Second Five-Year Review Report
For

Arkwood, Inc. Site
Boone County
Omaha, Arkansas



February 2006

Prepared By
Region 6

United States Environmental Protection Agency
Dallas, Texas

956554



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

This memorandum documents EPA's approval of the Arkwood Second Five-Year Review Report prepared by McKesson Corporation (McKesson) on behalf of EPA.

Summary of Five-Year Review Findings

Arkwood was a wood treating site where wood treating fluids contaminated the soil. The remedy was implemented in phases. Phase I was pretreatment and storage of contaminated soil to implement the remedy specified in the ROD, and backfilling with clean soil to minimize environmental impact. Phase II was separation of contaminated soil from rock fragments and off-site incineration of the soil fines. The above procedure was followed by placement of clean topsoil and seeding. The remediation area is fenced with signs and locked gates. The groundwater exits about ¼-mile downgradient of the wood treating area at New Cricket Spring. Pentachlorophenol (PCP) concentration at New Cricket Spring has decreased significantly since the soil remedy was completed. As a part of the groundwater remedy, water at New Cricket Spring is treated by an ozone oxidation process to destroy the PCP contamination of the groundwater. The groundwater treatment installed in 1997 was upgraded in 1998 and 1999 and is able to destroy PCP in the water to the level set by Arkansas Department of Environmental Quality (ADEQ) (18.7 ppb daily maximum). The ozone injection system has reduced PCP concentration in New Cricket Spring by 93 percent. However, the PCP values have reached a plateau of 130 ppb (approximate average). In late 2005, McKesson installed two injection wells near the sink hole where wood treating wastes were disposed of. The sink hole is hydraulically connected to New Cricket Spring through subsurface fractures. Injection of ozonated water into the two wells is expected to destroy residual PCP in the subsurface fractures thus cleaning up New Cricket Spring permanently.

Actions Needed

No major deficiencies were noted. To ensure future protectiveness, a deed restriction will be filed by McKesson to protect the existing cap and provide notice that the remediated area is zoned for industrial use. In addition, the groundwater treatment system should continue until water exiting the New Cricket Spring meets ADEQ Water Quality standard for PCP for the Arkwood 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 Second Five-Year Review Report are addressed as described above.

John Q. Hepola, for

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

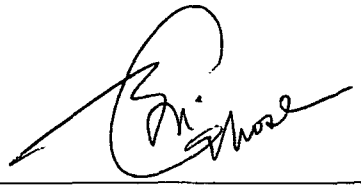
3/31/06
Date

CONCURRENCES

SECOND FIVE YEAR REVIEW

for the

Arkwood Site



2-24-06

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List of Acronyms

ADEQ	Arkansas Department of Environmental Quality
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
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 second five-year review for the Arkwood, Inc. Site (Site) located in Boone County in Omaha, Arkansas. The review was conducted from October 2005 through December 2005. 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 topsoil and seeding. The vegetation is in good condition. The groundwater treatment system, located immediately downgradient of the mouth of New Cricket Spring, is functioning as designed and is meeting treatment goals. Therefore, the remedies that were implemented for soil and groundwater at the Site continue 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 affected soil was excavated and pretreated. The affected fine-grained soils were separated from the gravel component and transported offsite for incineration. Verification sampling was conducted to ensure that the affected soil had been removed. The excavations were backfilled with clean materials, topsoil was placed over the clean materials and the 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.

Groundwater Remediation

The remedy that was implemented for the groundwater 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 (Site soils) no longer exists, the groundwater continues to be impacted by residual contaminants in the subsurface fractures and channels. The groundwater contaminants will continue to naturally attenuate over time.

The region in which the Site is located has experienced drought conditions for the past several years. The result is that New Cricket Spring flows are lower than normal making it difficult to obtain high flow data. However, the existing data confirm that the treatment system is effectively removing contaminants from the water. McKesson installed an ozone injection pilot in December 2005. The ozone injection system consisted of two wells approximately 25 and 50 feet from the sinkhole where the wood treatment wastes were disposed of. Previous tests indicated that the well locations were connected to the New Cricket Spring through fractures. The idea is to inject ozonated

water through these two wells to destroy residual PCP in the subsurface fractures and permanently clean up New Cricket Spring.

