation and Recovery Act
SDWA = Safe Drinking Water Act
USC = United States Code
VOC = volatile organic compound

TABLE D-3
Chemical-Specific ARARs
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Contaminant	Media	Citation	Requirement	Origin	ARARs Determination	Comments
All COCs	Groundwater	Safe Drinking Water Act (40 U.S.C. 300 et seq.) National Primary Drinking Water Standards (40 CFR Part 141)	Chemical-specific drinking water standard MCLs have been promulgated under the Safe Drinking Water Act (SWDA). Drinking-water MCLs have also been promulgated under SDWA. MCL goals (MCLGs) above zero are considered chemical-specific ARARs under the NCP (40 CFR 300,430(e)(2)(1)(B)). When the MCLGs are equal to zero (which is generally the case for a chemical considered a carcinogen), the MCL is considered to be a chemical-specific ARAR, instead of the MCLG (40 CFR 300.430(e)(2)(I)(C)).	1999 ROD Amendment #2	Relevant and Appropriate	MCLs are ARARs for any water that is considered to be a source or potential source of drinking water. MCLs are applicable at the tap when the water is directly provided to 25 or more people or 15 or more service connections. Otherwise, MCLs are relevant and appropriate. The COCs remain unchanged since the 1999 ROD Amendment #2. The MCL for arsenic is less than half the site background concentration. The Water Quality Control Plan for the Sacramento Basin and San Joaquin River Basin expressly states that its water quality objectives do not require improvement over naturally occurring background concentrations.
All COCs	Groundwater	California Safe Drinking Water Act CCR Title 22, Division 4, Chapter 15, Articles 4, 5.5, and 16	California primary drinking water standards establish enforcement limits for chemicals that may affect public health or the aesthetic qualities of drinking water. However, only those requirements that are more stringent than federal standards are ARARs. Also establishes monitoring requirements to ensure treated effluent is meeting cleanup standards.	1989 ROD and 1999 ROD Amendment #2	Relevant and Appropriate	California has not adopted a new MCL for arsenic. The current state MCL for arsenic is 50 ppb. The site background level for arsenic in groundwater is 27 ppb, which was established in the 1989 ROD as the cleanup standard for on-site and off-site groundwater. The COCs and state MCLs for the site remain unchanged since the 1999 ROD Amendment #2.
All COCs	Groundwater	California State Water Resources Control Board Resolution 88-63	In May 1988, the Central Valley Regional Water Board incorporated the State Board Policy of "Sources of Drinking Water" into the Basin Plan. The policy provides for a municipal and domestic supply designation for all waters of the State with some exceptions.		Applicable	Groundwaters of the state are considered to be suitable or potentially suitable for municipal or domestic supply with the following exceptions: 1) the total dissolved solids in the groundwater exceed 3,000 mg/L, and/or 2) the water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day. Groundwater at the site is considered a potential source of drinking water under state authority.
All COCs	Groundwater	California State Water Resources Control Board Resolution 68-16	On October 28, 1968, the State Water Resources Control Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California". This policy calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses.		Applicable	The original discharge of contamination to groundwater at the site was in violation of this resolution. The 1998 ROD Amendment created a 4-acre Technical Impracticability Zone for groundwater associated with the former creosote pond and cellon blowdown areas. Groundwater quality in all other areas associated with the site needs to be restored to its original quality as determined by the cleanup standards.

Notes:
CCR = California Code of Regulations
CDHS = California Department of Health Services
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
COC = contaminant of concern
CWA = Clean Water Act
EPA = U. S. Environmental Protection Agency
H&S Code = California Health and Safety Code
MCL = maximum contaminant level
NCP = National Contingency Plan
ROD = Record of Decision
SDWA = Safe Drinking Water Act
USC = United States Code

TABLE D-4
Location-Specific ARARs
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Location	Citation	Requirement	Origin	ARARs Determination	Comments
Property Containing Landfill	40 CFR 264.18 as implemented through California EPA, Department of Toxic Substances Control, Hazardous Waste Regulations, Title 22, Chapter 14 22") 66264.18	Requires that new facilities not be located within 61 meters of a fault which has been displaced in Holocene time. In addition, a landfill located in a floodplain must be designed, constructed, operated, and maintained to prevent washout by a 100-year flood or must otherwise meat standards designed to withstand such a flood.	1999 ROD Amendment	Applicable	No substantive changes have been made to this regulation.
Property Containing Landfill	40 CFR 264.301(c) as implemented through Title 22, 66264.301(c)	Design standards for a landfill liner system, the leachate collection and removal systems, and leak detection systems.	1999 ROD Amendment	Applicable	No substantive changes have been made to this regulation.
Property Requiring Deed Restriction	Title 22, CCR, Chapter 39, Section 67391.1	As of April 19, 2003 The DTSC requires all properties which contain hazardous waste and require a land use covenant (LUC) to have the LUC signed by the California Department of Toxic Substances Control (DTSC)	April 19, 2003	Applicable	The ROD Amendment #2 required a deed restriction for the Site to prevent exposure to contaminants in the Technical Impracticability Zone, to prevent installation of wells in this zone other than for monitoring or remediation, and to limit future land uses to industrial. This regulation would be applicable to the land use covenant for the site.
Property Containing Hazardous Waste	Title 22, CCR, Chapter 39, Section 67391.1	For properties that contain hazardous waste, citation requires all land use covenants to be signed by the DTSC and the landowner and be recorded in the county where the land is located.	New regulation	TBC	New regulation, effective April 19, 2003, for properties that contain hazardous waste should be considered. If the site contains hazardous waste, then a land use covenant would be applicable.

Notes:
CCR = California Code of Regulations
CFR = Code of Federal Regulations
DTSC = Department of Toxic Substances Control
EPA = U. S. Environmental Protection Agency
LUC = Land Use Covenant
ROD = Record of Decision
TBC = To be continued

Appendix E
Human Health, Toxicology and Ecological Risk Analysis Memorandum

Koppers Company Feather River Plant Superfund Site 5-Year Review

Human Health, Toxicology, and Ecological Risk Analysis

PREPARED FOR: U.S. Environmental Protection Agency, Region 9

PREPARED BY: CH2M HILL, Inc.

DATE: March 21, 2008

This technical memorandum presents a human health, toxicology, and ecological risk analysis to support the 5-year review of the Koppers Company Feather River Plant Superfund Site (Koppers site) near Oroville, California.

In an effort to determine whether the remedy at the Koppers site remains protective of human health and the environment, this memorandum discusses changes in site conditions, changes in exposure pathways, and changes in toxicity values since selection of the site remedy. An Endangerment Assessment for the site was prepared by Ebasco Services, Incorporated (1988), which was reviewed as part of this evaluation.

Current Site Conditions

The Koppers site is located in Butte County, south of the city limits of Oroville, California. The property owner, Koppers Industries, Inc., operated a wood-treating facility under Resource Conservation and Recovery Act (RCRA) requirements until operations ceased in March 2001.

Land use near the Koppers site is a mixture of residential, industrial, commercial, and agriculture and has not changed since the previous 5-year review. Rural homeowners on 1 to 5 acres of land commonly raise livestock and grow produce for home use. Residential areas are located to the northeast, southeast, south, and west of the site. Nearby residents were provided alternative water supplies until their own wells were deemed free of contamination. Although redevelopment is planned in the future, no land use changes have occurred in the last 5 years.

Identified Exposure Pathways

The exposure pathways for both human and ecological receptors evaluated in the 1988 Endangerment Assessment included:

- Inhalation of airborne dusts generated at the site,

- Contact with contaminated sediments in off-site ponds,
- Residential exposure to off-site soils, and
- Potential dietary exposures to persons who might consume meat or milk from cows that drink contaminated groundwater or eat produce grown with contaminated groundwater.

Potential future exposure pathways evaluated include:

- Exposure to surface soil by human or ecological receptors living at the site,
- Exposure to contaminated sediment or surface water by human or ecological receptors as a result of contaminated soil erosion in areas on and near the site,
- Exposure to a construction worker excavating into subsurface soil, and
- Exposure to a person using contaminated groundwater as a drinking water supply in on- and off-site well locations.

There are no new pathways that need to be addressed.

Toxicity Values

There have been a number of changes to the toxicity values for specific constituents of concern in soil and groundwater at the Koppers site since the final Endangerment Assessment was submitted in 1988. For example, pentachlorophenol (PCP) was not evaluated as a carcinogen in 1988 and has since been classified as one. Table E-1 provides a direct comparison between the 1988 toxicity values and current U.S. Environmental Protection Agency (EPA) Region 9 values. The chemicals listed are compiled from Table 3-4 of the Endangerment Assessment.

Summary of Analysis

There have been no changes in the last 5 years to the Koppers site conditions or to the exposure pathways in consideration of both human health and ecological risk. Although some toxicity values for specific constituents of concern found in soil and groundwater at the site have changed, these changes have not significantly affected the protectiveness of the remediation standards.

References

Ebasco Services Incorporated. 1988. Final Endangerment Assessment. Koppers Company Feather River Plant Superfund Site. November.

TABLE E-1
Direct Comparison Between the 1988 Toxicity Values used in the Endangerment Assessment and Current EPA Region 9 Values
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Chemical	Ingestion Exposure				Inhalation Exposure			
	RfDo mg/kg/day		SFo $(mg/kg/day)^{-1}$		RfDi mg/kg/day		SFi $(mg/kg/day)^{-1}$	
	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]
Organic Compounds								
Benzene	--	0.004	0.029	0.055	--	0.0086	0.029	0.027
Ethylbenzene	0.1	0.1	--	0.011	--	0.29	--	0.0087
Isopropyl Ether	0.26	--	--	--	0.26	0.11	--	--
Methylene chloride	--	0.06	0.0075	0.0075	--	0.86	--	0.0016
Pentachlorophenol (PCP)	0.03	0.03	--	0.012	--	0.03	--	0.012
2,3,4,6-Tetrachlorophenol	0.03	0.03	--	--	--	0.03	--	--
Polychlorinated dibenzodioxins (PCDDs)	1.00E-09	--	1.56E+05	1.30E+05	--	--	1.56E+05	1.30E+05
Noncarcinogenic PAHs (naphthalene)	0.41	0.02	--	--	--	0.000857	--	0.12
Carcinogenic PAHs (benzo(a)pyrene)	--	--	11.5	7.3	--	--	6.1	7.3
Toluene	0.3	0.2	--	--	1.5	0.11	--	--
Xylenes (mixed)	2	0.2	--	--	0.44	0.029	--	--
Inorganic Compounds								
Arsenic	--	0.0003	1.5	1.5	--	--	50	15.05
Barium	0.05	0.07	--	--	0.00014	0.00014	--	--
Boron	0.086	0.2	--	--	--	0.0057	--	--
Chromium III	1	1.5	--	--	--	--	--	--

TABLE E-1
Direct Comparison Between the 1988 Toxicity Values used in the Endangerment Assessment and Current EPA Region 9 Values
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Chemical	Ingestion Exposure				Inhalation Exposure			
	RfDo mg/kg/day		SFo $(mg/kg/day)^{-1}$		RfDi mg/kg/day		SFi $(mg/kg/day)^{-1}$	
	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]	Table 3-4[a]	Region 9[b]
Chromium VI	0.005	0.003	--	--	--	2.2E-06	41	294
Copper	0.037	0.04	--	--	--	--	--	--
Nickel	0.02	0.02	--	--	--	--	0.84	--

Notes:
[a]From Table 3-4 of the Endangerment Assessment, Ebasco Services, Incorporated (1988).
[b]Toxicity values as they appear on the October 2004 EPA Region 9 Table of Preliminary Remediation Goals.

mg/kg/day = milligrams per kilogram per day.

RfDo = Reference Dose, oral

SFo = Cancer Slope, oral

RfDi = Reference Dose, inhalation

SFi = Cancer Slope, inhalation

Appendix F
Data Review Memorandum

Groundwater Data Review Memorandum for Koppers Co., Inc. Superfund Site (Oroville, California), 5-Year Review

PREPARED FOR: Kim Hoang, PhD, MPH

PREPARED BY: CH2M HILL, Inc.

DATE: April 2, 2008

PROJECT NUMBER: 363329.SR.05

This technical memorandum summarizes findings from a review of documents and data related mostly to groundwater monitoring activities at the Koppers Co., Inc. Superfund Site (Koppers) during the current 5-year review period (Years 2003 to 2007).

The purpose of this data review is to identify trends in the information collected from groundwater monitoring to support an evaluation of whether the implemented groundwater remedies at the site remain protective of human health and the environment. This data review memorandum will be incorporated into the third 5-Year Review Report being prepared for the site.

A brief discussion of the past remedial activities relating to handling of the soils follows.

Background

While conducting a field bioremediation study at the Koppers site in 1993, dioxins were detected in onsite surface soils at levels that exceeded industrial standards for the workers per the 1989 Record of Decision (ROD). The U.S. Environmental Protection Agency (EPA) ordered a soil removal action for these dioxin contaminated soils as well as the former pole wash area. The soils were excavated and disposed of in soil disposal Cell No. 1, which was constructed in August 1995. Additionally, all soil excavations were completed, including the former process area known as 8C, in compliance with ROD Amendment No. 1 (August 1996).

Soil excavation for Cell No. 2 commenced in 1996 and was completed in September 2002 when the former process area 8C became available after facility closure in 2001. All excavated soils were disposed of in Cells No. 1 and 2, and the final caps were constructed in accordance with approved work plans. The soil remedial action achieved construction completion in 2003. For this reason, no data review was conducted for soils. Soil disposal Cells No. 1 and No. 2 are found onsite in the northeast corner of the facility. Groundwater and leachate monitoring continues at and in the vicinity of the two cells to ensure that no impacts to groundwater result from materials placed into the units. In addition, these disposal cells are surveyed annually to ensure that settlement or subsidence is not occurring that would compromise the integrity of the caps.

Groundwater Remediation Standards

The current groundwater restoration remediation standards that apply to both on- and off-property groundwater remediation (excluding the Technical Impracticability [TI] Zone, also known as the west plume) are based on the ROD, ROD Amendment No. 2, and Applicable or Relevant and Appropriate Requirements (ARARs), as listed in Table F-1:

TABLE F-1
Groundwater Remediation Standards

Chemical	Unit	Standard
Benzene	ppb	1.0
Ethylbenzene	ppb	680
Total Xylenes	ppb	1,750
Isopropyl Ether	ppb	2,800
Carcinogenic PAHs[a]	ppb	0.007
PCDD/PCDFs[b]	ppq	0.53
Pentachlorophenol	ppb	1.0
Arsenic	ppb	6-27[c]
Barium	ppb	1,000
Boron	ppb	1,200
Cadmium	ppb	5
Chromium	ppb	6-35
Copper	ppb	13-30
Mercury	ppb	2

Notes:

ppb=parts per billion; ppq=parts per quadrillion
[a]Includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(123-cd)pyrene.
[b] Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (dioxins).
[c] Because arsenic is naturally occurring, this value is based on background levels in groundwater.

