Superfund Record of Decision Amendment

Popile, Inc. Superfund Site
El Dorado, Arkansas

September 2001

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ACL	Alternate Concentration Limit
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
EPA	U.S. Environmental Protection Agency
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
PCP	Pentachlorophenol
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
TI	Technical Impracticability

POPILE, INC.
EL DORADO, ARKANSAS
RECORD OF DECISION AMENDMENT

DECLARATION

SITE NAME AND LOCATION

Popile, Inc.
El Dorado, Union County, Arkansas
CERCLIS ID # ARD008052508

STATEMENT OF BASIS AND PURPOSE

The Record of Decision (ROD) for the Popile, Inc., Superfund Site (Site) was signed on February 20, 1993. This decision document presents an amendment to the previously selected remedial action for the Site. The Amended Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (42 U.S. Code, Section 9601, et seq.), and, to the extent practicable, the National Contingency Plan (NCP) [40 CFR § 300.435(C)(2)(ii)]. This decision is based on the supplemental investigation conducted at the Site between 1998 and 2000. The U.S. Environmental Protection Agency (EPA) is the lead agency and the Arkansas Department of Environmental Quality is the support agency for the Site.

The Arkansas Department of Environmental Quality (ADEQ) concurs with the modification of the remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE REMEDY

This ROD Amendment documents the change in the overall site cleanup strategy including a change in the remedial action objectives and cleanup levels previously identified in the 1993 ROD. Prior response actions have addressed more than 66,000 cubic yards of contaminated soil through either stabilization and capping within clay-lined cells or covering with an engineered cap. Since the contaminated soil no longer poses a direct contact risk outside of EPA's acceptable risk range, the prior remedial action objective was to reduce the threat of

further contaminant leaching to the ground water via in-situ bioremediation. However, site monitoring since 1993 has demonstrated that the stabilized soil within the clay-lined cells is no longer leaching contaminants into the ground water. Therefore, the soil cleanup strategy outlined in this ROD Amendment is to maintain the existing engineering controls and implement institutional controls to prevent excavation or drilling activities that may result in accidental exposure to the Site contaminants.

The ground water cleanup strategy previously consisted of containing migration of the contaminant plume and restoring the aquifer to a beneficial use if technologically achievable. The cleanup goals were based on the maximum contaminant levels established under the Safe Drinking Water Act. A more detailed site investigation has revealed that a TI waiver is appropriate for this Site because the ground water extraction system will not be able to effectively address both the residual and free-phase NAPL present in the soils and upper aquifer. Unless both the free-phase (mobile) and residual NAPL are removed from the soil and aquifer material, a ground water extraction remedy will not be able to attain the remedial goals in a time frame that would be considered reasonable for the Site. Therefore, in accordance with Section 121(d)(4)(C) of CERCLA, a technical impracticability (TI) waiver is being implemented at this Site for the ground water cleanup goals. The ground water strategy now consists of monitoring and institutional controls to ensure there is no exposure from well installations at the Site. The Amended Remedy consists of the following components:

- Implementation of a ground water monitoring program, including sampling and analyses of the monitoring wells for a period of five years, to ensure the static conditions of the contaminant plume. Subsequent ground water monitoring will occur during the scheduled five-year review activities to ensure there is no human exposure.
- Maintenance of the existing engineering controls, including the cap on the clay-lined cells and a smaller cap over contaminated soils, and the site security fence, at the site. The solidified soils within the engineered impoundment will remain permanently in place and will not undergo further treatment. The Site will be utilized for long-term waste management of the treated soils.
- The selected remedy will include enforceable institutional controls as necessary to prevent drilling and excavation that might result in exposure to Site contaminants. A plan for monitoring the effectiveness of the institutional controls will be outlined in an Operation and Maintenance Plan (O&M Plan) for the site.

STATUTORY DETERMINATIONS

The Amended Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial

action (unless a waiver is justified), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The presence of non-aqueous phase liquids (NAPLs) in the ground water represents a principal threat at this Site. Since restoration of the aquifer is not feasible from an engineering perspective, a TI waiver has been issued for the cleanup levels appropriate to this Site. Therefore, treatment to reduce the toxicity, mobility, or volume of contamination in the ground water is not necessarily appropriate at this Site to achieve the remedial action objectives and goals. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is protective of human health and the environment.

AUTHORIZING SIGNATURE

By: Myron O. Knudson Date: 9-28-01

Myron O. Knudson, P.E., Director
Region 6 Superfund Division
U. S. Environmental Protection Agency

RECORD OF DECISION AMENDMENT NO. 1
POPILE, INC., SUPERFUND SITE
CONCURRENCE LIST

By: _____ Date: 9-28-01.

Shawn Ghose
Remedial Project Manager

By: _____ Date: 9-28-01

Gustavo Chavarria
AR/TX Project Management Section

By: _____ Date: 9/28/01

William K. Honker, Chief
AR/TX Superfund Branch

By: _____ Date: 9-27-01

Mike Boydston
Site Attorney

By: _____ Date: 09/28/01

Mark Peycke, Chief
Superfund Branch, Office of Regional Counsel

By: _____ Date: 9/28/01

Larry Andrews
Acting Regional Counsel

ADEQ
ARKANSAS
Department of Environmental Quality

September 28, 2001

William K. Honker, P.E.
Chief, AR/OK Branch
Superfund Division (6SF)
U.S. Environmental Protection Agency
1445 Ross Avenue
Suite 1200
Dallas, Texas 75202

Re: Popile Superfund Site
Technical Impracticability Waiver
Record of Decision (ROD) Amendment

Dear Mr. Honker:

The Arkansas Department of Environmental Quality (ADEQ) concurs with the ROD Amendment and Technical Impracticability Waiver for the Popile Superfund Site.

If you have any questions, please contact me at (501) 862 0831.

Sincerely,

Mike Bates
Chief, Hazardous Waste Division

cc: Gus Chavarria, EPA
Shawn Ghose, EPA
Jim Franks, ADEQ
Kin Siew, ADEQ
Brian Wakelyn, ADEQ

DECISION SUMMARY

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Popile, Inc. site (Site), CERCLIS ID # ARD008052508, is a 41 acre property about 3/4 mile south of the city of El Dorado in Union County, Arkansas (Figure 1). The Site is an inactive wood preserving operation that utilized creosote, pentachlorophenol (PCP), and petroleum distillates in its process. Product and waste handling practices resulted in contamination by these materials of surface and subsurface soils, ground water, surface water, and sediments. The property is bordered by South West Avenue on the west, the Ouachita Railroad on the east, and Bayou de Loutre on the north. These three boundaries intersect on the north end of the site. A forested highland area borders the site to the south. The surrounding area is rural and residential/commercial, although no homes are located along the site perimeter. The city of El Dorado has a population of approximately 25,000.

SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

Prior to the beginning of wood treatment operations, the Site was associated with oil field and storage operations. Prior oil-field activities included several above-ground storage tanks and oil pits in the immediate vicinity of the Site. El Dorado Creosote Co., the predecessor company of Popile, Inc., began using the site as a wood treatment facility in 1947. El Dorado Pole and Piling Company, Inc., purchased the property in 1958. A small impoundment was initially constructed to store process wastewater and sludge from the early operations. By 1964, this impoundment had grown considerably in size and a sludge pit was added. Two additional process impoundments were constructed in 1969. Starting in 1976, three surface pits were used as part of the waste treatment process at the plant. The primary contaminants found at the site include PCP and creosote compounds associated with wood treatment. Wood treatment operations stopped in July 1982. In September 1982, Popile, Inc. was formed and apparently purchased about 7.5 acres of the property, including the three surface pits. El Ark Industries, Inc. apparently purchased the remaining 34 acres (County records reveal some ambiguity as to whether these last two transactions were actually concluded).

The EPA conducted a Site Assessment in 1989 and found the leakage of contaminants from the consolidated impoundments closed under the Resource Conservation and Recovery Act (RCRA). The EPA conducted a Removal Action between September 1990 and August 1991 to address releases from the closure area. The Removal Action excavated sludge and contaminated soils from the impoundment areas and northern parts of the site and stabilized the contaminated materials using rice hulls and fly ash. The stabilized materials (66,000 cubic yards) were

disposed of in two clay-lined holding cells in the southern portion of the Site. Excavated areas were backfilled with clean soil and re-seeded. Drainage ditches and other erosion control measures were also constructed at the Site. In addition approximately 500,000 gallons of contaminated water with sheen were pumped off from a large number of surface trenches excavated during the Removal Action. The pumped ground water from trenches was treated and discharged into Bayou de Loutre. In addition, the old treatment facilities were dismantled.

The U.S. Environmental Protection Agency (EPA) proposed the site for inclusion on the National Priorities List (NPL) in February 1992. The site was listed on the NPL on October 14, 1992. The Remedial Investigation and Feasibility Study (RI/FS) began in January 1992 and was completed in July 1992. EPA issued a Record of Decision (ROD) in February 1993 specifying the in-situ treatment of contaminated ground water, the extraction and off-site disposal of free phase wood treating fluids, and the on-site biological land treatment of contaminated soils and sludge. The remedy selected in the 1993 ROD included the following components:

Soil Remedy

- Excavation and onsite biological treatment of contaminated soils and sludges in a land treatment unit;
- Grading of excavated/backfilled areas, followed by a vegetative cover;
- Construction/repair of the security fence, installation of warning signs; and
- Conduct environmental monitoring to ensure the effectiveness of the remedy.

Ground Water Remedy

- Extraction of shallow contaminated ground water and wood-treating fluids via interceptor trenches and/or pumping wells;
- Treatment and discharge of the contaminated water on site, either to a surface water system or reinjection into the aquifer;
- In-situ bioremediation of the deep subsurface soils via above ground bioreactor, nutrients and/or oxygen enhancement system and reinjection and/or infiltration galleries; and
- Off-site incineration of recovered wood treating fluids/carrier oils, such as NAPLs and dense non-aqueous phase liquids (DNAPLs), which have been determined to be a principal threat and continual source of ground water and subsurface soil contamination.

BASIS FOR AMENDING THE 1993 ROD REMEDY

The RI/FS completed in 1992 did not sufficiently characterize the subsurface conditions, in that it failed to define the contaminant source and its associated ground water plume so as to permit full implementation of the 1993 ROD remedy. A more detailed site investigation was performed by the U.S. Army Corps of Engineers (USACE) under contract to EPA. The

investigation included a Phase I Site Characterization and Analysis Penetrometer System (SCAPS) completed in 1997 and the Phase II Groundwater Investigation and Modeling completed in 1998. The Phase I SCAPS investigation evaluated in-situ geophysical soil properties while simultaneously detecting contamination with laser-induced fluorescence (LIF) technology. The SCAPS survey used 49 sampling locations laid out on a 100-foot triangular grid. The Phase II investigation defined the shallow subsurface geology and hydrology by means of 8 boreholes, 21 monitor wells, and 2 pump/observation well pairs. A total of 68 subsurface soil samples were collected from boreholes/wells and analyzed for chemical, physical, and biological parameters. This more detailed site investigation has revealed the need for an amended remedy, including a TI waiver.

Ground Water

The Popile site is located in an upland area adjacent to the alluvial valley of the Bayou de Loutre, a tributary of the Ouachita River. Near-surface geology in the area consists of the Quaternary age alluvium overlying the Cockfield and Cook Mountain formations. The Cockfield formation is the prevalent surface unit in the upland areas of the site and is present beneath the clean backfill. The Cockfield formation consists of fining upward sequences and is divided into two general stratigraphic units, namely the upper fine-grained unit consisiting of silts and clays (upper layer), and a lower carbonaceous rich sand layer (lower layer) (Figure 2).

The upper layer underlies most of the Popile site and areas east of the Site. This unit consists of interbedded clayey or sandy silts, or sandy clays. In the Removal Action area, the unit thickness across the site now ranges from approximately 6 to 19 feet. Based on the rise in water levels in wells completed in the underlying sand, this upper layer acts as a confining layer to sands below it on the eastern portion of the site. The upper layer appears to grade laterally into a sand facies along the western boundary of the site, consisting of fine- to very fine-grained clean sand with an occasional interbedded silt or clay layer. The fine-grained unit is projected to underlie the Bayou de Loutre.

