Third Five-Year Review Report

Arkwood, Inc. Site
Boone County
Omaha, Arkansas

July 2011

Prepared By
Region 6

United States Environmental Protection Agency
Dallas, Texas

9296693

THIRD FIVE-YEAR REVIEW
Arkwood, Inc.
ARD084930148
Boone County, Arkansas

This memorandum documents the Environmental Protection Agency's (EPA) approval of the third Five-Year Review report for the Arkwood, Inc., Superfund site. This document was prepared by EPA with data and reports provided by McKesson Corporation.

Summary of Five-Year Review Findings

Arkwood was a wood treating site where wood treating fluids contaminated the soil and ground water. The soil remedy was implemented in two phases. Phase I was pretreatment (drying and separation of contaminated soil from rock fragments), storage of contaminated soil to implement the remedy specified in the ROD, and backfilling with clean soil to minimize the environmental impact. Phase II was off-site incineration of the impacted soil. The above procedure was followed by placement of a six-inch topsoil cap and seeding. The remediation area is fenced with signs and locked gates. The ground water beneath the site is impacted by residual contamination. New Cricket Spring, located about 1/4-mile downgradient of the wood treating area, is impacted by the site. Pentachlorophenol (PCP) concentrations at New Cricket Spring have decreased significantly since the soil remedy was completed. As a part of the ground water remedy, water at New Cricket Spring was treated by an ozone oxidation process to destroy the PCP contamination in the groundwater. The ground water treatment system was installed in 1997 and upgraded in 1998 and 1999.

In late 2005, McKesson installed injection wells near the sinkhole where wood treating wastes were disposed. The sinkhole is hydraulically connected to New Cricket Spring through subsurface fractures. Ozonated water was injected into the wells from December 2005 through August 2009 to destroy residual PCP in the subsurface fractures with a goal of cleaning up New Cricket Spring permanently. Non-ozonated water continues to be injected in the vicinity of the sinkhole as a means of flushing and facilitating the efficient operation of the treatment system at New Cricket Spring. The ozone injection system has reduced PCP concentrations in New Cricket Spring by more than 95 percent. However, the PCP values have reached an average of 50 micrograms per liter (ug/l) over the past five years and an average concentration below 20 ug/l over the past two years. The current injection and treatment systems are able to destroy PCP in the water to the level set by Arkansas Department of Environmental Quality (ADEQ) (9.3 µg/l monthly average and 18.7 µg/l daily maximum). The PCP concentrations have attained the cleanup concnetrations several times in the last few years. While the average PCP concentration at New Cricket Spring has been successfully reduced to a level slightly exceeding the ADEQ cleanup goal, the attainment of cleanup values has not been consistent (see semi-log plot, Figure 2b). The ground water treatment system should continue until water exiting the New Cricket Spring consistently meets ADEQ water quality standards for PCP.

Actions Needed

No major deficiencies were noted in this Five Year Review. To ensure future protectiveness, a Deed Restriction was filed by the property owner in August 2010. The Deed Restriction protected the existing cap, provided a notice of residual contamination remaining on the site, and restricted future use to industrial purposes. The Deed Restriction of August 2010 needs minor corrections in the metes and bounds description and to add the notice that the site is zoned for industrial use only within 12 months of this review. It is anticipated that the corrections will be completed within the next twelve months. In January 2011, EPA made a Sitewide Ready for Anticipated Use determination at the Arkwood site. In addition, the New Cricket Spring ground water treatment system should continue until water exiting from the New Cricket Spring meets ADEQ Water Quality Standard for PCP at the site.

Determinations

I have determined that the remedy for the Arkwood site is protective of human health and the environment and will remain so provided the action items identified in the third Five-Year Review report are addressed as described above.

Pamela Phillips, Acting

Samuel Coleman, P.E.
Director
Superfund Division
U. S. Environmental Protection Agency, Region 6

8/18/11
Date

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THIRD FIVE-YEAR REVIEW REPORT
Arkwood, Inc.

7/20/11

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List of Acronyms

ADEQ	Arkansas Department of Environmental Quality (formerly ADPCE)
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemicals of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
gpm	gallons per minute
HASP	Health and Safety Plan
IRIS	Integrated Risk Information System
mg/kg	milligram per kilogram
mg/l	milligram per liter
MMI	Mass Merchandisers, Inc.
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCP	Pentachlorophenol
PER	Preliminary Engineering Report
PNA	Polynuclear Aromatics
ppb	parts per billion
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SOW	Statement of Work
µg/l	microgram per liter

EXECUTIVE SUMMARY

This is the third Five-Year Review for the Arkwood, Inc., site located in Boone County in Omaha, Arkansas. The results of this Five-Year Review indicate that the remedy is protective of human health and the environment. Soil remediation was completed in 1995 followed by placement of a topsoil cap and seeding. The vegetation is in good condition. The ground water treatment system, located immediately downgradient of the mouth of New Cricket Spring, is functioning as designed and is meeting treatment goals. Therefore, the remedy that was implemented for soil and ground water at the site continues to be protective of human health and the environment.

Soil Remediation

The remedy that was implemented for soil remediation is protective of human health and the environment. The soil remedy was implemented in two phases. During the first phase, the impacted soil was dried, excavated and separated from the rock fragments. In Phase II, the impacted soil was transported offsite for incineration. Verification sampling was conducted to ensure that the affected soil above cleanup goals had been removed. The excavated areas were backfilled with clean materials, covered with a topsoil cap, and the entire site was seeded. Perimeter fencing is in place and is effective in preventing unauthorized entry or use of the site. The site is in good condition and is inspected and maintained on a regular basis.

Ground water Remediation

The remedy that was implemented for the ground water is protective of human health and the environment. The Site is located in an area of karst geology that is characterized by subsurface fractures and channels hydraulically connecting the site to New Cricket Spring. Although the main source area (contaminated soil) no longer exists, the ground water continues to be impacted by residual contaminants in the subsurface fractures and channels.

Ground water monitoring data confirm that the treatment system is removing contaminants from the water effectively. An ozone injection pilot study was initiated in December 2005 and operated through August 2009 to evaluate the potential for accelerating reduction of residual PCP in the subsurface between the site and New Cricket Spring. The system, followed by continued injection of non-ozonated water, has successfully reduced the average PCP concentration at New Cricket Spring to a level slightly exceeding the Arkansas Department of Environmental Quality (ADEQ) cleanup goal. The ground water contaminants will continue to attenuate naturally over time.

Five Year Review Summary Form

SITE IDENTIFICATION			
Site Name: Arkwood, Inc. Site			
EPA ID: ARD084930148			
Region: 6	**State:** Arkansas	**City/County:** Omaha/Boone County	
SITE STATUS			
NPL Status	⊗ Final	○ Deleted	○ Other (specify)
Remediation Status(choose all that apply)	○ Under Construction	⊗ Operating	⊗ Complete
Multiple OUs?	○ YES	⊗ NO	**Construction Completion Date:** 12/13/95
Has site been put into reuse?	○ YES	⊗ NO	
REVIEW STATUS			
Reviewing Agency:	⊗ EPA	○ State	○ Tribe	○ Other Federal Agency_____
Author Name: Shawn Ghose M.S., P.E. , ASME			
Author Title: Remedial Project Mgr	**Author Affiliation: USEPA**		
Review Period: 3/06 to 3/11			
Date(s) of site inspection: by USEPA and ADEQ personnel			
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 ○ Construction Completion ○ Other (specify _____	○ Actual RA Start at OU #_____ ⊗ Previous Five-Year Review Report		
Triggering action date: 3/31/2006			
Due date (five years after triggering action date): 3/31/2011			

Five Year Review Summary form

Deficiencies

The following deficiency was identified:

- The property owner recorded a deed notice in August 2010. However, the Deed Restriction requires minor corrections in the description of the metes and bounds. In addition, a notice that the site is zoned for industrial use only must be added to the Deed Restriction.

Recommendations and Follow-up Actions

The following action is required to correct the deficiencies and ensure that protectiveness is maintained:

- Correction to metes and bounds description and the restriction to industrial use only on the Deed Restriction within twelve months.

Protectiveness Statements:

The remedial actions for the soil and ground water are protective of human health and the environment. Since both media remedies are protective, the remedy for the Site is protective of human health and the environment.

Other Comments:

The Site is in good condition and is inspected and maintained on a regular basis. No changes in land use are planned and the perimeter fence has been effective in preventing unauthorized access to the Site.

Arkwood, Inc. Site
Third Five-Year Review Report

I. Introduction

EPA Region 6 has conducted a third Five-Year Review of the remedial actions implemented at the Arkwood, Inc., site located in Omaha, Boone County, Arkansas. This review was conducted from December 2010 through February 2011, in accordance with the Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, dated June 2001. This report documents the results of this review. The purpose of a Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of these reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify deficiencies found during the review, if any, and identify recommendations to address them.