Five Year Review Summary Form

SITE IDENTIFICATION				
Site Name: Arkwood, Inc. Site				
EPA ID: AKD084930148				
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.				
Author Title: Remedial Project Mgr	**Author Affiliation: EPA**			
Review Period: 3/2001 to 2/2006				
Date(s) of site inspection: 12/14/05 by 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: 3/2001 (First Five Year Review)				
Due date (five years after triggering action date): 3/06				

Five Year Review Summary form

Deficiencies

The following deficiency was identified:

- Limited high flow (storm) data due to regional drought conditions.

This deficiency does not cause the remedy to be unprotective.

Recommendations and Follow-up Actions

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

- High flow (storm) data will continue to be collected, whenever feasible, to verify the effectiveness of the treatment system.

Protectiveness Statements:

The remedial actions for the soil and groundwater 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 anticipated; a deed restriction will be filed to provide notice of the remedy and the industrial use zoning. The perimeter fence has been effective in preventing unauthorized access to the Site.

Arkwood, Inc. Site
Second Five-Year Review Report

I. Introduction

EPA Region 6 has conducted a second five-year review of the remedial actions implemented at the Arkwood, Inc. Site located in Omaha, Boone County, Arkansas. This review was conducted from October 2005 through December 2005, and this report documents the results of the review. This second five-year review was conducted to satisfy statutory requirements, and documents the remedy to be protective of human health and the environment. This five-year review documents methods, findings and conclusions. The report identifies deficiencies found during the review, and provides recommendations to address them.

This is the second five-year review for the Site. The first five-year report was completed in March 2001. The statutory reason for continuing with the five-year reviews is the fact that the soils were remediated to industrial clean up standards which are above levels that allow for unrestricted use and unlimited exposure. In addition residual contaminants remain in the subsurface fractures for which groundwater treatment is ongoing at New Cricket Spring.

II. Site Chronology

Table 1: Chronology of Site Events

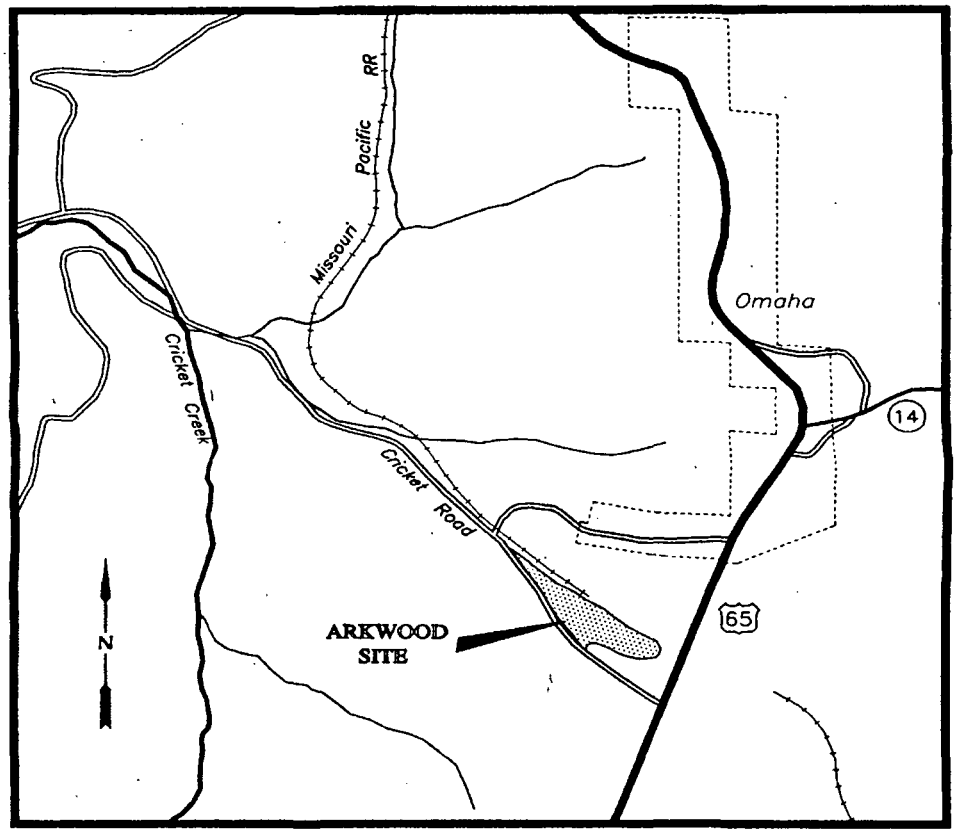
Date	Event
1962	Arkwood, Inc. commences wood-treating operations.
1973	Mass Merchandisers, Inc. (MMI) takes over operation of the plant under a lease agreement with the owner.
1981	Arkansas Department of Pollution Control and Ecology (ADEQ) receives a complaint about potentially affected water in the railroad tunnel.
1981 – 1985	Preliminary investigations by ADEQ 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	Initiate ozone injection pilot system.