The shallow Cockfield aquifer is within the carbonaceous rich lower layer and consists predominantly of a poorly graded, fine to very fine sand. Scattered small pebbles are common, and at some locations, thin beds of gravelly sand or sandy gravel occur. The upper third of this sand layer has disseminated carbonaceous matter (up to 3%) throughout the unit, averages 15-feet of thickness across the site, and is the aquifer zone of interest as far as contaminant migration.

Overall, the lower carbonaceous sand layer is 21 - 51 feet thick and comprises the lower 2/3 of the shallow aquifer, and the variation in thickness generally reflects the change in

elevation of the underlying Cook Mountain surface. A characteristic feature of this unit is that it has layered black carbonaceous matter which acts as a barrier and "filter" to downward migration of contaminants. The individual carbonaceous layers range in thickness from 18 to 31 inches.

The Cook Mountain formation consists of clays and silty clays and may range up to 160 feet in thickness. It is regionally the lower confining layer for Cockfield formation and also the upper confining layer for the underlying Sparta Sand aquifer, a regional drinking water aquifer.

Beneath the Site, the direction of ground water flow is east and northeast with a horizontal gradient on the order of 0.015 feet/feet within the shallow Cockfield aquifer. The aquifer transitions from unconfined conditions along the hills to the west of the site to confined conditions beneath the former treatment cell, as the sand aquifer is recharged in the higher elevation area and the upper layer acts as the confining layer in the lower elevation area. The degree of confinement increases toward the Bayou de Loutre as the proportion of silt and clay increases in the upper layer. Hydraulic communication between the shallow aquifer and the Bayou is weak, and ground water flow tends to pass beneath the Bayou in this segment.

Hydraulic conductivities across the site vary with depth. The greatest hydraulic conductivity contrast occurs on the interface between the upper layer and the sand layer. Hydraulic conductivity values tend to be within the $1x10^{-5}$ to $1x10^{-4}$ cm/sec range within the upper layer, and $5x10^{-4}$ to $5x10^{-3}$ cm/sec range within the shallow aquifer. Contaminant transport is predominantly horizontal in the sand layer.

Waste generated from past wood preserving operations occur as both a dense non-aqueous phase liquid (DNAPL) probably associated with creosote and light non-aqueous phase liquid (LNAPL) associated with carrier oils such as diesel. The 1993 ROD identified PCP and the following polycyclic aromatic compounds (PAHs) as contaminants of concern: benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene.

Chemicals used during this period typically included creosote or a mixture of 30% to 50% creosote with petroleum distillate or an asphalt-based residuum oil for wood treatment. The mixture was used to aid the penetration of creosote into the wood and was applied in pressurized cylinders. In 1958, wood preserving operations at the site included the use of creosote as well as pentachlorophenol (PCP). PCP preserving typically involved pressure treatment with a light carrier oil, such as diesel, containing approximately 5% entrained PCP.

Creosote is a complex mixture of chemical constituents encompassing diverse chemical structures. Of the 150 to 200 chemicals in creosote, only a few are present in amounts of 1% or

more. Creosote is a highly insoluble dense non-aqueous phase liquid (DNAPL) that tends to collect in "pools" within the soil matrix. Ground water tends to flow around these "pools" because the oil is highly hydrophobic, and as a result only a small fraction of the total contained PAH mass is actually exposed to the ground water. The solubilities of the PAHs identified at the Popile site vary from insoluble to 31 milligrams per liter (mg/L).

Commercial grade PCP is a white crystalline solid with low solubility in water (14 mg/L), but more soluble in diesel oil (3,100 mg/L). When PCP is used in wood preserving, it is applied in carrier oil to assist in penetration into the wood. PCP does not readily partition from the oil into the ground water, so it can slowly leach into the ground water for long periods of time. PCP in an aqueous phase (dissolved in water) can be biodegraded through both aerobic and anaerobic processes.

The Phase I and II investigations demonstrated that the contamination extends vertically from the soils beneath the impoundments to a depth of 30 feet or more in the upper sand of the Cockfield aquifer. The contamination consists of both residual and free-phase NAPL that are absent in the lower carbonaceous layer of the aquifer. The areal extent of the contamination is approximately 4 acres with an isolated area occurring east of the railroad tracks at a depth of 11 feet. However, adjacent off-site monitoring wells have not detected contamination from this isolated occurrence of NAPL. In addition, the constituents of the former carrier oil (diesel) used in the wood treating process, such as benzene, toluene, ethylbenzene, and xylene, have been detected within and adjacent to the NAPL contamination.

The field investigations demonstrated that only the PCP and naphthalene (a PAH) plumes are amenable for spatial interpretation because of their relatively high water solubility. The lack of mobility of the other PAH compounds cause them to exhibit extreme concentration drop off and virtually no spatial distribution. Dissolved phase ground water contamination, as indicated by the PCP and naphthalene, is limited to a 160-foot travel distance within the immediate area of the former process ponds (Figure 3). In addition, samples from monitor wells east of the Site boundary (Ouachita Railroad) indicate non-detect for PCP and PAHs.

While the pump and treat remedy selected in the 1993 ROD would likely be successful in reducing a dissolved plume, the ultimate effectiveness in long-term reduction of the NAPL source was less certain. The presence of a NAPL beneath the former impoundments is the key factor in evaluating the timeframe to achieve the Site remedial goals. The NAPL is present as both a residual phase adsorbed onto the soil and aquifer material and as free-phase contamination within the matrices of the soil and aquifer. The removal of NAPL through the use of ground water extraction wells and interceptor trenches is limited by the characteristics of the aquifer and the physical properties of the creosote and PCP present in the aquifer. Creosote is a highly

insoluble dense non-aqueous phase liquid (DNAPL) that tends to collect in "pools" within the soil matrix. Ground water tends to flow around these "pools" because the oil is highly hydrophobic, and as a result only a small fraction of the total contained PAH mass is actually exposed to the ground water. The solubilities of the PAHs identified at the Site vary from relatively insoluble to 31 milligrams per liter (mg/L). The efficiency of any recovery system installed at the Site will be limited by the slow rate of desorption of the creosote and PCP from the soil and aquifer material. As a result, large quantities of water must be pumped to remove even a small amount of the contaminants. Unless both the free-phase (mobile) and residual NAPL are removed from the soil and aquifer material, a ground water extraction remedy will not be able to attain the remedial goals in a time frame that would be considered reasonable for the Site.

The PAH compounds have various physical and chemical characteristics. The lower molecular weight PAHs are more biodegradable, volatile, and water-soluble than the heavier compounds. PAHs are biodegradable, especially under aerobic conditions (in the presence of oxygen). Several of the lower molecular-weight PAHs are also biodegradable under anaerobic conditions (in the lack of oxygen).

Microbial degradation takes place in aerobic and anaerobic forms at the Popile site. The dominant degradation mechanism is found to be an aerobic process, in which micro-organisms gain energy from PCP and PAHs through a series of oxidation-reduction reactions. For example, PCP and PAHs are oxidized (lose electrons), and oxygen is reduced (gain electrons). Major byproducts of the aerobic degradation are carbon dioxide, chloride, and water. Field evidence of aerobic biodegradation at the Popile site includes increased carbon dioxide and chloride concentrations, and decreased oxygen levels when compared with background levels outside the zone of contamination.

Observed Concentrations (microgram per liter)			
Areas (1)	Dissolved Oxygen	Carbon Dioxide	Chloride
Background	4,500	67	200
Reaction Area	1,250	88	575
Source Area	400	100	1,200

The Bioplume III model was used to simulate the contaminant distribution and ground water flow conditions that were defined during the Phase I and II investigations. Bioplume III is a two-dimensional finite difference model specifically designed for simulating the natural

attenuation of organic contaminants in ground water due to process of advection, dispersion, sorption, and biodegradation. The model was calibrated to the observed site conditions and additional model runs were used to predict the future ground water flow and contaminant transport. Although not a contaminant of concern (COC), naphthalene is present in the impoundment area of the Site. As the most mobile of the PAH class of compounds, naphthalene represents the "worst-case" travel scenario for all other PAH COCs.

The plume of PCP in the shallow subsurface has been relatively immobile for the past 40 years as indicated by extensive boring, drilling, and sampling. The PCP is only soluble up to 2080 ppb in water in the presence of other contaminants. The disposition of PCP plumes with time show that their concentrations drop off logarithmically, i.e., they drop off precipitously, within a short horizontal distance. Even at that, the outer limits of the plumes are still located only near the old impoundments and the treatment areas within the on-site areas. The reason for the static nature of the PCP plume is that biodegradation is occuring in-situ, along with adsorption onto the naturally dispersed carbon in the shallow Cockfield aquifer. This process might also be aided by anaerobic degradation process.

Predictive modeling of naphthalene indicated that the contaminant is not expected to extend to the off-site area. In addition, the calibration process for the ground water model showed the contaminant plumes to be essentially in a steady-state condition for the past 43 years (Figure 4) and are expected to remain so for another 50 years (Figure 5). The extent of the PCP and naphthalene contamination is predicted to remain within an approximate distance of 160 feet from the source areas, while all other PAHs will be essentially stationary.

Residual Soil Contamination

The 1993 ROD prescribed a remedy of bioremediation in treatment cells of all contaminated soil and sludge including the material stabilized in 1991. However the bioremediation pilot study demonstrated that the performance standards for PCP and PAHs set forth in the 1993 ROD cannot be achieved in a reasonable time frame. Pilot studies for bioremediation of the stabilized soil were unsuccessful with this method of remediation. Also, the contaminated soil that was stabilized in 1991 has been rendered immobile by the stabilization process and a clay liner. Monitoring of the holding cell (with the stabilized soil) for the past 10 years has not detected the COCs. Thus, the stabilized soil and sludges do not pose a threat of further releases into the environment.

Additional work in early 2000 addressed an area of surface contamination that was not included in the 1990 - 1991 removal action. This work included the installation of an engineered cap of approximately 0.9 acres near monitoring well 27 to prevent infiltration (Figure 6). The cap

was installed between February 21, 2000, and March 16, 2000. The design called for a 200 by 200 foot square base with two feet of compacted clay on top of existing grade plus one-half foot of topsoil, all on 4:1 side slopes.

Post-design field inspection of the secondary source area indicated the subgrade for the cap was not suitable for cap placement. The soils in the area were boggy and not capable of being compacted or proof rolled. Following a land survey to determine the accurate location of the cap area, a soil bridge was put in place to build the secondary cap sub-base. The soil bridge consisted of import clay soil from the borrow pit already designated and approved as the source for the secondary cap.

Preparatory work for the bridge included clearing the area of vegetation and debris, establishing drop-in-grade trenches for drainage, and establishing a reasonably level area for bridge placement. Geotextile fabric was installed over the entire bridge placement area. The geotextile was secured in place with perimeter anchor trenching. Clay was placed in 6 inch lifts with a dozer, and compacted by drum roller. Density testing was not required, but four density tests were performed on the subgrade. The total thickness of the bridge consisted of four 6-inch lifts, with an overall average bridge thickness of two feet.

The secondary source area cap was constructed over the soil bridge. A second geotextile layer was placed over the bridge material and secured in place with perimeter anchor trenching. The clay soil borrow was placed in 6 inch lifts and compacted and graded to specifications. Pre-approved topsoil from a different borrow pit was imported and placed at a depth of 6 inches. This soil was fertilized, graded with a dozer and seeded according to project specifications. Following seeding, straw mulch was placed over the entire surface of the cap (including slopes) and a silt fence was put in place to inhibit erosion. On May 18, 2000, Morrison-Knudson (MK), USACE, ADEQ, and EPA conducted the final on-site inspection.

The soil cap around monitoring well MW-27 also addressed an area of dioxin contamination identified in the 1993 ROD. The Remedial Investigation results identified less than 1 µg/L 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) equivalents in surface soil at a sample location adjacent to the MW-27 well location. The 1993 ROD determined that the dioxin contamination would be addressed during remediation of the creosote, PCP and other contaminants in the soils. The soil cap has effectively addressed this potential risk to human health by eliminating the exposure pathway.