Data Review

Tables F-2 and F-3 show the types of monitoring data currently collected at the Koppers site as part of operations and maintenance of the groundwater remedial action requirements and the general results of the monitoring data over the last 5-year period, respectively. The areas of interest include the two soil disposal cells; the on-property TI Zone, also known as the western plume, which includes product recovery of dense nonaqueous phase liquid (DNAPL); the on-property eastern plume where groundwater monitoring and enhanced *in situ* bioremediation are being conducted; and the off-property plume to the south, which also includes groundwater monitoring, *in situ* bioremediation, and residential wells where

alternate water supplies are required. Table F-2 also includes the institutional controls requirement for conducting an annual site inspection.

TABLE F-2
Types of Monitoring Data
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Unit Designation	Description	Monitoring System	Monitoring Schedule	Monitoring Analysis (Chemicals)	Data included in Annual/Semiannual report
Soil Disposal Cells No. 1 and No. 2:					
Soil: Monument Survey	Settlement monuments located on both disposal cells are periodically inspected for evidence of changes in elevations or signs of damage.	13 settlement monuments	Annually	See Table F-8 attached.	Annual
Soil: Groundwater Monitoring	Six groundwater monitoring wells are located around Cell No. 1, and four wells are located around Cell No. 2.	Cell No. 1: DCMW-1A, DCMW-2A, DCMW-3A, DCMW-1B, DCMW-2B, and DCMW-3B Cell No. 2: DCMW-5A, DCMW-5B, DCMW-6A, and DCMW-6B	Quarterly	Pentachlorophenol (PCP), arsenic, chromium, copper, and polynuclear aromatic hydrocarbon (PAH).	Annual/Semiannual
Leachate Monitoring	Both landfills are double-lined with 60-ml flexible membrane, contain leachate monitoring equipment, and are equipped with unsaturated zone monitoring apparatus.	There is no leachate extraction system; passive leachate collection is checked regularly and pumped out on an "as needed" basis. The leachate is sent to an appropriate disposal facility.			Not included in the semiannual or annual reports, but Koppers site manager confirms conducting these checks.
On-property Groundwater West Plume:					
Water Level	TI Zone is within the creosote pond and cellon blowdown area, where a significant mass of creosote and creosote emulsion DNAPL exists over an area of approximately 4 acres.	MW-15, MW-16, MW-19, MW-20A, MW-20B, MW-21A, MW-21B,MW-22A, MW-22B, MW-22C, MW-24, and MW-25	Monthly	--	Annual/Semiannual
Chemical Monitoring		MW-15, MW-16, MW-19, MW-20A, MW-24, and MW-25	Quarterly	PCP, isopropylether (IPE), PAH, benzene, ethylbenzene, xylenes, arsenic, barium, boron, cadmium, chromium, copper, mercury, and polychlorinated dibenzo-p-dioxins (PCDD/PCDF).	Annual/Semiannual
Product Recovery Well (PR-1)	PR-1 was installed in the former creosote pond area to operate as a passive recovery system where mobile creosote is present.	PR-1	Every 2 weeks	Quantity of product and creosote recovered is measured and recorded.	Annual/Semiannual
On-property Groundwater East Plume:					
Water Level	The groundwater treatment system is designed to pump 200 gallons per minute (gpm) from two extraction wells, EW-1 and EW-2, for a combined capacity of 400 gpm. The groundwater is treated using air stripping and granular activated carbon (GAC). The treated groundwater is reinjected into the aquifer through Injection Wells IW-3 and IW-4.	EW-01, EW-02, MW-01, MW-02, MW-03, MW-4, MW-05, MW-06, MW-07, MW-08, MW-11, MW-12, MW-13, MW-17, MW-18, MW-23, SW-01, TW-01, TW-02, and P-03	Monthly	--	Annual/Semiannual
Chemical Monitoring		EW-01, EW-02, MW-02, MW-03, MW-05, MW-07, MW-08, SW-01, TW-01, MW-17, and MW-18	Quarterly	PCP, isopropylether, PAH, benzene, ethylbenzene, xylenes, arsenic, barium, boron, cadmium, chromium, copper, mercury, and PCDD/PCDF.	Annual/Semiannual
In situ Bioremediation	Oxygen-releasing compound (EHC-O) additions are made to the monitoring wells.	Enhancement addition wells MW-1, MW-4, MW-6, MW-12, MW-13, and MW-23 Monitoring Wells MW-3, MW-5, MW-7, MW-8, and TW-1	Quarterly	PCP, orthophosphate as phosphorus, nitrite as nitrogen, nitrate as nitrogen, and ammonia as total nitrogen.	Annual/Semiannual

TABLE F-2
Types of Monitoring Data
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Unit Designation	Description	Monitoring System	Monitoring Schedule	Monitoring Analysis (Chemicals)	Data included in Annual/Semiannual report
Off-property Groundwater Plume:					
Water Level	Formerly part of pump-and-treat groundwater remedial system. Off-property system was taken offline in December 1995. Now, groundwater is monitored quarterly and compared against ROD-selected standards. Although well 86 is monitored as a part of the off-property plume, it appears to be contained by the on-property east plume. Well 25 is the downgradient well used to monitor well 86 for contaminant migration	3,5,15,18,25,26,31,31C1,31C2,68,86,P-1a, P-1B, RI-1, RI-2, RI-3, RI-4, RI-6, RI-8,RI-9,RI-10, RI-11, RI-12, RI-14, RI-15, RI-16A, RI-16B, RI-16C, RI-16D, RI-17A ,RI-17B, RI-17C, RI-17D, RI-18A, RI-18B, RI-19A, RI-19B, RI-20A, RI-20B	Monthly	--	Annual/Semiannual
Chemical Monitoring		25, 31C1, 31C2, 31D3, 86, EW-3, EW-4, RI-2, RI-3, RI-6, RI-10,RI-11,RI-12, RI-15, RI-16B, RI-20A, RI-20B	Quarterly except for those below	PCP	Annual/Semiannual
		EW-3, EW-4, RI-10, RI-15, and RI-20B	Semi annual	PCP	
In situ Bioremediation	Oxygen-releasing compounds are added to the monitoring wells.	Enhancement addition wells: 26, RI-20A , RI-11, 59, 81 Monitoring Wells: RI-2, RI-3, RI-10, RI-12, and RI-16B	Semi annual	PCP, orthophosphate as phosphorus, nitrite as nitrogen, nitrate as nitrogen, and ammonia as total nitrogen.	Annual/Semiannual
Off-property Alternate Water Supply (AWS)	Seven residents are provided with AWS reimbursement for presence of PCP above 0.5 ppb in their wells.	59,60,61,62, 81, 31C2, and 3103	Semi annual	PCP	Annual/Semiannual
Institutional Control	As required by the covenant to restrict use (2003) and confirmed by Ed Cargile of the Department of Toxic Substances Control (DTSC, 2008), annual inspection of the property is conducted by DTSC to ensure compliance with the covenant restrictions and prohibitions.	DTSC inspection	Annually	No chemical analysis is conducted; the purpose of the inspection is to ensure compliance with the covenant restrictions and prohibitions. This includes confirming that no activities are disturbing capped areas or allowing water to seep into the subsurface that might increase mobilization of contaminants left in place.	Not included in the semiannual or annual reports, but Ed Cargile of DTSC confirms conducting these inspections once per year.

TABLE F-3
Summary of Results
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Unit Designation	Previous 5-Yr Review Results	2003	2004	2005	2006	2007	Current Changes from Last 5-Yr Review
Soil Disposal Cells No. 1 and No. 2:							
Soil: Monument Survey	As of December 2001, there were no recorded changes in settlement monuments at the disposal cells.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No substantial change in the lateral and vertical positions of the monuments.	No changes
Soil: Groundwater Monitoring Note: Copper ROD standard = 13 to 30 ppb	The only chemical of concern detected at monitoring points was copper in the shallow aquifer at concentrations less than background level.	Copper: DCMW-1A at 11.7 ppb DCMW-2A at 19.2 ppb	Copper: DCMW-2A at 14.1 ppb (close to the quantitation limit of 10 ppb and not considered to be indicative of a release from the disposal cell).	Site constituents were not detected in the disposal cell wells.	Copper: DCMW-1A at 58.2 ppb	Data were not included in 2007 semiannual report.	Increase in copper concentration from 2003 to 2006.
On-property Groundwater West Plume:							
Water Level Notes: Groundwater has been extracted from well MW-8 at approximately 35 gpm since July 31, 2002, as approved by the EPA. This extraction has influenced groundwater flow in the vicinity of well MW-8. A depression in the groundwater elevation is present in the vicinity of well MW-8.	Water levels are monitored monthly.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.	No change. Groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems.
Chemical Monitoring Notes: All values are in ppb (ug/L) ND = Non Detect PCP ROD standard = 1.0 ppb Boron ROD standard = 1,200 ppb PAHs ROD standard = 0.007 ppb Benzene ROD standard = 1.0 ppb	Remedial actions within the TI Zone are functioning as intended. Installation of a new monitoring well downgradient of the TI Zone (required 1 year prior to shutdown of on-property treatment system) may provide a more comprehensive conclusion.	<u>Upgradient Wells</u> MW-15: PCP <0.5, PAH 4000-7700 MW-16: PCP 36-58, PAH 100000-4000000 MW-19: PCP <0.5, PAH 23-226 MW-20A: PCP <0.5, PAH ND <u>Downgradient Wells</u> MW-24: PCP <1, Boron 514 , PAH 4-6 MW-25: PCP <0.5, Boron 3700-3900 , PAH ND	<u>Upgradient Wells</u> MW-15: PAH 5000-9000 MW-16: PCP 36-53, PAH 600000-13000000 MW-19: PAH 18-50 MW-20A: PCP <0.5 <u>Downgradient Wells</u> MW-24: PCP <1, Boron 504 , PAH 4-6 MW-25: PCP <0.5, Boron 3720-4320 , PAH ND	<u>Upgradient Wells</u> MW-15: PCP <0.5, PAH 6900-7300 MW-16: PCP 15-40, PAH 500000-1450000 MW-19: PCP <0.5, PAH 9-10 MW-20A: PCP <0.5, PAH ND <u>Downgradient Wells</u> MW-24: PCP <1, Boron 524 , PAH 3-5 MW-25: PCP <0.5, Boron 3920-3940 , PAH ND	<u>Upgradient Wells</u> MW-15: PAH 6000-9000 MW-16: PCP 11-20, PAH 300000-900000 MW-19: PAH ND-16 MW-20A: PCP <0.5 <u>Downgradient Wells</u> MW-24: PCP <1, Boron 520-510 , PAH ND-4 MW-25: PCP <0.5, Boron 3660-3800 , PAH ND	<u>Upgradient wells</u> MW-15: PCP <0.5, PAH 6600-8000 MW-16: PCP 12-16, PAH 200000-800000 MW-19: PAH ND <u>Downgradient Wells</u> MW-24: PCP <1, PAH 3-5 MW-25: PCP <0.5, Boron 3470-3900 , PAH ND	PCP concentrations are below the ROD standards for all wells except for MW-16. Concentration of PCP in MW-16 has decreased from 2003 to 2007 MW-25 has high boron concentration, which has remained more or less constant or decreased minimally in the last 5 years. MW-15, MW-16, MW-19, and MW-24 show PAH concentrations above ROD standards in the last 5 years. PAH shows an increasing trend in MW-15.
Product Recovery Well (PR-1)	Product recovery is continuing at PR-1 and monitored every 2 weeks. Recovery is greater than 1	850 gallons of product and 625 gallons of creosote recovered.	980 gallons of product and 690 gallons of creosote recovered.	1,100 gallons of product and 750 gallons of creosote recovered.	1,250 gallons of product and 820 gallons of creosote recovered.	1,300 gallons of product and 850 gallons of creosote recovered.	Increase in quantity of product recovered.

TABLE F-3
Summary of Results
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Unit Designation	Previous 5-Yr Review Results	2003	2004	2005	2006	2007	Current Changes from Last 5-Yr Review
	gallon per year.						
On-property Groundwater East Plume:							
Water Level	The onsite groundwater remediation system continues to treat groundwater extracted from EW-1 and EW-2. Influent PCP concentrations have decreased over time to 5.2 ppb. Injection wells IW-3 and IW-4 are functioning optimally. The increase in PCP concentration in well 86 is being monitored to verify that EW-1 and EW-2 are adequately capturing the plume. Groundwater extraction at MW-8 began in July 2002. Periodic increases in PCP concentration in well 86 are reportedly related to groundwater elevation increases in the A-Zone. Recent detection of increased PCP in MW-8 to 780 ppb and boron at 2,450 ppb is attributed to historical activities at the Dri-Con/CCA Tank Area.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels in individual wells vary 5 to 10 feet between wet and dry seasons.	Water levels overall decreased slightly from 1986 to 1990, increased from 1991 through 1999, and began to level off from 1999 through present.
Chemical Monitoring Note: ND = Non Detect		MW-2: PCP 59-84, Boron 1300-1500 in Aug, 586 in Dec, PAH – ND MW-3: PCP 40-60, Boron 1200-1500 MW-18: PCP <0.5, Boron 3200-3450, PAH ND MW-8: PCP 250-430, Boron 1050-1500, PAH ND-50	MW-2: PCP 67-63, MW-3: PCP 20-30, Boron 1180-1300 MW-18: Boron 3100-3600 MW-8: PCP 340-390, Boron 1220-1280, PAH ND Treatment plant effluent PCP is less than 0.5 ppb and boron concentration is less than 700 ppb.	MW-2: PCP 24-37, Boron 546, PAH ND MW-3: PCP 10-15, Boron 1110-1170 MW-18: PCP <0.5, Boron 3200-3400, PAH ND MW-8: PCP 360-370, Boron 1300-1600, PAH ND Treatment plant effluent PCP is less than 0.5 ppb and boron concentration is less than 700 ppb.	MW-2: PCP 27-19 MW-3: PCP 1-3, Boron 920-950, MW-18: Boron 3000-3250, PAH 540-707 MW-8: PCP 250-290, Boron 1700-2300, PAH ND Treatment plant effluent PCP is less than 0.5 ppb and boron concentration is less than 700 ppb.	MW-2: PCP 25-20 MW-3: PCP 1-2, Boron 840, MW-18: Boron 2990-3060 MW-8: PCP 200-350, Boron 2000-2900, PAH ND Treatment plant effluent PCP is less than 0.5 ppb and boron concentration is less than 700 ppb.	PCP has been detected at concentrations above the ROD cleanup level in MW-2, MW-3, MW-18, and MW-8. PCP concentrations in MW-2, MW-3, and MW-18 show a decreasing trend from 2003 to 2007. Boron concentrations are above ROD levels in MW-18.
In situ Bioremediation	Concentration trends in the wells overall indicate stabilization in PCP trends. Monitoring of natural attenuation has not yet been implemented. Bioremediation ceased at BW-1 in June 2001 as it resulted in increase in mobility of PAHs.	PCP concentrations are below detection limit except for MW-8.	The results of the implementation of the On-Property Groundwater *In Situ* Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of PCP.	The results of the implementation of the On-Property Groundwater *In Situ* Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of PCP to less than ROD standards in MW -5 and MW-7.	Dissolved mobile PAHs have been detected at low concentrations at MW-24. The steady decrease in PCP concentrations at MW-16 indicates that PCP bioremediation was stimulated, and this increased bioactivity appears to be ongoing.	The results of the implementation of the On-Property Groundwater *In Situ* Bioremediation Program indicate that the enhancements have stimulated the aerobic degradation of PCP.	*In situ* bioremediation has stimulated aerobic degradation of PCP, but the size of the plume (see Figure B-1) has remained more or less the same from 2002 to 2007.

