Superfund Record of Decision

Jasper Creosoting Company
Jasper, Jasper County, Texas

September 2006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

JASPER CREOSOTING COMPANY
JASPER, JASPER COUNTY, TEXAS

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THE DECLARATION

SITE NAME AND LOCATION

The Jasper Creosoting Company Superfund Site is located in Jasper, Jasper County, Texas (Figure 1). The National Superfund Database (CERCLIS) identification number for this Site is TXD008096240.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Jasper 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 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 (RCC) and implementing a ground water pump and treat system for removal of free phase and residual non-aqueous phase liquid (NAPL) identified in the saturated zone. A hydraulic containment system will be added as a component to the selected remedy, as necessary, to prevent plume expansion and/or to protect Sandy Creek surface water. 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 soil and ground water. The major components of the selected remedy include:

- Excavating soil and sediment containing chemicals of concern (COCs) at concentrations exceeding the PRGs in the temporary waste cell (WC), former process area, drainage ditch, and wetland water inlet area, and disposing the excavated soil and sediment into an onsite RCC designed to meet the RCRA Subtitle C landfill requirements.
- Monitoring natural attenuation for sediment exceeding the ecological remediation goals in the wetland for five years.
- 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.
- Implementing a hydraulic containment system at the front edge of the ground water plume, as necessary, to prevent plume expansion and/or to protect Sandy Creek surface water.
- Applying a TI waiver to waive the MCLs and or ground water PRGs and define a TI zone (TIZ) for the contaminated ground water.

- Establishing a plume management zone (PMZ) to prevent ground water development within a defined area encompassing the TIZ. 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 and 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 from the Site] and containment [onsite engineering control of contaminated soil and 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 sections of *Identification of Chemicals of Concern* and *Nature and Extent Contamination*);
- The baseline risk represented by the COCs (see the *Summary of Site Risk* section);

- Cleanup levels established for the COCs and the basis for these levels (see the *Remedial Action Objectives* section);
- Source materials constituting principal threat wastes have been identified in the ground water at this Site (see the *Principal Threat Wastes* section);
- Current and reasonable anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD (see the *Current and Potential Future Land and Ground Water Uses* section);
- Potential land and ground 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), 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* section).

AUTHORIZING SIGNATURE

By: Pamela Phillips, Acting Date: 9/20/06

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RECORD OF DECISION
JASPER CREOSOTING COMPANY, SUPERFUND SITE
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THE DECISION SUMMARY

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Jasper Creosoting Company (JCC) Site is a former wood treating facility located at 601 North McQueen Street in 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 Site measures 11.3 acres and is bounded on the east by the Burlington Northern-Santa Fe (BNSF) railroad tracks, to the west by North McQueen Street, on the south by Highway 776, and to the north by the inactive Louisiana Pacific Lumber Facility (Figure 1). The approximate geographic coordinates for the center of the facility are 30°56'06" north latitude and 93°58'56" west longitude. The Site is located 1 mile northeast of downtown Jasper in a predominantly wooded area with mixed industrial, commercial, and residential land use. The major features of the Site are: the upland area including the former process area and the temporary WC, the drainage ditch located east of the Site, and the wetland area located east of the railroad tracks.

The JCC site was proposed to the National Priorities List (NPL) on March 6, 1998, based on a Hazard Ranking System (HRS) score of 50.0. The NPL listing was finalized on July 28, 1998. The site's CERCLIS identification number is TXD008096240. The area of the Site to be addressed in this remedial action encompasses all 11 acres, centered around the JCC former process area, drainage ditch, and wetland area.

SITE BACKGROUND AND ENFORCEMENT ACTIVITIES

SITE HISTORY

The Site is located near the City of Jasper in a predominantly wooded area with mixed 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. Approximately 1,100 people reside within a 1-mile radius of the Site (MABLE/Geocorr

Geographic Correspondence Data, U.S. Census Bureau). Within that radius, approximately 15 percent (165 individuals) are children 6 years of age or younger; approximately 16 percent (176 individuals) are children between the ages of 7 and 15 (U.S. Census Bureau, on-line April 2001). The nearest domestic residence is located 400 feet southwest of the former process area.

Wood treatment operations were performed at the Site between 1946 and 1986, using a steam preconditioning and pressurized creosote and pentachlorophenol (PCP) process. Creosote and PCP (dissolved in a diesel carrier fluid) were stored in the northern part of the facility in aboveground storage tanks (ASTs). Three treatment cylinders, adjacent to the tanks, were employed for creosote or PCP wood treatment. Wood products, typically utility poles and railroad ties, were placed in a cylinder for several hours of pressurized steam preconditioning. The cylinder was then placed under vacuum to remove air, wood sap, and water from the wood. Creosote or PCP was then introduced into the cylinder under pressure to impregnate the wood. Once the treated wood achieved a specified preservative retention level, a vacuum was applied to the cylinder to evacuate excess fluids. The wood was then removed and transferred to the drip pad for air-drying.

Wastewater from the creosoting process was discharged between 1946 and 1964 directly into a drainage ditch running parallel to the eastern edge of the Site. From 1964 to 1971 the wastewater was discharged to the City of Jasper wastewater treatment facility. However, in 1971, the facility resumed wastewater discharge to the drainage ditch.

In 1981, a fish kill in Sandy Creek was linked to JCC facility operations. Analysis of stream water samples indicated elevated levels of phenol. In March 1982, the Texas Department of Water Resources (TDWR) ordered JCC to stop discharging to the drainage ditch. In February 1983, the TDWR took a surface water sample from the drainage ditch and measured PCP at a concentration of 15,570 parts per million (ppm). In March 1983, surface water samples taken from Sandy Creek contained detectable levels of wood treatment chemicals.

In 1985, JCC resumed wastewater discharge to the City. However, in June 1986, the City discontinued service again because of continued problems. JCC shut down wood treatment operations shortly thereafter and abandoned the facility in 1992.

Potential contaminant sources present at the Site, following abandonment in 1992, included a drip pad, deteriorating ASTs, contaminated treatment cylinders, wastewater holding

tanks (impoundments), filter boxes, cooling towers (heat exchanger), storage containers, an incinerator, and contaminated soil associated with spills and leaks.

HISTORY OF FEDERAL AND STATE INVESTIGATION AND RESPONSE ACTIONS

A number of environmental-related investigations, leading up to EPA's 1996 time-critical removal action, were performed at the Site. The earliest work was initiated by JCC in 1983 and continued through 1985. A brief summary of work performed is provided below.

Potentially Responsible Party Lead Investigations

In July 1983, in response to a request from the Texas Water Commission (TWC), JCC initiated a program to assess the impacts of past waste management practices on ground water and surface water quality. Work performed by Southwestern Laboratories and Guyton Associates Incorporated between May 1983 and November 1984 included:

- Field inventory to identify water wells in the vicinity of the Site.
- Rotary drilling of four deep soil borings to depths up to 135 feet and installation of four piezometers to characterize hydrogeologic conditions.
- Hollow stem auger drilling of 12 soil borings to depths up to 50 feet to characterize the extent of facility-related contaminants in subsurface soil.
- Collection of surface water samples from the drainage ditch along the facility's east side and from Sandy Creek.

Based on the findings from this work, Southwestern Laboratories returned to the Site in May 1984 and installed eight additional ground water monitor wells. In March 1985 JCC, under the direction of the TDWR, collected soil samples at the inlet to a wetland area located approximately 1,300 feet southeast of the Site. Surface water samples were also collected from Sandy Creek.

Texas Department of Water Resources Sampling

In 1983 the TWDR , and in 1985 and 1986 the Texas Water Development Board (TWDB) and the TWC, collected surface water and sediment samples at locations downstream of the JCC site.

Removal Actions

Prior investigation work performed at the Site focused primarily on surface soil and ground water contamination and, to a lesser extent, on offsite migration of contaminants to the adjacent drainage ditch and wetland. In August 1995, EPA's Technical Assessment Team (TAT) initiated a removal assessment to address onsite contaminant sources associated with the process area and surface impoundment. The removal assessment was conducted to identify the types of waste material and contaminated media present, to approximate the quantity of waste onsite, and to collect background data.

Based on this work, the potential for rupture or spills of liquid creosote or PCP into the drainage ditch, wetland, and Sandy Creek from the ASTs was identified as an immediate threat. The threat potential was increased because of the lack of secondary containment around the tanks.

1996 Removal Action

In response to the data collected during the 1995 TAT removal assessment, EPA initiated a time-critical removal action on April 8, 1996. This action included removal of the existing buildings/structures, ASTs, other facility equipment, and contaminated soil. All ASTs, treatment vessels, containers and process buildings were dismantled. Scrap metals were cleaned and sent offsite for salvage. Scrap creosote-treated wood, heavily contaminated onsite soil, and liquid wastes from tanks and containers were sent offsite for disposal. Other less-contaminated soil was stockpiled onsite in a temporary WC.

An area encompassing the footprint of a former impoundment was excavated and expanded for use as an onsite WC. Contaminated soil from the stockpile was placed into the WC and a cover of clean soil placed over the contaminated material. The cover was then graded, overlain with topsoil, and grass-seeded for erosion control. A security fence was erected around the WC. Removal actions were completed on June 22, 1996.

1999-2000 Removal Action

Surface soil erosion in the vicinity of the WC, following completion of the 1996 removal action, resulted in the need for additional work. Between November 1999 and January 2000, EPA conducted another removal action to mitigate threats posed by the Site conditions. The removal action included stabilization, removal of creosote-soaked lumber, and removal and offsite disposal

of liquid from an exposed pipe leading out of the WC. Stabilization measures included backfilling portions of the WC cover where settling and erosion had occurred, re-seeding the cover, and placement of erosion control matting, geo-textile, and railroad ties along the bluff east of the WC. Surface water diversions were also placed along the southeastern edge of the property boundary on top of the bluff to direct surface water runoff.

2005-2006 Removal Action

A time-critical removal action was conducted between July 7, 2005 and March 1, 2006 to address the immediate threats to human health and the environment that were identified during the RI/FS. The removal action implemented components of the Selected Remedy for contaminated soil and sediment (Alternative S-3, Excavation and Onsite disposal), as described in this ROD. This removal action is consistent with all actions considered in the ROD.

Engineering Evaluation and Cost Analysis

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

The primary focus for the EE/CA field investigation was to determine the volume and characteristics 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.

Waste Cell Soil Sampling

From December 4 to December 7, 2000, 26 Geoprobe™ borings were advanced within the fenced area enclosing the WC to obtain information on the boundaries and quantity of contaminated soil and concentration of contaminants present.

Samples collected from five of the 26 boring locations were selected for laboratory analysis based on field screening, visual inspection, and spatial coverage requirements. Composite samples of visibly contaminated material were prepared in the field, packaged, and shipped to a certified laboratory for semivolatile organic compound (SVOC), total petroleum hydrocarbon (TPH), target analyte list (TAL) metals and total organic carbon (TOC) analysis. Samples were

also obtained using the Encore samplers and sent to the laboratory for volatile organic compound (VOC) analysis. Toxicity characteristic leaching procedure (TCLP) was also performed on these samples and the extracts analyzed for SVOCs, VOCs, and Resource Conservation and Recovery Act (RCRA) metals using the methods listed above. Additional composite samples from the above locations were also prepared in the field and shipped to a certified laboratory to be analyzed for dioxins/furans.

Seven representative soil samples were also obtained at different depths from six selected boring locations for geotechnical testing.

Wetland Sampling

Surface and subsurface soil samples were taken at 14 locations in the wetland area. Free-phase creosote was encountered above a clay layer at depths of approximately 8 feet, and the borings were terminated to avoid penetrating the clay layer. Surface samples were collected by transferring material with a small hand shovel into the designated containers. All 14 surface soil samples were sent to a certified laboratory for SVOC and TOC analysis. Another split set of the 14 surface soil samples was sent to a certified laboratory to be analyzed for dioxins/furans.

All wetland subsurface soil samples were analyzed using a RaPID Assay™ immunoassay field screening test kit, which yields a total PAH concentration expressed as phenanthrene. Six discrete samples were also selected for laboratory confirmation analysis based on field screening results and area distribution. These samples were sent to a certified laboratory for SVOC, VOC, TPH, TAL metals, and TOC analysis.

Six representative soil samples from five boring locations, taken at different depths, were selected for geotechnical testing.

Un-named Tributary Surface Water and Sediment Sampling

Surface water and sediment samples were collected at three sampling locations. These three locations included one at the outlet area of the wetland and two others along the un-named tributary between the outlet of the wetland and Sandy Creek. One additional sample was collected for both surface water and sediment at the wetland drainage inlet to better delineate contaminant migration.

All four surface water and sediment samples from the un-named tributary were sent to the EPA Region 6 Laboratory to be analyzed for SVOCs. A split set of these samples was shipped to a certified laboratory for dioxins/furans analysis.

Engineering Evaluation and Cost Analysis Determinations

Based on the alternatives assembled and evaluated for the EE/CA, excavation and onsite thermal desorption was recommended as the preferred alternative for the WC materials. Access controls were recommended as the preferred alternative for the wetland area. However, because the cost estimate for WC remediation exceeded the statutory limit specified in the National Contingency Plan, the Site was referred to the RI/FS program for additional evaluation.

Texas Natural Resource Conservation Commission Ground Water Sampling

In May 2001 URS, under contract to the TNRCC, performed water level measurements and collected ground water samples from existing monitor wells. Samples were submitted to the laboratory for VOC, SVOC, RCRA Metals and dioxin analysis.

National Priorities List

The EPA published a proposed rule on March 6, 1998, to add the Jasper Creosoting Site to the National Priorities List (NPL) of Superfund sites [Federal Register Listing (FRL-5974-5), Volume 63, Number 44, Pages 11340 - 11345], based on a Hazard Ranking System (HRS) score of 50.0.

The Site was added to the NPL in a final rule published on July 28, 1998 [Federal Register Listing (FRL-6130-9), Volume 63, Number 144, Pages 40182 - 40188]. The NPL listing was finalized on July 28, 1998. The site's CERCLIS identification number is TXD008096240.

COMMUNITY PARTICIPATION

The EPA held a public meeting on August 3, 2005, 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 Report and Proposed Plan for the Jasper Site were made available to the public on July 25, 2005. 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 27, 2005. The EPA's response to the comments received, during the comment period between July 25, 2005 and August 25, 2005, 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 soil, sediment, and ground water and to minimize future migration of contaminants from soil and sediment to ground water and possibly from ground water to Sandy Creek surface water. The 1996 and 1999-2000 removal actions completed at the Site removed the wood treating processing equipment, excavated the subsurface soils and creosote oils under the process area, and placed the excavated soils in an onsite temporary WC. The 2005-2006 EPA removal action completed at the Site implemented components of the Selected Remedy for contaminated soil and sediment (Alternative S-3, Excavation and Onsite Disposal), as described in this ROD. This response action addresses the remaining Site risks that were not addressed by the 1996, 1999 and 2005 removal actions.

SITE CHARACTERISTICS

The area of the Site to be addressed in this remedial action encompasses approximately 11 acres centered around the upland area, the temporary WC, the drainage ditch, the wetland, 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 and supplemental RI (SRI) activities at the Site.

SITE ENVIRONMENTAL SETTING

The JCC Site is approximately 11.26 acres in size and located 1 mile northeast of downtown Jasper in a predominantly wooded area with mixed industrial, commercial, and

residential land use. The Site is bounded by an inactive lumberyard to the north and west, railroad tracks and vacant-wooded industrial property to the east, and a residential area to the south and west. A forested wetland east of the railroad tracks receives surface water runoff from the Site. The wetland drains under Highway 776, through an un-named tributary to Sandy Creek (Figure 1).

In the vicinity of the Site, the former process area lies in a relatively level area at an elevation varying from 250 to 255 feet above mean sea level (msl). Along the site's east property line, there is a topographic bluff where the ground elevation drops rapidly from 250 to 230 feet msl. The bluff extends the full length of the property, but is less pronounced to the south at Highway 776 and to the north of the Site within the Louisiana Pacific property.

The Site is underlain by alluvium composed of varying proportions of clay, silt, sand, and gravel-size material extending to depths of 150 feet. The subsurface geology was grouped into three primary strata identified as permeable Zone P1, low-permeability Zone I2, and permeable Zone P3. One of the most significant discoveries from the RI is the absence of low permeability Zone I2 along the southeast margins of the former process area. The discontinuous nature of Zone I2 at this location, and potentially elsewhere, could facilitate contaminant transport from Zone P1 to P3.

At the former process area, Zone P1 occurs at depths between ground surface and 32 feet and Zone I2 at depths between 32 and 38 feet. Zone P3 is at least 60 to 70 feet thick and extends to depths up to 150 feet west of the drainage ditch at the former process area and 130 feet east of the drainage ditch. Although ground water occurs in Zones P1 and I2, Zone P3 represents the uppermost aquifer at the Site, and would be the primary zone for ground water flow and contaminant transport. Water level measurements performed between 2004 and 2006 indicate a southeast ground water flow direction toward Highway 776 at an estimated velocity of up to 120 feet per year.

The Site lies within 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 City of Jasper municipal well #6 (CWA-6), located 0.72-mile southeast (down-gradient) of the Site. This well is screened at depths between 416 and 767 feet.

An evaluation of the Site's hydrogeologic characteristics, and the proximity of facility-related contaminants to the water supply well, concluded that Zone P1 and Zone P3 ground water does not represent a current source of water but may represent a future source of

water. Inspection of the geologic log for CWA-6 indicates the presence of multiple clay units, with a collective thickness of 77 feet, between Zone P3 and the uppermost screened section of CWA-6. These clay units are expected to represent a significant barrier to vertical contaminant migration. This conclusion is also supported by a hydraulic interaction test conducted at monitor wells M-4S and M-4D in May and June of 2006.

SAMPLING STRATEGY

The EPA initiated the RI for the Site in 2004 and finalized the RI/FS Report in August 2005. 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 **9** ground water monitor wells and collecting a total of **150** samples from various media. The sampling program included **2** subsurface soil samples from the WC; **23** surface soil samples from the former process area and drainage ditch (Figure 2), **58** subsurface soil samples from 29 sampling locations at the former process area and drainage ditch (Figure 3); **20** ground water samples from 17 existing or newly installed monitoring wells (Figure 4); **6** surface water samples (including 2 background) from the wetland, un-named tributary, and Sandy Creek (Figure 5); **36** sediment samples (including 2 background) from the wetland, un-named tributary, and Sandy Creek (Figure 5); and **5** biota/fish samples (including 2 background) from Sandy Creek. Ground water elevations were measured and some additional ground water sample collection performed through and including December 2004. Analyses performed on these samples included: VOCs, SVOCs, PCP, dioxin/furans, Target Analyte List (TAL) metals, water quality parameters and soil physical parameters.

After completion of the 2005 removal action, EPA performed an additional round of ground water sampling in February 2006 to evaluate ground water quality changes resulting from removal of source material from the drainage ditch and wetland water inlet area. Samples were collected at 15 monitor well locations. Wells MW-6 and MW-7 were not sampled because they were abandoned during construction of the RCC. The ground water samples were analyzed for SVOCs.

Between May and July 2006, EPA conducted a supplemental RI (SRI) to evaluate potential risks to a residential receptor adjacent to the Site, and any potential impact to Sandy Creek surface water and CWA-6 ground water. The SRI activities are described below and the field sampling locations are provided in Figure 6.