This review is required 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 §121(c), as amended, which 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."

NCP Section 300.430(f)(4)(ii), 40 CFR § 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 initiation of the selected remedial action."

This is the third Five-Year Review for the Arkwood, Inc., site. The triggering action for this review was the second Five-Year Review report completed in March 2006. Because site soil was remediated to industrial levels, which are above levels that allow for unrestricted use and unlimited exposure, and residual contaminants remain in the karst geology features of fractures and channels beneath the Site resulting in ongoing treatment of ground water at New Cricket Spring, Five-Year Reviews are required.

II. Site Chronology

Table 1: Chronology of Site Events

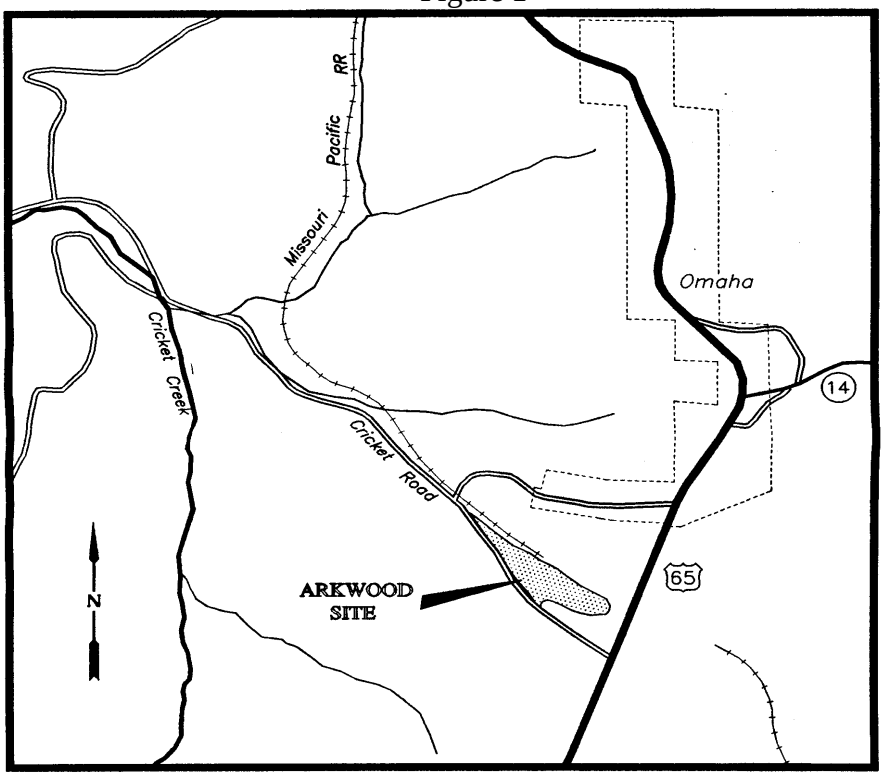
Date	Event
1962	Arkwood, Inc. commences wood-treating operations.
1973	Mass Merchandisers, Inc. (MMI) takes over operation of the plant under a lease agreement with the owner.
1981	Arkansas Department of Pollution Control and Ecology (ADPCE) receives a complaint about potentially affected water in the railroad tunnel.
1981 – 1985	Preliminary investigations by ADPCE indicate detectable levels of pentachlorophenol (PCP) in the area immediately surrounding the Site.
6/84	Plant operation ceases.
9/04/85	U.S. Environmental Protection Agency (EPA) proposes adding the Site to the National Priorities List (NPL).
5/15/86	EPA and MMI enter into an Administrative Order on Consent (AOC) for performance of a Remedial Investigation/Feasibility Study (RI/FS).
3/31/89	The Site is added to the NPL.
5/90	The RI/FS is completed by MMI.
9/28/90	EPA issues a Record of Decision (ROD) for the Site.
5/30/91	Execution of a Consent Decree (CD)
9/24/92	Entry of a corrected Consent Decree (CD) between EPA and MMI for Site remediation.
9/92	EPA approves a Remedial Design Work Plan (RDWP) for the Site.
11/16/93	A Preliminary Engineering Report (PER) is approved for the Site.
2/94	Remedial Action activities commence.
6/14/95	An Explanation of Significant Differences (ESD) is executed changing treatment of the affected soils to incineration at an offsite facility.
12/13/95	Remedial Action is complete.
5/97	An ozone pilot treatment system is installed at the Site.
11/97 – 1/98	The treatment system is upgraded with an ozone diffuser and baffles.
10/99 – 12/99	A new higher capacity ozone treatment system is installed.
12/05 – 8/09	An ozone injection pilot system is operated.
8/09 - present	Non-ozonated ground water is injected continually near sinkhole.

III. Background

A. Location

The Arkwood, Inc., site is located in Omaha, Section 27, T.21N. and R.21W., Boone County, Arkansas. The site is approximately one-half mile southwest of Omaha, Arkansas, and lies to the west of the old U.S. Highway 65 (see Figure 1 below). The site is a 30-acre parcel that slopes gently toward the northwest. It is located in a valley on Cricket Creek Road, bounded by ridges covered with native trees. The site is generally sparsely vegetated and covered with gravel and rocks mixed with native, clayey soils. Near-surface soils were contaminated by the former wood-treating operations that used creosote and pentachlorophenol (PCP) in the processes. The site is in an area of karst geology that is characterized by subsurface fractures and channels. New Cricket Spring, located down valley immediately west of the site, was contaminated by the former site activities.

Figure 1



GENERAL AREA MAP

The area immediately to the north is a steeply-sloped wooded hillside. The outskirts of the Omaha, Arkansas, community starts approximately one-half mile to the north of the Site. Old Highway 65 lies to the east of the Site with woods beyond the highway. To the south is Cricket Creek Road. On the other side of Cricket Creek Road is a track of undeveloped woods. Storm water and runoff from this area flow onto the site. East of the site are scattered residences; the closest being approximately one-half mile from the site.

B. History

The site was developed in the 1950's when a railroad company excavated about 40 to 50 feet below natural grade to obtain fill dirt for constructing a railroad embankment. Arkwood, Inc. began wood treating operations at the Site in 1962. The operations consisted of a millwork shop, a wood-treating plant that used creosote and PCP in its process, and a yard for storing treated wood products prior to sale. Wood-treating operations involved bringing untreated timber posts and poles to the Site, and placing the wood materials into a treatment cylinder where the chemical preservatives were introduced under pressure.

In 1973, the site owner leased the wood-treating facility to Mass Merchandisers, Inc. (MMI). MMI continued to operate the Arkwood plant until June 1984. Subsequently, the remaining inventory was sold or removed from the site. In January 1985, MMI's lease expired and was not renewed. The owner dismantled the plant in 1986.

During its 20-plus years of operation, wastes from plant operations were disposed of onsite. From 1962 through 1970, wastes were reportedly dumped into a sinkhole adjacent to the treatment plant. The sinkhole was subsequently sealed and the wastes were placed in a ditch adjacent to the railroad until approximately 1974 when MMI began using a chemical recovery process. Other wastes included liquids used to wash the treatment plant floor and equipment. Such waste liquids were accumulated in a tank and then spread over the wood storage yard to control dust.

The Arkansas Department of Pollution Control and Ecology (ADPCE) received a complaint about the Site in 1981. Preliminary investigations revealed detectable levels of PCP in area ground water. In 1985, EPA proposed the Site for inclusion on the National Priorities List (NPL). The Site was formally added to the NPL on March 31, 1989.

With EPA oversight, MMI conducted a Remedial Investigation and Feasibility Study (RI/FS) to determine the nature and extent of contamination and to investigate possible remedies for the Site. The RI/FS was conducted between 1987 and 1990 pursuant to an Administrative Order on Consent (AOC). The Regional Administrator for EPA Region 6 approved the Record of Decision (ROD) for the site on September 28, 1990.

The 1990 ROD documented that the principle threat from the Site was direct contact with soils contaminated above health-based levels. In addition, the 1990 ROD stated that these soils posed a long-term threat to groundwater. Site soils were contaminated with PCP, polynuclear aromatic hydrocarbons (PAHs), and dioxin. Contaminated materials were defined as all site materials that contain greater than 300 milligrams per kilogram (mg/kg) PCP, greater than 20 micrograms per kilogram (µg/kg) dioxin as 2,3,7,8-TCDD equivalents**,** or greater than 6.0 mg/kg carcinogenic polynuclear aromatic hydrocarbons (c-PAHs) as benzo-a-pyrene equivalents. New Cricket Spring contained concentrations of PCP above the Arkansas Water Quality Standard.