TABLE F-3
Summary of Results
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Unit Designation	Previous 5-Yr Review Results	2003	2004	2005	2006	2007	Current Changes from Last 5-Yr Review
Off-property Groundwater Plume:							
Water Level / Chemical Monitoring Notes: PCP has been detected in well 86 intermittently from 1986 to 1988 and since 1999. The detections of PCP are correlated with times at which the water level in well 86 reaches or exceeds 122 feet mean sea level (msl). The PCP detections typically persist for 8 to 12 months after the time the water level reaches this elevation.	Monitoring data do not indicate that any contaminants would be captured by extraction from EW-3 or EW-4. PCP in well 86 has been >50 ppb since 2000. Boron was detected in vicinity of MW-8.	PCP (ppb) Upgradient Wells RI-2: <0.5 RI-3: 8-10 86: 20-100 25: <0.5 Downgradient Wells RI-12: <0.5	PCP (ppb) Upgradient Wells RI-2 <0.5 RI-3 4-10 86 40-140 25 <0.5 Downgradient Wells RI-12 <0.5	PCP (ppb) Upgradient Wells RI-2 <0.5 RI-3 2-5 86 30-90 25 <0.5 Downgradient Wells RI-12 <0.5	PCP (ppb) Upgradient Wells RI-2 <0.5 RI-3 0.5-3.5 86 13-100 25 <0.5 Downgradient Wells RI-12 <0.5	PCP (ppb) Upgradient Wells RI-2 <0.5 RI-3 0.5-1 86 20-40 25 <0.5 Downgradient Wells RI-12 <0.5	PCP concentrations detected at well RI-3 have decreased significantly, with the concentrations below 1 ppb in 2007. Well 86 has PCP concentrations above ROD standards and is showing a slow decreasing trend,
In situ bioremediation	Concentration in the wells indicate a decreasing trend in PCP except for an anomalous detection in well RI-12 during November 2000 (0.66 ppb).	Nitrate concentration in RI-2, RI-3, RI-10, and RI-12 are higher than concentrations in background wells. The nitrate concentration in RI-13 is less than 15 ppb.	The addition of DAP (nutrients) has been discontinued.	The *in situ* bioremediation program is considered to be effectively enhancing bioremediation of PCP. Sampling at RI-2, RI-6, RI-10, RI-12, and RI-16B has been reduced to semiannual monitoring.	As of September 2006, oxygen releasing compound (ORC) socks have been added to wells 59 and 81 to enhance the bioremediation of PCP detected at well 59.	-	*In situ* bioremediation has stimulated aerobic degradation of PCP.
Off-property AWS	Beazer East, Inc. continues to provide an AWS for down-gradient residences with drinking water supply wells impacted by PCP. As of December 2001, five residences with private wells in the vicinity of RI-11 (59, 60, 61, 62, and 81), plus wells 31C2 and 31D3, remain in the AWS program.	The PCP analytical results were below 0.5 ppb for each sample collected at wells 31C2 and 31D3.	The PCP analytical results were below 0.5 ppb for each sample collected at wells 31C2 and 31D3.	The PCP analytical results were below 0.5 ppb at wells 31C2 and 31D3.	The PCP analytical results were below 0.5 ppb at wells 31C2 and 31D3.	The PCP analytical results were below 0.5 ppb at wells 31C2 and 31D3.	The PCP analytical results were below 0.5 ppb at both wells 31C2 and 31D3 from 2003 to 2007.

Soil Disposal Cells

The three types of data currently collected for monitoring remedial activities associated with the soil disposal cells are settlement, groundwater, and leachate data.

Settlement Monitoring

Thirteen settlement monuments are located on disposal Cells No. 1 and No. 2 and are periodically inspected for evidence of change in elevations or signs of damage. The survey data presented in the annual monitoring reports indicate that there has been no substantial change in the lateral and vertical positions of the monuments.

Groundwater Monitoring

There are six groundwater monitoring wells (DCMW-1A, -2A, -3A, -1B, -2B, and -3B) located on the north side of the Koppers property near disposal Cell No. 1 to monitor for constituents of concern derived from the materials in the disposal cell. Four more groundwater monitoring wells (DCMW-5A, -5B, -6A, and -6B) were installed around Cell No. 2 to monitor for early indication of release from that disposal cell. These wells are sampled and analyzed for PCP, arsenic, chromium, copper, and PAHs. Of these, PCP, arsenic, and chromium were below their respective reporting limits of 0.5 ppb, 5 ppb, and 5ppb, respectively. Copper was detected at 58.2 ppb, which is above the ROD standard of 13-30 ppb, in well DCMW-1A during the 2006 sampling event. Other wells showed copper concentrations below the ROD standard or below the reporting limit of 10ppb. According to the annual reports, this copper detection is anomalous and not considered to be indicative of a release from the disposal cells since well DCMW-1A is upgradient of the cell.

Leachate Monitoring

The soil disposal cells are double-lined with a 60-ml flexible membrane containing leachate monitoring equipment and equipped with unsaturated zone monitoring apparatus. There is no leachate extraction system, but leachate is passively collected and the leachate level is checked regularly and pumped out on an as-needed basis. The leachate is shipped to an appropriate disposal facility, Aragonite, a permitted commercial hazardous waste incinerator located in Utah, using a hazardous waste manifest. These leachate shipments occur intermittently once every 18 months.

On-property and Off-property Groundwater Monitoring

In order to determine the progress of the remedial action for groundwater, groundwater monitoring is conducted on both on- and ff-property wells on a regular basis (see Table F-2). Groundwater monitoring data from 2003 to 2007 was evaluated and is summarized below with the help of Figures F-2 through F-4 and Tables F-2 through F-8). The monitoring well review data has been divided into on-property well data and off-property well data to be consistent with the 5-year review documents. Each section describes water-level monitoring to define elevation of water table surface across the site within the last 5 years, chemical concentration monitoring to determine the concentration of constituents above the standards defined in the ROD, and change in concentration of chemicals of concern as a result of the *in situ* bioremediation system.

On-Property Groundwater Monitoring

Various on-property wells were sampled for a combination of PCP, isopropyl ether, PAHs, benzene, ethyl benzene, xylene, arsenic, barium, boron, cadmium, chromium, copper, and mercury, depending on previous detections of these analytes. Wells sampled include EW-l, EW-2, MW-2, MW-3, MW-5, MW-7, MW-8, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20A, MW-24, MW-25, SW-1, and TW-1. The discussion on concentration of chemicals of concern is divided into two pentachlorophenol plumes: the TI Zone plume (west plume) and the east plume.

TI Zone / West Plume

Water Level Monitoring

Groundwater elevations are measured monthly in west plume wells. The hydrographs for seasonal variability of groundwater elevations show that the water levels in individual wells vary 5 to 10 feet between wet and dry seasons. The hydrographs from previous years indicate that water levels decreased overall slightly from 1986 to 1990, increased from 1991 through 1999, and began to level off from 1999 through the present. The groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems. The on-property groundwater flow direction is generally to the south.

Chemical Concentration Monitoring

The wells that are monitored include MW-15, MW-16, MW-19, and MW-20A within the TI Zone plume. Downgradient wells used to monitor constituents potentially migrating from the TI Zone include MW-24 and MW-25. A summary of results for each contaminant of concern from 2003 to 2007 is presented below, and final conclusions are provided at the end of this section.

- MW-16 is showing a steady reduction of PCP concentration but is still above the cleanup levels as specified in the ROD (1 ppb). The most recent concentration was 16 ppb measured in May 2007. MW-24 has PCP concentrations below ROD standards, while MW-25 has shown concentrations below the reporting limit of 0.5 ppb for 2003 through 2007. Wells having PCP concentrations below the reporting limit were not included in the tables.

- Although decreasing, the boron concentrations found in MW-25 have remained above the ARARs cleanup level of 1,200 ppb. Most recently in 2007, the boron concentration in MW-25 was 3,470 ppb. Concentration of boron is also decreasing at a very slow rate in MW-24, but is below cleanup level. Because MW-24 is downgradient of MW-25, the data seems to indicate that boron in groundwater is not migrating south.

- Monitoring data indicated that bioremediation had resulted in an apparent increase in mobility of PAHs downgradient. Currently, monitoring for PAHs continues downgradient of the TI Zone to ensure that the ROD standards of 0.007 ppb are not exceeded. PAHs were detected in groundwater from wells MW-15, MW-16, MW-19, and MW-24 over the last 5 years. Concentrations of Total Carcinogenic PAHs and Total PAHs in wells MW-15, MW-16, MW-19, and MW-24 vary significantly over time and are above the ROD standard of 0.007 ppb. For well MW-15, Total Carcinogenic PAH concentrations have declined from 2003 to 2007 (concentrations were within 100 ppb in

2002, then increased to approximately 300 ppb in 2003/2004, and steadily decreased to less than 10 ppb since 2005). By comparison, Total PAH concentrations increased from 4,333 ppb in 2003 to 8,041 ppb in 2007. PAH (Total Carcinogenic and Total PAH) concentrations for MW-16 and MW-19 are showing a decreasing trend. MW-24 concentrations have declined from 2003 to 2007, although there is a significant variation in data from 2003 to 2004. PAH concentrations in well MW-24 may be due to the production of biosurfactants stimulated by bioremediation.

- Concentration of isopropyl ether is below the ROD standard of 2,800 ppb in wells MW-24 and MW-25. MW-24 shows an increasing trend from 2003 to 2007, although values are below ROD standards. Isopropyl ether concentration in MW-25 is below the reporting limit of 1 ppb.

  Ethyl benzene and xylenes detected in wells MW-15 and MW-16 are below the cleanup level of the ROD (680 ppb and 1750 ppb, respectively), although the concentrations in MW-15 vary significantly and are showing an increasing trend. MW-16 is below ROD standards and has remained essentially the same from 2003 to 2007. Ethyl benzene and xylene concentrations in MW-24 are less than the reporting limit.

  Benzene concentrations have been less than 0.5 ppb since 2003 in all wells except for MW-16. Well MW-16 had greater than 1 ppb of benzene in 2003, but eventually reduced to less than 0.5 ppb in 2007.

- Barium concentration in groundwater is decreasing at a very slow rate in wells MW-24 and MW-25, but both are below ROD cleanup levels.

  Chromium, copper, and arsenic are below reporting limits for MW-24 and MW-25 from 2003 to 2007.

- PCDDs/PCDFs as 2,3,7,8 TCDD were detected in groundwater samples collected from well MW-16. The PCDDs/PCDF concentrations in MW-16 vary significantly over time and are above the ROD cleanup level of 0.53×10^{-7} ppb. Product recovery well PR-1, which collects mobile creosote, is located approximately 25 feet south of well MW-16 and is believed to have increased the flow of creosote in the area. Hence, the 2006 annual groundwater monitoring report attributes the concentration of PCDDs/PCDFs in the well to emulsion in groundwater and not presence of dissolved-phase constituents.

The monitoring wells data in the TI Zone (west plume) show a general decreasing trend of contaminants in all wells. Although the PCP concentration in well MW-16 and boron concentration in well MW-25 are above the screening levels, downgradient well MW-24 shows both PCP and boron concentrations below ROD standards. This indicates that the west plume is not migrating to the south. PAH concentrations in the TI Zone exceed the ROD standards. Monitoring in these wells should be continued for further evaluation of downgradient mobility of PAHs.

Product Recovery Well

To enhance treatment of PCP in DNAPL in the groundwater, product recovery is continuing at PR-1 in the TI Zone. Product recovery well PR-1 was installed in the former creosote pond area to operate as a recovery system. Through December 2006, approximately 1,250 gallons of product has been recovered. The creosote recovery rate has been consistent since 2001. Refer to Table F-7 for a summary of the PR-1 production history.

East Plume

Water Level Monitoring

Groundwater elevations are measured monthly in the east plume wells. The hydrographs for seasonal variability of groundwater elevations show that the water levels in individual wells vary 5 to 10 feet between wet and dry seasons. The groundwater flow direction in the east plume area is generally to the south.

Chemical Concentration Monitoring

Based on data from the on-property monitoring wells, , the downgradient extent of of the east plume can be defined by wells MW-18, MW-2, MW-3, and off-property well 86. Groundwater has been extracted and blended with treatment plant influent since August 2002 from MW-8. Extraction from MW-8 is intended to contain and reduce the effects of increased boron and PCP concentrations at the Dri-Con/CCA tank area.

- PCP has been detected at concentrations above the ROD cleanup level in wells MW-2 and MW-3. The values range from 59 ppb in 2003 to 20 ppb in 2007 for MW-2, and 44 ppb in 2003 to 1.2 ppb in 2007 for MW-3. The results also indicate that PCP has been reducing at a steady rate for the three wells. PCP has been detected at concentrations above the ROD standard at well TW-1; the concentrations range from 15 ppb in 2003 to 1.1 ppb in 2007, indicating they are declining at a good rate. All other wells sampled in this zone have PCP concentrations below the reporting limit of 0.5 ppb (see Table F-2). Wells having PCP concentrations below the reporting limits have not been included in the tables and figures presented at the end of this appendix.

- Boron was detected in all the wells sampled. MW-18 has shown a very slow boron reduction from 3,230 ppb in 2003 to 2,990 ppb in 2007; however, the values are above the ROD standard of 1,200 ppb. MW-3 and MW-17 have also shown steady reductions in boron concentration, which was detected at less than 1,200 ppb in 2007. All other wells sampled in the east plume area have concentrations below the cleanup level. Wells having boron concentrations below the reporting limit have not been included in the tables presented at the end of this appendix. Further investigations are required for high boron concentrations occurring in well MW-8. Boron concentrations in MW-8 have been increasing steadily over the last 5 years, from below 1,200 ppb in 2004 to more than 2,500 ppb in 2007.

- PAH concentration in MW-8 has decreased over time, but does not meet the ROD standard of 0.007 ppb. Measured PAHs in MW-8 decreased from 52 ppb to 28 ppb in 2003. In 2006, PAHs were detected at 3.29 ppb in MW-8.

  MW-18 had high concentrations of PAHs that exceeded ROD standards in 2006. Further monitoring data is required to assess the reason for the sudden increase of PAHs in

MW-18. The high peak in PAHs may be due to migration of PAHs downstream from TI Zone wells.

Total PAHs were detected below ROD standards in MW-2 from 2003 to 2005.

- The concentration of isopropyl ether has decreased below the cleanup level of 2,800 ppb in well EW-2 and is continuing to decline at a steady rate. Isopropyl ether has been detected at concentrations below the reporting limit in EW-1. Other wells sampled in this zone show concentrations below the ROD standard.