III. Background

A. Location

The Arkwood, Inc. Site is located in Omaha in Section 27, T.21N., and R.21W., in Boone County, Arkansas. The Site is approximately one-half mile southwest of Omaha, Arkansas, and lies to the west of U.S. Highway 65 (see Figure 1 below). The Site is a 15-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 impacted by the former wood-treating operations that used creosote and pentachlorophenol 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, is affected 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 Arkwood Site. To the east, down the valley, 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 pentachlorophenol (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, 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 though 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.

ADEQ initially received a complaint about the Site in 1981. Preliminary investigations revealed detectable levels of PCP in area groundwater. In 1985, EPA proposed that the Site be added to 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 of EPA Region VI 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 affected with pentachlorophenol (PCP), polynuclear aromatic hydrocarbons (PNAs), and dioxin. Affected materials were defined as "all Site materials that contain greater than 300

mg/kg PCP, greater than 20 μg/kg dioxin as 2,3,7,8-TCDD equivalents (dioxin), or greater than 6.0 mg/kg carcinogenic polynuclear aromatic hydrocarbons (c-PNAs) 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 predesign 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 as presented in correspondence from Cynthia J. Kaleri, the former EPA Remedial Project Manager for the Site. 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. Phase I 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 groundwater 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 Site 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 the Dye Tracing Study, spring sampling was conducted quarterly for four years after the soil remediation was completed. In addition, an ozone pilot system was installed in April 1997 and data was collected during varying flow events and equipment settings. Based on the results, the treatment system was upgraded in 1997 and a new, higher capacity system was installed in 1999. An ozone injection pilot study was initiated in December 2005 to evaluate the potential for accelerating reduction of residual PCP in the subsurface between the Site and 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 materials 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 defined as affected and would be incinerated onsite. However, based on additional studies, final treatment of the affected material was changed to incineration at an offsite facility.

Groundwater Remedy

As part of the groundwater remedy, treatment at New Cricket Spring was required if after two years following completion of the soils 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 these alternatives were protective of human health and the environment, attained federal and state requirements that are applicable or relevant and appropriate, were cost-effective compared to equally environmentally protective alternatives, and utilized permanent solutions and alternative treatment technologies to the maximum extent practicable.

B. Remedy Implementation

MMI managed the full remediation activities. Roy F. Weston, Inc. provided oversight for the EPA during the implementation of the soil remediation. The Remediation Actions were completed in phases.

a. Soil Remediation

Near-surface soils were impacted by the former wood treating operations that used creosote and pentachlorophenol in the processes. The 1990 ROD specified that all sludges and affected soils would be excavated, pre-treated onsite, and then incinerated onsite. Affected soils were defined as those soils containing contaminants greater than the clean up goals. Clean up goals included the following: 300 mg/kg PCP, 6 mg/kg benzo-(a)-pyrene equivalents (c-PNAs), and 20 μg/kg tetracholorodibenzo-p-dioxin equivalents (dioxin). 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 that affected soils totaled about 20,000 cubic yards to an approximate depth of one to two feet on the main area of the Site, and four to five feet in the railroad ditch area. The 1990 ROD estimated that sludges 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 correspondence with MMI dated November 16, 1993, approved a phased approach and detailed the split of remedial activities for each of 2 phases. 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 soils remedy. Rather than constructing an onsite incinerator, the small volume of fines (and other affected debris) could be shipped off-site for incineration and disposal.