In addition to the soil capping, EPA also initiated on March 6, 2000, the removal of a 500-gallon underground storage tank (UST) located at the southeast central portion of the Site. The UST surface area consisted of an above grade fill pipe riser and a dispenser pad situated directly adjacent to the UST. Following exposure of the tank, the contents of the tank were

purged of product, residual vapors and product rinsate. A vacuum truck was used to capture the UST contents and rinsate. The vacuum truck transported all fluids for disposal.

After removal of all product from the tank, the tank was rinsed and the excavation continued to enable removal of the UST from the excavation. A survey showed two 3/8" holes in the tank bottom but no other damage was noted. The UST excavation presented no evidence of product staining or discoloration of soil. There was, however, a strong scent of old gasoline. At this point, the excavation was extended two feet below the invert of the UST. Using the track hoe bucket, grab samples were taken at opposite ends of the cavity floor and 18 inches below the product line invert, halfway between the tank and dispenser pad.

Following UST confirmation sampling, 6-mil visqueen was placed in the cavity to act as a barrier and delineation marker for the excavation. The excavated soil was then placed back into the UST cavity, compacted with the track hoe bucket, and brought to grade with import soil. The upper two to three feet was track rolled for compaction.

Analyses resulting from the confirmation samples indicated that soils beneath the UST contained contamination above ADEQ action limit of 100 mg/kg total petroleum hydrocarbons (TPH). Samples taken at the invert of the UST exhibited a TPH of 780 and 890 mg/kg. Soil beneath the product line was clean. On May 16 and 17, 2000, MK, Robbins Contractors and Slaight Environmental excavated and disposed of approximately 186 cubic yards of TPH-contaminated soils to complete the closure of the UST.

DESCRIPTION OF AMENDED REMEDY AND 1993 ROD REMEDY

The Amended Remedy for the site relies on the existing engineering controls for the contaminated soils and the use of institutional controls and ground water monitoring to prevent exposure to the soil and ground water contamination. Because the amended remedies for the soil and ground water will result in hazardous substances remaining on site above health-based concentration levels, a review will be conducted within five years of the effective date of the ROD Amendment to ensure that the remedy continues to provide adequate protection of human health and the environment.

In accordance with Section 121(d)(4)(C) of CERCLA, a Technical Impracticability (TI) waiver will apply to the remedial goal of 0.2 parts per billion (ppb) for polynuclear aromatic hydrocarbon (PAH) compounds expressed as benzo(a)pyrene. This remedial goal was established in the 1993 Record of Decision (ROD) and is based on the Maximum Contaminant Level (MCL) identified in the Safe Drinking Water Act. While the 1993 ROD did not identify any other remedial goals for the ground water, the other potential Applicable or Relevant and Appropriate

Requirements (ARARs) for this Site that the TI Waiver will apply to is the 1 ppb MCL for pentachlorophenol (PCP).

The remedial action objectives for the ground water are also being amended to reflect the changes in the cleanup strategy for the Site. The 1993 ROD established two remedial action objectives for the ground water: (1) control migration of shallow ground water contaminants so as to reduce and/or eliminate the potential threat of contamination impacting deeper drinking water aquifer and, (2) if technologically achievable, restore the shallow ground water to potential future beneficial use. The revised ground water strategy for this site will eliminate the restoration of the shallow ground water to a potential future beneficial use as a remedial action objective. The existing site conditions significantly reduce any further migration of the Site contaminants in the ground water as seen in the limited plume size beneath the source areas. A ground water monitoring program will be implemented to verify that there is not a threat of human exposure.

Institutional controls will be implemented to prevent exposure to contaminants at concentrations above health-based risk levels that may remain at the Site, as discussed below in more detail under "Description of the Selected Remedy." A plan for monitoring the effectiveness of the institutional controls will be outlined in an Operation and Maintenance Plan (O&M Plan) for the site.

COMPARATIVE ANALYSIS OF AMENDED REMEDY AND 1993 ROD REMEDY

CERCLA § 121(b) presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the Amended Remedy and the 1993 ROD remedy using the nine evaluation criteria in order to amend the site remedy. The nine criteria are divided into two threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with applicable or relevant and appropriate requirements (ARARs); five balancing criteria: (3) long-term effectiveness and permanence, (4) reduction of toxicity, mobility, or volume of contaminants through treatment, (5) short-term effectiveness, (6) implementability, and (7) cost; and two modifying criteria: (8) State acceptance and (9) community acceptance.

1. Overall Protection of Human Health and the Environment

This criterion addresses the way in which a potential remedy would reduce, eliminate, or control the risks posed by the site to human and health and the environment. The methods used to achieve an adequate level of protection may be through engineering controls, treatment techniques, or other controls such as restrictions on the future use of the site. Total elimination of risk is often impossible to achieve. However, a remedy must minimize risk to assure that human health and the environment will be protected.

The original selected remedy, if successfully implemented, would be protective of human health and the environment by reducing levels of contaminants in the soils and ground water through extraction and treatment. However, the ability to achieve the remedial goals throughout the areas of contamination could not be fully determined until the extraction system had been implemented, modified as necessary, and monitored over time.

As discussed in the 1993 ROD, "the human health risk from the potential exposure to ground water is based on the conservative assumption that exposure would occur at the site. Such exposure is unlikely to occur since no domestic wells currently exist on the site, however, it is assumed that future use could occur. As shown, the principal risks to human health are not associated with surface soils or sediments. However, risks are attributed to contaminated ground water."

Based on the data collection since the 1993 ROD, the contaminated soil within the clay-lined cells does not pose a risk to further contamination of the ground water. In addition, the current ground water contamination does not pose a risk to off-site receptors or to underlying drinking water aquifers. The Amended Remedy will ensure that the current site conditions remain protective of human health and the environment through engineering controls, ground water monitoring, and institutional controls. Since the potential for waste migration at the site has been found to be negligible, the Amended Remedy will achieve the amended site remedial action objectives.

2. Compliance With Applicable or Relevant and Appropriate Requirements (ARARs)

Compliance with ARARs assures that a selected remedy will meet all related federal, state, and local requirements. The requirements may specify maximum concentrations of chemicals that can remain at a site; design or performance requirements for treatment technologies; and, restrictions that may limit potential remedial activities at a site because of its location.

The MCL identified as a chemical-specific ARAR for this Site under the 1993 ROD has been waived under the TI waiver for the site-wide ground water in this ROD Amendment. The TI waiver will apply to the remedial goal of 0.2 parts per billion (ppb) for polynuclear aromatic hydrocarbon (PAH) compounds expressed as benzo(a)pyrene. This remedial goal was established in the 1993 Record of Decision (ROD) and is based on the MCL identified in the Safe Drinking Water Act. While the 1993 ROD did not identify any other remedial goals for the ground water, the other potential ARARs for this Site that the TI Waiver will apply to is the 1 ppb MCL for pentachlorophenol (PCP).

3. Long-Term Effectiveness and Permanence

This criterion addresses the ability of a potential remedy to reliably protect human health and the environment over time, after the remedial goals have been accomplished.

The 1993 ROD remedy achieves long-term effectiveness and permanence through treatment of the contaminated soil and ground water. The Amended Remedy will ensure long-term effectiveness through monitoring and the use of institutional controls to prevent exposure to site contaminants. The site data collected during the design activities indicates that the plume boundary is static due to the adsorption of the contaminants by naturally occurring carbon in the aquifer and by biodegradation. In addition, a fifty year projection of the current extent of ground water contamination utilizing the Bioplume III model showed little to no change of the contaminant boundary.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion assesses how effectively a proposed remedy will address the contamination problem. Factors considered include the nature of the treatment process; the amount of hazardous materials destroyed by the treatment process; how effectively the process reduces the toxicity, mobility, or volume of waste; and the type and quantity of contamination that will remain after treatment.

The 1993 ROD remedy would have achieved a reduction of toxicity, mobility, and volume through further treatment of the contaminated soil and ground water. However, complete reduction of the soil contaminants and achievement of the remedial goals through biological treatment was not demonstrated during a pilot study. In addition, the persistent nature of the ground water contamination may limit the effectiveness of an active treatment system.

The prior stabilization and capping of the contaminated soils has effectively reduced the mobility of the contaminants in the soil. Since the ground water monitoring data demonstrates that the

plume boundary has remained static under current conditions, the Amended Remedy will also monitor the ongoing effectiveness of the in-situ processes to reduce the toxicity, mobility and volume of the contaminants in the aquifer. Monitoring of the ground water contamination will evaluate any changes in the aquifer conditions or the waste management area.

5. Short-term Effectiveness

This criterion addresses the time factor. Technologies often require several years for implementation. A potential remedy is evaluated for the time required for implementation and the potential impact on human health and the environment during the remediation.

The short-term risks associated with the 1993 ROD Remedy are greater when compared with those risks associated with the Amended Remedy. The multiple waste handling steps involved in the original ROD remedies will result in more opportunities for air emissions from the waste and potential exposure. Potential risks from accidents and spillage of the waste are also associated with transport of any waste material to an off-site treatment/disposal facility. The Amended Remedy minimizes air emissions by maintaining the waste in the engineered impoundment and allowing natural degradation to reduce concentrations in the aquifer.

6. Implementability

Implementability addresses the ease with which a potential remedy can be put in place. Factors such as availability of materials and services are considered. The soil treatment pilot study conducted during the design activities demonstrated that the performance standards could not be achieved by bioremediation. While construction of the ground water treatment plant would utilize existing technologies, the ultimate success of the remedy is unknown given the persistent nature of the ground water contaminants.

The Amended Remedy is readily implementable. The ground water monitoring program can be readily implemented utilizing the existing monitoring wells and standard sampling procedures. EPA and the State of Arkansas will implement the appropriate institutional controls as part of the cleanup objectives for the Site, as discussed below in more detail under "Description of the Selected Remedy."

7. Cost

Costs (including capital costs required for design and construction, and projected long-term maintenance costs) are considered and compared to the benefit that will result from implementing the remedy.

The estimated costs to implement the remedy selected in the 1993 ROD is $19.4 million. The Amended Remedy costs are associated with the ground water monitoring program, institutional controls, and conducting five-year reviews. The EPA estimates the total present worth costs at $298,000 for 30 years of monitoring.

8. State Acceptance

State Acceptance indicates whether, based on its review of documents in the Administrative Record and the Amended Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

The ADEQ concurs with the Amended Remedy. The ADEQ was provided with a copy of the Proposed Plan describing the proposed remedy change for their review and comment. The ADEQ has also participated throughout the design activities and field pilot study as well as the development of institutional controls for the site.

9. Community Acceptance

The EPA recognizes that the community in which a Superfund site is located is the principal beneficiary of all remedial actions undertaken. The EPA also recognizes that its responsibility to inform interested citizens of the nature of Superfund environmental problems and solutions, and to learn from the community what its desires are regarding these sites.

The public comment period for the Proposed Plan began July 23, 2001, and closed on August 21, 2001. The EPA did not receive any comments on the Proposed Plan during the public comment period. A public meeting held on July 30, 2001, at the South Arkansas Community College Library Auditorium in El Dorado, Arkansas was not attended by the local community. The transcript of the public meeting is a part of the Administrative Record.

SUMMARY OF THE AMENDED REMEDY

Summary of the Rationale for the Amended Remedy

The EPA believes the Amended Remedy is equally protective of human health and the environment and will achieve the amended remedial action objectives established for the site. The additional site characterization has demonstrated that active treatment and restoration of the ground water contaminant plume is unnecessary to control migration of shallow ground water contaminants so as to reduce and/or eliminate the potential threat of contamination impacting deeper drinking water aquifers. The presence of a carbonaceous layer in the aquifer, the low

solubility of the PAH and PCP contaminants, and the occurrence of biodegradation has limited the extent of contamination to the top 30 feet of the shallow aquifer within the outlines of the old impoundments at the site. In addition, nearly ten years of soil cell monitoring have shown that further leaching of contaminants has been reduced or eliminated from the stabilized soils. This is to be expected as the soils, in addition to being stabilized, were protected by a two-foot clay liner in the soil cell. Thus, there is little or no fluid movement out of the low permeability soil cell.

