Superfund Record of Decision

Hart Creosoting Company
Jasper, Jasper County, Texas

September 2006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

HART CREOSOTING COMPANY
JASPER, JASPER COUNTY, TEXAS

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES (All figures appear at the end of the ROD)

LIST OF TABLES

THE DECLARATION

SITE NAME AND LOCATION

The Hart Creosoting Company Superfund Site is located in Jasper, Jasper County, Texas (Figure 1). The National Superfund Database (CERCLIS) identification number for this Site is TXD050299577.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Hart Creosoting Company, Superfund Site (Site) in Jasper, Jasper County, Texas, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9631(k), and which is available for review at the Jasper Public Library, 175 E. Water Street, Jasper, Texas; at the Texas Commission on Environmental Quality (TCEQ) offices in Austin, Texas; and at the United States Environmental Protection Agency (EPA) Region 6 offices in Dallas, Texas. The Administrative Record Index (Appendix B to the Record of Decision) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The State of Texas (through the TCEQ) concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) 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 SELECTED REMEDY

This ROD sets forth the selected remedy for the Site, which includes removal and treatment of contaminated surface water prior to remediation of sediment, excavation of the contaminated soils and sediments exceeding the preliminary remedial goals (PRGs) and containment onsite in a Resource Conservation and Recovery Act (RCRA) containment cell, and implementing a ground water pump and treatment system for removal of free phase and residual non-aqueous phase liquid (NAPL) identified in the saturated zone. Due to the presence of free phase and residual NAPL and dissolved polycyclic aromatic hydrocarbons (PAHs) in the saturated zone, restoration of the contaminated ground water to its beneficial uses is technically impracticable (TI) within a reasonable time frame. Thus, a TI waiver to waive the maximum contaminant levels (MCLs) and ground water PRGs for the potential drinking water source is included as a component of the selected remedy. The selected remedy is a comprehensive approach for this Site that addresses all current and potential future risks caused by exposure to soil, ground water, surface water, and sediment that were impacted by the prior wood preserving treatment process. Institutional controls will also be implemented to ensure future redevelopment of the Site is consistent with the long-term management of the waste contained at the Site and the acceptable risk levels remaining in the onsite soils and ground water. The major components of the selected remedy include:

- Removing contaminated surface water and treating the contaminated surface water to meet the Texas Surface Water Quality Standards (TSWQSs) and/or surface water PRGs prior to discharge.
- Excavating soil and sediment containing chemicals of concern (COCs) at concentrations exceeding the PRGs and disposing the excavated soil/sediment into an onsite RCRA containment cell (RCC) to be constructed to meet the RCRA Subtitle C landfill requirements.
- Implementing institutional controls (ICs) for the Site to restrict the future use of the Site to commercial/ industrial land use.
- Installing a NAPL recovery system to remove free phase and residual NAPL from the saturated zone to the extent practicable.
- Applying a TI waiver to waive the MCLs and or ground water PRGs and define a TI zone (TIZ) for the contaminated ground water.
- Establish a plume management zone (PMZ) encompassing the TIZ to prevent ground water development. The PMZ will assure that future ground water pumping does not mobilize contaminants beyond the TIZ.
- Implementing ICs for the TIZ and PMZ to restrict future ground water use.

- Implementing a ground water monitoring program to evaluate natural attenuation of the COCs and to verify that the contaminated ground water is managed within the PMZ.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with or meets the requirements for a waiver of Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, is cost-effective, and utilize permanent solutions (e.g., onsite engineering control of contaminated soil/sediment) and alternative treatment (e.g., free phase and residual NAPL removal) technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment and/or containment as a principal element of the remedy [e.g., reduce the toxicity, mobility, or volume (TMV) of hazardous substances as a principal element through treatment (offsite incinerate of free phase and residual NAPL recovered) and containment (onsite engineering control of contaminated soil/sediment)].

Because the selected remedy will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of remedial action to ensure that the remedy is, and will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this Site.

- Chemicals of concern (COCs) and their respective concentrations (see the Identification of Chemicals of Concern Section);
- The baseline risk represented by the COCs (see the Risk Characterization Section);
- Cleanup levels established for the COCs and the basis for these levels (see the Remedial Action Objectives and Goals Section and the Expected Outcomes of Selected Remedy Section);
- Source materials constituting principal threat wastes have been identified in the ground water at this Site (see the Principal and Low-Level Threat Wastes Section);
- Current and potential future beneficial land and water uses in the ROD (see the Current and Potential Future Land and Ground Water Uses Section);

- Cleanup levels established for the COCs and the basis for these levels (see the Remedial Action Objectives and Goals Section and the Expected Outcomes of Selected Remedy Section);
- Source materials constituting principal threat wastes have been identified in the ground water at this Site (see the Principal and Low-Level Threat Wastes Section);
- Current and potential future beneficial land and water uses in the ROD (see the Current and Potential Future Land and Ground Water Uses Section);
  Potential land and water uses that will be available at the Site as a result of the Selected Remedy (see the Expected Outcomes of Selected Remedy Section);
- Estimated capital, long-term response action (LTRA), operation and maintenance (O&M) after the LTRA period, and total present worth costs; discount rate, and the number of years over which the remedy cost estimates are projected (see the Summary of Estimated Remedy Costs Section); and,
- Decisive factor(s) that led to select the remedy (see the Summary of the Rationale for the Selected Remedy).

AUTHORIZING SIGNATURE

By: [signature] Date: 9/21/06

Samuel Coleman, P.E., Director
Superfund Division
U.S. EPA Region 6

RECORD OF DECISION
HART CREOSOTING COMPANY, SUPERFUND SITE
CONCURRENCE LIST

By: [signature] Date: 9-15-06
Robert Sullivan
Remedial Project Manager

By: [signature] Date: 9-15-06
Gustavo T. Chavarria, Chief
AR/TX Project Management Section

By: [signature] Date: 9.15-06
John Hepola, Chief
AR/TX Branch

By: Gloria Moran Date: 9-15-06
Gloria Moran
Site Attorney

By: [signature] Date: 09/21/06
Mark A. Peycke, Chief
Superfund Branch, Office of Regional Counsel

for By: [signature] Date: 9/21/06
Pamela Phillips, Deputy Director
Superfund Division

THE DECISION SUMMARY

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Hart Creosoting Company (HCC) Site is a former wood treating facility located on the west side of State Highway 96, approximately 1 mile south of Jasper, Texas. The U.S. Environmental Protection Agency (EPA) is the lead agency for the Site activities and is issuing this Record of Decision (ROD). The Texas Commission on Environmental Quality (TCEQ) represents the State of Texas as the support agency and provided technical assistance to the EPA. The source of monies for the Remedial Investigation/Feasibility Study (RI/FS) is through Superfund.

The HCC Site is approximately 23.4-acres in size and is bounded by densely forested, private property (Temple Inland) to the south and west, commercial property to the north and State Highway 96 to the east (Figure 1). The approximate geographic coordinates for the center of the Site are 30º53’38” north latitude and 93º59’41” west longitude. The Site is located 1 mile south of downtown Jasper and lies predominantly within a wooded area with light industrial, commercial, and residential land use. The major features of the Site are: the former process area, the waste water treatment areas, a temporary waste cell (WC), and non-process areas. An un-named tributary flows along the west-southwest Site boundary, converging with Big Walnut Run Creek approximately 1 mile south of the Site (Figure 1).

The HCC site was proposed to the National Priorities List (NPL) on April 23, 1999, based on a Hazard Ranking System (HRS) score of 48.3. The NPL listing was finalized on July 22, 1999. The Site’s CERCLIS identification number is TXD050299577.

SITE BACKGROUND AND ENFORCEMENT ACTIVITIES

SITE HISTORY

The Site is located near the City of Jasper in a predominantly wooded area with light industrial, commercial, and residential land use. Jasper is approximately 11 square miles in size and home to 8,247 residents. The City is the county seat for Jasper County, which has a population of 35,600.

The total number of people living within 1-mile radius of the Site is 1,063 (U.S. Bureau of the Census, 1991). Within that radius, approximately 10 percent (106 individuals) are children 6 years of age or younger. When the Site was active, approximately seven people worked at the facility.

Wood treatment operations, which used a steam preconditioning and pressurized creosote process, began in 1958 and ended in May 1993. Raw wood products were delivered to the Site by truck and placed in the untreated wood storage area. Wood was loaded onto trams and placed inside a treatment cylinder for a 10 to 17 hour steam pre-conditioning period. The cylinder was then placed under vacuum to remove air and water from the wood.

Preheated creosote was introduced into the cylinder under pressure to impregnate the wood. Once the treated wood had achieved a specified preservative retention level, a vacuum was applied to the cylinder to evacuate excess fluid. The wood was then removed and transferred to the drip pad for air-drying and subsequent storage in the Treated Wood Storage Yard. Excess creosote removed from the treatment cylinders was transferred to a condenser and the creosote was recovered for reuse.

Between 1958 and 1977, creosote waste from treatment operations was managed in six unlined surface impoundments (ponds). Around 1977, these ponds were reconfigured into four ponds (Pond A to Pond D/E) and used until November 1985 (Figure 1). The four ponds apparently were closed under Texas Water Commission (TWC) oversight in 1988. Creosote waste was removed from the four ponds and treated in two biological treatment cells and an aeration pond, and then transferred to a holding tank prior to discharge to City of Jasper publicly owned treatment works (POTW). Creosote wastes generated following pond closure were treated in an onsite wastewater treatment system prior to POTW discharge.

Other processes performed at the Site included a saw mill that operated between 1952 and 1958, a pole peeling plant that operated from 1968 to 1978, and a pipe threading shop that operated from 1982 until 1985.

Potential contaminant sources present at the Site, following its abandonment in 1993, included the drip pad, deteriorating aboveground storage tanks (ASTs), contaminated treatment cylinders, wastewater holding tanks, cooling towers (heat exchanger), treated wood storage areas, and contaminated soil and ground water associated with historic spills and waste management practices.

HISTORY OF FEDERAL AND STATE INVESTIGATION AND RESPONSE ACTIONS

Numerous prior investigations and one time-critical removal action have been conducted at the Site. The earliest work was initiated by HCC in 1984 and continued through 2001. A brief summary of work performed is provided in the following subsections.

Potentially Responsible Party Lead Investigations

In October 1984, in response to a compliance agreement with the Texas Department of Water Resources (TDWR), HCC initiated a program to assess the impacts of past waste management practices on ground water quality. Work performed by Southwestern Laboratories, Guyton Associates Incorporated, and Jones and Neuse included:

- Preparation and implementation of a waste analysis plan in November 1984 to characterize wastewater and sludge present in Ponds A to D/E and in soil beneath the ponds.
- A hydrogeologic investigation in July 1985 that included drilling three soil borings and construction of three monitor wells to complement three existing wells installed in 1977.
- An expanded hydrogeologic investigation in July 1986 to add six new wells to the ground water monitoring network.

A brief summary of this work and its findings is provided in the following subsections.

Waste Analysis Plan

The waste analysis plan included a field investigation to estimate the volume of sludge and total volume of Ponds A to D/E, and to obtain samples for hazardous waste characterization testing. This work revealed that 660 cubic yards (CY) of sludge was present in Pond A and approximately 300 CY in the remaining three ponds. All of the sludge samples contained visual evidence of free-phase creosote.

Laboratory analysis of waste water samples, sludge composite samples, and grab samples of soil taken beneath the ponds revealed significant levels of polycyclic aromatic hydrocarbons (PAHs) beneath Pond A and Pond B with phenanthrene concentrations varying from 0.6 parts per million (ppm) to 9,416 ppm. PAHs were not detected above the 0.05 ppm reporting limit in the soil samples collected beneath Pond C. Soil samples collected beneath Pond D/E contained phenanthrene concentrations ranging from less than 0.05 ppm to 0.13 ppm.

Although the sludge samples did not exhibit any of the characteristic hazardous waste properties (40 CFR Part 261), the sludge was identified as a K001 hazardous waste ("bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol") in the Waste Analysis Plan Investigation Report.

Hydrogeologic Investigation – July 1985

In July 1985, HCC commissioned Guyton Associates, Inc., to perform a hydrogeologic assessment to develop a "better understanding of subsurface conditions in the vicinity of the wood treating plant." The work included a search of TDWR records for well location information, drilling of three soil borings to depths up to 158 feet, and installation of three monitor wells (MW-1 to MW-3) to determine the direction of ground water flow and to characterize ground water quality (Figure 2).

The TDWR well log search identified two large-capacity wells, owned by the City of Jasper, located between 1.5 and 2 miles north of the Site. These wells were reportedly screened at depths between 350 and 900 feet below ground surface (bgs). The search also revealed the presence of an onsite well, 2 inches in diameter and approximately 150 feet deep. This well supplied water by air-lift pumping for process use. Another well was also identified about 0.5 mile southeast of the Site on property used by the Hart Lumber company. This well was reported to be 2 inches in diameter with a total depth of 140 feet.

Geologic descriptions from three soil borings drilled along the north, west, and southwest boundary revealed four primary geologic strata, which were identified as the Upper Clay, Upper Sand, Lower Clay, and Lower Sand. Visual evidence of creosote was observed at the boring located at the southwest corner of the facility in samples obtained from the Upper Clay at depths between 2 and 12 feet and from the Upper Sand at depths between 30 and 61.5 feet bgs.

Three new 4-inch-diameter monitor wells, identified as MW-4, MW-5, and MW-6, were screened in the Upper Sand at depths between 33 and 54 feet, 31 and 52 feet, and 24 and 45 feet, respectively. The wells were developed following installation, to remove residual drilling mud, at rates averaging approximately 30 gallons per minute (gpm).

Laboratory analysis of ground water samples collected from the three new wells, and from existing wells MW-1, MW-2, and MW-3, showed non-detect levels for many PAHs. Naphthalene was observed at wells MW-3 and MW-5 at concentrations of 0.032 milligrams per liter (mg/L) and 0.02 mg/L, respectively. Benzo(b)fluoranthene was detected at well MW-3 at a concentration of 0.125 mg/L.

Expanded Hydrogeologic Investigation – July 1986

Three new monitor wells, identified as MW-5A, MW-5B, and MW-7 (Figure 2), were installed to obtain ground water quality information on the southeast side of Pond A; three additional wells (MW-1A, MW-2A, and MW-3A) were paired with existing wells MW 1, MW 2, and MW-3. Well screen intervals for five of the six new wells set in the Upper Sand varied in length from 20 feet (MW-5B and MW-7) to 62 feet (MW-2A). Monitor well MW-5A was screened in the Upper Clay at depths between 5 and 12 feet.

Ground water samples collected from wells MW-5A, MW-5B, and MW-7 were tested for PAHs and chlorophenols. Naphthalene was detected at concentrations between 0.11 mg/L and 15.2 mg/L and pentachlorophenol (PCP) at concentrations between 0.26 mg/L and 6.8 mg/L. Re-sampling to confirm the presence of PCP, which reportedly was never used as a wood treating agent at the Site, was not performed.

RCRA Facility Assessment

In 1988, under contract to the EPA (Work Assignment R26-05-55), A.T. Kearney conducted a preliminary review – visual site inspection (PR/VSI) at the Site. The overall purpose for the work was to identify potential solid waste management units (SWMUs) and areas of concern (AOC) that might have released hazardous constituents that could pose a threat to human health and the environment.

The PR/VSI identified 27 SWMUs and 7 AOCs at the Site and recommended that further investigation be conducted at 10 SWMUs and 4 AOCs.

Agency Sampling Efforts

Numerous soil, ground water, surface water, and sediment sampling events were performed by Texas and federal regulatory agencies following the Site's closure in 1983. Elevated PAH concentrations were detected in all the environmental media that were sampled.

Removal Action

In 1995, EPA performed a time-critical removal action to drain the four ponds and stabilize the remaining sludge. Sludge and visibly contaminated soil were consolidated and placed in an onsite, natural clay-lined temporary Waste Cell (WC) (see Figure 1 for the location of the WC). A clay cover was placed over the cell and seeded with grass for erosion control.

Engineering Evaluation and Cost Analysis

An Engineering Evaluation and Cost Analysis (EE/CA) was conducted from December 2000 to January 2001 under EPA's Removal Program. A U.S. Army Corps of Engineers (USACE) contractor performed the work.

The primary focus for the EE/CA field investigation was to determine the extent of contaminated soil remaining, after the time-critical removal action, in the former process area and the volume of contaminated soil placed in the WC, and to assess the impact of historical releases on surface water and sediment downstream of the Site. The EE/CA also included a screening-level risk assessment and evaluation of remedial action alternatives.

Former Process Area Soils Investigation

The former process area soils investigation characterized contaminant distribution in subsurface soil beneath the former process area and Ponds A and B. Field investigation work performed during the EE/CA included:

- Drilling and sampling of 12 Geoprobe™ (SB-01 to SB-12) and 4 JMC (SB-13 to SB-16) soil borings in the former process area (Figure 3).
- Drilling of 5 soil borings (LIF-1 to LIF-5) in the former process area with a USACE cone penetrometer (CPT) equipped with a laser-induced fluorescence (LIF) sensor.

Samples collected from the Geoprobe™ and JMC borings were tested in the field with a PAH RaPID Assay Kit, which reports a total PAH concentration expressed as phenanthrene. The field screening results were used to select a subset of samples for PAH-Method SW8310 confirmation testing by a USACE certified laboratory. The field tests detected PAHs, expressed as phenanthrene, in 61 of 66 samples at concentrations varying from 0.1 to 13,580 ppm. Laboratory analysis detected PAHs in 17 of 20 samples, with total PAH concentrations ranging from 0.008 milligrams per kilogram (mg/kg) to 1,258 mg/kg.

Because the Geoprobe™ was unable to collect samples below the flowing sand interval at 25 feet, CPT equipment was used to drill five additional borings at locations selected based on the RaPID Assay results. At each location, the LIF sensor provided a continuous record of creosote absence or presence to the total depth investigated.

According to the information provided in the EE/CA, residual creosote was observed primarily at borings LIF-2, LIF-3, and LIF-5 located in the vicinity of Pond A. At LIF-3, creosote was detected at depths up to 79 feet. Borings LIF-1 and LIF-4, placed along the west property line and on the south side of the WC, respectively, did not show significant creosote occurrences. Laboratory analyses of selected LIF soil samples for PAHs by Method SW8310 revealed total PAH concentrations between 45 and 58,635 mg/kg.

Waste Cell Soil Investigation

Soil samples were also collected from five shallow borings (IMP-1 to IMP-5) drilled within the boundaries of the WC with the JMC soil sampler (Figure 3). At each location, a composite sample was prepared with visibly contaminated material from each depth interval. The samples were tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TAL metals, total petroleum hydrocarbons (TPH), and total organic carbon (TOC). The samples were also evaluated per the toxicity characteristic leaching procedure (TCLP) and the TCLP extract was tested for hazardous waste per toxicity characteristics (40 CFR 261.24), SVOCs, VOCs, and metals. Total SVOC concentrations varied from 329 to 2,856 mg/kg; TCLP results showed very low concentrations for 4 of the 40 listed constituents.

Ground Water Quality Investigation

The existing ground water monitoring network comprises six wells identified as MW-1, MW-1A, MW-2, MW-2A, MW-8, and MW-9 (Figure 2). Eight other wells (MW-3, MW-3A, MW-4, MW 5, MW-5A, MW-5B, MW-6, and MW-7) were not located during the EE/CA and are presumed to have been abandoned or destroyed during the 1995 EPA removal action.

Water level measurements performed during the EE/CA indicate a horizontal ground water flow direction to the south–southeast, which is consistent with the regional flow pattern reported in the literature.

Aquatic Ecosystem Investigations

Eight sediment and surface water samples were collected from the un-named tributary in December 2000. One location was established at a background site (SED/SW-1), and the remaining locations were placed equidistant between the downstream Site boundary and the un-named tributary and Big Walnut Run Creek confluence. SVOCs were not detected at the background location or at location SED/SW-5. However, SVOCs were detected at the remaining locations at total SVOC concentrations ranging between 0.07 and 10.3 mg/kg in sediment and 0.002 and 0.32 mg/L in surface water.

In March 2001, fish and collocated sediment samples were collected from the un-named tributary and Big Walnut Run Creek. Fish tissue was analyzed for PAHs in both fillet and whole body samples. Tissues and sediments from the un-named tributary background sample location had no detectable PAHs. Samples collected from reaches in the un-named tributary downstream of the Site showed detectable PAHs in the fish tissue (0.55 and 0.49 mg/kg) and sediment (9.3 and 8.1 mg/kg). The tissue samples taken from reaches within Big Walnut Run Creek contained total PAH concentrations varying from non-detect to 0.25 mg/kg. PAHs were not detected in the Big Walnut Run sediment samples taken at Reaches 1 to 5, or in the tissue samples collected at the furthest downstream site Reach 5.

The risk screening concluded that contaminant concentrations in surface water and sediment in the un-named tributary, adjacent to and downstream of the Site, have the potential to adversely affect adult anglers in Big Walnut Run Creek and aquatic life in the un-named tributary and Big Walnut Run Creek.

National Priorities List

The EPA published a proposed rule on April 23, 1999, to add the Hart Creosoting Site to the National Priorities List (NPL) of Superfund sites [Federal Register Listing (FRL-6329-8), Volume 64, Number 78, Pages 19968 - 19974], based on a Hazard Ranking System (HRS) score of 48.3.

The Site was added to the NPL in a final rule published on July 22, 1999 [Federal Register Listing (FRL-6401-5), Volume 64, Number 140, Pages 39878 - 39885]. The NPL listing was finalized on July 22, 1999. The site's CERCLIS identification number is TXD050299577.

COMMUNITY PARTICIPATION

The EPA held a public meeting August 15, 2006, at the City of Jasper First National Bank in Jasper to present the Proposed Plan, to answer questions on the remedial alternatives and to present the EPA's preferred alternative for addressing cleanup of the Site. The RI/FS reports and Proposed Plan for the HCC Site were made available to the public on July 26, 2006. The documents are in the Administrative Record file and the information repository maintained at the EPA Docket Room in Region 6, at the TCEQ offices in Austin, Texas, and at the Jasper City Library. The notice of the availability of these documents was published in the Jasper Newsboy on July 26, 2006. The EPA's response to the comments received, during the comment period between July 26, 2006 and August 25, 2006, is included in the Responsiveness Summary, which is part of this ROD.

SCOPE AND ROLE OF RESPONSE ACTION

This response action is the final Site remedy and is intended to address fully the threats to human health and the environment posed by the conditions at this Site. The purpose of this response action is to implement a site-wide strategy for preventing exposure to contaminated soils, sediments, surface water, and ground water and minimizing future migration of contaminants from soil and sediment to surface water and ground water. The prior removal action completed at the Site includes removing surface water from four waste water ponds, stabilizing the remaining sludge in the ponds, excavating visibly contaminated soil, and placing the soil and sludge in an onsite temporary WC. This response action addresses the remaining Site risks that were not addressed by the prior removal action.

SITE CHARACTERISTICS

The area of the Site to be addressed in this remedial action encompasses approximately 23 acres centered on the former process area, the temporary WC, Pond D/E, the un-named tributary, and the overall Site ground water plume. The remainder of the property does not demonstrate levels of contamination requiring remedial action. This section summarizes information obtained as part of the RI/FS activities at the Site.

SITE ENVIRONMENTAL SETTING

The HCC Site is approximately 23-acres in size and lies predominantly within a wooded area with light industrial, commercial, and recreational land use. The Site is bounded by densely forested, private commercial property (Temple Inland) to the south and west, commercial property to the north and State Highway 96 to the east. An un-named tributary flows along the west-southwest Site boundary, converging with Big Walnut Run Creek approximately 1 mile south of the Site (Figure 1).

The Site topography slopes from northeast to southwest, with the ground surface elevation descending from 200 feet mean sea level (msl) in the vicinity of the north property line to 189 feet msl along the bank of un-named tributary. The WC area is raised between 5 and 10 feet above the ground surface at an elevation of 205 feet msl. The un-named tributary receives all the surface water runoff from the Site.

The Site is underlain by alluvium composed of varying proportions of clay, silt, and sand size material extending to depths up to 220 feet. The subsurface geology was grouped into three low-permeability and three permeable zones. The low-permeability zones, which are comprised primarily of silt to clay size material, are informally referred to as Zones I-1, I-3 and I-5. Sandwiched between the low permeability units are permeable Zones P-2, P-4 and P-6. These units are comprised primarily of sand sized material. Zones I-1 and P-2 are the uppermost units at the Site and were the primary zones of investigation during the RI and SRI. Although there is some variability across the Site, Zone I-1 generally occurs at depths between ground surface and 23 feet, and Zone P-2 at depths between 23 and 63 feet. Ground water in Zone P-2 is approximately 8 to 10 feet below the ground water surface in the former process area and flows in south-southeast direction at an estimated velocity of 52 feet per year.

The HCC Site lies in an area where the Jasper Aquifer intersects the ground surface. The Jasper Aquifer is the sole water supply for the towns of Jasper and Newton, Texas. The nearest active water supply well is the Upper Jasper County Water Authority (UJCWA) newly constructed well #10, located 0.74-mile northwest (up-gradient) of the Site. This well is screened at depths between 539 and 820 feet.