The ESD provided resource savings for EPA and the PRP in completing the soils remedy two years ahead of the CD schedule and 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 onsite. The Phase I RA was initiated in the spring of 1994 and was completed in the summer of 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 in addition to the approximately 11,000 cubic yards of topsoil stockpiled during the Site preparation period;
- The Site was seeded with a variety of grasses; and
- A complete survey of the Site was completed.

EPA, ADEQ 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. Groundwater Remediation

A major conclusion from the Arkwood Remedial Investigation Report prepared April 4, 1990 concerning ground water is quoted as:

> "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 flow direction, gradient and velocity. The affected ground water emerging from New Cricket Spring provides evidence to indicate that this spring is hydraulically down gradient of the Arkwood site and that it is formed by the only major conduit to which affected groundwater 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 soils 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/early 1998 by installation of an ozone diffuser and a stainless steel baffle system. In the fall of 1999, a new higher capacity treatment system was installed. An ozone injection pilot study was initiated in December 2005 to evaluate the potential for accelerating reduction of residual PCP in the subsurface between the Site and New Cricket Spring.

Sampling of Springs

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 year 2000, spring sampling was reduced to only New Cricket Creek since this is the only spring that continues to be impacted with PCP. Monthly sampling was initiated May 15, 2000. Data from the sampling from 1996 to 2005 is shown in Table 2 and Figure 2.

Table 2

Spring Samples 1996 – 2005

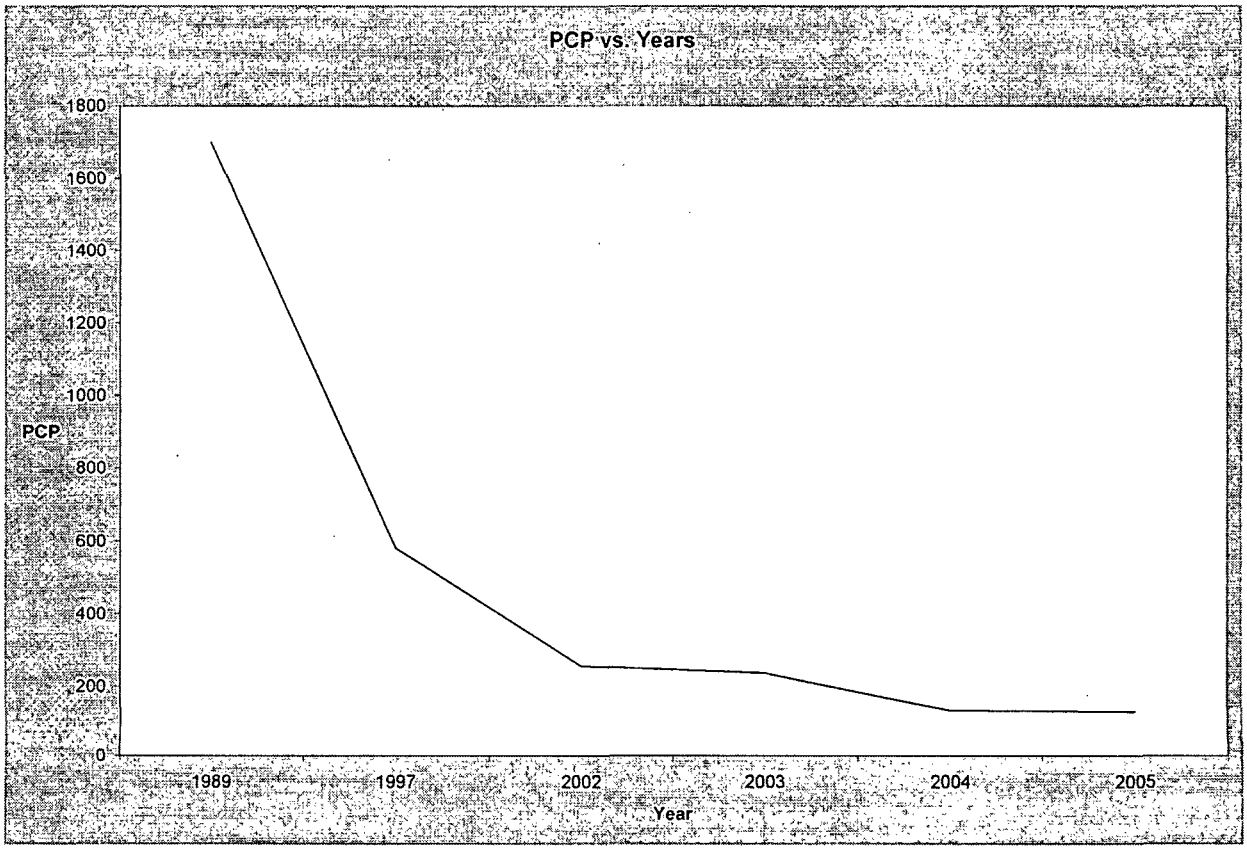
Date	New Cricket Spring Flow GPM	Average GPM	New Cricket Spring PCP	Average PCP
7/2/1996	112		688	
10/11/1996	2		651	
		57		**670**
1/20/1997	34		681	
3/16/1997	34		330	
7/18/1997	2		775	
9/30/1997	50		560	
		30		**586**
1/20/1998	42		561	
5/7/1998	65		196	
7/23/1998	3		561	
11/4/1998	8		570	
		30		**472**
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**