- Performed a door to door survey for ground water use in the area between the JCC Site and well CWA-6.
- Installed 6 new monitor wells (Figure 4), including 2 shallow wells and 4 multilevel wells (screened at 7 depth intervals), to horizontally and vertically delineate the plume. A temporary monitor well was also installed along the west bank of Sandy Creek opposite well MW16.
- Collected a total of 39 samples from the 6 new wells and 9 of the 15 existing wells and analyzed for SVOCs.
- Conducted a long-term water level monitoring test to evaluate hydraulic connectivity between Zone P3 and the formation supplying ground water to well CWA-6.
- Surveyed the Sandy Creek surface water elevation and channel bottom elevation to determine if ground water discharges to Sandy Creek.
- Collected a surface soil sample from the onsite residential area to verify that there is no potential unacceptable risk for the residents.
- Collected three sediment samples from the main drainage channel of the wetland to evaluate any potential ecological risks remaining after completion of the 2005 removal action (figure 6). The samples were split for analysis of SVOCs using method SW 8270 SIM and for screening-level bioassays using the freshwater amphipod *Hyalella azteca*.
- Collected one composite sediment sample and one composite plant tissue sample from the wetland and analyzed for dioxins and furan congeners.

NATURE AND EXTENT OF CONTAMINATION

Historical operations performed at JCC employed coal tar creosote and PCP 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 analysis results associated with testing of RI and SRI soil, ground water, surface water, sediment and biota samples collected at the Site. The concentration range and location of highest observed total PAH (TPAH) and total CPAH (TCPAH) concentrations measured in the RI and SRI soil, sediment, and ground water samples at each of the study areas are also summarized in Table 1.

Waste Cell Soils

Two samples were collected from the WC during the RI. The first sample was a composite of Visually Contaminated (VC) material encountered at depths between 2 and 9.5 feet, and the second a grab sample of visually clean (CL) soil taken at a depth of 11.5 feet, 2 feet below the base of the waste material. A brief summary of the contaminant indicator results is provided below:

SVOCs

A TPAH concentration of 2,299 mg/Kg was detected in the VC composite sample collected from the WC. This result is comparable with TPAH concentrations of 395.4 to 4,539 mg/Kg observed in the EE/CA WC samples. In the CL soil sample collected beneath the WC, a TPAH concentration of 7.64 mg/Kg was detected. The TCPAH concentration of 33 mg/Kg detected in the VC sample is also comparable with the 1.52 mg/Kg to 38.3 mg/Kg range reported in the EE/CA. In the CL soil sample taken beneath the WC, a TCPAH concentration of 0.06 mg/Kg was observed. The PCP concentration of 212 mg/Kg detected in the VC sample is comparable to the 59 mg/Kg to 360 mg/Kg range reported in the EE/CA data set.

Dioxins

VC material and the native soil sample collected beneath the WC were not tested for dioxin. Total dioxin concentrations, expressed in 2,3,7,8-TCDD equivalents, ranged from 1.84 µg/Kg (184×10^{-5} mg/Kg) to 2.49 µg/Kg (249×10^{-5} mg/Kg) in the EE/CA data set. These values are 100 times greater than the 1.77×10^{-5} mg/Kg EPA Region 6 Medium-Specific Screening Level (MSSL).

VOCs

Ethylbenzene at 0.39 J mg/Kg, m, p-xylene at 1.36 mg/Kg, and o-xylene at 0.628 mg/Kg were detected in the VC sample collected from the WC. BTEX constituents were not detected at concentrations above the laboratory reporting limit in the CL soil sample.

Trace Metals

A majority of the TAL metals in the VC sample collected from the WC were present at concentrations above background. However, other than arsenic, detected at a concentration of 1.95 mg/Kg (Region 6 MSSL is 1.8 mg/Kg), TAL metals concentrations were less than EPA Region 6 MSSLs. The CL soil sample taken beneath the WC revealed concentrations less than their corresponding EPA Region 6 MSSLs.

TABLE 1
Summary of TPAH and TCPAH Concentrations
Jasper Creosoting Company – Jasper, Texas

	Concentration Range (Location of Highest Observed)					
	Waste Cell	Former Process Area	Drainage Ditch	Forested Wetland	Un-named Tributary	Sandy Creek
Surface Soil/Sediment						
No. of Samples	0	20	3	3	3	1
TPAH (mg/Kg)	NA	0.09 to 764.7 (SO-11)	3.98 to 187.3 (DD-06)	14.37 to 211.4 (SD-01)	2.63 to 7.29 (SD-02)	0.04
TCPAH (mg/Kg in BaP Eq)	NA	0.009 to 36.68 (SO-11)	0.825 to 35.17 (DD-06)	1.71 to 20.54 (SD-01)	0.43 to 0.89 (SD-02)	ND
Subsurface Soil/Sediment – Visually Contaminated Interval						
No. of Samples	5 (EE/CA) 1 (RI)	23	6	18	0	0
TPAH (mg/Kg)	395.4 to 4,539 (GP-15B) 2,299 (Cell – TS)	ND to 25.92 (SB-08)	135 to 4,728 (DD-03)	ND to 17,770 (NE-08)	NA	NA
TCPAH (mg/Kg in BaP Eq)	1.52 to 56.85 (GP-15B) 32.96 (Cell-TS)	ND to 1.595 (SB-07)	3.132 to 107.8 (DD-05)	ND to 239.3 (NE-08)	NA	NA
Subsurface Soil/Sediment – Visually Clean Interval [a,b,c]						
No. of Samples	1 (RI)	23	6	9	0	0
TPAH (mg/Kg)	7.64 (Cell – NS)	ND to 0.589 (SB-04)	431 to 3,598 (DD-02)	ND to 31.64 (NE-08)	NA	NA
TCPAH (mg/Kg in BaP Eq)	0.06 (Cell-NS)	ND to 0.05 (SB-04)	0.57 to 49.8 (DD-02)	ND to 0.52 (NE-08)	NA	NA
Ground Water (RI)						
No. of Well Locations	0	4	2	3	0	0
TPAH (mg/L)	NA	307 (MW-6)	0.0004 (M-3S)	0.543 (M-4S)	NA	NA
TCPAH (mg/L in BaP Eq)	NA	0.648 (MW-6)	< 0.00001 (M-3S)	0 (M-4S)	NA	NA

Notes:

ND = not detected. NA = not applicable

a. Drainage ditch borings not advanced through Zone I-2 to identify visually clean material.
b. Visually clean sediment in Forested Wetland corresponds to lowermost sample collected.

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c. Waste cell RI boring Cell-TS drilled and sampled next to GP-15B.

Surface Soils - Former Process Area and Drainage Ditch

Surface soil samples (0 to 0.5 foot) were collected at 20 locations in the former process area and from three locations in the drainage ditch (Figure 2). Each sample was tested for SVOCs, four samples tested for VOCs, 13 tested for TAL metals, and six tested for dioxins/furans.

SVOCs

TPAH concentrations in the 20 surface soil samples collected from the former process area ranged from 0.09 mg/Kg to 764.7 mg/Kg with concentrations exceeding the 0.234 mg/Kg Region 6 MSSL at 19 of the 20 locations. TPAH concentrations greater than 100 times the MSSL were observed at four locations. In the three drainage ditch surface soil samples, TPAH concentrations ranged from 3.98 mg/Kg to 187.3 mg/Kg.

TCPAH concentrations, expressed in B(a)P equivalence ranged from 0.009 mg/Kg to 36.68 mg/Kg with concentrations exceeding the 0.234 Region 6 MSSL at 14 of the 20 former process area sample locations. TCPAH concentrations greater than 100 times the MSSL were detected at two locations. In the drainage ditch surface soil samples, TCPAH concentrations varied from 0.825 mg/Kg to 35.17 mg/Kg.

PCP concentrations in the former process area surface soils varied from 0.014 mg/Kg to 2.67 mg/Kg, and in the drainage ditch surface soil samples from 0.178 mg/Kg to 1.99 mg/Kg. PCP concentrations greater than the 10 mg/Kg Region 6 MSSL were not observed at any of the 27 sample locations.

Dioxins

Total dioxin concentrations, expressed in 2,3,7,8-TCDD equivalence, collected at three locations in the former process area ranged from 2.7×10^{-5} mg/Kg to 2.95×10^{-4} mg/Kg. Concentrations in the drainage ditch samples ranged from 4.2×10^{-5} mg/Kg to 4.36×10^{-3} mg/Kg. Total dioxin concentrations exceeding the 1.77×10^{-5} mg/Kg Region 6 MSSL were observed at each of the six sample locations.

VOCs

VOC indicators BTEX were not detected in the three surface soil samples collected from the former process area or in the single sample collected from the drainage ditch.

TAL Metals

Surface soil samples for TAL metals analysis were collected at 13 of the 24 former process area and drainage ditch locations. Although a number of TAL metals were detected at concentrations above background, arsenic was the only metal detected above the 1.8 mg/Kg EPA Region 6 MSSL. Arsenic concentrations varied from 0.8 to 8.4 mg/Kg, with concentrations above the MSSL observed at five locations.

Total Organic Carbon

TOC was tested for in 13 of the 23 surface soil samples collected from the former process area and drainage ditch. TOC concentrations ranged from 1,090 to 43,200 mg/Kg, with the highest observed concentration detected in the drainage ditch.

Subsurface Soil - Former Process Area and Drainage Ditch

Subsurface soil samples were collected from 20 locations in the former process area placed on an approximate 100 x 100-foot grid in the area south of the WC (Figure 3). Three additional borings were placed north of the WC during the field investigation. Subsurface soil samples were also collected from six locations, placed on approximate 300-foot centers, from the drainage ditch located along the Site's east property line.

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.

All the 29 VC and 29 CL samples were tested for SVOCs; three samples for dioxins; five samples for VOCs; and five samples for TAL metals.

SVOCs

TPAH concentrations, potentially indicative of past creosote releases, ranged from non-detect (ND) to 25.92 mg/Kg in the VC samples collected in the former process area. Concentrations exceeding the 0.234 mg/Kg EPA Region 6 MSSL were observed at 12 of the 23 locations. The highest observed TPAH concentration of 25.92 mg/Kg occurred where visual evidence of residual creosote was observed at depths between ground surface and 2.5 feet. Residual creosote was observed at depths between zero and 14.5 feet.

In the drainage ditch VC samples, TPAH concentrations ranged from 135 to 4,728 mg/Kg with concentrations exceeding the EPA Region 6 MSSL of 0.234 mg/Kg occurring at each of the six sites. Although heavy creosote staining was observed at each of the six drainage ditch boring locations, a layer of clean material to depths of 6 feet was noted on the boring logs. This material may represent sediment, transported from upstream locations, that has been deposited over the VC material by natural processes.

TPAH concentrations from the CL soil horizon in the former process area ranged from ND to 0.589 mg/Kg with concentrations exceeding the EPA Region 6 MSSL of 0.234 mg/Kg occurring at four locations.

Total CPAH concentrations in the 29 VC samples collected from the former process area and drainage ditch ranged from ND to 107.8 mg/Kg (SB-DD-05), with concentrations exceeding the 0.234 mg/Kg EPA Region 6 MSSL occurring at 11 of the 29 sites. In the 23 soil samples collected from the CL soil horizon in the former process area, TCPAH concentrations ranged from ND to 0.05 mg/Kg. Thus, the vertical extent of contamination was adequately defined by the samples collected. In the six grab samples collected from the bottom of the drainage ditch borings, which did not encounter CL material, TCPAH concentrations varied between 0.57 and 49.8 mg/Kg.

PCP concentrations in the VC samples collected from the former process area ranged from ND to 11.4 mg/Kg, with concentrations exceeding the 10 mg/Kg EPA Region 6 MSSL occurring at one location. Non-detect levels were reported for VC samples collected at 13 of the 23 locations.

PCP concentrations in the drainage ditch VC samples ranged from less than 0.9 to 69.2 mg/Kg with concentrations exceeding the 10 mg/Kg EPA Region 6 MSSL occurring at three locations. PCP concentrations in the CL samples collected from the former process area ranged from ND to 0.139 mg/Kg. ND levels were reported for 17 of the 23 samples taken from the CL soil horizon. The location of the maximum observed concentration of 0.139 mg/Kg occurred at a depth of 20.5 feet, and PCP was ND in CL samples collected from adjacent sites.

Dioxins

Three subsurface soil samples collected from the VC soil horizon were tested for dioxins. Total dioxin concentrations, expressed in 2,3,7,8-TCDD equivalents, ranged from 49.9×10^{-5} mg/Kg to 157×10^{-5} mg/Kg. Total dioxin concentrations exceeded the 1.77×10^{-5} mg/Kg EPA Region 6 MSSL at each location.

VOCs

BTEX constituents are expected to be the primary VOCs associated with releases of the PCP diesel carrier fluid. In the VC and CL composite sample tested for VOCs, BTEX constituents were not detected.

In the VC sample taken from the drainage ditch, ethylbenzene was detected at 0.23 J mg/Kg, ortho (o) and meta (m) xylenes at 0.467 J mg/Kg, and para (p) xylene at 0.229 mg/Kg. In the CL sample, toluene was detected at 0.003 mg/Kg, ethylbenzene at 0.057 mg/Kg, o and m-xylene at 0.066 mg/Kg, and p-xylene at 0.033 mg/Kg. Toluene, ethylbenzene, and xylene concentrations detected in these samples were less than their corresponding EPA Region 6 MSSLs.

TAL Metals

Several TAL metal compounds were detected above background levels in the two samples collected from the VC soil horizon and the three samples collected from the CL soil horizon in the former process and drainage ditch areas. However, concentrations were below their corresponding EPA Region 6 MSSLs at each location.

Total Organic Carbon

One subsurface soil sample from the VC soil horizon was analyzed for TOC at location SB 05 and a concentration of 226 mg/Kg detected.

Ground Water

The RI hydrogeologic investigation included sampling of seven existing monitor wells and nine new monitor wells constructed in June 2004 (Figure 4). Monitor wells MW-10, MW-11 and MW-12 are screened in Zone P1, and the remaining wells screened at varying depths within Zone P3. Confirmation sampling of selected wells (MW-10, MW-13, and M-4S) was performed in November 2004. During the confirmation sampling event, well M-5 (located along Highway 776 near the wetland culvert outlet) was found and the well sampled in December 2004.

General ground water quality parameters (pH, temperature, specific conductance, dissolved oxygen and oxidation-reduction potential) were measured in the field and samples from all 17 monitor well locations tested in the laboratory for SVOCs, VOCs, total and dissolved metals and general chemistry parameters as discussed in the following subsections.

During the June 2006 SRI, four new multilevel and two new single completion monitor wells were constructed at the locations shown on Figure 4. Following installation and development, the new wells were sampled for SVOCs in July 2006.

Field Water Quality Parameters

Field water quality parameters measured during the June 2004 RI sampling event revealed an average ground water pH of 5.06 in Zone P1 ground water, and a site-wide average pH value of 5.12 and 5.36 in the shallow and deep Zone P3 monitor wells, respectively. Ground water temperatures varied between 20.8 and 21.5 degrees Centigrade and specific conductance (SC) values between 80 and 207 micro-siemens per centimeter (uS/cm). The SC values are very low, only slightly higher than typical surface water or rainfall values, and are consistent with what would be expected in a ground water recharge area. Dissolved oxygen concentrations averaged 3.9 mg/L in the shallow Zone P3 monitor well group and 6.35 mg/L in the deep Zone P3 monitor well group.

June 2004 SVOC Sampling and Analysis

TPAH concentrations in ground water samples collected from Zone P1 and shallow Zone P3 monitor wells during the June 2004 RI varied widely from 0.2344 µg/L at well MW-07 to 307,000 µg/L at MW-06. TPAH concentrations were highest in the area bounded by monitor wells M-2S, MW-6 and MW-11 but showed significant decreases down-gradient (southeast) of this area declining from 8486 µg/L at M-2s to 543 µg/L at M-4s; a distance of 750 feet.

The elevated concentrations of 307,000 µg/L reported for MW-06 and 29,000 µg/L for MW-11 can be attributed to free-phase creosote present at both locations. Naphthalene concentrations of 105,000 µg/L and 15,300 µg/L, respectively, account for the majority of the TPAH present at each well. Total CPAH concentrations, expressed in B(a)P equivalence, ranged from less than 0.01 µg/L to 648 µg/L.

In the deep Zone P3 monitor wells, TPAH concentrations were significantly lower, ranging from 0.1779 µg/L at M-3D to 190.5 µg/L at M-2D. At the furthest down-gradient well (M-4D), a TPAH concentration of 52.24 µg/L was detected. Total CPAH concentrations were less than 0.01 µg/L at each of the four deep Zone P3 monitor well locations.

Comparison of TPAH concentrations between well pair M-2S and M-2TD shows significant vertical attenuation of the contaminant plume over a distance of 65 feet as evidenced by TPAH concentrations that decline from 8486 µg/L at M-2S to 0.42 µg/L at M-2TD. This trend also occurs further down-gradient at well pair M-4S and M-4D) where TPAH concentrations

declined from 543 µg/L to 52 µg/L respectively, over a vertical distance of approximately 50 feet.

Fall 2004 SVOC Sampling and Analysis

Confirmation sampling of monitor wells MW-10, MW-13 and MW-15A (M-4S) was performed in November 2004 for SVOCs. During this sampling event, existing well M-5 was also located and the well sampled in December 2004 for SVOCs. TPAH concentrations observed at these four well locations ranged from non-detect at MW-10 to 1270 µg/L at MW-15A (M-4S) with naphthalene (1100 µg/L) accounting for a majority of the TPAH concentration at MW-15A (M-4S). Comparison of the TPAH concentrations for the June and November 2004 sampling events revealed a significantly higher concentration only at M-4S. TPAH concentrations at wells MW-10 and MW-13 were comparable. At well M-5, located within the forested wetland, a TPAH concentration of 1.62 µg/L was observed.

SRI SVOC Sampling and Analysis (February, May and July 2006)

Confirmation sampling and SVOC analysis of 12 monitor wells in February 2006 identified comparable TPAH levels with concentrations varying from less than 1 to approximately 13,000 µg/L. The highest observed concentrations occurred at wells MW-9 (13,335 µg/L) and M-2s (12,214 µg/L). In May 2006, 11 monitor wells were sampled and analyzed for SVOCs. TPAH concentrations ranged from less than 20 to 14,222 µg/L. At well MW-11, a TPAH concentration of 430,910 µg/L was reported. However, this sample contained creosote, which contributed to the unusually high TPAH concentration.

Sampling and analysis of ground water samples collected from the four new multilevel wells (MW14 to MW17), the two new single completion wells (M-5s and MW-15s) and temporary well MW-18 in July 2006 detected TPAH concentrations varying from less than 20 to 345 µg/L. The highest observed TPAH concentrations of 321 and 345 µg/L were detected in samples taken at MW-18 and MW14-1 (uppermost sample interval). TPAH concentrations at the remaining MW14 sample intervals, and at wells MW15, MW16, MW17, M-5s and MW-15s were less than 100 µg/L.

VOCs

Benzene concentrations in the Zone P1 and shallow Zone P3 monitor well group ranged from less than 2 µg/L at up-gradient well MW-5 to 149 µg/L at MW-6, with concentrations exceeding the 5 µg/L MCL observed at five of the 11 locations. A concentration of 101 µg/L was detected at MW-11 which, like MW-6, also contains free-phase creosote in the vicinity of the well. At down-gradient well M-4S (MW-15A) benzene was detected at 9.1 µg/L. In the four deep Zone

P3 monitor wells, and Zone P1 well MW-10, benzene was not detected above the 2 µg/L reporting limit. Low levels of ethylbenzene, toluene, and xylenes were also detected in the shallow Zone P3 monitor wells at concentrations less than their corresponding MCLs of 700 µg/L, 1000 µg/L, and 10,000 µg/L.