  Benzene and ethyl benzenes were detected below reporting limits in all sampled wells in the east plume area.

- Barium concentrations in EW-1 and EW-2 are decreasing at a slow rate, and concentrations since 2003 have been below the ROD standard of 1,000 ppb. Arsenic, cadmium, chromium, and mercury were detected below reporting limits in all sampled wells in the east plume area. Copper concentrations have been detected at less than the reporting limit for all wells sampled in this area.

Data from the east plume monitoring wells show a general decreasing trend of contaminants in all wells, indicating that the pump-and-treat system is working effectively in this area.

On-Property Groundwater In Situ Bioremediation Program

Enhanced bioremediation of the east on-properly PCP plume began on March 6, 1998. PCP degradation was augmented by adding oxygen and nutrients to wells MW-1, MW-4, MW-6, MW-12, MW-13, and MW-23 between March 1998 and First Quarter 2004. The wells were not sampled during this period. During Second Quarter 2004, the enhancements were revised in accordance with the *Revisions to the Off-Property and On-Property Groundwater In situ Bioremediation Programs, Koppers Company, Inc. Superfund* Sire *(Feather River Plant), Oroville, California* (GeoTrans, Inc., February 2004) and EPA's March 16, 2004 approval. The revisions included reducing the amounts of ORC added and eliminating the nutrient addition. The oxygen enhancement added to the site wells was switched from a magnesium peroxide compound to a calcium peroxide-based compound effective First Quarter 2007.

The On-Property Groundwater *In Situ* Bioremediation Program seems to have enhanced the remediation of groundwater PCP concentrations. The size of the east plume detected in the semiannual (Second Quarter) 2007 review has declined compared to the size of the plume when the bioremediation program began. However, the plume map shows no reduction in size from 2002 to 2007, indicating that *in situ* bioremediation may not have been as effective during the last 5 years with the application of enhancements to the current wells. Enhancement addition wells may have to be revised to facilitate more effective bioremediation.

Off –Property Groundwater Monitoring

This section discusses the off-property ground water monitoring results. Wells sampled include 25, 59, 86, 31C1, 31C2, 31D3, RI-2, RI-3, RI-6, RI-10, RI-11, RI-12, RI-15, RI-16B, RI-20A, and RI-20B. All off-property groundwater wells are sampled and analyzed for PCP only.

Water Level Monitoring

The hydrographs for seasonal variability of water levels in individual groundwater wells vary 5 to 10 feet between wet and dry seasons. The hydrographs indicate that water levels overall decreased slightly from 1986 to 1990, increased from 1991 through 1999, and began to level off from 1999 through the present. The groundwater flow directions from 2003 to 2007 are consistent with 1995 flow directions and those observed prior to startup of groundwater remediation systems. The off-property groundwater flow direction is generally south-southwest.

Chemical Concentration Monitoring

The upgradient extent of the residual off-property plume is defined by well RI-3, and the downgradient extent is defined by well RI-11. PCP concentrations detected at well RI-3 have decreased significantly, with the concentrations below 10 ppb since 2003 and below 1 ppb (ROD standard) since November 2006. RI-11 has not been measured since 2003 due to bioremediation enhancement additions, but concentration of PCP in RI-12, which is south of RI-11, has been less than 0.5 ppb from 2003 to 2007. Groundwater monitoring reports indicate that PCP concentrations have decreased significantly after implementation of the bioremediation program.

Well 86 is an off-property well but is contained by the on-property east plume. PCP concentrations in well 86 have been decreasing at a slow rate from 2003 to 2007, but the values vary significantly (see Table F-5). The concentrations remain above the ROD standard of 1 ppb. The latest annual groundwater monitoring report (GeoTrans, Inc., 2006) indicates that the PCP detections in well 86 are related to the B-zone aquifer and does not indicate impacts to the A-zone aquifer as identified in earlier reports. The monitoring reports present information indicating that PCP detected at well 86 is captured by extraction well EW-2.Well 25, which is located approximately 2,200 feet downgradient of well 86 and is used to monitor well 86 for contaminant migration, shows PCP concentrations less than the reporting limit of 0.5 ppb. This indicates that the on-property east plume has not migrated beyond well 86.

PCP concentration in well 59 is below the ROD standard, and all other wells sampled in the off-property area show concentrations below the reporting limit of 0.5 ppb. Wells having PCP concentrations below the reporting limit have not been included in the tables and figures presented at the end of this appendix.

Off-Property Groundwater In situ Bioremediation Program

Enhanced bioremediation of the residual off-property PCP plume began on August 26, 1998, in accordance with the Revised Off-Property Groundwater *In Situ* Bioremediation Program. PCP degradation was augmented by adding oxygen and nutrients to three specific wells in the residual off-property plume and evaluating changes in nutrient and PCP concentrations at downgradient wells. The oxygen and nutrients were added in the form of ORCs and di-ammonium phosphate. Wells 26, RI-20A, and RI-11 were not sampled during the enhancement program (through First Quarter 2004). During Second Quarter 2004, the enhancements were revised by reducing the amounts of ORCs and eliminating the nutrient addition in accordance with the *Revisions 10 of the Off-Property and On Property Groundwater In situ Bioremediation Programs, Koppers Company, Inc. Superfund Site (Feather River Plant),*

Oroville, California (GeoTrans, Inc., February 2004) and EPA's March 16, 2004 approval. The EPA issued a letter on January 31, 2007 accepting the use of a calcium peroxide-based compound to replace the magnesium peroxide compound previously used for remediation.

Samples were collected from downgradient monitoring wells and analyzed for PCP, orthophosphate as phosphorus, nitrite as nitrogen, nitrate as nitrogen, and ammonia as total nitrogen to estimate the effectiveness of the bioremediation program. The off-property bioremediation program seems to be efficient in enhancing bioremediation of PCP, as established by the groundwater monitoring reports.

Alternate Water Supply Wells

In compliance with the ROD and Consent Decree, Beazer East, Inc. continues to provide an alternate water supply for seven residences with impacted wells of greater than 0.5 ppb PCP (half ROD standard). Groundwater is monitored quarterly and compared against ROD-selected standards to gauge remedial performance. The monitoring wells associated with AWS wells are 59, 60, 61, 62, 81, 31C2, and 31D3. Quarterly monitoring of wells 86 and 25 is supposed to continue until analytical results are less than 0.5 ppb for four consecutive quarters at wells 31C2 and 31D3. PCP analytical results were below 0.5 ppb for samples collected from wells 31C2 and 31D3 from 2003 to 2007.

Figures

FIGURE F-1
Site Map

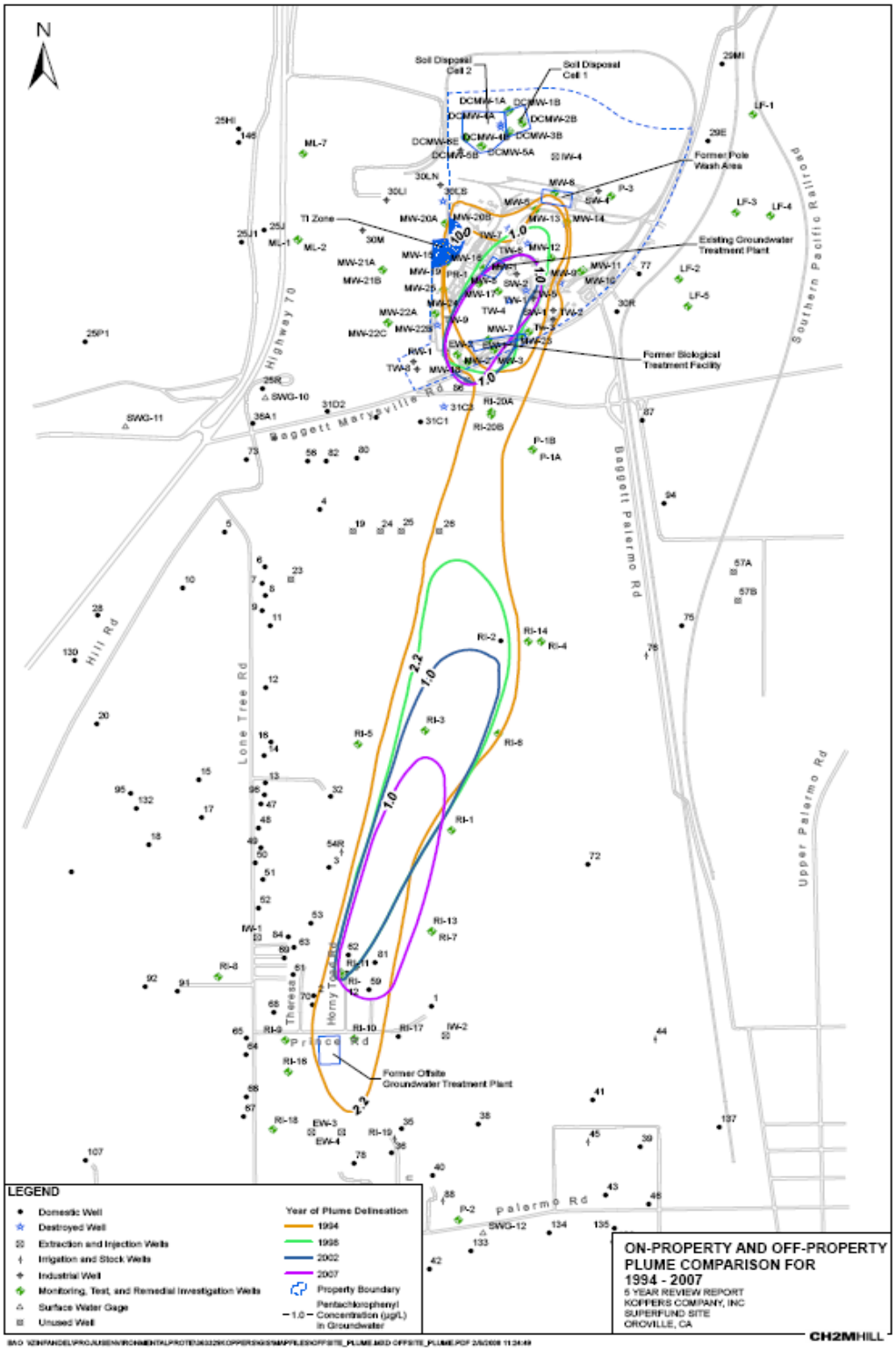
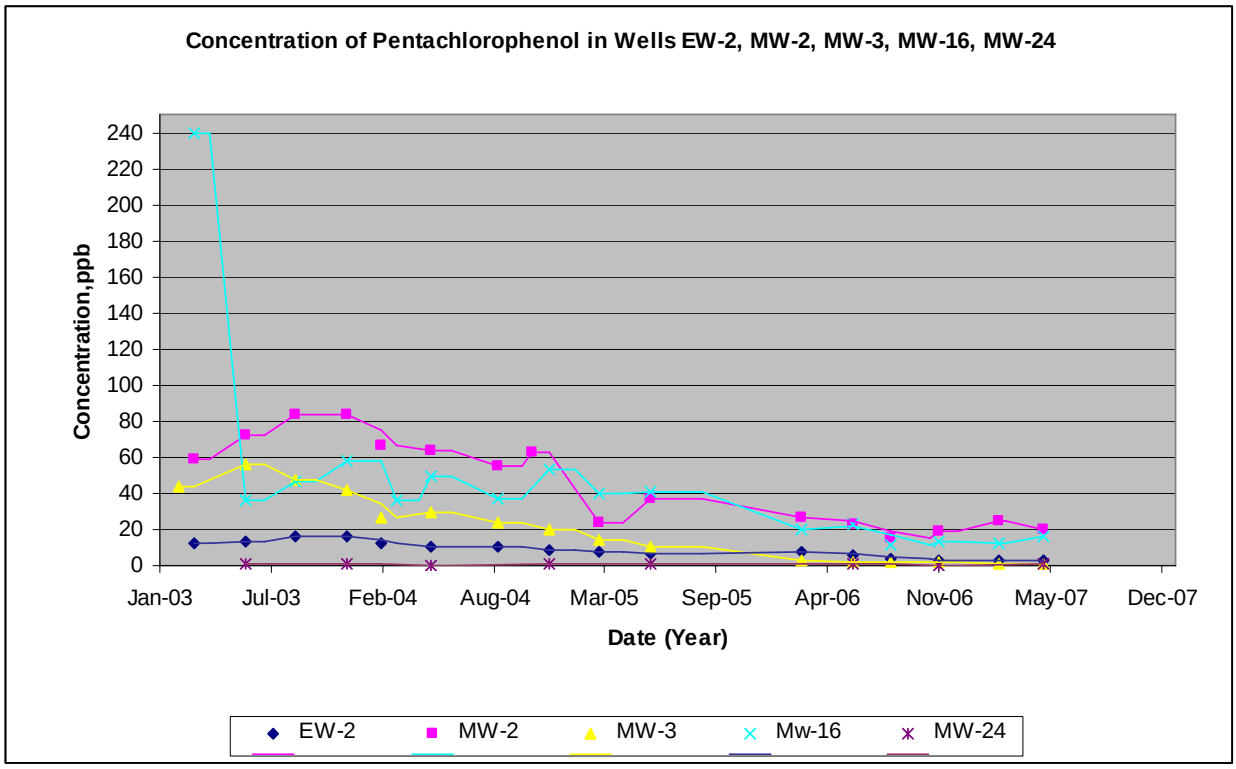


FIGURE F-2
Concentration of Pentachlorophenol in Groundwater Monitoring Wells, 2003-2007



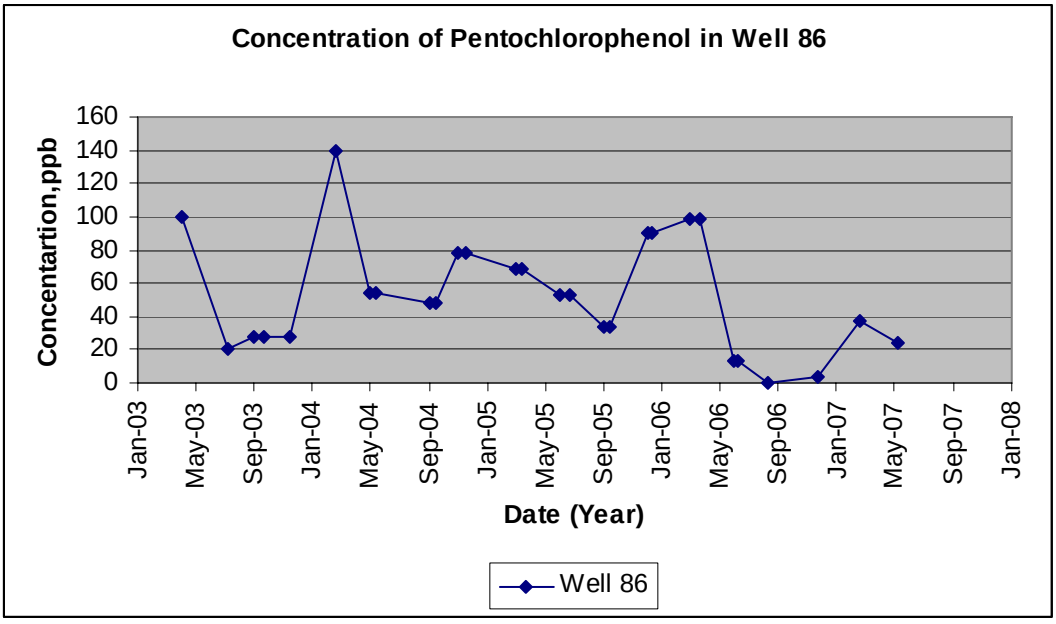


FIGURE F-2 (CONTINUED)
Concentration of Pentachlorophenol in Groundwater Monitoring Wells, 2003-2007