Date	New Cricket Spring Flow GPM	Average GPM	New Cricket Spring PCP	Average PCP
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**

Date	New Cricket Spring Flow GPM	Average GPM	New Cricket Spring PCP	Average PCP
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	
		27		**132**
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	
		34		**134**
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	
		10		**132**

Figure 2
1989-2005



PCP vs. Years
1989/1990≅1700
1996/1998≅581
2002≅255
2003≅237
2004≅134
2005≅132

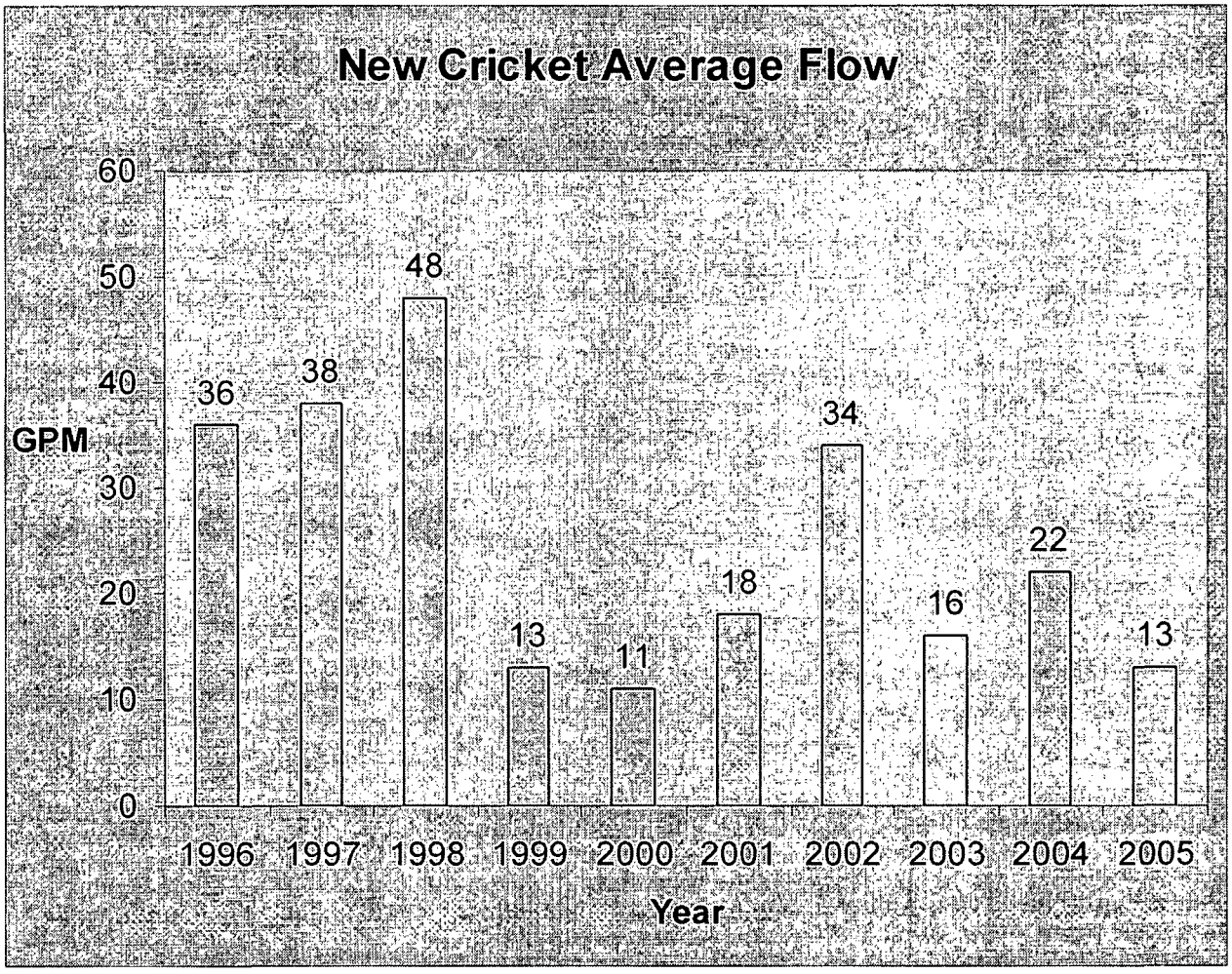
New Cricket Spring Flow Dynamics

The volume of water flow at New Cricket Spring has been measured over the past ten years. Flows vary from less than 1/2 gallon per minute (gpm) to over 1,000 gpm. From the spring of 1999 though summer 2000, a drought affected the mid-west and south-eastern United States. Spring flows recovered briefly during 2002. However, it appears that the effect of drought years has returned as the flows for 2003 and 2004 are significantly lower that those recorded during 1996 through 1998. Table 3 and Figure 3 below present average monthly and yearly spring flows for the past ten years.