TAL Metals

Arsenic, chromium, and lead were the primary constituents detected in ground water samples collected from the Zone P1 and shallow Zone P3 wells MW-06 and MW-11 (free-phase creosote present) at concentrations above background and EPA drinking water maximum contaminant levels (MCLs). Arsenic above the 10 µg/L MCL was observed at both wells at concentrations of 135 and 72.9 µg/L, chromium above the 100 µg/L MCL observed at MW-06 at 101 µg/L, and lead above the 15 µg/L MCL detected at both wells at concentrations of 48.4 and 48.2 µg/L, respectively. No other metals were detected above MCLs. However, iron and manganese above their respective secondary maximum contaminant levels (SMCLs) of 300 µg/L and 50 µg/L were reported at 8 of 11 shallow Zone P3 monitor wells.

In the deep Zone P3 monitor well group, lead at 267 µg/L and thallium at 11 µg/L were observed at well M-3D at concentrations above their respective MCLs of 15 µg/L and 2 µg/L, respectively. Iron and manganese concentrations also exceeded SMCLs in ground water samples collected from the four deep Zone P3 monitor wells.

Dissolved TAL Metals

Ground water samples for dissolved TAL metals were collected from 13 of the 17 monitor wells present at the Site to assess potential effects to aquatic receptors associated with ground water discharge to Sandy Creek. Samples at wells MW-6 and MW-11 were not tested because of the presence of free-phase creosote. The ground water sample from well M-5, which was only recently located, was also not tested for dissolved metals.

Elevated levels of zinc exceeding Texas acute and chronic ambient water quality criteria were detected at existing monitor wells M-2D, M-2TD, M-3S and M-4D. The riser casing for these four wells is fabricated of carbon steel, which may be the source of zinc observed in these samples. Lead at 2.88 B µg/L was also detected at a concentration slightly higher than the 2.5 µg/L chronic criteria at well M-3S. The B data qualifier reported for the lead result indicates that the concentration is estimated.

General Water Quality Parameters

Laboratory analysis for general water quality parameters included testing for alkalinity, (total as CaCO3), chloride (Cl), nitrate (NO3-N), sulfate (SO4), sulfide (HS) and TOC. Comparisons made with these parameters between up-gradient and down-gradient well locations can provide natural attenuation indications for BTEX, PCP, and low molecular weight PAHs.

General water quality parameter analysis results show comparable levels between up-gradient well MW-5 and down-gradient wells MW-6, M-2S, and M-4s. However, one notable difference is evident; a sharp reduction in the sulfate concentration. At up-gradient well MW-5, a sulfate concentration of 27 mg/L was measured. At down-gradient well MW-6, located in the former process area, the sulfate concentration declines to 8.25 mg/L. At well M-2S, on the east side of the railroad track, the concentration declines to less than 1 mg/L and it remains at 1 mg/L between M-2S and M-4S. Coincident with the sulfate concentration decline is an increase in sulfide. Nitrate concentrations also decline in a pattern similar to that observed for sulfate. Collectively, this information indicates the presence of sulfate- and nitrate-reducing bacteria, which may be using dissolved BTEX, PCP, and low molecular weight PAHs in oxidation-reduction reactions.

Iron- and manganese-reducing bacteria are also expected to be present. However, because existing wells M-2S, M-2D, M-2TD, M-4S and M-4D are constructed with carbon steel riser casing, the water quality analysis results were not used to assess the significance of these processes.

Contaminant Migration

Following installation of the new SRI monitor wells in June 2006, a visual survey of Sandy Creek channel was performed. The survey, which extended approximately 100 feet upstream and 100 feet downstream of the FM 776 bridge, was possible due to the low water-level conditions present at the time. Visually stained sand, with a detectable creosote odor, was observed along the west bank of Sandy Creek along an approximate 100-foot reach downstream of the bridge, and at isolated locations upstream. These observations, in conjunction with the analysis results for MW-18 and the strong upward gradients observed at multilevel wells MW16 and MW17 indicate that the ground water contaminant plume is entering Sandy Creek in the vicinity of the FM776 bridge. Although just one round of sampling has been performed, the absence of PAHs at MW16 indicates no significant migration beyond Sandy Creek at this time.

Surface Water

Surface water samples were collected from a total of six locations as part of the RI. One sample was collected immediately at the inlet to the forested wetland as water enters through a culvert under the railroad track. Two samples were collected from the un-named tributary: one at its beginning at the culvert under Highway 776, and one as the tributary becomes a trickle in the cattle grazing field just before it drains into Sandy Creek. Two samples were collected from Sandy Creek: one upstream of the Site as a reference station, and one downstream to determine if there is a significant contribution of Site-related contaminants to the creek. One other sample was taken from Martin Dies Junior State Park to act as a reference for the sample in the wetland (Figure 5).

All surface water samples were analyzed for SVOCs. VOCs, metals, and dioxins were analyzed in a lower percentage of the samples. A summary of the nature and extent of contamination in surface water is presented below.

VOCs

Six VOCs were detected at estimated levels in the sample collected at the wetland inlet next to the railroad track. The detected constituents include acetone, benzene, ethylbenzene, chlorobenzene, o-xylene, and m,p-xylenes. The acetone is a common laboratory contaminant that is not associated with site activities, so the concentration is not likely Site-related. The other compounds are mostly associated with gasoline and most likely come from the railroad tracks and not the Site. No VOCs were detected in the Sandy Creek sample downstream of the Site or in the Sandy Creek or Martin Dies Junior State Park reference samples.

SVOCs

Fifteen PAHs were detected in surface water samples in the wetland and un-named tributary to Sandy Creek. In most cases, concentrations decrease by an order of magnitude as the samples progress further from the Site. Detected concentrations of TPAH concentration, the BaP TEQ concentration, and individual PAH constituent concentrations are all above the National Recommended Water Quality Criteria (NRWQC). Acenaphthene was the lone PAH detected in the Sandy Creek sample downstream of the Site and in the reference samples. PCP was also detected in the forested wetland and un-named tributary samples at concentrations above the NRWQC. PCP was not detected in Sandy Creek or the reference stations. Di-n-butyl phthalate is the only other SVOC detected at a station within the influence of the Site (Sandy Creek), and it is detected at a lower concentration than the Sandy Creek reference station.

Trace Metals

Fourteen metals were detected or estimated as detected within the wetland. Eleven were detected or estimated as detected in the Sandy Creek downstream sample. Concentrations decrease with distance from the Site. Concentrations from both samples downstream of the Site are slightly greater than concentrations at reference stations.

Dioxins

Concentrations of 13 individual dioxin and furan constituents were detected or estimated as detected in the forested wetland sample. Concentrations increased with increasing degree of chlorination. 1,2,3,4,6,7,8,9-octachlorodibenzodioxin was detected at the highest concentration (3.8 x 10-5 mg/L). The 2,3,7,8-TCDD TEQ for fish was 7.8 times the screening level. The 2,3,7,8-TCDD TEQ for humans was four orders of magnitude greater than the screening value. Concentrations are significantly lower at the downstream Sandy Creek station where only three individual dioxin and furan constituents were detected, and the concentrations of detected constituents are two orders of magnitude lower than concentrations in the wetland. The 2,3,7,8-TCDD TEQ for fish in the Sandy Creek sample is below the screening level. The 2,3,7,8-TCDD TEQ for humans is two orders of magnitude greater than the screening value. Concentrations in the Sandy Creek sample vary from the same to slightly greater than those for reference stations.

Sediment

Sediment samples were collected from a total of 18 locations as part of the RI (Figure 5). Nine samples were collected at surface level from the top 6 inches for use in the risk assessments. Samples from the other nine locations were all collected in the forested wetland at 1-foot intervals to help determine both the lateral and vertical extent of contamination within the wetland. The risk assessment samples can also be used to aid in the nature and extent investigation; however, the vertical extent will be limited to 6 inches. The risk assessment samples were all collected in the same locations described for surface water samples, with the addition of two more surface sediment samples in the main drainage channel of the wetland at its center, and just before it drains from the wetland into a culvert under Highway 776.

All sediment samples were analyzed for SVOCs. VOCs, metals, and dioxins were analyzed in a lower percentage of the samples. A summary of the nature and extent of contamination in sediment is presented below with respect to the primary contaminant indicators identified, as well as a discussion of the general contaminants detected.

VOCs

One VOC was detected and six others detected at estimated concentrations in the sample collected at the wetland inlet next to the railroad track. The detected constituents include acetone, ethylbenzene, o-xylene, m,p-xylenes, isopropylbenzene (cumene), methyl ethyl ketone, and toluene. The acetone, cumene, and methyl ethyl ketone are common laboratory contaminants that are not associated with Site activities, so the concentrations are not likely Site-related. The other compounds are mostly associated with gasoline and most likely come from the railroad tracks and not the Site. Three common laboratory contaminants (acetone, methylene chloride, and methyl ethyl ketone) were detected or estimated as detected in the un-named tributary. No VOCs were detected in the Sandy Creek sample downstream of the Site. Bromomethane was detected in the Sandy Creek reference sample. Methylene chloride, acetone, ethylbenzene and trichloroethylene were detected in the Martin Dies Junior State Park reference sample.

SVOCs

Concentrations of individual PAHs were detected or estimated as detected in most of the forested wetland samples and the un-named tributary samples. In general, concentrations are greatest in the 0 to 6-inch and 0 to 1-foot samples than at greater depths. The concentrations in the wetland are highest where water first flows into the wetland and decrease as the location moves away from the center channel. The extent of contamination appears to be as deep as 4 feet at the inlet of the wetland, down to 2 feet in the center channel, and at about 1 foot in areas away from the center channel.

Concentrations in the un-named tributary are highest in the middle of the tributary and lowest closest to Highway 776. The concentrations of TPAH and BaP TEQs are greater than the screening level in all of the 0 to 6-inch samples in the wetland and tributary, most of the 0 to 1-foot samples in the wetland, and a few of the 1- to 2-foot samples in the center of the wetland near the main channel.

Concentrations are significantly lower at the downstream Sandy Creek station, where only two individual PAH constituents are estimated as detected and the concentrations of the detected constituents are two orders of magnitude lower than concentrations in the un-named tributary. The concentrations of TPAH and BaP TEQs in the Sandy Creek sample are below the screening level. Concentrations in Sandy Creek are similar to those for reference stations.

PCP was detected or estimated as detected in all 0 to 6-inch and 0 to 1- foot samples in the wetland and un-named tributary. It was not detected at lower depths except at Station FW NE-08 near the inlet of the wetland. Detection limits of all NDs in these two areas were inadequate. All detected concentrations, estimated concentrations, and detection limits in these samples are above the screening value. Concentrations of PCP in Sandy Creek downstream of the Site and at the two reference locations are below the screening level.

Trace Metals

Nineteen of the twenty-two metals analyzed were detected or estimated as detected within at least one of the wetland samples. Eighteen of the twenty-two metals analyzed were detected or estimated as detected within at least one of the un-named tributary samples. Eleven metals were detected or estimated as detected in the Sandy Creek downstream sample. Concentrations are greatest in the middle of the wetland and are greater at the station next to Highway 776 than they are at the entrance to the wetland next to the railroad track. Concentrations in the wetland are at least an order of magnitude greater than concentrations at reference stations.

Concentrations in the un-named tributary are lowest in the middle of the tributary and highest closest to the creek. Concentrations at the station nearest the creek are similar in magnitude to those in the wetland near Highway 776. Concentrations in Sandy Creek downstream of the Site are only slightly greater than concentrations at the reference stations.

Dioxins

Concentrations of all 17 individual dioxin and furan constituents analyzed were detected or estimated as detected in at least one of the forested wetland samples and the un-named tributary samples. Concentration increases with increasing degree of chlorination. In general, concentrations are greater in the 0 to 6-inch samples than in the 1- to 2-foot samples. The concentrations in the wetland are higher with increasing distance from the railroad tracks. Concentrations in the un-named tributary are highest in the middle of the tributary and lowest closest to Sandy Creek. The 2,3,7,8-TCDD TEQ for humans was greater than the screening level in all of the 0 to 6-inch samples and in two of the 1- to 2-foot samples.

Concentrations are significantly lower at the downstream Sandy Creek station, where only six individual dioxin and furan constituents were detected and the concentrations of detected constituents are two orders of magnitude lower than concentrations in the un-named tributary and wetland. The 2,3,7,8-TCDD TEQ for humans in the Sandy Creek sample is below the screening level. Concentrations in Sandy Creek vary from the same to slightly greater than those for reference stations.

Aquatic Biota

Biota/fish tissue samples included benthic invertebrates (crayfish), forage fish (for example, green sunfish), and sport fish (for example, bass and catfish). The benthic invertebrate

and forage fish samples were analyzed as whole-body samples, with the intent of using the data in the ecological risk assessment. Only the fillets of the sport fish were analyzed, with the intent of using the data for the human health risk assessment. Biota samples were collected at the same upstream and downstream stations established on Sandy Creek where surface water and sediment samples were collected.

Insufficient sample volume was available to analyze a sport fish sample at the upstream reference location. All biota samples were analyzed for dioxins, metals, and SVOCs. VOCs were not analyzed in any of the biota samples collected from Sandy Creek. A summary of the nature and extent of contamination in biota is presented below with respect to the contaminant indicators identified, as well as a discussion of the general contaminants detected.

SVOCs

Four PAHs were detected or estimated as detected in the crayfish sample collected downstream of the Site. The TPAH concentration is greater than the screening value for benthic invertebrates. However, the detection limits of three ND PAHs are greater than the screening value, while detected concentrations are lower than the screening value, as are the detection limits of all other PAHs. Two PAHs were detected or estimated as detected in the sample from the reference area at concentrations greater than those from the sample downstream of the Site. Detection limits are all within range and the TPAH concentration is below the screening value. Thus, it is unlikely that PAH concentrations that have accumulated in benthic invertebrate tissue downstream of the Site are at concentrations that warrant concern.

Seven PAHs and PCP were detected or estimated as detected in the forage fish sample collected downstream of the Site. The TPAH concentration and PCP are both less than their respective screening values for fish. Concentrations in the sample upstream of the Site are similar in concentration with a slightly different list of detected constituents. It is unlikely that PAH or PCP concentrations that have accumulated in benthic invertebrate tissue downstream of the Site are at concentrations that warrant concern.

Two PAHs were estimated as detected in the fillet sample comprised of sport fish collected downstream of the Site. Individual PAH concentrations of detected constituents, detection limits of non-detected PAHs, and the TPAH concentration are all greater than the EPA Region 3 Risk-based Concentration (RBC). PCP was not detected and the detection limit is below the EPA Region 3 RBC. PAHs are not known to accumulate in fish tissue (TNRCC, 2001).

Trace Metals

Twelve metals were detected or estimated as detected in the crayfish sample collected downstream of the Site. Fourteen were detected or estimated as detected at the background station. Concentrations were slightly higher at the downstream station.

Ten metals were detected or estimated as detected in the forage fish sample collected downstream of the Site. Eleven were detected or estimated as detected at the background station. Concentrations were similar at both stations, with some metals being higher at the downstream station and some at the reference station.

Nine metals were detected or estimated as detected in the fillet sample comprised of sport fish collected downstream of the Site. Metals concentrations that have accumulated in fish fillet tissue downstream of the Site are not at concentrations that warrant concern.

Dioxins

Twelve individual dioxin and furan constituents were detected or estimated as detected in the crayfish sample collected downstream of the Site. Concentrations increased with increasing degree of chlorination. 1,2,3,4,6,7,8,9-octachlorodibenzodioxin was detected at the highest concentration (8.8 x 10-5 mg/kg). The 2,3,7,8-TCDD TEQ for fish is below the screening level. Thus, it is unlikely that dioxin concentrations that have accumulated in benthic invertebrate tissue downstream of the Site are at concentrations that warrant concern.

Twelve individual dioxin and furan constituents were detected or estimated as detected in the forage fish sample collected downstream of the site. Concentrations increased with increasing degree of chlorination. 1,2,3,4,6,7,8,9-octachlorodibenzodioxin was detected at the highest concentration (4.9 x 10-5 mg/kg). The 2,3,7,8-TCDD TEQ for fish is below the screening level. Thus, it is unlikely that dioxin concentrations that have accumulated in forage fish tissue downstream of the Site are at concentrations that warrant concern.

Five individual dioxin and furan constituents were detected or estimated as detected in the fillet sample comprised of sport fish collected downstream of the Site. The 2,3,7,8-TCDD TEQ for fish is slightly greater than the EPA Region 3 RBC at 1.3 times the value.

Bioassays

Several types of bioassays were conducted on samples from throughout the JCC Site with the intent of determining if Site concentrations are potentially toxic to lower trophic level organisms (that is, 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. 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.

Bioassay Results

The results of bioassays are determined by comparing recorded data from 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 JCC 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. All dilutions run from a given site were compared to the reference results using one-way statistical analysis (that is, if results were better for samples from onsite locations, the difference was not reported).

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, then 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.

The majority of the bioassays did not indicate toxicity. 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 were not used to define the nature and extent of contamination.

WASTE CELL MATERIAL STABILIZATION TESTING

A stabilization testing was conducted for the composite sample of visually contaminated material obtained between depths of 2 and 9.5 feet from the WC during the RI. 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 Portland cement alone could not reduce the leachability of PAHs and PCP unless GAC is added. To achieve 90% reduction of the leachability of PAHs and PCP, a minimum of 8% GAC has to be added into the contaminated soil.

GEOLOGIC CONCEPTUAL SITE MODEL

A geologic conceptual Site model (GCSM), as shown in Figure 7, 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 of 150 feet. The subsurface geology was grouped into three primary strata identified as permeable zone P1, low-permeability zone I2, and permeable zone P3. Zone I2 is discontinuous east of the process area at the drainage ditch and is absent down-gradient of the Site at the area south of Highway 766, where the Zone P1 and Zone P3 are merged. Since the ground water levels are normally higher than the bottom elevations of Sandy Creek, the top few feet of ground water discharges directly into Sandy Creek.

Free phase NAPL was observed at monitor wells MW-6 and MW-11 during the RI sampling event. The absence of creosote in soil samples collected from ground surface to depths of 31.5 feet at MW-6 and 29 feet at MW-11, in conjunction with observation made by EPA's On-Scene Coordinator during the 2005 removal action, indicates that free-phase creosote observed at these two monitor well locations during the RI originated from the lateral spreading of creosote discharged to the drainage ditch. The discontinuity in Zone I2 or "window" present in the drainage ditch between borings DD-01 and DD-04 most likely facilitated free-phase creosote entry from Zone P1 to Zone P3.

CURRENT AND FUTURE LAND AND GROUND WATER USES

LAND USES

The Site is currently vacant. Process buildings and all the wood treating equipment was removed from the Site during the 1996 EPA removal action. The 2005 EPA removal action constructed a RCRA containment cell (RCC) onsite. Two offsite properties to the east of the Site

have been impacted by Site contaminants. One property is the BNSF railroad. The other property, owned by Louisiana Pacific Corporation (LP), was operated as commercial property, and is currently not active. 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 and related offsite areas to the east will be limited to industrial and/or commercial use after completion of the remedial action. The City of Jasper currently intended future use of the Site to be an industrial railroad park. The surrounding property use is residential. Sandy Creek can be utilized for recreational use.