Description of the Selected Remedy

The Amended Remedy consists of the following components:

- Implementation of a ground water monitoring program, including sampling and analyses of the monitoring wells for a period of five years, to ensure the static conditions of the contaminant plume. Subsequent monitoring of off-site monitoring wells would occur during the scheduled five-year review activities to ensure there is no human exposure.

- Maintenance of the existing engineering controls, including the engineered impoundment's soil cover and the site security fence, at the site. The solidified soils within the engineered impoundment will remain permanently in place and will not undergo further treatment. The Site will be utilized for long-term waste management of the treated soils.

- Institutional controls will be implemented to prevent exposure to contaminants at concentrations above health-based risk levels that may remain at the Site. Usually institutional controls limit activities at or near sites. Examples include: land and natural resource use restrictions, deed restrictions (i.e., controlling future land use), prohibitions on well drilling, well use advisories, and deed notices. The Amended Remedy for the Site will include enforceable institutional controls as necessary to prevent drilling and excavation that might result in exposure to Site contaminants. Specifically, EPA will work with ADEQ to request Union County to exercise its authority under A.C.A. § 14-268-104 to bar drilling and excavation activities in the area of the Site. This section of the Arkansas Code permits local authorities to "enact ordinances, building or zoning codes, or other appropriate measures regulating, restricting, or controlling the management and use of land, structures, and other developments in flood-prone areas." According to the U.S. Army Corps of Engineers, it appears that a substantial portion of the Site is within the 100-year flood plain. In fact, according to the ATSDR Public Health Assessment conducted for the Site, "a major flood event had occurred at the site" in 1989 or 1990, which "inundated the site drainage area" and formed a channel that "allowed heavily contaminated materials to drain off the site and directly enter the

Bayou." The potential for such releases should provide ample justification for the County to exercise its flood loss prevention authority in the manner described.

In the alternative, if the method described above becomes unavailable or impracticable, EPA will work with ADEQ to require the owners of the property to encumber their interests with enforceable restrictions on excavation and drilling, or take other similarly effective measures.

As a further protective measure, a copy of any form of restriction will be filed with the Union County Clerk and any other authority having jurisdiction over local land use.

- A plan for monitoring the effectiveness of the institutional controls will be outlined in an Operation and Maintenance Plan (O&M Plan) for the site.

Summary of the Estimated Amended Remedy Costs

Annual Operation and Maintenance Costs for the Amended Remedy				
Description	Unit Cost	Quantity	Total Cost	Present Worth Cost
Sampling & Analysis per Event	$3000/well	10 wells	$30,000	
Sampling Year 1	$30,000	2 events	$60,000	
Sampling Year 2	$30,000	1 events	$30,000	
Sampling Year 3	$30,000	1 event	$30,000	
Sampling Year 4	$30,000	1 event	$30,000	
Sampling Year 5	$30,000	1 event	$30,000	
Subtotal for 5 Yr sampling			$180,000	
Administrative Cost @ 15%			$27,000	
Five Year Review	$25,000	1 event	$25,000	
Well Maintenance for 5 years	$500/well/year	10 wells/year	$25,000	

Annual Operation and Maintenance Costs for the Amended Remedy				
Description	Unit Cost	Quantity	Total Cost	Present Worth Cost
Subtotal Cost for 5 Years			**$257,000**	**$183,000**
Yearly Cost of Sampling at 5 year intervals.	$30,000/event	1 event	$30,000	
Well Maintenance Cost	$5,000/yr	5 years	$25,000	
Five Year Reviews	$25,000 /event	1 event	$25,000	
Subtotal Cost for Monitoring and Performance of 5 Year Reviews			$80,000/5 years	
10 th Yr Cost			$80,000	$224,000
15th Yr Cost			$80,000	$253,000
20th Yr Cost			$80,000	$274,000
25th Yr Cost			$80,000	$287,000
30th Yr Cost			$80,000	$298,000
Notes: Present worth cost estimates are given a 7% discount rate for a 30 year duration. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the Amended Remedy. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.				

Expected Outcomes of the Amended Remedy

While the 1993 ROD did not specify the expectations following completion of the remedial action, the prior soil treatment and capping and this Amended Remedy will establish long-term waste management as the expected land use at the Site. Implementation of the appropriate institutional controls will limit or prevent invasive activities, such as drilling, excavating, etc., that may disturb or expose the underlying soils or shallow ground water at the Site. In addition, approximately half of the Site lies within the Bayou de Loutre floodplain which will further limit the scope and type of other possible redevelopment alternatives for the property. Given these restrictions, other alternatives for redevelopment of the property are likely limited to

a recreational scenario. Since the human health risk assessment evaluated the risks associated with a residential scenario in the 1993 ROD, a recreational scenario will produce an even lower rate of exposure that will remain protective of human health. The Site will be available for redevelopment following the implementation of the appropriate institutional controls.

Implementation of the TI waiver at the Site will prevent future use of the shallow ground water in the Cockfield aquifer since contaminant concentrations will remain above the MCLs established under the Safe Drinking Water Act. While the TI waiver only applies to the Cockfield aquifer at the Site, the institutional controls will also prevent any future well installations at the Site which will effectively eliminate the shallow and deeper aquifers as either a potable or non-potable water supply at the Site.

The purpose of this amended response action is to control risks posed by direct contact with the treated and capped soils and ground water. The principal risks to human health are not associated with surface soils or sediments but with the contaminated ground water. Cleanup levels established for the ground water in the 1993 ROD have been removed through the TI waiver, and a combination of monitoring and institutional controls will be used to prevent direct contact. While ongoing biodegradation is expected to limit contaminant migration in the ground water, the remaining contaminant concentrations are expected to remain above the appropriate MCLs.

The Amended Remedy is not anticipated to provide significant socio-economic or community revitalization impacts to the surrounding area. The 41 acre property is approximately 3/4 mile south of the city of El Dorado and the surrounding area is rural and residential/ commercial, although no homes are located along the site perimeter.

STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Amended Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Amended Remedy protects human health and the environment through maintenance of the engineering controls implemented during prior response actions, implementation of a ground water monitoring program, and the placement of institutional controls on the Site property. The engineering controls through one or more of stabilization, capping and storage in clay lined cells have reduced a potential source of leachate to the ground water. Maintenance of the caps placed on the soils will ensure that infiltration from the surface will not cause further waste migration. Site monitoring during the last ten years has demonstrated that this action was successful in eliminating further leaching of contaminants from these areas into the ground water.

The potential for waste migration at the Site is negligible and the implementation of a monitoring program will ensure that the current site conditions remain protective of human health and the environment to potential off-site receptors. Further waste migration in the ground water is limited by the presence of a carbonaceous layer in the aquifer, the low solubility of the PAH and PCP contaminants, and biodegradation that has degraded site contaminants. The extent of ground water contamination is limited to the top 30 feet of the shallow aquifer within the outlines of the old impoundments at the site. The dissolved phase ground water contamination, as indicated by the PCP and naphthalene, is limited to a 160-foot travel distance within the immediate area of the former process ponds. As a result, the placement of institutional controls on the Site preventing further drilling in the area will further reduce the potential for exposure to the contaminated ground water.

Compliance with Applicable or Relevant and Appropriate Requirements

The 1993 ROD remedy (page 106) of excavation and biological treatment identified chemical-specific, location-specific, and action-specific ARARs, and other criteria, advisories, or guidance to be considered (TBC) for compliance during implementation of the remedial action. These ARARs and TBC criteria (with two exceptions) do not apply to the amended remedial action in this ROD Amendment since waste material will not be further excavated, stored or treated.

The first of two ARAR/TBC criteria exceptions from the 1993 ROD is the Safe Drinking Water Act MCLs identified in 40 CFR Part 141. In accordance with Section 121(d)(4)(C) of CERCLA and Section 300.430(f)(1)(ii)(C)(3), a TI waiver is being implemented at this Site for the MCLs identified as the ground water cleanup goals. The TI Waiver will apply to the remedial goal of 0.2 parts per billion (ppb) for polynuclear aromatic hydrocarbon (PAH) compounds expressed as benzo(a)pyrene. This remedial goal was established in the 1993 Record of Decision

(ROD) and is based on the MCL identified in the Safe Drinking Water Act. While the 1993 ROD did not identify any other remedial goals for the ground water, the other potential ARARs for this Site that the TI Waiver will apply to is the 1 ppb MCL for pentachlorophenol (PCP).

A TI waiver is appropriate for this Site because the ground water extraction system will not be able to effectively address both the residual and free-phase NAPL present in the soils and upper aquifer. Data from remedy performance is not always necessary to justify an ARAR waiver due to TI (Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites, OSWER Directive 9283.1-12). Under the conditions identified at the Site, ground water restoration of the remaining NAPL in the aquifer is technically impracticable. Unless both the free-phase (mobile) and residual NAPL are removed from the soil and aquifer material, a ground water extraction remedy will not be able to attain the remedial goals in a time frame that would be considered reasonable for the Site.

The second exception is the TBC criterion concerning a non-promulgated local deed notice for this Site. This criterion or a more effective measure will still be implemented at this Site as part of the institutional controls to assist in the prevention of exposure to Site related contaminants of concern.

Cost Effectiveness

The estimated present worth cost of the 1993 ROD remedy was $11.9 million for the biological treatment of the contaminated soils and $7.5 million for cleanup of the contaminated ground water for a total cost of $19.4 million. Subsequent cost estimates during the remedial design projected total project costs of $25 million with an additional $800,000 for the bioremediation pilot studies. The higher costs associated with the 1993 ROD remedy were proportional to the expected reduction of the toxicity and mobility of the wastes during treatment of the soil and ground water. However, the pilot tests conducted by EPA failed to accomplish the remedial goals established for the soils. Subsequent monitoring of the Site has demonstrated that the soil treatment cells are not a major source for continued leaching of contaminants into the ground water. Since the 1993 ROD did not identify the surface soils as direct contact risk exceeding EPA's acceptable levels, further treatment of the soils was determined to be unwarranted. In addition, the ground water contamination was demonstrated to be relatively stable, with little or no migration outside of the original source area and no predicted impacts to the surrounding off-site areas or underlying aquifers supplying drinking water.

The Amended Remedy is a cost-effective solution that remains protective of human health and the environment and complies with the ARARs. The Amended Remedy relies on the existing engineering controls, site monitoring and the implementation of institutional controls to limit site access and potential exposure due to invasive activities. The cost-effectiveness of the

Amended Remedy also achieves the same long-term effectiveness and permanence and short-term effectiveness as the 1993 ROD remedy while relying on the site's natural capacity to reduce the toxicity, mobility, and volume of the ground water contaminant plume. The present worth costs associated with the monitoring program, institutional controls, and performance of the five-year reviews are estimated at $298,000 for 30 years versus the $19.4 million estimated for the 1993 ROD remedy. In addition, the costs for the different phases of the remedial action including the additional soil and ground water investigation, ground water modeling to forecast the plume migration, and remedial construction of the secondary cap around monitoring well MW-27, and the UST removal cost $1.892 million. The cost for the construction of the secondary cap was $250,000. Removal of the UST was $27,000.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The EPA has determined that the Amended Remedy for the soils meets the statutory requirement to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The Amended Remedy recognizes that the principal threats posed by the soils have been addressed by the soil stabilization and capping during the 1990 - 1991 removal action and the supplemental soil capping in 2000. The prior actions prevent or significantly reduce further leaching into the ground water, provide the most effective treatment method, and will cost less than the 1993 ROD remedy. The Amended Remedy remains consistent with program expectations that principal threat wastes are a priority for treatment. The EPA has determined that the amended source control remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

In accordance with Section 121(d)(4)(C) of CERCLA and Section 300.430(f)(1)(ii)(C)(3), a TI waiver is being implemented at this Site for the ground water cleanup goals. A TI waiver is appropriate for this Site because the ground water extraction system will not be able to effectively address both the residual and free-phase NAPL present in the soils and upper aquifer. Unless both the free-phase (mobile) and residual NAPL are removed from the soil and aquifer material, a ground water extraction remedy will not be able to attain the remedial goals in a time frame that would be considered reasonable for this Site. Thus, EPA has determined that the Amended Remedy for ground water meets the statutory requirement to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The Site's natural capacity to limit further migration rather than active extraction and treatment is the most practicable and cost efficient treatment method available. While a treatment technology

is not employed at the Site, the Site's natural capacity to contain ground water contamination is an alternative means of achieving the remedial objectives compared to the other alternative. The EPA has determined that the selected ground water remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