Table 3
New Cricket Spring
Average Flow Rates **1996 – 2005**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
JAN		29	179	3	10	7	16	26	24	16
FEB		104	76	2	3	50	16	19	30	28
MAR		115	127	8	2	14	63	24	27	22
APR		42	36	5	8	5	70	15	22	12
MAY	15	18	40	8	5	5	59	22	23	9
JUN	6	21	9	84	8	5	95	20	16	2
JUL	12	12	9	6	84	17	18	12	21	6
AUG	7	12	20	6	1	8	8	5	17	7
SEP	50	16	12	5	1	6	8	2	12	13
OCT	12	13	20	9	1	10	8	10	32	23
NOV	127	30	12	6	2	9	27	22	50	8
DEC	58	41	33	13	4	74	23	17	12	
AVG	36	38	48	13	11	18	34	16	24	13

Figure 3



Treatment System Operations

The groundwater treatment system is an ozone oxidation system. Groundwater from the spring is piped to a sump adjacent to the treatment building. The treatment system is composed of an ozone generator and two mass transfer systems. The two mass transfer systems are designed to accommodate low flow rates with the small skid, medium flow rates with the large skid, and high flow rates with both skids operating in parallel. The affected water is processed through the treatment system and the treated water is discharged over a weir into the receiving stream. Table 4, below, presents the results of operational data for 2000 -2005.