GROUND WATER USES

The Site lies in the area where the Jasper aquifer outcrops, or intersects the ground surface. The geologic strata underlying the Site are comprised of clay, silt, sand and small gravel extending to depths up to 150 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 Zone P1, Zone I2, and Zone P3. Zone I2 is absent in some of the down-gradient areas from the Site.

The Jasper Aquifer serves as the primary water supply for the towns of Jasper and Newton, Texas. Based on a search of Texas Water Development Board (TWDB) records, there are no known drinking water wells within a 0.5-mile radius of the Site. Between 0.5 and approximately 1.0 mile, there are eight drinking water wells, six of which are reported to be inactive. The depth of these wells ranges from 581 feet to 1353 feet bgs. The well closest to the Site, the City of Jasper municipal well CWA-6 is located 3800 feet (0.72 mile) to the southeast. This well draws water from depths between 416 and 767 feet below ground surface and is currently active. An additional 19 water wells are located between 1.0 and 4.0 miles from the Site. These wells range in depth from 22 feet to 640 feet bgs. All of the wells within the 4-mile radius of the JCC facility draw ground water from the Jasper Aquifer. The door-to-door survey conducted during the SRI confirmed no residential use of the ground water between the Site and the City of Jasper municipal well CWA-6.

Based on the well log search and information acquired from the RI and SRI, a resource classification for Zone P1 and Zone P3 ground water was performed following the guidelines described in Ground water Classification-RG-366/TRRP-8 (Texas Commission on Environmental Quality, March 2003). The information compiled from this effort indicates a Class II determination for Zones P1 and P3. This classification is similar to the Class IIB - future drinking

water source determination obtained through Guidelines for Ground-Water Classification Under the EPA Ground-Water Protection Strategy (EPA, 1986).

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 and updated by the onsite residential surface soil data and the wetland sediment, plant tissue, and toxicity data collected during the 2006 SRI 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 and SRI 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, six exposure areas (EAs) and associated media were identified for further evaluation in the HHRA and BERA:

- Upland former process area soil
- Drainage ditch soil
- Forested wetland soil/sediment and surface water
- Un-named tributary soil/sediment and surface water
- Sandy Creek sediment and surface water
- 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 on the existing and future land use classifications. The upland area and drainage ditch are classified as industrial and will continue to be so in the future; thus, the industrial worker was selected as the representative receptor for these EAs.

The assessment of risk for a future industrial worker encompasses the risk to a current recreational user or trespasser. The forested wetland property is owned by LP. It is not currently used for industrial purposes and does not contain any habitable buildings. The existing use is expected to remain constant in the future; thus, an adolescent recreator was deemed the most appropriate receptor for evaluation at the forested wetland. The un-named tributary is a 10 foot-wide shallow drainage channel located partly on land abutting a scrap metal recycling facility

on Highway 776 and partly on a privately owned cattle grazing area. The existing land use is not expected to change. Hence, the adolescent recreator was deemed the most appropriate receptor for evaluation. Sandy Creek feeds into a listed water of the State of Texas (Segment) designated for recreational use including the consumption of fish, and into a public fishing pond in the town of Jasper. Hence, the adolescent recreator was selected as the appropriate receptor for evaluation of risk in Sandy Creek.

Ecological

The BERA focused on particular species recommended to represent the feeding guilds found within different foodwebs present within each EA. In most cases, the same feeding guilds are found within multiple foodwebs that overlap within EAs. The feeding guilds include 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 (USFWS), none are present in the vicinity of the Site.

COMPLETE EXPOSURE PATHWAYS AND CONCEPTUAL MODEL

Figure 8 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, surface water leaching to ground water, and ground water discharging into Sandy Creek surface 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 (EPA, 2004b).

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 complete EAs except ground water. Point estimates were also calculated in the upland area for human health, but not ecological exposure. EPCs for complete exposure areas were generated via the program ProUCL Version 3.0. In the drainage ditch, un-named tributary, and Sandy Creek, EPCs represent maximum concentrations because only a limited number of samples were collected from the depth of soil to which receptors are exposed. EPCs for VOCs and some metals in the upland and forested wetland also utilized maximum detected concentrations based on the number of samples collected and detected.

Ground water EPCs for the HHRA used the group of wells at the center of the ground water plume as a subset from which to develop the EPCs. For the BERA, concentrations from the two wells closest to Sandy Creek in the southeast and northeast direction were considered individually.

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, 2003b) outlines using the toxicity information and toxicity values in the Integrated Risk Information System (IRIS; EPA, 2004c) 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.

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 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 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 PAHs. 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 from wells onsite were evaluated to better understand the potential for 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, and dioxins. The receptors evaluated and those identified as being potentially at risk varies between the EAs. Table 2 presents a summary of unacceptable risk identified 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 above 1×10^{-6}. There is no evidence of metals being associated with any Site related activities or processes, thus for marginal risks from metals in soil (i.e., HQs between 3 and 10) remedial actions were not considered necessary.

All other constituents can also, with reasonable confidence, be excluded from further risk assessment. In summary the risk conclusions by EA are:

- Sandy Creek presented no risk to human health or ecological receptors.
- The un-named tributary presented no risk to human health or ecological receptors.
- The drainage ditch presented risk to both human health and ecological receptors from PAHs, dioxins, carbazole, dibenzofuran, 4,6-dinitro-2-methylphenol, and PCP.
- The forested wetland presented risk to both human health and ecological receptors from PAHs, dioxins, carbazole, and PCP. However, re-evaluation of the sediment data collected during the SRI reveals that the remaining ecological risk posed by the wetland sediment, after completion of the 2005 EPA removal action, is acceptable.
- The upland process area presented risk to human health from PAHs and dioxins.
- Ground water presented risk to human health from PAHs, dioxins, carbazole, benzene, and PCP. There is also potential future risk to ecological receptors in Sandy Creek based on the comparison of ground water data to surface water screening values.

A non-cancer risk from mercury (HQ=3) was calculated for an adolescent recreator consuming fish from Sandy Creek; however, this risk is not considered genuine for the reason previously described and for two other reasons. First, the calculation was overly conservative in assuming all the mercury was methylated, which is unlikely. Second, and more importantly, the entire watershed upstream of the site, including Sam Rayburn Reservoir, is elevated in mercury as recently reported by the Texas Department of Health (2004), and therefore is deemed not Site-related.

RISK MANAGEMENT

Overall, Sandy Creek presented no risk to human health and ecological receptors. However, there is current and potential risk to human health and ecological receptors in the drainage ditch and forested wetland, as well as to human health in the upland former process area and ground water. Because these risks remain after completion of the uncertainty analysis, these compounds are considered COCs instead of 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.

It is the EPA's current judgment that the selected remedy identified in this ROD is necessary to protect public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment.

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

Contaminant of Potential Concern	Upland	Drainage Ditch	Forested Wetland	Unnamed Tributary	Sandy Creek
Human Health Risks					
Outdoor Worker	PAHs 2E-04 at SO-11 1E-04 at SO-24	PAHs, Diox 3.9E-04	IP	IP	IP
Adolescent Trespasser - SED	IP	IP	NH	NH	NH
Adolescent Trespasser - SW	IP	IP	PAH, Diox, PCP 1.5E-04	NH	NH
Adult Resident - GW	Carb, PAHs, PCP, Benz 4E-02 535	Carb, PAHs, PCP, Benz 4E-02 535	Carb, PAHs, PCP, Benz 4E-02 535	Carb, PAHs, PCP, Benz 4E-02 535	IP
Child Resident - GW	Carb, PAHs, PCP,Benz 2E-02 3600	Carb, PAHs, PCP,Benz 2E-02 3600	Carb, PAHs, PCP,Benz 2E-02 3600	Carb, PAHs, PCP,Benz 2E-02 3600	IP
Ecological Risks					
American Woodcock	NH	NH	PCP 1.3	NH	IP
American Kestrel	NH	NH	NH	NH	IP
Northern Bobwhite Quail	NH	NH	NH	NH	IP
Deer Mouse	NH	Diox 3.1	Diox, PAHs 1.7	NH	IP
Nine-banded Armadillo	NH	NH	Carb 1.4	NH	IP
Red Fox	NH	NH	NH	NH	IP
Mink	NH	NH	NH	NH	NH
Green Heron	IP	IP	IP	IP	NH
Belted Kingfisher	IP	IP	IP	IP	NH
Terrestrial Plants and Invertebrates	NH	Carb, Diox, PAHs, PCP 57333	IP	IP	IP
Wetland Plants	NH	NH	NH	NH	NH
Benthic Invertebrates	NH	NH	PAHs 9584	NH	NH
Fish	IP	IP	IP	IP	NH

Notes:

* For soil and sediment, the risk levels represent the site conditions prior to the 2005 EPA removal action.
Diox = dioxins and furans as 2,3,7,8-TCDD toxicity equivalents
Carb = carbazole
benz = benzene
PAHs = polycyclic aromatic hydrocarbons
PCP = pentachlorophenol

IP	= Incomplete pathway
NH	= Risk determined to be below applicable risk hazard quotients concluding no harm to the receptor in the AOC.

REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

Remedial action objectives (RAOs) were developed for the JCC 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 current and potential future unacceptable human health and environmental risks. The PRGs for the contaminated media are summarized in Table 3. *These media cleanup levels attain the EPA's risk management goal for remedial actions and have been determined by the EPA to be protective.* The basis for determination of the PRGs for each of the contaminated media is discussed in the following subsections.

Soil PRGs

PRGs were developed for surface soil to protect human and ecological receptors from direct exposure to the contaminated surface soil posing unacceptable risk (e.g. direct contact PRGs) and for surface and subsurface soil to protect ground water (e.g. GWP-PRGs). The basis for determination of the direct contact PRGs and GWP-PRGs is discussed below.

Direct Contact PRGs

It is currently anticipated that future land use at the Site is likely to be commercial and/or industrial. This includes the drainage ditch adjacent to the Site. Unacceptable human health risks (total risk $>1.0 \times 10^{-4}$) are present in two small upland areas and in the main drainage from the bluff to the drainage ditch below. The PRGs determined for the upland process area and drainage ditch are therefore derived from risk-based concentrations developed for an onsite worker exposure scenario. Nine chemical constituents are identified as the primary human health COCs in the upland process area and drainage ditch surface soil, based on their toxicity, risks, and distribution throughout the area. The human health COCs include arsenic, 6 CPAHs, and dioxin [or 2,3,7,8-TCDD (TEQ)]. In addition to the human health COCs, dioxin was also detected at concentration levels posing unacceptable risk for the ecological receptors.

Direct contact soil PRGs for the human health COCs were established to protect onsite industrial workers by back-calculating from the risk estimates described in the HHRA to define the soil concentration 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 human health risk assessment calculation.

An ecological PRG was developed for 2,3,7,8-TCDD (TEQ) for protection of herbivorous mammals feeding onsite. The PRG was developed by taking the toxicological reference value (TRV) of 2,3,7,8-TCDD (TEQ) known to cause adverse effects and dividing it by the total dose from the site-specific risk estimates (HQs) and factoring out the Site-specific soil exposure concentrations used in those estimates. The resulting value is the soil concentration that would represent an excessive risk, and that value was assigned as the PRG. A lower range PRG was established by using a no-effect level TRV (highest concentration at which no effects were observed) as a starting point and an upper-range PRG was established by using a lowest-effect level TRV (lowest concentration at which an effect was observed) as a starting point. The final PRG was the average of the no-effect and lowest-effect level PRGs as allowed in EPA guidance and recommended in TCEQ guidance document.

The lower values of the soil direct contact PRGs for protection of both human health and the ecological receptors were selected as the final soil direct contact PRGs.

Soil to Ground Water Protection PRGs (GWP-PRGs)

GWP-PRGs were developed to ensure that the leaching of COCs from contaminated soils (including soils at the upland process, drainage ditch, and wetland areas) into ground water would not result in an increase of COC concentrations within the existing ground water plume. The GWP-PRGs were calculated based on the higher values of the representative ground water COC concentrations used for HHRA at the exposure point or the ground water PRGs (if a GW-PRG is higher than the representative ground water COC concentration used for HHRA at the exposure point), the published chemical specific soil-water partitioning coefficients, and the soil/water partition equation provided in EPA's guidance document entitled "Soil Screening Guidance: User's Guide".

Since Site specific information is not available to calculate the dilution attenuation factor (DAF), the 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 GWP-PRG calculation. The TRRP Tier

1 default soil parameters 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 GWP-PRGs were not developed for the metals identified as ground water COCs because the metals were detected in the soil samples at concentrations below the EPA Region 6 MSSLs except arsenic. Arsenic was detected in only one surface soil sample at a concentration (8.04 mg/kg) slightly above the Texas specific background concentration of 5.9 mg/kg.

Surface and Subsurface Soil PRGs

Since direct contact and soil to ground water are the two major exposure pathways of concern for the contaminated surface soil, the surface soil PRGs were determined by selecting the lower values of direct contact PRGs and GWP-PRGs. The GWP-PRGs were selected as the subsurface soil PRGs because soil to ground water is the only exposure pathway of concern for subsurface soil. The surface and subsurface soil PRGs are provided in Table 3.

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 22 chemical constituents are identified as the primary human health COCs in the ground water, based on their toxicity, risks, and distribution in ground water. The COCs, as listed in Table 3, include 4 metals, 2 VOCs, and 16 SVOCs. Since ground water is a future potential drinking water source, the ground water 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.

Surface Water PRGs

The results of the human health and ecological assessment indicate that COCs in the wetland surface water pose unacceptable risks to human health and ecological receptors and migration of COCs from Zone P1/P3 ground water will potentially impact Sandy Creek surface water quality. Since the wetland surface water will eventually discharge into Sandy Creek, the surface water PRGs were developed based on the guidelines provided in TSWQS (30 TAC §307) to ensure protection of human health and ecological receptors in both the wetland area and Sandy 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 the Wetland Area

In the initial ecological risk assessment conducted prior to the 2005 EPA removal action, potential unacceptable ecological risks were identified in the sediment located at the south portion of the wetland. Re-evaluation of the data collected, after removal of the source material from the drainage ditch and the wetland water inlet area in the 2005 EPA removal action, reveals that the wetland sediment does not pose any potential unacceptable risk to the ecological receptors. Therefore, it is not necessary to develop PRGs for sediment in the wetland area.

Ground Water to Surface Water PRGs

As indicated in the GCSM (Figure 7), ground water from the Site discharges into Sandy Creek at the locations approximately 1,000 to 1,200 feet down-gradient of the Site. Although unacceptable human health and ecological risks were not identified in Sandy Creek surface water and sediment, there is a potential future risk to human and ecological receptors in Sandy 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 Sandy Creek, a base flow rate of 15 cubic feet per second (cfs) measured in 1983 indicates 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.

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

COCs	Surface Soil PRG (mg/kg)	Subsurface Soil to Ground water PRG (mg/kg)	Ground water PRG (µg/L)	Surface Water PRG (µg/L)	Ground Water to Surface Water PRG (µg/L)
Metals					
Arsenic	NA	NA	10*	NA	NA
Iron	NA	NA	4240	NA	NA
Thallium	NA	NA	2*	NA	NA
Vanadium	NA	NA	14	NA	NA
PAHs					
Acenaphthene	34	34	130	23	153
Benzo(a)anthracene	21	34	0.085	0.81	5.4
Benzo(a)pyrene	2.1	92	0.2*	0.014	0.093
Benzo(b)fluoranthene	21	115	0.05	0.014	0.093
Benzo(k)fluoranthene	210	295	12	0.014	0.093
Chrysene	52	52	8.5	7	46.7
Dibenz(a,h)anthracene	2.1	183	0.12	0.18	1.2
Indeno(1,2,3-c,d)pyrene	21	333	0.05	0.014	0.093
Naphthalene	240	240	100	250	1,667
Phenanthrene	82	82	290	30	200
Others					
2,4-Dimethylphenol	4.2	4.2	250	105	700
2-Methylnaphthalene	76	76	57	63	420
Benzene	0.21	0.21	5*	106	707
Carbazole	21	21	43	56.8	379
Cresols, M- & P-	3.6	3.6	710	272	1813
Dibenzofuran	47	47	4.3	74	493
Pentachlorophenol	6.2	6.2	1*	5.23	34.9
Xylene, M- & P-	61	61	10,000*	1340	8,933
2,3,7,8-TCDD (TEQ)	0.00052	NA	NA	NA	NA

Notes:

NA: Not Applicable (not a COC for the medium)

*: The PRG is MCL.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) were developed for the Jasper 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. The Remedial Action Objectives were developed based on the following:

- The reasonable anticipated land use scenario is based on the future redevelopment of this vacant Site for industrial or commercial use, consistent with the City of Jasper redevelopment plans, LP's land use plans and the BNSF railroad land use plans;
- Potential ecological risks will not be a factor because the future planned industrial use will likely not support an ecological habitat, with the exception of the wetland area.

The remedial action objectives for this Site are:

- **RAO No. 1** - Prevent direct human (industrial site workers) contact with surface soil containing COCs at concentrations exceeding the surface soil PRGs provided in Table 3.
- **RAO No. 2 -** Prevent leaching of COCs from the surface and subsurface soil containing COCs at concentrations exceeding the respective PRGs, as provided in Table 3, into ground water and resulting in an increase of the COC concentrations within the existing ground water plume.
- **RAO No. 3 -** Prevent exposure to ground water containing COCs at concentrations exceeding the ground water PRGs provided in Table 3, and reduce the quantity of NAPL identified in the saturated zone to the extent practicable.
- **RAO No. 4**- Prevent plume expansion and prevent migration of COCs from ground water into Sandy Creek surface water and resulting in the surface water COC concentrations exceeding the surface water PRGs provided in Table 3.
- **RAO No. 5** - Prevent direct human (adolescent recreators) contact with the wetland surface water and prevent discharge of water containing COCs at concentrations exceeding the surface water PRGs into Sandy Creek.

OCCURRENCE AND VOLUME OF AFFECTED MEDIA ABOVE PRGS

Contaminated environmental media that pose unacceptable risks to human health and the environment includes surface and subsurface soil in the upland area and drainage ditch, surface water and sediment in the wetland area, and ground water adjacent to and down gradient of the Site. Preliminary estimates of the quantity of contaminated media have been prepared 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.

Preliminary estimates of the quantity of contaminated media are summarized in Table 4 and discussed in the following paragraphs.

TABLE 4
Estimated Volumes of Soil and Sediment PRG Exceedences
Jasper Creosoting Company - Jasper, Texas

Contaminated Area	Area Size (SF)	Average Thickness (ft)	Volume (CY)
Surface Soil PRG Exceedences			
Process Area	23,000	2	1,700
Drainage Ditch	15,500	2	1,100
Temporary Waste Cell	NA	NA	NA
Estimated Total Surface Soil PRG Exceedence Volume (CY)			***2,800***
Subsurface Soil PRG Exceedences			
Process Area	7,300	12.5	3,400
Drainage Ditch	15,500	13	7,500
Temporary Waste Cell	NA	NA	14,300
Estimated Total Subsurface Soil PRG Exceedence Volume (CY)			***25,200***
Wetland Sediment PRG Exceedences			
Sediment Containing Creosote (Wetland Water Inlet Area)	5,000	4	740
Estimated Total Soil and Sediment PRG Exceedence Volume (CY)			***28,740***

Soil PRG Exceedences

The volume of the contaminated soil with COC concentrations exceeding the surface soil PRGs for direct contact and soil PRGs for ground water protection 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.