Preference for Treatment as a Principal Element

Prior treatment of contaminated soils by stabilization and capping has addressed the principal threats posed by the Site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. However, the presence of NAPLs in the aquifer represents a principal threat waste at the Site that has not been addressed through treatment. Based on the field collected for this Site, a TI waiver is appropriate for the ground water contamination because the ground water extraction system will not be able to effectively address both the residual and free-phase NAPL present in the soils and upper aquifer. Reliance on the natural capacity of the aquifer and in-situ biodegradation to limit further spreading of the NAPL and the associated dissolved plume instead of active treatment for the ground water is more cost effective because the same degree of protectiveness to human health and the environment is achieved at a much lower cost. Therefore, treatment of the ground water is not necessarily appropriate at this Site to achieve the remedial action objectives or goals.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years of the effective date of this ROD Amendment to ensure that the remedy is protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

Implementation of the engineering controls, monitoring activities, and the institutional controls to ensure the Amended Remedy is protective of human health and the environment remains unchanged from those same activities identified as part of the Preferred Alternative in the Proposed Plan. The significant change from the Preferred Alternative identified in the Proposed Plan is an administrative action by EPA to change the Remedial Goals and Remedial

Action Objectives for this Site. In the Proposed Plan, the EPA identified Alternate Concentration Limits (ACLs) of 2,080 ppb for PCP and 110 ppm for PAHs (expressed as benzo(a)pyrenes) as a replacement for the ground water Remedial Goals of 0.2 ppb PAHs identified in the 1993 ROD. The ACLs were proposed for application at this Site based on site-specific reasons that coincided with a change in the remedial action objectives.

Based upon further review, the EPA has determined that the proposed ACLs at this Site may not be consistent with the intended use of ACLs as described in the NCP. As a result, the EPA has determined that a TI waiver for the Remedial Goals identified in the 1993 ROD is a more appropriate administrative action that is consistent with the change in Site remedial action objectives identified in this ROD Amendment. Since the remedial action objective of restoring the ground water to a potential future beneficial use is no longer applicable to this Site, the TI waiver will achieve the same results as the implementation of ACLs. The TI waiver is included in the Administrative Record.

RESPONSIVENESS SUMMARY

The public comment period for the Proposed Plan began July 23, 2001, and closed on August 21, 2001. A notice of the public comment period, the public meeting, and location of the administrative record were published in the El Dorado News-Times newspaper on July 20, 2001. In addition, copies of the Proposed Plan were mailed to the local community. A public meeting was held on July 30, 2001, at the South Arkansas Community College Library Auditorium in El Dorado, Arkansas. The EPA did not receive any comments on the Proposed Plan during the public comment period and nobody attended the public meeting except for representatives from EPA and ADEQ. A transcript of the public meeting is included in the Administrative Record.