In April 1991, a Consent Decree (CD) was entered between the United States of America, on behalf of the EPA (United States) and MMI to remediate the Site. The CD includes the ROD and a Statement of Work (SOW) as Appendices A and B, respectively, (collectively the Consent Decree). A corrected CD was entered on September 23, 1992, including the same attachments.

In September 1992, EPA approved the Remedial Design Work Plan (RDWP) for the Site. The RDWP provides a definition of the pre-design studies, design elements, review schedules**,** and deliverables to EPA for MMI to implement the CD. Pursuant to the RDWP, MMI prepared a Preliminary Engineering Report (PER), dated May 21, 1993. This PER, presented the results of certain redesign studies and certain design criteria. Based on evaluation of the results of the pre-design studies documented in the PER and in the subsequent Report on Additional Field Scale Pilot Studies (dated July 23, 1993), MMI proposed a phased approach for the soil remedy.

EPA agreed to the phased approach on November 16, 1993. Phase I of the soil project for the site consisted of the pretreatment and storage stage of the remedy specified in the ROD and CD. This phase also included backfilling activities that were necessary to minimize adverse environmental impacts prior to implementation of Phase II. MMI prepared an Interim Remedial Action Design (IRAD) and Preliminary Remedial Action Plan (PRAP) to describe the Phase I remedial activities. The EPA conditionally approved both the IRAD and PRAP on June 29, 1994. Preparation of the site for Phase I activities began in February 1994 and was completed in July 1994. Phase I remediation began on August 1, 1994, and was suspended due to weather on October 14, 1994. Work performed during this period included excavation of affected soil, pretreatment of this soil, and storage of the pretreated soil for final treatment. Phase I activities performed during 1994 are documented in the Preliminary Interim Remedial Action Statement of Completion Report submitted to EPA in February 1995. Phase I remediation resumed in May 1995 and was completed by mid-August 1995.

Phase II of the project was the Final Remedial Action for the Site and consisted of off-site incineration of affected materials and Site closure, excluding ground water issues. The ROD and CD specified onsite incineration for the remedy for affected materials at the Site. However, due to changes in conditions since entry of the ROD and CD, MMI and EPA agreed that off-site incineration was a more appropriate remedy. To document the change in the final remedy, EPA prepared an Explanation of Significant Difference (ESD) that was signed by the Regional Administrator on June 14, 1995. The soil remediation project was completed December 13, 1995.

Although none of the domestic or municipal wells sampled during the study contained confirmed evidence of wood-treatment compounds, an extension to the Omaha municipal water line was constructed in 1991 to provide city water to designated residences down gradient from the site as a safeguard. As set forth in the CD and based on the results of a dye tracing study, the springs were sampled quarterly for four years after the soil remediation was completed. In addition, an ozone pilot system was installed in April 1997. Based on the results of the pilot study, the treatment system was upgraded in 1997 and a new, higher capacity system was installed in 1999. A second ozone injection pilot study was conducted from December 2005 through August 2009 with the goal of accelerating the reduction of residual PCP in the subsurface between the site and New Cricket Spring. Non-ozonated water continues to be injected in the vicinity of the sinkhole as a means of continued flushing and to facilitate efficient operation of the treatment system at New Cricket Spring.

IV. Remedial Actions

A. Remedy Selection

Soil Remedy

The EPA Regional Administrator for Region 6 signed the Record of Decision (ROD) on September 28, 1990. The ROD stated that all site soil containing greater than 300 mg/kg PCP, greater than 20 µg/kg dioxin as 2,3,7,8 TCDD equivalents, or greater than 6.0 mg/kg carcinogenic polynuclear aromatic hydrocarbons as benzo(a)pyrene equivalents were to be incinerated onsite. However, final treatment of the contaminated material was changed to incineration at an offsite facility.

Ground water Remedy

As part of the ground water remedy, treatment at New Cricket Spring was required if, after two years following completion of the soil remedy, the water quality at the spring did not meet Arkansas Water Quality Standards. Since the spring continued to exceed standards after the two-year period, installation of a water treatment system was initiated.

The EPA determined that this remedy was protective of human health and the environment, attained federal and state requirements that are applicable or relevant and appropriate, was cost-effective compared to equally environmentally protective alternatives, and utilized permanent solutions and alternative treatment technologies to the maximum extent practicable.

B. Remedy Implementation

Mass Merchandisers, Inc. (MMI) managed the remedial activities. Roy F. Weston, Inc., provided oversight for the EPA during the implementation of the soil remediation. The remedial actions were completed in phases.

a. Soil Remediation

Near-surface soils were contaminated by the former use of creosote and PCP in the treatment processes. The 1990 ROD specified that all contaminated sludge and soil would be excavated, pre-treated onsite, and then incinerated onsite. Contaminated soils were defined as those soils containing contaminants greater than the following clean up goals: 300 mg/kg PCP, 6.0 mg/kg benzo-(a)-pyrene equivalents (c-PNAs), and 20 µg/kg tetracholorodibenzo-p-dioxin equivalents. The pretreatment step was anticipated to produce a coarse material fraction separate from the fine, affected soils. The 1990 ROD provided that the coarse material be tested and, if clean up goals were met, the material could be backfilled onsite. The 1990 ROD stipulated that coarse materials not meeting the clean up goals would be incinerated along with the fines.

Based upon information generated in the RI/FS, the 1990 ROD estimated the volume of contaminated soils to be about 20,000 cubic yards to an approximate depth of one to two feet on the main area of the site, and a depth of four to five feet in the railroad ditch area. The ROD estimated the volume of sludge in the railroad ditch area and material in the sinkhole totaled 425 cubic yards.

In order to optimize the design as well as the implementation of the soils remedy, the Remedial Design (RD) and Remedial Action (RA) activities outlined in the CD were completed in two phases. The CD Statement of Work (SOW) outlined the initial consideration of a phased approach, to be determined during the preliminary design (SOW, Section II (A)(21), p. 17). EPA approved a phased approach and detailed the split of remedial activities for each of 2 phases in correspondence with MMI dated November 16, 1993. EPA issued a fact sheet to describe the approved phased approach on May 6, 1994.

The phased approach allowed remedial activities to be started one year ahead of the original RD/RA schedule provided in the CD. Implementation of the phased RD/RA project also provided information which helped determine that the volume of affected fines was much less than that estimated in the ROD (3,500 cubic yards as compared to 7,000 cubic yards), prior to the completion of the remedial design for Phase II. This information was used to plan and complete an Explanation of Significant Differences (ESD) on June 14, 1995, which changed one aspect of the soil remedy. Rather than constructing an onsite incinerator, the small volume of fine material (and other affected debris) was shipped off-site for incineration and disposal.

The ESD provided resource savings for EPA and the PRP by completing the soils remedy two years ahead of the CD schedule and also eliminated the concerns about constructing an incinerator in close proximity to the Omaha school.

The Phase I RD/RA included excavation, pretreatment, and temporary storage of contaminated soil onsite. The Phase I RA was initiated in Spring 1994 and was completed in Summer 1995. The Phase II RD/RA included off-site incineration and site closure activities. The Phase II RA was initiated upon completion of Phase I and all soil remedial activities were completed on December 13, 1995. A total of approximately 8,700 cubic yards of soil was excavated and pretreated resulting in approximately 5,200 cubic yards of clean coarse material and 3,500 cubic yards of affected fine soil. The affected soil was transported offsite and incinerated.

b. Site Closure Activities

As a part of Site closure activities, MMI performed the following activities:

- Constructed a perimeter fence along the north boundary of the Site (the rest of the Site was fenced previously);
- Backfilled and regraded the remediated areas. An additional 600 cubic yards of topsoil was brought to the Site. Approximately 11,600 cubic yards of topsoil was used during the Site preparation period;
- Seeded the Site with a variety of grasses; and
- Completed a complete survey of the Site.

EPA, ADPCE, and MMI performed a final inspection on December 13, 1995. Site maintenance activities included inspecting the Site regularly to assess the condition of the vegetative cover, storm water ditches and perimeter fencing.

c. Ground water Remediation

A major conclusion from the Arkwood Remedial Investigation Report (April 4, 1990) concerning ground water was:

> "It was determined that the site is underlain by a shallow, unconfined karst aquifer within the St. Joe Formation. Water movement appears to be dominated by conduit flow through fractures and other features that have been widened and enlarged by solution activity. A diffuse flow component of the aquifer appears to transport water from zones of storage within the deeper residuum clays and subcutaneous zone to the larger conduit network. The apparent lack of a well-defined water table complicates the determination of aquifer characteristics such as flow direction, gradient and velocity. The presence of shallow ground water is intermittent and depends on the precipitation. During periods of heavy rain, the subsurface fractures are saturated. The affected ground water emerging from New Cricket Spring provides evidence to indicate that this spring is hydraulically downgradient of the Arkwood site and that it is formed by the only major conduit to which affected ground water has been shown to be converging. Pentachlorophenol (PCP) levels detected in New Cricket Spring have been found to range from 1.0 to 2.3 mg/l."