Surface soil data collected during the RI was compared to the surface soil PRGs to identify the area with COC concentrations above acceptable levels. Surface soil PRG exceedences were identified along the entire drainage ditch. Two areas containing surface soil PRG exceedences were also identified in the former process area at locations adjacent to the drainage ditch.

Since the horizontal extent of the COCs have not been fully delineated in the drainage ditch, the following assumptions are made, based on the field observations and soil analytical results, to determine the volume of the soil PRG exceedences in the drainage ditch:

- The total length of the drainage ditch associated with the surface and subsurface soil PRG exceedences is about 1650 feet;
- The average width of the drainage ditch associated with the surface and subsurface soil PRG exceedences is approximately 10 feet.

The subsurface soil PRG exceedences were determined by comparing the subsurface soil data collected during the RI and EE/CA with the subsurface soil PRGs developed for ground water protection. The subsurface soil PRG exceedences were identified along the entire drainage ditch and within the process area at a location adjacent to the drainage ditch. The average thickness of the subsurface soil PRG exceedences in the process area is approximately 12.5 feet (2 to 14.5 feet bgs) and in the drainage ditch is approximately 13 feet (2 to 15 feet bgs).

According to the EE/CA, the contaminated soil disposed of in the temporary WC contains COCs at concentrations exceeding the subsurface soil PRGs. The estimated contaminated soil volume in the WC is approximately 14,300 cubic yards (CY).

The estimated surface and subsurface soil PRG exceedence volumes are summarized in Table 4. The total soil PRG exceedence volume is approximately 29,000 (CY).

Wetland Sediment Containing Creosote

Heavy phase creosote contaminated sediment was observed in the wetland at the location where surface water enters from the drainage ditch into the wetland. This heavy phase creosote contaminated sediment, which is referred to as the wetland water inlet area, encompasses an area of approximately 5,000 SF. The visible creosote contamination is approximately 4 feet below ground surface. The estimated total creosote contaminated sediment is approximately 740 CY.

Ground Water PRG Exceedences

Ground water PRG exceedences were observed during the RI at 9 monitor wells locations within and southeast of the process area. The 9 locations include MW-06, MW-11, MW-09, M-2S, M-2D, M-4S, MW-14, MW-15S, and MW-15 with the highest COC concentrations detected in the samples collected from MW-06 and MW-11, where free phase creosote (NAPL) was observed.

The boundary of the ground water PRG exceedences has been defined by wells MW-05 and MW-12 in the north, by wells M-3D/M-3S and M-5/M-5S in the west, by wells MW-16 and MW-17 in the south, and by wells MW-08 and MW-13 in the east. The size of the PRG exceedences is approximately 12 acres. The depth of the ground water PRG exceedence is less than 90 feet bgs at monitor wells M-2TD and MW-15 and less than 69 feet bgs at monitor wells M-4D and MW-14. Therefore, it is reasonable to assume that the vertical boundary of the ground water PRG exceedence is defined by the bottom of the Zone P3 (approximately 150 feet bgs at the former process area and 130 feet bgs east of the former process area). Free phase NAPL was encountered during installation of monitor wells MW-06 and MW-11 and during excavation of the drainage ditch. The extent of the free phase NAPL was not completely defined during the RI and SRI, and will be defined in the design investigation which will be conducted prior to beginning the remedial action.

Contaminated Surface Water in the Wetland Area

COCs were detected at concentrations exceeding the surface water PRGs in the surface water sample collected from the wetland water inlet area. Since the wetland area is a seasonal wetland and surface water level varies significantly between the dry and wet seasons, surface water may not be encountered if the remedy is implemented during the dry season. To facilitate the Site remediation, any surface water that contacts the creosote contaminated soil or sediment is assumed to be in exceedence of surface water PRGs, and will be treated, prior to discharge, to meet the surface water PRGs.

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 similar contaminated soil at the Hart Creosote Company Superfund Site;
- 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 at the JCC Site 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

Remedial alternatives for contaminated soil and sediment were first developed based on the RI findings in the original RI/FS. To address the immediate threat posed by the source materials in the drainage ditch and the wetland surface water inlet area, EPA conducted a removal action between July 2005 and March 2006 and implemented Alternative S-3 described below. The component of monitored natural attenuation (MNA) for the wetland sediment is eliminated from the original alternative description because the residual COCs remaining in the wetland sediment, after completion of the 2005 EPA removal action, do not pose unacceptable risks to human health and ecological receptors.

Alternative S-1: No Further Action
Estimated Total Capital Cost: $0
Estimated Total O&M Costs: $0
Estimated Total Periodic Costs: $43,000
Estimated Total Present Worth: $43,000

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 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: Institutional Controls
Estimated Total Capital Cost: $244,000
Estimated Total O&M Cost: $89,000
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $376,000
Time Needed to Implement Remedy: 3 to 6 months

Alternative S-2 would include implementation of institutional controls for soil, sediment, and surface water containing COCs exceeding human health PRGs. The RAOs are met with this

alternative through access restrictions and land use restrictions. This alternative would not allow for future industrial use of the property since contamination and exposure pathways would remain onsite. The main components of this alternative are discussed below.

Access Restrictions

Since the contaminated surface soil in the drainage ditch area poses unacceptable risks to human health, a fence would be installed along the boundary of the surface soil PRG exceedences to prevent direct contact with the PRG exceedences. In addition to the drainage ditch, the creosote contaminated sediment identified in the wetland water inlet area would also be fenced to prevent direct contact. The existing fence surrounding the temporary WC would be maintained to prevent access to the waste in the WC.

Land Use Restrictions

Under this alternative, a land use control with the property owner or the City of Jasper (onsite) and/or BNSF railroad (offsite) would be required for the former process area and drainage ditch to limit future land use. Placement of a land use control with LP would be required to prevent disturbance of the soil/sediment within the wetland area without proper controls.

Alternative S-3: Excavation and Disposal of PRG Exceedences in an Onsite RCRA Containment Cell (RCC)
Estimated Total Capital Cost: $3,874,000
Estimated Total O&M Cost: $390,000
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $4,307,000
Time Needed to Implement Remedy: 6 to 12 months

Alternative S-3 would include excavating contaminated soil containing COCs exceeding the human health PRGs in the WC, former process area, drainage ditch, and the creosote contaminated sediment in the wetland water inlet area; disposal of excavated soil/sediment in an onsite RCRA containment cell (the cell would be designed to meet RCRA subtitle C landfill requirements); backfilling the excavations with clean soil or soils below the PRGs and re-vegetating the backfilled areas; and monitored natural attenuation for the remaining ecological PRG exceedences in the wetland area. This alternative also includes removing and treating contaminated surface water in the wetland area with granular activated carbon (GAC) prior to discharge into Sandy Creek if the alternative is implemented during the wet season. The main components of this alternative are discussed below.

Excavation and Onsite Disposal

The contaminated soil/sediment to be excavated would include all visually contaminated soil in the WC, the surface and subsurface soil PRG exceedences identified in the former process area and drainage ditch, and the wetland water inlet area. The initial estimate of the total volume of soil/sediment to be removed is approximately 29,000 CY.

The excavated soil/sediment would be disposed into an onsite RCRA containment cell (RCC) designed 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 would be conducted within the area of contamination (Preamble to the NCP, 55FR 8758-8760, March 8, 1990).

Construction of an Onsite RCRA Containment Cell

Under this alternative, an onsite RCC would be constructed in the process area south of the WC to contain all of the soil/sediment excavated from the Site. The RCC, which consists of a multilayered artificial liner, a leachate collection system, and a multilayered landfill cap, would be designed to have a capacity of approximately 35,000 CY. This volume allows for disposal of 29,000 CY from the above areas, a swell factor of 10-percent and a 10-percent contingency in the event additional material exceeding human health PRGs is discovered during remedial action confirmation sampling.

Backfill and Re-vegetation

Upon complete removal of the contaminated soil/sediments from the designated areas, the excavated areas would be backfilled with the soil (exclude the PRG exceedences) generated during construction of the RCC and clean soil from offsite sources. The backfilled areas would be placed with a 6-inch topsoil layer and seeded with grass to prevent erosion.

Institutional Controls

Because principal and low threat waste material would be left onsite, institutional controls (ICs), including access restrictions and land use restrictions, would be required to prevent breaching of the RCC cover and for future industrial development of the Site. The ICs required for the Site soil and sediment are further identified in the selected remedy section below.

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 is included in the ground water remedial alternatives described below.

Alternative S-4: Excavation, Thermal Desorption and Offsite Disposal
Estimated Total Capital Cost: $15,391,000
Estimated Total O&M Cost: $0
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $15,434,000
Time Needed to Implement Remedy: 1 year

Alternative S-4 would be the same as Alternative S-3 with the exception that the excavated soil/sediment PRG exceedences would 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 would 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.

Alternative S-5: Excavation, Thermal Desorption, and Reuse
Estimated Total Capital Cost: $9,238,000
Estimated Total O&M Cost: $0
Estimated Total Periodic Cost: $43,000
Estimated Total Present Worth: $9,281,000
Time Needed to Implement Remedy: 1 year

Alternative S-5 would be the same as Alternative S-4 with the exception that the excavated soil/sediment PRG exceedences would 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
Jasper Creosoting Company - Jasper, Texas

COCs	Surface Soil PRGs (mg/kg)	Subsurface Soil PRGs (mg/kg)	LDRs (mg/kg)

2,4-Dimethylphenol	4.2	4.2	140
2-Methylnaphthalene	76	76	NA
Acenaphthene	34	34	34
Benzene	0.21	0.21	100
Benzo(a)anthracene	21	34	34
Benzo(a)pyrene	2.1	92	34
Benzo(b)fluoranthene	21	115	68
Benzo(k)fluoranthene	210	295	68
Carbazole	21	21	NA
Chrysene	52	52	34
Cresols, M- & P-	3.6	3.6	56
Dibenz(a,h)anthracene	2.1	183	82
Dibenzofuran	47	47	0.1
Indeno(1,2,3-c,d)pyrene	21	333	34
Naphthalene	240	240	56
Pentachlorophenol	6.2	6.2	74
Phenanthrene	82	82	56
Xylene, M- & P-	61	61	300
2,3,7,8-TCDD (TEQ)	0.00052	--	0.1

Notes:

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 P1, I2 and P3), 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.

Alternative G-2: Institutional Controls and Monitored Natural Attenuation
Estimated Total Capital Cost: $710,000
Estimated Total LTRA Cost: $0
Estimated Total O&M Cost: $1,472,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $2,247,000

Alternative G-2 includes applying a TI waiver for the TIZ, implementing ICs for a designated PMZ to restrict future 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 12 acres, is defined horizontally by monitor wells MW-05 and MW-12 in the north, by monitor wells M-3S/M-3D and M-5s/M-5 in the west, by monitor wells MW-08 and MW-13 in the east, and by monitor wells MW-16 and MW-17 in the south direction. The TIZ is defined depth-wise as the ground water found in the Zones P1 and P3 from the ground surface to approximately 150 feet below ground surface (bgs).

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. A restrictive

covenant or governmental ordinance will reduce the potential exposure pathway by preventing construction of water supply wells within the PMZ and a deed notice will reduce the potential exposure pathway by providing public with notice.

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 contaminated ground water is managed within the PMZ.

Alternative G-3: Institutional Controls and NAPL Removal
Estimated Total Capital Cost: $2,397,000
Estimated Total LTRA Cost: $2,731,000
Estimated Total O&M Cost: $506,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $5,681,000

Alternative G-3 is identical to G-2 with the addition of a NAPL recovery system as discussed below.

NAPL Removal

Under this alternative, free-phase and residual NAPL identified within the NAPL source 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 the Site. The extent of the NAPL source area will be determined during the remedial design investigation. 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: $2,896,000
Estimated Total LTRA Cost: $3,634,000
Estimated Total O&M Cost: $1,281,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $7,876,000

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 and/or prevent the discharge of ground water containing COCs at concentrations exceeding the ground water to surface water PRGs (as provided in Table 3) into Sandy Creek if future investigation work determines that the plume is expanding or the discharge of the contaminated ground water will potentially impact the Sandy Creek surface water quality.

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 Sandy 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 Sandy Creek.

Alternative G-5: NAPL Removal, Plume Containment and Enhanced In-Situ Bio-treatment
Estimated Total Capital Cost: $3,097,000
Estimated Total LTRA Cost: $4,250,000
Estimated Total O&M Cost: $1,282,000
Estimated Total Periodic Cost: $65,000
Estimated Total Present Worth: $8,694,000

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 and S-2, 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 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. Alternative S-3 would also provide adequate protection from exposure; however, perpetual maintenance of the RCC and institutional controls would be required to ensure long-term protectiveness. Alternatives S-3, S-4, and S-5 are equally protective of human health and the environment in terms of meeting the RAOs and site-specific PRGs for the soil/sediment contamination.

All three alternatives would prevent inhalation, ingestion, or direct contact with human carcinogens in excess of established risk levels, and would significantly reduce the potential long-term impacts to ground water. Removal of contaminant sources from the drainage ditch and wetland water inlet area should lessen future contaminant loading enabling natural attenuation processes to reduce the concentrations of the residual COCs remaining in the wetland sediment.

Alternative S-2 provides protection for human health but not the environment. Access restriction and administrative controls would prevent inhalation, ingestion, or direct contact with human carcinogens in excess of established risk levels; however it would not reduce the transport of COCs into the environment through infiltration, volatilization, and storm water runoff.

Protection of human health and the environment is not provided by Alternative S-1. Levels of contaminants and existing 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, and the potential

for discharge of ground water containing COCs exceeding ground water to surface water PRGs into Sandy Creek. Under current Site conditions, there is no known water well within the plume and the COC concentrations in the ground water samples collected immediately up-gradient of Sandy Creek are below the ground water to surface water PRGs. Therefore, 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 enforced, 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) 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 and preventing discharge of ground water containing COCs at concentrations exceeding ground water to surface water PRGs into Sandy Creek following remedy implementation. By limiting COC migration, Alternatives G-4 and G-5 prevent further degradation of the down-gradient surface water and/or ground water and thus protect the environment. Alternative G-3 would achieve RAOs relative to surface water protection 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 for surface water protection 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 JCC Site.

Soil and Sediment Alternatives

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. Alternative S-2 would comply with the human health PRGs, but it would not comply with the ecological PRGs as the institutional controls can prevent human exposure but can not prevent ecological exposure to the contaminated media containing PRG exceedences. The remaining alternatives can be designed and implemented to achieve the contaminant-specific, location-specific, and action-specific ARARs.

Alternatives S-3 through S-5 had 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 Alternative S-3. Alternative S-4 will attain its respective Federal and State ARARs including LDRs. Meeting LDRs is not required for Alternative 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).

Ground Water Alternatives

MCLs and/or 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 ROD would achieve the contaminant specific ARARs for ground water within the TIZ. Alternatives G-3 through 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 Sandy 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-3, S-4, and S-5 would achieve long-term effectiveness and permanence by eliminating potential future exposure (Alternatives S-3 and S-4) or reducing COC concentrations to PRGs (Alternative S-5). There is a slight increase of long-term effectiveness and permanence in Alternatives S-3 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 RCC for Alternative S-3 would require perpetual maintenance and institutional controls to ensure long-term effectiveness.

Alternative S-2 offers much less long-term effectiveness or permanence than Alternatives S-3, S-4, and S-5. Future migration of site-related contaminants may still occur under Alternative S-2 because affected soil/sediment posing unacceptable risk will remain onsite without any engineering controls. 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 protecting Sandy Creek surface water (assuming the plume is not stable) 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 protecting Sandy Creek surface water if the plume is not stable. Alternative G-3 would achieve the RAO of preventing plume expansion and protecting Sandy Creek 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 35,000 CY of soil/sediment exceeding the PRGs for human health protection will be removed and treated with thermal desorption process 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 112,000 kg (or 246,000 lbs).

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 30,000 CY of 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 82,000 kg (or 180,000 lbs).

Alternative S-3 would provide a reduction in mobility by placing the contaminated soil and sediment in a secured disposal cell. However, it would not result in reduction of toxicity or volume because no treatment would be performed prior to placement in the onsite RCC. Alternatives S-1 and S-2 do not provide 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 organic 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 Sandy 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.

Since fence installation is the only construction work required by the remedy, Alternative S-2 would provide the least short-term effectiveness as compared with the other alternatives.

There would be potential risks to construction workers during excavation of contaminated soil and sediment in Alternatives S-3, S-4, and S-5. These risks are primarily associated with equipment movement and exposure to contaminated 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-3 would present short-term risk to the nearby residents and onsite workers with the additional activity associated with staging of contaminated soil and construction of the RCC. Both Alternatives S-4 and S-5 present short-term risk 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 destruction of the Site contaminants 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.

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 protect Sandy Creek surface water. Since NAPL removal and institutional controls would not immediately eliminate the plume expansion, Alternative G-3 would require a longer period than Alternatives G-4 and G-5 to achieve the RAO for preventing plume expansion and protecting Sandy Creek 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 a longer period to achieve the RAO for preventing plume expansion and protecting Sandy Creek 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 fence installation is the only construction work required by the remedy. Alternative S-3 through S-5 would be more difficult to implement than S-2 because of the uncertainties associated with excavating in the WC, drainage ditch and wetland inlet areas.

Alternative S-3 would require construction of an onsite containment cell. Equipment, material, and labor necessary to construct the onsite RCC are conventional and available. Difficulties may be encountered during construction of the onsite disposal cell depending on the conditions of the subsurface soil. Onsite areas available for staging of the excavated soil during the construction of the RCC may be limited. Long-term maintenance of the cell would be required for this alternative.

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 ^{o}F to a maximum of about 1,000 ^{o}F. Several PAH constituents at the Site have boiling points near 1,000 ^{o}F (i.e., indeno (1,2,3-cd) pyrene = 997 ^{o}F, benzo (a,h) anthracene = 975 ^{o}F, and benzo (a) pyrene = 923 ^{o}F), and while it is possible to run the units near 1,000 ^{o}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 and G-4 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 a 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 $376K (net present value) based on $244K total capital cost, $89K 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 $4,307K (net present value) based on $3,874K 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 $15,434K (net present value) based on $15,391K 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 $9,281K (net present value) based on $9,238K 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 distant 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. Alternatives S-1 and S-2 are the least expensive alternatives.

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 $2,247K (net present value) based on $710K total capital cost, zero total LTRA cost, $1,472K 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 $5,681K (net present value) based on $2,379K total capital cost, $2,731K total LTRA cost, $506K 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 $7,876K (net present value) based on $2,896K total capital cost, $3,634K total LTRA cost, $1,281K 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 $8,694K (net present value) based on $3,097K total capital cost, $4,250K total LTRA cost, $1,282K 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
		N/A			

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
S-2	$244,000		$89,000	$43,000	$376,000
S-3	$3,874,000	N/A	$390,000	$43,000	$4,307,000
S-4	$15,391,000	N/A	$0	$43,000	$15,434,000
S-5	$9,238,000	N/A	$0	$43,000	$9,281,000
Ground Water					
G-1	$0	N/A	$0	$65,000	$65,000
G-2	$710,000	N/A	$1,472,000	$65,000	$2,247,000
G-3	$2,379,000	$2,731,000	$506,000	$65,000	$5,681,000
G-4	$2,896,000	$3,634,000	$1,281,000	$65,000	$7,876,000
G-5	$3,097,000	$4,250,000	$1,282,000	$65,000	$8,694,000

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 ground water. The contaminated soil and sediment in the WC, the drainage ditch, and the wetland water inlet area 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 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. The contaminated ground water does not pose a current or near-term threat to the surrounding residents or receptors in Sandy Creek if the plume is stable. Because PAH contaminated soil, sediment, surface water, and ground water are considered both principal threat waste and low-level threat waste, the selected alternative satisfies the statutory mandate for permanence and treatment to the maximum extent practicable.