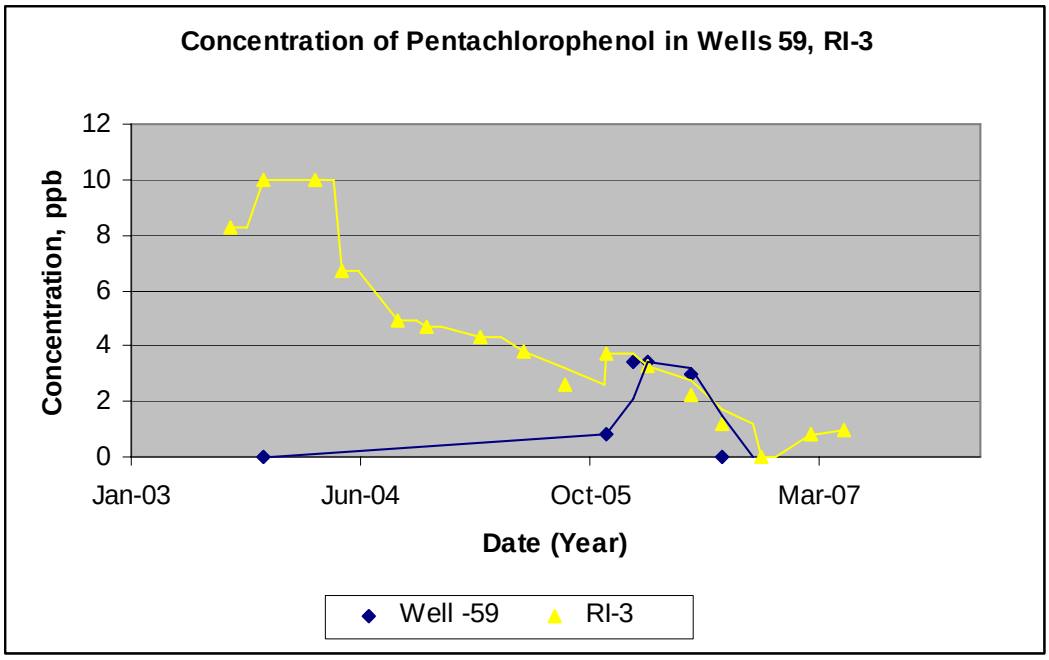


FIGURE F-3
Concentration of Boron in Groundwater Monitoring Wells, 2003-2007

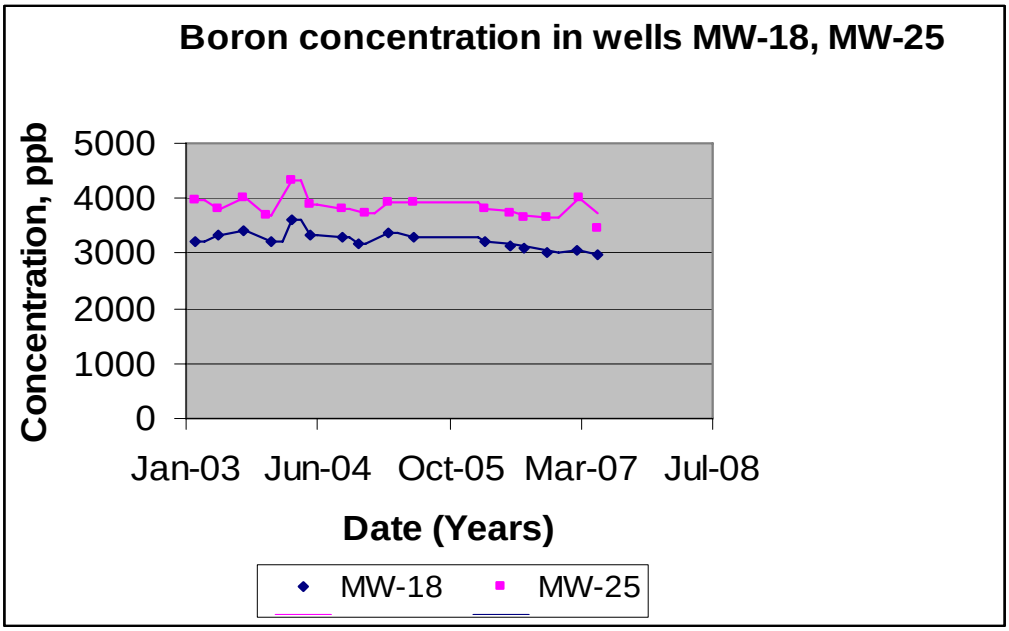
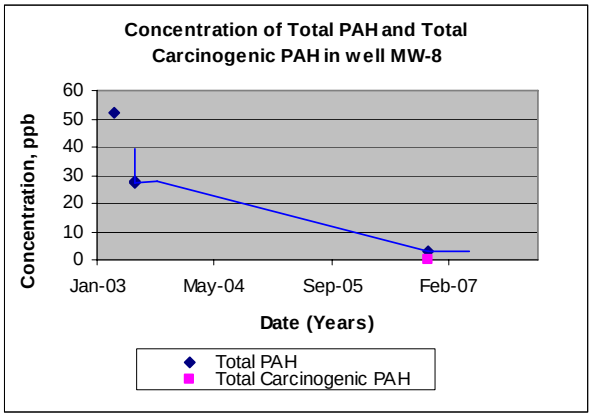
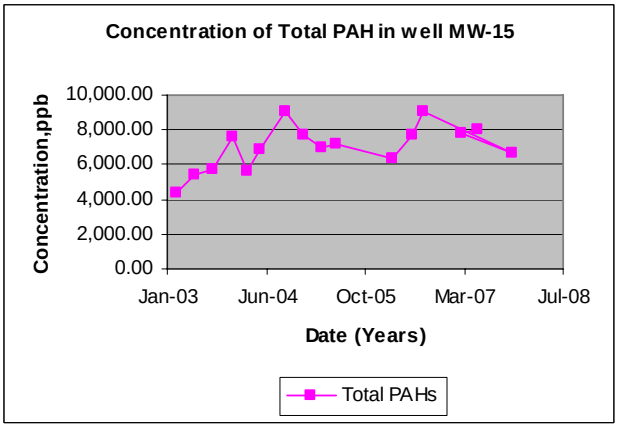
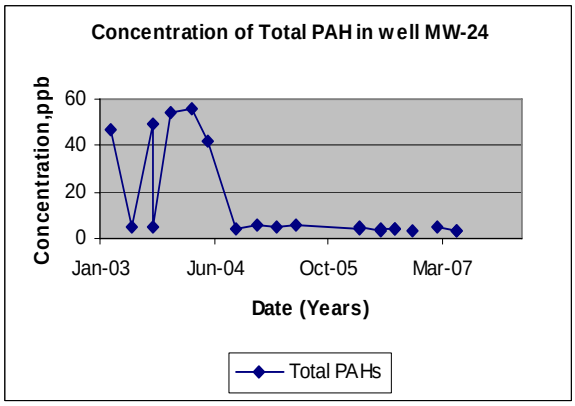


FIGURE F-4
Concentration of PAHs in Groundwater Monitoring Wells, 2003-2007







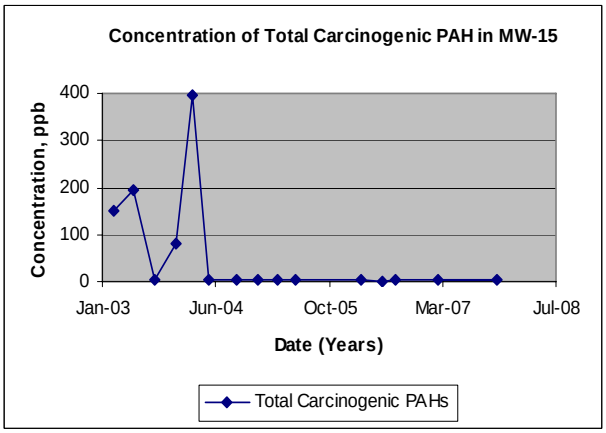
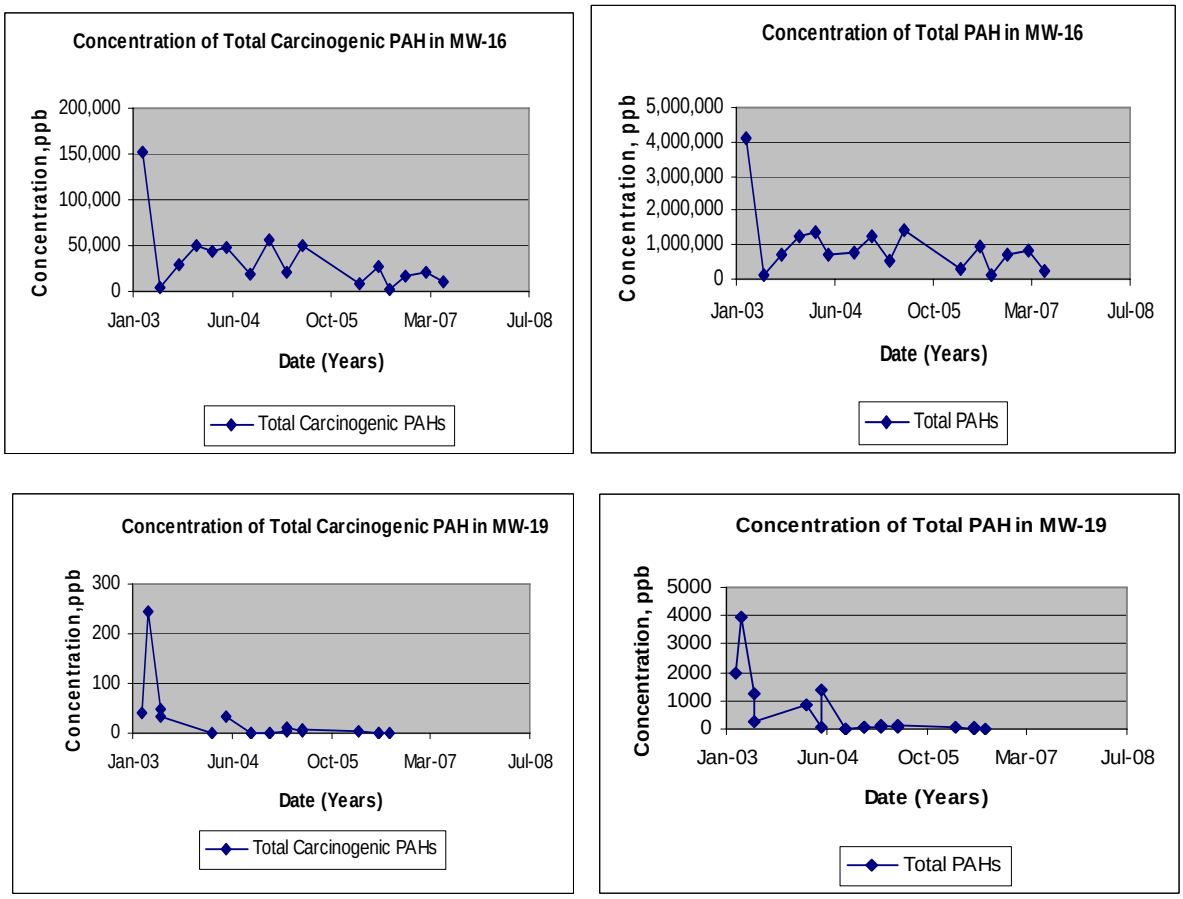


FIGURE F-4 (CONTINUED)
Concentration of PAHs in Groundwater Monitoring Wells, 2003-2007



Tables

TABLE F-4
Concentration of Pentachlorophenol in Groundwater Monitoring Wells, 2003 through 2007
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Wells	EW-1	EW-2	MW-2	MW-3	MW-16	MW-24	59	RI-3
Date								
Feb-03				44				
Mar-03	<0.5	12	59		240			
Jun-03	<0.5	13	72	56	36	0.83		
Sep-03	<0.5	16	84	48	47			8.3
Nov-03							<0.5	10
Dec-03	<0.5	16	84	42	58	0.54		
Feb-04	<0.5	12	67	27				
Mar-04					36			10
May-04	<0.5	10	64	29	49	<0.5		6.7
Sep-04	<0.5	10	55	24	37			4.9
Nov-04			63					4.7
Dec-04	<0.5	8.6		20	53	0.59		
Mar-05	<0.5	7.6	24	14	40			4.3
Jun-05	<0.5	7.1	37	10	41	0.53		3.8
Sep-05								2.6
Dec-05							0.81	3.7
Jan-06							3.4	
Mar-06	<0.5	7.5	27	2.8	20		3.4	3.3
Jun-06	<0.5	5.6	23	1.5	23	0.7	3	2.2
Aug-06	< 0.5	3.7	15	1.8	11		<0.5	1.2
Nov-06	< 0.5	3.2	19	1.8	13	<0.5		<0.5
Feb-07	< 0.5	3.2	25	1.3	12			0.8
Apr-07								0.96
May-07	< 0.5	2.9	20	1.2	16	0.61		

TABLE F-5
Concentration of Pentachlorophenol in Groundwater Monitoring Well 86, 2003 through 2007
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	PCP (µg/l)
Apr-03	100
Jul-03	20
Sep-03	28
Sep-03	28
Nov-03	28
Feb-04	140
May-04	54
May-04	54
Sep-04	48
Sep-04	48
Nov-04	78
Nov-04	78
Mar-05	68
Mar-05	68
Jun-05	53
Jun-05	53
Sep-05	34
Sep-05	34
Dec-05	90
Dec-05	90
Mar-06	99
Mar-06	99
Jun-06	13

TABLE F-6
Concentration of Boron in Groundwater Monitoring Wells, 2003 through 2007
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