FIGURES

FIGURE 1 - Location Map

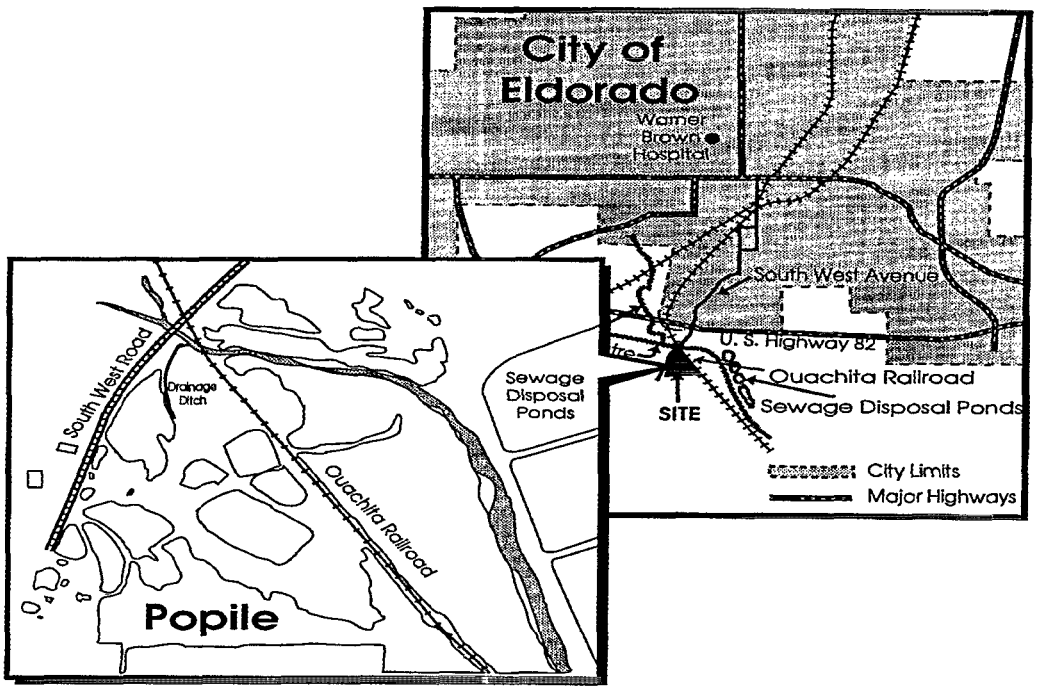


FIGURE 2 - Geologic Setting

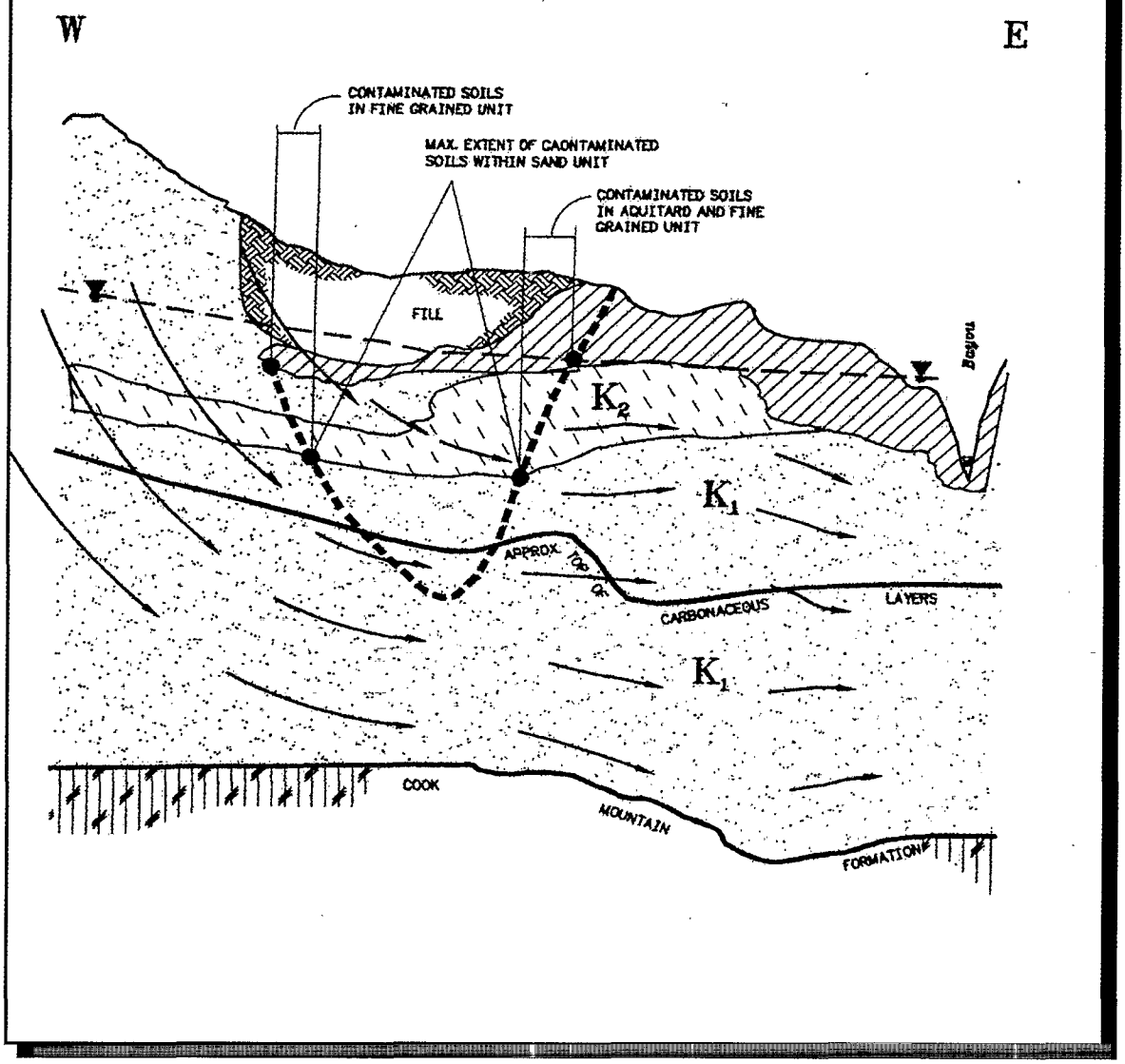


Figure 3 - PCP Contaminant Plume

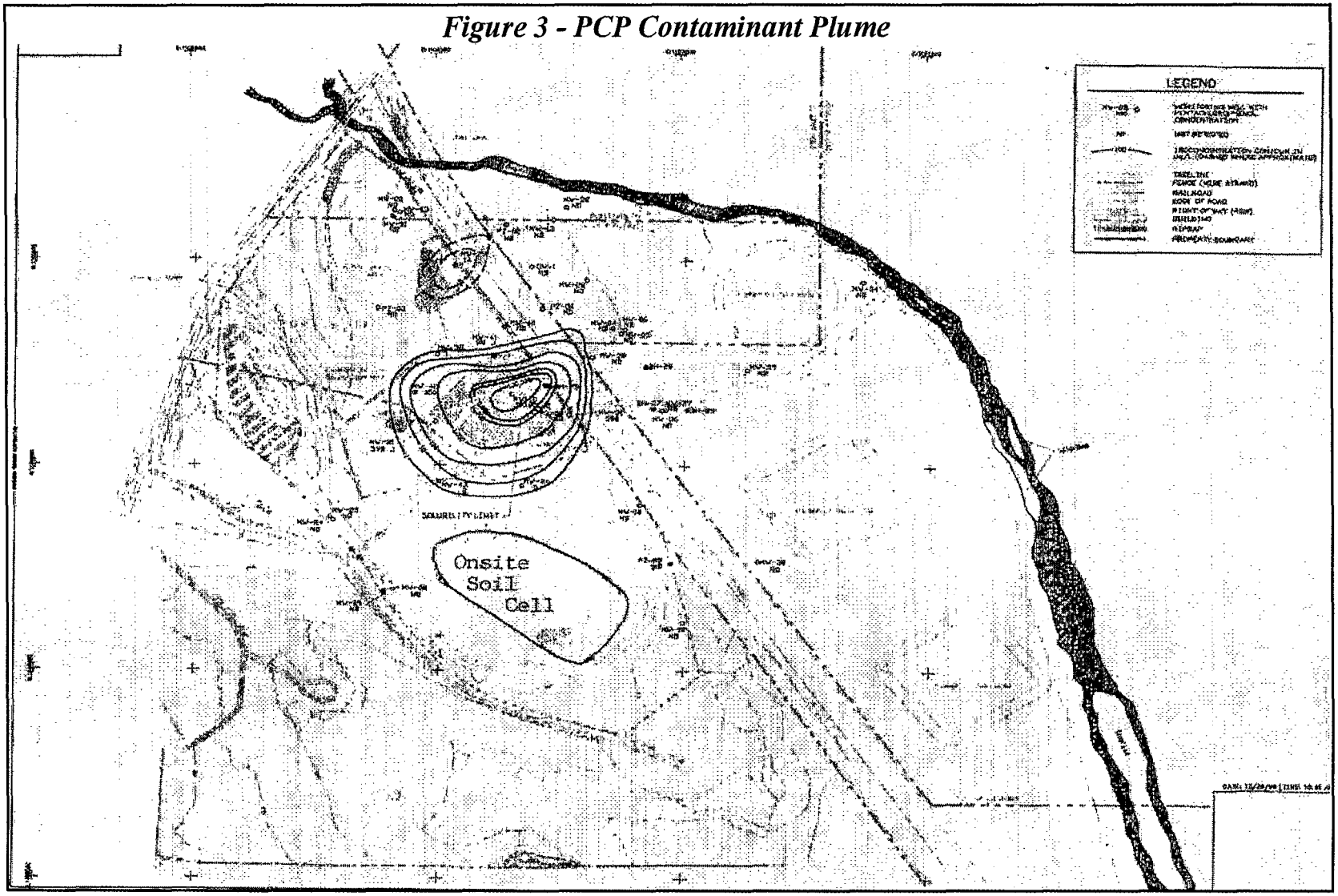


FIGURE 4 - PCP (ppb) Plume In 1998

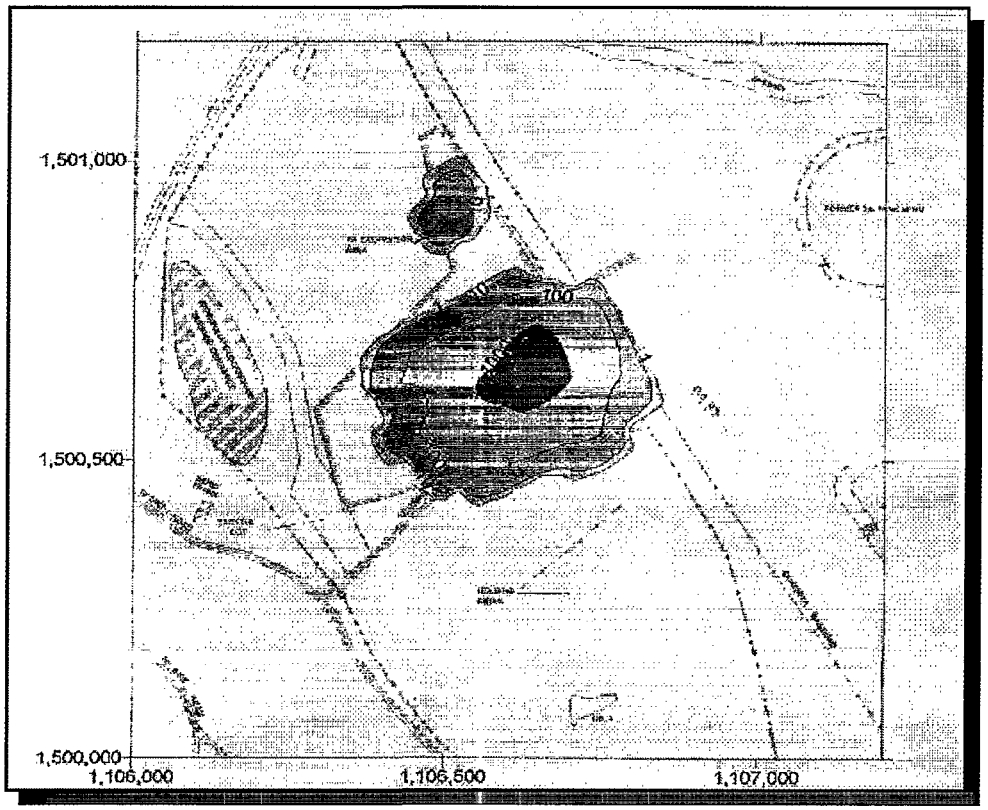


FIGURE 5 - PCP (ppb) Plume in Year 2048

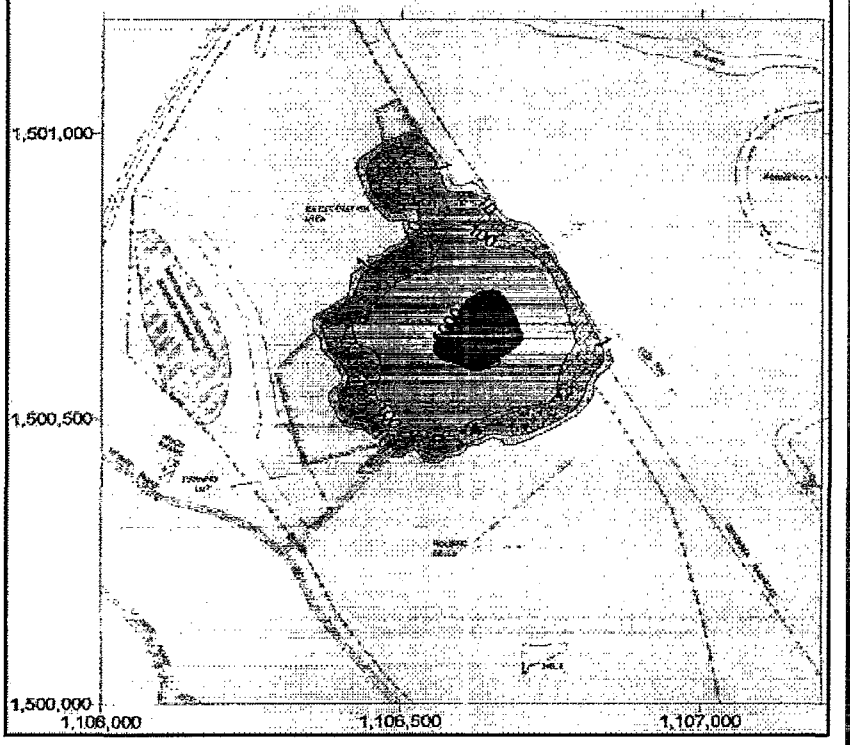
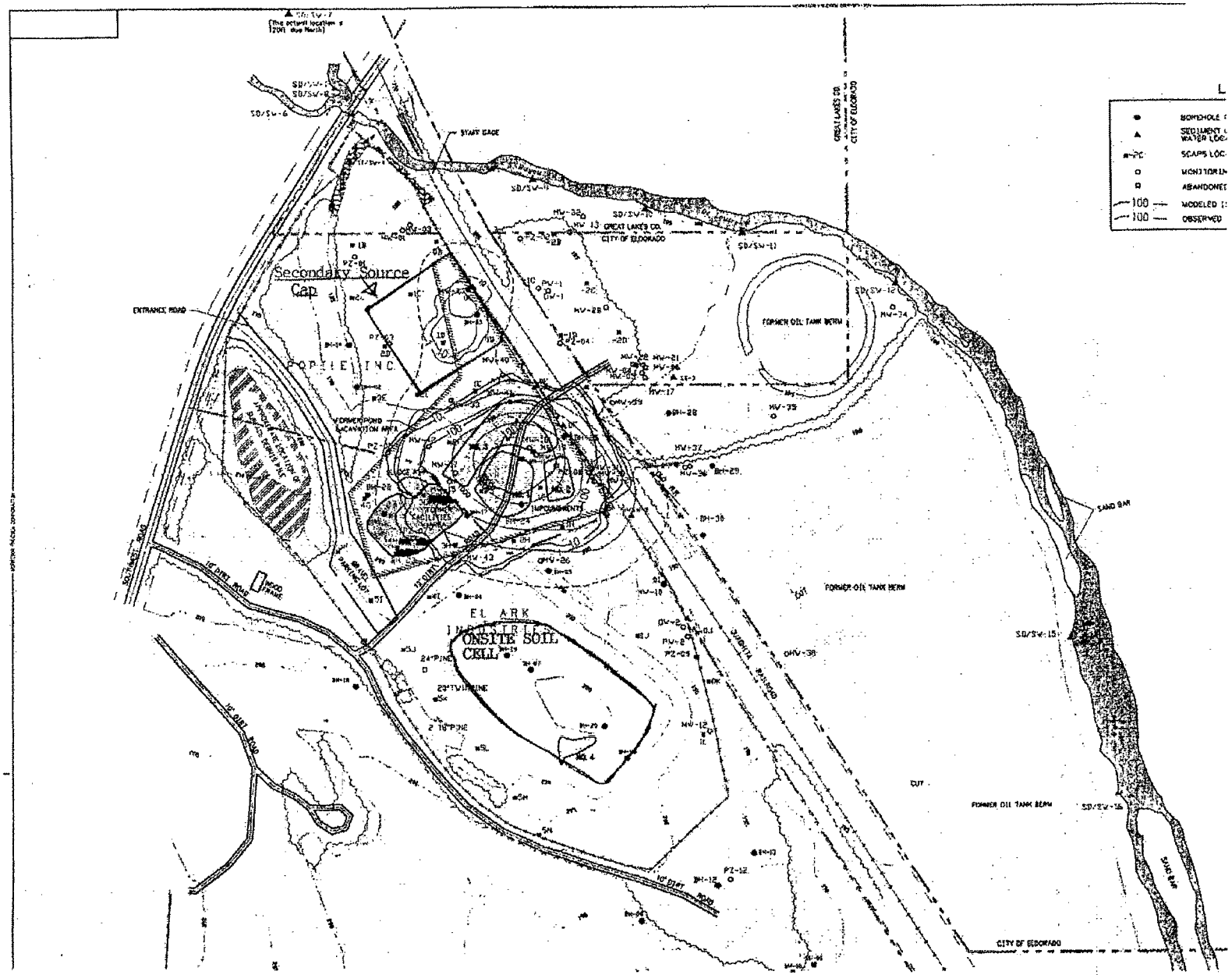


FIGURE 6 SECONDARY CAP



POPILE, INC., SUPERFUND SITE
TECHNICAL IMPRACTICABILITY DETERMINATION

The Popile, Inc. Superfund Site (Site), CERCLIS ID # ARD008052508, is a 41 acre property about 3/4 mile south of the city of El Dorado in Union County, Arkansas (Figure 1). The property is bordered by South West Avenue on the west, the Ouachita Railroad on the east, and Bayou de Loutre on the north. These three boundaries intersect on the north end of the Site. A forested highland area borders the Site to the south. The surrounding area is rural and residential/ commercial, although no homes are located along the Site perimeter. The city of El Dorado has a population of approximately 25,000.

Prior to the beginning of wood treatment operations, the Site was associated with oil field and storage operations. Prior oil-field activities included several above-ground storage tanks and oil pits in the immediate vicinity of the Site. El Dorado Creosote Co., the predecessor company of Popile, Inc., began using the Site as a wood treatment facility in 1947. El Dorado Pole and Piling Company, Inc., purchased the property in 1958. A small impoundment was initially constructed to store process wastewater and sludge from the early operations. By 1964, this impoundment had grown considerably in size and a sludge pit was added. Two additional process impoundments were constructed in 1969. Starting in 1976, three surface pits were used as part of the waste treatment process at the plant. The primary contaminants found at the Site include PCP and creosote compounds associated with wood treatment. Wood treatment operations stopped in July 1982. In September 1982, Popile, Inc. was formed and apparently purchased about 7.5 acres of the property, including the three surface pits. El Ark Industries, Inc. apparently purchased the remaining 34 acres (County records reveal some ambiguity as to whether these last two transactions were actually concluded).

The Environmental Protection Agency (EPA) proposed the Site for inclusion on the National Priorities List (NPL) in February 1992. The Site was listed on the NPL on October 14, 1992. The Remedial Investigation and Feasibility Study (RI/FS) began in January 1992 and was completed in July 1992. EPA issued a Record of Decision (ROD) in February 1993 specifying the in-situ (in place) treatment of contaminated ground water, the extraction and off-site disposal of free phase wood treating fluids, and the on-site biological land treatment of contaminated soils and sludge.

SPECIFIC ARARs or MEDIA CLEANUP STANDARDS

The Technical Impracticability (TI) waiver will apply to the remedial goal of 0.2 parts per billion (ppb) for polycyclic aromatic hydrocarbon (PAH) compounds expressed as benzo(a)pyrene. This remedial goal was established in the 1993 Record of Decision (ROD) and is based on the Maximum Contaminant Level (MCL) identified in the Safe Drinking Water Act. While the 1993 ROD did not identify any other remedial goals for the ground water, the other

potential Applicable or Relevant and Appropriate Requirements (ARARs) for this Site that the TI Waiver will apply to is the 1 ppb MCL for pentachlorophenol (PCP).