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 the contaminated soil and sediment is Alternative S-3. To address the immediate threat posed by the waste identified at the drainage ditch, wetland water inlet area, and WC, EPA initiated a time-critical removal action immediately after completion of the draft RI/FS report in July 2005. Alternative S-3, as described in the ROD, was implemented between July 7, 2005 and March 1, 2006 under the EPA time-critical removal action program.

During the EPA time-critical removal action, the soil and sediment PRG exceedences identified in the WC, the former process area, the drainage ditch, and the wetland water inlet area were completely removed and disposed into an onsite RCC that was designed to meet the RCRA Subtitle C landfill requirements outlined in 40 CFR Part 264, subpart N. The waste removal and disposal activities are documented in a Removal Report, which is included in Appendix C of the ROD. The activities associated with construction of the RCC are documented in a Construction Quality Assurance Report (CQAR). The CQAR is included in Appendix D of the ROD. The selected remedy for contaminated soil is illustrated in Figure 9.

In addition to removal and onsite disposal of the soil and sediment PRG exceedences in an RCC, as the main components of the selected remedy, institutional controls and environmental monitoring are also being implemented at the Site. These main components of the selected remedy for contaminated soil and sediment are described below.

Institutional Controls

Because waste material would be left onsite, ICs are required to maintain the permanence and effectiveness of the selected remedy for soil and sediment at the Site. Since the future land use could potentially be redevelopment for commercial or industrial use, the objective of the ICs is to maintain a future industrial or commercial land use scenario for both onsite and contaminant impacted offsite properties, and to maintain the integrity and protectiveness of the onsite RCC.

The mechanism to implement the ICs would 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 the City of Jasper (onsite), and BNSF Railroad, Lucille Martindale and LP Corporation (offsite). In the alternative, the State of Texas will issue a Deed Notice. The City of Jasper, BNSF, Lucille Martindale and LP are not a Potentially Responsible Party (PRP) at this Site, so an enforceable Restrictive Covenant (to the favor of the TCEQ and the State of Texas) must be voluntarily agreed to and signed by each property owner. The RCC has been 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. Negotiations must be held with the City of Jasper, BNSF Railroad, Lucille Martindale and LP Corporation. Voluntary agreement must be sought, since these entities are not a PRP at the Site. Future responsibilities for IC management will be negotiated with the City of Jasper and current onsite and offsite property owners. BNSF Railroad presently owns the land adjacent to the east of the Site, for the purpose of operating a rail line. Lucille Martindale and LP own separate land tracts east of the railroad, where the Wetland Area is located.

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. The ground water monitoring program is included in the selected remedy for 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 surface water in Sandy Creek 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 Sandy Creek 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 will include installing a NAPL recovery system to remove the free phase and residual NAPL identified at the Site; 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 the contaminated ground water is managed within the PMZ. The selected ground water remedy is illustrated in Figure 10. The main components of the ground water remedy are discussed below.

NAPL Recovery

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 at the Site. 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. Three 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 Sandy 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 Sandy 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 frame. 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 and offsite 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 12 acres, is defined horizontally by monitor wells MW-05 and MW-12 in the north, by M-3S/3D and M-5/M5S in the west, by MW-08 and MW-13 in the east, and by MW-16 and MW-17 in the south direction. The TIZ is defined depth-wise as the ground water found in the Zones P1 and P3 from ground surface to approximately 150 (onsite) or 130 (offsite) feet bgs.

Institutional Controls

A PMZ, as shown in Figure 10, 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 or 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 P1 and P3 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 negotiated with all affected property owners. Since the contaminated ground water plume underlies the onsite property and the offsite property owned by BNSF Railroad, Lucille Martindale and LP Corporation, and the current offsite property owners are not a PRP for the Site, the Restrictive Covenants 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 the City of Jasper 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 and sediment and ground water, to quantify the natural attenuation rate, and to verify that the contaminated ground water is managed within the PMZ. This ground water monitoring program will include sampling of approximately 20 wells on a semi-annual 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

According to the 2005 EPA removal action, implementation of the selected remedy for contaminated soil and sediment costs approximately $3.5 millions. This cost is close to the total capital cost ($3.9 millions) estimated in the original RI/FS Report. Since the selected remedy for contaminated soil and sediment has been implemented, the estimated cost for implementation of this selected remedy will not be detailed in the ROD.

The estimated costs for implementation of the selected remedy for ground water are detailed in Table 7 (for Alternative G-3) and Table 8 (for the hydraulic containment component in Alternative G-4). The costs are estimated based on the best available information regarding the anticipated scope of the selected remedy for the contaminated ground water. 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 soil 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 P1 and P3 ground water within the PMZ will be restricted from private and industrial use.

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Jasper 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 the Site	1	LS	$10,000.00	$10,000
Site Clearing For Drill Rig Access	1	LS	$15,000.00	$15,000
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	$125.00	$10,000
PRE-DESIGN INVESTIGATION				
Aquifer Testing				
Conduct 8 hour Drawdown/Recovery Test at Wells M-3S/3D	50	HR	$125.00	$6,250
Equipment Rental	1.5	Week	$3,000.00	$4,500
Per Diem	6	Day	$150.00	$900
Data Evaluation	40	HR	$125.00	$5,000
Installation of Ground Water Monitoring Wells				
Mobilization/Demobilization of Drilling Subcontractor and Equipment to Site	1	LS	$10,000.00	$10,000
Install Ground Water Monitor Well to a Depth of 70' in the NAPL Source Area	210	LF	$200.00	$42,000
Replace Monitor Wells Damaged During the Removal Action	140	EA	$200.00	$28,000
Install Two CMT Monitor Wells at Creek (50 ft) and SE of MW14 (90 ft).	140	LF	$200.00	$28,000
Per Diem	16	Day	$150.00	$2,400
Monitor Well Development	7	EA	$1,350.00	$9,450
Monitor Well Surveying	1	LS	$7,000.00	$7,000
Quarterly Ground Water Sampling				
Ground Water Sampling - Conventional Monitor Wells	40	EA	$600.00	$24,000
Ground Water Sampling - CMT Wells	60	EA	$600.00	$36,000
Sampling Equipment	40	EA	$250.00	$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

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Jasper Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
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
SUBTOTAL				**$590,250**
Contingency	20%		$590,250	$118,050
SUBTOTAL - PRE-DESIGN INVESTIGATION COST				**$708,300**
NAPL RECOVERY SYSTEM				
NAPL Recovery Testing				
NAPL Recovery Test	1	LS	$10,000.00	$10,000
Sample Analysis	2	EA	$1,000.00	$2,000
Implementation of NAPL Recovery System				
Install NAPL Extraction Well with Pump, Controls and Probe	4	EA	$20,000.00	$80,000
NAPL Extraction Well Development	32	HR	$150.00	$4,800
Install a Microtunnel to Convey Fluids from East Side of R/R Tracks to West	1	LS	$35,000.00	$35,000
Install NAPL Removal and Ground Water Treatment System	1	LS	$731,600.00	$731,600
Install Ground Water Injection Well with Pump and Piping	4	EA	$20,000.00	$80,000
Conveyance Piping to Treatment Site (double wall pipe) from Extraction Wells	1600	LF	$32.00	$51,200
SUBTOTAL				**$994,600**
Contingency	20%		$994,600	$198,920
SUBTOTAL				**$1,193,520**
General Requirements:	10%		$1,193,520	$119,352
Misc. Un-scoped Items	10%		$1,193,520	$119,352
Permitting & Legal	5%		$1,193,520	$59,676
Services During Construction	15%		$1,193,520	$179,028
Engineering & Design Cost	12%		$1,193,520	$143,222
SUBTOTAL - CONSTRUCTION COST				**$1,670,928**
OPERATION AND MAINTENANCE COST				
ANNUAL LTRA COST *(assume 10 years)*				
DNAPL Extraction and GW Injection System Operation	1	LS	$150,000.00	$150,000

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Jasper Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
Offsite Transport and Disposal of Recovered NAPL	1	2 KGAL	$3,000.00	$3,000
Semiannual Ground Water Sampling	50	EA	$600.00	$30,000
Per Diem	40	Day	$150.00	$6,000
Sampling Equipment	20	EA	$250.00	$5,000
Annual surface Water and Sediment Sampling at Wetland Area	1	LS	$3,000.00	$3,000
Analyze Ground Water Samples for SVOCs	53	EA	$250.00	$13,250
Analyze GW Samples for BTEX, Metals, and Natural Attenuation Parameters	25	EA	$500.00	$12,500
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				**$270,030**
Overhead and Profit		20%		$54,006
SUBTOTAL				**$324,036**
Contingency		20%		$64,807
TOTAL - Annual LTRA Cost				**$388,843**
ANNUAL O&M COST (for the Years after LTRA)				
Annual Ground Water Sampling	25	EA	$600.00	$15,000
Per Diem	20	Day	$150.00	$3,000
Sampling Equipment	10	EA	$250.00	$2,500
Analyze Ground Water Samples for SVOCs	27	EA	$250.00	$6,750
Analyze GW Samples for BTEX, Metals, and Natural Attenuation Parameters	13	EA	$500.00	$6,500
Data Validation and Interpretation	1	LS	$20,000.00	$20,000
Project Management Costs - Ground Water Monitoring	96	HR	$120.00	$11,520
SUBTOTAL				**$65,270**
Overhead and Profit		20%		$13,054
SUBTOTAL				**$78,324**
Contingency		20%		$15,665
TOTAL - Annual O&M Cost				**$93,989**
TOTAL COST				
TOTAL - Capital Cost				**$2,379,000**
TOTAL - Periodic Cost				**$65,000**
TOTAL – LTRA Cost (from 1 to 10 years)				**$2,731,000**

TABLE 7
Estimated Cost for the Selected Remedy for Contaminated Ground Water
Jasper Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
TOTAL - O & M Cost (from 11 to 30 years)				**$506,000**
TOTAL – Net Present Value				**$5,681,000**

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 8
Estimated Cost for Implementation and Operation of Hydraulic Containment System
Jasper 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	3	EA	$20,000.00	$60,000
Containment Well Development	30	HR	$150.00	$4,500
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	1500	LF	$42.00	$63,000
Concrete Slab, Containment and Shelter for EQ and GAC	1	LS	$50,000.00	$50,000
SUBTOTAL				**$307,000**
Contingency	20%		$307,500	$61,500
SUBTOTAL - CONSTRUCTION COST				**$369,000**
General Requirements	10%		$369,000	$36,900
Misc. Unscoped Items	10%		$369,000	$36,900
Permitting & Legal	5%		$369,000	$18,450
Services During Construction	15%		$369,000	$55,350
Engineering & Design Cost	12%		$369,000	$44,280
SUBTOTAL - IMPLEMENTATION COST				**$516,600**
OPERATION AND MAINTENANCE COST				
ANNUAL LTRA COST *(assume 10 years)*				
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 LTRA Cost				**$144,000**
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 8
Estimated Cost for Implementation and Operation of Hydraulic Containment System
Jasper Creosoting Company – Jasper, Texas

Description of Remedial Actions	Quantity	Unit	Unit Cost	Total Cost
TOTAL COST				
TOTAL - Capital Cost				**$517,000**
TOTAL - Periodic Cost				**$0**
TOTAL – LTRA Cost (from 1 to 10 years)				**$1,011,000**
TOTAL - O & M Cost (from 11 to 30 years)				**$776,000**
TOTAL – Net Present Value				**$2,304,000**

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

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 for the Site are for industrial or commercial reuse, there are no anticipated environmental or ecological benefits from the selected remedy for the onsite area. For the offsite wetland area, the environmental or ecological benefits are anticipated within 1 year after removal of source materials from the drainage ditch and wetland water inlet area.

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 onsite containment of the contaminated soil/sediment, and removal and treatment of free phase and residual NAPL in the saturated zone to the extent practicable. The soil and sediment containment cell and NAPL extraction and offsite treatment process would contain and immobilize the hazardous substances present in these media. The utilization of an onsite RCC would minimize future leaching of contaminants from the waste into the ground water and reduce the short-term risks by eliminating the offsite transport of treated or untreated waste. The excavation of waste material and replacement with natural soil would also prevent direct contact with the residual wastes below PRGs.

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

- Protection of Wetlands Executive Order No. 11990 (40 CFR §6.302(a) and Appendix A Clean Water Act Section 404). This federal regulation requires federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists. Applicable to the Site because the selected remedy includes excavation of heavily contaminated soil/sediment from the wetland water inlet area.

- 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. This requirement is 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 for the selected remedies is **$4,307,000 for contaminated soil and sediment** and **$5,681,000 for contaminated ground water**. The alternatives ranged in cost from $43,000 to $15,434,000 for soil and sediment and $65,000 to $8,694,000 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. If the ground water plume is not stable or has a potential to impact the Sandy Creek surface water quality, a hydraulic containment system can be easily added to the selected remedy to prevent plume expansion or to minimize the impact to the surface water quality. The selected remedy for contaminated soil and sediment provides the most effective engineering control 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 25, 2005. 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 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 documents, 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 25, 2005. Documents and information EPA relied on in making its recommendations in the Proposed Plan were made available to the public on or before July 25, 2005, 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, 2005. The EPA held a public meeting to receive comments and answer questions on August 3, 2005, 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

Comment (by letter dated July 29, 2005): The TCEQ Superfund Cleanup Section provided comments on the Preferred Remedial Alternatives, S-3 and G-3, in the Proposed Plan. The specific comments for Alternative S-3 were: 1) Uncertainty regarding the amount of soil to be excavated and placed into the RCRA vault, 2) Design of the RCRA vault in relation to the seasonal high water table and associated leachate problems, and 3) Institutional Controls on the RCRA vault and

the drainage ditch area. The specific comment for Alternative G-3 was: 4) The efficiency of this alternative is predicated on the removal of the contamination sources.

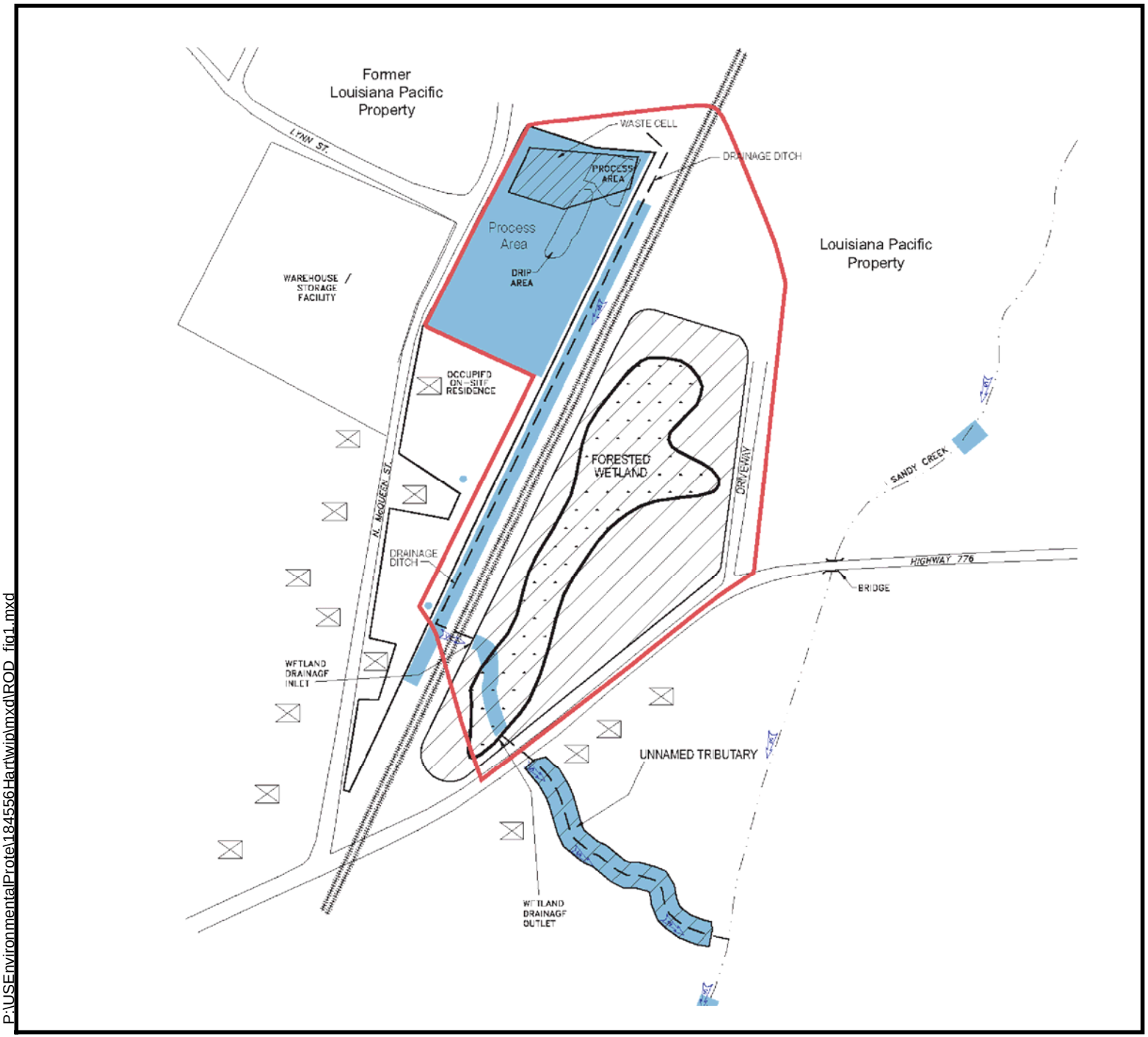
EPA Response: 1)This EPA ROD for the JCC Site estimates a total volume of 35,000 cubic yards (CY) of contaminated soil and sediment requiring excavation and disposal. The EPA Action Memorandum dated June 30, 2005, implementing elements of this remedy estimates 50,000 CY of soil and sediment be removed to ensure the RCRA vault is designed and built to accommodate all the excavated waste (35,000 CY), plus contingencies for soil volume increases during excavation. 2) EPA will design the vault with an EPA approved engineering contractor that will meet the design criteria of the TCEQ. TCEQ has assigned an engineer to this Site to review and approve the RCRA vault design. The seasonal water table is estimated to fluctuate between 30 feet bgs to 44 feet bgs at MW-5. 3) EPA agrees that Institutional Controls are a necessary component of the remedy. IC implementation is discussed in the Selected Remedy section of this ROD. 4) The remedy will remove the existing contamination sources present in the temporary WC, the drainage ditch and the wetland inlet area. These sources are an estimated 35,000 CY. Source removal coupled with NAPL removal to the extent practicable will achieve the remedial action objectives (RAOs) for the Site.

Comment: On August 3, 2005 while attending the EPA Public Meeting on the former Jasper Creosoting Company site, abandoned in 1992, my sister and I learned that we and our family could have possibly been exposed to harmful chemical contamination from 1959 to 1972. We lived on Edgewood Street just yards from the railroad tracks.