	EW-1	EW-2	MW-2	MW-3	MW-7	MW-17	MW-18	MW-24	MW-25	SW-1
Mar-03	540	588		1360		1300	3230		3970	1130
Apr-03	566	626		1450	696					
May-03	512	577		1290	624					
Jun-03	583	645		1510	725	1340	3340		3790	1120
Jun-03	525	590		1410						
Jul-03	649	642	1490	1490	741					
Aug-03	556	611	1390		701					
Sep-03	517	581		1380	665	1310	3420		3990	1190
Sep-03	555	583		1400						
Oct-03	507	561		1310	638					
Nov-03	508	597		1410	657					
Dec-03	492	574	586	1310	632			514	3700	1140
Dec-03	473	567		1290	602	1230	3220			
Feb-04	504	586		1290	625					
Feb-04	481	576		1280	604	1180				
Mar-04	481	570		1250	609		3630		4320	
Apr-04	543	584		1320	714					
May-04	489	600		1210	676					1190
May-04	523	615		1300	693	1270	3330		3880	
Jun-04	485	586		1220	661					
Jul-04	530	638		1270	721					
Aug-04	488	586		1220	638					
Sep-04	504	613		1270	654	1180				
Sep-04	519	613		1230	645		3280		3800	
Oct-04	481	575		1190	606					
Nov-04						1200	3190			1070
Dec-04	493	570		1180	606			504	3720	
Mar-05	500	601		1170	625	1230	3380		3940	
Apr-05										
Jun-05	491	619		1110	653	1160	3290		3920	1230

TABLE F-6
Concentration of Boron in Groundwater Monitoring Wells, 2003 through 2007
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

	EW-1	**EW-2**	**MW-2**	**MW-3**	**MW-7**	**MW-17**	**MW-18**	**MW-24**	**MW-25**	**SW-1**
Feb-06										
Mar-06	495	565			604	1180	3230		3800	952
Jun-06	463	560		948	602	1090	3150		3730	1090
Aug-06	474	545			583		3100		3670	1170
Nov-06	453	548		924		1030	3030	510	3660	1080
Dec-06					526					
Feb-07	494	588			584		3060		3990	
May-07	445	532		840	543	981	2990		3470	938

TABLE F-7
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	Total Fluid *	Product	Emulsion
09/30/94	15.5	5.6	0
10/05/94	12.5	0.75	0.75
11/02/94	14	0.25	0.25
12/01/94	10	0.75	0.75
01/30/95	11.5	0	4
02/21/95	6	0	3.75
04/11/95	43	0	40
05/11/95	14	4.6	5
06/07/95	13.3	4.3	4
07/11/95	13.5	4	6.3
07/25/95	8.3	0	5
08/23/95	8.92	1.25	4.17
09/19/95	5.8	4.2	0.8
10/20/95	5.8	0	1.67
11/29/95	5	0	1.67
12/22/95	6.25	0	0.83
01/30/96	6.25	0	1.25
02/21/96	6.25	0	2.5
03/20/96	5	0	1.25
04/23/96	6.25	0	1.25
05/23/96	5.8	0.4	0
06/17/96	6.25	0	1.25
07/31/96	7.05	1.25	2.5
08/27/96	5.8	3.75	1.7
09/24/96	5.4	0	0.83
10/28/96	5.4	0	0.83
11/20/96	5	0	0.83
12/23/96	6.18	0	1.6
01/27/97	8.3	0	3.3
02/28/97	8.75	0	2.5
03/25/97	8.75	0	3.75
04/22/97	9.83	0	3.75
05/19/97	7.92	0	2.92

TABLE F-7 (CONTINUED)
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	Total Fluid *	Product	Emulsion
06/24/97	7.08	1.67	0.83
07/30/97	20.42	7.5	7.5
08/26/97	23.3	7.5	10.4
09/23/97	18.4	9.6	3.8
10/28/97	12.9	5.4	2.5
12/09/97	9.13	5	0.83
12/30/97	9.59	1.25	4.17
01/27/98	7.9	0.4	3.75
02/24/98	9.17	0	3.75
03/26/98	10.42	4.17	1.25
04/27/98	16.7	10	2.5
05/26/98	19.2	7.5	5
06/24/98	12.5	4.6	3.8
07/23/98	21.67	7.5	10
08/18/98	21.65	12.9	4.17
09/22/98	19.98	10.4	4.58
10/22/98	23.75	8.75	10
12/01/98	29.17	13.75	11.25
12/30/98	30	10	15
01/19/99	17.1	7.5	5
02/19/99	20.4	7.5	10
03/16/99	19.17	7.5	7.5
04/19/99	22.08	10	7.5
05/19/99	27.08	12.5	10
08/23/99	34.58	15	19.58
07/19/99	30	15	10
08/24/99	27.5	12.5	10
09/22/99	27.5	15	7.5
10/22/99	32.5	17.5	10
11/24/99	30	15	10
12/08/99	26.25	11.25	10
01/28/00	28.75	13.75	10
02/23/00	23.33	8.75	10
03/29/00	21.66	7.08	10

TABLE F-7 (CONTINUED)
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	Total Fluid *	Product	Emulsion
04/12/00	15.8	5	10.8
04/25/00	12.5	3.3	5
05/09/00	9.16	3.75	1.25
05/22/00	10.38	3.3	2.5
06/05/00	10.41	3.75	2.5
06/20/00	11.25	4.58	2.5
07/18/00	11.67	5	2.5
08/01/00	14.17	6.67	2.5
08/23/00	14.17	5	5
09/11/00	17.33	7.5	5
09/25/00	17.9	10.4	2.5
10/09/00	15	7.5	2.5
10/23/00	12.46	4.16	3.3
11/06/00	11.25	3.75	2.5
11/20/00	12.5	5	2.5
12/04/00	13.3	5	2.5
12/18/00	12.5	5	2.5
01/02/01	12.5	5	2.5
01/16/01	12.5	5	2.5
02/01/01	15	6	2.57
02/13/01	14	6.13	2.63
02/27/01	15	6	2.57
03/13/01	14	6.13	2.63
03/27/01	11	4.71	2.36
04/10/01	13	5.69	2.44
04/24/01	14	6.36	2.55
05/08/01	15	6.25	3.33
05/22/01	14	6.36	2.55
06/05/01	11	4.89	2.44
06/19/01	13	5.2	2.6
07/03/01	15	6.56	2.81
07/17/01	13	5.2	2.6

TABLE F-7 (CONTINUED)
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	Total Fluid *	Product	Emulsion
10/22/02	13	5.2	2.6
11/05/02	13	5.2	2.6
11/19/02	13	5.2	2.6
12/03/02	13	5.2	2.6
12/18/02	13	5.2	2.6
12/31/02	13	5.2	2.6
01/14/03	13	5.2	2.6
01/28/03	13	5.2	2.6
02/11/03	13	5.2	2.6
02/25/03	13	5.2	2.6
03/11/03	13	5.2	2.6
03/25/03	13	5.2	2.6
04/08/03	13	5.2	2.6
04/22/03	13	5.2	2.6
05/06/03	13	5.2	2.6
05/20/03	13	5.2	2.6
06/03/03	13	5.2	2.6
06/16/03	13	5.2	2.6
07/01/03	13	5.2	2.6
07/18/03	13	5.2	2.6
07/30/03	13	5.2	2.6
08/12/03	13	5.2	2.6
08/26/03	13	5.2	2.6
09/09/03	13	5.2	2.6
09/23/03	13	5.2	2.6
10/08/03	13	5.2	2.6
10/21/03	13	5.2	2.6
11/05/03	13	5.2	2.6
11/18/03	13	5.2	2.6
12/03/03	13	5.2	2.6
12/16/03	13	5.2	2.6
12/30/03	13	5.2	2.6

TABLE F-7 (CONTINUED)
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Date	Total Fluid *	Product	Emulsion
05/10/05	13	5.2	2.6
05/24/05	13	5.2	2.6
06/07/05	13	5.2	2.6
06/21/05	13	5.2	2.6
07/05/05	13	5.2	2.6
07/19/05	13	5.2	2.6
08/01/05	13	5.2	2.6
08/16/05	13	5.2	2.6
08/30/05	13	5.2	2.6
09/15/05	13	5.2	2.6
09/27/05	13	5.2	2.6
10/11/05	13	5.2	2.6
10/25/05	13	5.2	2.6
11/08/05	13	5.2	2.6
11/18/05	13	5.2	2.6
12/06/05	13	5.2	2.6
12/20/05	13	5.2	2.6
01/03/06	13	5.2	2.6
01/17/06	13	5.2	2.6
01/31/06	13	5.2	2.6
02/14/06	13	5.2	2.6
02/28/06	13	5.2	2.6
03/14/06	13	5.2	2.6
03/28/06	13	5.2	2.6
04/11/06	13	5.2	2.6
04/24/06	13	5.2	2.6
05/09/06	13	5.2	2.6
05/23/06	13	5.2	2.6
06/06/06	13	5.2	2.6
06/20/06	13	5.2	2.6
07/05/06	13	5.2	2.6
07/20/06	13	5.2	2.6
08/01/06	13	5.2	2.6
08/14/06	13	5.2	2.6
08/29/06	13	5.2	2.6
09/18/06	13	5.2	2.6
09/26/06	13	5.2	2.6

TABLE F-7 (CONTINUED)
Production History of Well PR-1
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

10/11/06	13	5.2	2.6
10/24/06	13	5.2	2.6
11/13/06	13	5.2	2.6
11/28/06	13	5.2	2.6
12/12/06	13	5.2	2.6
12/26/06	13	5.2	2.6
	3,268	1,251.1	821.2

Notes: All values in gallons.

These volumes are based on a visual assessment of the fluid purged from well PR-1. Black purged fluid is identified as product, gray and brown fluid is identified as emulsion, and clear fluid is identified as water.

* This volume includes water, product, and emulsion pumped from well PR-1.

TABLE F-8
Summary of Disposal Cells Monument Survey
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Monument Number	1	2	3	4	5	5-2003	6-2003	7-2003	8-2003	9-2003	10-2003	11-2003	12-2003
2001 Eastings[1]	6,684,390.62	6,684,419.97	6,684,432.94	6,684,352.67	6,684,338.13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2001 Northing[1]	2,299,545.62	2,299,588.89	2,299,513.30	2,299,502.28	2,299,574.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2002 Eastings[1]	6,684,390.62	6,684,419.98	6,684,432.96	6,684,352.69	6,684,338.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2002 Northing[1]	2,299,545.61	2,299,588.88	2,299,513.29	2,299,502.27	2,299,574.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2001-2002 Delta Eastings	0.00	0.01	0.02	0.02	0.02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2001-2002 Delta Northings	-0.01	-0.01	-0.01	-0.01	-0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2003 Eastings[1]	6,684,390.62	6,684,419.99	6,684,432.96	6,684,352.70	6,684,338.16	6,683,950.01	6,683,923.74	6,684,031.64	6,684,034.39	6,684,085.15	6,684,122.39	6,684,160.01	6,683,988.08
2003 Northing[1]	2,299,545.62	2,299,588.89	2,299,513.30	2,299,502.28	2,299,574.57	2,299,384.15	2,299,491.64	2,299,488.86	2,299,370.81	2,299,441.85	2,299,411.37	2,299,497.67	2,299,444.08
2002-2003 Delta Eastings	0.00	0.01	0.00	0.01	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2002-2003 Delta Northings	0.01	0.01	0.01	0.01	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2004 Eastings[1]	6,684,390.62	6,684,419.98	6,684,432.95	6,684,352.69	6,684,338.15	6,683,949.99	6,683,923.72	6,684,031.62	6,684,034.36	6,684,085.12	6,684,122.37	6,684,160.00	6,683,988.05
2004 Northings[1]	2,299,545.59	2,299,588.87	2,299,513.28	2,299,502.26	2,299,574.55	2,299,384.13	2,299,491.63	2,299,488.84	2,299,370.77	2,299,441.81	2,299,411.34	2,299,497.65	2,299,444.05
2003-2004 Delta Eastings	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.02	-0.01	-0.03
2003-2004 Delta Northings	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.04	-0.04	-0.03	-0.02	-0.03
2005 Eastings[1]	6,684,390.64	6,684,419.98	6,684,432.96	6,684,352.69	6,684,338.16	6,683,950.00	6,683,923.72	6,684,031.62	6,684,034.37	6,684,085.12	6,684,122.37	6,684,160.00	6,683,988.05
2005 Northings[1]	2,299,545.60	2,299,588.87	2,299,513.28	2,299,502.26	2,299,574.56	2,299,384.12	2,299,491.62	2,299,488.84	2,299,370.76	2,299,441.81	2,299,411.34	2,299,497.64	2,299,444.05
2004-2005 Delta Eastings	0.02	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
2004-2005 Delta Northings	0.01	0.00	0.00	0.00	0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	0.00
2006 Eastings[1]	6,684,390.64	6,684,419.99	6,684,432.97	6,684,352.71	6,684,338.17	6,683,950.02	6,683,923.76	6,684,031.65	6,684,034.40	6,684,085.14	6,684,122.39	6,684,160.02	6,683,988.08
2006 Northings[1]	2,299,545.61	2,299,588.88	2,299,513.29	2,299,502.27	2,299,574.56	2,299,384.13	2,299,491.61	2,299,488.83	2,299,370.77	2,299,441.81	2,299,411.34	2,299,497.65	2,299,444.05
2005-2006 Delta Eastings	0.00	0.01	0.01	0.02	0.01	0.02	0.04	0.03	0.03	0.02	0.02	0.02	0.03
2005-2006 Delta Northings	0.01	0.01	0.01	0.01	0.00	0.01	-0.01	-0.01	0.01	0.00	0.00	0.01	0.00
2007 Eastings[1]	6,684,390.64	6,684,420.00	6,684,432.98	6,684,352.71	6,684,338.17	6,683,950.04	6,683,923.78	6,684,031.66	6,684,034.42	6,684,085.15	6,684,122.41	6,684,160.03	6,683,988.10
2007 Northings[1]	2,299,545.62	2,299,588.89	2,299,513.30	2,299,502.28	2,299,574.57	2,299,384.12	2,299,491.59	2,299,488.83	2,299,370.75	2,299,441.80	2,299,411.33	2,299,497.65	2,299,444.04
2006-2007 Delta Eastings	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02
2006-2007 Delta Northings	0.01	0.01	0.01	0.01	0.01	-0.01	-0.02	0.00	-0.02	-0.01	-0.01	0.00	-0.01

TABLE F-8 (CONTINUED)
Summary of Disposal Cells Monument Survey
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Monument Number	1	2	3	4	5	5-2003	6-2003	7-2003	8-2003	9-2003	10-2003	11-2003	12-2003
2001 Elevations (ft,msl)	180.54	178.95	178.54	179.34	179.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2002 Elevations (ft,msl)	180.53	178.95	178.53	179.34	179.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2001-2002 Elevation Delta	-0.01	0.00	-0.01	0.00	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2003 Elevations (ft,msl)	180.53	178.95	178.53	179.34	179.11	202.62	202.78	203.92	202.24	204.36	203.61	202.13	204.52
2002-2003 Elevation Delta	0.00	0.00	0.00	0.00	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2004 Elevations (ft,msl)	180.52	178.94	178.52	179.33	179.1	202.56	202.73	203.86	202.18	204.3	203.53	202.06	204.46
2003-2004 Elevation Delta	-0.01	-0.01	-0.01	-0.01	-0.01	-0.06	-0.05	-0.06	-0.06	-0.06	-0.08	-0.07	-0.06
2005 Elevations (ft,msl)	180.52	178.94	178.52	179.33	179.10	202.56	202.72	203.85	202.18	204.29	203.52	202.05	204.45
2004-2005 Elevation Delta	0.00	0.00	0.00	0.00	0.00	0	-0.01	-0.01	0	-0.01	-0.01	-0.01	-0.01
2006 Elevations (ft,msl)	180.52	178.94	178.52	179.32	179.10	202.54	202.7	203.83	202.16	204.26	203.49	202.02	204.44
2005-2006 Elevation Delta	0.00	0.00	0.00	-0.01	0.00	-0.02	-0.02	-0.02	-0.02	-0.01	-0.03	-0.03	-0.01
2007 Elevations (ft,msl)	180.516	178.936	178.516	179.325	179.10	202.527	202.693	203.819	202.137	204.261	203.476	202.005	204.417
2006-2007 Elevation Delta	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.02	-0.02

[1] Coordinates listed in this table are California State Plane Coordinates, Zone 2, NAD 83.
ft, msl = feet mean sea level.
Coordinates and elevations surveyed by GDA Engineering, Surveying, Planning.
Cell #2 was opened in the summer of 2002 and material was added. New settlement marker monuments were installed.