SPATIAL EXTENT OF TI WAIVER

The TI waiver will apply to the ground water present beneath the current Site boundary eastward to the Ouachita Rail Road as illustrated in Figure 1. The horizontal extent is based on the presence of residual contamination throughout the Site soils and non-aqueous phase liquid (NAPL) within the aquifer beneath the former impoundment area. The vertical extent of the TI waiver is to the base of the Cockfield aquifer approximately 55 feet below the ground surface containing the PCP and PAH NAPLs and associated dissolved contaminant plume. While NAPL contamination has been found in an isolated off-site area, the contamination does not extend vertically to the aquifer and the adjacent ground water monitoring wells have remained non-detect for the contaminants of concern.

SITE CONCEPTUAL MODEL

Background

There are no drinking water wells located within ½ mile of the Site. Shallow groundwater (20 feet deep) within the county is used only upgradient of the Site, primarily for livestock and irrigation. The Site is located within a former oilfield area with production dating back to the 1920's. In addition, crude oil contamination of the soil is present between the eastern Site boundary and Bayou de Loutre. Ground water quality has likely been degraded as a result of the past operations in the area. Deep aquifer (500 to 600 feet deep) wells completed in the El Dorado aquifer of the Sparta Sand are more than 3 miles from the Site and provide drinking water to more than 26,000 residents. These wells draw from a much deeper ground water zone than the shallow zone.

Geologic and Hydrologic Setting

The Popile Site is located in an upland area adjacent to the alluvial valley of the Bayou de Loutre, a tributary of the Ouachita River. Near-surface geology in the area consists of the Quaternary age alluvium overlying the Cockfield and Cook Mountain formations. The Cockfield formation is the prevalent surface unit in the upland areas of the Site and is present beneath the clean backfill. The Cockfield formation consists of fining upward sequences and is divided into two general stratigraphic units, namely: the upper fine-grained unit consisiting of silts and clays (upper layer); and a lower carbonaceous rich sand layer (lower layer) (Figure 2).

The upper layer underlies most of the Popile Site and areas east of the Site. This unit consists of interbedded clayey or sandy silts, or sandy clays. In the Removal Action area, the unit

thickness across the Site now ranges from approximately 6 to 19 feet. Based on the rise in water levels in wells completed in the underlying sand, this upper layer acts as a confining layer to sands below it on the eastern portion of the Site. The upper layer appears to grade laterally into a sand facies along the western boundary of the Site, consisting of fine- to very fine-grained clean sand with an occasional interbedded silt or clay layer. The fine-grained unit is projected to underlie the Bayou de Loutre.

The shallow Cockfield aquifer is within the carbonaceous rich lower layer and consists predominantly of a poorly graded, fine to very fine sand. Scattered small pebbles are common, and at some locations, thin beds of gravelly sand or sandy gravel occur. The upper third of this sand layer has disseminated carbonaceous matter (up to 3%) throughout the unit, averages 15 feet in thickness across the Site, and is the aquifer zone of interest as far as contaminant migration.

Overall, the lower carbonaceous sand layer is 21 - 51 feet thick and comprises the lower 2/3 of the shallow aquifer, and the variation in thickness generally reflects the change in elevation of the underlying Cook Mountain surface. A characteristic feature of this unit is that it has layered black carbonaceous matter which acts as a barrier and "filter" to downward migration of contaminants. The individual carbonaceous layers range in thickness from 18 to 31 inches.

The Cook Mountain formation consists of clays and silty clays and may range up to 160 feet in thickness. It is regionally the lower confining layer for the Cockfield formation and also the upper confining layer for the underlying Sparta Sand aquifer, a regional drinking water aquifer.

Beneath the Site, the direction of groundwater flow is east and northeast with a horizontal gradient on the order of 0.015 feet/feet within the shallow Cockfield aquifer. The aquifer transitions from unconfined conditions along the hills on the western side of the Site to confined conditions beneath the former treatment cell, as the sand aquifer is recharged in the higher elevation area and the upper layer acts as the confining layer in the lower elevation area. The degree of confinement increases toward the Bayou de Loutre as the proportion of silt and clay increases in the upper layer. Hydraulic communication between the shallow aquifer and the Bayou is weak, and groundwater flow tends to pass beneath the Bayou in this segment.

Hydraulic conductivities across the Site vary with depth. The greatest hydraulic conductivity contrast occurs on the interface between the upper layer and the sand layer. Hydraulic conductivity values tend to be within the $1x10^{-5}$ to $1x10^{-4}$ cm/sec range within the upper layer, and $5x10^{-4}$ to $5x10^{-3}$ cm/sec range within the shallow aquifer. Contaminant transport is predominantly horizontal in the sand layer.

Contaminant Source

Wood-preserving operations at the Popile Site began in 1947. Chemicals used during this period typically included creosote or a mixture of 30% to 50% creosote with petroleum distillate or an asphalt-based residuum oil for wood treatment. The mixture was used to aid the penetration of creosote into the wood and was applied in pressurized cylinders. In 1958, wood preserving operations at the Site included the use of creosote as well as pentachlorophenol (PCP). PCP preserving typically involved pressure treatment with a light carrier oil, such as diesel, containing approximately 5% entrained PCP.

A small impoundment was initially constructed to store process wastewater and sludge from the early operations. By 1964, this impoundment had grown considerably in size and a sludge pit was added. Two additional process impoundments were constructed in 1969. Wood treatment operations ceased at the Site in 1982.

Creosote is a complex mixture of chemical constituents encompassing diverse chemical structures. Of the 150 to 200 chemicals in creosote, only a few are present in amounts of 1% or more. Creosote is a highly insoluble dense non-aqueous phase liquid (DNAPL) that tends to collect in "pools" within the soil matrix. Groundwater tends to flow around these "pools" because the oil is highly hydrophobic, and as a result only a small fraction of the total contained PAH mass is actually exposed to the groundwater. The solubilities of the PAHs identified at the Site vary from relatively insoluble to 31 milligrams per liter (mg/L).

Commercial grade pentachlorophenol (PCP) is a white crystalline solid with low solubility in water (14 mg/L), but more soluble in diesel oil (3,100 mg/L). When PCP is used in wood preserving, it is applied in carrier oil to assist in penetration into the wood. PCP does not readily partition from the oil into the groundwater, so it can slowly leach into the groundwater for long periods of time. PCP in an aqueous phase (dissolved in water) can be biodegraded through both aerobic and anaerobic processes.

Contaminant Distribution, Transport, and Fate

The RI/FS completed in 1992 did not sufficiently characterize the subsurface conditions such as defining contaminant source and its associated groundwater plume to fully implement the 1993 ROD remedy. A more detailed site investigation was performed by the U.S. Army Corps of Engineers (USACE) under contract to EPA. The investigation included a Phase I Site Characterization and Analysis Penetrometer System (SCAPS) completed in 1997 and the Phase II Groundwater Investigation and Modeling completed in 1998. The Phase I SCAPS investigation evaluated in-situ geophysical soil properties while simultaneously detecting contamination with laser-induced fluorescence (LIF) technology. The SCAPS survey used 49 sampling locations laid out on a 100-foot triangular grid. The Phase II investigation defined the shallow subsurface geology and hydrology by means of 8 boreholes, 21 monitor wells, and 2

pump/observation well pairs. A total of 68 subsurface soil samples were collected from boreholes/wells and analyzed for chemical, physical, and biological parameters.

Waste generated from past wood preserving operations occurs as both a dense non-aqueous phase liquid (DNAPL) probably associated with creosote and light non-aqueous phase liquid (LNAPL) associated with carrier oils such as diesel. The 1993 ROD identified PCP and the following polycyclic aromatic compounds (PAHs) as contaminants of concern: benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene.

The contamination extends vertically from the soils beneath the impoundments to a depth of 30 feet or more in the upper sand of the Cockfield aquifer. The contamination consists of both residual and free-phase NAPL that are absent in the lower carbonaceous layer of the aquifer. The areal extent of the contamination is approximately 4 acres with an isolated area occurring east of the railroad tracks at a depth of 11 feet. However, adjacent off-site monitoring wells have not detected contamination from this isolated occurrence of NAPL. In addition, the constituents of the former carrier oil (diesel) used in the wood treating process, such as benzene, toluene, ethylbenzene, and xylene, have been detected within and adjacent to the NAPL contamination.

The Phase I and II investigations demonstrated that only the PCP and naphthalene (a PAH) plumes are amenable to spatial interpretation because of their relatively high water solubility. The lack of mobility of the other PAH compounds causes them to exhibit extreme concentration drop off and virtually no spatial distribution. Dissolved phase groundwater contamination, as indicated by the PCP and naphthalene, is limited to a 160-foot travel distance within the immediate area of the former process ponds (Figure 3). In addition, samples from monitor wells and boreholes east of the Site boundary (Ouachita Railroad) indicate non-detect for PCP and PAHs.

The PAH compounds have various physical and chemical characteristics. The lower molecular weight PAHs are more biodegradable, volatile, and water-soluble than the heavier compounds. PAHs are biodegradable, especially under aerobic conditions (in the presence of oxygen). Several of the lower molecular-weight PAHs are also biodegradable under anaerobic conditions (in the lack of oxygen).

Microbial degradation takes place in aerobic and anaerobic forms at the Site. The dominant degradation mechanism is found to be an aerobic process, in which micro-organisms gain energy from PCP and PAHs through a series of oxidation-reduction reactions. For example, PCP and PAHs are oxidized (lose electrons), and oxygen is reduced (gain electrons). Major byproducts of the aerobic degradation are carbon dioxide, chloride, and water. Field evidence of aerobic biodegradation at the Site includes increased carbon dioxide and chloride concentrations, and decreased oxygen levels when compared with background levels outside the zone of contamination.

Observed Concentrations (microgram per liter)			
Areas (1)	Dissolved Oxygen	Carbon Dioxide	Chloride
Background	4,500	67	200
Reaction Area	1,250	88	575
Source Area	400	100	1,200

The Bioplume III model was used to simulate the contaminant distribution and ground water flow conditions that were defined during the Phase I and II investigations. Bioplume III is a two-dimensional finite difference model specifically designed for simulating the natural attenuation of organic contaminants in groundwater due to process of advection, dispersion, sorption, and biodegradation. The model was calibrated to the observed site conditions and additional model runs were used to predict the future groundwater flow and contaminant transport. Although not a contaminant of concern (COC), naphthalene is present in the impoundment area of the Site. As the most mobile of the PAH class of compounds, naphthalene represents the "worst-case" travel scenario for all other PAH COCs. Predictive modeling of naphthalene indicated that the contaminant is not expected to extend to the off-site area. In addition, the calibration process for the ground water model showed the contaminant plumes to be essentially in a steady-state condition for the past 40 years (Figure 4) and are expected to remain so for another 50 years (Figure 5). The extent of the PCP and naphthalene contamination is predicted to remain within an approximate distance of 160 feet from the source areas, while all other PAHs will be essentially stationary. Accordingly, it appears that contamination will not enter the Bayou in the foreseeable future, nor is it expected to extend to off-site receptors.

EVALUATION OF RESTORATION POTENTIAL

Source Control Measures

The EPA conducted a Site Assessment in 1989 and found the leakage of contaminants from the consolidated impoundments closed under the Resource Conservation and Recovery Act (RCRA). The EPA conducted a Removal Action between September 1990 and August 1991 to address releases from the closure area. The Removal Action excavated sludge and contaminated soils from the impoundment areas and northern parts of the Site and stabilized the contaminated materials using rice hulls and fly ash. The stabilized materials (66,000 cubic yards) were disposed of in two clay-lined holding cells in the southern portion of the Site (Figure 6). Excavated areas were backfilled with clean soil and reseeded. Drainage ditches and other erosion control measures were also constructed at the Site. In addition, approximately 500,000 gallons of contaminated water with sheen were pumped off from a large number of surface trenches excavated during the Removal Action. The pumped ground water from trenches was

treated and discharged into Bayou de Loutre. In addition, the old treatment facilities were dismantled.