The 1990 ROD specified that New Cricket Spring would be monitored for two years following completion of the soil remedy. If the concentration of PCP did not meet the Arkansas Water Quality Standard via natural attenuation at the end of the two year monitoring period, treatment of the spring would be required.

During the intervening two years, the PCP concentrations at New Cricket Spring dropped significantly. However, since the levels remained above Arkansas Water Quality Standards, a pilot treatment system was installed in April 1997. The system was upgraded in late 1997 by the installation of an ozone diffuser and a stainless steel baffle system. In Fall 1999, a new, higher capacity treatment system was installed. An ozone injection pilot study was operated from December 2005 through August 2009 with a goal of accelerating the reduction of residual PCP in the subsurface between the Site and New Cricket Spring. From August 2009 to the present, non-ozonated water continues to be injected in the vicinity of the sinkhole as a means of flushing the ground water and facilitating the efficient operation of the treatment system at New Cricket Spring.

<u>Sampling of Springs</u>

Based on the dye tracing studies, four springs were identified for monitoring: New Cricket Spring, Walnut Creek Spring, Cricket Creek Spring, and Railroad Tunnel Spring. As shown in Table 2 below, these springs were sampled quarterly from 1996 through 1999 except during periods of insufficient flow. In 2000, spring sampling was reduced to only New Cricket Spring, since this is the only spring that continued to be contaminated with PCP. Monthly sampling was initiated in May 2000. Three samples are collected monthly at the site: one from the mouth of the spring, one from the weir, and a duplicate sample generally from the weir. The third sample is used by the laboratory to run their QA/QC analyses. Six surrogate compounds are evaluated for recovery as presented in the analytical reports attached to the monthly reports. Data from the sampling is shown in Table 2 and Figure 2.

Table 2
Spring Samples 1996 – 2010

Date	New Cricket Spring Flow GPM	Average GPM	New Cricket Spring PCP	Average PCP (ppb)
7/2/1996	112		688	
10/11/1996	2		651	
		57		**670**
1/20/1997	34		681	
3/16/1997	34		330	
7/18/1997	2		775	
9/30/1997	50		560	
		30		**586**
1/20/1998	42		561	
5/7/1998	65		196	
7/23/1998	3		561	
11/4/1998	8		570	
		30		**472**
1/29/1999	60		288	
7/12/1999	42		ND	
		51		**288**
3/8/2000	5		284	
5/15/2000	2		272	
6/23/2000	75		389	
7/28/2000	3		627	
8/20/2000	2		424	
9/25/2000	1		577	
10/26/2000	1		114	
11/27/2000	25		632	
		14		**415**
2/26/2001	3		338	
3/13/2001	3		376	
4/27/2001	3		349	
5/27/2001	2		388	
7/27/2001	48		560	
8/27/2001	6		372	
9/27/2001	2		895	
10/22/2001	6		275	
11/30/2001	28		441	
12/22/2001	60		114	
		16		**411**
1/28/2002	12		373	
2/21/2002	15		372	
3/8/2002	22		318	
3/22/2002	42		226	
4/22/2002	22		79	

5/28/2002	70		71	
6/26/2002	17		259	
8/2/2002	17		231	
8/27/2002	12		178	
9/25/2002	10		95	
10/28/2002	8		461	
12/7/2002	2		398	
12/29/2002	35		218	
		21		**255**
2/3/2003	7		340	
3/7/2003	35		228	
4/8/2003	12		274	
6/4/2003	42		147	
7/7/2003	9		220	
8/7/2003	10		221	
8/28/2003	6		71	
9/29/2003	2		534	
10/28/2003	24		200	
12/10/2003	21		150	
		18		**237**
1/3/2004	26		139	
2/3/2004	29		144	
3/3/2004	28		84	
4/3/2004	30		85	
5/5/2004	65		115	
5/15/2004	20		102	
6/9/2004	12		300	
6/30/2004	30		222	
8/9/2004	6		84	
9/3/2004			43	
				132
		27		
10/4/2004	12			
11/3/2004	94		155	
11/14/2004	26		75	
11/22/2004	28		75	
12/1/2004	35		72	
12/21/2004	9		253	
				134
		34		
1/3/2005	10		279	
2/3/2005	12		155	
3/1/2005	34		208	
4/4/2005	9		148	
4/25/2005	6		121	
5/3/2005	9		150	
6/2/2005	3		151	
6/20/2005	2		55	
7/13/2005	2		95	

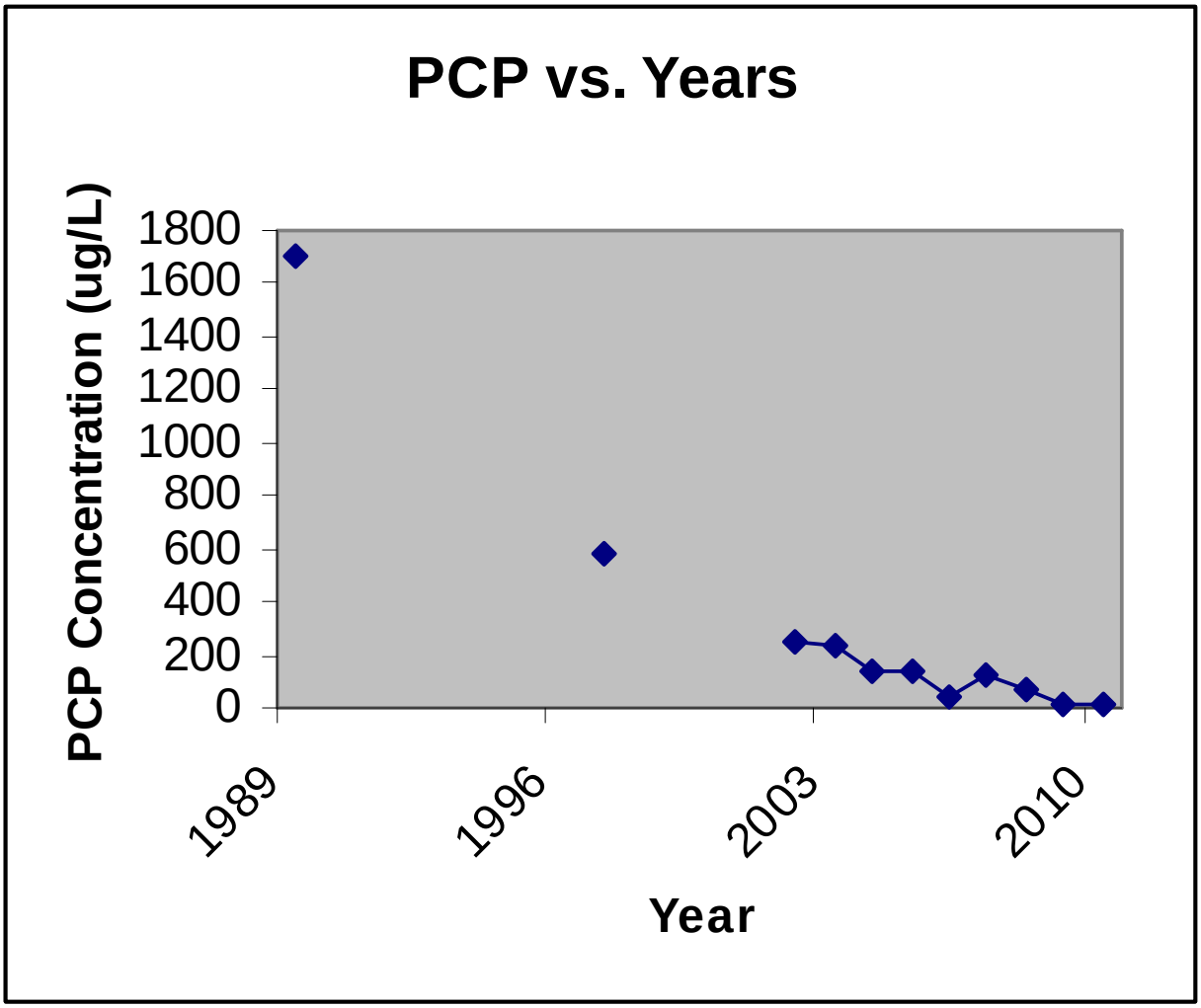
8/3/2005	12		85	
10/3/2005	27		63	
11/3/2005	6		278	
11/14/2005	6		15	
11/28/2005	8		47	
12/20/2005	27		7	
12/26/2005	27		11	
11/28/2005	8		47	
		10		**132**