TABLE 4
Treatment System Operation

Date	Ozone # / Day	Flow	PCP NCS (A)	PCP WEIR (B)
8/25/2000	0.5	2	424	ND
9/25/2000	0.5	1	577	ND
10/26/2000	0.5	1	114	ND
11/27/2000	2.1	25	632	ND
2/26/2001	0.5	3	338	ND
3/13/2001	0.5	2.5	376	10.8
4/27/2001	0.5	2.5	249	ND
5/27/2001	0.5	2	388	5.96
7/27/2001	2.2	48	560	ND
8/27/2001	2.2	6	372	ND
9/27/2001	0.5	2	895	3.9
10/22/2001	0.5	6	275	6.2
11/30/2001	2.1	28	441	5.6
12/22/2001	5.5	60	114	ND
1/28/2002	2.1	12	373	ND
2/21/2002	2.1	15	372	6.2
3/22/2002	5.4	42	226	6.5
4/22/2002	1.5	22	79	3.1
5/28/2002	2.2	70	71	ND
6/26/2002	2.1	17	259	ND
7/24/2002	2.1	17	ND	ND
8/2/2002	2.1	17	231	NA
8/27/2002	2.1	12	178	3.9
9/25/2002	2.1	10	94	16.9
10/28/2002	2.1	8	461	ND
12/2/2002	2.1	2	398	ND
12/29/2002	2.1	35	228	ND
2/3/2003	2.1	12	224	4.7
3/7/2003	2.1	42	147	ND
4/8/2003	2.1	9	220	ND
6/4/2003	2.1	10	221	ND
7/7/2003	2.1	6	71	ND
8/7/2003	2.1	2	534	163
8/28/2003	2.1	24	200	ND
9/29/2003	2.1	21	150	ND
10/28/2003	2.1		200	ND
12/10/2003	2.1	21	150	ND

Date	Ozone # / Day	Flow	PCP NCS (A)	PCP WEIR (B)
1/3/2004	2.1	26	139	ND
2/3/2004	2.1	29	144	ND
3/3/2004	2.1	28	84	ND
4/4/2004	2.1	30	85	ND
5/2/2004	2.1	65	115	13
5/13/2004	2.1	20	102	ND
6/9/2004	2.1	12	300	5.47
6/30/2004	2.1	4	222	ND
8/4/2004	2.1	6	84	ND
9/4/2004	2.1	12	43	ND
10/4/2004	2.1	12		
11/3/2004	2.1	94	155	25
11/14/2004	2.1	26	75	ND
11/22/2004	2.1	28	75	ND
12/1/2004	2.1	35	72	67
12/21/2004	2.1	9	253	21
1/3/2005	2.1	10	279	ND
2/3/2005	2.1	12	155	ND
3/1/2005	2.1	34	208	ND
4/4/2005	2.1	9	148	ND
4/25/2005	2.1	6	121	ND
5/3/2005	2.1	9	150	ND
6/2/2005	2.1	3	151	38
6/20/2005	2.1	2	55	ND
7/13/2005	2.1	2	95	ND
8/3/2005	2.1	12	85	ND
10/3/2005	2.1	27	63	ND
11/3/2005	2.1	25	278	12
11/14/2005	2.1	27	15	ND
11/28/2005	2.1	36	47	ND

V. Five Year Review Process

Shawn Ghose, EPA Remedial Project Manager for the site, led the Arkwood, Inc. Site five-year review.

This second five-year review consisted of reviewing the data against the established criteria and a December 2005 inspection of the Site by ADEQ personnel.

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 second five-year review. Ms. Mescher stated that the vegetative cover at the Site continues to improve with minimal stress locations. The Site is inspected every week. The groundwater treatment system located at the mouth of New Cricket Spring is operating well and is successfully meeting treatment goals. Ms. Mescher stated that there have been no complaints or inquiries concerning the Site.

B. Site Inspection

Representatives of ADEQ and McKesson Corporation conducted an inspection of the Site on December 14, 2005. Within the perimeter of the Site fence, the inspection included an evaluation of the surface condition, vegetation, storm water drainage system, buildings, perimeter fence, and gates. The groundwater 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. The perimeter road was in good condition; 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. 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 following treatment with ozone. ADEQ personnel paid particular attention to the two wells drilled approximately 25 feet and 50 feet respectively from the sinkhole, to inject ozonated water. The wells are approximately 25 feet deep and previous studies have indicated that the location of the wells are connected to the New Cricket Spring through

subsurface fractures. By injecting ozonated water into the fractures McKesson anticipates that the destruction of residual PCP in the fractures will be accelerated.