The 1993 ROD prescribed a remedy of bioremediation in treatment cells of all contaminated soil and sludge including the material stabilized in 1991. However, the bioremediation pilot study demonstrated that the performance standards for PCP and PAHs set forth in the 1993 ROD cannot be achieved in a reasonable time frame. Pilot studies for bioremediation of the stabilized soil were unsuccessful with this method of remediation. Also contaminated soil stabilized in 1991 have been rendered immobile by the stabilization process and a clay liner. Ground water monitoring in the surrounding area for the past 10 years have not detected contaminants leaching from the holding cells. Thus, the stabilized soil and sludges do not pose a significant threat of further releases into the environment.

Additional work in early 2000 addressed an area of surface contamination that was not included in the 1990 - 1991 removal action. This work included the installation of an engineered cap of approximately 0.9 acres near monitoring well 27 to prevent infiltration (Figure 6). The cap installation commenced on February 21, 2000, and was completed four weeks later, on March 16, 2000. The design called for a 200 by 200 foot square base with two feet of compacted clay on top of existing grade plus one-half foot of topsoil, all on 4:1 side slopes.

While the prior removal action and soil capping addressed the potential surface exposure route, NAPLs are still present in the remaining soil profile The NAPLs occur as both a residual and free-phase material extending vertically from beneath the clean backfill to a depth of 30 feet or more in the upper part of the aquifer. The lateral extent of the NAPLs is approximately 4 acres representing a significant mass of soils for either excavation or in-situ treatment. While the biotreatment pilot test on the contaminated soils was unsuccessful, in-situ treatment of the low permeability soil is also unlikely to succeed in treating either the free-phase or residual phase NAPL contamination. The removal of NAPL through the use of ground water extraction wells and interceptor trenches is limited by the characteristics of the aquifer and the physical properties of the creosote and PCP present in the aquifer.

Timeframe to Achieve Remedial Goals

The 1993 ROD identified an area of NAPL contamination in the vicinity of the former impoundments and estimated that a dissolved plume extended well beyond the Site boundary to Bayou de Loutre. The two remedial action objectives for the ground water contamination at this site included:

- Control migration of shallow ground water contaminants so as to reduce and/or eliminate the potential threat of contamination impacting deeper drinking water aquifers; and,
- If technologically achievable, restore the shallow ground water to a potential future beneficial use.

The 1993 remedy selected ground water extraction wells and interceptor trenches as the remedial approach to accomplish the two objectives and remove both the dissolved plume and the NAPL.

The subsequent Site investigation conducted between 1998 and 2000 significantly refined the size and character of the ground water plume at the Site. Ground water contamination is actually confined to an area immediately beneath the former impoundments coinciding with the NAPL contamination surrounded by a narrow band of dissolved plume. The presence of layered black carbonaceous matter in the aquifer which acts as a barrier and "filter" to downward migration of contaminants combined with ongoing in-situ biodegradation of the contaminants has apparently limited further growth of the dissolved plume. Ground water modeling has demonstrated that the plume has changed relatively little in size for the past 43 years and is predicted to remain static for the next 48 years. In addition, the Cook Mountain formation consists of clays and silty clays ranging up to 160 feet in thickness acts as the lower confining layer for the Cockfield formation and also the upper confining layer for the underlying Sparta Sand aquifer, a regional drinking water aquifer. In effect, two objectives of the 1993 remedy have already been achieved for the dissolved plume by demonstrating that the dissolved plume is still within the Site boundary and no further reduction or plume control is necessary, and the underlying Sparta aquifer is protected from potential contamination by the relatively impermeable Cook Mountain formation.

While the pump and treat remedy selected in the 1993 ROD would likely be successful in reducing a dissolved plume, the ultimate effectiveness in long-term reduction of the NAPL source was less certain. The presence of a NAPL beneath the former impoundments is the key factor in evaluating the timeframe to achieve the Site remedial goals. The NAPL is present as both a residual phase adsorbed onto the soil and aquifer material and as free-phase contamination within the matrices of the soil and aquifer. The removal of NAPL through the use of ground water extraction wells and interceptor trenches is limited by the characteristics of the aquifer and the physical properties of the creosote and PCP present in the aquifer. Creosote is a highly insoluble dense non-aqueous phase liquid (DNAPL) that tends to collect in "pools" within the soil matrix. Groundwater tends to flow around these "pools" because the oil is highly hydrophobic, and as a result only a small fraction of the total contained PAH mass is actually exposed to the groundwater. The solubilities of the PAHs identified at the Site vary from relatively insoluble to 31 milligrams per liter (mg/L). The efficiency of any recovery system installed at the Site will be limited by the slow rate of desorption of the creosote and PCP from the soil and aquifer material. As a result, large quantities of water must be pumped to remove even a small amount of the contaminants. Unless both the free-phase (mobile) and residual NAPL are removed from the soil and aquifer material, a ground water extraction remedy will not be able to attain the remedial goals in a time frame that would be considered reasonable for the Site.

Alternative Cleanup Technologies

Steam enhanced extraction is an alternative cleanup technology for the DNAPL at this Site. Steam enhanced extraction has been utilized at a limited number of sites with creosote and PCP contamination with the most notable being the Visalia Pole Yard Superfund Site in California. The technology can reduce the residual soil saturation and enhance the mobility of the DNAPL for capture and removal by conventional ground water extraction wells.

A potential limiting factor in applying steam enhanced extraction is the area extent of the residual and free-phase NAPL contamination and the characteristics of the soils and upper section of the shallow aquifer. Contamination extends from the surface to approximately 30 feet in a series of clayey silts and sands before terminating in the upper sands of the Cockfield aquifer. The widespread shallow contamination will require numerous injection and extraction points to address the lower permeability sediments as well as prevent downward migration of the mobilized NAPL to the lower Cockfield aquifer.

A second limiting factor in applying the technology to this Site is the high capital cost involved for the installation of the systems. An accurate cost estimate is difficult because of the limited number of sites employing the steam extraction system. Cost estimates from the Visalia site indicate a unit cost of $57 per cubic yard of soil treated with an approximate total project cost of $21.5 million for an area of 1.75 acres. Similar cost estimates of 4 - 6 million dollars per acre for system installations can be applied when estimating the total cost for a system installation. For this Site, the impoundments and surrounding area encompass approximately 4 acres with an estimated cost for enhanced steam extraction of 16 - 24 million dollars. Since the Site is located within a former oilfield, and the Sparta aquifer is the local drinking water supply, remediation of the shallow aquifer is cost prohibitive. The cost for an alternative cleanup technology such as steam enhanced extraction is impracticable given the limited future beneficial use.

COST ESTIMATE

The total cost for the 1993 ROD remedy for the ground water cleanup is $7.5 million with an estimated capital cost of $2.1 million and annual operation and maintenance costs of $180,000 for 30 years. The total cost for bioremediation of the soils was estimated at $11.9 million. The remedial alternative of monitoring the ground water and implementing institutional controls reduces the cost to less than $300,000 for 30 years.

SUMMARY

The EPA has determined that a TI waiver is appropriate for this Site because the ground water extraction system will not be able to effectively address both the residual and free-phase NAPL present in the soils and upper aquifer. Data from remedy performance is not always

Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites, OSWER Directive 9283.1-12). Under the conditions identified at the Site, ground water restoration of the remaining NAPL in the aquifer is technically impracticable. Recognizing the inherent limitations of a pump and treat system in this setting, the 1993 ROD built in certain contingencies for the operating system in the event that contaminant levels cease to decline. These contingencies include low-level pumping to maintain gradient control of the plume, the implementation of a TI waiver for certain portions of the aquifer, and/or the use of institutional controls to restrict access. Based on the available Site data, the contaminant concentrations have already achieved static levels indicating steady-state conditions between the NAPL and the surrounding dissolved phase plume. These conditions are further demonstrated by the lack of plume growth with little or no predicted changes based on modeling of the site conditions. Implementation of a pump and treat system for the recovery of NAPL or dissolved phase contamination would have a limited impact in achieving the Site remedial goals and objectives. Furthermore, limited pumping of the aquifer is unnecessary to maintain gradient control since the dissolved plume has demonstrated little or no migration from the source area due to physical adsorption and biodegradation within the aquifer. The long-term management solutions for the ground water contamination includes the use of institutional controls to prevent exposure and the use of a TI waiver for the previously established remedial goals (chemical-specific ARARs).

By: _____ Date: 9/28/01

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Prepared for

United States Environmental Protection Agency

Region 6

ADMINISTRATIVE RECORD INDEX

for

POPILE, INCORPORATED
SUPERFUND SITE
ROD AMENDMENT

EPA ID No. ARD008052508

ESS II
Task Order No. 083-017

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July 2, 2002

PREAMBLE

The purpose of this document is to provide the public with an index to the Administrative Record file (AR) for the U.S. Environmental Protection Agency's (EPA) selected remedial action to respond to conditions at the Popile, Incorporated Superfund site (the "Site"). EPA's remedial action is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9601 et seq.

Section 113 (j)(1) of CERCLA, 42 U.S.C. Section 9613 (j)(1), provides that judicial review of the adequacy of a CERCLA response action shall be limited to the administrative record. Section 113 (k)(1) of CERCLA, 42 U.S.C. Section 9613 (k)(1), requires the EPA to establish an administrative record upon which it shall base the selection of its remedial actions. As the EPA decides what to do at the site of a release of hazardous substances, it compiles documents concerning the site and the EPA's decision into an "administrative record file." This means that documents may be added to the administrative record file from time to time. Once the EPA Regional Administrator or the Administrator's delegate signs the Action Memorandum or the Record of Decision memorializing the selection of the action, the documents which form the basis for the selection of the response action are known as the "administrative record."

Section 113(k)(1) of CERCLA requires the EPA to make the administrative record available to the public at or near the site of the response action. Accordingly, the EPA has established a repository where the record may be reviewed near the Site at:

Barton Public Library
200 East 5th Street
El Dorado, Arkansas 71730-3897
(870) 863-5447

The public may also review the administrative record at the EPA Region 6 offices in Dallas, Texas, by contacting the Remedial Project Manager at the address listed below. The record is available for public review during normal business hours. The record is treated as a non-circulating reference document. Any document in the record may be photocopied according to the procedures used at the repository or at the EPA Region 6 offices. This index and the record were compiled in accordance with the EPA's Final Guidance on Administrative Records for Selecting CERCLA Response Actions, Office of Solid Waste and Emergency Response (OSWER) Directive Number 9833.3A-1 (December 3, 1990), and in accordance with Superfund Removal Procedures Public Participation Guidance for On-Scene Coordinators: Community Relations and the Administrative Record, OSWER 9360.3-05 (July 1992).

Documents listed as bibliographic sources for other documents in the record might not be listed separately in the Site index. Where a document is listed in the Site index but not located among the documents which EPA has made available in the repository, EPA will, upon request, include the document in the repository or make the document available for review at an alternate location. This applies to documents such as verified sampling data, chain of custody forms, guidance and policy documents, as well as voluminous site-specific reports. Copies of guidance documents also can be obtained by calling the RCRA/Superfund/Title 3 Hotline at (800) 424-9346. It does not apply to documents in EPA's confidential file. These requests should be addressed to :

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The documents included in the AR index are arranged predominantly in chronological order. The AR index helps locate and retrieve documents in the file. It also provides an overview of the response action history. The index includes the following information for each document:

- **Doc ID**- The document identifier number.
- **Date** - The date the document was published and/or released. "01/01/1001" means no date was recorded.
- **Pages** - Total number of printed pages in the document, including attachments.
- **Title -** Descriptive heading of the document.
- **Document Type** - General identification, (e.g. correspondence, Remedial Investigation Report, Record of Decision.)
- **Author** - Name of originator, and the name of the organization that the author is affiliated with. If either the originator name or the organization name is not identified, then the field is captured with the letters "N/A".
- **Addressee**- Name and affiliation of the addressee. If either the originator name or the organization name is not identified, then the field is captured with the letters "N/A".