1/2/2006	21	42
1/9/2006	20	32
1/16/2006	28	32
1/23/2006	33	16
1/30/2006	41	34
2/6/2006	38	<5.10
2/13/2006	34	24
2/20/2006	21	6
2/27/2006	26	20
3/6/2006	16	25
3/13/2006	57	107
3/20/2006	48	26
3/27/2006	27	4.09J
4/3/2006	24	11
4/10/2006	16	39
4/17/2006	22	8
4/24/2006	16	7
4/27/2006	50	11
4/29/2006	193	28
5/1/2006	94	23
5/8/2006	59	52
5/15/2006	22	15
5/22/2006	16	<5.00
5/30/2006	17	6
6/7/2006	3	253
6/12/2006	2	LE
6/19/2006	17	52
6/26/2006	17	75
7/5/2006	22	10
7/17/2006	17	22
8/7/2006	17	24
8/14/2006	17	<5.00
9/5-6/2006	23	7
9/18/2006	24	6
10/2/2006	24	17
10/16/2006	41	40
10/16/2006	81	92
10/18/2006	27	118
11/7/2006	41	53

11/20/2006	24		57	
11/30/2006	636		<50.0	
12/4/2006	59		<54.3	
12/6/2006	37		<52.6	
12/18/2006	21		24	
		47		**39**
1/8/2007	21		17	
1/22/2007	79		35	
2/5/2007	27		26	
2/19/2007	47		20	
3/5/2007	27		<5.00	
3/19/2007	25		NA	
4/9/2007	23		<5.00	
4/23/2007	30		7	
5/7/2007	21		2.90J	
5/21/2007	20		4.36J	
6/4/2007	20		<5.00	
6/18/2007	21		10	
7/9/2007	20		15	
7/23/2007	18		9	
8/6/2007	1		191	
9/10/2007	23		217	
9/24/2007	18		16	
10/10/2007	18		6	
10/22/2007	18		1190	
11/5/2007	18		209	
11/19/2007	18		20	
12/3/2007	18		20	
12/17/2007	32		87	
		24		**123**
1/7/2008	23		<5.00	
1/21/2008	23		58	
2/4/2008	24		52	
2/18/2008	83		57	
3/3/2008	580		<5.00	
3/17/2008	44		11	
4/7/2008	78		10	
4/12/2008	240		7	
4/13/2008	100		7	
4/14/2008	78		8	
5/10/2008	68		75	
5/27/2008	18		189	
6/9/2008	30		77	
6/23/2008	580		6	
7/7/2008	80		194	
7/10/2008	140		254	

7/21/2008	42		477	
8/4/2008	22		108	
8/18/2008	36		31	
9/1/2008	25		32	
9/22/2008	40		22	
10/6/2008	21		20	
10/20/2008	21		13	
11/3/2008	24		<5.00	
11/17/2008	30		28	
12/1/2008	24		12	
12/22/2008	24		<5.00	
		93		**76**
1/5/2009	32		7	
1/26/2009	27		<5.00	
2/9/2009	90		<5.00	
2/23/2009	31		6	
3/9/2009	30		6	
3/23/2009	30		<5.00	
4/6/2009	38		6	
4/20/2009	243		9	
5/4/2009	343		8	
5/18/2009	51		6	
6/8/2009	38		<5.00	
6/29/2008	25		9	
7/20/2009	47		39	
8/10/2009	24		31	
9/13/2009	22		8	
10/12/2009	104		21	
11/9/2009	45		<50	
12/7/2009	28		8	
		69		**13**
1/10/2010	42		13	
2/15/2010	87		11	
3/15/2010	35		<5.00	
4/15/2010	40		10	
5/17/2010	180		11	
6/13/2010	43		15	
7/8/2010	33		66	
8/19/2010	17		16	
9/21/2010	33		28	
10/18/2010	20		15	
11/20/2010	21		5	
12/16/2010	24		6	
		48		**18**

Figure 2a
New Cricket Spring
PCP Concentrations
1989-2010



PCP vs. Years

1989/1990≅1700	2006≅39
1996/1998≅581	2007≅123
2002≅255	2008≅76
2003≅237	2009≅13
2004≅134	2010≅18
2005≅132	

Figure 2b
New Cricket Spring
PCP Concentrations – Semi-Log
1989-2010

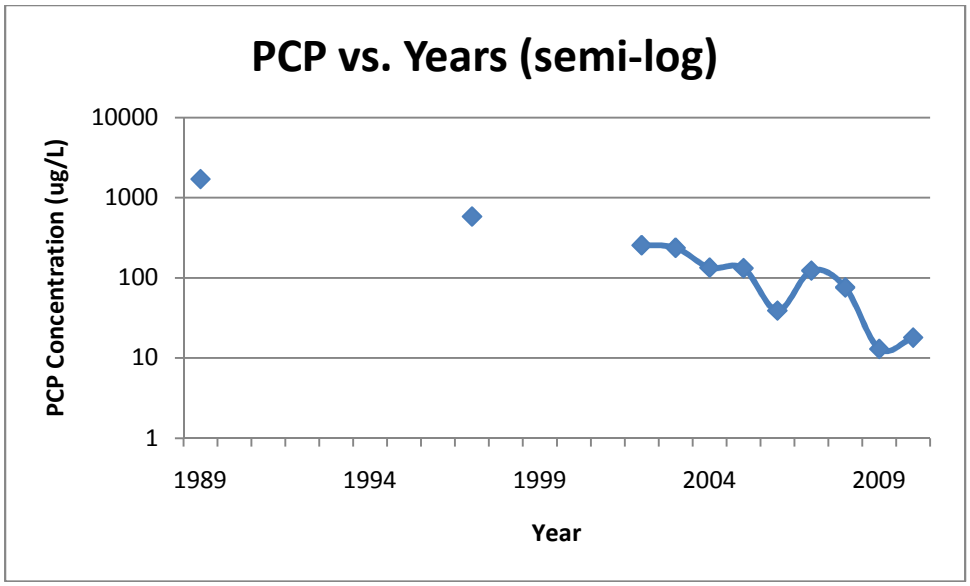


Table 3

New Cricket Spring

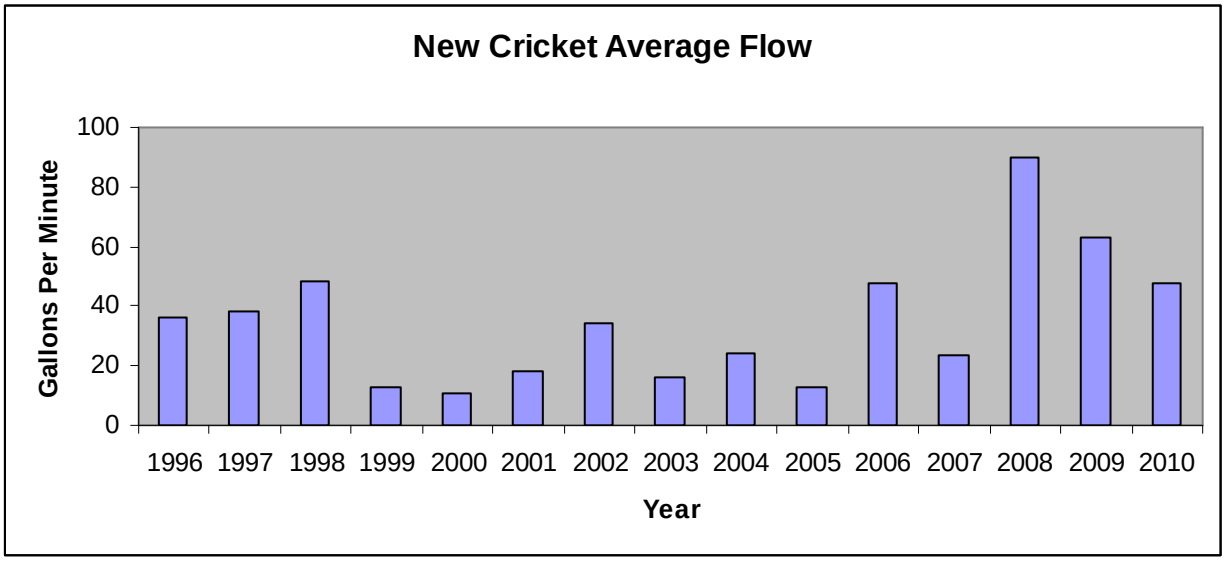
Average Flow Rates **1996 – 2010**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
JAN		29	179	3	10	7	16	26	24	16	27	50	23	30	42
FEB		104	76	2	3	50	16	19	30	28	30	37	54	61	87
MAR		115	127	8	2	14	63	24	27	22	37	26	312	30	35
APR		42	36	5	8	5	70	15	22	12	54	27	124	141	40
MAY	15	18	40	8	5	5	59	22	23	9	41	21	43	197	180
JUN	6	21	9	84	8	5	95	20	16	2	10	21	305	32	43
JUL	12	12	9	6	84	17	18	12	21	6	19	19	87	47	33
AUG	7	12	20	6	1	8	8	5	17	7	17	1	29	24	17
SEP	50	16	12	5	1	6	8	2	12	13	24	21	33	22	33
OCT	12	13	20	9	1	10	8	10	32	23	43	18	21	104	20
NOV	127	30	12	6	2	9	27	22	50	8	234	18	27	45	21
DEC	58	41	33	13	4	74	23	17	12	25	39	25	24	28	24
AVG	36	38	48	13	11	18	34	16	24	13	48	24	90	63	48

New Cricket Spring Flow Dynamics

The volume of water flow at New Cricket Spring has been measured over the past fifteen years. Flows vary from less than 1/2 gallon per minute (gpm) to over 1,000 gpm.