SAMPLING STRATEGY

The EPA initiated the RI for the Site in 2004, conducted a supplemental RI (SRI) in 2006, and finalized the RI Report in September 2006. The RI was conducted to further characterize the nature and extent of contamination originally documented by the earlier investigations and to provide data to support the completion of human health and ecological risk assessments. The RI data collection efforts included the collection and analysis of additional onsite soil, ground water, surface water, sediment, and fish samples.

The RI field investigation was conducted in 2004 (primary data collected in April and May). The RI field work consisted of installing 10 (5 pairs) ground water monitoring wells and collecting a total of **156** samples from various media. The sampling program included **10** background surface soil samples from an offsite area, **20** surface soil samples from non-process areas (Figure 4), **45** subsurface soil samples from 25 soil borings at process and non-process areas, **23** subsurface soil samples from 5 soil borings at the former Pond A area, **2** soil samples from one soil boring at the WC (Figure 5), **17** ground water samples from the onsite and offsite areas (Figure 6), **8** surface water samples and **29** sediment samples from the un-named tributary (Figure 7), Pond D/E and Big Walnut Run Creek, and **2** biota tissue samples from the un-named tributary and Big Walnut Run Creek. Surface soil samples were not collected in the former process area because this area was excavated and covered with clean fill during the 1995 removal action. Ground water elevations and some additional ground water sample collection were performed through the end of 2004.

Since the ground water plume was not fully defined horizontally and vertically during the RI, a SRI was conducted in 2006 to collect more ground water samples to verify the ground water quality data collected during the RI and to install 4 additional monitor wells at locations west and south of the former process area to define the plume in the south and west directions. Each of the new wells was screened at multiple depth intervals. The SRI fieldwork included collecting 34 ground water samples from the existing wells in February and May and 27 ground water samples from the newly installed wells in July 2006.

Analyses performed on the RI and SRI samples included: SVOCs, VOCs, Target Analyte List metals, water quality parameters and soil physical parameters.

NATURE AND EXTENT OF CONTAMINATION

Historic operations performed at HCC employed coal tar creosote dissolved in diesel to treat railroad ties and utility poles. Coal tar creosote, a listed hazardous waste (U051), is manufactured through the distillation of coal tar and is the most widely used wood preservative in the United States. It is a thick, oily liquid, typically amber to black in color, with a specific gravity of 1.03 to 1.09. Creosote contains over 300 different chemical compounds. One important group of environmentally significant compounds present in creosote is the PAHs. There are 16 PAHs routinely encountered at wood treating sites, seven of which have been identified as probable human carcinogenic polycyclic aromatic hydrocarbons (CPAHs). Although elevated levels of volatile organic compounds (VOCs) and metals were not expected to be as prevalent in environmental media at the Site, testing was performed on a subset of the soil and sediment samples, and all water samples, to ascertain the significance of these compounds, if present.

The following paragraphs present laboratory analytical results associated with testing of RI soil, ground water, surface water, sediment and biota samples collected at the Site between May and November 2004, as well as the ground water data collected at the Site during the SRI between February to July 2006. The concentration range and location of highest observed total PAH (TPAH) and total CPAH (TCPAH) concentrations measured in the RI soil and sediment samples are also summarized in Table 1.

Surface Soil – Non Process Areas

Surface soil samples (0 to 0.5-foot) were collected at 20 locations in the former non-process areas (Figure 4). All samples were tested for SVOCs, three samples tested for VOCs, and 15 samples tested for TAL metals. The SVOC testing was performed using gas chromatography – mass spectrometer (GC/MS) by EPA Method SW8270C. Low-level PAH and PCP analysis was performed at selected locations using SIM.

SVOCs

TPAH concentrations in the surface soil samples ranged from 0.03 to 95.7 mg/Kg with concentrations exceeding ecological screening values present at nearly all locations. Total CPAH concentrations expressed in benzo(a)pyrene equivalents [B(a)P] ranged from 7.2 x 10^{-7} mg/Kg to 12.2 mg/Kg and exceeded the 0.234 mg/Kg human health screening value for B(a)P at six locations. PCP was detected in 3 of the 20 surface soil samples at concentrations between 0.0244 to 0.122 J mg/Kg. PCP was also detected in 1 of the 3 background samples at a concentration of 0.005 mg/Kg. The highest PCP concentration (0.122 mg/Kg) exceeds the ecological screening value but not the 10 mg/Kg human health screening value.

VOCs

Toluene was detected at an estimated (J) concentration of 0.002 mg/Kg at two sample locations. The estimated concentrations did not exceed the lower of the human health screening (230 mg/Kg) or ecological screening values. Acetone was detected in one sample but was also detected in the associated laboratory blanks, thus the detection is not Site-related. No other VOCs were detected in surface soils.

Metals

Arsenic was the only metal detected above the associated human health screening value of 1.8 mg/Kg. Arsenic concentrations varied from 1.5 mg/Kg to 6.4 mg/Kg with concentrations above the screening value observed in six of the ten surface soil samples. Chromium, lead, and vanadium concentrations exceeded ecological screening values at three, two, and ten locations respectively. Arsenic, chromium, and vanadium concentrations were similar or slightly higher onsite than at the background stations while onsite lead concentrations were similar to the levels detected at the background stations.

Subsurface Soil - Former Process and Non-Process Areas

Subsurface soil samples were collected at 20 locations (SB21 through SB 40) in the former process area placed on an approximate 100 x 100-foot grid in the area between the WC and un-named tributary (Figure 5). Five additional borings (SB41 through SB45) were placed west of the WC in a non-process area where historic site maps indicated treated wood was stored.

At each location a composite sample of visually contaminated (VC) material was prepared from aliquots of material retained at each 4-foot Geoprobe™ sample interval. A grab sample of visually clean (CL) material was also collected from the soil horizon immediately below the VC interval. Due to the depth of contamination and difficult drilling conditions (i.e. refusal) present, visually clean material was not encountered at 6 of the boring locations. The visually clean samples collected at these locations were taken at the base of the visually contaminated soil horizon at depths between 15 and 30 feet.

Each of the 20 VC and 25 CL samples (45 total) were tested for SVOCs, and six samples tested for VOCs and TAL metals. The SVOC testing included GC/MS by EPA Method SW8270C, and low-level PAHs and PCP by SIM (at selected locations).

SVOCs – Visually Contaminated Soil

Total PAH concentrations in the visually contaminated soil samples varied from non-detect (ND) levels to 8,187 mg/Kg. Non-detect levels were reported for 10 of the 20 locations with the highest observed concentrations occurring at 4 borings located within the former Pond A and drip pad footprints. At these 4 locations the thickness of visually contaminated material ranged from 15 to greater than 31 feet.

Total CPAH concentrations ranged from 0 to 80.99 mg/Kg with concentrations exceeding the 0.234 mg/Kg EPA Region 6 Medium-Specific Screening Level (MSSL) present at 7 of the 20 locations. PCP was not detected in any of the 20 visually contaminated soil samples.

SVOCs – Visually Clean Soil

Total PAH concentrations in the visually clean soil samples varied from 0.0275 to 41.44 mg/Kg. In the six samples labeled as visually clean but collected at the base of the visually contaminated soil horizon, total PAH concentrations ranged from 2.4 to 18,880 mg/Kg with the highest concentration occurring at a depth of 30 feet.

Total CPAH concentrations ranged from 0 to 0.609 mg/Kg in the 19 samples collected from visually clean material. In the six samples taken at the base of the visually contaminated soil horizon, total CPAH concentrations varied from 0.0006 to 206.4 mg/Kg. Total CPAH concentrations greater than the 0.234 mg/Kg EPA Region 6 MSSL were observed at all the six samples labeled as visually clean but collected at the base of the visually contaminated soil horizon.

TABLE 1
Soil and Sediments Investigation - TPAH and CPAH Concentration Summary
Hart Creosoting Company – Jasper, Texas

	Concentration Range (Location of Highest Observed)						
	Non-Process Area	Former Process Area	Waste Cell	Former Pond A	Pond D/E	Un-named Tributary	Big Walnut Run Creek
Surface Soil/Sediment							
No. of Samples	20	0	0	0	1	4	3
TPAH (mg/Kg)	0.03 – 95.7 (UA-SO-3-4)	NA	NA	NA	889 (SD-01)	0.04 – 39.73 (UT-SD02)	0.03 – 0.08 (WC-SD03)
CPAH (mg/Kg in BaP Eq)	7.2E-07 – 12.2 (UA-SO-3-4)	NA	NA	NA	25.1 (SD-01)	0.002 – 1.18 (UT-SD-03)	0.00006 – 0.005 (WC-SD03)
Subsurface Soil/Soil – Visually Contaminated Interval							
No. of Samples	0	20	5 (EE/CA) 1 (RI)	23	3	10 (A Horizon)	0
TPAH (mg/Kg)	NA	ND – 8187 (SB33)	284 – 2353 (IMP1) 1027 (CELL)	3.9 – 16,740 (SB46-10')	7.5 – 8063 (NE-02D)	ND – 10,110 (NE-03A)	NA
CPAH (mg/Kg in BaP Eq)	NA	0 to 81 (SB39)	3 – 29.5 (IMP1) 16.5 (CELL)	0 – 104.2 (SB46-10')	0 – 193.9 (NE-02D)	0 – 120 (NE-03A)	NA
Subsurface Soil – Visually Clean Interval							
No. of Samples	5	20	1	0	0	10 (B Horizon)	0
TPAH (mg/Kg)	0.03 – 0.11 (SB41)	0.03 – 41.1 (SB26) 2.4 – 18,880 (a)	2.19 (CELL)	NA	NA	ND – 3714 (b) (NE-06B)	NA
CPAH (mg/Kg in BaP Eq)	0 – 0.008 (SB42)	0 – 0.61 (SB26) 0.001 – 206.4 (a)	0.03 (CELL)	NA	NA	0 – 50.1 (b) (NE-06B)	NA

Notes:

ND = not detected. NA = not applicable

a. Soil borings SB32, SB33, SB34, SB38, SB39 and SB40 did not encounter visually clean material. These results are for samples collected at base of visually contaminated interval. Highest TPAH and TCPAH concentrations occurred at SB33.

b. Sediment cores NE-02 to NE-06 did not encounter clean material.

Total PAH and total CPAH concentrations in the five samples collected from the former treated wood storage area (e.g., non-process area) were all less than the 0.234 mg/Kg EPA Region 6 MSSL.

PCP was not detected in any of the visually clean subsurface soil samples.

VOCs

VOCs were analyzed for four samples collected within the visually contaminated soil interval and two samples taken from the visually clean soil interval. Benzene was detected in one of the visually contaminated samples at a concentration of 0.247 mg/Kg. Toluene at 1.24 mg/Kg, ethylbenzene at 1.53 mg/Kg, and xylenes at 6.05 mg/Kg were also detected in the same visually contaminated soil sample. BTEX was not detected in the other five samples. The concentrations of BTEX detected in the soil sample were less than their corresponding EPA Region 6 MSSLs.

TAL Metals

Metal analysis results were from testing of four samples collected from the visually contaminated soil interval and two samples taken from the visually clean soil interval. Although several metals including aluminum, chromium, iron, magnesium, potassium and vanadium were detected at concentrations above the sitewide background concentration, the factor of exceedence was less than one order of magnitude. None of the calculated background values or detected concentrations exceed EPA Region 6 MSSLs.

Total Organic Carbon

Total organic carbon (TOC) was not detected above the 4,000 mg/Kg reporting limit in samples collected from the monitor well MW-10A and MW-10B soil borings at depths of 35 and 85 feet respectively. The absence of naturally occurring organic matter within the Zone P2 matrix indicates a nominal capacity for sorption of organic contaminants. The TOC concentrations of 15,000 and 8,670 mg/Kg measured in the samples collected from the MW-11B and MW-12A soil borings reflect the presence of residual creosote in the sample.

Waste Cell

Five composite samples of visually contaminated material were collected from the WC during the EE/CA, therefore, only limited sampling was performed during the RI (Figure 5). The RI sampling included a single composite sample prepared from visually contaminated material collected from a location adjacent to EE/CA boring IMP-1 and collection of a native soil sample from beneath the WC at the same location.

Based on information obtained from the 1995 EPA removal action, and a topographic survey, the volume of contaminated soil present in the WC was estimated at 65,400 cubic yards (CY). Laboratory analysis of visually contaminated material tested during the EE/CA revealed TPAH concentrations ranging from 284 to 2,353 mg/Kg and TCPAH concentrations between 3 and 29.5 mg/Kg. The RI sampling results are discussed further in the following subsections.

SVOCs

A TPAH concentration of 1,027 mg/Kg was detected in the waste cell visually contaminated composite sample. This value lies within the range observed during the EE/CA. In the native soil sample collected beneath the waste cell, a TPAH concentration of 2.19 mg/Kg was detected.

The TCPAH concentration of 16.5 mg/Kg detected in the visually contaminated composite sample also falls within the range of 3.0 to 29.5 mg/Kg observed during the EE/CA. A TCPAH concentration of 0.03 mg/Kg was measured in the native soil sample collected beneath the WC. This concentration is significantly lower than the 0.234 mg/Kg EPA Region 6 MSSL.

VOCs

BTEX was detected in the visually contaminated composite sample at concentrations between 0.164 mg/Kg (benzene) and 3.87 mg/Kg (total xylenes). Toluene, ethylbenzene and xylenes were also detected in the native soil sample at concentrations between 0.0008 and 0.006 mg/Kg.

Metals

Several metals were detected in the visually contaminated composite sample and native soil sample at concentrations above site wide background levels. However, other than arsenic, which was observed at a concentration of 1.81 mg/Kg (EPA Region 6 MSSL is 1.8 mg/Kg), metal concentrations were less than EPA Region 6 MSSLs.

SPLP Results

Synthetic precipitation leaching procedure (SPLP) testing was performed on both the visually contaminated composite and native soil samples. SPLP-SVOC testing revealed a TPAH concentration of 9,684 µg/L and a TCPAH concentration of 7 µg/L. The TPAH and TCPAH leachate concentrations are approximately 100 and 2,000 times lower than observed in their corresponding soil samples.

BTEX was detected in the visually contaminated soil SPLP leachate at concentrations between 2.78 (benzene) and 67.4 µg/L (xylenes). Toluene was detected in the SPLP leachate from the native soil sample at 0.2 µg/L, as was trichloroethene at 4.42 µg/L.

Elevated metals concentrations in the SPLP leachate from the visually contaminated soil sample, exceeding the background level observed in MW-8 ground water were also detected. Aluminum at 23,700 µg/L and iron at 18,700 µg/L were the metals observed at the highest concentrations. Background aluminum concentrations in ground water were less than 100 µg/L and iron less than 25 µg/L.

Pond A Subsurface Soil

Five CPT-LIF borings (LIF-1 through LIF-5) were advanced in the vicinity of the former Pond A footprint during the EE/CA to ascertain the presence of free phase and/or residual creosote (Figure 5). The investigation detected creosote in four of the five borings to depths up to 79 feet (LIF-3) with TPAH concentrations between 45 and 58,635 mg/Kg detected in the confirmation samples. Heavy phase creosote contaminated soil was observed in the depth intervals within Zones I-1, P-2, and I-3.

To further define the extent of residual creosote underlying former Pond A, the RI advanced five soil borings (SB46 to SB50) to depths up to 65 feet with samples collected at 10 foot intervals for laboratory analysis. Difficult subsurface drilling conditions, and the nature of the equipment being used, prevented the borings from being advanced below depths of 65 feet. 23 samples were collected and each sample analyzed for SVOCs. Two samples were also tested for VOCs and TAL metals.

SVOCs

TPAH concentrations in the former Pond A subsurface soil samples ranged from 3.9 mg/Kg to 17,740 mg/Kg with the highest concentrations generally occurring within Zone I-1 at depths less than 20 feet. However, increasing TPAH concentrations observed at a depth of 72 feet (58,635 mg/Kg) and 60 feet (7,384 mg/Kg) suggest there is potential for pooled creosote overlying Zone I-3 in the area between EE/CA boring LIF-3 and RI boring SB46.

VOCs

BTEX concentrations less than 1 mg/Kg were observed in the samples collected at depths of 20 and 40 feet at SB48. Total PAH concentrations in these two samples were 20.2 and 418 mg/Kg respectively.

Metals

Elevated concentrations of several metals, notably aluminum at 3,210 and 162 mg/Kg and iron at 9,430 and 3,210 mg/Kg, were detected in the samples collected at depths of 20 and 40 feet respectively from SB48.

Ground Water

The hydrogeologic investigation included sampling of six existing monitor wells and ten new monitor wells constructed during the RI, and sampling of 17 existing monitoring wells and 4 new monitor wells installed during the SRI (Figure 6). Twelve of the existing monitor wells, and 27 of the 28 SRI continuous multichannel tubing (CMT) intervals, are screened at varying depths within Zone P-2. Monitor wells MW-1 and MW-2 are screened in Zone I-1. Monitor well MW-10B and CMT interval MW17-7 are screened in Zone P-4. Up-gradient monitor well MW-8 is screened across Zones I-1, P-2, I-3, P-4, I-5 and P-6.

The RI ground water sampling was performed in May and June 2004. Another existing well (MW-6) was discovered by the surveying subcontractor in September 2004 and sampled in November 2004 during confirmation sampling of wells MW-14A/14B. General ground water quality parameters (pH, temperature, specific conductance, dissolved oxygen and oxidation-reduction potential) were measured in the field at the time of sample collection and samples from all 17 monitor well locations tested by the EPA-Houston or a Contract Laboratory for SVOCs. Total and dissolved metals and general chemistry parameters were analyzed for at 16 of the 17 well locations (MW-6 not tested). Samples from up-gradient well MW-8 and wells MW-12A/12B were also tested for VOCs. The SRI ground water sampling was performed in February, May and July 2006. Free phase NAPL was observed, during the SRI sampling events, in well MW-12B with a thickness of approximately 1.5 feet. Field and laboratory analysis results are summarized below.

Field Water Quality Parameters

Field water quality parameters measured during the May – June 2004 RI sampling event indicate an average ground water pH of 5.1, temperature of 20.5 degrees Celsius (^oC), and specific conductance (SC) of 76 microseimens per centimeter (uS/cm) in the shallow Zone P-2 wells. Comparable values were also observed in the deep Zone P-2 wells. Dissolved oxygen (DO) concentrations averaged 1.5 mg/L in the shallow Zone P-2 wells and 0.8 mg/L in the deep Zone P-2 wells.

The most significant aspect from the field water quality measurements is the low SC values, which reflect very nominal amounts of dissolved inorganic matter. SC values of 35 to 217 uS/cm measured in Site ground water correspond to total dissolved solids concentrations (TDS) ranging from 21 to 128 mg/L. The SC values are very low, only slightly higher than typical surface water or rainfall values, and consistent with values expected in a ground water recharge area. The levels of DO observed during this initial sampling event indicate anoxic conditions with anaerobic (DO < 0.5 mg/L) conditions present at several locations.

SVOCs

Total PAH concentrations detected in Zone P-2 ground water in the RI samples varied from 0.17 to 9,110 µg/L with the highest concentrations observed at wells MW-12A and MW-13A located near the Site of former Pond A. At the two furthest down-gradient wells, MW-14A/14B, TPAH concentrations of 92.5 µg/L and 74.3 µg/L were detected in the samples taken in late June 2004. Confirmation sampling of these same two wells in November 2004 revealed TPAH concentrations of 348 and 222 µg/L respectively.

Confirmation sampling performed during the SRI in February and May 2006 revealed TPAH concentrations up to 25,500 µg/L at MW-13A and TPAH concentrations of 9516 and 9278 µg/L at MW-14A and 3484 and 2376 µg/L at MW-14B. These levels, which were significantly higher than observed during the RI, are indicative of a larger dissolved phase plume. Accordingly, two of the four new SRI monitor wells, MW-15 and MW-18, were installed approximately 700 feet down-gradient of the Site property line. Sampling of these wells in July 2006 detected TPAH concentrations between 18 and 20 µg/L at CMT well MW15 and between 24 and 10,276 µg/L at CMT well MW18.

At MW-6, which is located just west of the WC near the up-gradient margins of the Site, a TPAH concentration of 46.6 µg/L was detected in November 2004 and 23 µg/L in February 2006. PAHs were not detected during the May 2006 sampling event.

Naphthalene accounts for a majority of the TPAH concentration at wells MW-11A/11B, MW-12A/12B, MW-13A/13B, MW-14A/14B and CMT well MW18. This condition is consistent with the makeup of creosote-based wood treating solutions where naphthalene typically accounts for 7 to 9-percent of the total fraction. Naphthalene also has a higher aqueous solubility than many other PAH compounds which allows for greater environmental mobility.

Comparison of TPAH concentrations between nested wells MW-11A/11B (3,051 versus 4,506 µg/L), MW-12A/12B (8,031 versus 7,119 µg/L) and MW-13A/13B (9,110 versus 2,310 µg/L) indicates that the contaminant plume spans the full saturated thickness of Zone P-2. This trend was also observed further down-gradient, at wells MW-14A/14B and MW-18. At CMT well MW-18, a TPAH concentration of 3194 µg/L was detected in the uppermost sample interval (MW18-1), 10,276 µg/L in the sample collected from the middle of Zone P-2 (MW18-5) and 24.1 µg/L in the sample collected at the bottom of Zone P-2 (MW18-7).

PCP has been detected in ground water samples collected from several well locations across the Site where low-level analytical methods have been employed. Concentrations have consistently been less than the 1 µg/L Primary Drinking Water Standard – Maximum Contaminant Level (MCL).

Contaminant Distribution

The distribution of TPAH in Zone P-2 ground water indicates that the contaminant plume has migrated beyond the down-gradient margins of the current monitor well network. To estimate the potential extent of the dissolved-phase plume, a one-layer ground water flow and contaminant naphthalene transport model was constructed using MODFLOW and MT3D.

Naphthalene was selected as the primary contaminant indicator because it occurs at the highest concentrations within the probable source underlying former Pond A and has a tap water MSSL of 6.2 µg/L. Although carbazole and dibenzofuran have comparable tap water MSSLs of 3.4 µg/L and 12 µg/L respectively, their maximum observed concentrations of approximately 350 to 880 µg/L observed within the source area are significantly lower than the 15,000 µg/L maximum observed naphthalene concentration detected at MW-13A. Additionally, naphthalene has lower organic carbon partition coefficient (Koc) or higher mobility than the other COCs.

The model simulation indicates that naphthalene concentrations in Zone P-2, greater than the EPA Region 6 MSSL of 6.2 µg/L, could extend up to 1700 feet beyond the southern property line. Naphthalene, as well as other soluble organic compounds, transport at the Site is greatly facilitated by the absence of natural organic carbon in the aquifer matrix. Soluble organic compounds, such as naphthalene, are adsorbed by organic carbon which in turn slows their transport rate. In the absence of organic carbon, contaminants may be transported at rates equal to the ground water velocity of 52 feet per year.

Concentration Trends

Sampling of monitor wells MW-11A/11B, MW-12A/12B and MW-13A/13B, located within the estimated boundaries of the NAPL source area, between June 2004 and May 2006 has shown relatively stable PAH concentrations in Zone P-2 ground water. Approximately 200 feet down-gradient of the NAPL source area, at wells MW-14A/14B, TPAH concentrations increased between the November 2004 and February 2006 event, rising from 348 µg/L to 9516 µg/L at MW-14A and from 222 µg/L to 3484 µg/L at MW-14B. TPAH concentrations observed during the May 2006 event were comparable to those observed in February 2006 event. The four new wells installed during the SRI have been only sampled once, therefore, it's unknown at this time if concentrations are stable in this portion of the plume.

The absence of organic carbon and dissolved oxygen with the core region of the contaminant plume suggests only nominal attenuation potential. Therefore, in the absence of any remedial action, the plume is expected to continue to expand to the south-southeast in the direction of ground water flow. Around the plume's periphery, where dissolved oxygen does occur, aerobic biodegradation may attenuate the plume's lateral expansion.

VOCs

VOCs were not detected in the ground water sample collected from up-gradient well MW-8. At wells MW-12A/12B benzene was detected at concentrations of 292 µg/L and at 7.9 µg/L respectively. Toluene was also observed at concentrations of 231 and 78.4 µg/L and ethylbenzene at concentrations of 103 and 102 µg/L. Total xylenes were detected at concentrations of 236 µg/L at MW-12A and 226 µg/L at MW-12B. Low concentrations of ketones and styrene were also reported in the sample collected at MW-12A.

Benzene present in ground water at MW-12A, at a concentration above the 5 µg/L MCL, indicates the presence of residual carrier fluid at the Site and the need for expanded VOC testing during future monitoring events. Toluene, ethylbenzene and xylenes were not detected above their respective MCLs of 1,000 µg/L, 700 µg/L and 10,000 µg/L. Styrene at 83.7 µg/L was also detected at a concentration less than its 100 µg/L MCL. There are no published MCLs for acetone, methyl ethyl ketone or methyl isobutyl ketone.

TAL Metals

Laboratory analysis of the ground water samples collected from the Zone P-2 monitor wells detected several metals at concentrations above background levels and EPA primary Drinking Water Standards. Metals were observed at concentrations above background at more than 6 of the 17 wells, and their maximum observed concentration, included aluminum (9,860 µg/L), calcium (6,490 µg/L), iron (4,050 µg/L), magnesium (3,840 µg/L), and manganese (471 µg/L).