EPA Response: Edgewood Street is approximately 4000 feet southwest of the JCC Site, south of Highway 776 and west of the BNSF Railroad tracks. Site soil and sediments that exceed the preliminary remediation goals (PRGs) are confined to the Site, the drainage ditch and the inlet to the wetland area east of the Site. All contaminated soil and sediment that poses risk to human health are north of Highway 776. The current contaminated ground water plume, as well, extends to the southeast of the Site and is bounded by Highway 776 to the south. No drinking water wells are located within the ground water plume. There is no current risk to Sandy Creek and there are no known impacts from the Site to residents of Edgewood Street.

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

- Residence
- RI Study Areas
- Flow Pathway
- Wetland
- EE/CA Investigation Areas
- BASF Railroad
- Site Property
- Ditch
- Creek
- Groundwater Study Area

N

0 500

Approximate Scale in Feet

Figure 1
Site Location and
Layout Map

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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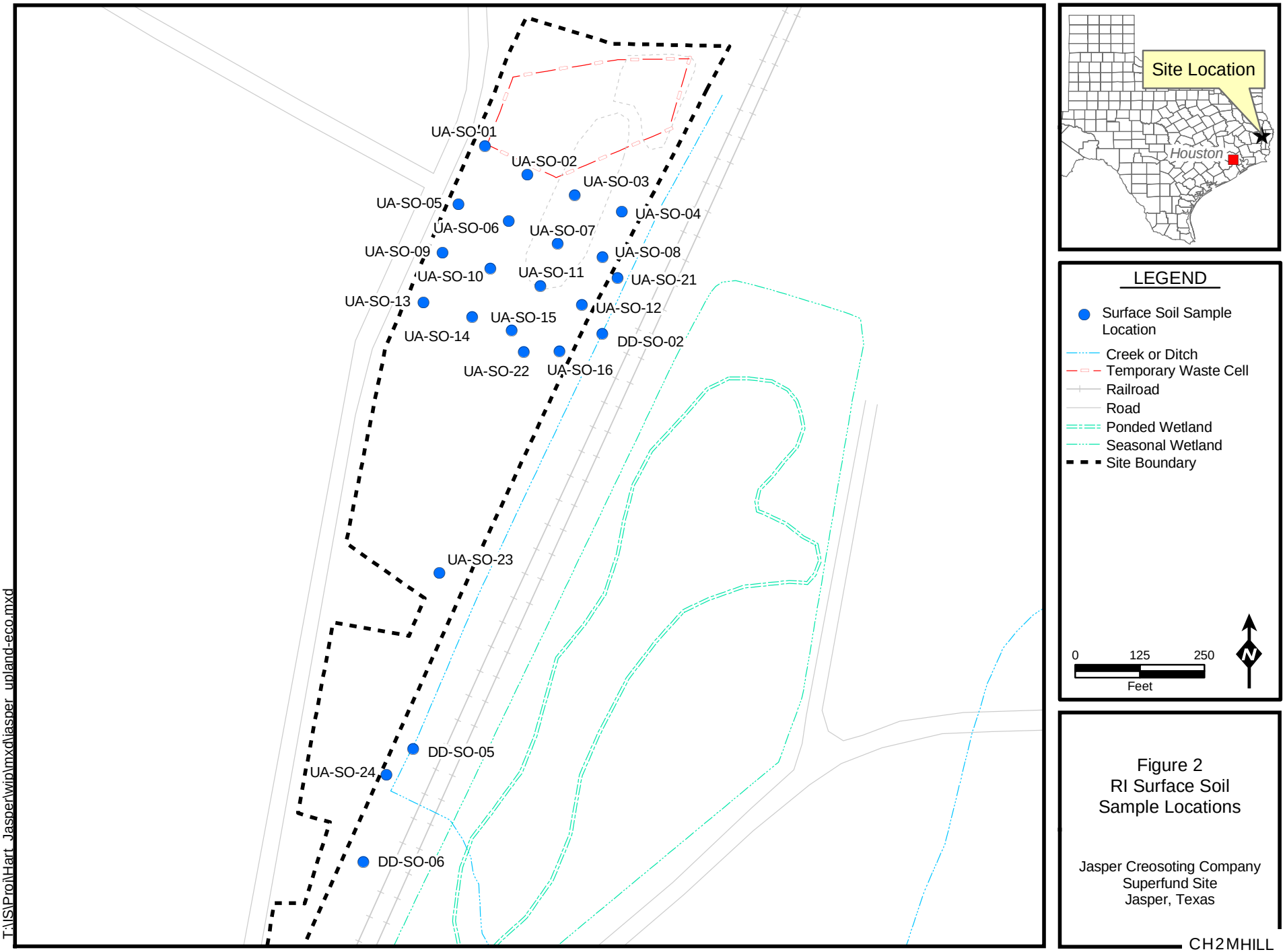

Figure 2
RI Surface Soil Sample Locations

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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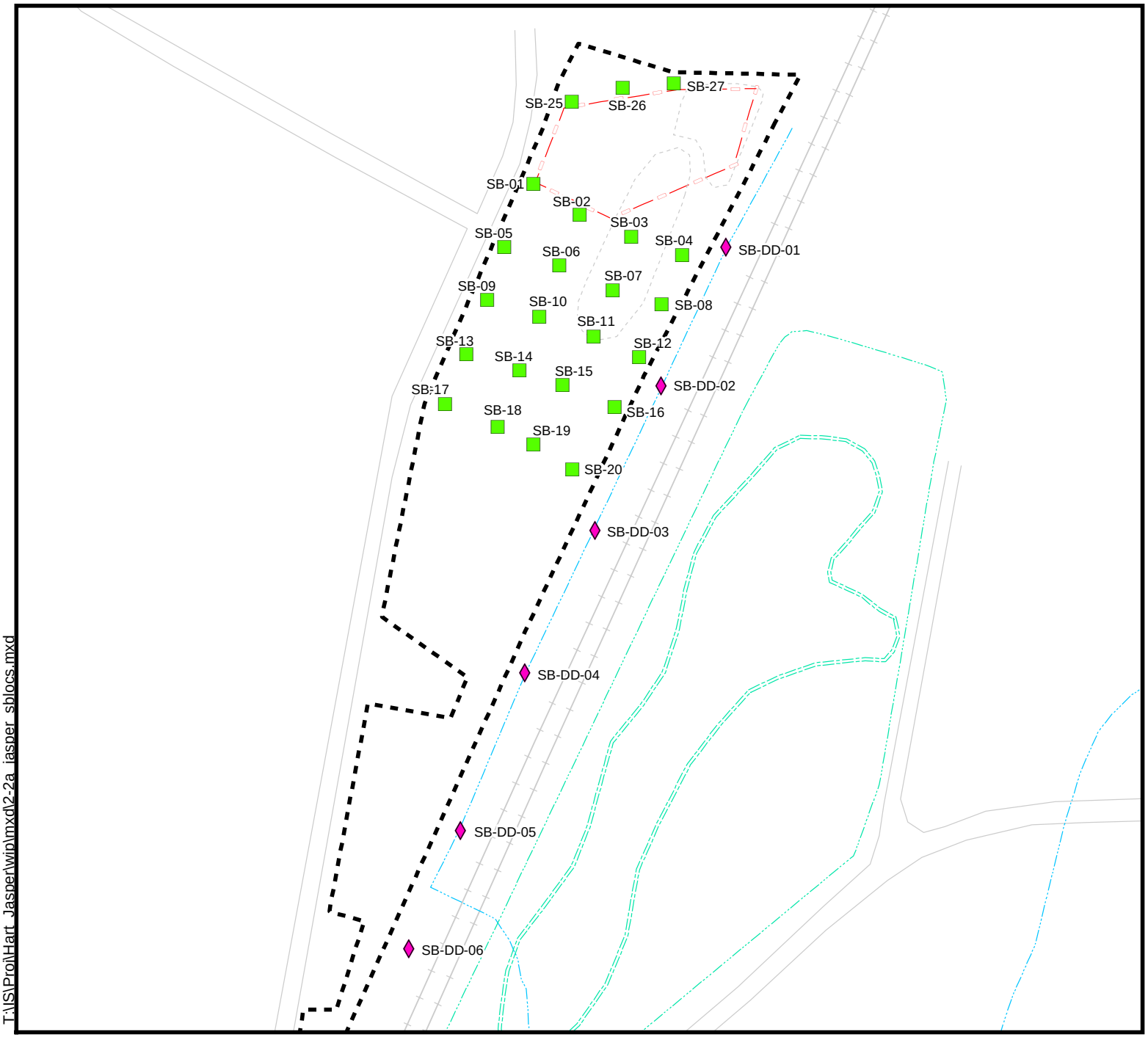

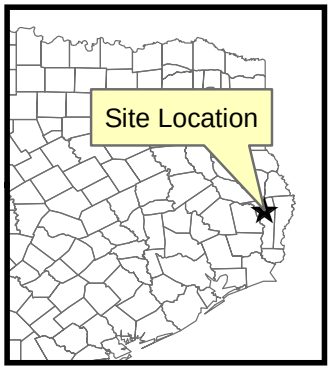

LEGEND

- SB-02 — Former Process Area Geoprobe Soil Boring Location
- SB-DD-01 — Drainage Ditch Geoprobe Soil Boring Location
- Creek or Ditch
- Temporary Waste Cell
- Railroad
- Road
- Ponded Wetland
- Seasonal Wetland
- Site Boundary

0 125 250
Feet

N

Figure 3
RI Subsurface Soil Sample Locations

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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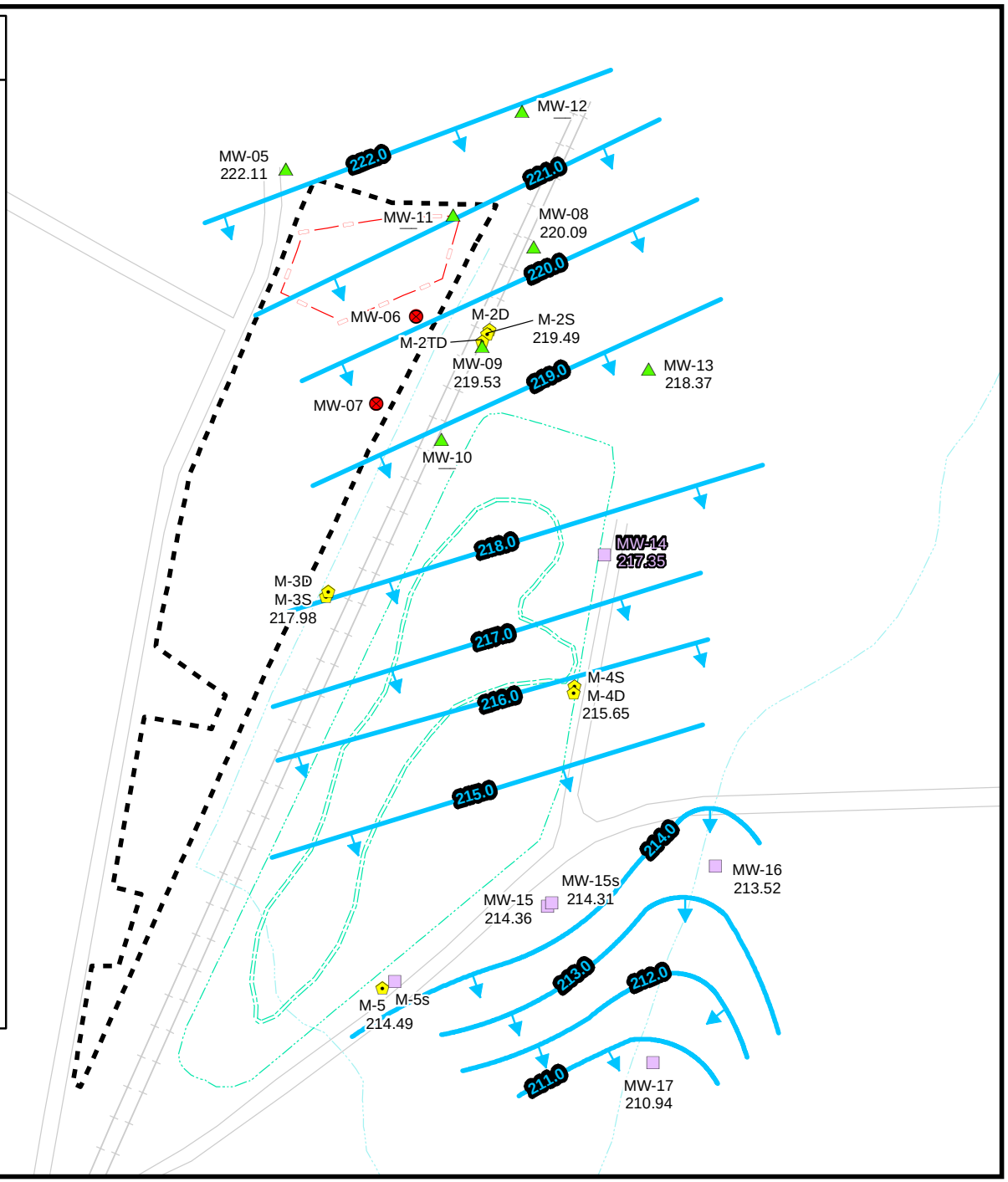
Well	Mid-Screen (Ft.) Depth	Elev.
M-2S	35	198.9
M-2D	57	176.5
M-2TD	100	133.8
M-3S	48	181.4
M-3D	78	151.4
M-4S	30	192.2
M-4D	79	143.2
M-5	39	179.2
M-5s	30	187.7
MW-05	60	195.1
MW-08	30	203.4
MW-09	34	199.8
MW-10	17	214.4
MW-11	27	221.7
MW-12	25	215.8
MW-13	30	194.0
MW-14-1	25	198.6
MW-14-2	35	188.6
MW-14-3	47.5	176.1
MW-14-4	57.5	166.1
MW-14-5	67.5	156.1
MW-14-6	77.5	146.1
MW-14-7	90	133.6
MW-15-1	15	204.7
MW-15-2	28	141.7
MW-15-3	35	184.7
MW-15-4	41	178.7
MW-15-5	60	159.7
MW-15-6	75	144.7
MW-15-7	87	132.7
MW-15s	30	189.5
MW-16-1	10	206.9
MW-16-2	20	196.9
MW-16-3	35	181.9
MW-16-4	50	166.9
MW-16-5	60	156.9
MW-16-6	70	146.9
MW-16-7	82.5	134.4
MW-17-1	10	204.6
MW-17-2	15	199.6
MW-17-3	23.5	191.1
MW-17-4	32	182.6
MW-17-5	37	177.6
MW-17-6	42	172.6
MW-17-7	78.5	136.1



LEGEND

- Existing RCRA Monitor Well (1983)
- RI Monitor Well Location
- SRI Monitor Well Location
- Abandoned/Plugged RI Monitor Well
- 221 — August 2006 Ground Water Elevation Contour
- Inferred Direction of Ground Water Flow
- Stream
- Fence
- Seasonal Wetland
- Railroad
- Road
- Ponded Wetland
- Site Boundary

0 175 350
Feet

N

Figure 4
RI Ground Water
Sample Location Map

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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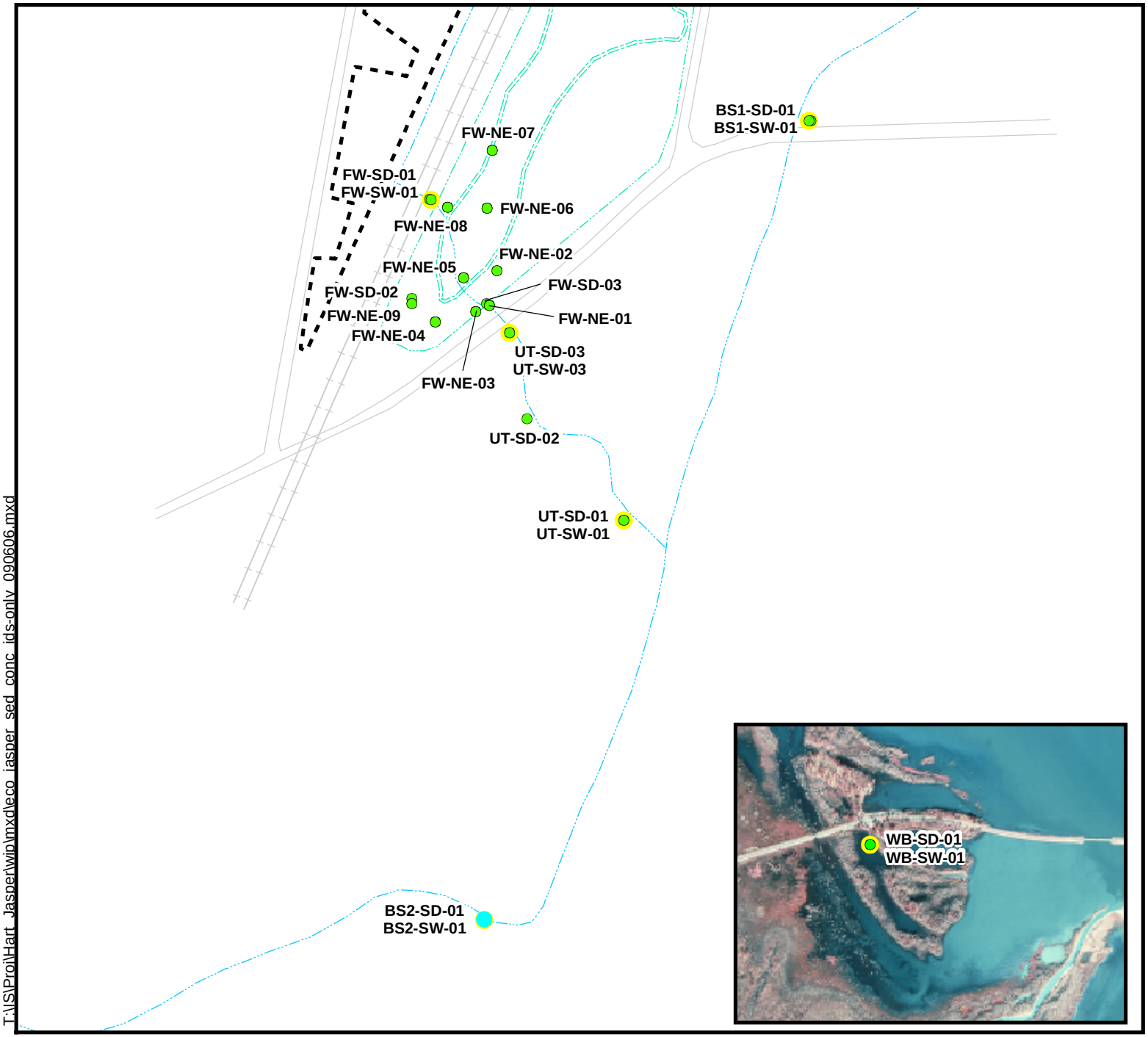

LEGEND

- Sediment Sample Location
- Surface Water and Sediment Sample Location
- Creek or Ditch
- Fence
- Railroad
- Road
- Ponded Wetland
- Seasonal Wetland
- Site Boundary