Figure 3



Treatment System Operations

The ground water treatment system is an ozone oxidation system. Ground water from the spring is piped to a sump adjacent to the treatment building. The treatment system is composed of an ozone generator and a mass transfer system. The mass transfer system is designed for injection of the ozone into the water stream and to allow for contact between the ozone and water streams. The mass transfer system has the capability for recirculation to allow for variable flow from the spring. The affected water is processed through the treatment system and the treated water is discharged over a weir into the receiving stream. The results of operational data for 2005 – 2010 are presented in Table 4.

Table 4: Ozone Injection Pilot Study

Date	Variables		Spring	PCP	
	Water Inj	O3 Inj	Flow	Mouth	Weir
12/8/05			5		
12/9/05	35		5		
12/14/05	35	1lb/10 g	21	28	
12/15/05	35	1lb/10 g	30/27	29.3	
12/20/05	36	1lb/10 g	27	7.39	<5.10
12/26/05	36	1lb/10 g	27	11.4	11.1
1/2/06	36	1lb/10 g	21	42.4	35.1
1/9/06	36	1lb/10 g	20	32.4	33
1/16/06	36	1lb/10 g	27.5	32.3	<5.00
1/23/06	36	1lb/10 g	34/32	15.9	<5.00
1/30/06	36	1lb/10 g	41	34.3	<5.00
2/6/06	36	1lb/10 g	38	<5.10	<5.00
2/13/06	36	1lb/10 g	34	23.9	<5.00
2/20/06	36	1lb/10 g	21	5.53	4.19J
2/27/06	36	1lb/10 g	26	19.9	<5.00
3/6/06	34	1-2lb/10 g	16	25.1	<5.00
3/13/06	33	1-2lb/10 g	57	107	<5.00
3/20/06	32	1-2lb/10 g	48	26.2	<5.00
3/27/06	32	1-2lb/10 g	27	4.09J	<5.00
4/3/06	34	2-3lb/10 g	24	11.3	<5.00
4/10/06	33	2-3lb/10 g	16.4	39.3	<5.00
4/17/06	34	2-3lb/10 g	22	7.94	7.82
4/24/06	35	2-3lb/10 g	16	7.0	<5.00
4/27/06	33	2-3lb/10 g	50	11.3	NA
4/29/06	33	2-3lb/10 g	193	28.2	NA
5/1/06	33	2-3lb/10 g	94	23.4	7.16
5/8/06	33	2-3lb/10 g	59	52.3	23.3
5/15/06	34	2-3lb/10 g	21.7	14.9	<5.00
5/22/06	34	2-3lb/10 g	16	<5.00	<5.00
5/30/06	34	2-3lb/10 g	16.7	5.64	<5.00

6/7/06	0	0	3	253	<5.00
6/12/06	0	0	2.19	LE	LE
6/19/06	34	0	16.7	52.1	14.3
6/26/06	34	0	16.7	74.7	<5.00
7/5/06	35	0	21.7	9.8	<5.00
7/17/06	34	0	16.7	21.9	4.01J
8/7/06	34	0	16.7	23.6	18
8/14/06	34	0	16.7	<5.00	5.22
9/5-6/06	34	0	23	6.57	<5.10
9/18/06	34	0	24	6.29	<5.00
10/2/06	34	0	24	16.8	<5.00
10/16/06	34	2-3lb/10 g	41	39.6	2.22J
10/16/06	34	5-6lb/10g	81	92.3	19.4
10/18/06	34	5-6lb/10g	27	118	<5.00
11/7/06	35	2-4lb/10g	41	52.7	4.70J
11/20/06	35	2-4lb/10g	24	57.4	<5.00
11/30/06	35	5-6lb/10g	636	<50.0	<5.00
12/4/06	35	5-6lb/10g	59	<54.3	<5.00
12/6/06	35	5-6lb/10g	37	<52.6	<5.00
12/18/06	35	2-3lb/10 g	21	24.1	<5.00
1/8/07	35	2-3lb/10 g	21	16.7	<5.00
1/22/07	35	2-3lb/10 g	79	34.6	<5.00
2/5/07	35	2-3lb/10 g	27	25.9	<5.00
2/19/07	35	2-3lb/10 g	47	19.6	<5.00
3/5/07	35	2-3lb/10 g	27	<5.00	<5.00
3/19/07	35	2-3lb/10 g	25	NA	NA
4/9/07	35	2-3lb/10 g	23	<5.00	<5.00
4/23/07	35	2-3lb/10 g	30	7.27	<5.00
5/7/07	35	2-3lb/10 g	21	2.90J	<5.00
5/21/07	35	2-3lb/10 g	20	4.36J	<5.00
6/4/07	35	2-3lb/10 g	20	<5.00	<5.00
6/18/07	35	0	21	9.62	<5.00
7/9/07	35	0	20	15.0	<5.00
7/23/07	35	0	18	8.65	<5.00
8/6/07	0	0	1	191	9.19

9/10/07	35	0	23	217	26.4
9/24/07	35	0	18	16.2	19.4
10/10/07	35	2-3lb/10 g	18	5.63	1.15J
10/22/07	35	2-4lb/10g	18	1190	53.7
11/5/07	35	2-4lb/10g	18	209	7.93
11/19/07	35	2-4lb/10g	18	19.8	24.1
12/3/07	35	2-4lb/10g	18	20.1	<5.00
12/17/07	36	2-4lb/10g	32	87.4	1.20J
1/7/08	36	2-4lb/10g	23	<5.00	<5.00
1/21/08	36	2-4lb/10g	23	58	<5.00
2/4/08	36	2-4lb/10g	24	52	<5.00
2/18/08	35	2-4lb/10g	83	57	15
3/3/08	35	5-6lb/10g	580	<5.00	<5.00
3/17/08	35	5-6lb/10g	44	11	<5.00
4/7/08	35	5-6lb/10g	78	10	<5.00
4/12/08	35	5-6lb/10g	240	6.5	NA
4/13/08	35	5-6lb/10g	100	6.8	NA
4/14/08	35	5-6lb/10g	78	8.2	NA
5/10/08	36	5-6lb/10g	68	75	<5.00
5/27/08	0	0	18	189	<5.00
6/9/08	35	2-4lb/10g	30	77	<5.00
6/23/08	35	2-4lb/10g	580	5.6	<5.00
7/7/08	35	2-4lb/10g	80	194	189
7/10/08	35	5-6lb/10g	140	254	20
7/21/08	35	5-6lb/10g	42	477	<5.00
8/4/08	35	2-4lb/10g	22	108	14
8/18/08	35	2-4lb/10g	36	31	<5.00
9/1/08	35	2-4lb/10g	25	32	<5.00
9/22/08	35	2-4lb/10g	40	22	<5.00
10/6/08	35	2-4lb/10g	21	20	<5.00
10/20/08	33	2-4lb/10g	21	13	<5.00
11/3/08	35	2-4lb/10g	24	<5.00	<5.00
11/17/08	35	2-4lb/10g	30	28	<5.00
12/1/08	35	2-4lb/10g	24	12	<5.00
12/22/08	33	2-4lb/10g	24	<5.00	<5.00