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.

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

State
Arkansas Water Quality Standards

ADEQ Regulation 2 sets a water quality standard for PCP based on pH. Based on ADEQ Regulation 2 and as calculated by Masoud Arjmandi (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.

D. Data Review

A review of records and monitoring reports through December 2005 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, groundwater discharging at New Cricket Spring is 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 area around the Site is zoned industrial, thus land use is not anticipated to change in the near future. In addition, McKesson plans to file a deed restriction to provide notice of the existing cap and industrial use of the Site. The deed restriction will be filed at the time the Site is proposed for deletion. The remedy involved excavating the contaminated soil in the main area of the Site to an industrial cleanup standard and covering this area with uncontaminated soil to cut off the direct exposure pathway. The cap was vegetated with a variety of grasses. The remediated area is fenced with signs and locked gates, and maintained to provide an adequate means of restricting access. The groundwater is being treated by ozonated water injection until water exiting New Cricket Spring meets ADEQ water quality standard for PCP.

Remedial Action Performance: The soil remediation, including excavation and offsite incineration of the affected soils, has been effective in minimizing the potential for dermal contact with the Chemicals of Concern (COC) and has removed the source area for groundwater impacts. The only deficiency noted is lack of regional precipitation that has resulted in limited high flow equipment usage. However, since the existing data support the treatment capabilities, this deficiency does not affect the performance or integrity of the Site remedial action.

System Operations and Maintenance (O & M): Groundwater treatment system operations are conducted by a full-time onsite operator. The operator is responsible for maintaining the groundwater treatment system in good operating condition 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 groundwater treatment system are performed 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 groundwater remedies at the Arkwood, Inc. The Site is in compliance with the State Water Quality Standards for PCP of 9.3 µg/l for a monthly average and 18.7 µg/l for a 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. There is no indication that the treated wastes were not properly characterized, removed and treated during the soil remediation. No current or planned changes in land use are anticipated. Access to the remediated area is restricted because of the fencing, signs and locked gates. In addition, the area is zoned industrial and

McKesson plans to file a deed restriction to protect the existing cap and provide notice that the area is zoned industrial use. Also, there is no indication that the groundwater hydrology was not adequately characterized prior to the implementation of the groundwater remedy.

Changes in Toxicity and Contaminant Characteristics: Toxicity or other characteristics have not changed for the contaminants of concern.

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 only deficiency identified is limited high flow treatment equipment usage due to regional drought conditions. The existing data support that spring flows have been successfully treated using the primary mass transfer system and that the treatment system is operating as designed and treating affected water to water quality standards. This deficiency is not significant and the remedy remains protective.

IX. Recommendations and Follow-up Actions

It is recommended additional data continue to be collected during periods of high flow, e.g. storm events, to provide additional treatment equipment efficiency and effectiveness information. Obviously, this recommendation is dependent upon weather conditions and does not impact the protectiveness of the remedy.

X. Protectiveness Statements

The remedies that were implemented for soil and groundwater at Site continue to be protective of human health and the environment. Since the remedies for soil and groundwater 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 groundwater conditions by removing source material. Perimeter fencing is in

place and is 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.

Groundwater Remedy

The remedy that was implemented for the groundwater is protective of human health and the environment. The ground water continues to be collected and treated to water quality standards at the mouth of New Cricket Spring. Since the affected soil at the Site has been removed, the ground water should continue to attenuate naturally over time. The new ozone injection system is expected to accelerate the destruction of residual PCP in fractures so that effluent water at New Cricket Spring will meet Arkansas standards and the site can be deleted from the NPL.

XI. Next Five-Year Review

The next five-year review will be conducted in 2011. The scope of the next review may be limited to an inspection of the Site to ascertain that unauthorized entry to the Site is controlled, the surface vegetation continues to be in good condition, the deed restriction is filed, and the groundwater treatment system 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

RECEIVED
FEB 0 9 REC'D
ENV. & ENG SERVICES

January 30, 1998

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.

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

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Arkwood, Inc. Site, Activity Report, July 2004 – September 2005, 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.