0 200 400
Feet

N

Figure 5
RI Surface Water and Sediment Sample Locations

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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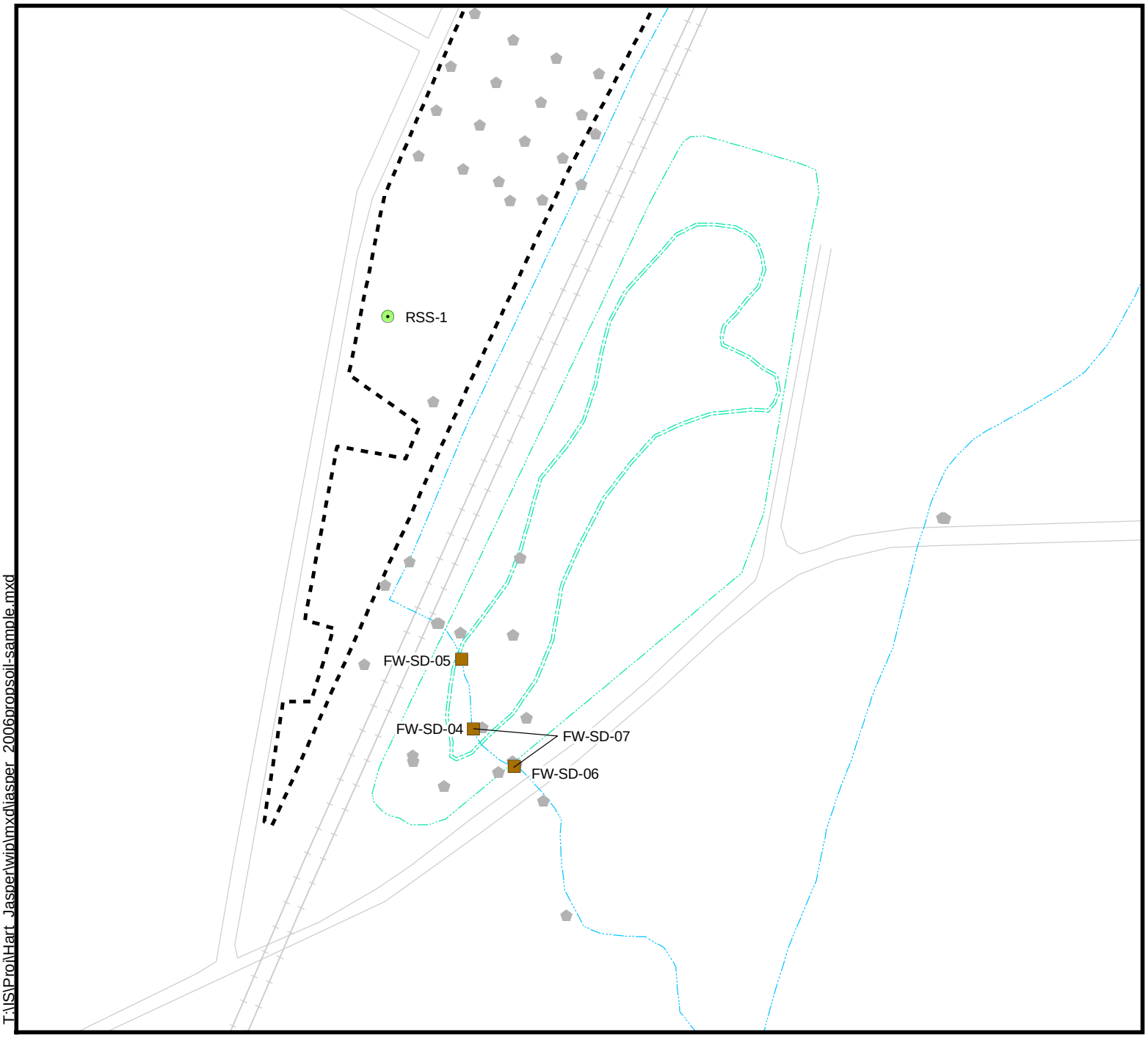

LEGEND

- SRI Sediment and Bioassay Sampling Location
- SRI Soil Sample Location
- Historical Eco Sampling Location
- Creek or Ditch
- Railroad
- Road
- Ponded Wetland
- Seasonal Wetland
- Site Boundary

0 150 300
Feet

N

Figure 6
SRI Soil and Sediment Sample Locations

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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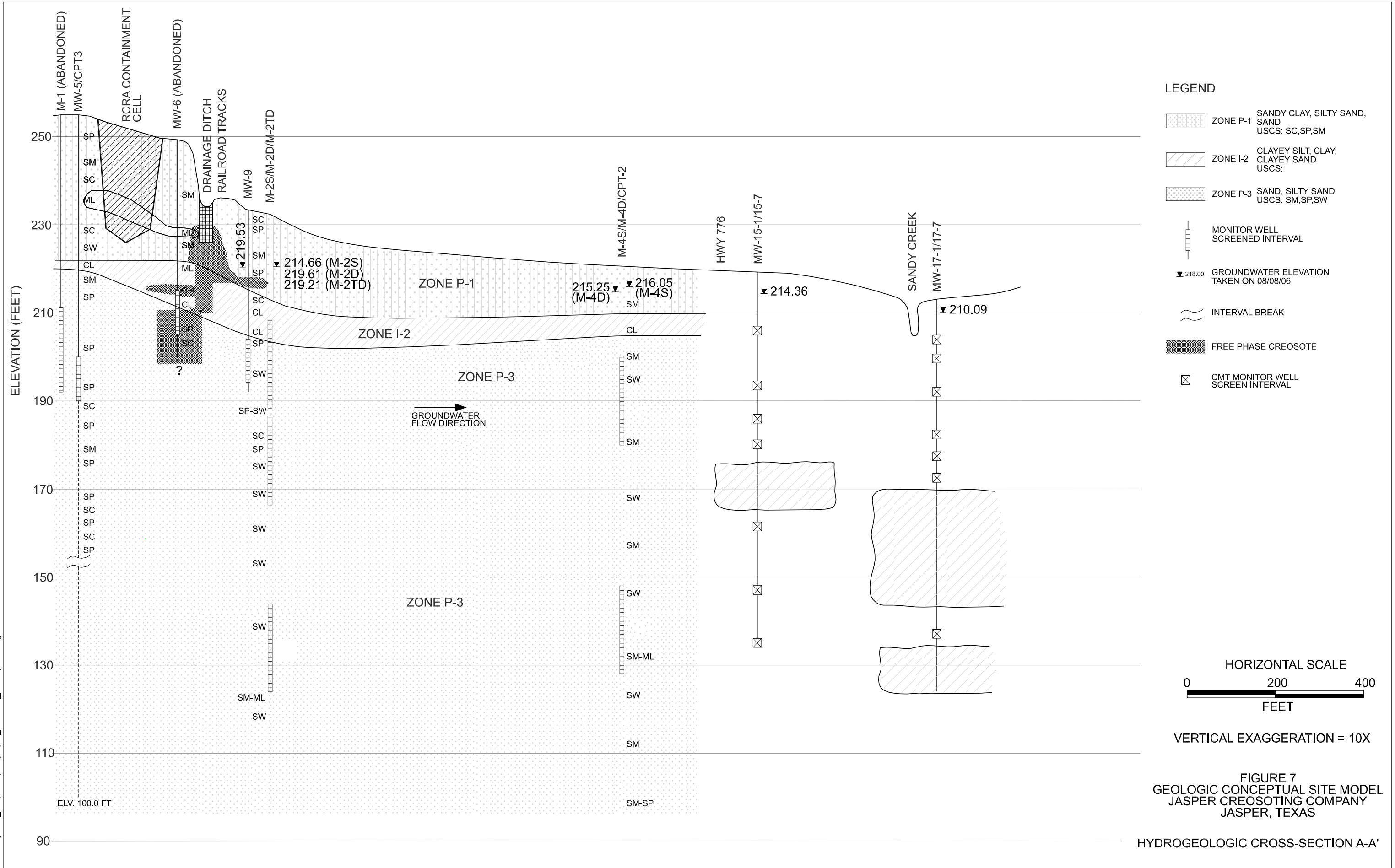

FIGURE 7
GEOLOGIC CONCEPTUAL SITE MODEL
JASPER CREOSOTING COMPANY
JASPER, TEXAS

HYDROGEOLOGIC CROSS-SECTION A-A'

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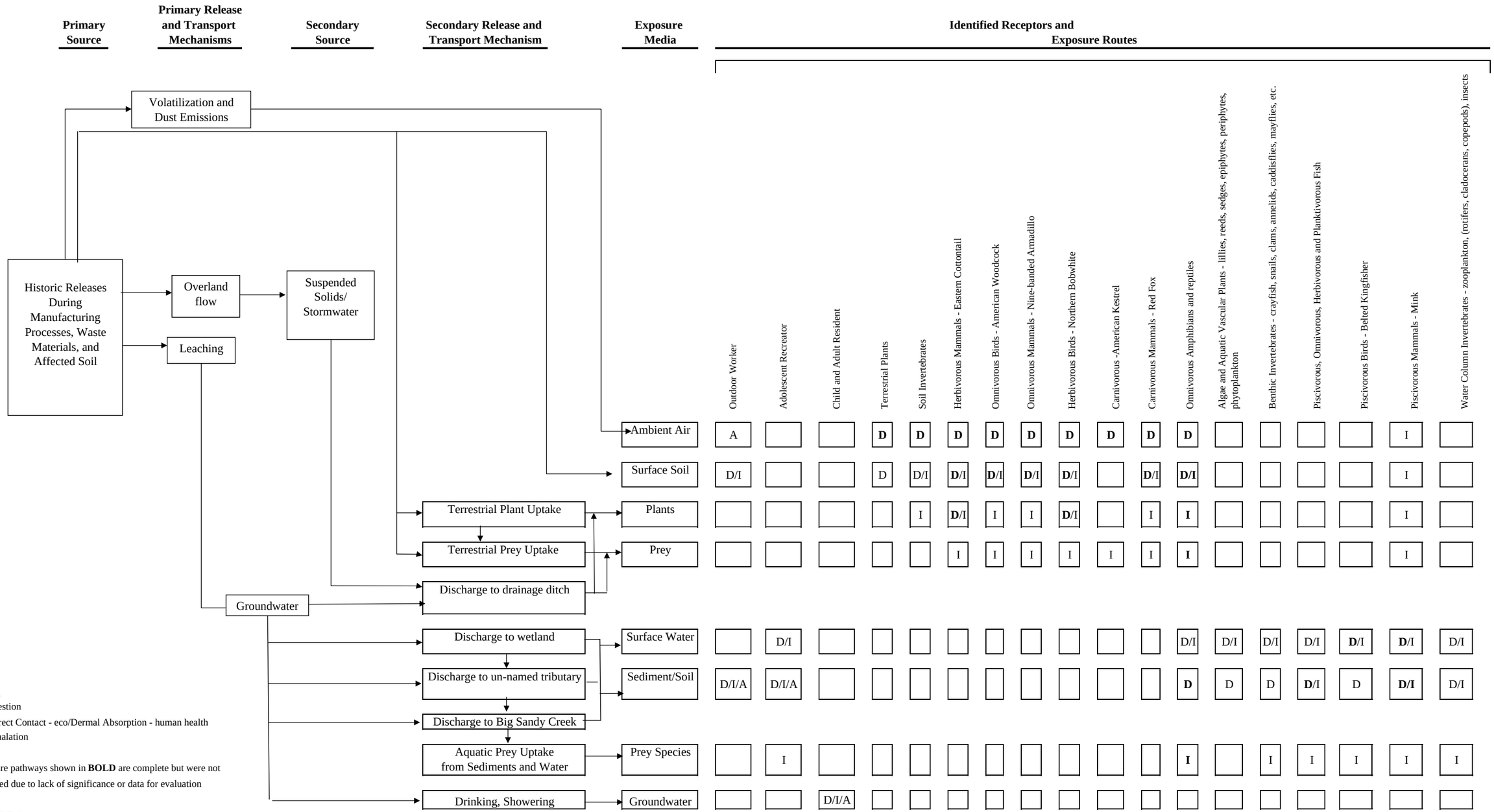
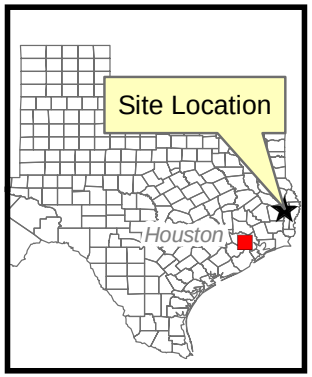


Legend
I = Ingestion
D = Direct Contact - eco/Dermal Absorption - human health
A = Inhalation

Exposure pathways shown in **BOLD** are complete but were not evaluated due to lack of significance or data for evaluation

FIGURE 8
Human Health and Ecological Conceptual Site Model
Jasper Creosoting Company - Jasper, Texas



LEGEND

- Proposed RCRA Containment Cell
- Proposed Soil/Sediment Excavation Area
- Creek or Ditch
- Railroad
- Road
- Ponded Wetland
- Seasonal Wetland
- Site Boundary

0 125 250
Feet

N

Figure 9
Selected Remedial Alternative for Contaminated Soil and Sediment

Jasper Creosoting Company
Superfund Site
Jasper, Texas

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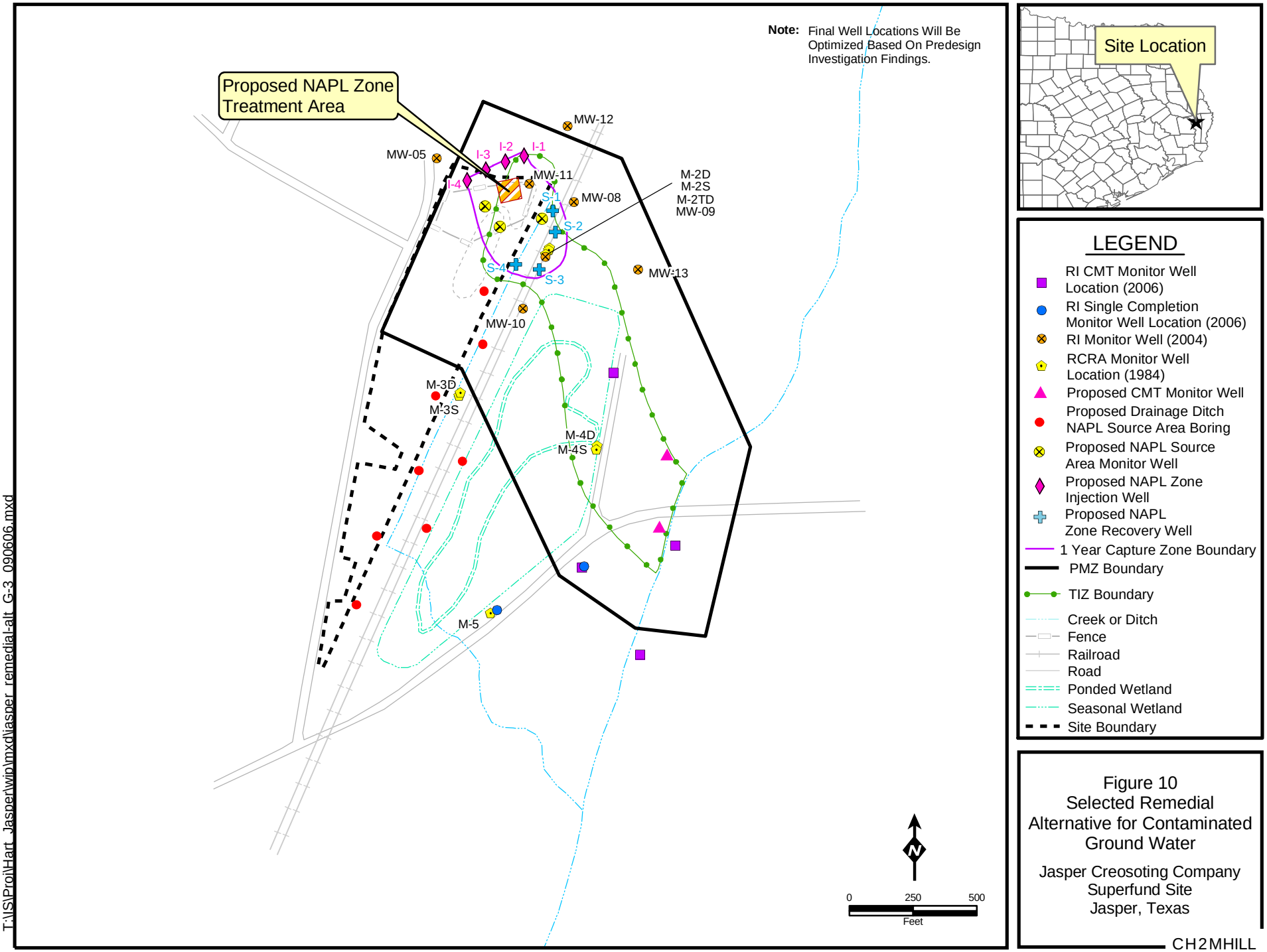

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Figure 10
Selected Remedial Alternative for Contaminated Ground Water

Jasper Creosoting Company Superfund Site
Jasper, Texas

CH2MHILL

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 30, 2006

Mr. Samuel Coleman, P.E., Director
Superfund Division
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Re: Record of Decision
Jasper Creosoting Company Superfund Site TXD008096240
Jasper, Jasper County, Texas

Dear Mr. Coleman:

The Texas Commission on Environmental Quality (TCEQ) received your final Superfund Record of Decision (ROD) for the Jasper Creosoting Company (Jasper) Superfund Site in Jasper, Texas, on September 15, 2006. The TCEQ has completed the review of the above referenced document and conditionally concurs that the response action for the Jasper site described in the ROD is the most appropriate remedy for this site.

The ROD states that institutional controls (ICs) are required to maintain the permanence and effectiveness of the chosen remedy, which includes preventing access and ingestion of contaminated groundwater by preventing the construction of water supply wells within the Plume Management Zone (PMZ). The ROD identifies a governmental ordinance, a restrictive covenant, a deed notice, and PMZ registration with the Texas Department of Licensing and Regulation (TDLR) and the Southeast Texas Groundwater Conservation District as ICs.

This item is very important to the TCEQ in addressing the contamination at the site. Thus, if you do not agree with the TCEQ's position as outlined above, please do not consider this letter a concurrence with the ROD for the Jasper site. However, based on discussions between our staffs, I'm optimistic that we can move forward.

Sincerely,

Glenn Shankle
Executive Director

GS/AH/cw

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

November 22, 2006

Mr. John Hepola, Associate Director
Remedial Branch
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Re: Correction to Record of Decision Concurrence Letter
Jasper Creosoting Company Superfund Site TXD008096240
Jasper, Jasper County, Texas

Dear Mr. Hepola:

The Texas Commission on Environmental Quality (TCEQ) had sent to Region 6 two (2) letters of conditional concurrence for the Jasper Creosoting Company (Jasper) Record of Decision (ROD) and the Hart Creosoting Company (Hart) ROD on October 30, 2006. Each letter contained a discussion of the institutional controls (ICs); however, due to an administrative error the second IC paragraph was omitted in the attached Jasper letter. The paragraph to be added between the second and last paragraphs of the Jasper letter should read as follows:

> Under the substantive requirements of 30 Texas Administrative Code 350.111, ICs include restrictive covenants, deed notices and specific governmental ordinances. PMZ registration with the TDLR and the Southeast Texas Groundwater Conservation District fail to meet the substantive requirements of 30 TAC 350.111 and do not meet the TCEQ's definition of an IC. Therefore, the TCEQ is not responsible for maintaining or enforcing PMZ registration with the TDLR and the Southeast Texas Groundwater Conservation District.

I apologize for any confusion this administrative error may have caused.

Sincerely,

M.A. Barne for
A. U. Rahman

Ata U. Rahman, P.G.
Manager
State Lead Section

AR/AH/jc