1/5/09	35	2-4lb/10g	32	7.3	<5.00
1/26/09	32	2-4lb/10g	27	<5.00	<5.00
2/9/09	33	2-4lb/10g	90	<5.00	<5.00
2/23/09	33	2-4lb/10g	31	6	<5.00
3/9/09	34	2-4lb/10g	30	5.7	<5.00
3/23/09	33	2-4lb/10g	30	<5.00	<5.00
4/6/09	32	2-4lb/10g	38	5.8	<5.00
4/20/09	32	2-4lb/10g	243	8.5	<5.00
5/4/09	33	2-4lb/10g	343	8.2	8.7
5/18/09	33	2-4lb/10g	51	6.2	<5.00
6/8/09	35	2-4lb/10g	38	<5.00	<5.00
6/29/08	33	2-4lb/10g	25	9.1	<5.00
7/20/09	32	2-4lb/10g	47	39	<5.00
8/10/09	32	2-4lb/10g	23.7	31	<5.00
9/13/09	32	0	22	8	<5.00
10/12/09	32	0	104	21	<5.00
11/9/09	32	0	45	<50	<5.00
12/7/09	32	0	28	8.2	<5.00
1/10/10	32	0	42	13	<5.00
2/15/10	32	0	87	11.1	<5.00
3/15/10	32	0	35	<5.00	<5.00
4/15/10	32	0	40	9.62	<5.00
5/17/10	32	0	180	11	<5.00
6/13/10	32	0	43	15	<5.00
7/8/10	32	0	33	66	<2
8/19/10	0-20	0	17	16.3	<5.00
9/21/10	34	0	33	28.2	<5.00
10/18/10	37	0	20	14.9	<10.00
11/20/10	37	0	21	4.89	<4.00
12/16/10	37	0	24	6,15	<5.00

NOTES: Flow rates in gallons per minute (gpm)
O3 injection rates in pounds per 10 gallons
PCP concentrations in parts per billion (ppb)
NA - not analyzed
LE - Lab Error - samples not usable

V. Five-Year Review Process

Shawn Ghose, the EPA Remedial Project Manager for the site, led the Arkwood, Inc., site Five-Year Review.

This Five-Year Review consisted of interviews, reviewing the data against established cleanup criteria, and an inspection of the site.

VI. Five Year-Review Findings

A. Interviews

Ms. Jean Mescher, Arkwood Project Coordinator and Director of Environmental Services at McKesson Corporation (former owners of MMI), was contacted as part of the third Five-Year Review. Ms. Mescher stated that the vegetative cover at the site is healthy. The site is inspected every week. The ground water treatment system located at the mouth of New Cricket Spring is operating well and is successfully meeting the established treatment goals. Ms. Mescher stated that there have been no complaints or inquiries concerning the site with the exception of an unauthorized temporary boat parking,

On February 16, 2011, Mr. Ghose interviewed Mr. Robert Ritchie on the phone (408-227-9398). Mr. Ritchie's house is located down slope from the capped area going towards New Cricket Spring. Mr. Ritchey bought the property at 660 Old Cricket Road, Omaha, AR in 1997 shortly after the remedy for the capped area was completed. Mr Ritchie reported "a lot of activity" on the capped area. Mr. Richie also reported that the McKesson Corporation site manager "comes and maintains the site at least twice a month." Mr. Ritchie indicated that he receives water from the city, as do his neighbors located down slope from the site.

On April 21, 2011, Mr. Ghose spoke with Ms. Gina Dunn of the City of Omaha Mayor's office. Ms. Dunn was aware that McKesson was performing the O&M activities at the site. She explained that she drives by the site on Cricket Road and used to be able to see the site from the road. Ms. Dunn indicated that the site is not visible from Cricket Road because the trees have grown. Ms. Dunn said that she is not aware of any complaints from the Cricket Road neighborhood about the site.

On April 12, 2011 the EPA and ADEQ had a teleconference with Kurt Grisham, representative of Mr Bud Grisham, land owner of the Arkwood Superfund Site. Participants on the teleconference were Jean Mescher representing McKesson Corporation (RP) and Tim Kresse, a consultant from USGS for EPA. Main topic of discussion was the long process of ground water cleanup at New Cricket Spring. Kurt Grisham believes that the cleanup of the ground water is almost complete and questioned some of the monitoring results from McKesson. Kurt Grisham believes EPA should consider deleting the Arkwood Site from the National Priorities List (NPL).

B. Site Inspection

Representatives of USEPA, ADEQ, and McKesson Corporation conducted an inspection of the site on February 23, 2011. The inspection included an evaluation of the surface condition, vegetation, storm water drainage system, buildings, perimeter fence, and gates. The ground water treatment facilities onsite and at the mouth of New Cricket Spring were also inspected.

The site was found to be in good condition. There was no evidence of topsoil erosion or surface cracks and the vegetative cover is healthy. The storm water drainage ditches were free from debris and in working order. Fences and gates are maintained and provide an adequate means to restrict access. The perimeter road was in good condition and there was no evidence of unauthorized access to the site.

The onsite treatment building and associated equipment as well as the pump house and equipment at the mouth of New Cricket Spring were all in good condition. The equipment was well maintained and in good working order. Monthly operational samples are collected at the mouth of New Cricket Spring and at the effluent point (weir) following treatment with ozone.

C. Risk Information Review

The following standards were identified as Applicable or Relevant and Appropriate requirements (ARARs) in the Record of Decision. The standards were reviewed for changes that could affect the protectiveness of the remedy.

<u>Federal</u>

Resource Conservation and Recovery Act
Comprehensive Environmental Response, Compensation, and Liability Act
Superfund Amendments and Reauthorization Act

<u>State</u>

Arkansas Water Quality Standards

ADPCE Regulation 2 sets a water quality standard for PCP based on pH. Based on ADPCE Regulation 2 and as calculated by Masoud Arjmandi of ADPCE (now ADEQ) (see Attachment 1), the State Water Quality Standards for pentachlorophenol at the point of discharge are currently 9.3 µg/l and 18.7 µg/l for monthly averages and daily maximums, respectively.

The Arkwood, Inc. Site continues to be in compliance with the Federal and State ARARs. The remedial action involved excavation and transportation of affected soils to an offsite incinerator. Affected ground water is treated at New Cricket Spring to Arkansas Water Quality Standards.

EPA's dioxin reassessment has been developed and undergone review over many years with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. The results of the assessment have currently not been

finalized or adopted into state or federal standards. Therefore, the dioxin toxicity reassessment for this Site will be updated during the next Five Year Review.

D. Data Review

A review of records and monitoring reports through December 2010 indicates that the concentration of PCP emanating from New Cricket Spring has decreased significantly since the soil remediation was completed. It is anticipated that the PCP concentration will continue to attenuate over time. In the meantime, ground water discharges at New Cricket Spring are collected and treated to Arkansas Water Quality Standards.

VII. Assessment

The following conclusions support the determination that the implemented remedy at the Arkwood, Inc. Site is continuing to be protective of human health and the environment.

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

Institutional Controls and Other Measures: The property owner has filed a Deed Restriction which provides a notice of residual contamination and maintenance requirements remaining at the Site. The property owner will be revising the Deed Restriction to correct minor errors in the metes and bounds and to provide an additional notice that the Site is zoned for industrial use only. There are no changes or planned changes in land use. The ground water exiting New Cricket Spring is being treated until it meets the ADEQ water quality standard for PCP.

Remedial Action Performance: The soil remediation, including excavation and offsite incineration of the contaminated soil and capping of the remaining soil, has been effective in minimizing the potential for dermal contact with the site contaminants and has removed the source of ground water contamination. The ground water treatment system located at the mouth of New Cricket Spring is effective in reducing PCP concentrations to below ADEQ water quality standards.

Operations and Maintenance (O&M): Ground water treatment system operations are conducted by an environmental contractor, James E. Fleer, Principal Engineer, Oxford Environmental and Safety, Inc. The contractor is responsible for maintaining the ground water treatment system and collecting monthly operational samples, as well as inspecting the site fencing, vegetative cover, storm water drainage system and buildings.

Early Indicators of Potential Remedy Failure: There is no indication of remedy failure. The site is inspected on a regular basis and operation and maintenance activities of the ground water treatment system are monitored daily.

Question B: Are the assumptions used at the time of remedy selection still valid?

Changes in Standards To Be Considered: This Five-Year Review did not identify any changes in Federal or State standards that impact the soil or ground water remedies at the Arkwood, Inc. The site currently meets the State Water Quality Standards for PCP of 9.3 µg/l (monthly average) and 18.7 µg/l (daily maximum).

Changes in Exposure Pathways: This five-year review did not identify any changes in exposure pathways since the completion of the soil remediation. The filed Deed Restriction, when revised to correct the minor errors in the metes and bounds description and to provide notice that the Site is zoned for only industrial use, will be effective in preventing any current or planned changes in land use. Access to the remediated area is restricted because of fencing, signs and locked gates. There is no indication that the treated wastes were not properly characterized, removed and treated during the soil remediation. There is no indication that the ground water hydrology was not adequately characterized prior to the implementation of the ground water remedy.