Metals detected in ground water at concentrations above their respective MCLs of 15 µg/L and 2 µg/L included lead and thallium. Lead was detected at MW-2 at a concentration of 40.2 µg/L. Thallium was detected at MW-2, MW-2A and MW-10A at concentrations between 2.5 and 8.2 µg/L.

Aluminum concentrations exceeding the Secondary Maximum Contaminant Level (SMCL) of 50 to 200 µg/L were observed at MW-2, MW-13B, MW-14A/MW-14B. The absence of aluminum in the dissolved metal analysis results suggests the elevated levels are attributable to colloidal matter present in the ground water samples. This is not an uncommon condition in newly installed wells and should abate as the monitor well boring and casing reach equilibrium with the aquifer matrix.

Elevated concentrations of iron and manganese, exceeding the Secondary Maximum contaminant Level (SMCL) of 300 µg/L and 50 µg/L respectively, observed in both the total and dissolved samples are most likely byproducts associated with microbial degradation of dissolved organics. Microorganisms frequently utilize ferric iron (Fe^{3+}) and manganese oxide (Mn^{4+}) in oxidation – reduction reactions, which yield soluble ferrous iron (Fe^{2+}) and manganese (Mn^{2+}) as reaction byproducts.

Dissolved TAL Metals

Ground water samples for dissolved metals were collected from 16 of the 17 monitor wells (MW-6 not tested) at the Site to assess potential impacts to surface water quality associated with ground water discharge to the un-named tributary. RI water level information collected in September 2004 suggests the tributary is a losing-stream. Under these conditions, surface water from the tributary seeps through the channel bottom, recharging Zone P-2. However, this determination is based on limited water level data, and given the regional hydrogeologic setting, it’s expected the un-named tributary is losing along some reaches and gaining in others.

Comparison of dissolved metals concentrations with chronic - ambient water quality criteria (C-AWQC) indicates that cadmium and lead are present in ground water at six locations, including background well MW-8, at concentrations above their respective criteria of 1 µg/L and 2.5 µg/L. Cadmium concentrations ranged from less than 1 µg/L to 8.3 µg/L (MW-1A) with a background concentration of 8.1 µg/L detected. Lead concentrations ranged from less than 1 µg/L to 9.2 µg/L (MW-1) as compared to a background concentration of 8.6 µg/L measured in ground water at MW-8.

General Water Quality Parameters

Laboratory analysis for general water quality parameters included alkalinity, (total as CaCO3), chloride (Cl), nitrate (NO_3-N), sulfate (SO_4), sulfide (HS) and TOC. Comparisons made with these parameters between up-gradient and down-gradient well locations can provide an indication of natural attenuation potential for BTEX and low molecular weight PAH (LPAH) compounds.

Comparison of up-gradient Zone P-2 ground water at MW-10A with down-gradient Zone P-2 ground water analysis results show increased concentrations of sulfate, sulfide, alkalinity, iron and manganese, all of which provide preliminary evidence of anaerobic biodegradation processes. Although oxygen is expected to be the primary electron acceptor for aerobic biodegradation of BTEX and LPAH compounds, increased sulfate and sulfide concentrations along the ground water flow path between MW-10A and MW-14A, and MW-10A and MW-14B provide evidence of sulfate reducing bacteria. Rising iron and manganese concentrations most likely correspond to iron and manganese reducing bacteria. Increased bicarbonate alkalinity concentrations may indicate the formation of carbon dioxide, a byproduct of aerobic biodegradation, which in turn reacts with water to form bicarbonate. Collectively, these data suggest that aerobic and anaerobic biodegradation of BTEX and LPAH compounds is occurring in Zone P-2 at the Site. These processes are expected to be more predominant around the plume's periphery.

Surface Water

Surface water samples were collected at eight locations as part of the RI. One sample was collected from onsite Pond D/E, four samples taken from the un-named tributary, and three others from Big Walnut Run Creek (Figure 7). All samples were analyzed for SVOCs. VOCs and metals were analyzed for in the Pond D/E sample and in 3 of the 4 samples taken from the un-named tributary. Samples in Big Walnut Run Creek were not analyzed for VOCs or metals. Laboratory analysis results from this sampling effort are presented below.

SVOCs

In Pond D/E, six individual PAHs were detected in the surface water sample collected from the middle of the pond. All but one of the detected constituents was a LPAH. The measured concentration for each of the six PAHs and TPAH is greater than the national recommended water quality criteria (NRWQC) for human health for benzo(a)pyrene of 0.0038 µg/L. However, no CPAHs were detected in the Pond D/E sample. All measured concentrations were less than their respective ecological screening values.

In the un-named tributary adjacent to the Site, 16 PAHs, including both LPAHs and high molecular weight PAHs (HPAHs), were detected at concentrations above the NRWQC. Concentrations decreased by an order of magnitude as the samples progress further from the Site. In some cases, concentrations of individual PAHs from samples collected adjacent to the Site are one or two orders of magnitude greater than those collected at the confluence with Big Walnut Run

Creek. Total PAHs and TCPAH concentrations at all stations in the un-named tributary are above the NRWQC and above concentrations measured upstream. Concentrations of the six detected LPAHs were greater than those of the seven carcinogenic PAHs by two orders of magnitude at station UT-SD-02 and one order of magnitude at the confluence with Big Walnut Run Creek. Concentrations of at least one individual PAH exceed ecological screening values at all stations downstream of the Site.

Concentrations of individual PAHs, total PAHs, and CPAHs measured in Big Walnut Run Creek samples are all greater than the un-named tributary upstream reference station. Concentrations of total PAHs are similar at all three stations in Big Walnut Run Creek. Concentrations of CPAHs, however, are higher at the reference station than the middle station and highest at the furthest downstream station. Concentrations of CPAHs at the middle station in Big Walnut Run Creek are below the NRWQC, while they are greater than the NRWQC at the reference station and further downstream. The concentration of benzo(a)pyrene and benzo(b)fluoranthene are above ecological screening levels at the station furthest downstream. A small automobile repair shop does operate within a few hundred feet of the downstream station representing a possible source of hydrocarbons. The upstream station is located at a road crossing where the shore and creek are full of scattered debris and refuse representing possible sources of contamination.

VOCs

No VOCs were detected in any of the samples collected.

Trace Metals

The same eight metals were detected or estimated as detected within Pond D/E, the un-named tributary, and the un-named tributary reference sample. Calcium, magnesium, potassium, and sodium are essential nutrients, so although detected they are not considered issues at the Site. Concentrations of aluminum, barium, and iron exceed ecological screening values in the un-named tributary while the concentration of barium exceeds the ecological screening value in Pond D/E. Concentrations of all detected metals decrease with increased distance from the Site, except for aluminum.

Sediment

Sediment samples were collected from a total of 21 locations as part of the RI (Figure 7). Eight samples were collected at surface level from the top 6 inches for use in the risk assessments. Samples from 10 locations were collected in the un-named tributary at various depth intervals ranging from 13 to 51 inches to help determine both the lateral and vertical distribution of creosote within the un-named tributary channel. The risk assessment samples can also be used to aid in the nature and extent investigation, however, the vertical extent in those locations would not be complete. All sediment samples were analyzed for SVOCs. VOCs and metals were analyzed in three of the risk assessment samples. Laboratory analysis results of the sediment samples are discussed below.

SVOCs

In addition to individual PAHs, bis(2-ethyhexyl) phthalate, carbazole, and dibenzofuran were detected in a majority of the three Pond D/E samples. Concentrations are highest in the middle of the pond where surface samples were collected with a petite ponar. Concentrations in the center of the pond and the northwest side exceed ecological and human health screening criteria for individual PAHs, TPAHs, and CPAHs. Concentrations are significantly lower in the southeast corner of the pond where CPAHs were not detected.

In the un-named tributary, PAHs were detected in most of the samples collected downstream of the Site. Upstream of the Site, concentrations are much lower and were reported as estimated values. In general, concentrations are higher in the surface samples, and decrease with depth, although this trend was not observed at transects UT-NE-05 and UT-NE-06. Detected concentrations decreased with increasing distance form the Site. CPAH concentrations exceeded human health screening criteria as far downstream as station UT-NE-07. TPAH concentrations exceeded ecological screening values as far downstream as station UT-NE-08. In addition to PAHs, carbazole and dibenzofuran were detected in samples collected from the tributary.

Low-level PAH detections or estimated concentrations were observed in the Big Walnut Run Creek samples, both upstream and downstream of its confluence with the un-named tributary. The highest reported concentrations and estimated values were observed at the furthest downstream sample location WC-SD-03. Concentrations are below both human health and ecological screening values for all individual PAHs except benzo(b)fluoranthene, which exceeded the ecological screening value. No other SVOCs were detected in the creek sediment samples.

VOCs

Methyl acetate was detected in the one sample collected at Pond D/E. Methyl acetate is used in many resins and oils and is not known to be Site-related. No VOCs were detected in the un-named tributary, sampled downstream of the Site.

Trace Metals

16 metals were detected in Pond D/E. Thirteen of the twenty-three metals analyzed were detected in all of the un-named tributary samples. Concentrations are greatest upstream of the Site and decrease moving downstream. Metals were not sampled in the Big Walnut Run Creek.

Aquatic Biota

Two biota tissue samples, benthic invertebrates (crayfish), were sampled during the 2004 RI sampling event. The benthic invertebrate samples were analyzed as whole body samples with the intent of using the data in the ecological risk assessment. Biota samples were collected at the same downstream stations established on the un-named tributary where sediment samples UT-SD-03 and UT-SD-04 were collected (Figure 7). All biota samples were analyzed for metals and SVOCs. VOCs were not analyzed in any of the biota samples collected from the tributary. A summary of the nature and extent of contamination in biota is presented below with respect to the primary contaminants of concern identified in the other environmental media.

Biota SVOCs

Thirteen PAHs were detected or estimated as detected in both tissue samples collected in the tributary during the 2004 sampling event. Concentrations are below screening values for benthic organisms. Detection limits at station UT-SD-03 and estimated concentrations at station UT-SD-04 are both above screening levels for benthic organisms for di-n-octyl-phthalate and di-n-butyl-phthalate. There appears to be no correlation with proximity to the Site as the maximum detected concentrations for some constituents are from UT-SD-03 and some are from UT-SD-04.

Biota Trace Metals

Ten metals were detected or estimated as detected in both tissue samples collected in the tributary downstream of the Site. Concentration of chromium, manganese, nickel and zinc are all above screening values for benthic invertebrates at both station UT-SD-03 and UT-SD-04. Concentrations at the upstream location are greater than those at the downstream location in all cases.

Bioassays

Several types of bioassays were conducted on samples from throughout the HCC Site with the intent of determining if Site concentrations are potentially toxic to lower trophic level organisms (i.e., the bottom of the food chain). Soil and sediment samples were collected from the Site and sent to an offsite laboratory where standard test organisms were introduced to the media from the Site and observations were recorded all according to standard protocols (mostly EPA protocols). The bioassays conducted are what are called “definitive bioassays” or a dilution series.

Organisms were introduced to unaltered Site media, as well as several mixes of Site media and clean sand at concentrations of 50 percent Site media, 25 percent Site media, 12.5 percent Site media, and 6.25 percent Site media. The results of the bioassays are presented below.

Results of Bioassays

The bioassay results were evaluated by comparing recorded data from the test sites to recorded data from controls. EPA bioassay protocols specify how to perform statistical comparisons of the data sets for each bioassay. The protocols call for the comparisons to be made to laboratory controls that represent ideal conditions. In addition to these required statistical analyses, for the HCC Site bioassays, the laboratory was specifically requested to perform statistical analysis against data for in-stream reference stations that are outside of the influence of the Site and that are representative of conditions throughout the watershed upstream of the Site as well as a background soil sample. All dilutions run from a given Site were compared to the reference results using one way statistical analysis (i.e., if results were better for samples from onsite locations, the difference was not reported). In interpreting the data, results from Sites should differ statistically from both the laboratory control and the Site reference for differences to be considered indicative of Site related toxicity to the test species. In addition, there should be a clear pattern of improved results with each dilution (e.g., a sample diluted to 6.25 percent of the Site media should have a higher percent survival than the 12.5 percent dilution unless all organisms also survived with the less diluted 12.5 percent sample). No toxicity was observed in the earthworm toxicity tests. The lettuce germination test results indicated a statistically significant reduction in germination at the 25 percent dilution for station UA-SO-3-3 compared to the laboratory and field references. The amphipod bioassay results suggest a statistically significant reduction in survival at the 50 percent dilution for station UT-SD-02 compared to the laboratory and field references. The results of the lettuce and amphipod tests were indicative of toxicity that might be attributable to the Site.

Interpretation of Bioassay Results with Respect to Nature and Extent

Bioassay results could be used, along with screening values for human health and ecological risk to help define the extent of contamination at a site. At a given sampling station, if chemical concentrations exceed screening values, the location is considered to be contaminated. In the same manner, if a bioassay at the same station suggests toxicity, than the same conclusion could be drawn. Thus, using the bioassay data and the screening values, the most sensitive receptor will define the extent of contamination.

Caution should be used when including both bioassay results and comparisons to ecological screening values in determining the extent of contamination. Both may be independent lines of evidence that can be used to assess the same endpoint e.g., maintaining species diversity in the Un-named Tributary downstream of the Site. However, they may yield conflicting results about the same vital resource. In such a situation a weight-of-evidence is needed to determine if the resource is at risk and if concentrations indicate contamination. The weight-of-evidence analysis is typically part of the ecological risk assessment. Thus, using bioassay results to define the extent of contamination is better suited for assisting in the development of Site-specific preliminary remediation goals (PRGs) that are tied to the risk assessment and identifying the extents of selected remedial strategies.

At the HCC Site, bioassay results would not likely add much to defining the extent of contamination. In the areas where toxicity was identified, contamination was also identified by exceedence of screening values for both human and ecological receptors. Thus, the bioassay results for the HCC Site were not used to define the nature and extent of contamination.

WASTE CELL MATERIAL TESTING

A stabilization testing and a chemical oxidation testing were conducted for the composite sample of visually contaminated material obtained between depths of 2 and 15 feet from the WC. The testing results are presented below.

Waste Stabilization Testing

Aliquots of the waste material were blended, by weight, with Portland cement and granular activated carbon (GAC). The Portland cement concentration was maintained at 15 percent and GAC added to obtain a 4 percent, 8 percent, and 12 percent by weight mix. A control with 15 percent cement and 0 percent GAC was also prepared to assess the benefits of cement-only treatment. The treated samples were tested for SVOCs and synthetic precipitation leaching procedure (SPLP) - SVOCs. The 12 percent GAC sample was also tested for VOCs, SPLP-VOCs, and SPLP-TAL metals.

The analysis results indicate that 8 to 12 percent GAC addition is effective at immobilizing a majority of the PAH, SVOC, VOC and metals present in the waste cell material. However, the treatment at the 8 and 12 percent GAC level was not effective at immobilizing phenanthrene to a concentration less than the 0.059 mg/L criteria (land disposal restriction) specified in 40 CFR 268.40. The high proportion of phenanthrene in the waste cell sample will most likely require a GAC addition of 16 percent to attain this level of treatment.

Chemical Oxidation Testing

Chemical oxidation testing yielded an oxidant demand of 16 to 20 grams of potassium permanganate per kilogram (kg) of soil containing a TPAH concentration of 1027 mg/Kg. Assuming a soil density of 100 pounds per cubic foot, the treatment cost for chemicals alone was estimated at $2.73 per cubic foot of soil or $74 per cubic yard. Based on the expected volume of contaminated soil requiring treatment, the cost for a chemical oxidation based remedy was deemed unreasonable. Therefore, no further evaluation of chemical oxidation for treatment of creosote contaminated soil was performed in the feasibility study (FS).

GEOLOGIC CONCEPTUAL SITE MODEL

A geologic conceptual Site model (GCSM), as shown in Figure 8, was developed based on the information collected during the RI and SRI. The Site is underlain by alluvium composed of varying proportions of clay, silt, sand, and gravel-size material extending to depths up to 220 feet below ground surface (bgs). The subsurface geology was grouped into three low-permeability zones (Zones I-1, I-2 and I-3) and three permeable zones (Zones P-2, P-4, and P-6). Zones I-1 and P-2 are the uppermost units at the Site and were the primary zones of investigation during the EE/CA, RI and SRI.

Free phase creosote (NAPL) was measured at monitor well MW-12B with a thickness of 1.5 feet and residual creosote was observed in the borings drilled within the footprint of the former Pond A at multiple depth intervals. Creosote present within this area most likely entered the subsurface through Pond A seepage – a common release mechanism at many historic wood treating sites where unlined impoundments were used for wastewater management. The extent of the free-phase creosote has not been fully defined during the RI and SRI.

The free phase and residual creosote identified in Zones I-1 and P-2 represents the major source of the groundwater contamination. Due to their low solubility, the COCs are slowly released from the source area and transported by ground water.

CURRENT AND FUTURE LAND AND GROUND WATER USES

LAND USES

The Site is currently vacant. Process buildings and all the wood treating equipment were removed during the 1995 EPA Removal Action. The offsite property that has been impacted by the past operation of the facility is the un-named tributary. The Site has been generally abandoned since 1993.

Past land use on the facility and the City of Jasper's redevelopment plans for the Site forms the basis for reasonable exposure assessment assumptions and risk characterization conclusions. According to the City of Jasper, and the planned Institutional Controls (IC's), the former facility will be limited to industrial and/or commercial use after completion of the remedial action. The un-named tributary and Big Walnut Run Creek can be utilized for recreational use.

GROUND WATER USES

The HCC Site lies in an area where the Jasper Aquifer intersects the ground surface. The geologic strata underlying the Site are comprised of clay, silt, and sand extending to depths up to 220 feet. Based on information developed from the RI and historical site investigation data, geologic strata underlying the Site were grouped into alternating sequences of less permeable (I) and permeable (P) strata. These units include Zones I-1, P-2, I-3, P-4, I-5, and P-6.

The Jasper Aquifer is the sole water supply for the towns of Jasper and Newton, Texas. A search of TWDB records indicates that there are no registered drinking water wells within a 0.5 mile radius of the Site. The Upper Jasper County Water Authority's (UJCWA) newly constructed well #10, located 3,900 feet northwest (up-gradient) is the nearest water supply well. This well was brought online in June 2005 and produced about 367,000 gallons per day (255 gallons per minute) in June 2005 and 394,000 gallons per day (274 gallons per minute) in July 2005. A copy of the well construction report, dated June 29, 2004, indicates well #10 is screened at depths of 539 to 566 feet, 610 to 696 feet, 732 to 754 feet and 774 to 820 feet. The uppermost screen interval is 450 feet below the base of Zone P-2.

Between 0.5 and 1 mile from the Site there are three water supply wells. Well 61-08-902 is a private domestic well located west (cross-gradient) that is screened at a depth of 47 feet. Wells 62-01-702 and 62-01-703 are industrial supply wells located northeast (up-gradient) of the Site and screened at depths of approximately 230 and 175 feet respectively.

A ground water beneficial use classification performed in conjunction with preparation of the RI/FS report concluded that ground water underlying and immediately down-gradient of the HCC Site is a Class IIB ground water resource. The Class IIB classification indicates that ground water is not currently being used, but could be used in the future.

SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and ecological effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The public health risk assessment followed a four step process: 1) identification of the chemicals of concern from those hazardous substances which, given the specifics of the Site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates.

A summary of those aspects of the risk assessment which support the need for remedial action is discussed in the following sections. The risk assessment is based on data collected during the 2004 RI field effort.

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT PROCESS

The human health risk assessment (HHRA) was conducted in accordance with the Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual, (Part D Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (RAGS Part D) (EPA Publication 9285.7-47, December 2001).

The Baseline Ecological Risk Assessment (BERA) began at Step 3 of the EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (1997). All of the components of Steps 1 and 2 of the process are discussed in the EE/CA for the Site. The results of the screening risk assessment in the EE/CA concluded that there was a potential for ecological exposure and risk at the Site. Therefore, the BERA completed Steps 3 through 8 of the ERA process.

INITIAL COPC SELECTION

The initial list of COPCs contained in the baseline problem formulation (BPF) document included 17 PAHs, 23 TAL metals, SVOCs, and VOCs based on historical data collected through 2001. Expanded media sampling during the RI targeted these COPCs yielding additional data for soil, sediment, surface water, ground water, and organism tissue.

EXPOSURE AREA IDENTIFICATION AND INVESTIGATION MEDIA

Based on the screening process, five exposure areas (EAs) and their associated media were identified for further evaluation in the HHRA and BERA:

- Upland Area Including Process and Non-process Area Soil.
- Pond D/E Sediment and Surface Water.
- Un-named Tributary Sediment and Surface Water.
- Big Walnut Run Creek Sediment, Surface Water, and Fish.
- Ground water.

The approach to sampling and analysis during the RI to address ecological risk also included targeted site-specific evaluations including prey tissue analysis and direct toxicity testing of representative sensitive species. Results were used to develop a weight-of-evidence for the BERA.

RECEPTOR SELECTION

Human Health

Separate and distinct exposure scenarios were identified for each EA based upon existing and future land use classifications. The process and non-process areas are classified as industrial and will continue to be so in the future, thus the industrial worker was selected as the representative receptor for this EA. Pond D/E is currently owned by HCC. It is not used for industrial purposes and does not contain any habitable buildings. The existing use is expected to remain constant in the future and could be secured with institutional controls, thus an adolescent recreator was deemed the most appropriate receptor. The un-named tributary is an eight to ten foot wide natural drainage channel located immediately west of the Site that traverses private, forested property before converging with Big Walnut Run Creek approximately one mile south of the Site. The existing land use is not expected to change. Hence, the adolescent recreator was deemed the most appropriate receptor. Big Walnut Run Creek converges with a listed water of the State of Texas (Segment) designated for recreational use and fish consumption. Hence, the adolescent recreator was selected as the appropriate receptor.

Ecological

The BERA focused on particular species selected to represent the feeding guilds found within different foodwebs present in each EA. In most cases, the same feeding guilds are found within multiple foodwebs that overlap within EAs. The feeding guilds included omnivorous, herbivorous, and carnivorous birds and mammals. Only one individual species was selected to represent each guild within multiple foodwebs and EAs. Rare, threatened, or endangered species and critical habitats were considered. Based on data available from the Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service (US FWS), none are present in the vicinity of the Site.

COMPLETE EXPOSURE PATHWAYS AND CONCEPTUAL MODEL

Figure 9 presents the combined human health and ecological conceptual site model (CSM). Potentially complete exposure pathways involve multiple media to which multiple human receptors and ecological feeding guilds are exposed. Runoff, erosion, vapors, dust and surface water leaching to ground water are considered primary mechanisms of transport. Analytical evidence suggests that leaks and/or spills from the onsite process area have resulted in the subsurface soil and ground water contamination. The COPCs present at the Site can make contact with human and ecological receptors through several exposure pathways. Each of these pathways is linked to a testable hypothesis regarding the protection of each receptor against adverse toxic effects. The hypotheses for ecological receptors were described in detail in the BPF that supports the BERA for the Site.

REFINED COPC SCREENING

Based on the data collected during the RI, the COPCs were refined by comparing the maximum detected chemical concentrations for each exposure area from soil, sediment, surface water and ground water samples with appropriate screening benchmarks. The upland exposure area is approximately 8 acres in size, which is much larger than a typical industrial exposure area (0.5 to 1 acre); therefore, for the HHRA an initial screen was conducted on the entire set of upland soil samples, and, based on those results, a secondary screen was conducted on each individual sample location. For the HHRA, EPA Region 6's Medium-Specific Screening Levels (MSSLs; EPA, 2004a) for industrial soil or residential tap water were used as benchmarks. Values from TCEQ guidance or values developed using TCEQ methodology were used in the absence of MSSLs.

For the BERA, ecological screening benchmarks were taken from EPA and TCEQ guidance, with various surrogates used as appropriate and as documented in the BERA. A gradient analysis was also included for each media to identify constituents that did not have a site-related gradient (that is, declining concentrations with distance from the Site or distance from the area of concern), thus indicating whether or not they originated at the Site. The gradient analysis was performed on constituents with low frequency of detection or no site-related history.

EXPOSURE, TOXICITY, AND EFFECTS ASSESSMENT

The HHRA and BERA included estimates of the doses of site-related COPCs to which receptors are expected to be exposed. The exposure doses were estimated by taking the exposure point concentration (EPC) of each COPC in each exposure medium and using exposure modifying factors to develop the total doses of the COPCs.

EPCs for the HHRA and BERA were the same for all EAs except ground water. EPCs were generated via the program ProUCL version 3.0, and correspond to the 95th percent upper confidence limit (UCL) on the mean. In the un-named tributary and Big Walnut Run Creek, EPCs represent the maximum detected concentrations as only a limited number of samples were collected. EPCs for VOCs and some metals in the process area also correspond to maximum detected concentrations as too few samples were analyzed to obtain a UCL based EPC. For the HHRA, the ground water EPC was determined from a subset of wells located within the center of the ground water plume. For the BERA, EPCs were developed from monitor wells located closest to the un-named tributary and Big Walnut Run Creek.

Human Health

The exposure assessment used chemical-specific data and exposure parameters to generate an estimate of each receptor's chemical intake, as specified in Risk Assessment Guidance Under Superfund (RAGs) Part D (EPA, 2001). Exposure pathways included ingestion, inhalation, and dermal absorption. The residential ground water assessment included inhalation from volatilization of COPCs during showering. The toxicity assessment gathered available toxicity values for each COPC to be used in the characterization of risk and hazard. When a toxicity value was absent, alternate sources were consulted.