Appendix G
Site Inspection Checklist

APPENDIX G

Site Inspection Checklist

This appendix presents the checklist for the Koppers Company, Inc. Superfund Site (Koppers site) inspection conducted on December 18 and 19, 2007. The site inspection team roster is presented in table G-1, followed by the site inspection checklist.

TABLE G-1
Team Roster for Site Inspection, December 18 and19, 2007
Third Five-Year Review Report for Koppers Company, Inc. Superfund Site
Oroville, Butte County, California

Name	Title	Affiliation
Kim Hoang	Remedial Project Manager	U.S. Environmental Protection Agency
K.C. Hendrix	Operations and Maintenance Manager	GeoTrans, Inc.
Caroline Ziegler	Project Manager	CH2M HILL, Inc.
Seena Babu	Project Engineer	CH2M HILL, Inc.

Site Inspection Checklist

I. SITE INFORMATION

Site name: Koppers Company, Inc. Superfund Site

Date(s) of inspection: December 18 and 19, 2007

Location and Region: Oroville (Butte County), CA

EPA ID: CAD009112087

Agency, office, or company leading the five-year review: U.S. Environmental Protection Agency, Region 9

Weather/temperature: Breezy, cold, light rain

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments:

- ☒ Inspection team roster attached
- ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** K. C. Hendrix (Name) Site Manager (Title) 12/18 & 19/2007 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 530-370-5481
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency Regional Water Quality Control Board (RWQCB)
   Contact Phil Woodward (Name) Project Manager (Title) 01/08/08 (Date) 530-224-4853 (Phone no.)
   Problems; suggestions; ☐ Report attached _____

   Agency Department of Toxic Substances Control (DTSC)
   Contact Ed Cargile (Name) Project Manager (Title) 01/29/08 (Date) 916-255-3703 (Phone no.)
   Problems; suggestions; ☐ Report attached _____

   Agency _____

Contact _____ _____ _____ _____
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached _____
_____

Agency _____

Contact _____ _____ _____ _____
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

Mike Tischuk, Project Manager, Beazer East, Inc.

Jennifer Abrahams, Project Manager, GeoTrans, Inc.

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

1. **O&M Documents**

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

Remarks: Operations and maintenance (O&M) manual – May 1998; post-closure maintenance and monitoring plan and as-built drawings for disposal Cells No. 1 and No. 2 – Feb 2004; soil disposal cell records, operation records for groundwater remediation system and daily inspection report, weekly and monthly inspection reports, treatment plant discharge records, extraction well flow records.

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**:** Site-Specific Health and Safety Plan – March 2005.

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: There was an NPDES discharge permit (No. CA0082988) issued in 1992 for an off-site discharge. This permit was rescinded in 1997.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Landfill gases not monitored, vent is open to air

6. **Settlement Monument Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks: Last surveyed January 2007.

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks: Semiannual groundwater monitoring reports to document quarterly groundwater sampling events are submitted to EPA and the Regional Water Quality Control Board (RWQCB).

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Leachate elevation levels at the disposal cells are monitored monthly and extracted only as required.

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☐ N/A
☒ Water (effluent) ☒ Readily available ☒ Up to date ☐ N/A
Remarks: Effluent discharge is monitored and reported monthly, meeting substantive permitting requirements.

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

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: Approximately $833,000 per year inclusive to operate and maintain both on- and off-property pump-and-treat system and to conduct sitewide groundwater monitoring. ☐ Breakdown attached

Total annual cost by year for review period if available

From 1/1/2006 (Date) To 12/31/2006 (Date) $190,000 (Total cost) ☐ Breakdown attached
For On-Property pump and treat system and groundwater monitoring
From 1/1/2007 (Date) To 12/31/2007 (Date) $208,000 (Total cost) ☐ Breakdown attached
For On-Property pump and treat system and groundwater monitoring
From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: O& Mcosts are usually for motor relay equipment, electrical problems, and general maintenance. No unanticipated or unusually high O&M costs reported over the review period 2003-2007.
_____

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

A. Fencing

1. **Fencing damaged** ☒ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: There is no fence around the whole 205-acre site. However, various areas within the site are fenced, including the treatment system, the disposal cells, the Technical Impracticability(TI) product recovery well found in the TI Zone, and the on-site extraction wells. A portion of the disposal cell fence was removed by vandals about 2 years ago. It has been replaced.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks: There were signs posted on the fences at both the treatment plant and disposal cells.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Site inspections
Frequency annually
Responsible party/agency Department of Toxic Substances Control
Contact EdCargile (Name) Project Manager (Title) 916-255-3703 (Phone no.)

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

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

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks: A deed restriction was recorded with Butte County in 2003 and has been incorporated as part of the title. The deed restriction restricts land use in certain areas of the property that continue to be owned and maintained by Beazer East. These areas include the on-site treatment plant, the disposal cells, the TI Zone including product recovery well, PR-1, the on-site extraction wells, and re-injection wells. The rest of the property has been sold and is planned for redevelopment.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: Although there is no current evidence of vandalism in the areas that are owned, operated, and maintained by Beazer East as part of the continuing remedial action at the site, there are other areas of the property, owned by a redevelopment company, that are accessible by vehicle where evidence of illegal dumping has occurred.

2. **Land use changes on site** ☒ N/A
Remarks: Currently zoned for commercial / industrial use as in previous years.

3. **Land use changes off site** ☒ N/A
Remarks: Currently zoned for residential/agricultural use as in previous years.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

Remarks: Gravel roads onsite. Paved roads offsite are not owned by Beazer East.

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks: Annual settlement surveys are conducted at the disposal cells to check for any subsidence that may be occurring over time.

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** ☐ Location shown on site map ☒ 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: _____
   _____

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

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____ Height_____
   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: _____
   _____

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

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐No evidence of settlement
   Areal extent_____ Depth_____
   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 Maintenance
☐ N/A
Remarks: Landfill gases are not monitored or sampled. The gas vents allow for inorganics to escape to the open air.

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

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks: _____
_____

4. **Leachate Extraction Wells**
☒ Properly secured/locked ☒ Functioning ☐ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks: There is not a leachate extraction system, but passive leachate collection which is checked regularly and pumped out on an "as needed" basis. The leachate is sent to an appropriate disposal facility.
_____

5. **Settlement Monuments** ☒ Located ☒ Routinely surveyed ☐ N/A
Remarks: The settlement monuments located on both disposal cells 1 and 2 are surveyed annually. The annual survey report for 2006 was available for review.

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

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks: _____
_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks: _____
_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks: _____
_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

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

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

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

1. **Siltation** Areal extent_____ Depth_____ ☐ 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: There is an open discharge channel between the two disposal cells; a slight vegetative cover was observed.

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 properly operating ☐ Needs Maintenance ☐ N/A
Remarks: _____
_____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☒ Needs Maintenance
Remarks: Both extraction wells associated with the on-site treatment system, EW-1 and EW-2, were observed to be leaking at the time of the site inspection on December 19, 2007.
_____

3. **Spare Parts and Equipment**
☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: _____
_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks: _____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks: _____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: _____
_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☒ Air stripping ☒ Carbon adsorbers
☒ Filters Sand filters
☐ Additive (*e.g.*, chelation agent, flocculent)_____
☐ Others_____
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☒ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☐ Quantity of groundwater treated annually_____

☐ Quantity of surface water treated annually_____
Remarks_____
_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks: _____
_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks: _____
_____

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks: _____
_____

5. **Treatment Building(s)**
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks: _____
_____

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: Although not all of the wells were visited at the time of the site inspection, the O&M site manager showed the log sheets used to record the information for conducting the required quarterly, semiannual, and annual groundwater monitoring.
_____

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining
Note: In most of the wells.

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A
Remarks: Monitored natural attenuation is a contingency remedy for the on- and off-property groundwater plumes excluding the TI Zone (also known as the west plume). However, this remedy has not been implemented because the *in situ* bioremediation remedy is currently being conducted in both the on-site east plume and the off-site plume.
_____

X. OTHER REMEDIES

If there are remedies applied at the site which 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.

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 primary objectives of the remedial actions conducted at the Koppers site are to restore groundwater to drinking water standards both on and off site, exclusive of the TI Zone (also known as the west plume). The implementation of this remedy continues with an on-site extraction and treatment system, augmented by *in situ* bioremediation and product recovery from the TI Zone. The off-site plume is undergoing *in situ* bioremediation as well. The groundwater monitoring well network continues to be monitored on a quarterly basis and reported semiannually. An alternate water supply continues to be provided to seven local residences where remedial action objectives have not yet been met.

The excavation/disposal/capping objectives relating to the soil cleanup and in compliance with ROD Amendment No. 1, have been completed, including the former process area. Soil excavation for disposal Cell No. 2 commenced in 1996 and was completed in September 2002 when process Area 8C became available after the facility closure. All excavated soils were disposed in Cell No. 2, and the final cap was constructed in accordance with approved work plans. The disposal cells are surveyed regularly to ensure limited subsidence. A passive leachate collection system is monitored and any collected leachate is disposed of at an off-site authorized disposal facility. There are monitoring wells surrounding the disposal cells that are sampled regularly to ensure that disposal wastes are not contributing to further groundwater contamination.

For the purposes of conducting this 5-year review, a Condition of Title report was obtained for the Koppers site. A Covenant to Restrict Use of the Property has been incorporated into the title documents and, based on interviews with key personnel and the site inspection, it appears that the institutional controls are currently functioning as intended.

B. Adequacy of O&M

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

A site inspection was conducted on December 18 and 19, 2007 concurrently with an interview of the site operations and maintenance manager, K.C. Hendrix. The remedial action systems and current O&M activities and documentation all appeared to be in order. However, there was one issue observed while conducting the site inspection. Both of the on-site extraction wells, EW-1 and EW-2, were leaking on December 19, 2007. As long as these O&M procedures continue to be followed, the remedy should remain protective for the long term. In the short term, the leaking extraction wells should be repaired.

C. Early Indicators of Potential Remedy Problems

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

Wells EW-1 and EW-2 were both leaking at the time of the site inspection. Leaking well EW-2 could be of potential concern because PCP has been detected at concentrations above the ROD cleanup level (1 ppb) in EW-2, with values ranging from 12 ppb in 2003 to 2.9 ppb in 2007.

D. Opportunities for Optimization

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

There is an opportunity to optimize the groundwater monitoring system using principles set forth in long-term monitoring optimization methodologies prepared by EPA and other federal agencies. An optimization evaluation can help to identify opportunities for improving remedy effectiveness, improving efficiency, and speeding progress toward site closure.

Appendix H
Site Inspection Photographs

Photo 1: Onsite water treatment plant

Photo 2: Onsite Soil Disposal Cells

Photo 3: Leachate sumps on Landfill

Photo 4: Landfill gas vents

Photo 5: Landfill settlement monument

Photo 6: Location of former soil storage building

Photo 7: Injection well-3

Photo 8: Product Recovery Well

Photo 9: Biological treatment bed

Photo 10: EW-1

Photo 11: EW-2

Photo 12: Former off-site water treatment plant

Photo 13: Wells RW-11 and RW-12

Appendix I
Technical Interview Checklists

APPENDIX I

Interview Checklists

TECHNICAL INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this 5-year review. the attached contact record(s) provide a detailed summary of the interviews.

Name	Title/Position	Organization	Date
K.C. Hendrix	Site Operations and Maintenance Manager	GeoTrans, Inc.	12/18/07 and 12/19/07
Name	**Title/Position**	**Organization**	**Date**
Phil Woodward	Project Manager	Regional Water Quality Control Board (RWQCB)	01/08/2008
Name	**Title/Position**	**Organization**	**Date**
Jennifer Abrahams	Project Manager	GeoTrans, Inc.	1/11/2008
Name	**Title/Position**	**Organization**	**Date**
Mike Tischuk	Project Manager	Beazer East, Inc.	1/28/2008
Name	**Title/Position**	**Organization**	**Date**
Ed Cargile	Project Manager	Department of Toxic Substances Control (DTSC)	01/29/2008

INTERVIEW RECORD

Site Name: Koppers Company, Inc. Superfund Site	**EPA ID No.:** CAD009112087	
Subject: Interview with Operations and Maintenance Site Manager	**Time:** 1:00 pm	**Date:** 12/18/2007
Type: ☐ Telephone ☒Visit ☐ Other **Location of Visit:** Oroville (Butte County), CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Kim Hoang	**Title:** Project Manager	**Organization:** EPA Region 9

Individual Contacted:

Name: K.C. Hendrix	**Title:** Site Manager	**Organization:** GeoTrans, Inc.
Telephone No: 530-370-5481 **Fax No:** 916-853-1860 **E-Mail Address:** kchendrix@geotransinc.com	**Street Address:** 3035 Prospect Park Drive, Suite 40 **City, State, Zip:** Rancho Cordova, CA 95670	

Summary Of Conversation

Caroline Ziegler and Seena Babu, representatives from CH2M HILL, and Kim Hoang, representative of EPA Region 9, conducted an interview with K.C. Hendrix (GeoTrans, Inc.) on December 18, 2007 at 1:00 pm, followed by a site inspection of on-site property including treatment plant, disposal cells, and TI Zone area. Another interview was conducted on December 19, 2007 at 9:00 am to check available documentation and records, followed by a site visit to the off-site property.

K.C. Hendrix indicated that his overall impression of the treatment system is that it is functioning as per the operations and maintenance (O&M) requirements. According to him, the current treatment remedy is adequate and the plume is being contained. Other issues/topics discussed are briefly documented below:

- There are no effluent discharge permits available onsite.
- All 200 acres of the site are open with fencing only around the treatment plant and disposal cells.
- Vandalism and trespassing is a concern at all times. The landfill fence was cut out and stolen in 2005. An alarm system is maintained in the on-property treatment plant to prevent unauthorized entry to the plant. The alarm also autodials K.C. Hendrix in case of emergency.
- On-site property is currently zoned for commercial/industrial use, and off-site property is currently zoned for residential/agricultural use.
- O&M costs are for electrical system maintenance and repairs.
- The disposal cell leachate level is monitored monthly and extracted as required. The last leachate extraction was in 2006 and approximately 4,000 gallons were removed. Gas vents are open to air with no sampling/monitoring of landfill gases. There is a vegetated drainage channel between the two disposal cells for discharge of runoff from the covers of the disposal cells.
- Boron occurs naturally in the area and is detected occasionally during groundwater sampling. MW-8 is sampled monthly for boron and quarterly for PCP.