Changes in Toxicity and Contaminant Characteristics: The cleanup levels for PCP, c-PNAs, and dioxin have not changed since the last Five-Year Review. EPA's dioxin reassessment has been developed and undergone review over many years with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. The Agency followed current cancer guidelines and incorporated the latest data and physiological/biochemical research into the assessment. The results of the assessment have currently not been finalized or adopted into State or Federal standards. In addition, EPA/OSWER has proposed to revise the interim preliminary remediation goals (PRGs) for dioxin and dioxin-like compounds based on technical assessment of scientific and environmental data. However, EPA has not made any final decisions on interim PRGs at this time. Therefore, the dioxin toxicity reassessment for this Site will be updated during the next Five Year Review. As long as the Site cap remains undisturbed, the Site is protective of human health and the environment and the remedy selection is still valid.

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

No additional information has been identified that questions the protectiveness of the remedy.

VIII. Deficiencies

The property owner recorded a Deed Restriction notice in August 2010. The property owner has agreed to correct minor errors in the metes and bounds description in the restriction and to add a notice that the Site is zoned for industrial use only within 12 months of this review.

IX. Recommendations and Follow-up Actions

As noted above, the property owner has agreed to correct minor errors in the metes and bounds description in the restriction and to add a notice that the Site is zoned for industrial use only within 12 months of this review.

X. Protectiveness Statements

The remedies that were implemented for soil and ground water at the Arkwood, Inc. Site continue to be protective of human health and the environment. Since the remedies for soil and ground water are protective of human health and the environment, the remedy for the Site is protective of human health and the environment.

Soil Remedy

The remedy that was implemented for the affected soils is protective of human health and the environment. The excavation and offsite incineration of the affected soil has been effective in preventing exposure due to direct contact and fugitive dust and has improved ground water conditions by removing source material. The Deed Restriction provides notice of the residual contamination remaining on the Site. The property owner will revise the Deed Restriction to correct minor errors in the metes and bounds description and to provide notice that the Site is zoned for industrial use only The Deed Restriction will ensure that the remedy will remain protective and provide notice of Site conditions for future property owners. Perimeter fencing, locks and signs are in place and are effective in preventing unauthorized entry or use of the Site. The surface vegetation at the Site is in good condition and is inspected and maintained on a regular basis.

Ground water Remedy

The remedy that was implemented for the ground water is protective of human health and the environment. The ground water continues to be collected and treated to ADEQ water quality standards at the mouth of New Cricket Spring. Non-ozonated water continues to be injected in the vicinity of the sinkhole to flush the ground water and facilitate the efficient operation of the treatment system at New Cricket Spring. Also, since the affected soil at the Site has been removed, the ground water should continue to attenuate naturally over time

XI. Next Five-Year Review

The next five-year review will be conducted in 2016. The scope of the next review may be limited to an inspection of the Site to ascertain that the surface vegetation and topsoil cap continue to be in good condition and an inspection of the ground water treatment system to ensure that it is in good working order.

Attachment 1
Arkansas Water Quality Standards Calculations

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL & ECOLOGY
HAZARDOUS WASTE DIVISION
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501)682-0744 FAX: 682-0880

January 30, 1998

RECEIVED
FEB 0 9 RECD
ENV. & ENG SERVICES

Jean Mescher, Project Coordinator
Director, Environmental Services
McKesson Corporation
One Post Street
San Francisco, CA 94104-5296

RE: New Cricket Spring
Arkwood Superfund Site, Omaha, Arkansas

Dear Ms. Mescher:

Based on pH of 7.38 for the nearest station to the New Cricket Spring (Station WHI67), the State Water Quality Standards for pentachlorophenol (PCP) at the point of discharge are as follows:

1. Monthly average: 9.3 μg/l
2. Daily Maximum: 18.7 μg/l

Moreover, pH values of the treated water of the New Cricket Spring shall not be below 6.0 or above 9.0

If you have any questions, please call me at (501) 682-0852.

Sincerely,

Masoud Arjmandi
Engineer II, Superfund Branch

cc: Mike Bates, Chief, HWD
Jean Koeninger, Superfund Branch Manager, HWD
Kin Siew, Engineer Supervisor, Superfund Branch, HWD
Mo Shafii, Engineer II, NPDES Branch, WD
Cynthia J. Kaleri, Project Manager, EPA Region 6 (6SF-LP)

Attachment 2
Documents Reviewed

DOCUMENTS REVIEWED

Arkwood, Inc. Site, Activity Report, July 1996 – September1997, R2P5 Environmental Remediation, Inc., October 1997.

Arkwood, Inc. Site, Activity Report, July 1997 – September 1998, R2P5 Environmental Remediation, Inc., October 1998.

Arkwood, Inc. Site, Activity Report, July 1998 – September 1999, R2P5 Environmental Remediation, Inc., November 1999.

Arkwood, Inc. Site, Activity Report, July 1999 – September 2000, R2P5 Environmental Remediation, Inc., November 2000.

Arkwood, Inc. Site, Activity Report, October 2000 – September 2001, R2P5 Environmental Remediation, Inc., November 2001.

Arkwood, Inc. Site, Activity Report, October 2001 – September 2002, R2P5 Environmental Remediation, Inc., November 2002.

Arkwood, Inc. Site, Activity Report, October 2002 – September 2003, R2P5 Environmental Remediation, Inc., November 2003.

Arkwood, Inc. Site, Activity Report, October 2003 – September 2004, R2P5 Environmental Remediation, Inc., January 2005.

Arkwood, Inc. Site, Activity Report, October 2004 – September 2005, R2P5 Environmental Remediation, Inc., January 2006.

Arkwood, Inc. Site, Activity Report, October 2005 – September 2006, R2P5 Environmental Remediation, Inc., November 2003.

Arkwood, Inc. Site, Activity Report, October 2006 – September 2007, R2P5 Environmental Remediation, Inc., January 2005.

Arkwood, Inc. Site, Activity Report, October 2007 – December 2008, R2P5 Environmental Remediation, Inc., January 2006.

Arkwood, Inc. Site, Activity Report, January 2009 – December 2009, R2P5 Environmental Remediation, Inc., January 2006.

Corrected Consent Decree, United States of America, Plaintiff, v. Mass Merchandisers, Inc., Defendant, September 23, 1992.

Explanation of Significant Differences, Arkwood, Inc. Site, Environmental Protection Agency Region 6, June 14, 1995.

Interim Remedial Action Design, Arkwood, Inc. Site, The Forrester Group, June 29, 1994.

Preliminary Engineering Report, Arkwood, Inc. Site, The Forrester Group, May 21, 1993.

Preliminary Remedial Action Plan, Arkwood, Inc. Site, The Forrester Group, June 29, 1994.

Record of Decision, Arkwood, Inc. Site, Environmental Protection Agency, Region 6, September 28, 1990.

Report on Additional Pilot Scale Field Studies, Arkwood, Inc. Site, The Forrester Group, 7/23/93.

Site Closeout Report, Arkwood, Inc. Site, The Forrester Group, July 1996.

Attachment 3
Photographic Log – Site Inspection

Photographic Log
Arkwood Superfund Site
Five Year Review Site Visit
February 23, 2011

Figure 1-Grass cover over soil remediation area.

Figure 2-Injection system skid.

Figure 3 -Injection well field.

Figure 4 - Mouth of New Cricket Spring.

Figure 5 - Treatment system instrumentation equipment.

Figure 6 - Site security camera.

Attachment 4
Site Inspection Form

Arkwood Site Inspection Checklist
Five-year Review

Performed By: Shawn Ghose

Date of Inspection: Feb 23, 2011 Temperature: 45°F % Cloud cover: ~50% Inches of snow: —

Site Inspection:

For each item listed below, identify if the item is in good condition or needs maintenance and performing adequately or needs repair, adjustment or upgrade. Comments are required for each item designated as needing maintenance, repair, adjustment or upgrade.

	Condition:		Performance:			
Site conditions observed:	Good	Maintenance needed	Adequate	Repair	Adjustment	Upgrade
Fencing:	✓		✓			
Signage:	✓		✓			
Buildings and improvements	✓		✓			
General site conditions	✓		✓			
Cover:						
Erosion	✓		✓			
Cracking	✓		✓			
Vegetative Cover	✓		✓			
Groundwater Injection:						
Withdrawal wells	✓		✓			
Injection wells	✓		✓			
Related equipment and systems	✓		✓			
Surface Water Treatment:						
Ozone generation	✓		✓			
Treatment train	✓		✓			

Comments:

Arkwood Site Inspection Checklist
Five-year Review

Documentation review:

For each documentation item listed below, identify if the documentation is readily available and up-to-date. Comments are required for each item identified as not meeting expectations.

Documentation reviewed:	Readily available: Yes	Readily available: No	Up-to-date: Yes	Up-to-date: No
Training records:				
Hazwopper update:	✓		✓	
Health and safety plan	✓		✓	
Access/Sign-In logs	✓		✓	
Operation and maintenance documentation:				
O&M manual	✓		✓	
As-built drawings	✓		✓	

Comments: _____