The hierarchy presented by EPA in OSWER Directive 9285.7-53, "Human Health Toxicity Values in Superfund Risk Assessments" (EPA, 2003) outlines using the toxicity information and toxicity values in the Integrated Risk Information System (IRIS; EPA, 2004) as Tier 1, Provisional Peer-Reviewed Toxicity Values (PPRTVs) from the Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) as Tier 2, and additional EPA and non-EPA sources of toxicity information as Tier 3. This hierarchy was followed in selecting the toxicity values used in the HHRA.

Health effects are divided into two broad groups: non-carcinogenic, and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing non-carcinogenic health effects were evaluated independently from those having carcinogenic effects. Some chemicals may produce both non-carcinogenic and carcinogenic effects, and were evaluated in both groups.

Ecological

Exposure of ecological receptors was evaluated by considering multiple pathways. Exposure pathways not explicitly addressed in this BERA include: 1) inhalation and dermal exposure pathways for upper trophic level organisms, 2) foliar uptake of dissolved COPCs by aquatic plants, and 3) risk to amphibians and reptiles, because these pathways currently lack enough accompanying toxicological exposure information and guidance for a complete quantitative evaluation (EPA, 1999a).

For lower trophic level communities exposed to soil, sediment, and surface water (trophic levels 1 and 2), the exposure assessment consists of determining media-specific EPCs and comparing them to media-specific direct toxicity reference values (TRVs). Comparisons were made on a station-specific basis.

The exposure to upper trophic level organisms was assessed by quantifying the daily dose of ingested contaminated food items (that is, plant and animal) and ingested media. The exposure is estimated using chemical-specific EPCs and bioaccumulation data, and several other factors such as species-specific body weights, ingestion rates, home range data, and area use factors. Prey tissue concentrations were estimated using chemical-specific bioaccumulation factors and bioaccumulation regression models except for benthic invertebrates and fish, for which site-specific tissue data were used.

The effects assessment for the BERA was completed by identifying measures of effects that were evaluated to determine the potential for a COPC to have an adverse effect on selected receptors. The process included identifying the highest exposure level considered to be without adverse ecological impact (TRV). TRVs for wildlife were all selected from literature databases using the TRV selection hierarchy methods specified by EPA (1999) and uncertainty factors were applied as directed when necessary. TRVS for lower trophic level organisms (plants and invertebrates) were derived using the results of site-specific bioassays and co-located medium-specific COPC concentrations.

RISK CHARACTERIZATION

Human Health

The risk characterization combines the information from the exposure assessment and toxicity assessment to produce a quantitative representation of health risk and hazard. Both carcinogenic risk and non-carcinogenic hazard are presented without units. If the risk from a carcinogen is greater than one excess case of cancer in one million ($1x10^{-6}$), it is considered a chemical of concern (COC); however, $1x10^{-6}$ to $1x10^{-4}$ is considered an allowable risk range. Carcinogens that present a risk greater than $1x10^{-4}$ will definitely be targeted for remediation. If the hazard quotient (HQ) from a non-carcinogen is greater than one, or if the combined hazard index (HI) from a group of similarly acting chemicals is greater than one, then it is considered a COC.

Ecological

The primary means of characterizing ecological risk in the BERA was to determine the ratio of the estimated chemical exposure level or dose for the receptor with the chemical specific TRV. The following equation was used:

$$HQ = ED/TRV \text{ or } C/ECB$$

where:

HQ = Ecological hazard quotient (unitless)
ED = Estimated chemical intake by receptor (mg/kg-day)
TRV = Toxicity reference value (mg/kg-day)
C = Sediment or water concentration (mg/kg or mg/L)
ECB = Ecological benchmark (numerical standard, criteria or guidance value) (mg/kg or mg/L)

HIs were also calculated to assess the potential for adverse effects resulting from multiple COCs based on the assumption that the effects are additive for COPCs that act by the same toxicological mechanisms. HIs were calculated as the sum of all HQs with similar toxicological mechanisms and was calculated as follows:

$$HI = HQ_1 + HQ_2 + \ldots + HQ_i$$

where:

HI = Ecological hazard index (unitless)
HQi = Ecological hazard quotient for the ith COPC (unitless)
HI values were calculated for high molecular weight PAHs (HPAHs) and low molecular weight PAHs (LPAHs). HQs and HIs above 1.0 were considered unacceptable risks.

Ecological Weight of Evidence

In addition to HQs and HIs, a weight of evidence (WOE) was presented. The WOE for the terrestrial plant and invertebrate communities included the risk characterization results, site-specific bioassays, and observation of species and communities found at the site. For the benthic communities the WOE included the risk characterization data, bioassays, calculation of the Shannon Diversity Index, benthic tissue data compared to TRVs, and other ancillary data such as habitat structure. The WOE for the fish community included the risk characterization data, calculation of Indices of Biological Integrity (IBI), fish tissue data compared to TRVs, and other ancillary data. Ground water data were evaluated to understand the potential for ground water from wells onsite to impact the fish community in the future.

Ground water data were evaluated to better understand the potential for onsite ground water to impact the fish community in the future. This evaluation was not considered in determining whether or not there is currently a risk to the fish community.

RISK SUMMARY

There is a potential for receptors to experience adverse effects from exposure to PAHs, metals, SVOCs and benzene. The receptors evaluated and those identified as being potentially at risk varies between the EAs. Table 2 presents a summary of unacceptable risk remaining at the conclusion of the HHRA and BERA. Final COCs were identified as constituents with individual HQs above 1.0, HIs above 1.0, or carcinogenic risks greater than $1x10^{-6}$. There is no evidence of metals or bis(2ethylhexyl)phthalate being associated with any Site-related activities or processes; thus, for marginal risks from these constituents (that is, HQs between 3 and 10), remedial actions were not considered necessary. All other constituents can, with reasonable confidence, be excluded from further risk assessment.

In summary the risk conclusions by EA are:

- The process and non-process areas presented risk to industrial workers from PAHs. However, the risk is within the EPA acceptable risk range of $1x10^{-6}$ to $1x10^{-4}$. To account for possible future use of non-process area as a soccer venue, the non-process area soil data were also screened using the TCEQ residential protective concentration levels (PCLs) during development of the remedial alternative. Potential unacceptable risk is identified at the non-process area if the future use of the non-process area will be changed from commercial/industrial to recreational (e.g., a soccer venue) land use.
- The sediments in Pond D/E presented risk to both human health and ecological receptors from PAHs, SVOCs and benzene. Amphibians exposed to surface water may also be at risk though the exact constituents of concern are unknown.

- The un-named tributary presented risk to both human health and ecological receptors from PAHs in surface water and sediment.
- Big Walnut Run Creek presented no risk to human health and ecological receptors.
- Ground water presented risk to human health from PAHs (carcinogenic and non carcinogenic), SVOCs and benzene.

RISK MANAGEMENT

Overall, Big Walnut Run Creek presented no risk to human health and ecological receptors. However, there was risk to human health and ecological receptors in Pond D/E and the un-named tributary, as well as to human health in the process and non-process areas, and in shallow ground water. Because these risks remain after completion of the uncertainty analysis, these compounds are considered contaminants of concern (COCs) instead of contaminants of potential concern (COPCs). Based on these calculated risks, Preliminary Remediation Goals (PRGs) were developed and presented in the Feasibility Study portion of the RI/FS Report and are presented later in this ROD.

TABLE 2
Summary of Risks for All Exposure Areas and All Receptors
Hart Creosoting Company - Jasper , Texas

Contaminant of Potential Concern	Upland	Pond D/E	Walnut Run Creek	Un-named Tributary
		Human Health Risks		
Outdoor Worker	PAHs 6E-05	IP	IP	IP
Adolescent Tresspasser - SED	IP	PAHs 2.1E-04	IP	PAHs 1.2E-04 3.69
Adolescent Tresspasser - SW	IP	NH	NH	PAHs 3E-05
Adult Resident - GW	PAHs, SVOCs, benzene 1E-03 540	PAHs, SVOCs, benzene 1E-03 540	PAHs, SVOCs, benzene 1E-03 540	PAHs, SVOCs, benzene 1E-03 540
Child Resident - GW	PAHs, SVOCs, benzene 6E-04 3700	PAHs, SVOCs, benzene 6E-04 3700	PAHs, SVOCs, benzene 6E-04 3700	PAHs, SVOCs, benzene 6E-04 3700
		Ecological Risks		
American Woodcock	NH	IP	IP	IP
American Kestrel	NH	IP	IP	IP
Northern Bobwhite Quail	NH	IP	IP	IP
Deer Mouse	NH	IP	IP	IP
Nine-banded Armadillo	NH	IP	IP	IP
Red Fox	NH	IP	IP	IP
Mink	IP	total PAHs - 2	NH	NH
Green Heron	IP	NH	NH	NH
Belted Kingfisher	IP	NH	NH	NH
Terrestrial Plants and Invertebrates	NH	IP	IP	IP
Amphibians and Reptiles	NH	Risk - but COCs not identified	NH	fluorene (and possibly others) 1.5
Benthic Invertebrates	IP	PAHs, Pyrene 599	NH	PAHs, SVOCs 9585
Fish	IP	NH	NH	PAHs 21

Notes:

IP	= Incomplete pathway
NH	= Risk determined to be below applicable risk hazard quotients concluding no harm to the receptor in the EA.
(yellow)	= For ecological risk - COCs based on LOECs and LOAELs and COC with highest HQ / Hi is listed = For human health risk – COCs, the cumulative risk level, and HQ / HI are shown.

REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

Remedial action objectives (RAOs) were developed for the HCC Site for those COCs that pose a carcinogenic risk above EPA's target cancer risk range or non-carcinogenic hazard to human health and the environment based on site-specific risk calculations. RAOs are also defined such that Applicable or Relevant and Appropriate Requirements (ARARs) are met. RAOs specify the COCs, exposure routes, receptors, and cleanup levels or PRGs for each affected media to be achieved by the remedial action. RAOs for the Site were developed by first evaluating the COCs and their associated risks per media, and then by developing PRGs to minimize significant risks.

PRELIMINARY REMEDIATION GOALS

The PRGs were developed, based on current and future land use and the results of the RI and risk assessments, for the contaminated media posing unacceptable human health and environmental risks. The basis for determination of the PRGs for each media is discussed in the following subsections.

Ground Water PRGs

The results of the HHRA indicate that exposure to the contaminated ground water poses an unacceptable human health risk. A total of 17 chemical constituents are identified as the primary human health COCs in ground water, based on their toxicity, risks, and distribution in ground water. The COCs, as listed in Table 3, include 11 PAHs, 5 SVOCs, and benzene. Since ground water is a future potential drinking water source, the ground water PRGs (GW-PRGs) were developed based on a drinking water scenario (for protection of both adult and child residents) and the following assumptions:

- Ingestion, inhalation, and dermal contact are the major exposure pathways of concern for the ground water.
- The risk level for an individual carcinogenic COC should not be greater than 1×10^{-5} and the cumulative risk level for all the carcinogenic COCs in ground water should be less than 1×10^{-4}.
- The hazard quotient for an individual non-carcinogenic COC should not be greater than 1 and the cumulative hazard quotient for all the non-carcinogenic COCs in ground water should be less than 10.
- If a MCL or EPA Lifetime Health Advisory Value is available for a specific COC, the MCL or the EPA Lifetime Health Advisory Value will be used as a PRG for this specific

COC and the risk level or HQ for this COC will not be included in the cumulative risk level calculation.

The GW-PRGs were back calculated using the method and parameters documented in the Appendix K (Human Health Risk Assessment) of the RI/FS Report. The calculated GW-PRGs are summarized in Table 3.

Soil PRGs

Since unacceptable human health risks (total risk > 1.0×10^{-4}) are not identified for the surface soil at the Site, the exposure pathway of concern for soil is leaching of COCs from surface and subsurface soil to ground water. Therefore, the soil PRGs were developed for surface and subsurface soil to prevent leaching of COCs from contaminated soil into ground water and resulting in ground water COCs at concentrations exceeding GW-PRGs.

The soil to ground water protection PRGs (GWP-PRGs) were calculated based on the ground water PRGs developed above, the published chemical specific soil-water partitioning coefficients, and the soil/water partition equation (Equation 10) provided in EPA's guidance document entitled "Soil Screening Guidance: User's Guide"(EPA, 1996). Since Site specific information is not available to calculate the dilution attenuation factor (DAF), a default DAF of 10 for contaminant sources greater than 0.5 acres, as provided in the Texas Risk Reduction Program (TRRP), was used for the soil GWP-PRG calculation. Total organic carbon (TOC) for soil was determined to be 10,000 mg/kg based on the soil data collected from the WC and the background and onsite surface soil sample locations. Other TRRP Tier 1 default soil parameters (such as soil bulk density, and soil volumetric air and water contents) provided in 30 TAC §350.75(b)(1) were used in the PRG calculation rather than the EPA soil default values as the TRRP Tier 1 values are considered to be more representative of the Site soil conditions. The calculated soil GWP-PRGs are summarized in Table 3.

Surface Water PRGs

As indicated by the BERA results, there is unacceptable ecological risk associated with exposure to surface water in the un-named tributary. A total of 4 CPAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)-pyrene, are identified as the primary COCs, based on their toxicity and risks. Since the contaminated surface water will eventually discharge into Big Walnut Run Creek and there is a potential for migration of ground water COCs into Big Walnut Run Creek, the surface water PRGs were developed based on the guideline provided in TSWQS (30 TAC §307) to ensure protectiveness of human health and ecological receptors in both the un-named tributary and Big Walnut Run Creek.

Surface water PRGs for protection of human health and ecological receptors were calculated according to TCEQ guidelines outlined in the guidance document entitled *Determining Protective Concentration Levels for Surface Water and Sediment* and summarized in Table 3. The surface water PRGs in Table 3 represent the lower of two surface water screening values, those protective of human health and ecological health. Human health values were selected with the following hierarchy; Texas Surface Water Quality Standards (30 TAC §307), National Recommended Ambient Water Quality Criteria, and calculated according to the TCEQ guidance document. Ecological screening values are those presented in a TCEQ guidance document entitled *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* (2006 revision) or were developed according to the method provided in the guidance.

PRGs for Contaminated Sediment in Pond D/E and the Un-named Tributary

The results of the human health and ecological risk assessment indicate that the COCs in the un-named tributary and Pond D/E sediments pose unacceptable risks to human health and ecological receptors. A total of 7 PAHs are identified as the primary sediment COCs for human health. In addition to the human health COCs, 16 PAHs and 2 SVOCs, as listed in Table 3, are also identified as sediment COCs for ecological receptors.

The sediment PRGs were developed to protect human health, ecological receptors, and ground water. Therefore, the final sediment PRGs were determined by selecting the lowest values of human health direct contact PRGs, ecological PRGs, and the sediment to ground water protection PRGs. The final sediment PRGs are summarized in Table 3 and the method for development of the PRGs for each of the exposure pathways and/or receptors are provided below.

Since the future land use for the un-named tributary and Pond D/E is likely to be recreational, sediment direct contact PRGs for the human health COCs were established to protect adolescent recreational use by back-calculating from the risk estimates described in the Appendix J (HHRA) of the RI/FS Report to define the sediment COC concentrations that met the target risk level. The PRGs were determined for the carcinogenic COCs using a carcinogenic risk level of 1×10^{-5} and for the non-carcinogenic COCs using a non-carcinogenic hazard quotient (HQ) of 1. This ensures that the cumulative carcinogenic risk level is below 1×10^{-4} and the cumulative non-carcinogenic hazard quotient is less than 10. The carcinogenic and non-carcinogenic PRGs were calculated based on the toxicity factors and other parameters used for the human health risk assessment calculations in HHRA.

The ecological PRGs were developed for the SVOCs and PAHs for protection of benthic organisms living in the sediment. PRGs were developed as the midpoint between the Site specific no-effect and lowest-effect screening values developed in the BERA. Details regarding the development of the Site-specific screening values are presented in the BERA, which is included in Appendix J of the RI/FS Report.

The sediment GWP-PRGs are assumed to be the same as the soil GWP-PRGs.

Ground Water to Surface Water PRGs

As indicated in the GCSM (Figure 8), ground water from the Site discharges into Big Walnut Run Creek at the locations approximately 3,000 to 3,500 feet down-gradient of the Site. Although unacceptable human health and ecological risks were not identified at Big Walnut Run Creek, there is a potential future risk to human and ecological receptors in Big Walnut Run Creek based on the comparison of ground water data to surface water PRGs. Therefore, ground water to surface water PRGs were developed to ensure that the migration of COCs from ground water to surface water will not result in exceeding surface water PRGs.

Although a seven-day, two-year low flow rate (7Q2) is not available for Big Walnut Run Creek, based on the observation of the water flow rate at various seasons, it appears that the affected ground water discharge rate (<0.1 cfs) is clearly less than 15% of the 7Q2. Thus, a TCEQ default dilution factor of 0.15 is applied to calculate the ground water to surface water PRGs. The calculated ground water to surface water PRGs are provided in Table 3.

REMEDIAL ACTION OBJECTIVES

The RAOs were established to address unacceptable human health and ecological risks identified through the risk assessment process. Due to the presence of PAHs and free phase and residual NAPL in the saturated zones, EPA believes that it is technically impracticable (TI) to restore the contaminated ground water to meet the maximum contaminant levels (MCLs) and/or GW-PRGs within the reasonable time frame. A TI waiver is proposed so that restoration of the contaminated ground water to the drinking water standards will not be required for the Site. Instead of meeting MCLs and/or GW-PRGs, the ground water remedial strategy for the Site would be to prevent future exposure to the contaminated ground water.

The following media specific RAOs were developed for the contaminated media posing the unacceptable and potential unacceptable risks:

- **RAO No. 1** - Prevent exposure to ground water containing COCs at concentrations exceeding the GW-PRGs listed in Table 3, minimize dissolved phase plume expansion, and reduce the quantity of free phase and residual NAPL identified in the saturated zone to the extent practicable.

- **RAO No. 2** - Prevent leaching of COCs from the surface and subsurface soil/sediment containing COCs at concentrations exceeding the respective PRGs listed in Table 3 into ground water and resulting in the COC exceedences of the ground water PRGs.
- **RAO No. 3 -** Prevent direct human (adolescent recreators) and/or ecological receptor contact with sediment containing COCs at concentrations exceeding the PRGs listed in Table 3 in the un-named tributary and Pond D/E.
- **RAO No. 4**- Prevent plume expansion and prevent migration of COCs from ground water into Big Walnut Run Creek surface water and resulting in the surface water COC concentrations exceeding the surface water PRGs provided in Table 3.
- **RAO No. 5 -** Minimize the transport of remaining COCs from the un-named tributary into the down-gradient surface water bodies (Big Walnut Run Creek and Neches River).

TABLE 3
Summary of PRGs for Contaminated Media
Hart Creosoting Company - Jasper, Texas

COCs	Ground Water PRG (µg/L)	Soil GWP-PRG (mg/kg)	Surface Water PRG (µg/L)	Sediment PRG (mg/kg)	Ground Water to Surface Water PRG (µg/L)
2,4-Dimethylphenol	250	3.2	105	NA	700
2-Methylnaphthalene	57	25	63	0.54*	420
2-Methylphenol	660	7.1	1,120	NA	7,467
3 &/or 4-Methylphenol	660	6.0	1,120	NA	7,467
Acenaphthene	130	52	23	0.121*	153
Acenaphthylene	NA	NA	23	1.22*	153
Anthracene	NA	NA	0.3	0.57*	2
Benzo(a)anthracene	0.085	3.0	0.81	1.17	5.4
Benzo(a)pyrene	0.2	19	0.014	0.789	0.093
Benzo(b)fluoranthene	0.052	6.3	0.014	0.976	0.093
Benzo(g,h,i)perylene	NA	NA	0.014	0.28*	0.093
Benzo(k)fluoranthene	NA	NA	0.014	0.833	0.093
Carbazole	43	10.6	56.8	NA	379
Chrysene	19	587	7	2.02*	47
Dibenz(a,h)anthracene	0.0033	0.63	0.18	0.131	1.2
Dibenzofuran	5	4.3	74	0.912*	493
Fluoranthene	NA	NA	6.16	2.9*	41
Fluorene	87	66	11	1.07*	73
Indeno(1,2,3-cd)-pyrene	0.052	18	0.014	0.304	0.093
Naphthalene	100	15.6	250	0.1	1,667
Phenanthrene	130	184	30	3.4*	200
Pyrene	NA	NA	7	1.97*	47
Benzene	5	0.039	106	NA	707

Notes:

NA: Not Applicable (not a COC for the medium)
*: PRGs for protection of ecological receptors only.

OCCURRENCE AND VOLUME OF AFFECTED MEDIA ABOVE PRGS

Contaminated media that pose unacceptable risks includes surface water and sediment in the un-named tributary at locations adjacent to and down-gradient of the Site, sediment in Pond D/E, and ground water at, adjacent to, and down-gradient of the Site. In addition to the media posing unacceptable risks, surface and subsurface soil in the process and non-process areas and waste disposed in the WC contain COCs at concentrations exceeding the soil to ground water protection levels and would potentially impact the ground water quality. Although not posing unacceptable risks at the Site, surface water in Pond D/E should be addressed as a contaminated medium due to the potential unacceptable risks associated with directly discharging into the environment.

Preliminary estimates of the quantity of contaminated media are summarized in Table 4 and discussed in the following paragraphs. The estimated quantities are used to assist in identifying and screening possible remedial alternatives and to provide a basis for creating an order of magnitude cost estimate for alternative comparison.

TABLE 4
Estimated Volumes of PRG Exceedences
Hart Creosoting Company - Jasper, Texas

Contaminated Area	Contaminated Media	Area Size (SF)	Average Thickness (ft)	Volume (CY)
Waste Cell	Disposed Waste	125,000	14	65,000
Non-Process Area	Surface Soil	30,000	2	2,200
Former Process Area	Subsurface Soil	64,000	8	19,000
Pond D/E	Sediment/Soil	14,000	2	1,000
Un-named Tributary	Sediment/Soil	25,000[a]	3	2,800
Subtotal Soil/Sediment PRG Exceedence Volume (CY):				**90,000**
Pond D/E	Surface Water	14,000	8	838,000
Un-named Tributary	Surface Water	6,000[b]	1	45,000
Subtotal Surface Water Volume (GAL)				**883,000**

Notes:
a. Assume the average width of the contaminated sediment/soil to be excavated is 10 feet.
b. Assume the average width of surface water is 3 feet.

Soil PRG Exceedences

The volume of the contaminated soil with COC concentrations exceeding soil PRGs were estimated based on the soil analytical results and soil boring data collected during the RI and EE/CA. Comparing the analytical results with the field observations indicates that soil PRG exceedences are typically associated with heavy phase (saturated or near saturated) creosote occurrences.

Evaluation of the surface soil data collected from the Site indicates that there are two surface soil PRG exceedence areas, one area is located adjacent to the process area at sampling location UA-SO-2-1, and the other area is located east of the process area at sampling location UA-SO-3-4. The surface soil data were also compared with the TCEQ protective concentration levels (PCLs) for residential land use to determine the additional areas that require remediation to account for possible future use of the non-process area as a soccer venue. In addition to the two surface soil PRG exceedences, two residential PCL exceedences (UA-SO-2-2 and UA-SO-3-5) were also identified at the locations adjacent to the surface soil PRG exceedences. These residential PCL exceedences are considered as portion of the surface soil PRG exceedences that require remediation. Thus, the estimated surface soil PRG exceedence volume is approximately 2,200 cubic yards (CY).

Although no surface soil samples were collected from the former process area, it appears that the contaminated surface soil at the former process area was removed and the area was backfilled with clean soil during the EPA removal action in 1995. The thickness of the backfill material is unknown and could not be determined by the soil boring logs; however, as a conservative consideration, it is estimated that the subsurface soil PRG exceedences are from approximately 2 feet below ground surface to the ground water level. The average thickness of the soil PRG exceedences is approximately 8 ft. The estimated subsurface soil PRG exceedence volume is approximately 19,000 CY.

According to the data collected during the EE/CA and RI, the waste (contaminated soil) disposed in the WC contains COCs at concentrations exceeding the soil PRGs. The volume of the contaminated soil in the WC, as estimated in the EE/CA, is approximately 65,000 CY.

Sediment PRG Exceedences

The volume of contaminated sediment/soil with COC concentrations exceeding the sediment PRGs in Pond D/E and the un-named tributary was estimated based on the past site operation practice, field observations, and the sediment data collected during the RI and EE/CA. Pond D/E measures approximately 0.31 acres (or 13,400 square feet). According to the field observation and sediment samples collected from Pond D/E, the average sediment thickness in

Pond D/E is approximately 1 foot. Considering the high COC concentrations detected in the Pond D/E sediment samples, the underneath soil may have been contaminated by the COCs. Assuming the thickness of the underneath soil containing COCs at concentrations exceeding the soil to ground water PRGs is 1 foot, the average thickness of sediment/soil PRG exceedences would be approximately 2 feet.