Site documents were inspected on December 19, 2007 and found satisfactory. Documents included the Site Heath and Safety Plan, Operations and Maintenance Manual, Post Closure Maintenance and Monitoring Plan, K.C. Hendrix training records, soil disposal cell records, inspection log sheets, operation records for the groundwater remediation system, daily inspection sheets, weekly and monthly inspection reports, extraction well flow records, and treatment plan discharge records.

After the interview, it was determined that a list of questions would also be sent to GeoTrans, Inc. representative Jennifer Abrahams for further information (including information on effluent discharge compliance records and permits).

INTERVIEW RECORD

Site Name: Koppers Company, Inc. Superfund Site	**EPA ID No.:** CAD009112087	
Subject: Interview with RWQCB contact	**Time:** 2:30 pm	**Date:** 1/8/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Caroline Ziegler	**Title:** Project Manager	**Organization:** CH2M HILL, Inc.

Individual Contacted:

Name: Phil Woodward	**Title:** Project Manager	**Organization:** Regional Water Quality Control Board (RWQCB)
Telephone No: 530-224-4853 **Fax No:** 530- 224-4857 **E-Mail Address:** pwoodward@waterboards.ca.gov	**Street Address:** Redding Branch Office 415 Knollcrest Drive, Suite 100 **City, State, Zip:** Redding, CA 96002	

Summary Of Conversation

Caroline Ziegler and Seena Babu, representatives from CH2M HILL, conducted a telephone interview with Phil Woodward (RWQCB) on January 8, 2008 at 2:30 pm as part of the agency interviews to be conducted for the 5-year Koppers site review report. Phil Woodward has been involved with the Koppers site since 1987/1988 as a State agency contact from the RWQCB. Phil indicated that his overall impression of the site and the treatment system is that it is functioning as expected. According to him, the groundwater issues are being addressed by bioremediation and natural attenuation and the on-property treatment plant is functioning as expected. Other issues/topics discussed are briefly documented below:

- Landfill: RWQCB has no involvement in the day-to-day issues of the landfill and monitoring wells at the Koppers site. Phil Woodward mentioned that RWQCB was involved during the design and construction phase of the landfill and he agrees that all requirements have been met during construction. EPA is involved with daily issues related to landfill operation, groundwater monitoring around the landfill, and vegetative cover.
- RWQCB receives semiannual groundwater monitoring reports from Beazer East, Inc./GeoTrans, Inc. and agrees that the reports indicate a decreasing trend in concentration of contaminants of concern at the site.
- Phil Woodward receives a discharge monitoring report from Beazer regularly. Waste discharge monitoring reports were required to be sent to RWQCB when the wood-treating facility was operating. Since the facility has ceased operation and the site has become a Superfund site under EPA, RWQCB is not required to issue permits on a Superfund site, although substantive requirements still must be met. According to Phil, Beazer is not really required to send the discharge monitoring report to RWQCB. Phil also thought that groundwater monitoring could likely be reduced from semiannual to annual monitoring, if needed.
- Phil confirmed that he has not received any complaints or issues from the project in the last 2 years, including complaints related to vandalism.
- Phil thinks that both natural processes (attenuation) and the *in situ* treatment has contributed to the decreasing trend of contaminant levels in groundwater. He added that Beazer and its consultants keep the board well informed on site activities and the status of the project.
- RWQCB does not keep up with the &M requirements of the site. EPA is responsible for verifying that the groundwater monitoring and treatment is performed as per requirements.
- The Annual Groundwater Monitoring Report, 2006 (GeoTrans, Inc.) refers to NPDES Permit No. CA 0082988 for meeting treatment and discharge objectives. Phil indicated that this permit is no longer in force. It had been established previously

while the site was operating; however, because the site is now a Superfund site, no permits are required and only substantive requirements must be followed.

- Phil mentioned that he was informed about a complaint to the State and Local Public Health Department from a resident of Oroville regarding a pancreatic cancer spike in the region near the Koppers site on the day of this interview. This is the first community concern that he had heard of about the site in a very long time.
- Phil did not have any further comments, suggestions, or recommendations regarding the site. He did say that there is an opportunity for optimization by reducing groundwater monitoring at the site.

INTERVIEW RECORD

Site Name: Koppers Company, Inc. Superfund Site		**EPA ID No.:** CAD009112087
Subject: Interview with Project Manager of Geo Trans, Inc.	**Time:** 10:00 am	**Date:** 1/11/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☒ Outgoing

Contact Made By:

Name: Caroline Ziegler	**Title:** Project Manager	**Organization:** CH2M HILL, Inc.

Individual Contacted:

Name: Jennifer Abrahams	**Title:** Project Manager	**Organization:** GeoTrans, Inc.
Phone No: 916-853-1800 **Fax No:** 916-853-1860 **E-mail Address:** jabrahams@geotransinc.com	**Street Address:** 3035 Prospect Park Drive, Suite 40 **City, State, Zip:** Rancho Cordova, CA 95670	

Summary Of Conversation

Caroline Ziegler and Seena Babu, representatives from CH2M HILL, conducted a telephone interview with Jennifer Abrahams (GeoTrans, Inc.) on January 11, 2008 at 10:00 am as part of the technical interviews to be conducted for the 5-year Koppers review report. Jennifer Abrahams has been involved with the Koppers site for the last 12 years as the Project Manager. GeoTrans, Inc. is a consultant to the potentially responsible party (PRP) Beazer East, Inc. and assists in complying with the ROD and Consent Decree requirements related to groundwater monitoring and treatment.

Jennifer indicated that her overall impression of the site and the treatment system is that it is functioning as expected and groundwater remediation is progressing. According to Jennifer, the off-property groundwater extraction and treatment system was put into place in 1993, and the on-property system was started in February 1994. The primary contaminant of concern in groundwater is pentachlorophenol (PCP). The off-property groundwater remediation system was taken offline in 1995 because the plume had retreated upgradient of the two extraction wells. In 1998, the groundwater remediation was enhanced both on- and off-property using *in situ* bioremediation techniques. The groundwater monitoring data shows an overall decreasing trend of PCP both on- and off- property. In 2006, GeoTrans, Inc. noted the presence of PCP in one of the private off-property wells through routine alternate water supply program (AWSP) monitoring. An oxygen releasing compound (ORC) was added to the well to stimulate bioremediation of the PCP, and surrounding wells in the vicinity continue to be monitored.

Other issues/topics discussed are briefly documented below:

- Concentrations of PCP in the on-property wells are continuing to decrease. The TI zone is self contained; hence, there are no issues with transfer of contaminants to surrounding areas. MW-24, immediately downgradient of the TI zone, has had very low concentrations (<5 ug/L) of polynuclear aromatic hydrocarbons (PAHs) detected since 1998. The presence of PAHs in groundwater at MW-24 was attributed to the production of biosurfactants stimulated by the oxygen and nutrient addition to the TI zone that was part of the TI Zone bioremediation program started in 1995. The addition of ORC and nutrients disturbed the natural equilibrium of the TI zone, and the resultant biosurfactants mobilized some PAHs from the creosote. As a result, bioremediation has been discontinued at the TI Zone. PAHs have not been detected in the influent of the treatment system.
- Jennifer indicated that Beazer East, Inc. and GeoTrans, Inc. are working toward optimization based on the sampling data. The off-property plume is being remediated, and the groundwater monitoring results show a decreasing trend.
- O&M costs:

  There were unexpected O&M costs due to an unanticipated high concentration of boron in MW-8 in 2002. Hence,

GeoTrans began to extract groundwater from MW-8 and blend this water with the influent to the groundwater treatment system to get effluent boron concentrations below the ROD standard. The remedy of groundwater extraction at MW-8 and blending with the influent was approved by EPA, RWQCB, and DTSC.

O&M costs for 2006 were approximately $190,000, which included $32,000 for groundwater sampling and $158,000 for operating the system and labor.

O&M costs for 2007 were approximately $208,000, which included $28,000 for groundwater sampling and $180,000 for operating the system, utilities, parts, and labor.

- Opportunity to optimize sampling in the O&M plans:
- Jennifer mentioned that a conservative approach to optimize sampling at the site was initiated in the 1990s. Because the concentrations in the plume have continued to decrease over the years, GeoTrans is considering optimization in sampling. A few of the approaches suggested include:

  Conducting only confirmation and boundary sampling

  Reducing the number of wells sampled

  Reducing the frequency of sampling

  Reducing the parameters analyzed

  Characterizing and defining the plume annually rather than semiannually
- A copy of any hazardous waste manifests of contaminated carbon or other wastes generated as part of the site remediation should be on file with Bob Fisher of Beazer East, Inc., located in Pittsburgh, PA.
- Jennifer indicated that there is no current NPDES permit in place for effluent discharge. She indicated that the permit mentioned in the 2006 annual report had applied to off-property, but it is no longer in force. The NPDES permit for the discharge of off-property effluent was issued in 1992 and rescinded in 1997. There is not an on-property NPDES permit.
- The recent complaint from an Oroville resident to the State and Local Public Health Department that the pancreatic cancer spike in the region is due to the 1987 fire at the Koppers site was discussed. Jennifer stated that she thought a correlation between the pancreatic cancer cluster and the fire at the site was unlikely.
- Jennifer did not have any other comments, suggestions, or recommendations regarding the site.

INTERVIEW RECORD

Site Name: Koppers Company, Inc. Superfund Site	**EPA ID No.:** CAD009112087	
Subject: Interview with Project Manager of Beazer East, Inc.	**Time:** 10:00 am	**Date:** 1/28/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Caroline Ziegler	**Title:** Project Manager	**Organization:** CH2M HILL, Inc.

Individual Contacted:

Name: Mike Tischuk	**Title:** Project Manager	**Organization**: Beazer East, Inc.
Phone No: (412) 208-8809 **E-mail Address:** Mike.Tischuk@hanson.biz	**Street Address:** One Oxford Centre, Suite 3000 **City, State, Zip:** Pittsburgh, PA 15219	

Summary Of Conversation

Caroline Ziegler and Seena Babu, representatives from CH2M HILL, conducted a telephone interview with Mike Tischuk (Beazer East, Inc.) on January 28, 2008 at 10:00 am as part of the technical interviews conducted for the Koppers site 5-year review report. Mike has been involved with the Koppers site for the last 14 years as the Project Manager. Beazer East, Inc. is the PRP and is responsible for complying with the ROD and Consent Decree requirements related to soil and groundwater monitoring and treatment. The Koppers site was formerly operated by Koppers Company, Inc., which was sold in 1989 and then became Koppers Industries, Inc.

Mike Tischuk indicated that his overall impression of the site and the treatment system is that it is functioning as expected and groundwater remediation is progressing.

Other issues/topics discussed are briefly documented below:

- According to Mike, review of the groundwater monitoring reports indicates that the contaminated plume shows a decreasing trend. Mike discussed that the TI Zone, which is under the Technical Impracticability Waiver, is discrete, isolated, and has no receptors.
- Mike agreed that the Koppers site follows a set O&M plan.
- O&M costs:
  - Beazer East, Inc. is trying to cut down O&M costs by optimizing the groundwater sampling events
  - There have been no recent unexpected O&M costs
- Opportunity to optimize sampling in the O&M plans:

The following approaches were suggested:

- Reduce the number of wells sampled
- Reduce the frequency of sampling
- Prepare a report for optimization planning
- Mike indicated that in the near future, EPA and other regulatory agencies might be more open to the idea of optimization considering that the Koppers site has a lot of historical data

- The recent complaint from an Oroville resident to the State and Local Public Health Department that the pancreatic cancer spike in the region is due to the 1987 fire at the Koppers site was discussed. Mike stated that he thought a

correlation between the pancreatic cancer cluster and the fire at the site was unlikely because none of the residents affected live close to the plume. He also indicated that a dioxin study was conducted after the 1987 fire and no remarkable results were found.

- Mike stated that the Oroville residents are hoping for industrialists to develop the Koppers site area and bring them more jobs.
- Mike suggested that EPA should try and reduce the cost associated with the Koppers site.
- He did not have any other comments, suggestions, or recommendations regarding the site.

INTERVIEW RECORD

Site Name: Koppers Company, Inc. Superfund Site		**EPA ID No.:** CAD009112087
Subject: Interview with DTSC contact	**Time:** 10:00 am	**Date:** 1/29/2008
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☒ Outgoing

Contact Made By:

Name: Caroline Ziegler	**Title:** Project Manager	**Organization:** CH2M HILL, Inc.

Individual Contacted:

Name: Ed Cargile	**Title:** Project Manager	**Organization:** Department of Toxic Substances Control (DTSC)
Telephone No: 916-255-3703 **Fax No:** 916-255-3697 **E-Mail Address:** ECargile@dtsc.ca.gov	**Street Address:** 8800 Cal Center Drive **City, State, Zip:** Sacramento, CA 95826-3200	

Summary Of Conversation

Caroline Ziegler and Seena Babu, representatives from CH2M HILL, conducted a telephone interview with Ed Cargile (DTSC) on January 29, 2008 at 10:00 am as part of the agency interviews conducted for the Koppers 5-year review report. Ed Cargile has been involved with the Koppers site since 1989 as an agency contact from the DTSC.

Ed indicated that his overall impression of the site and the treatment system is that it is functioning as expected. According to Ed, there has been a noticeable reduction of the PCP plume, and site cleanup is progressing quicker than expected.

Other issues/topics discussed are briefly documented below:

- Landfill: As the PRP, Beazer East, Inc. signed a letter of certification with DTSC wherein they discussed the landfill construction activities and concurred on the remedies.
- Responsibilities of the DTSC include both groundwater and soil contamination. EPA has been the lead agency since 1984; The DTSC, as well as the RWQCB, serve as following agencies for the remedial activities being conducted at the site. The DTSC and EPA have reviewed all the necessary documents pertaining to groundwater and soil contamination.
- The DTSC receives monthly discharge monitoring reports and semiannual groundwater monitoring reports from Beazer, Inc./GeoTrans, Inc. Ed Cargile also has frequent conversations with Beazer and their consultant, GeoTrans, Inc.
- The DTSC has to conduct site visits at least once per year to confirm that the Koppers site is complying with the requirements of the Deed Restriction. Ed indicated that they usually go out to the site to check if anything is out of the normal (for example, any land features that impact groundwater directly or indirectly). Ed stated that the owner is not allowed to discharge to groundwater, change balance of infiltration in any way, or construct injection wells other than those that already exist for remedial purposes.
- Ed stated that he has not received any complaints or issues from the project. The only contact was in regard to the potential pancreatic cancer spike in the region due to the 1987 fire at Koppers site. According to Ed, a correlation between the pancreatic cancer cluster and the fire at the site was unlikely and there should be no issues of exposure.

Ed did not have any other comments, suggestions, or recommendations regarding the site. He said that this is a good stage of the project to aim for optimization at the site.