Based on past site operational practices and similar site experience, it is likely that the discharge of process waste water into the un-named tributary, during facility operation, has resulted in accumulation of residual creosote within the tributary channel. This material represents a source of dissolved phase contaminants for surface water flow and a potential Zone P-2 ground water contaminant source through surface water infiltration. It is reasonable to assume that vadose zone soil underneath the contaminated sediment also contains COCs at concentrations exceeding the soil to ground water PRGs. According to the survey data collected along the un-named tributary, the tributary bottom elevations are approximately 2 to 3 feet above the respective ground water levels, and the width of the tributary is between 5 to 10 feet. Although the horizontal extent of the COCs have not been fully delineated, the following assumptions are made, based on the field observations and soil analytical results, to determine the volume of the sediment/soil PRG exceedences in the un-named tributary:

- The total map-scale length of the un-named tributary channel associated with the sediment/soil PRG exceedences is about 2,000 feet. However, the channel follows a very tortuous path. Therefore, a contingency factor of 1.25, which increases the channel length to 2500 feet, has been incorporated into the volume estimate.
- The average width of the drainage ditch associated with the sediment/soil PRG exceedences is approximately 10 feet.
- The average thickness of the sediment/soil PRG exceedences in the vadose zone is approximately 3 feet.

The estimated total sediment/soil PRG exceedence volume in Pond D/E and the un-named tributary is approximately 3,800 CY.

<u>Ground Water PRG Exceedences</u>

Ground water PRG exceedences were observed during the RI at 6 monitor wells locations within and down-gradient of the former process area. The six locations include wells MW-11A/B, MW-12A/B, MW-13A/B, MW-14A/B, MW-17 and MW-18 with the highest COC concentrations detected in the samples collected from MW-12A and MW-13A.

The ground water PRG exceedence area was estimated based on the ground water modeling results. The probable PRG exceedence boundary within Zone P-2 is estimated at 13 acres. This area could increase if future design investigation work reveals PRG exceedences beyond the potential PRG exceedence area. The volume of Zone P-2 ground water contained within the potential PRG exceedence area is estimated at 185 million gallons. The depths at which Zone P-2 ground water PRG exceedences occur is expected to vary between 10 and 95 feet below ground surface, with an average Zone P2 thickness of 45 feet.

Free phase NAPL was observed in well MW-12B at a thickness of 1.5 feet during the SRI sampling events and residual NAPL was encountered during the RI soil boring and sampling in the former Pond A area. The extent of the free phase NAPL was not defined during the RI and SRI and will be defined in the design investigation which will be conducted prior to beginning the remedial action. The estimated area where free phase and residual NAPL may occur in Zone P-2 is 2 acres. The volume of Zone P-2 ground water present within the NAPL source area is estimated at 8 million gallons.

There are two monitor wells screened in Zone P-4; MW-10B and MW17-7. Well MW-10B is located up-gradient of the NAPL source area while MW17-7 is located approximately 400 feet down-gradient. COCs at concentrations above PRG levels have not been detected at these two locations.

Contaminated Surface Water

To facilitate Site remediation, any surface water that contacts sediment and/or soil with PRG exceedences is assumed to be contaminated, and it will be treated, prior to discharge, to meet the surface water PRGs. The quantity of surface water in contact with sediment PRG exceedences in the un-named tributary and Pond D/E is estimated based on the average water thickness observed during the RI surface water sampling event. During the Site remediation, the actual volume of contaminated surface water may be different from what was estimated in the RI/FS report because of the seasonal changes. This estimate is used to provide a basis for creating an order of magnitude cost estimate for remedial alternatives.

DESCRIPTION OF REMEDIAL ALTERNATIVES

STATUTORY REQUIREMENTS/RESPONSE OBJECTIVES

Under its legal authorities, the EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences, including: (1) a requirement that EPA's remedial action, when complete, must comply with all applicable, relevant, and appropriate federal and more stringent state environmental and facility sitting standards, requirements, criteria or limitations, unless a waiver is invoked; (2) a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (3) a preference for remedies in which treatment permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances. Response alternatives were developed to be consistent with these statutory mandates.

REMEDIAL TECHNOLOGY SCREENING

Presumptive remedies are preferred technologies for common categories of sites, based on the EPA's experience and its scientific and engineering evaluation of alternative technologies. The presumptive remedies for wood treater sites provides guidance on selecting remedies for cleaning up soils, sediments, and sludges that are contaminated primarily with creosote, PCP, and/or CCA [see Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites, OSWER Directive 9200.5-162, EPA/540/R-95/128]. The presumptive remedies for wood treater sites with soils, sediments, and sludges contaminated with organic contaminants are; bioremediation, thermal desorption, and incineration. The presumptive remedy for soils, sediments, and sludges contaminated with inorganic contaminants is immobilization. Evaluation of the presumptive remedies excluded bioremediation, thermal desorption, and immobilization from further consideration because:

- Bioremediation is not effective for CPAHs based on the results of the pilot study conducted from September 2002 through January 2003 for the contaminated soil in the WC;
- Incineration is not cost effective for the large amount of contaminated soil/sediment at the Site;
- Immobilization is not an effective treatment technology for the Site COCs (organic contaminants).

In addition to the presumptive remedies, the development of the remedial alternatives for addressing risks to human health from the contaminated soils and sediments also included the use of excavation and onsite containment of soils and sediments and hot spot pump and treat for ground water with offsite disposal of recovered NAPL.

CERCLA and the National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed to address the soil and sediment contamination at the Site. In summary, five remedial alternatives involving differing treatment and engineering control options for the soil/sediment contamination and five remedial alternatives for ground water were selected for detailed analysis.

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the RI/FS report (CH2M HILL, September 2006). The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy or procure contracts for construction. The net present-worth costs associated with the ground water pumping and monitoring requirements are calculated using a discount rate of seven percent and a 30-year time interval.

REMEDIAL ALTERNATIVES FOR CONTAMINATED SOIL AND SEDIMENT

Alternative S-1: No Further Action

Estimated Total Capital Cost: $0
Estimated Total O&M Costs: $0
Estimated Total Periodic Costs: $0
Estimated Total Present Worth: $43K

Regulations governing the Superfund program, 40 CFR § 300.430(e)(6) require that the "no action" alternative be evaluated at every Site to establish a baseline for comparison. Under this alternative, no actions would be taken to prevent exposure to the remaining contaminated soils, sediment, and surface water at the Site. EPA would however conduct 5 year reviews for 30 years.

Alternative S-2: Excavation and Disposal of PRG Exceedences in the Existing Onsite Upgraded Containment Cell (UCC)

Estimated Total Capital Cost: $4,073,000
Estimated Total O&M Cost: $390,000
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $4,506,000
Time Needed to Implement Remedy: 6 months to 1 year

Evaluation of ground water data collected, prior to and after 10 years construction of the WC, from the wells (MW2/2A and MW-10A/10B) located down-gradient of the WC indicates that there is no COC release from the WC into ground water. Therefore, the WC is considered to be protective of ground water and can potentially be used to manage the creosote contaminated soil.

Alternative S-2 would include implementing a drainage ditch to replace the portion of un-named tributary that contains soil/sediment PRG exceedences; removing and treating contaminated surface water in Pond D/E and the un-named tributary; excavating soil and sediment containing COCs exceeding the human health and ecological PRGs in the former process area, the un-named tributary and Pond D/E; expanding the WC to include the Pond D/E and an area northwest of the WC, disposal of excavated soil/sediment PRG exceedences into the expanded area and the top of the WC; upgrading the WC by covering the PRG exceedences disposed in the expanded WC with RCRA Subtitle C landfill cover; backfilling the excavations with clean soil or soil below the PRGs and re-vegetating the backfilled areas; monitoring ground water for the effectiveness of the UCC; and implementing institutional controls (ICs) to prevent potential exposure to the PRG exceedences disposed in the UCC. The main components of this alternative are discussed below.

Surface Water Diversion

Before removal of sediment/soil PRG exceedences from the un-named tributary, a surface water drainage ditch will be installed west of the un-named tributary to divert surface water. To minimize the future transport of COCs remaining at the Site and within the un-named tributary to down-gradient water bodies, the drainage ditch will be designed and constructed to permanently replace the portion of the un-named tributary that contains sediment/soil PRG exceedences.

Surface Water Removal and Treatment

Upon completion of the surface water drainage ditch, the surface water remaining within the footprint of the excavation areas in the un-named tributary and Pond D/E will be removed and treated prior to discharge into the down-gradient water bodies. The contaminated surface water will be filtered to remove suspended solids and then treated using liquid granular activated carbon (GAC) adsorption technology to meet the surface water PRGs prior to discharging into the un-named tributary or Big Walnut Run Creek.

Excavation and Onsite Disposal

The contaminated soil and sediment to be removed will include the surface and subsurface soil PRG exceedences in the former process area, and the sediment/soil PRG exceedences identified in the un-named tributary and Pond D/E. Since there is no evidence of COC release from the waste disposed in the WC, the PRG exceedences in the WC will not be removed under this alternative. The excavated soil and sediment PRG exceedences will be disposed into the onsite UCC. Treatment of soil/sediment exceeding LDRs is not required for this alternative because the remediation will be conducted within the area of contamination (Preamble to the NCP, 55FR 8758-8760, March 8, 1990). However, prior to disposal, treatment of sediment not passing the paint filter test will be required. The treatment will include solidifying the sediment using Portland cement or fly ash.

Expanding and Upgrading the Existing Onsite Waste Cell

Under this alternative, the existing onsite WC will be expanded horizontally to include Pond D/E and the area northwest of the WC and vertically (as necessary) on the top of the WC. After removal of the sediment and soil PRG exceedences from the pond, the designated expansion area will then be excavated to the same depth as the WC and lined with a minimum of 3 feet of clay that has a hydraulic permeability less than 1×10^{-7} cm/s. The trees and uncontaminated soil cover will be removed prior to disposal of soil/sediment PRG exceedences on the top of the WC. The WC will be upgraded, after completion of waste disposal activity, by implementing a final cover that meets the RCRA Subtitle C landfill requirements outlined in 40 CFR Part 264, subpart N. This upgraded final cover will significantly reduce infiltration and thereby, minimizing the leaching of COCs into ground water.

Backfill and Revegetation

The excavated areas will be backfilled with the on-site or off-site soil containing COCs below the soil PRGs. The excavated portion of the un-named tributary will be filled all the way back to ground surface to minimize the future transport of residual COCs into the down-gradient water bodies. An erosion control layer will be installed at the top of the backfill to prevent erosion.

Institutional Controls

Because principal and low level threat waste material will be left onsite, ICs, including access restrictions and land use restrictions, would be required to prevent breaching of the UCC cover and to preclude development of the Site for residential use.

Environmental Monitoring

Following remediation, the condition of the UCC cover will be visually inspected annually as part of the post closure care plan. Ground water monitoring will be necessary to evaluate the effectiveness of the alternative and to predict the potential impacts to human health and the environment. A ground water monitoring program will be included in the ground water remedial alternatives.

Alternative S-3: Excavation and Disposal of PRG Exceedences in an Onsite RCRA Containment Cell (RCC)

Estimated Total Capital Cost: 7,684,000
Estimated Total O&M Cost: $390,000
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $8,117,000
Time Needed to Implement Remedy: 1 year

Alternative S-3 would include implementing a drainage ditch to replace the portion of un-named tributary that contains soil/sediment PRG exceedences; removing and treating contaminated surface water in Pond D/E and the un-named tributary; excavating soil and sediment containing COCs exceeding the human health and ecological PRGs in the WC, former process area, the un-named tributary, and Pond D/E; disposal of excavated soil/sediment into an onsite RCRA Containment Cell (RCC) to be designed to meet RCRA subtitle C landfill requirements; backfilling the excavations with clean soil or soil below the PRGs and re-vegetating the backfilled areas; monitoring ground water for the effectiveness of the RCC; and implementing ICs to prevent potential exposure to the PRG exceedences disposed in the RCC. The main components of this alternative are discussed below.

Surface Water Diversion

This component would be the same as that described in Alternative S-2.

Surface Water Removal and Treatment

This component would be the same as that described in Alternative S-2.

Excavation and Onsite Disposal

The contaminated soil/sediment to be excavated will include the surface and/or subsurface soil PRG exceedences in the WC and the former process area, and the sediment/soil PRG exceedences identified in Pond D/E and the un-named tributary. The excavated soil/sediment will be disposed in an onsite RCC, which will be constructed to meet the RCRA Subtitle C landfill requirements outlined in 40 CFR Part 264, subpart N. Treatment of soil/sediment exceeding LDRs is not required for this alternative because the remediation will be conducted within the area of contamination (Preamble to the NCP, 55FR 8758-8760, March 8, 1990). However, treatment of sediment not passing the paint filter test will be required prior to disposal. The treatment will include solidifying the sediment using Portland cement or fly ash.

Construction of an Onsite RCRA Containment Cell

An onsite RCC, which is designed to meet the RCRA Subtitle C landfill requirements, will be constructed in the area where the WC is located. All the soil/sediment PRG exceedences excavated from the Site will be disposed and managed in the RCC.

Backfill and Revegetation

The excavated areas except the WC area will be backfilled with the on-site or off-site soil containing COCs below the soil/sediment PRGs. The excavated portion of the un-named tributary will be filled all the way back to the ground surface to minimize the future transport of residual COCs into the down-gradient water bodies. An erosion control layer will be installed at the top of the backfill to prevent erosion.

Institutional Controls

This component would be the same as that described in Alternative S-2.

Environmental Monitoring

This component would be the same as that described in Alternative S-2.

Alternative S-4: Excavation, Thermal Desorption and Offsite Disposal
Estimated Total Capital Cost: $50,008,000
Estimated Total O&M Cost: $0
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $50,051,000
Time Needed to Implement Remedy: 2 years

Alternative S-4 would be the same as Alternative S-3 with the exception that the excavated soil/sediment PRG exceedences will be disposed of in an off-site disposal facility. Based on the Site characterization data, it appears that most of the soil/sediment PRG exceedences would exceed Land Disposal Restrictions (LDRs) listed in Table 5 and would require treatment to meet LDRs prior to offsite disposal.

Under this alternative, the excavated soil/sediment exceeding LDRs will be treated with an onsite thermal desorption unit (the majority of thermal desorption services are mobile, onsite units) to meet LDRs. This alternative assumes initial performance testing indicates successful treatment can be achieved. The treated soil/sediment will then be transported and disposed in an offsite RCRA Subtitle C hazardous waste landfill. Concentrated contaminants generated from the thermal desorption process will be transported to an offsite incinerator facility for treatment. It is assumed that the average amount of COCs and other petroleum hydrocarbons to be removed from soil/sediment to meet LDRs is approximately 4,000 mg/kg. The estimated total amount of concentrates to be generated from the thermal desorption process is approximately 530 tons.

Alternative S-5: Excavation, Thermal Desorption, and Reuse
Estimated Total Capital Cost: $24,664,000
Estimated Total O&M Cost: $0

Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $24,707,000
Time Needed to Implement Remedy: 2 years

Alternative S-5 would be the same as Alternative S-4 with the exception that the excavated soil/sediment PRG exceedences will be treated through thermal desorption to meet the PRGs (other than LDRs), and then reused on-site as backfill material (other than offsite disposal).

TABLE 5
Summary of Soil, Sediment PRGs and LDRs
Hart Creosoting Company - Jasper, Texas

COCs	Sediment PRGs (mg/kg)	Soil PRGs (mg/kg)	LDRs (mg/kg)
2,4-Dimethylphenol	--	3.2	140
2-Methylnaphthalene	0.54	25	NA
Cresol, O-	--	7.1	56
Cresols, M- & P-	--	6.0	56
Acenaphthene	1.22	52	34
Acenaphthylene	0.121	--	34
Anthracene	0.57	--	34
Benzo(a)anthracene	1.17	3.0	34
Benzo(a)pyrene	0.789	19	34
Benzo(b)fluoranthene	0.976	6.3	68
Benzo(g,h,i)perylene	0.28	--	18
Benzo(k)fluoranthene	0.833	--	68
Carbazole	--	10.6	NA
Chrysene	2.02	587	34
Dibenz(a,h)anthracene	0.131	0.63	82
Dibenzofuran	0.912	4.3	NA
Fluoranthene	2.9	--	34
Fluorene	1.07	66	34
Indeno(1,2,3-c,d)pyrene	0.304	18	34
Naphthalene	0.1	15.6	56
Phenanthrene	3.4	184	56
Pyrene	1.97	--	82
Benzene	--	0.039	100

NA: Not Applicable or Not Available
--: Not a COC for the contaminated medium

REMEDIAL ALTERNATIVES FOR CONTAMINATED GROUND WATER

Due to the presence of PAHs and free phase and residual NAPL in multi lithology zones, including permeable and less permeable zones (e.g., Zones I-1, P-2, I-3, and possibly P-4), it is technically impracticable to restore ground water quality to meet the drinking water standards within a reasonable time frame. Therefore, a TI waiver to waive the drinking water ARARs (e.g., MCLs or GW-PRGs) will be included as a common component for the ground water alternatives. To ensure continued protection of the public, a technically impracticable zone (TIZ) will be established to identify the area where the TI waiver will be applied and exposure to ground water within and adjacent to the TIZ shall be prevented.

Alternative G-1: No Action
Estimated Total Capital Cost: $0
Estimated Total LTRA Cost: $0
Estimated Total O&M Cost: $0
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $65,000

Regulations governing the superfund program, 40 CFR §300.430(e)(6) require that the "no action" alternative be evaluated at every Site to establish a baseline for comparison. Under this alternative, no further actions will be conducted to prevent exposure to the contaminated ground water at the Site. EPA would however conduct 5 year reviews for 30 years.

Alternative G-2: Institutional Controls and Monitored Natural Attenuation
Estimated Total Capital Cost: $776,000
Estimated Total LTRA Cost: $0
Estimated Total O&M Cost: $1,510,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $2,351,000

Alternative G-2 includes applying a TI waiver for the TIZ, implementing ICs for the designated PMZ to restrict use of ground water within and adjacent to the TIZ, and monitoring ground water to evaluate the effectiveness of the remedy and to verify that the contaminated ground water is managed within the PMZ. The main components of this alternative are discussed below.

TI Waiver

The area over which the TI decision applies, includes all portions of the onsite contaminated ground water that do not meet the required ground water cleanup levels (MCLs or GW-PRGs) for Site COCs, and is referred to as a TIZ for the Site. The Site TIZ, which measures approximately 13 acres, is defined area wide as the zone of ground water containing naphthalene at concentrations greater than the PRG (100 µg/L) as determined by the ground water modeling results. The TIZ is defined depth-wise as the ground water found in the Zones P-2 and P-4 from about 10 to 200 feet below ground surface (bgs). The final TIZ boundary will be modified after completion of the pre-design investigation as proposed in the RI/FS Report.

Institutional Controls

A PMZ will be established to include the TIZ and the area adjacent to the TIZ to assure that future ground water pumping does not mobilize contaminants beyond the TIZ. ICs, potentially including governmental ordinances, deed notices and restrictive covenants, will be implemented for the PMZ to prevent the potential exposure to ground water within the TIZ. The ICs will eliminate the potential exposure pathway by preventing construction of water supply wells within the PMZ.

Monitored Natural Attenuation

A long-term ground water monitoring program will be implemented upon completion of the soil/ sediment remediation to evaluate the effectiveness of the selected soil/sediment remedy and the effectiveness of MNA and to verify that the contaminant ground water is managed within the PMZ.

Alternative G-3: Institutional Controls and NAPL Removal
Estimated Total Capital Cost: $1,926,000
Estimated Total LTRA Cost: $2,822,000
Estimated Total O&M Cost: $497,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $5,310,000

Alternative G-3 is identical to G-2 with the addition of a Zone P-2 NAPL recovery or hot-spot extraction system as discussed below.

NAPL Removal

Under this alternative, free-phase and residual NAPL identified at the former Pond A area will be removed, through vertical extraction wells, to the extent practicable. Vertical extraction wells will be installed along the down-gradient boundary of the NAPL source area to pump NAPL from Zone P-2. Since ground water will be co-extracted with NAPL, an oil removal system will be used to separate the NAPL from ground water. Recovered NAPL will be transported to an offsite facility for incineration. Partially treated ground water will be injected using vertical wells at a location up-gradient of the NAPL recovery wells to promote flushing of the residual NAPL.

Alternative G-4: NAPL Removal and Plume Containment
Estimated Total Capital Cost: $2,543,000
Estimated Total LTRA Cost: $4,339,000

Estimated Total O&M Cost: $1,272,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $8,219,000

Alternative G-4 is the same as alternative G-3 with the addition of a hydraulic containment system, as described below, to prevent plume expansion if future investigation work determines that the plume is expanding or the discharge of the contaminated ground water will potentially impact the quality of surface water in Big Walnut Run Creek.

Hydraulic Containment System

Under this alternative, vertical ground water recovery wells will be installed within the ground water PRG exceedence area to hydraulically contain COCs to prevent plume expansion or to protect the Big Walnut Run Creek surface water. Recovered ground water will be treated through GAC adsorption process to reduce COC concentrations to below the surface water PRGs and the treated water discharged to the un-named tributary.

Alternative G-5: NAPL Removal, Plume Containment and Enhanced In-Situ Bio-treatment
Estimated Total Capital Cost: $2,745,000
Estimated Total LTRA Cost: $4,956,000
Estimated Total O&M Cost: $1,272,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $9,038,000

Alternative G-5 is identical to G-4 except that treated ground water from the NAPL recovery system will be amended with oxygen and nutrients prior to re-injection to stimulate biodegradation and promote a higher level of cleanup within the NAPL source area.

COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a soil/sediment and ground water remedy. The nine evaluation criteria are (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume of contaminants through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) State/support agency acceptance; and (9) community acceptance. This section of the ROD profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall Protection Of Human Health and the Environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Soil and Sediment Alternatives

All the soil/sediment alternatives, with the exception of S-1, are protective of human health and the environment. Alternatives S-4 and S-5 will be protective of human health and the environment by removing affected soil/sediment posing unacceptable and potential risk based on defined exposure pathways, and treating the excavated soil/sediment to meet either LDRs for offsite disposal or PRGs for onsite reuse as backfill material. Alternatives S-2 and S-3 would also provide adequate protection from exposure; however, perpetual maintenance of the UCC/RCC, ICs, and a ground water monitoring program would be required to ensure long-term protectiveness. Alternatives S-2 through S-5 are equally protective of human health and the environment in terms of meeting the RAOs and site-specific PRGs for the contaminated soil/sediment. All four alternatives would prevent inhalation, ingestion, or direct contact with human carcinogens in excess of established risk levels. As compared with the other three alternatives, Alternative S-2 would have less protection for ground water because the UCC doesn't have a leachate collection system and the long-term effectiveness of the existing clay liner in the UCC is uncertain.

Protection of human health and the environment is not provided by Alternative S-1. Levels of contaminants and existing unacceptable risks to human health and the environment would remain unchanged. The RAOs would not be achieved since contaminants exceeding PRGs would be left onsite with no protective barriers or controls.

Ground Water Alternatives

The primary risk associated with contaminated ground water at the Site is the potential for future exposure in the event ground water were used as a drinking water source. Under current site conditions there is no known exposure to contaminated ground water.

All the alternatives, with the exception of G-1, are protective of human health, in that institutional controls will prevent exposure to ground water within the PMZ. However, if institutional controls are not implemented, there would be unacceptable risk associated with construction of new drinking water wells and consumption of contaminated ground water until such time as natural attenuation and/or other remedial actions reduce ground water COCs to below PRGs. The length of time for which the risk is unacceptable varies among the alternatives. The risk would decrease most quickly under Alternatives G-3 through G-5, and very slowly under Alternative G-2 because NAPL source material will be left in place allowing long-term contaminant release into ground water.

If the ground water plume is stable, all three alternatives (G-3, G-4, and G-5) would have the same overall protection to human health and the environment. If the ground water plume is not stable, only Alternatives G-4 and G-5 would achieve the ground water RAO of preventing plume expansion (or protection of environment) following remedy implementation. By limiting COC migration, Alternatives G-4 and G-5 prevent further degradation of the down-gradient ground water and/or surface water and thus protect the environment. Alternative G-3 would achieve RAOs relative to preventing plume expansion and protecting surface water much quicker than Alternatives G-1 and G-2 because removal of NAPL from the saturated zone would accelerate plume stabilization. Alternative G-1 and G-2 would not achieve the ground water RAO of preventing plume expansion and protecting surface water in the near term, although it is likely that contaminated soil removal and natural attenuation would result in plume stabilization in the long-term.

COMPLIANCE WITH ARARS

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and NCP § 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4), 42 U.S.C. § 9621(d)(4).

ARARs are divided into chemical-specific, action-specific, and location-specific categories. Chemical-specific requirements include promulgated health- or risk-based standards, numerical values, or methodologies that, when applied to site-specific conditions, establish the acceptable amount or concentration of a contaminant that may be detected or discharged in the environment. Action-specific requirements include technology or activity based requirements or limitations on actions taken with respect to hazardous substances, pollutants, and contaminants. There were no location-specific ARARs pertinent to the HCC Site.

Soil and Sediment Alternatives

Alternatives S-2 through S-5 have common ARARs associated with the excavation and removal portion of the remedy. Onsite air emissions from the thermal desorption activities would require consideration for Alternatives S-4 and S-5, while landfill construction requirements would be applicable to Alternatives S-2 and S-3. Alternative S-4 will attain its respective Federal and State ARARs including LDRs. Meeting LDRs is not required for Alternatives S-2 and S-3 because remediation will be conducted within the area of contamination, and therefore, LDRs are not triggered (Preamble to the NCP, 55FR 8758-8760, March 8, 1990). Alternative S-2 will not comply with the action specific ARAR because the existing clay bottom and slope liner in the UCC do not meet the RCRA Subtitle C landfill design requirements. The other three alternatives can be designed and implemented to achieve the contaminant specific and action specific ARARs.

Alternative S-1 will not comply with the ARARs because the contaminated soil/sediment contains PRG exceedences that are left onsite without protective barriers or controls to protect human health and the environment.

<u>Ground Water Alternatives</u>

MCLs and ground water PRGs are ARARs for the contaminated ground water at the Site. Based on the subsurface geologic conditions, the presence of free phase and residual NAPL, and the physical-chemical properties of the ground water COCs (primarily PAHs), EPA believes that it is technically impractical to restore ground water quality at the Site to meet ARARs. Consequently, EPA is proposing a technical impracticability (TI) waiver (see 40 CFR 330.430[f][l][ii][C] and EPA, 1996b). To ensure continued protection of public, EPA will make arrangements with the State, the City of Jasper and the Southeast Texas Ground Water Conservation District to restrict construction of new water supply wells within the PMZ. EPA will also negotiate and implement ICs, potentially through a governmental ordinance, an enforceable Restrictive Covenant or a Deed Notice with both onsite and offsite property owners to restrict access to this potential exposure pathway. The TIZ and the proposed TI Waiver are included in the common elements that are a part of Alternatives G-2 through G-5. This means that none of the remedial alternatives proposed in the FS would achieve the contaminant specific ARARs for ground water within the TIZ. Alternatives G-2 and G-5 will not require an ARAR waiver for re-injection of partially treated ground water co-extracted during NAPL removal because this action is allowable under RCRA section 3020 (b) (EPA Memorandum, December 27, 2000). Re-injection promotes a higher level of treatment throughout the NAPL source zone by flushing residual (immobile) NAPL to the recovery wells for removal.

NAPL removal in Alternatives G-3 through G-5 would require RCRA-hazardous-waste-contaminated NAPL accumulation in containers for periods of more than 90 days. Consequently, RCRA container-labeling and storage requirements would be met as ARARs. In addition, RCRA treatment, storage and disposal requirements would be met by transporting manifested NAPL to a RCRA-compliant treatment, storage, and disposal (TSD) facility.

Alternatives G-4 and G-5 are expected to comply with the ARARs related to treating contaminated ground water pumped from the containment system prior to discharge. Contaminated ground water would be treated to meet the surface water PRGs prior to discharging into the un-named tributary or Big Walnut Run Creek. The treatment system would be designed such that air emissions meet concentration and volume limits for discharge of COCs under the State exemption for remediation.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term Effectiveness and Permanence refers to expected residual risk and the ability to maintain reliable protection of human health over time, once cleanup levels have been met.

Soil and Sediment Alternatives

Alternatives S-2 through S-5 would achieve long-term effectiveness and permanence by eliminating potential future exposure (Alternatives S-2 and S-3) or reducing COC concentrations to LDRs or PRGs (Alternatives S-4 and S-5). There is a slight increase of long-term effectiveness and permanence in Alternatives S-2 to S-5. Some uncertainty in reliability for Alternative S-4 results from long-term containment of soil/sediment in the offsite disposal facility. However, this would be minimized by choosing a facility that is approved to take contaminated soil treated to LDRs. The onsite UCC and RCC for Alternatives S-2 and S-3 would require perpetual maintenance, ground water monitoring, and institutional controls to ensure long-term effectiveness. Alternative S-2 would have less long-term effectiveness because the existing clay liner in the UCC may not be sufficient in protection of the underlying ground water. Alternative S-1 provides no long-term effectiveness or permanence.

Ground Water Alternatives

Alternatives G-4 and G-5 provide the highest long-term effectiveness and permanence because the source (NAPL) removal coupled with the plume containment system would immediately achieve the RAO of preventing plume expansion and eventually reduce ground water COC concentrations to MCLs or PRGs. Alternative G-5 offers better long-term effectiveness and permanence than Alternative G-4 as the enhanced in-situ bioremediation in Alternative G-5 is more effective in reducing COC concentrations within the NAPL source zone than the water flushing proposed in Alternative G-4. It is anticipated that Alternatives G-4 and G-5 would take more than 30 years to achieve MCLs or PRGs because of uncertainties associated with complete NAPL removal.

Alternatives G-2 and G-3 would achieve long-term effectiveness and permanence by eliminating potential future exposure; however, they would not be effective in achieving the RAO of preventing plume expansion and/or protecting surface water in Big Walnut Run Creek if the plume is not stable and/or the COCs are migrating into the Big Walnut Run Creek at the concentrations exceeding the surface water PRGs. Alternative G-3 would achieve the RAO of preventing plume expansion and protecting surface water much quicker than Alternative G-2 as removal of NAPL would reduce COC concentrations and accelerate plume stabilization. Alternative G-1 does not provide long-term effectiveness and permanence.

REDUCTION OF TMV THROUGH TREATMENT

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Soil and Sediment Alternatives

Alternative S-5 offers the best reduction in TMV. Approximately 90,000 CY of soil/sediment exceeding the PRGs will be removed and treated with thermal desorption to meet PRGs for onsite reuse as backfill material. An estimated amount of organic contaminants to be removed from the contaminated soil/sediment is approximately 675 tons.

Alternative S-4 offers the next best reduction in TMV by treating excavated soil/sediment above LDRs and disposing of soil/sediment above PRGs in an offsite RCRA Subtitle C landfill. It is estimated that a total of 87,800 CY soil/sediment will require treatment to meet LDRs prior to disposal and the amount of organic contaminants to be removed from the thermal desorption process is approximately 525 tons.

Alternatives S-2 and S-3 would provide a reduction in mobility by placing the soil/sediment PRG exceedences in a secure disposal cell. However, they would not result in reduction of toxicity or volume because no treatment would be performed prior to placement in the onsite UCC or RCC. Alternative S-3 offers better reduction in mobility than Alternative S-2 as the multi-layer liners on the bottom of the RCC is anticipated to have lower permeability and higher protection than the clay liner on the bottom of the UCC.

Alternative S-1 does not offer any TMV reduction.

Ground Water Alternatives

Alternatives G-1 and G-2 do not include active treatment to reduce the toxicity, mobility, or volume of contaminated ground water. The COCs in the plume would attenuate naturally over time. However, the rate of natural attenuation is not known and site specific data would be required for an accurate determination of the natural attenuation rate.

Alternatives G-3 through G-5 include NAPL removal and treatment to reduce the toxicity, mobility, and volume of NAPL in the saturated zone with treatment performed at an offsite incinerator facility. Alternatives G-3 and G-4 will provide an equivalent amount of NAPL source zone TMV reduction, whereas Alternative G-5 will provide a higher degree of TMV reduction through in-situ biodegradation.

Alternatives G-4 and G-5 would provide better TMV reduction for the dissolved phase contaminant plume than Alternative G-3 because contaminated ground water extracted from the plume containment wells would be treated using GAC prior to discharge into Big Walnut Run Creek. In addition, Alternative G-5 would also include the use of Organo Clay/Carbon® to decrease COC concentrations further in ground water co-extracted with NAPL prior to re-injecting ground water amended with hydrogen peroxide and nutrients to promote a higher level of treatment within the NAPL source zone.

SHORT-TERM EFFECTIVENESS

Short-term Effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during implementation.

Soil and Sediment Alternatives

Short-term risks originate from the construction required to implement the alternatives. Alternative S-1 has no short-term impacts because it does not involve remedial construction. There would be potential risks to construction workers during excavation of contaminated soil/sediment in Alternatives S-2 through S-5. These risks are primarily associated with equipment movement and exposure to contaminated soil and dust. However, engineering controls would be implemented to control the potential for exposure, and workers would be required to wear the appropriate level of protection to avoid exposure during excavation and treatment activities.

Alternative S-2 would provide the lowest short-term risks as compared with the other alternatives because this alternative does not require excavation and management/treatment of a large amount of contaminated soil (65,000 CY) in the WC. Alternative S-3 would present short-term risk to the nearby residents and onsite workers with the additional activity associated with excavation of the WC, staging of contaminated soil/sediment, and construction of the RCC. Both Alternatives S-4 and S-5 present short-term risks to the nearby residents and onsite workers due to the increased handling required for feed preparation, and additional emissions from the onsite thermal desorption process. Performance testing would be required for Alternatives S-4 and S-5 to ensure the LDRs or PRGs can be achieved via thermal desorption. Alternative S-4 would also present additional short-term risk to the nearby residents because it will require offsite transport of treatment residuals. All the short-term impacts can be managed with proper safety and engineering control.

During the remedial action, short term, health related risks will be minimized through air monitoring and use of emission control techniques. Short term noise impacts and safety related risks to the residents can be lessened by minimizing haul routes through residential areas.

The short-term effectiveness with respect to the time until the RAOs are achieved is shortest for S-2 because it does not include excavation and disposal/treatment of contaminated soil in the WC. The next shortest time is S-3. The slowest are S-4 and S-5, which would take a minimum of 1 year for preparation and treatment of contaminated soil/sediment. All the remedial alternatives would be completed within two years.

Ground Water Alternatives

Significant effects on workers, the community, or the environment during remedy implementation are not expected for any of the five alternatives.

Assuming the plume is not stable, Alternatives G-4 and G-5 would require the shortest time to achieve ground water RAOs because the two alternatives use containment wells to prevent plume expansion and to eliminate the migration of COCs from ground water to surface water. Since NAPL removal and institutional controls would not immediately eliminate the plume expansion, Alternative G-3 would require longer period than Alternatives G-4 and G-5 to achieve the RAO for preventing plume expansion and protecting the down-gradient surface water.

Alternatives G-1 and G-2 would have the lowest short-term effectiveness because they rely solely on natural attenuation and thus require longer period to achieve the RAO for preventing plume expansion and protecting the down-gradient surface water.

IMPLEMENTABILITY

Implementability considers the technical and administrative feasibility of a remedy such as relative availability of goods and services and coordination with other governmental entities.

Soil and Sediment Alternatives

No administrative coordination of labor, equipment, materials, or laboratory services are required for Alternative S-1. Alternative S-2 provides the most straightforward implementation action since excavation and management of contaminated soil in the WC are not required during the remedy implementation. Alternative S-3 through S-5 would be more difficult to implement than S-2 because of the uncertainties associated with excavation, management, and treatment of contaminated soil in the WC.

Alternative S-2 would require expanding and upgrading the existing WC. Equipment, material, and labor necessary to expand and upgrade the WC are conventional and available. Difficulties may be encountered during construction of the UCC depending on the conditions of the WC and subsurface soil. Long-term maintenance of the UCC and ICs would be required to prevent breaching of the UCC cover and to maintain the future industrial or commercial land use. In addition, pre-approval from EPA and TCEQ will be required because the UCC does not meet the bottom and slope liner design requirements specified in 40 CFR 364.301.

Alternative S-3 would require construction of a new onsite RCC. Equipment, material, and labor necessary to construct the onsite RCC are conventional and available. Because a large amount of contaminated soil will be removed for construction of the RCC, onsite areas available for staging of the contaminated soil may be limited. Long-term maintenance of the RCC and ICs would be required to prevent breaching of the RCC cover and to maintain the future industrial or commercial land use.

For Alternatives S-4 and S-5, the technology required to perform thermal desorption is widely used and proven. Through-put rates generally run between 30 to 40 tons per hour, and these units can be run 24 hours per day. However, thermal desorbers are typically run at temperatures near 800 °F to a maximum of about 1,000 °F. Several PAH constituents at the Site have boiling points near 1,000 °F (i.e., indeno (1,2,3-cd) pyrene = 997 °F, benzo (a,h) anthracene = 975 °F, and benzo (a) pyrene = 923 °F), and while it is possible to run the units near 1,000 °F, increasing the temperature will increase cost. In addition to the temperature, site-specific parameters such as percent moisture, BTU content, soil type, and contaminant levels will affect treatment effectiveness and cost. Although similar sites with similar contaminants and conditions have been successfully remediated via thermal desorption, complete destruction of the Site COCs cannot be guaranteed prior to performance of a treatability study. The amount of space available for operation of the thermal desorption treatment unit and supporting structures (i.e., treated soil pad, trailers, etc.) could also affect the feasibility of thermal treatment. Alternative S-5 would be more difficult to implement than Alternative S-4 because more stringent treatment standards (e.g., PRGs instead of LDRs) are required.

Ground Water Alternatives

All alternatives are readily implemented. There are no technical issues associated with implementation of Alternatives G-1 and G-2. Alternatives G-3 through G-5 all involve technologies, services, and material that are readily available. Alternative G-5 would present the most challenges in terms of implementability due to the uncertainty associated with optimizing peroxide and nutrient concentrations to ensure NAPL biodegradation within the source area.

ICs are required to maintain the permanence and effectiveness of Alternatives G-2 through G-5. The mechanism to implement the ICs would potentially be through a governmental ordinance and an enforceable Restrictive Covenant or Deed Notice with both onsite and offsite property owners. Administrative problems affecting implementation of the ICs are not anticipated. Permanence and effectiveness will also be achieved through PMZ registration with the Texas Department of Licensing and Regulation (TDLR), and with the Southeast Texas Ground Water Conservation District (Jasper/Newton County). The TDLR and Southeast Texas Ground Water Conservation District can delineate a restricted drilling area. Drillers must first contact the TDLR's Water Well Driller/Pump Installer Section prior to drilling any new water wells within the outlined restricted drilling area.

COST

Cost encompasses all engineering, construction, and operation and maintenance (O&M) costs incurred over the life of the project. Total present worth cost is the total cost of an alternative over time in terms of today’s dollar value. The total present worth cost is broken into total capital, long-term response action (LTRA), O&M, and periodic cost. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Soil and Sediment Alternatives

The estimated costs for each of the remedial alternatives developed for the contaminated soil/sediment are summarized in Table 6. The table breaks down the estimated capital cost, total O&M cost, total periodic cost, and net present value for a period of 30 years.

Alternative S-1 is estimated to be $43K (net present value) based on zero total capital cost, zero total O&M cost, and $43K total periodic cost. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the lowest cost alternative.

Alternative S-2 is estimated to be $4,506K (net present value) based on $4,073K total capital cost, $390K total O&M cost, and $43K total periodic cost. The total O&M cost includes annual inspection and maintenance of the UCC for a period of 30 years. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the second lowest cost alternative.

Alternative S-3 is estimated to be $8,117K (net present value) based on $7,684K total capital cost, $390K total O&M cost, and $43K total periodic cost. The total O&M cost includes annual inspection and maintenance of the RCC for a period of 30 years. The periodic cost includes completion of five-year reviews for a period of 30 years. This is the third lowest cost alternative.

Alternative S-4 is estimated to be $50,051K (net present value) based on $50,008K total capital cost, $0 total O&M cost, and $43K total periodic cost. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the highest cost alternative.

Alternative S-5 is estimated to be $24,707K (net present value) based on $24,664K total capital cost, $0 total O&M cost, and $43K total periodic cost. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the second highest cost alternative.

The cost of Alternative S-4 is significantly higher than the other alternatives. The highest cost associated with Alternative S-4 is due to the high treatment rate caused by use of the thermal desorption treatment process and the high transportation and disposal rate associated with long distance transport and offsite disposal of the treated materials. Alternative S-5 is much less expensive than Alternative S-4; however, the cost is based on the assumption that the contaminated soil/sediment can be treated to meet the PRGs. Alternative S-3 has a lower cost than Alternatives S-4 and S-5 because treatment is not required for onsite disposal of excavated material. Alternative S-2 is less expensive than Alternative S-3 because excavation and disposal of the contaminated soil in the WC will not be necessary under Alternative S-2. Alternative S-1 is the least expensive alternative.

The cost estimates presented above have been developed strictly for comparing the five soil/sediment remedial alternatives. The final costs and resulting feasibility will depend on actual labor and material costs, market conditions, actual site conditions, final project scope, implementation schedule, the firm selected for final engineering design, and other variables. The cost estimates have an intended accuracy range of +50 percent to -30 percent.

Ground Water Alternatives

The estimated costs for each of the remedial alternatives developed for the contaminated ground water are also summarized in Table 6. The table breaks down the estimated capital cost, total LTRA cost, total O&M cost, total periodic cost, and net present value for a period of 30 years.

Alternative G-1 is estimated to be $65K (net present value) based on zero total capital cost, zero total LTRA cost, zero total O&M cost, and $65K total periodic cost. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the lowest cost alternative.

Alternative G-2 is estimated to be $2,351K (net present value) based on $776K total capital cost, zero total LTRA cost, $1,510K total O&M cost, and $65K total periodic cost. The total O&M cost include ground water quality and natural attenuation monitoring for the PMZ for 30 years. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the second lowest cost alternative.

Alternative G-3 is estimated to be $5,310K (net present value) based on $1,926K total capital cost, $2,822K total LTRA cost, $497K total O&M cost, and $65K total periodic cost. The total LTRA cost includes operating the NAPL recovery/ground water injection system for 10 years. The O&M cost consist of ground water quality monitoring for the PMZ after completion of LTRA. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the third lowest cost alternative.

Alternative G-4 is estimated to be $8,219K (net present value) based on $2,543K total capital cost, $4,339K total LTRA cost, $1,272K total O&M cost, and $65K total periodic cost. The total LTRA cost includes operating the NAPL recovery/ground water injection system and the ground water containment /treatment system for 10 years. The total O&M cost consist of operating the ground water containment /treatment system and monitoring ground water quality for the PMZ after completion of LTRA. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the second highest cost alternative.

Alternative G-5 is estimated to be $9,038K (net present value) based on $2,745K total capital cost, $4,956K total LTRA cost, $1,272K total O&M cost, and $65K total periodic cost. The total LTRA cost includes operating the NAPL recovery/in-situ enhanced ground water treatment system and the ground water containment/treatment system for 10 years. The total O&M cost consists of operating of the ground water containment/treatment system and monitoring ground water quality for the PMZ after completion of LTRA. The total periodic cost includes completion of five-year reviews for a period of 30 years. This is the highest cost alternative.

TABLE 6
Summary of Alternative Costs
Hart Creosoting Company - Jasper, Texas

Remedial Alternative	Total Capital Cost	Total LTRA Cost	Total O&M Cost	Total Periodic Cost	Total Present Worth
Soil/Sediment					
S-1	$0	N/A	$0	$43,000	$43,000
S-2	$4,073,000	N/A	$390,000	$43,000	$4,506,000
S-3	$7,684,000	N/A	$390,000	$43,000	$8,117,000
S-4	$50,008,000	N/A	$0	$43,000	$50,051,000
S-5	$24,664,000	N/A	$0	$43,000	$24,707,000
Ground Water					
G-1	$0	N/A	$0	$65,000	$65,000
G-2	$776,000	N/A	$1,510,000	$65,000	$2,351,000
G-3	$1,926,000	$2,822,000	$497,000	$65,000	$5,310,000
G-4	$2,543,000	$4,339,000	$1,272,000	$65,000	$8,219,000
G-5	$2,745,000	$4,956,000	$1,272,000	$65,000	$9,038,000

Notes:
N/A: Not applicable.

The costs associated with Alternatives G-2 and G-3 are significantly lower than Alternatives G-4 and G-5. The higher costs associated with Alternatives G-4 and G-5 are due to the long-term operation of the ground water containment and treatment system. Alternative G-1 is the least expensive alternative.

The cost estimates presented above have been developed strictly for comparing the five remedial alternatives. The final costs and the resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, the implementation schedule, the firm selected for final engineering design, and other variables. The cost estimates have an intended accuracy range of +50 percent to -30 percent.

STATE AGENCY ACCEPTANCE

State Agency Acceptance considers whether the State agrees with U.S. EPA's analyses in the FS Report and Preferred Remedy in the Proposed Plan.

The State of Texas, through the Texas Commission on Environmental Quality, supports Alternative S-3 and G-3 (see Appendix A).

COMMUNITY ACCEPTANCE

Community Acceptance considers whether the local community agrees with U.S. EPA's analyses and preferred alternative described in the Proposed Plan.

The community provided comments on the proposed remedy components and offered suggestions on improving the future redevelopment of the property. The EPA has considered these comments before making a final remedy selection. The EPA's responses to comments are included in the Responsiveness Summary.

PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials that are highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The source materials include liquids and other highly mobile materials (e.g., oils or solvents) or materials having high concentrations of toxic compounds. Non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

The Site investigation identified liquids or semi-liquid wastes (free phase and residual NAPL in the saturated zone) that would appear to be a highly mobile source material. Also, the risk evaluation identified wastes that are highly toxic to human health under the industrial/commercial exposure scenario. Therefore, EPA has determined the NAPL in the saturated zone to be a principal threat waste based on the overall risk posed by the contamination and the high mobility of the contaminants in the soil, sediment and ground water. The contaminated soil and sediment in the WC, the un-named tributary, and Pond D/E are considered non-principal threat waste.

SELECTED REMEDY

The selected remedy for soil and sediment at the Site is Alternative S-3: “Excavation and Disposal of PRG Exceedences in an Onsite RCRA Containment Cell”.

The selected remedy for ground water at the Site is Alternative G-3: “Institutional Controls and NAPL Removal” (primary) or G-4: “NAPL Removal and Plume Containment” (secondary, as necessary) for ground water. These alternatives will provide the maximum practical treatment of the soils, sediments, and ground water and avoid longer treatment times and unnecessary waste handling.

Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, EPA and the State of Texas believe that the selected remedy will achieve this goal.

SUMMARY OF THE RATIONALE FOR THE SELECTED REMEDY

The vacant land at the Site poses a potential threat to human health at the present time and in the future if the property is redeveloped as a commercial/industrial facility according to the City of Jasper. The selected remedy constitutes a site-wide cleanup strategy and is intended to address fully the threats to human health and the environment posed by the conditions at this Site.

Consolidation of the contaminated soil and sediment in RCRA Subtitle C landfill, with maintenance and institutional controls to ensure long-term effectiveness, will provide adequate protection from exposure. Removal of NAPL from the ground water, to the extent practicable, and offsite treatment will reduce contaminant concentrations and accelerate plume stabilization. Also, if the ground water plume is found to be unstable then a hydraulic containment system would be included, in addition to NAPL removal and treatment, to minimize plume expansion and prevent contaminant migration from ground water to surface water. Institutional controls will be implemented to prevent construction of water supply wells and exposure to contaminated ground water.

Because PAH contaminated soil, sediment, surface water, and ground water are considered both principal threat waste and low-level threat waste, the preferred alternative satisfies the statutory mandate for permanence and treatment to the maximum extent practicable. However, the existing soil, sediment, surface water, and ground water contamination does not pose a current or near-term threat to the surrounding residents or users of Big Walnut Run Creek.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy will achieve the remedial action objectives of:

- Prevent human exposure, based on industrial and construction worker scenarios, through dermal contact, ingestion, or inhalation, to soil, sediment and ground water containing COCs above risk-based standards;
- Prevent or minimize potential leaching of COCs from contaminated soil/sediment in the vadose zone to ground water; and
- Prevent plume expansion and migration of ground water COCs into the down-gradient surface water body and resulting in exceedence of surface water PRGs.

The Selected Remedy consists of remedies for contaminated soil/sediment and for contaminated ground water.

Selected Remedy for Contaminated Soil/Sediment

The selected remedy for contaminated soil/sediment would include implementing a drainage ditch to replace the portion of un-named tributary that contains soil/sediment PRG exceedences; removing and treating contaminated surface water in Pond D/E and the un-named tributary; excavating soil and sediment containing COCs exceeding the human health and ecological PRGs in the WC, former process area, the un-named tributary, and Pond D/E; disposal of excavated soil/sediment into an onsite RCRA Containment Cell (RCC) to be designed to meet RCRA subtitle C landfill requirements; backfilling the excavations with clean soil or soil below the PRGs and re-vegetating the backfilled areas; monitoring ground water for the effectiveness of the RCC; and implementing ICs to prevent potential exposure to the PRG exceedences disposed in the RCC. The main components of the selected remedy are described below.

Surface Water Diversion

Before removal of sediment/soil PRG exceedences from un-named tributary, a surface water drainage ditch will be installed west of the un-named tributary (as shown on Figure 10) to divert surface water. To minimize the future transport of COCs remaining at the Site and within the un-named tributary to down-gradient water bodies, the drainage ditch will be designed and constructed to permanently replace the portion of the un-named tributary that contains sediment/soil PRG exceedences. The estimated length of the drainage ditch to be constructed is approximately 2000 feet.

Surface Water Removal and Treatment

Upon completion of the surface water drainage ditch, the surface water remaining within the footprint of the excavation areas in the un-named tributary and Pond D/E will be removed and treated prior to discharge into the down-gradient water bodies. The contaminated surface water will be filtered to remove suspended solids and then treated through two 1000 lb GAC vessels in series to remove COCs. The estimated total surface water to be pumped and treated is approximately 883,000 gallons.

Excavation and Onsite Disposal

The contaminated soil and sediment to be removed will include the surface and/or subsurface soil PRG exceedences in the WC and the former process area, and the sediment PRG exceedences identified in Pond D/E and along the un-named tributary. The estimated total volume of soil/sediment PRG exceedence to be removed is approximately 90,000 CY.

The excavated soil/sediment will be stock piled at the location southeast of the WC prior to disposal of in an onsite RCC, which will be constructed to meet the RCRA Subtitle C landfill requirements outlined in 40 CFR Part 264, subpart N. Treatment of soil/sediment exceeding LDRs is not required for this alternative because the remediation will be conducted within the area of contamination (Preamble to the NCP, 55FR 8758-8760, March 8, 1990). However, prior to disposal, treatment of sediment not passing the paint filter test will be required. The treatment will include solidifying the sediment using Portland cement or fly ash.

Assumptions specifically associated with excavation and disposal activities are as follows:

- Air monitoring will be required during all excavation and disposal activities.
- Portions of the soil and sediment removal areas will require grubbing and/or heavy brush/trees removal prior to excavation.
- Excavation of the subsurface soil PRG exceedences at the former process area will be vertically terminated at ground water level and confirmation samples from side walls will be required following excavation to ensure complete removal of contaminated soil exceeding PRGs from vadose zone. The top two feet surface soil containing COCs below

PRGs will be stockpiled, and the excavation area will be backfilled with clean backfill or the stock piled soil that meets the PRGs.

- Excavation of the sediment/soil PRG exceedences in the un-named tributary will be vertically terminated at the ground water level and confirmation samples from the banks will be required following excavation to ensure complete removal of contaminated sediment/soil exceeding PRGs from vadose zone.

Construction of an Onsite RCRA Containment Cell

Under this alternative, an onsite RCC will be constructed in the area where the WC is located. The proposed RCC location and foot print are shown in Figure 11. The RCC would be designed to have a capacity of approximately 100,000 CY. This volume allows for disposal of 90,000 CY from the excavation areas, a swelling factor of 5% and a 6% contingency in the event additional material exceeding PRGs is discovered during remedial action confirmation sampling.

The RCC will be designed to meet the RCRA Subtitle C landfill requirements. Considering the property available for construction of the RCC, the proposed RCC is expected to be about 464 feet in length and 364 feet in width, and will extend about 15 feet above ground surface and 11 feet below ground surface (these dimensions do not include the thickness of lining and cover materials). In addition to the contaminated soil to be excavated from the foot print of the RCC, it is estimated that approximately 40,000 CY of uncontaminated soil will be excavated to construct the RCC.

Assumptions specifically associated with construction of the RCC are as follows:

- The soil beneath the RCC has sufficient strength to support the anticipated excavation slopes and final fill slopes and heights.
- Material that is excavated from the footprint of the RCC location, excluding the soil that is defined as exceeding PRGs, will be acceptable for use as backfill and/or protective layer material.

Backfill and Re-vegetation

The excavated areas will be backfilled with the on-site or off-site soil containing COCs below the soil PRGs. The excavated portion of the un-named tributary will be filled all the way back to ground surface to minimize the future transport of residual COCs into the down-gradient water bodies. The backfilled areas will be overlaid with 6 inches of topsoil and seeded with grass to prevent erosion.

Institutional Controls

Because principal and low level threat waste material will be left onsite, ICs, including access restrictions and land use restrictions, would be required to prevent breaching of the RCC cover and to preclude development of the Site for residential use.

The objective of the ICs is to maintain a future industrial or commercial land use scenario for both onsite and offsite affected properties, and to maintain the integrity and protectiveness of the RCC. The mechanism to implement the ICs will potentially be through a governmental ordinance, an enforceable Restrictive Covenant or a Deed Notice with both onsite and offsite property owners. The City of Jasper does not have zoning restrictions, so an ordinance that complies with any State regulations on institutional controls appears to be an appropriate institutional control. In addition, enforceable Restrictive Covenants will potentially be negotiated with the property owner or Jasper County (onsite), and Temple Inland (offsite). In the alternative, the State of Texas will issue a Deed Notice. The RCC will be surveyed, permanently identified by geographical markers, and the location registered with TCEQ and the City of Jasper. The ICs will be in place before signature of the Preliminary Closeout Report (PCOR), signifying remedial action construction completion.

EPA will be responsible for implementing the ICs, with technical assistance from the TCEQ and the City of Jasper. Since Jasper County and Temple Inland are not a Potentially Responsible Party (PRP) at this Site, an enforceable Restrictive Covenant (to the favor of the TCEQ and the State of Texas) must be voluntarily agreed to and signed by the onsite and offsite property owners. Future responsibilities for management of ICs will be negotiated with Jasper County and current onsite and offsite property owners.

Environmental Monitoring

Following remediation, the condition of the RCC cover will be visually inspected annually as part of the post closure care plan. Ground water monitoring will be necessary to evaluate the effectiveness of the alternative and to predict the potential impacts to human health and the environment. A ground water monitoring program will be included in the remedy for contaminated ground water.

Selected Remedy for Contaminated Ground Water

The selected remedy for contaminated ground water is Alternative G-3 because the available data and the ground water modeling results indicate that the ground water plume is stable and the potential for migration of COCs from ground water to surface water and resulting in exceedences of surface water PRGs is low. However, if the results of the pre-design investigation indicate that the ground water plume is not stable and/or migration of COCs from ground water to Big Walnut Run Creek surface water will result in exceedences of surface water PRGs, the selected remedy would be changed to Alternative G-4. Alternative G-4 is identical to Alternative G-3 with the exception that a hydraulic containment system will be added to minimize the plume expansion and to prevent the migration of COCs from ground water to surface water. A hydraulic containment system can be easily added as a component to Alternative G-3; therefore, Alternative G-3 is considered as the primary selected remedy for contaminated ground water.

The selected remedy for contaminated ground water will include installing a NAPL recovery system to remove the free phase and residual NAPL identified at former Pond A; implementing a hydraulic containment system as necessary, to prevent plume expansion and to protect Big Walnut Run Creek surface water; applying a TI waiver to waive the drinking water ARARs; implementing ICs for a designated PMZ to restrict ground water use; and monitoring ground water quality to evaluate the effectiveness of the RCC, to determine the natural attenuation rate, and to verify that contaminated ground water is managed within the PMZ boundary. The selected ground water remedy is illustrated in Figure 11. The main components of the ground water remedy are discussed below.

NAPL/Hot-Spot Extraction

Vertical extraction wells will be installed along the down-gradient boundary of the NAPL source area to remove the free phase and residual NAPL identified in Zone P-2. Since ground water will be co-extracted with NAPL, an oil removal system will be used to separate the NAPL from ground water. Recovered NAPL will be transported to an offsite facility for incineration. Partially treated ground water will be injected using vertical wells at a location up-gradient of the NAPL recovery wells to promote flushing of the residual NAPL. Since the boundaries of the free phase and residual NAPL have not been fully defined, the cost associated with this alternative is based on an assumption (and modeling result) that three to five NAPL recovery wells and three to five injection wells will be able to address the target area. The NAPL extraction wells will be operated to achieve a 90 percent concentration reduction as defined by a TOC or oil and grease test.

Hydraulic Containment

Vertical ground water recovery wells will be installed, as necessary, at the locations within the ground water PRG exceedence area to hydraulically contain COCs to prevent plume expansion and to minimize the migration of the COCs from ground water to surface water. Five vertical containment wells, as determined based on the ground water modeling results, are proposed for the

Site. The locations and the total number of containment wells will be modified based on the results of the pre-design investigation. Recovered ground water will be treated through GAC adsorption process to reduce COC concentrations to below the surface water PRGs and the treated water discharged to Big Walnut Run Creek.

A determination on full-scale implementation of the component will be made following completion of the pre-design investigation. If the results of the pre-design investigation show no expansion of the contaminant plume and no discharge of ground water containing COCs at concentrations exceeding ground water to surface water PRGs into Big Walnut Run Creek, the hydraulic containment system will not be implemented.

TI Waiver

Due to the presence of PAHs in the dissolved phase ground water plume and the presence of free phase and residual NAPL in multi-lithology zones, it is technically impracticable to restore the ground water quality to meet the MCLs or GW-PRGs within a reasonable time. A TI waiver to waive the drinking water ARARs is deemed to be appropriate for the contaminated ground water. The area over which the TI decision applies, includes all portions of the onsite contaminated ground water that do not meet the required ground water cleanup levels (MCLs or GW-PRGs) for Site COCs, and is referred to as a TIZ for the Site. The TIZ, which measures approximately 13 acres, is defined area wide as the zone of ground water containing naphthalene at concentrations greater than the ground water PRG (100 µg/L) as determined by the ground water modeling results. The TIZ is defined depth-wise as the ground water found in the Zones P-2 and P-4 from about 10 to 200 feet bgs. The final TIZ boundary will be modified after completion of the pre-design investigation proposed in the RI/FS Report.

Institutional Controls

A PMZ, as shown in Figure 11, will be defined to include the TIZ and the adjacent area to assure that future ground water pumping does not mobilize contaminants beyond the TIZ. ICs, including deed notice and restrictive covenants, will be implemented for the PMZ to eliminate the potential exposure pathway by preventing construction of water supply wells within the PMZ. The objective of the ICs is to prevent ingestion of contaminated ground water in the P-2 and P-4 zones. Currently, no drinking water wells are located within the proposed PMZ. The mechanism to implement the ICs will potentially be through a governmental ordinance, an enforceable Restrictive Covenant or a Deed Notice with both onsite and offsite property owners. As the contaminated ground water plume underlies the onsite property and the offsite property owned by Temple Inland, and the current offsite property owner is not a PRP for the Site, the Restrictive Covenants (to the favor of the TCEQ and the State of Texas) must be voluntarily agreed to by the affected property owners. In the alternative, the State of Texas will issue a Deed Notice. EPA will be responsible for implementing the ICs with technical assistance from the TCEQ and the City of Jasper. Future responsibilities for management of the ICs will be negotiated with Jasper County and onsite and offsite property owners.

Permanence and effectiveness of restricting construction of water supply wells within the PMZ will also be achieved through PMZ registration with the Texas Department of Licensing and Regulation (TDLR), and with the Southeast Texas Ground Water Conservation District (Jasper/Newton County). Prior to drilling any new water wells within the registered PMZ, drillers must get a drilling permit from the TDLR's Water Well Driller/Pump Installer Section. PMZ registration will be made with TDLR and the Southeast Texas Ground Water Conservation District.

Monitored Natural Attenuation

A long-term ground water monitoring program will be implemented to evaluate the effectiveness of the selected remedy for the contaminated soil/sediment and ground water, to quantify the natural attenuation rate, and to verify that the contaminant ground water is managed within the PMZ boundary. This ground water monitoring program will include sampling of approximately 20 wells on a semiannual basis for the first 10 years (LTRA period) after implementing the ground water remedy, and annually for the years after 10. Samples will be tested for SVOCs, BTEX and natural attenuation parameters. The water levels and water quality monitoring results will be presented and the effectiveness of the selected remedy will be evaluated in an annual remedial action progress report.

SUMMARY OF THE ESTIMATED REMEDY COSTS

The cost estimate information provided in Table 7 (for Alternative S-3), Table 8 (for Alternative G-3), and Table 9 (for the hydraulic containment component in Alternative G-4) is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur before construction begins or afterwards. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. The total present worth cost is calculated based on a 7% discount rate and a 10-year LTRA period. 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 SELECTED REMEDY

The expected outcome of the selected remedy is that the contaminated soils and sediment will no longer present an unacceptable risk to future industrial and construction workers via ingestion, inhalation, or dermal exposure and the property will be suitable for redevelopment as an industrial or commercial property. The Zones P-2 and P-4 ground water will be restricted from private and industrial use.

The remedial action is expected to achieve the remedial objectives and goals within one year. The Site will be available for socio-economic or community revitalization projects following implementation of the selected remedy. Since the existing redevelopment plans are for industrial or commercial reuse, there are no anticipated environmental or ecological benefits from the selected remedy.

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Soil/Sediment
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COST				
General Site Work:				
Air Monitoring During Site Work	3,600	HR	$75.00	$270,000
Site Clearing (on site area)	12	AC	$2,500.00	$30,000
Site Clearing (un-named tributary)	3	AC	$8,000.00	$24,000
Site Clearing (replacement drainage ditch)	3	AC	$8,000.00	$24,000
Replacement Drainage Ditch	2,000	LF	$20.00	$40,000
Surface Water Removal and Treatment:				
Surface Water Management	1	LS	$125,000.00	$125,000
Surface Water in Pond D/E	838	KGAL	$7.00	$5,866
Surface Water in the Un-named Tributary	45	KGAL	$7.00	$315
Excavation, Stock Pile and Onsite Disposal of PRG Exceedences				
Excavate, Stock Pile, and Dispose Surface Soil PRG Exceedences	2,200	CY	$10.00	$22,000
Excavate, Haul, and Stock Pile Surface Soil Below PRGs	4,700	CY	$8.00	$37,600
Excavate, Stock Pile, and Dispose Subsurface Soil PRG Exceedences	19,000	CY	$12.00	$228,000
Excavate, Haul, and Stock Pile Uncontaminated Cover Material from the WC	8,400	CY	$8.00	$67,200
Excavate, Stock Pile, and Onsite Dispose Waste in the WC	65,000	CY	$12.00	$780,000
Excavate, Stock Pile, and Dispose Sediment/Soil PRG Exceedences in Pond D/E	1,000	CY	$25.00	$25,000
Excavate, Stock Pile, and Dispose Sediment/Soil PRG Exceedences in the Un-named Tributary	2,800	CY	$25.00	$70,000
Confirmation Sampling and Analysis	60	EA	$650.00	$39,000
Backfill				
Backfill Soil Excavation Area	25,900	CY	$5.00	$129,500
Backfill Sediment Excavation Area in the Un-named Tributary	7,500	CY	$10.00	$75,000
Top Soil	2,300	CY	$25.00	$57,500
Seeding	14,000	SY	$0.45	$6,300
RCRA Containment Cell Construction				
Excavation				
Excavate and Stockpile Soil	40,000	CY	$5.00	200,000
Subgrade Preparation	127,100	SY	$1.00	127,100
Bottom Lining				

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Soil/Sediment
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
Compacted Low-Permeability Clay Lining - 3 Feet Thick	13,330	CY	$25.00	$333,250
60 mil HDPE Geomembrane (2 Layers)	26,670	SY	$8.00	$213,360
Clean Sand/Pea Gravel - 2 Feet Thick	8,890	CY	$25.00	$222,250
Geotextile (4 Layers)	53,330	SY	$2.50	$133,325
Protective Fill (Lining) - 1.5 Feet Thick	6,670	CY	$20.00	$133,400
Piping	1,400	LF	$4.00	$5,600
Leak Detection & Collection Sumps & Pumps	2	EA	$10,000.00	$20,000
Slope Lining				
Compacted Low-Permeability Clay Lining - 3 Feet Thick	5,600	CY	$25.00	$140,000
60 mil HDPE Geomembrane (2 Layers)	11,200	SY	$8.00	$89,600
Drainage Net (Geonet) - 2 layers	11,200	SY	$5.00	$56,000
Geotextile (4 Layers)	22,400	SY	$3.00	$67,200
Protective Fill (Lining) - 1.5 Feet Thick	2,800	CY	$20.00	$56,000
Operations				
Run-On Controls	1	LS	$25,000.00	$25,000
Storm Water Treatment	3260	KGAL	$7.00	$22,820
Cover				
Grading Fill - 0.5 Feet Thick	3280	CY	$10.00	$32,800
Compacted Low-Permeability Clay Lining - 2 Feet Thick	12510	CY	$25.00	$312,750
60 mil HDPE Geomembrane (1 Layer)	19700	SY	$8.00	$157,600
Clean Sand/Pea Gravel - 1 Foot Thick	6260	CY	$25.00	$156,500
Geotextile (1 Layer)	18770	SY	$3.00	$56,310
Protective Surface Soil - 2 Feet Thick	12510	CY	$10.00	$125,100
Topsoil - 0.5 Feet Thick	3280	CY	$20.00	$65,600
Seeding	4	AC	$2,500.00	$10,000
Piping	1600	LF	$4.00	$6,400
Other				
Perimeter Fence	1740	LF	$25.00	$43,500
Erosion Management (silt fences, etc)	1	LS	$20,000.00	$20,000
SUBTOTAL				**$4,887,746**
Contingency	20%		$4,887,746	$977,549
SUBTOTAL - CONSTRUCTION COST				**$5,856,295**
General Requirements	10%		$5,856,295	$586,530
Misc. Un-Scoped Items	5%		$5,856,295	$293,265

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Soil/Sediment
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
Permitting & Legal	5%		$5,856,295	$293,265
Services During Construction	11%		$5,856,295	$654,182
Engineering & Design Cost	8%		$5,856,295	$469,224
TOTAL - IMPLEMENTATION COST				**$7,683,537**
OPERATION AND MAINTENANCE COST				
Annual O&M:				
Cover Inspection/Mowing/Maintenance	96	HR	$150.00	$14,400
Allowance for Annual Repairs (fencing, erosion repairs, etc.)	1	LS	$5,000.00	$5,000
Project Management Costs - Inspection and Repair	24	HR	$100.00	$2,400
SUBTOTAL				**$21,800**
Overhead and Profit		20%		$4,360
SUBTOTAL				**$26,160**
Contingency		20%		$5,232
TOTAL - ANNUAL O&M COSTS				**$31,392**
TOTAL COST				
TOTAL - Capital Cost				**$7,684,000**
TOTAL - Periodic Cost				**$43,000**
TOTAL - O & M Cost				**$390,000**
TOTAL – Net Present Value				**$8,117,000**

Notes:
1. Ground water monitoring cost is included in the selected remedy for contaminated ground water.
2. Period cost (for five-year review) is assumed to be $20,000 for every five years for a period of 30 years.
3. The total periodic cost, total O&M cost, and net present value are calculated based on a 7% discount rate and a 30- year O&M period.

AC = acre; CY = cubic yard; EA = each; LF = liner feet; HR = hour LS = lump sum; KGAL = 1000 gallons; SF = square feet; SY = square yard

TABLE 8
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COST				
ADDITIONAL SITE CHARACTERIZATION				
Project Planning and Management	2	Year	$20,000.00	$40,000
Mobilization/Demobilization of Drilling Subcontractor and Equipment to Site	1	LS	$10,000.00	$10,000
Site Clearing for Drill Rig Access	1	LS	$30,000.00	$30,000
Install Sonic Soil Borings to Depths up to 100' Below Grade	900	LF	$150.00	$135,000
Per Diem	20	Day	$150.00	$3,000
Laboratory Testing Of Soil Samples - SVOCs	90	EA	$250.00	$22,500
Data Review and Interpretation	80	HR	$120.00	$9,600
PRE-DESIGN INVESTIGATION				
Installation of Ground Water Monitoring Wells				
Mobilization/Demobilization of Drilling Subcontractor and Equipment to Site	1	LS	$10,000.00	$10,000
Install 600 ft of gravel base access road	600	LF	$100.00	$60,000
Install Zone P-2 Monitor Wells to Define Downgradient Plume Boundary	500	LF	$200.00	$100,000
Per Diem	15	Day	$150.00	$2,250
Monitor Well Development	5	EA	$1,350.00	$6,750
Per Diem	6	Day	$150.00	$900
Monitor Well Surveying	1	LS	$5,000.00	$5,000
Quarterly Ground Water Sampling				
Ground Water Sampling - Conventional Monitor Wells	60	EA	$600.00	$36,000
Ground Water Sampling - CMT Wells	40	EA	$600.00	$24,000
Sampling Equipment	100	EA	$100.00	$10,000
Per Diem	80	Day	$150.00	$12,000
Analysis of SVOCs	105	EA	$250.00	$26,250
Analysis of BTEX and Natural Attenuation Parameters	50	EA	$500.00	$25,000
ESTABLISH PLUME MANAGEMENT ZONE (PMZ)				
Ground Water Data Validation and Management	240	HR	$100.00	$24,000
Ground Water Data Evaluation	160	HR	$100.00	$16,000
Update Ground Water Model	80	HR	$100.00	$8,000
Deed and Bound Survey	1	LS	$20,000.00	$20,000
Prepare Deed Recordation Document	1	LS	$10,000.00	$10,000

TABLE 8
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
SUBTOTAL				**$646,250**
Contingency	20%		$4,887,746	$129250
SUBTOTAL - PRE-DESIGN INVESTIGATION COST				**$775,500**
NAPL RECOVERY				
NAPL Recovery Test				
NAPL Recovery Test	1	LS	$10,000.00	$10,000
Sample Analysis	4	EA	$1,000.00	$4,000
NAPL Recovery System				
Install NAPL Extraction Well with Pump, Controls and Probe	3	EA	$20,000.00	$60,000
NAPL Extraction Well Development	30	HR	$150.00	$4,500
Install NAPL Removal and Ground Water Treatment System	1	LS	$527,000.00	$527,000
Install Ground Water Injection Well with Pump and Piping	3	EA	$20,000.00	$60,000
Conveyance Piping to Treatment Site (double wall pipe) from Extraction Wells	600	LF	$32.00	$19,200
SUBTOTAL				**$684,700**
Contingency	20%		$684,700	$136,940
SUBTOTAL - CONSTRUCTION COST				**$821,640**
General Requirements	10%		$821,640	$82,164
Misc. Un-Scoped Items	10%		$821,640	$82,164
Permitting & Legal	5%		$821,640	$41,082
Services During Construction	15%		$821,640	$123,246
Engineering & Design Cost	12%		$821,640	$98,597
TOTAL - IMPLEMENTATION COST				**$1,150,296**
OPERATION AND MAINTENANCE COST				
ANNUAL LTRA COST				
DNAPL Extraction and GW Injection System Operation	1	LS	$150,000.00	$150,000
Offsite Transport and Disposal of Recovered NAPL	1	2KGALs	$3,000.00	$3,000
Semiannual Ground Water Sampling	60	EA	$600.00	$36,000
Per Diem	40	Day	$150.00	$6,000
Sampling Equipment	60	EA	$100.00	$6,000
Analyze Ground Water Samples for SVOCs	63	EA	$250.00	$15,750
Analyze GW Samples for BTEX and Natural Attenuation Parameters	30	EA	$500.00	$15,000

TABLE 8
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
Data Validation, Management, and Interpretation	1	LS	$30,000.00	$30,000
Project Management Costs - Ground Water Monitoring	144	HR	$120.00	$17,280
SUBTOTAL				$279,030
Overhead and Profit		20%		$55,806
SUBTOTAL				$334,836
Contingency		20%		$66,967
TOTAL - Annual LTRA Costs				**$401,803**
ANNUAL O&M COST (for the Years after LTRA)				
Annual Ground Water Sampling	30	EA	$600.00	$18,000
Per Diem	20	Day	$150.00	$3,000
Sampling Equipment	10	EA	$250.00	$2,500
Analyze Ground Water Samples for SVOCs	30	EA	$250.00	$7,500
Analyze GW Samples for BTEX and Natural Attenuation Parameters	3	EA	$500.00	$1,500
Data Validation and Interpretation	1	LS	$20,000.00	$20,000
Project Management Cost – Ground Water monitoring	96	HR	$120.00	$11,520
SUBTOTAL				$64,020
Overhead and profit		20%		$12,804
SUBTOTAL				$76,824
Contingency		20%		$15,365
TOTAL - Annual O&M Cost				**$92,189**
TOTAL COST				
TOTAL - Capital Cost				**$1,926,000**
TOTAL - Periodic Cost				**$65,000**
TOTAL – LTRA Cost (from 1 to 10 years)				**$2,822,000**
TOTAL - O & M Cost (from 11 to 30 years)				**$497,000**
TOTAL – Net Present Value				**$5,310,000**

Notes:
1. Period cost (for five-year review) is assumed to be $30,000 for every five years for a period of 30 years.
2. The total LTRA cost is calculated based on a 7% discount rate and a 10 - year LTRA period.
3. The total O&M cost is calculated based on a 7% discount rate and a 20 - year period starting 10 years after implementation of the remedy.
4. The total periodic cost and net present value are calculated based on a 7% discount rate and a 30 - year O&M period.

EA = each; HR = hour; LF = liner feet; LS = lump sum; KGAL = 1000 gallons

TABLE 9
Estimated Cost for Implementation and Operation of Hydraulic Containment System
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COST				
GROUND WATER CONTAINMENT SYSTEM				
Install Containment Well with Pump and Controls	5	EA	$20,000.00	$100,000
Containment Well Development	60	HR	$200.00	$12,000
Install GAC Vessels for Ground Water Treatment	1	LS	$100,000.00	$100,000
Flow Equalization tank + level control (20000 gals)	1	EA	$30,000.00	$30,000
Conveyance Piping to Treatment Site (double wall pipe) from Extraction Wells	1800	LF	$42.00	$75,600
Concrete Slab, Containment and Shelter for EQ and GAC	1	LS	$50,000.00	$50,000
SUBTOTAL				**$367,600**
Contingency	20%		$367,600	$73,520
SUBTOTAL - CONSTRUCTION COST				**$441,120**
General Requirements	10%		$441,120	$44,112
Misc. Unscoped Items	10%		$441,120	$44,112
Permitting & Legal	5%		$441,120	$22,056
Services During Construction	15%		$441,120	$66,168
Engineering & Design Cost	12%		$441,120	$52,934
SUBTOTAL - IMPLEMENTATION COST				**$617,568**
OPERATION AND MAINTENANCE COST				
ANNUAL LTRA COST *(assume 10 years)*				
Operation of GW Containment System	1	LS	$150,000.00	$150,000
SUBTOTAL				**$150,000**
Overhead and profit		20%		$30,000
SUBTOTAL				**$180,000**
Contingency		20%		$36,000
TOTAL - Annual LTRA Cost				**$216,000**
ANNUAL O&M COST (for the Years after LTRA)				
Operation of GW Containment System	1	LS	$100,000.00	$100,000
SUBTOTAL				**$100,000**
Overhead and profit		20%		$20,000
SUBTOTAL				**$120,000**
Contingency		20%		$24,000
TOTAL - Annual O&M Cost				**$144,000**

TABLE 9
Estimated Cost for Implementation and Operation of Hydraulic Containment System
Hart Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
TOTAL COST				
TOTAL - Capital Cost				**$618,000**
TOTAL - Periodic Cost				**$0**
TOTAL – LTRA Cost (from 1 to 10 years)				**$1,517,000**
TOTAL - O & M Cost (from 11 to 30 years)				**$776,000**
TOTAL – Net Present Value				**$2,911,000**

Notes:
1. Period cost is included in Table 7.
2. The total LTRA cost is calculated based on a 7% discount rate and a 10 - year LTRA period.
3. The total O&M cost is calculated based on a 7% discount rate and a 20 - year period starting 10 years after implementation of the remedy.
4. The net present value are calculated based on a 7% discount rate and a 30 - year O&M period.

EA = each; HR = hour; LF = liner feet; LS = lump sum

STATUTORY DETERMINATIONS

Under CERCLA section 121, 42 U.S.C. § 9621, the EPA must select remedies that are protective of human health and the environment, comply with or meets the requirements for a waiver of Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, 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 reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through the excavation and containment of the contaminated soil/sediment, removal and treatment of free phase and residual NAPL in the saturated zone to the extent practicable, and hydraulic containment of the ground water COCs, as necessary, to prevent degradation of the down-gradient ground water and surface water quality. The soil/sediment containment system and NAPL extraction and offsite treatment process will contain and immobilize the hazardous substances present in these media. The containment will significantly reduce future leaching of contaminants from the waste into the ground water. The utilization of an onsite containment cell will also reduce the short-term risks by eliminating the transport of untreated waste. The excavation of waste material and replacement with natural soil will also prevent direct contact with the residual wastes below PRGs. Since the Site is currently vacant, there is no direct human health threat.

There are no contaminated ground water users identified for any private water wells. Placement of an institutional control on the Site property and ground water will be used to protect human health and prevent accidental exposure through the following actions: 1) alert prospective purchasers that hazardous substances are present at the Site and explaining the actions taken to address the Site contamination; 2) document the restricted activities that would interfere with or adversely affect the integrity or protectiveness of the remedy implemented at the Site; and, 3) ensure future site development is consistent with the industrial/commercial human health exposure scenario (i.e., non-residential usage) that is the basis for the soil and ground water cleanup goals.

COMPLIANCE WITH ARARs

The selected remedy for contaminated soil/sediment and ground water complies with or meets the requirements for a waiver of Federal and State requirements that are legally applicable or relevant and appropriate to this remedial action. The ARARs are summarized below.

Selected Remedy ARARs -- Contaminated Soil/Sediment

Chemical-Specific ARARs

- Texas Surface Water Quality Standards (30 TAC 307). This state regulation specifies water quality standards for surface water and implementation procedures for application of the surface water quality standards. The requirements are applicable to the discharge of water from the excavations containing water that must be removed to complete the remedial action.

- Waste Classification (30 TAC 335, Subchapter R). This state regulation specifies numerical criteria for designating a waste as a hazardous waste or as one of three classes of solid waste. The criteria are applicable for classification of wastes generated during the Site remediation.

- Solid Waste Disposal Act Subtitle C Requirement (40 CFR, Part 264, Subpart F). This federal regulation governs the maximum concentration of constituents released to ground water from solid waste management units (SWMU). This regulation applicable because the selected remedy includes onsite disposal and ground water has been adversely affected.

Location Specific ARARs

- Fish and Wildlife Coordination Act (16 U.S.C. §661, 16 U.S.C. §742, and 16 U.S.C. §2901). The federal regulations requires consultation when a modification of a stream or other water body is proposed or authorized and requires adequate provision for protection of fish and wildlife resources. Relevant and appropriate to the Site because the selected remedy requires the heavily contaminated soil/sediment to be removed from the un-named tributary.

Action-Specific ARARs

- Standards for Waste Piles and Landfills (40 CFR Part 264 Subparts L and N). Subpart L sets design and operating requirements for the storage or treatment of wastes in piles. If the waste piles are closed with wastes left in place, Subpart N requirements must be met. Subpart N establishes construction, design, performance, closure, and operation requirements pertaining to hazardous waste landfills. Subpart L and N would be relevant and appropriate to the Site because the selected remedy includes excavation, stockpile, and disposal of hazardous waste in an onsite RCRA containment cell.

- Control of Air Pollution from Visible Emissions and Particulate Matter (30 TAC 111). Requires that all reasonable precautions shall be taken to prevent particulate matter from becoming airborne, including use of water or chemicals for control of dust in the construction operations, clearing of land, and on dirt roads or stockpiles. Applicable during excavation and transport of soils, or any other activity that may generate airborne particulate matter at the Site.

- Permits and Enforcement (CERCLA 121(e)). This section specifies that no federal, state, or local permits shall be required for any portion of a CERCLA remedial action that is conducted on the Site of the facility being remediated. This includes exemption from the RCRA permitting process. Applicable to the Site because the selected remedy includes constructing a RCRA Subtitle C landfill (onsite containment cell) at the Site for disposal of hazardous wastes generated during the remedial action.

Selected Remedy ARARs-- Contaminated Ground water:

Chemical-Specific ARARs

- Maximum Contaminant Levels (40 CFR Part 141). This regulation establishes MCLs for drinking water. Although shallow ground water at and adjacent to the Site is not currently being used by the residents, it is classified as a potential drinking water source and ground water in the deeper zone is the public drinking water supply source. MCLs are applicable to the Site. However, due to the presence of PAHs and free phase and residual NAPL in the saturated muti-lithology zones, it is technically impracticable to restore the ground water quality to meet the MCLs. A TI waiver will be applicable to waive this Federal requirement.

- National Contingency Plan (40 CFR Part 300.430). This federal regulation evaluates baseline human health risk as a result of current and potential future site exposures and establishes contaminant levels in environmental media for protection of public health. This regulation is applicable for development of protective ground water concentration levels for the Site COCs that do not have associated MCLs. However, due to the presence of PAHs and free phase and residual NAPL in the saturated multi-lithology zones, it is technically impracticable to restore the ground water quality to meet the risk based ground water clean-up levels (e.g., GW- PRGs). A TI waiver will be applicable to waive this Federal requirement.

- Texas Surface Water Quality Standards (30 TAC 307). This state regulation specifies water quality standards for surface water and implementation procedures for application of the surface water quality standards. The requirements are applicable to the discharge of ground water co-extracted with NAPL, if discharge of ground water is necessary.

- Waste Classification (30 TAC 335, Subchapter R). This state regulation specifies numerical criteria for designating a waste as a hazardous waste or as one of three classes of solid waste. The criteria are applicable for classification of wastes generated during remediation of contaminated ground water.

Location-Specific ARARs

There were no location-specific ARARs pertinent to the selected remedy for contaminated ground water.

Action-Specific ARARs

- Exceptions to ARAR Rules (CERCLA 121(d)(4)). This federal regulation allows EPA to waive compliance with ARARs in six circumstances. The third circumstance "Compliance with the ARAR requirements is technically impracticable from an engineering perspective" is considered to be applicable for the Site due to the presence of PAHs and free phase and residual NAPL in the saturated multi-lithology zones.

- Use and Management of Containers Tank Systems (40 CFR Part 264 Subparts I and J). Subpart I sets operating and performance standards for container storage of hazardous waste. Subpart J outlines similar standards but applies to tanks rather than containers. These requirements would be applicable because the selected remedy includes using containers/tanks for storage and/or treatment of NAPL and contaminated ground water prior to injection or offsite disposal.

- Underground Injection Control (30 TAC 331). This state regulation establishes requirements and prohibitions related to underground injection of fluids. Generally prohibits injection of hazardous fluids, except that wells used to inject hazardous-waste contaminated ground water that is of acceptable quality to aid remediation and that is re-injected into the same formation from which it was drawn is not prohibited (30 TAC 331.6). Injection wells must be registered with the State. Applicable to the Site because the selected remedy includes re-injection of contaminated ground water co-extracted with NAPL to enhance the NAPL removal efficiency.

COST EFFECTIVENESS

The estimated net present worth is **$8,117,000 for the selected remedy for soil and sediment** and **$5,310,000 for the selected remedy for ground water**. All the alternatives considered ranged in cost from $43,000 to $50,051,000 for soil and sediment and $65,000 to $9,038,000 for ground water. ***The selected remedy is cost-effective and represents a reasonable value for the money spent.***

In making this determination, the following standard was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430(f)(1)(ii) (D)). The overall effectiveness of the remedy is determined by evaluating three of the five balancing criteria used in the detailed analysis of the alternatives: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, and volume through treatment; and (3) short-term effectiveness. Overall effectiveness was then compared to cost to determine cost-effectiveness. The selected remedy attains the same long-term effectiveness as the more expensive alternatives; achieves less reduction in toxicity and volume, and an equal reduction in mobility, within an appropriate time frame as other alternatives; and, is equally effective in the short-term when compared with all the alternatives. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and hence, this alternative represents a reasonable value for the money to be spent.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy meets the statutory requirement to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in TMV achieved through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element, the bias against off-site land disposal of treated and untreated waste, and State and community acceptance.

The selected remedy satisfies the criteria for long-term effectiveness through containment to reduce the mobility of COCs in soil/sediment and treatment to remove source material (free phase and residual NAPL) in ground water. The selected remedy does not present short-term risks different from the other treatment alternatives. There are no special implementability issues that set the selected remedy apart from any of the other alternatives. The selected remedy provides the most effective engineering control and treatment method and will cost less than onsite thermal treatment and off-site disposal or other treatment options.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Principal threat wastes were identified at the Site in ground water. The selected remedy does satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. The selected remedy will result in recovery and offsite treatment of free phase and residual NAPL in ground water.

FIVE-YEAR REVIEW REQUIREMENTS

Since the selected remedy will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review must be conducted within five years of the initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Pursuant to CERCLA Section 121(c), 42 U.S.C. § 9621(c), and as provided in the current guidance on Five Year Reviews [OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (June 2001)], EPA must conduct a statutory review within five years from the initiation of construction at the Site.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Site was released for public comment on July 26, 2006. The Proposed Plan identified Alternatives S-3 and G-3, excavation and onsite containment of contaminated soil and sediment, removal of free phase and residual NAPL from saturated zone, and monitoring and institutional controls of contaminated ground water, as the preferred alternatives. Based upon its review of the written and verbal comments submitted during the public comment period, the EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate. However, if the ground water plume is determined to be unstable or have a potential to impact the down-gradient surface water quality during the pre-design investigation, a hydraulic containment system (a component of Alternative G-4) will be added to Alternative G-3.

RESPONSIVENESS SUMMARY

STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

The EPA has prepared this Responsiveness Summary for the Site, as part of the process for making a final remedy selection. This Responsiveness Summary document's, for the Administrative Record, public comments and issues raised during the public comment period on the EPA's recommendations presented in the Proposed Plan, and provides the EPA's responses to those comments. The EPA's actual decisions for the Site are detailed in the ROD. Pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617, the EPA has considered all comments received during the public comment period in making the final decision contained in the ROD for the Site.

OVERVIEW OF PUBLIC COMMENT PERIOD

The EPA issued its Proposed Plan of Action detailing remedial action recommendations for public review and comment on July 26, 2006. Documents and information EPA relied on in making its recommendations in the Proposed Plan were made available to the public on or before July 26, 2006, in three Administrative Record File locations, including the Jasper Public Library located in Jasper, Texas. The 30-day public comment period ended on August 25, 2006. The EPA held a public meeting to receive comments and answer questions on August 15, 2006, at the First National Bank in Jasper, Texas. All written comments as well as the transcript of oral comments received during the public comment period are included in the Administrative Record for the Site and are available at the three Administrative Record repositories.

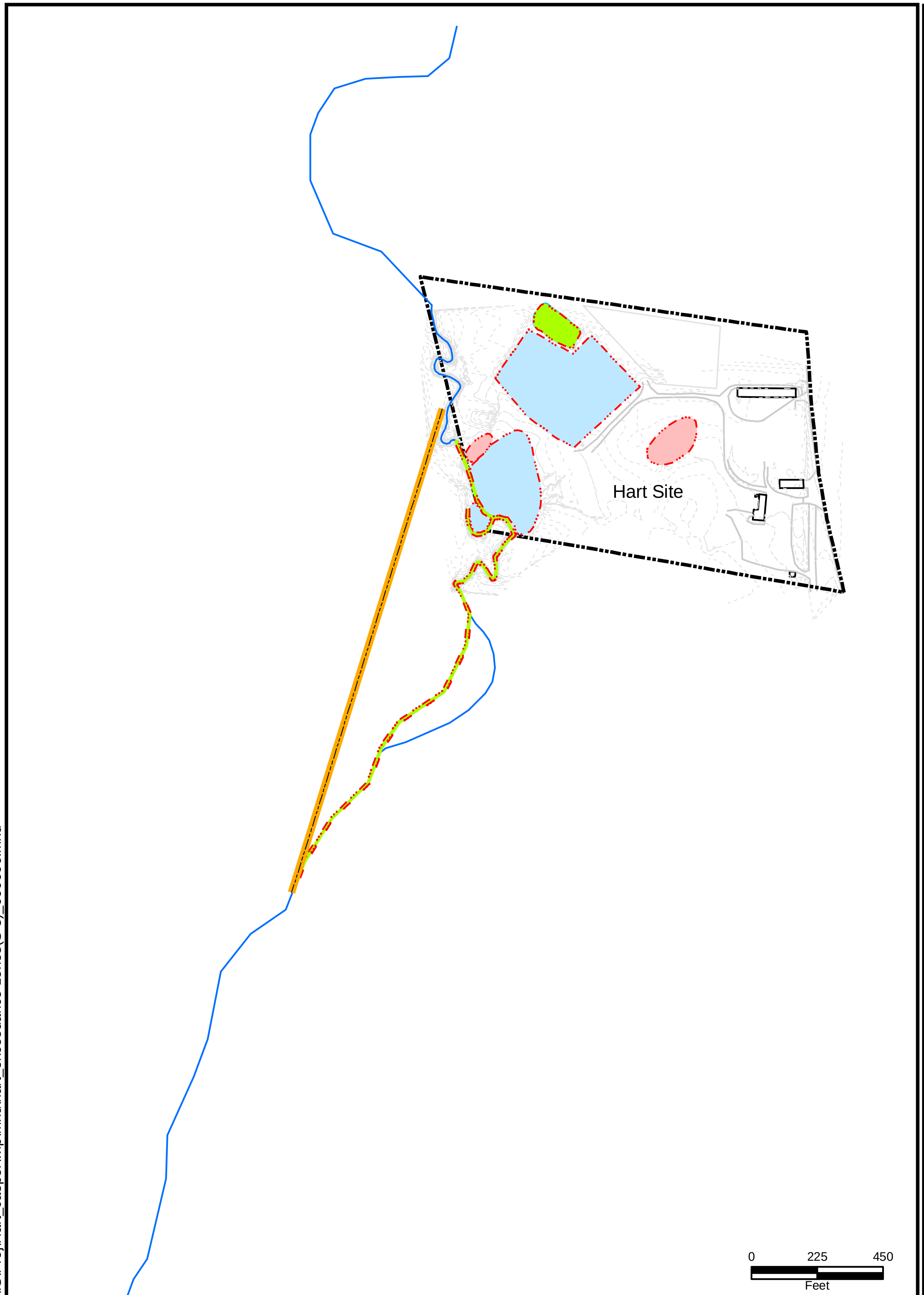
This Responsiveness Summary summarizes comments submitted during the public comment period and presents the EPA's written response to each issue, in satisfaction of community relations requirements of the NCP. The EPA's responses to comments received during the public meeting are provided below and in some cases include subsequent expanded responses to those comments as appropriate.

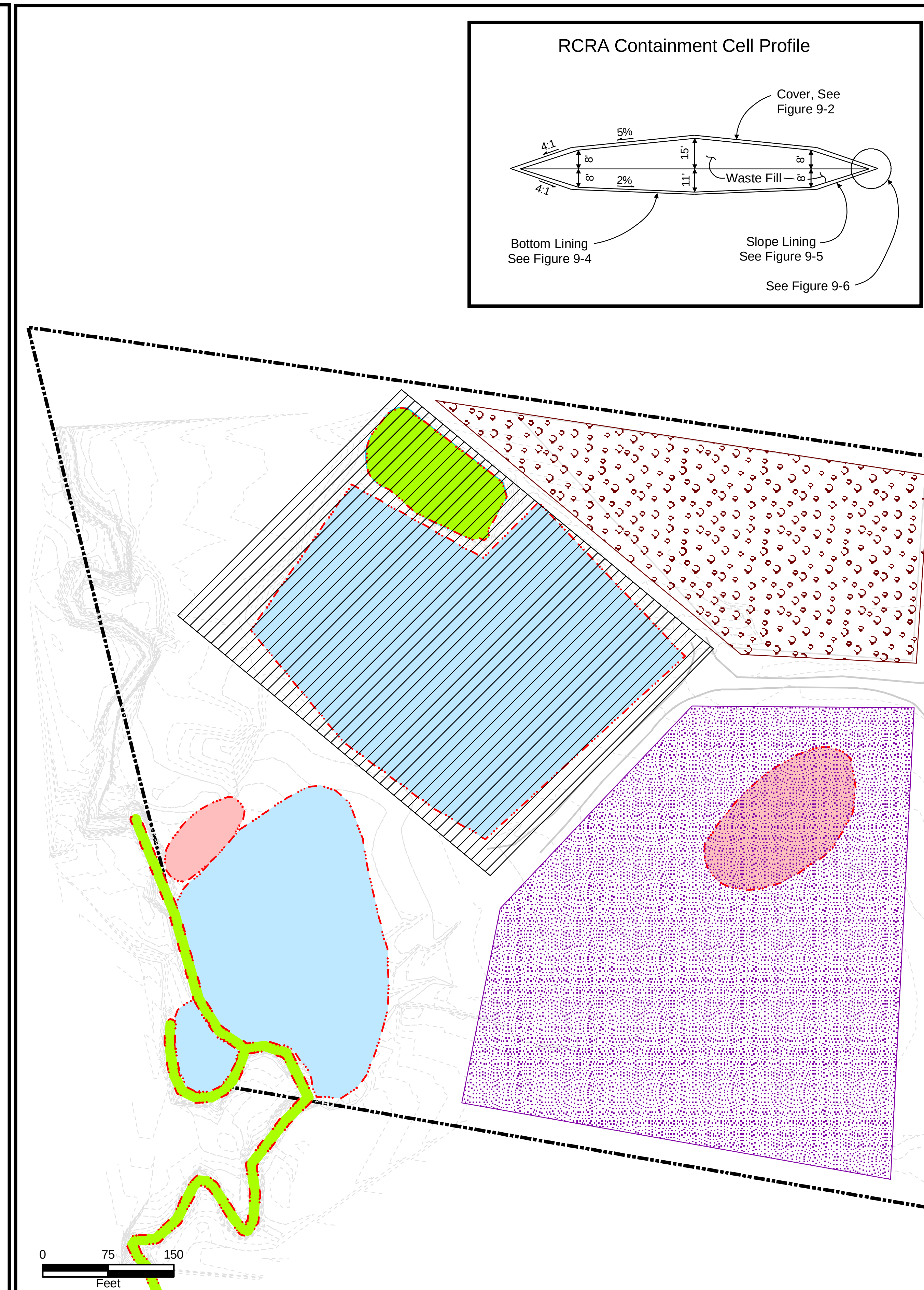
SUMMARY OF PUBLIC COMMENTS AND EPA RESPONSES

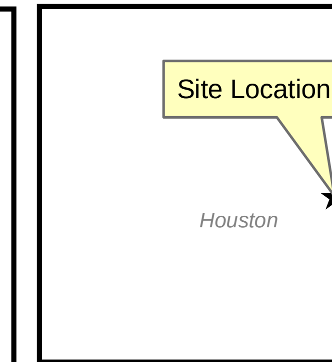
EPA received no comments during the public comment period.

TECHNICAL AND LEGAL ISSUES

The Selected Remedy is consistent with the potential property redevelopment for industrial or commercial use. Institutional controls will be a necessary component of the long-term Site management to ensure future property development is consistent with the soil cleanup levels and restricted ground water usage.







LEGEND

- Proposed Excavation Area
- Subsurface Soil PRG Exceedence
- Surface Soil PRG Exceedence
- Sediment PRG Exceedence
- Proposed RCRA Containment Cell Location
- Proposed Waste Stock Pile Area
- Proposed Uncontaminated Soil Stock Pile Area
- Proposed Replacement for the Un-named Tributary
- Site Boundary
- Road Features
- Building

N

Figure 10
Selected Remedial Alternative for Contaminated Soil and Sediment

Hart Creosoting Company
Superfund Site
Jasper, Texas

CH2MHILL

T:\IS\Proj\Hart_Jasper\wip\mxd\hart_exceedance-zones(S-3)_090606.mxd

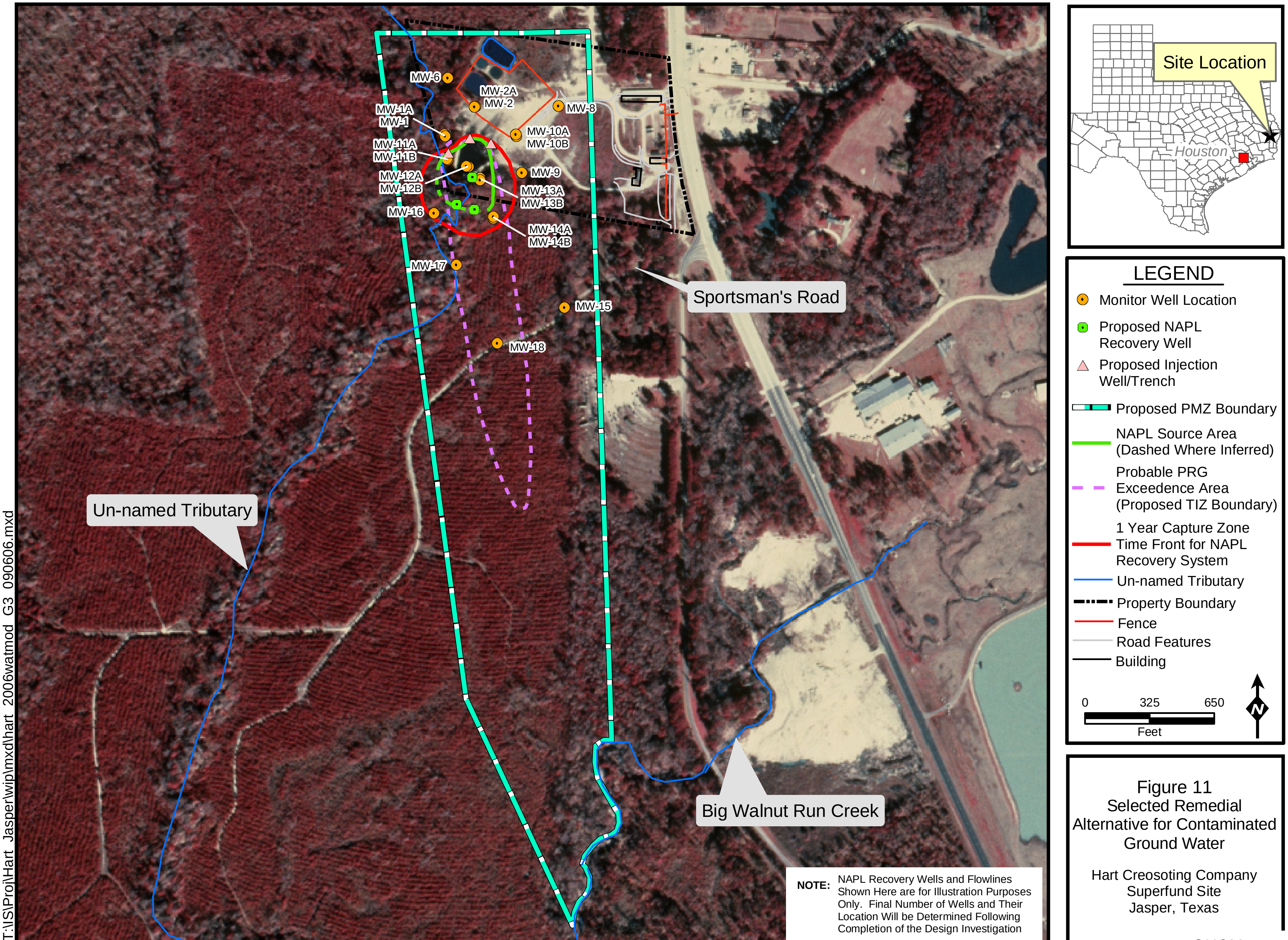


Figure 11
Selected Remedial Alternative for Contaminated Ground Water

Hart Creosoting Company
Superfund Site
Jasper, Texas

CH2MHILL

T:\IS\Proj\Hart_Jasper\wip\mxd\hart_2006watmod_G3_090606.mxd